

# FLORA AND ECOLOGICAL ANALYSIS OF THE VEGETATION OF THE FUNK FOREST NATURAL AREA, McLEAN COUNTY, ILLINOIS

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## INTRODUCTION

The purposes of this investigation were (1) to compile a list of vascular plants and (2) to analyze the vegetation of the Funk Forest Natural Area. This newest acquisition to the University of Illinois preserves is in the east-central part of Illinois, about

fifteen miles southwest of Bloomington, between the towns of Funks Grove and McLean (fig. 1). It is off U. S. Highway 66 in the southeast corner of Section 19, Funk's Grove Township, McLean County.

The Funk Forest Natural Area was presented to the University of

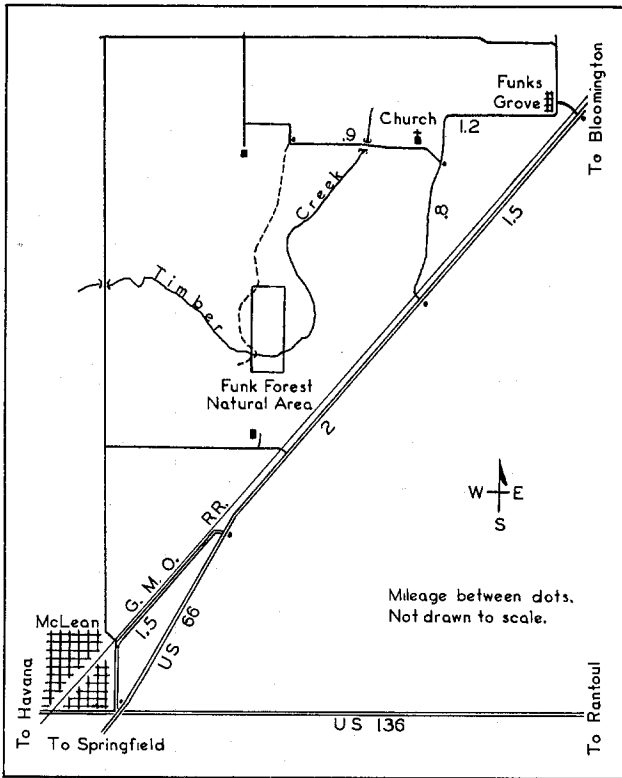


FIG. 1.—Location of the Funk Forest Natural Area.

Illinois, February 19, 1950, by the great-grandchildren of pioneer Isaac Funk. He settled at Funks Grove in 1824 and by 1863 he had purchased nearly 25,000 acres of land (Cavanagh, 1952). This portion of his original estate has been preserved since it was acquired in 1833. Thus, the tract now stands as a sample of prairie grove timber that has been fairly well preserved. It is to be used for scientific investigations of its plant and animal life and of its soil conditions.

The tract is about 2625 feet long and 1039 feet wide, an area of approximately 63 acres. Surrounding land was identified as slash timber, second-growth timber, brushy forest edge, grassy bottomland, pastured grassland, cleared pastured woodland, and uncleared pastured woodland (fig. 2). Evidence of cultural

disturbance within the preserve consisted of stumps and logs from a small amount of felled timber, logging wagon trails, refuse dumps, cattle trails and grazing.

#### METHODS

This study began February 25, 1950, and ended November 1, 1951. Field trips were made biweekly in spring and summer seasons, weekly in autumn, and bimonthly in winter. The study area was divided into 50-meter square quadrats using a coordinate system (fig. 3). The base line, from which transect lines extended at right angles, coincided with the surveyor's north boundary line. A cornerstone at the northeast corner was the zero-point. Lath stakes marked quadrat corners. A tree nearest each corner was posted

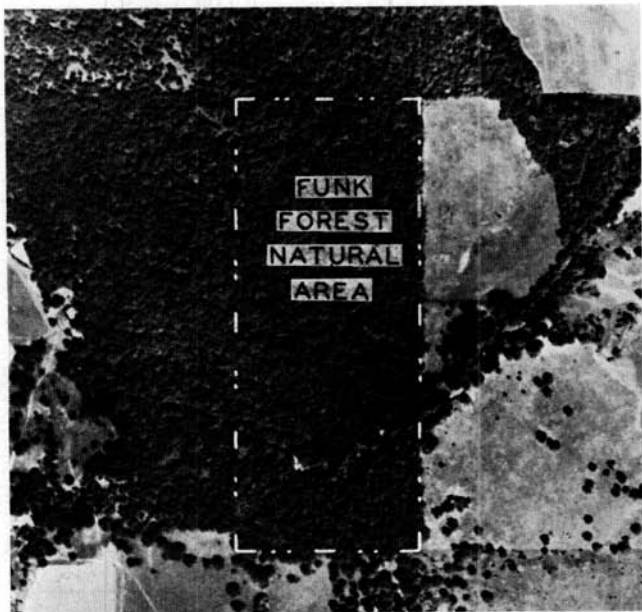


FIG. 2.—Aerial photograph of the Funk Forest Natural Area (U.S.D.A. X-5A-132, July 6, 1940).

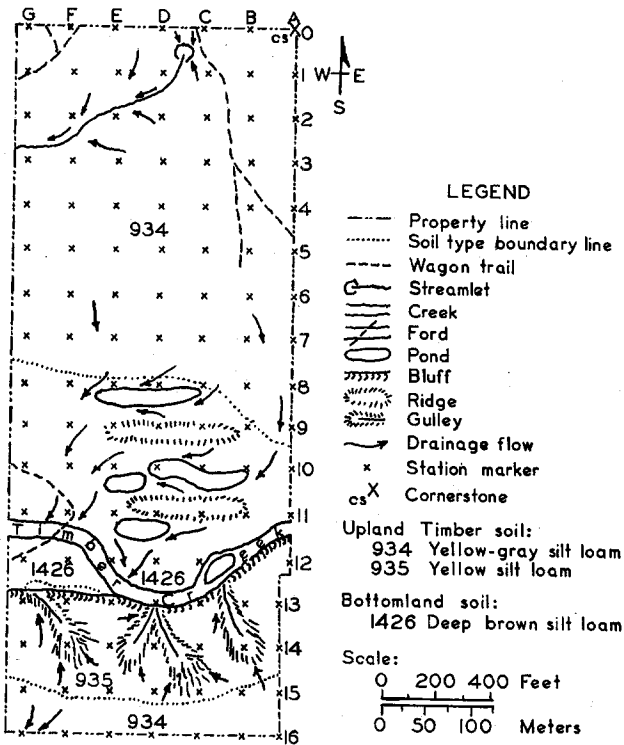


FIG. 3.—Field map of the study area.

