A FLORISTIC STUDY OF THE EAST FORK OF POND RIVER, KENTUCKY

LLOYD RAY SETTLE

A FLORISTIC STUDY

OF

THE EAST FORK OF POND RIVER, KENTUCKY

An Abstract

Presented to

the Graduate Council of

Austin Peay State University

In partial fulfillment

of the Requirements for the Degree

Master of Science

by

Lloyd Ray Settle

August, 1973

ABSTRACT

A preliminary investigation was conducted of the flowering plants, ferns, and fern allies of the initial drainage area of the East Fork of Pond River in Todd County, Kentucky. An annotated checklist was formulated that contained 374 species. This group represented 97 families.

A wide range of plant communities was noted within the study area. Communities were observed that ranged from purely aquatic, to those of dry, calcareous uplands. Communities were also noted that were associated only with noncalcareous soils. The communities were recognizable in each case by the presence of certain indicator species.

The list of nearly 400 species represents a wide range of plants to be found in such a relatively small area and is indicative of the variety of communities. Certain species were collected and identified from the study area that are clearly representative of an Appalachian flora. Still others were identified that are typical of calcareous "barrens" and some of swampy communities.

The diversity of the physiography of Todd County may be a major factor in the variety of plant life within the study area. Todd County is a part of two

physiographic sections. The southern portion of the county is a part of the Mississippean Plateau Section, chiefly calcareous. The northern portion of Todd County, in which the study area is found, is a part of the Shawnee Hills Section, chiefly noncalcareous. Each section is represented floristically within the study area.

A FLORISTIC STUDY

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Lloyd Ray Settle

August, 1973

To the Graduate Council,

I am submitting herewith a Thesis written by Lloyd Ray Settle entitled "A Floristic Study of the East Fork of Pond River, Kentucky". I recommend that it be accepted in partial fulfillment of the requirements for the degree Master of Science, with a major in Biology.

Edward W. Chester
Major Professor

We have read this thesis and recommend its acceptance:

Marvin M. Brown
Second Committee Member

Floyd L. Brown
Third Committee Member

Accepted for the Council

Wayne E. Stamper
Dean of the Graduate School

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I. INTRODUCTION

The state of Kentucky displays a wide variation in physiography, ranging from mountainous in the eastern portion of the state to swamps and prairie remnants in the west. Due to this diversity, a wide variety of habitats is present and well over 2000 species of vascular plants are found in the state (Wharton and Barbour, 1971).

According to Davis (1953), the geographic position of Kentucky accounts for its varied flora. It extends from the Mississippi River to the Appalachian Mountains, a distance of about 460 miles, and is midway between the Gulf of Mexico and the Great Lakes. In the western part of the state are found migratory plants of the river deltas intermingled with numerous species from the prairies (Davis, 1953). The Appalachian Mountains on the opposite border support an eastern highland flora. An overlapping of southern and northern plants at this midpoint forms an unusual distribution of species (Davis, 1953). So, as a result, the state is somewhat of a transition region.

There has been little or no ecological or floristic research done in Todd County with no documentation of plants from the area nor any adjacent area. According to Davis (1953), C.W. Short made collections of plants from Christian County, which joins the western side of Todd County, in the early 1800's. However, his collections were published as a catalogue of plants from the state of Kentucky and the material from Christian County was not published as a separate list. His specimens are now in the Academy of Natural Science in Philadelphia (Davis, 1953). E.L. Braun made collections from northern Todd County in 1937 during her research on the forests of Kentucky. However, this consisted of only one field trip and was not published in any form (personal communication).

Todd County varies greatly in its soil types and in its topography. This variation could be responsible for the great variance in the plant life as well. A sampling of the flora in an area between the two extremes in physiography of the state would perhaps give a good indication of the wide variation in the flora since portions of each of the floristic extremes may be represented in the intermediate area. For this reason, it is an excellent area for study.

Purpose of the Study

The purpose of this study was to determine the vascular floristic composition of the area and to formulate a preliminary checklist. Also, certain communities were described and linked to the presence of indicator species. Soil types were taken into consideration as a major determining factor in the floristic composition of the communities.

Methods and Materials

Collecting began in August of 1968 and was continued through August of 1969. Supplemental collections were made randomly through April of 1973. Collections were made weekly from April through August of 1969. Specimens were identified according to Fernald (1950), and Radford, *et al*. (1968). The plants were prepared in the usual manner for deposit in the Herbarium of Austin Peay State University. The scientific names used follow Fernald (1950). Braun (1943), and Wharton and Barbour (1971), were used as sources in correlating soil types and habitats with certain communities and species. Basic geological information was taken from McFarlan (1943).