with two types of markers. One was a small wooden nursery tag bearing the station reference number. The other consisted of a set of four yellow oilcloth tags, 3 by 5 inches, to provide for optimum visibility. Station reference numbers were marked on the oilcloth with black china-marking pencil. The tags were placed about six feet high at four points on the tree trunk where they were visible along north-south and east-west grid lines.

The species of vascular plants recorded in the checklist were chiefly collected within the study area. All identifications were verified by Harry E. Ahles, assistant in the

Herbarium of the University of Illinois. One or more specimens of each species is deposited in the Herbarium. Reports of species not based upon specimens have been omitted. Nomenclature is based upon Jones (1950).

The floral composition of the Funk Forest Natural Area was compared with records available through 1951 for other University of Illinois woodland preserves. Data for Robert Allerton Park were taken from unpublished records (Jones, ms.). Data for the University of Illinois Woodlands, which includes Brownfield Woods and Trelease Woods, were obtained from Jones (1947). The dis-

tribution of each species is indicated by appropriate symbols in the checklist.

Methods for analysis of the dominant vegetation were based upon Chapman and Meyer (1949) and Guise (1950). The strip method was used, in which cruises were made along five strips 33 feet wide and 2625 feet long. Each strip was laid out at right angles to the base line at Stations A-O, B-O, D-O, F-O and G-O (fig. 4). This area amounted to 9.9 acres, a 15.8 percent sample. All stems three inches and greater d.b.h. were identified and measured with a tree diameter tape.

Identifications for Raunkiaer's life-form classification were based on field observations, phenological records, and collections of specimens in various developmental stages. Information for the classification of grasses was obtained from Deam (1929) and Hitchcock (1950). Sources for identification of structures were Britton and Brown (1923), DuRoi (1931) and Fernald (1950). Classifications are given in the checklist only for species collected within the study area.

#### PHYSICAL ENVIRONMENT

The Funk Forest Natural Area is in the Till Plains section of the Central Lowland physiographic province (Fenneman, 1928). The soils have been influenced primarily by Early Wisconsin glaciation. A deposit of loess covers the Leroy moraine that underlies this area (Hopkins, et al., 1915). Within the study area are found upland timber and bottomland types of soil (fig. 3). One class of upland timber soil, yellow-gray silt loam, occurs as a part of the south-

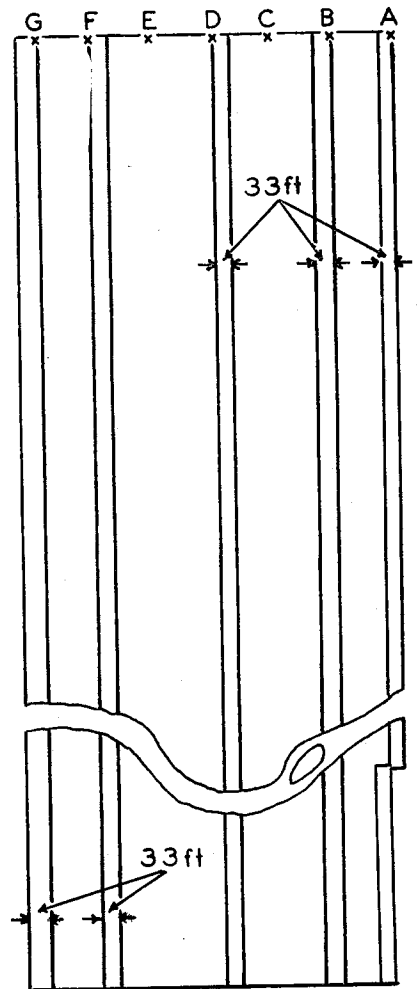


FIG. 4.—Location of five cruise strips for the tree survey.

ern margin and again in the northern end. A second class, yellow silt loam, occurs only along the south bank of Timber Creek where a high bluff has been formed. Bottomland soil, deep brown silt loam, covers the lowland north of Timber Creek. The creek bottom is varied; part is smooth clay from bluff outcrops, others sandy or strewn with rocks and boulders.

The highest elevation is 690 feet. The lowest point is about 640 feet. Areas of greatest local relief are along the deeply eroded bluff where places are as high as 40 feet above the creek bed. The slight relief in the bottomland appears as a series of three roughly concentric depressions ranging in depth from a few inches to about three feet (fig. 3). Timber Creek averages about 35 feet wide, and it is five to six feet below the north bank. The main stream is divided near the eastern margin to form an island 153 feet long and 55 feet wide. Water flows westward and there are pools that vary in depth from five to ten feet.

Drainage patterns (fig. 3) are based on field observations. Timber Creek is the principal outlet for springs that flow out of the bluff over the clay outcrops and for surface runoff. Water from thaws and floods drains through gullies cut into the banks. After overflows have receded, water stands in the depres-

sions until it evaporates and seeps away. These semi-permanent woodland ponds become stagnant and usually do not dry until late July. A second minor outlet is a small streamlet in the northern end of the tract. Water that collects in a shallow temporary pond at the head of the streamlet during spring is discharged onto a broad flat in the slash timberland beyond the western boundary of the tract.

#### LOCAL CLIMATE

Weather data (table 1) were obtained from the U. S. Weather Station at Normal, Illinois, 15 miles northeast of the Funk Forest Natural Area (Climatological Data, 1950 and 1951). The annual mean temperature was about 51°F. each year. High temperatures came in July and lows in December. In 1950, precipitation was above normal with the greatest amount in June and the least in March. In 1951, it was near

TABLE 1.—AVERAGE MONTHLY TEMPERATURES, TOTAL MONTHLY PRECIPITATION, AND DEPARTURES FROM NORMAL, 1950 AND 1951

Mos.	Temperature, °F				Precipitation, Inches			
	1950		1951		1950		1951	
	Monthly Average	De- parture	Monthly Average	De- parture	Monthly Total	De- parture	Monthly Total	De- parture
Jan	33.0	6.8	27.9	1.7	5.31	3.21	1.51	-0.59
Feb	29.1	0.4	30.6	1.9	3.62	1.87	3.98	2.23
Mar	37.0	-3.3	37.1	-3.2	0.75	-2.40	3.61	0.46
Apr	45.9	-5.6	49.1	-2.4	6.51	2.97	3.45	-0.09
May	64.9	2.3	65.6	3.0	1.38	-2.78	2.81	-1.35
June	71.7	-0.2	69.5	-2.4	7.02	2.91	5.35	1.24
July	73.7	-3.4	74.9	-1.6	3.37	0.30	3.37	0.30
Aug	70.6	-3.7	72.6	-1.7	0.97	-2.51	3.51	0.03
Sep	66.8	-0.5	65.0	-2.3	4.21	0.22	1.11	-2.88
Oct	61.6	6.4	58.4	3.2	1.60	-1.21	2.22	-0.59
Nov	36.3	-5.3	34.9	-6.7	2.37	-0.31	3.24	0.56
Dec	21.7	-7.6	27.9	-1.4	1.04	-0.59	2.01	0.05

normal with the greatest amount in June and the least in September. First and last snowfalls came November 20, 1949, and April 5, 1950; and November 2, 1950, and April 12, 1951. Daily maximum sunshine in summer was fifteen hours, and in winter it was nine hours. The sun was at its highest latitude June 21, while peak temperatures were later in mid-July.

In 1950, the last killing frost in spring was April 28, and the first in autumn was November 5. In 1951, they were on April 23 and November 1. Normal dates are April 27 and October 16. Length of time free from frost was about 190 days. Since 172 days is normal, with a range from 168 to 190 days (Page, 1949), the growing season for these two years averaged 18 days longer than normal.

Winds prevailed from the west and northwest. In summer they were more frequently southwesterly, but in winter they were northwesterly. Sudden changes in wind direction usually affected conditions of temperature and precipitation.

#### CHECKLIST OF VASCULAR PLANTS

The checklist of vascular plants includes 213 species in 148 genera and 69 families. Four plant names are excluded from the data for forthcoming discussions. They are the two species, osage orange, *Maclura pomifera*, and dwarf larkspur, *Delphinium tricorne*, which were collected in the border outside of the study area; and the two forms, spineless honey locust, *Gleditsia triacanthos* f. *inermis*, and white bluebells, *Mertensia virginica* f. *Berdi*.

The species that were recorded for the Funk Forest Natural Area were compared with records for two other University of Illinois preserves. Twenty-five (11.9%) of the species are recorded only for the Funk Forest Natural Area. Twenty-nine (13.7%) were also recorded for the University of Illinois Woodlands, which includes Brownfield Woods and Trelease Woods. Thirty-seven (17.5%) were also recorded for Robert Allerton Park. One hundred and twenty (56.9%) were recorded for all the preserves.

#### DIVISION I. PTERIDOPHYTA. FERNS AND FERN ALLIES

##### EQUISETACEAE MICHX.—HORSETAIL FAMILY

*Equisetum arvense* L., field horsetail.  
A.<sup>1</sup>

##### OPHIOGLOSSACEAE PRESL.—ADDER'S- TONGUE FAMILY

*Botrychium virginianum* (L.) Sw., rattlesnake fern. U.<sup>2</sup>

POLYPODIACEAE R.Br.—FERN FAMILY  
*Adiantum pedatum* L., maidenhair fern.  
A.

*Cystopteris fragilis* (L.) Bernh., brittle fern. A. U.

*Onoclea sensibilis* L., sensitive fern. A.

*Polystichum acrostichoides* (Michx.) Schott, Christmas fern. A.

#### DIVISION II. SPERMATOPHYTA. SEED PLANTS

##### SUBDIVISION II. ANGIOSPERMAE. FLOWERING PLANTS

##### Class I. Monocotyledoneae

##### GRAMINEAE JUSS.—GRASS FAMILY

*Bromus latiglumis* (Shear) Hitchc.,  
brome grass. H.<sup>3</sup>

*Echinochloa crusgali* (L.) Beauv., barn-  
yard grass. Th.<sup>3</sup> A. U.

*Elymus villosus* Muhl., slender wild rye.  
H. A.

*Elymus virginicus* L., wild rye. H. A.

<sup>1</sup> Robert Allerton Park.

<sup>2</sup> University of Illinois Woodlands.

<sup>3</sup> Raunkiaer life-form class: Chamaephytes (Ch); Cryptophytes (Cr); Hemicryptophytes (H); Phanerophytes (Ph); and Therophytes (Th).

*Glyceria striata* (Lam.) Hitchc., manna grass. H. U.

*Hystrix patula* Moench, bottlebrush grass. H.

*Panicum dichotomiflorum* Michx., spreading witch grass. Th. U.

*Poa sylvestris* A. Gray, woodland blue grass. H. A.

CYPERACEAE J. ST. HIL.—SEDE FAMILY

*Carex albursina* Sheldon. H. U.

*Carex hirtifolia* Mack. Cr. U.

*Carex jamesii* Schw. H.

*Carex pennsylvanica* Lam. Cr.

*Carex rosea* Schk. H. A. U.

*Carex shortiana* Dewey. H.

*Carex sparganioides* Muhl. Cr.

ARACEAE NECKER—ARUM FAMILY

*Arisaema dracontium* (L.) Schott, green dragon. Cr. A. U.