Climatic data were obtained from the Fort Campbell, Kentucky weather station. These data were collected over a nineteen year period.

II. THE STUDY AREA

Location

Todd County is located in the southwestern portion of Kentucky adjacent to the Tennessee state line. The study area is found in the northern section of Todd County and lies six miles north of Elkton, Kentucky and twenty miles north of the Tennessee-Kentucky state line. The area consists of the initial drainage area of the East fork of Pond River which is only a creek at this point but eventually becomes a relatively large stream before emptying into Green River some forty-five miles downstream. It is bordered on the northern side by State Highway 178 and on the eastern side by State Highway 181. The western side is bordered by State Highway 106 and on the southern side by the Collier Springs road, a County Road (Fig. I). The total area covers slightly less than four square miles or about twenty-three hundred acres.

Physiography

According to Wharton and Barbour (1971), the role of physiography is a complex one which includes past vegetational history and plant migration as related to the physiographic history or the development of the present topography. As a result, the physiography of

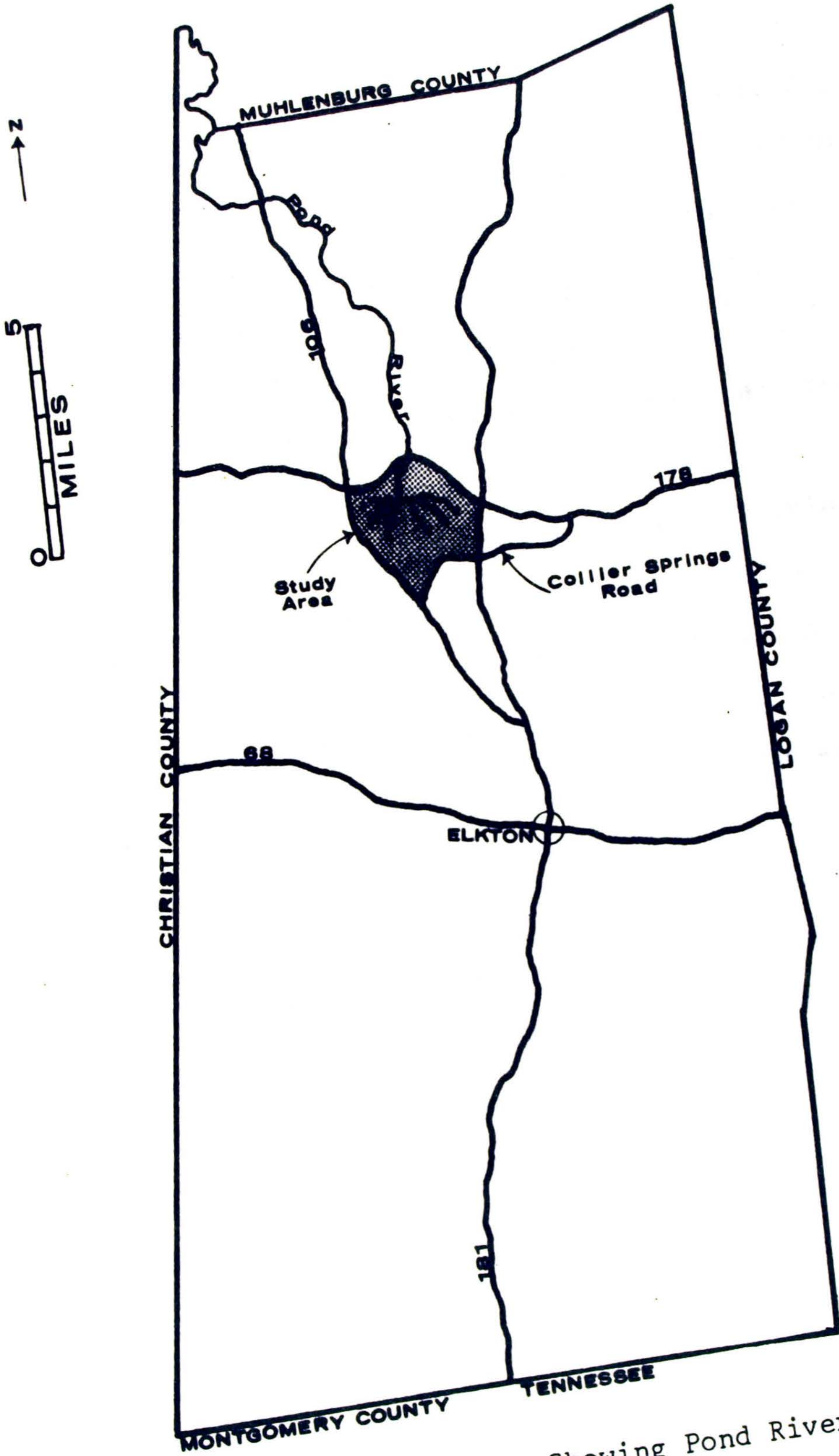

FIGURE I. Todd County, Kentucky Showing Pond River Drainage Area any given area can determine to a large extent the variation of the flora within the area. The physiography of Kentucky is very complex. The state is composed of several distinctly different regions that result in a wide variation in physiographic makeup (Fig. II). According to Fenneman (1938), Kentucky is a part of three major physiographic provinces. The eastern section of the state is a very mountainous region and is considered a part of the Appalachian Plateau Province. The extreme western section of the state is quite opposite in that it is a delta type area and is considered a part of the Central Lowland Province east of the Mississippi River. The portion of the state between these two extremes is considered to be a part of the Interior Lowland Plateau Province and is composed of several plateaus, escarpments, hill regions, and varied other regions. This wide range in physiography provides suitable circumstances for a great variety of habitats and in turn, a diverse vegetation.

Todd County is within the Interior Lowland Plateau Province (Thornbury, 1965). The term "plateau" has no specific implication as to height but rather implies a region with considerable summit area set off from adjacent areas by a marginal escarpment. All these restrictions are undoubtedly relative in nature and

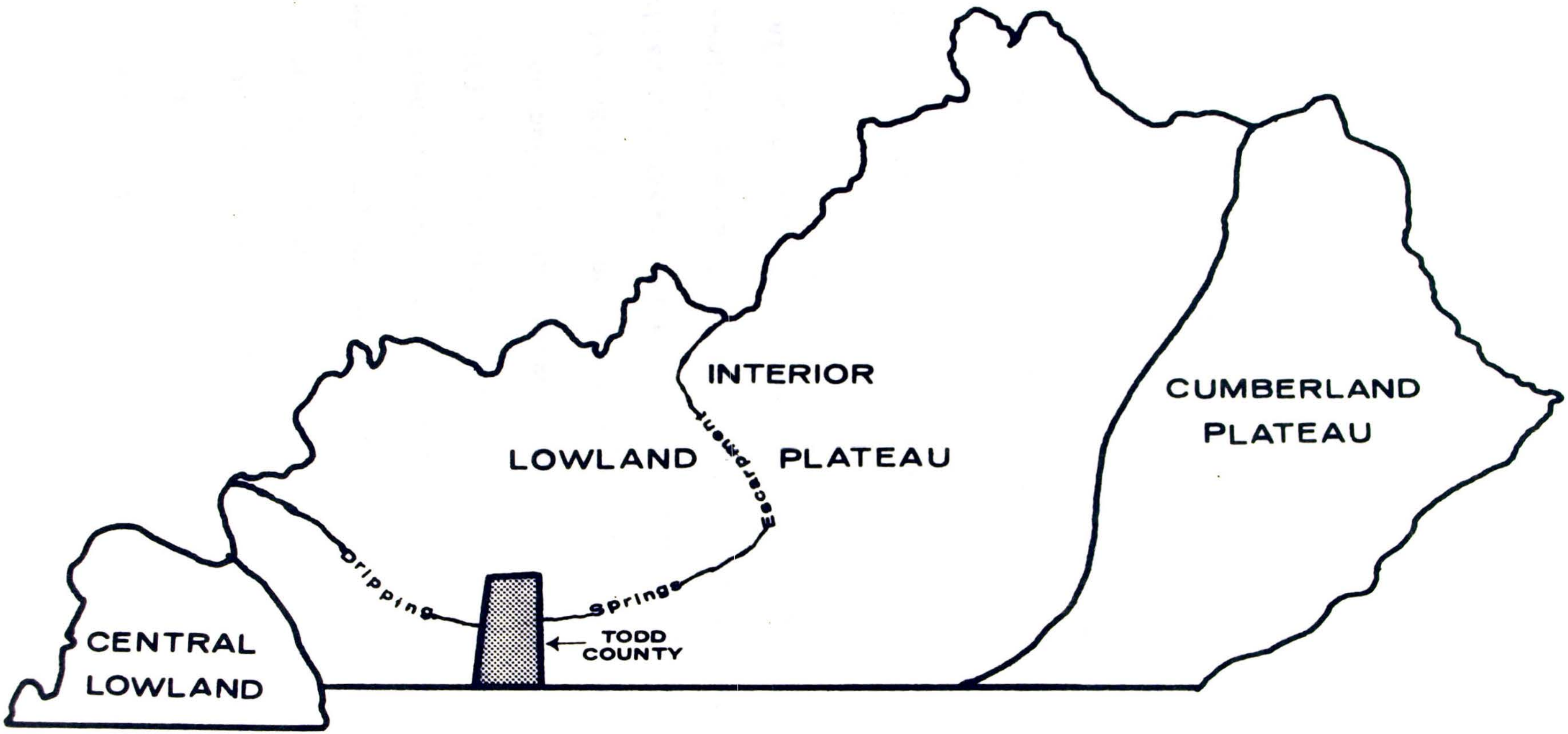

FIGURE II. Physiographic Diagram of Kentucky.