*Arisaema triphyllum* (L.) Schott, jack-in-the-pulpit. Cr. A. U.

COMMELINACEAE REINCHENB.—

SPIDERWORT FAMILY

*Tradescantia subaspera* Ker., zigzag spiderwort. H. A. U.

*Tradescantia virginiana* L., spiderwort. H. A.

LILIACEAE ADANS.—LILY FAMILY

*Allium canadense* L., wild garlic. Cr. A. U.

*Allium tricoccum* Ait., wild leek. Cr. A. U.

*Erythronium albidum* Nutt., white trout lily. Cr. A. U.

*Lilium michiganense* Farw., turk's-cap lily. Cr. U.

*Polygonatum commutatum* (Schult.) Dietr., Solomon's-seal. Cr. A.

*Polygonatum pubescens* (Willd.) Pursh, small Solomon's-seal. Cr. U.

*Smilacina racemosa* (L.) Desf., large false Solomon's-seal. Cr. A. U.

*Smilacina stellata* (L.) Desf., small false Solomon's-seal. Cr. A. U.

*Smilax ecirrhata* (Engelm.) Wats., upright smilax. Cr. A. U.

*Smilax hispida* Muhl., common green-brier. Ph. A. U.

*Smilax lasioneura* Hook., carrion flower. Cr. A. U.

*Trillium gleasoni* Fern., Gleason's trillium. Cr. A. U.

*Trillium nivale* Riddell, snow trillium. Cr. A.

*Trillium recurvatum* Beck, purple trillium. Cr. A. U.

*Uvularia grandiflora* Sm., bellwort. Cr. A. U.

*Veratrum woodii* Robbins., Wood's false hellebore. Cr.

DIOSCOREACEAE LINDL.—YAM FAMILY  
*Dioscorea villosa* L., yam. Cr.

ORCHIDACEAE LINDL.—ORCHID FAMILY  
*Aplectrum hyemale* (Muhl.) Torr., putty-root. Cr. U.

Class II. Dicotyledoneae Juss.

SALICACEAE LINDL.—WILLOW FAMILY  
*Salix nigra* Marsh., black willow. Ph. A.

JUGLANDACEAE LINDL.—WALNUT FAMILY  
*Carya cordiformis* (Wang.) K. Koch, bitternut hickory. Ph. A. U.

*Carya ovalis* (Wang.) Sarg., false shagbark Hickory. Ph.

*Carya ovata* (Mill.) K. Koch, shagbark hickory. Ph. U.

*Carya tomentosa* Nutt., mockernut Hickory. Ph. A.

*Juglans cinerea* L., butternut. Ph. U.

*Juglans nigra* L., black walnut. Ph. A. U.

BETULACEAE AGARDH.—BIRCH FAMILY  
*Carpinus caroliniana* Walt., blue beech. Ph. A. U.

*Ostrya virginiana* (Mill.) K. Koch., hop-hornbeam. Ph. A. U.

FAGACEAE A. BR.—BEECH FAMILY  
*Quercus alba* L., white oak. Ph. A.

X *Quercus fallax* E. J. Palmer (*Q. macrocarpa* X *Q. muhlenbergii*). Ph.

*Quercus macrocarpa* Michx., bur oak. Ph. A. U.

*Quercus muhlenbergii* Engelm., chinquapin oak. Ph. U.

*Quercus rubra* L., red oak. Ph. A. U.

*Quercus velutina* Lam., black oak. Ph. A. U.

ULMACEAE MIRB.—ELM FAMILY  
*Celtis occidentalis* L., hackberry. Ph. A. U.

*Ulmus americana* L., American elm. Ph. A. U.

*Ulmus rubra* Muhl., slippery elm. Ph. A. U.

MORACEAE LINDL.—MULBERRY FAMILY  
*Maclura pomifera* (Raf.) Schneid., osage orange. (Outside southeast corner.)

*Morus rubra* L., red mulberry. Ph. U.

URTICACEAE REICHENB.—NETTLE FAMILY  
*Laportea canadensis* (L.) Gaud., wood nettle. Cr. A. U.

*Urtica dioica* L., great nettle. H.

ARISTOLOCHIACEAE BLUME—BIRTHWORT FAMILY  
*Asarum reflexum* Bickn., wild ginger. H. A. U.

POLYGONACEAE LINDL.—BUCKWHEAT  
FAMILY

- Polygonum convolvulus* L., black bindweed. Th. A.  
*Polygonum hydropiper* L., water-pepper. Th.  
*Polygonum pennsylvanicum* L., Pennsylvania smartweed. Th. A. U.  
*Polygonum virginianum* L., Virginia knotweed. Cr. A. U.  
*Rumex altissimus* Wood, pale dock. H.

PHYTOLACCACEAE LINDL.—POKEWEED  
FAMILY

- Phytolacca americana* L., Pokeweed. Cr. A. U.

PORTULACACEAE REICHENB.—PURSLANE  
FAMILY

- Claytonia virginica* L., spring beauty. Cr. A. U.

CARYOPHYLLACEAE REICHENB.—PINK  
FAMILY

- Cerastium vulgatum* L., common mouse-ear chickweed. Ch. A. U.  
*Silene stellata* (L.) Ait. f., starry catch-fly. H. A. U.

ANNONACEAE DC.—CUSTARD-APPLE  
FAMILY

- Asimina triloba* (L.) Dunal., pawpaw. Ph. A. U.

RANUNCULACEAE JUSS.—BUTTERCUP  
FAMILY

- Actaea alba* (L.) Mill., white baneberry. Cr. A. U.  
*Delphinium tricornis* Michx., dwarf larkspur. (Outside western margin.)  
*Hepatica acutiloba* DC., sharp-lobed hepatica. H. A. U.  
*Hydrastis canadensis* L., goldenseal. Cr. U.  
*Isopyrum biternatum* (Raf.) T. & G., false rue-anemone. H. A. U.  
*Ranunculus abortivus* L., small-flowered buttercup. H. A. U.  
*Ranunculus hispidus* Michx., bristly buttercup. H.  
*Ranunculus septentrionalis* Poir., marsh buttercup. H. A. U.  
*Thalictrum dasycarpum* Fisch. & Lall., purplish meadow-rue. H.  
*Thalictrum revolutum* DC., waxy meadow-rue. H. A. U.

MENISPERMACEAE DC.—MOONSEED  
FAMILY

- Menispermum canadense* L., moonseed. Ch. A. U.

BERBERIDACEAE T. & G.—BARBERRY  
FAMILY

- Caulophyllum thalictroides* (L.) Michx., blue cohosh. Cr. U.  
*Podophyllum peltatum* L., mayapple. Cr. A. U.

- PAPAVERACEAE B. JUSS.—POPPY FAMILY  
*Sanguinaria canadensis* L., bloodroot. Cr. A. U.

- FUMARIACEAE DC.—FUMITORY FAMILY  
*Dicentra canadensis* (Goldie) Walp., squirrel-corn. Cr. A. U.  
*Dicentra cucullaria* (L.) Bernh., dutchman's-breeches. Cr. A. U.

- CRUCIFERAE B. JUSS.—MUSTARD FAMILY  
*Arabis dentata* T. & G., Rockcress. H. A.  
*Arabis laevigata* (Muhl.) Poir., smooth rockcress. H. A.  
*Barbarea vulgaris* R. Br., common wintercress. H. A. U.  
*Capsella bursa-pastoris* (L.) Medic., shepherd's purse. Th. A. U.  
*Dentaria laciniata* Muhl., toothwort. Cr. A. U.  
*Iodanthus pinnatifidus* (Michx.) Steud., purple rocket. H. A. U.  
*Rorippa sessiliflora* (Nutt.) Greene, yellow cress. H.

- CRASSULACEAE DC.—STONECROP FAMILY  
*Penthorum sedoides* L., ditch stonecrop. H.

GROSSULARIACEAE DUM.—GOOSEBERRY  
FAMILY

- Ribes missouriense* Nutt., common gooseberry. Ph. A. U.

PLATANACEAE LINDL.—PLANE-TREE  
FAMILY

- Platanus occidentalis* L., sycamore. Ph. A. U.

## ROSACEAE B. JUSS.—ROSE FAMILY

- Crataegus margareta* Ashe, Brown's thorn. Ph. A.  
*Crataegus mollis* (T. & G.) Scheele, downy thorn. Ph. A. U.  
*Geum canadense* Jacq., white avens. H. U.  
*Potentilla monspeliensis* L., rough cinquefoil. H. U.  
*Potentilla recta* L., rough-fruited cinquefoil. H. A.  
*Prunus serotina* Ehrh., wild black cherry. Ph. A. U.  
*Rubus allegheniensis* Porter, Allegheny blackberry. H. A.  
*Rubus occidentalis* L., black raspberry. H. A. U.

## LEGUMINOSÆ JUSS.—PEA FAMILY

- Amphicarpa comosa* (L.) G. Don, hog peanut. H.  
*Cercis canadensis* L., redbud. Ph. A. U.  
*Desmodium glutinosum* (Muhl.) Wood, tick-clover. H. A. U.  
*Gleditsia triacanthos* L., honey locust. Ph. A. U.  
*Gleditsia triacanthos* L. f. *inermis* (Moench) C. K. Schneid.  
*Gymnocladus dioica* (L.) K. Koch, Kentucky coffee-tree. Ph. A. U.  
*Melilotus alba* Desr., white sweet clover. H. A.  
*Trifolium pratense* L., red clover. H. A. U.

## GERANIACEÆ J. ST. HIL.—GERANIUM FAMILY

- Geranium maculatum* L., wild geranium. H. A. U.

## OXALIDACEÆ LINDL.—WOOD-SORREL FAMILY

- Oxalis cymosa* Small, common wood-sorrel. H. A. U.

## BALSAMINACEÆ LINDL.—JEWEL-WEED FAMILY

- Impatiens biflora* Walt., spotted touch-me-not. Th. A. U.  
*Impatiens pallida* Nutt., pale touch-me-not. Th. A. U.

## LIMNANTHACEÆ LINDL.—LIMNANTHES FAMILY

- Floerkea proserpinacoides* Willd., false mermaid. Th. A. U.

## RUTACEÆ JUSS.—RUE FAMILY

- Ptelea trifoliata* L., hop-tree. Ph. A.  
*Zanthoxylum americanum* Mill., prickly-ash. Ph. A. U.

## CELASTRACEÆ LINDL.—STAFF-TREE FAMILY

- Euonymus atropurpureus* Jacq., wahoo. Ph. A. U.

## STAPHYLEACEÆ DC.—BLADDERNUT FAMILY

- Staphylea trifolia* L., American bladder-nut. Ph. A. U.

## ANACARDIACEÆ LINDL.—SUMAC FAMILY

- Rhus radicans* L., poison ivy. Ph. A. U.

## ACERACEÆ LINDL.—MAPLE FAMILY

- Acer negundo* L., box elder. Ph. A. U.  
*Acer nigrum* Michx. f., black maple. Ph. U.  
*Acer saccharinum* L., silver maple. Ph. A. U.  
*Acer saccharum* Marsh., sugar maple. Ph. A. U.

## VITACEÆ LINDL.—GRAPE FAMILY

- Parthenocissus quinquefolia* (L.) Planch., Virginia creeper. Ph. A. U.  
*Vitis aestivalis* Michx., summer grape. Ph.  
*Vitis riparia* Michx., riverbank grape. Ph. A.

## TILIACEÆ JUSS.—LINDEN FAMILY

- Tilia americana* L., American linden. Ph. A. U.

## VIOLACEÆ DC.—VIOLET FAMILY

- Viola eriocarpa* Schw., common yellow violet. H. A. U.  
*Viola papilionacea* Pursh., butterfly violet. H. A. U.  
*Viola sororia* Willd., downy blue violet. H. A. U.

## CUCURBITACEÆ B. JUSS.—GOURD FAMILY

- Sicyos angulata* L., bur-cucumber. Th. A.

## ONAGRACEÆ DUM.—EVENING-PRIMROSE FAMILY

- Circaea latifolia* Hill, enchanter's-nightshade. Cr. A. U.  
*Oenothera biennis* L., common evening-primrose. H. A. U.

## CORNACEÆ LINK—DOGWOOD FAMILY

- Cornus racemosa* Lam., gray dogwood. Ph. A. U.

## ARALIACEÆ VENT.—GINSENG FAMILY

- Aralia racemosa* L., American spikenard. H.  
*Panax quinquefolius* L., ginseng. Cr. A. U.

## UMBELLIFERÆ B. JUSS.—PARSLEY FAMILY

- Cryptotaenia canadensis* (L.) DC., hone-wort. H. A. U.  
*Erigenia bulbosa* (Michx.) Nutt., harbinger-of-spring. Cr. A.  
*Heracleum lanatum* Michx., cow-parsnip. Cr. A.  
*Osmorhiza claytoni* (Michx.) Clarke, hairy sweet cicely. H. A. U.  
*Osmorhiza longistylis* (Torr.) DC., sweet cicely. H. A. U.  
*Pastinaca sativa* L., parsnip. H. A. U.  
*Perideridia americana* (Nutt.) Reichenb. Cr. A.  
*Sanicula canadensis* L., sanicula. H. U.  
*Sanicula gregaria* Bickn., clustered snakeroot. H. A.

## PRIMULACEÆ VENT.—PRIMROSE FAMILY

- Lysimachia ciliata* L., fringed loose-strife. H. U.

- OLEACEAE LINDL.—OLIVE FAMILY  
*Fraxinus americana* L., white ash. Ph. A. U.  
*Fraxinus lanceolata* Borkh., green ash. Ph. U.  
*Fraxinus quadrangulata* Michx., blue ash. Ph. U.
- ASCLEPIADACEAE LINDL.—MILKWEED FAMILY  
*Asclepias syriaca* L., common milkweed. Cr. A. U.
- CONVOLVULACEAE VENT.—MORNING-GLORY FAMILY  
*Ipomoea hederacea* Jacq., ivy-leaved morning-glory. Th. U.
- POLEMONIACEAE DC.—PHLOX FAMILY  
*Phlox divaricata* L., blue phlox. Ch. A. U.
- HYDROPHYLLACEAE LINDL.—WATERLEAF FAMILY  
*Ellisia nyctelea* L., nyctelea. Th. A. U.  
*Hydrophyllum appendiculatum* Michx., waterleaf. H. A. U.  
*Hydrophyllum canadense* L., Canada waterleaf. Cr. A. U.  
*Hydrophyllum virginianum* L., Virginia waterleaf. H. A. U.
- BORAGINACEAE LINDL.—BORAGE FAMILY  
*Mertensia virginica* (L.) Pers., bluebells. H. A. U.  
*Mertensia virginica* (L.) Pers. f. *Berdi* Moldenke, white bluebells.
- VERBENACEAE J. ST. HIL.—VERBENA FAMILY  
*Verbena stricta* Vent., hoary vervain. H. A.
- LABIATAE B. JUSS.—MINT FAMILY  
*Agastache nepetoides* (L.) Ktze, giant hyssop. H. A. U.  
*Agastache scrophulariaefolia* (Willd.) Ktze, figwort giant hyssop. H. A.  
*Blephilia hirsuta* (Pursh) Benth., hairy blephilia. H. A. U.  
*Leonurus cardiaca* L., motherwort. H. A. U.  
*Monarda fistulosa* L., bergamot mint. H. A.  
*Prunella vulgaris* L., selfheal. H. A. U.
- SCROPHULARIACEAE LINDL.—FIGWORT FAMILY  
*Collinsia verna* Nutt., blue-eyed mary. H. A. U.  
*Mimulus ringens* L., monkey flower. H. U.  
*Scrophularia lanceolata* Pursh, figwort. H. A.
- Veronica arvensis* L., corn speedwell. Th. U.  
*Veronica connata* Raf., speedwell. Ch.  
*Veronica peregrina* L., purslane speedwell. Th. U.
- ACANTHACEAE J. ST. HIL.—ACANTHUS FAMILY  
*Ruellia strepens* L., smooth ruellia. Cr. A. U.
- PHRYMACEAE SCHAUER—LOPSEED FAMILY  
*Phryma leptostachya* L., lopseed. H. A. U.
- PLANTAGINACEAE LINDL.—PLANTAIN FAMILY  
*Plantago rugellii* Dene., common plantain. H. A. U.
- RUBIACEAE B. JUSS.—MADDER FAMILY  
*Galium aparine* L., goose-grass. Th. A. U.  
*Galium circaeans* Michx., wild licorice. H.  
*Galium concinnum* T. & G., bedstraw. H. U.  
*Galium triflorum* Michx., sweet-scented bedstraw. H. A.
- CAPRIFOLIACEAE VENT.—HONEYSUCKLE FAMILY  
*Sambucus canadensis* L., common elder. Ph. A. U.  
*Viburnum prunifolium* L., blackhaw. Ph. A. U.
- CAMPANULACEAE JUSS.—BELLFLOWER FAMILY  
*Campanula americana* L., bellflower. H. A. U.
- LOBELIACEAE DUM.—LOBELIA FAMILY  
*Lobelia siphilitica* L., great lobelia. H. A. U.
- COMPOSITAE ADANS.—COMPOSITE FAMILY  
*Achillea millefolium* L., yarrow. H. A. U.  
*Aster lateriflorus* (L.) Britt., white woodland aster. H. A.  
*Aster ontarionis* Wieg., Missouri aster. H. A. U.  
*Aster sagittifolius* Wedem., arrow-leaved aster. H. A. U.  
*Aster shortii* Lindl., Short's aster. H. A. U.  
*Bidens aristosa* (Michx.) Britt., western tickseed-sunflower. Th. A.  
*Bidens cernua* L., smaller bur-marigold. Th.  
*Cacalia muhlenbergii* (Sch.-Bip.) Fern., indian-plantain. H. U.  
*Cirsium vulgare* (Savi) Airy-Shaw, bull thistle. H. A. U.

*Echlipta alba* (L.) Hassk., verba-de-tago. Th.  
*Erigeron annuus* (L.) Pers., whitetop. Th. U.  
*Erigeron philadelphicus* L., Philadelphia fleabane. H. A. U.  
*Eupatorium purpureum* L., joe-pye weed. H. A. U.  
*Eupatorium rugosum* Houtt., white snakeroot. H. A. U.  
*Heliopsis helianthoides* (L.) Sweet., heliopsis. H. A.  
*Lactuca canadensis* L., wild lettuce. H. A. U.  
*Lactuca floridana* (L.) Gaertn., Florida lettuce. Th. A. U.  
*Prenanthes crepidinea* Michx., rattle-snake-root. H.  
*Rudbeckia laciniata* L., goldenglow. H. A. U.  
*Rudbeckia triloba* L., brown-eyed susan. H. A. U.

*Solidago latifolia* L., broad-leaved goldenrod. H. U.  
*Solidago ulmifolia* Muhl., elm-leaved goldenrod. H. A.  
*Taraxacum officinale* Weber, common dandelion. H. A. U.  
*Verbesina alternifolia* (L.) Britt., yellow ironweed. H. A.

#### COMPOSITION OF THE DOMINANT VEGETATION

Forty species of trees and shrubs are listed in the checklist. Twenty-seven species of trees are recorded for the 9.9-acre strip-transect sample (table 2). Density of stems 3.0 inches and greater d.b.h. is 96 per acre.

TABLE 2.—NUMBER OF STEMS IN SIZE CLASSES AND PERCENTAGE OF RELATIVE ABUNDANCE FOR TREES MEASURED IN THE 9.9-ACRE STRIP-TRANSECT SAMPLE.

Species	Size classes, inches d.b.h.				Number of stems	Percentage of relative abundance
	3.0-7.9	8.0-11.9	12.0-23.9	over 24		
<i>Acer saccharum</i> .....	81	71	92	4	248	26.00
<i>Ulmus americana</i> .....	72	22	32	7	133	13.94
<i>Ulmus rubra</i> .....	60	15	25	11	111	11.64
<i>Tilia americana</i> .....	23	17	15	0	55	5.77
<i>Celtis occidentalis</i> .....	26	16	7	4	53	5.55
<i>Fraxinus americana</i> .....	1	9	38	2	50	5.24
<i>Carya ovata</i> .....	14	19	10	0	43	4.51
<i>Quercus alba</i> .....	1	1	10	28	40	4.19
<i>Carya cordiformis</i> .....	26	6	6	0	38	3.98
<i>Ostrya virginiana</i> .....	28	0	0	0	28	2.94
<i>Quercus rubra</i> .....	2	1	10	12	25	2.62
<i>Fraxinus lanceolata</i> .....	1	9	12	1	23	2.41
<i>Fraxinus quadrangulata</i> .....	2	9	5	0	16	1.68
<i>Asimina triloba</i> .....	16	0	0	0	16	1.68
<i>Crataegus mollis</i> .....	13	2	0	0	15	1.57
<i>Juglans nigra</i> .....	0	1	11	0	12	1.31
<i>Carpinus caroliniana</i> .....	10	0	0	0	10	1.05
<i>Gleditsia triacanthos</i> .....	2	1	3	0	6	0.63
<i>Carya tomentosa</i> .....	2	2	2	0	6	0.63
<i>Gymnocladus dioica</i> .....	1	2	1	1	5	0.52
<i>Platanus occidentalis</i> .....	0	0	3	2	5	0.52
<i>Morus rubra</i> .....	4	1	0	0	5	0.52
<i>Quercus macrocarpa</i> .....	0	0	0	4	4	0.42
<i>Quercus velutina</i> .....	0	0	3	0	3	0.31
<i>Acer negundo</i> .....	1	0	1	0	2	0.21
<i>Prunus serotina</i> .....	1	0	0	0	1	0.10
<i>Quercus muhlenbergii</i> .....	0	0	0	1	1	0.10
Totals.....	387	204	286	77	954	100.04

TABLE 3.—SIZE CLASSES AND DEVELOPMENTAL STAGES AS MODIFIED FROM GUISE (1950).

Class	d.b.h. in inches	Stages of development
Sapling	0.1 to 2.9	Brushwood
Small Pole	3.0 to 7.9	Polewood
Large Pole	8.0 to 11.9	Polewood
Standard	12.0 to 23.9	Young Timber
Veteran	24.0 and over	Old Timber

Sugar maples are the most abundant, while the American elms and slippery elms are next in rank, respectively. These three species account for 51.6 percent of the total number, while the remaining 24 species account for 48.4 percent.

When stems are classified according to size classes and developmental stages given in table 3, sugar maples are most numerous in the polewood and young timber stages of development, while only a small number are in the old timber stage. American elms and slippery elms are most numerous in the polewood stage, particularly the small pole class, and they are least in the old timber stage. In view of this evidence, it may be concluded that the Funk Forest Natural Area represents a maple-elm association chiefly composed of sugar

maples, American elms, and slippery elms.

The greater relative abundance of veteran oaks in the old timber stage appears to be significant (table 4). The data indicate that this forest is undergoing successional development in which a maple-elm group is becoming dominant and is replacing an older oak group.

#### LIFE-FORM SPECTRUM

Raunkiaer's life-form system was used to supplement analysis of the dominant vegetation. The resulting life-form spectrum provides an additional measure of the vegetational physiognomy and evaluation of the component species. These data may serve as a foundation for future periodic investigations of the herbace-

TABLE 4.—PERCENTAGE OF RELATIVE ABUNDANCE FOR STEMS OF THE OAK GROUP AND THE MAPLE-ELM GROUP IN THREE DEVELOPMENTAL STAGES.

##### A. Oak group.

Stage of development	White oak	Red oak	Bur oak	Black oak	Chinquapin oak	Average percentage
Polewood.....	5.0	12.0	0.0	0.0	0.0	3.4
Young Timber.....	25.0	40.0	0.0	100.0	0.0	33.0
Old Timber.....	70.0	48.0	100.0	0.0	100.0	63.6

##### B. Maple-elm group.

Stage of development	Sugar maple	American elm	Slippery elm	Average percentage
Polewood.....	61.3	70.7	67.6	66.5
Young Timber.....	37.1	24.1	22.5	27.9
Old Timber.....	1.6	5.2	9.9	5.6

ous as well as of the dominant woody vegetation that characterizes successional development in this maple-elm community.

For pertinent summaries of Raunkiaer's life-form concept, see Adamson (1939) and Cain (1950). The term "life-form" is applied to that part of the vegetative structure of a plant that survives unfavorable climatic seasons as a perennating bud or apical shoot. It is a category describing the plant body apart from reproductive structures, floral parts, or other morphological characteristics upon which phyletic classifications are based. Plants that possess vegetative structures of the same general morphological type are members of a given life-form class, irrespective of their position in the schema of an ordinal system (Cain, 1950).

Raunkiaer (1934) selected, as the basis of his life-form system, a form of vegetative structure which provides the meristematic tissues with optimum protection from critical conditions, as drought or cold. His original classification included five major divisions with thirty subdivisions, all based on differentiation of structures that protect the perennating bud. Life-forms in each of the major divisions progress from those which afford least protection to those which afford the most protection to the meristematic tissues.

For the purpose of this investigation, only those categories are described below that are useful in determining a life-form spectrum for the Funk Forest Natural Area. A classification noted for each species in the checklist is restricted to the members recorded within Division

## II, Spermatophyta.

*Division I.* Phanerophytes (Ph). Perennating buds are borne on stems that project into the air. These afford least protection to meristematic tissues.

*Division II.* Chamaephytes (Ch). Perennating buds are situated on or within 25 centimeters of the soil surface. Withered foliage, duff, and snowcover afford protection to the meristematic tissues in winter, while foliage and duff afford protection during drought periods.

*Division III.* Hemicryptophytes (H). Perennating buds are situated in the soil surface where they receive additional protection by a thin earth covering.

*Division IV.* Cryptophytes (Cr). Perennating buds are situated at varied levels beneath the soil surface or water, or in soil under water, that are concomitant with the species concerned. They receive greater protection in these media than do surface or aerial buds.

*Division V.* Therophytes (Th). Perennating buds are contained in embryonic form within seeds. This form is considered to give optimum protection of meristematic tissues.

Raunkiaer's "spectrum" for life-forms expresses the distribution in life-form classes of species comprising a flora. It reflects relationships of the flora to the general phytoclimate of large climatic areas (Raunkiaer, 1934). It provides a comparative basis for total regional flora. Since many spectra are based upon total floral populations, it may be important to supplement them with determinations of the relative importance of species in plant communities of undisturbed climax and sub-

climax types (Adamson, 1939). Thus, utilization of these techniques to smaller culturally undisturbed plant communities should be useful in indicating effects of local physical environmental influences, such as edaphic, drainage and micro-climatic factors, upon adaptive vegetative forms of component plant species.

The spectrum for the Funk Forest Natural Area indicates a hemipterophytic climate (table 5). This is in agreement with the phytoclimate for the humid temperate zone (Cain, 1945). It is third in rank when spectra for certain North American deciduous forests are arranged in decreasing order of hemipterophytic percentages. It is com-

parable to two more northern communities in Alberta and Michigan. It is least similar to a Cincinnati upland forest. The difference in the north-to-south distribution of hemipterophytic life-forms indicates differences in latitudinal and altitudinal phytoclimates which are in turn modified by local environmental influences that characterize various micro-phytoclimates.

#### SUMMARY AND CONCLUSIONS

The Funk Forest Natural Area is a well-preserved 63-acre remnant of a stream-belt type of east-central Illinois deciduous forest. The physical environment is an undulatory moraine covered by upland timber soil

TABLE 5.—LIFE-FORM SPECTRA FOR EIGHT TEMPERATE NORTH AMERICAN DECIDUOUS FOREST COMMUNITIES.

Plant community, location and source of data	Number species	Percentages in life-form classes				
		Ph	Ch	H	Cr	Th
Raunkiaer normal spectrum.....	1,000	46.0	9.0	26.0	6.0	13.0
Poplar association, Alberta, Canada (Moss, 1932).....	170	25.8	1.8	48.2	17.1	7.0
Aspen association, northern lower Michigan (Gates, 1930).....	310	22.9	3.9	47.1	16.1	10.3
Maple-elm forest, Funk Forest Natural Area, east-central Illinois.....	205	23.4	2.0	44.4	20.4	9.8
Oak-hickory climax, Piedmont area, North Carolina (Oosting, 1942).....	89	59.6	0.0	36.0	4.5	0.0
Mixed mesophytic climax, Cincinnati region, Ohio (Withrow, 1932).....	127	33.6	3.9	34.4	23.4	3.9
Oak woods, Long Island (Cain, 1936)....	92	34.8	10.9	32.6	20.6	1.1
Cove hardwoods mixed mesophytic, Smoky Mtns., Tenn. (Cain, 1945).....	113	36.3	4.4	30.1	25.8	3.4
Upland forest, Cincinnati region (Withrow, 1932).....	94	49.8	4.2	23.4	15.9	6.4

and bottomland soil, drained and dissected by two streams. During the period of this investigation, 1950 and 1951, the temperatures were cooler than normal, precipitation was above normal, and the growing season was longer than normal.

Vascular plants included 213 species in 148 genera and 69 families. About 57 percent of the plant species are in common with all four University of Illinois woodland preserves, whereas only 12 percent were recorded for only the Funk Forest Natural Area. The plant community represents a maple-elm association, chiefly composed of trees in

polewood and standard stages of development. Application of Raunkiaer's life-form system indicates a hemicryptophytic phytoclimate comparable to two more northern deciduous forest communities.

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