may have a wide variation as to interpretation. The Interior Lowland Plateau Province is thus not inappropriately named. Within the province is a series of cuestas, the fronts of which are prominent, although not high escarpments. Very little of the province rises above 1000 feet in altitude, and a considerable part of it is as low as 500 to 600 feet (Thornbury, 1965). The Interior Lowland Plateau Province is bounded on the east in Kentucky by the west-facing escarpment of the Appalachian Plateaus and on the southwest generally by the Tennessee River. The northern boundary follows very closely the southern limits of the Illinoian glaciation (Thornbury, 1965).

According to Fenneman (1938), the Interior Lowland Plateau Province falls naturally into four sections, each underlain by rocks within a certain range of age and character. The largest and most representative is the Highland Rim Section underlain by Mississippean rocks, mainly limestones. The Nashville Basin Section and Bluegrass Section result from the truncation of two low domes and the exposure of Ordovician rocks. The Shawnee Section is a syncline in western Kentucky and is distinguished by topographic features due to the preservation of sandstone of Chester and Pennsylvanian age (Fenneman, 1938).

As the state of Kentucky is very complex in its physiography, so is Todd County. A major factor in the lack of uniformity in physiography is that it lies on the border of two major physiographic sections. The southern half of the county is part of the Mississippean Plateau of the Highland Rim Section and chiefly limestone in its makeup, whereas the northern half is part of the Shawnee Hills Section and chiefly sandstone in makeup. The study area would then be a part of the Shawnee Hills Section as it is located in the northern part of Todd County.

The Shawnee Hills Section posesses a great diversity of topography because of the variety of its geology (Thornbury, 1965). In addition to the variety in lithology, two other factors distinguish the Shawnee Hills Section: intense faulting at its western end and widespread alluviation or valley-filling along all major valleys and the tributaries (Thornbury, 1965). The Shawnee Hills Section is characterized by numerous caves within its boundaries and is most pronounced in the Great Cave District which contains Mammoth Cave and others comparable in size (Fenneman, 1938). Sinkholes are common and may be found throughout the area. According to Thornbury (1965), the Dripping Springs Escarpment forms the southern and eastern boundaries of the Shawnee Hills Section of the Interior Lowland Plateau and thereby is the boundary between the two major sections found in Todd County. The Mississippean Plateau of the Highland Rim Section would then constitute that area of Todd County found south of the Dripping Springs Escarpment.

According to McFarlan (1943), the Dripping Springs Escarpment rises 150 to 200 feet above the bordering Pennyroyal or Mississippean Plateaus with the usual outlying remnants of Knobs. According to Shawe (1967), the rim of the Dripping Springs Escarpment reaches a height in Todd County of 860 feet at a point some two to three miles northwest of Elkton. This area is three to four miles south of the study area. The elevation drops to a low of 580 feet at a point approximately two miles to the south of Elkton. This low point lies within that section of Todd County that is considered a part of the Mississippean Plateau. The rim of the Dripping Springs Escarpment has an average elevation of 800 feet in Todd County and the area to the south, considered Mississippean Plateau, averages approximately 620 feet above sea level (Shawe, 1967). This gives an average difference in altitude of 180 feet between the Dripping Springs Escarpment and the bordering Mississippean Plateau in Todd County.

The margin of the Dripping Springs Escarpment is deeply indented by cliff-bordered valleys, which however, are marked by large sinks and dismembered drainage. It is in this rugged border belt in the vicinity of the Green River that the Great Cave Region of Kentucky is developed (McFarlan, 1943). According to McFarlan (1943), almost all commercial caves are located on this plateau behind the Dripping Springs Escarpment. The name Dripping Springs was originally applied to the escarpment in Edmonson County, Kentucky which contains Mammoth Cave (Fenneman, 1938). The Dripping Springs Escarpment is terminated in a maze of faults in western Kentucky.

The Dripping Springs Escarpment runs in an east-west direction in Todd County and is found approximately two to three miles north of Elkton. The general line of the escarpment lies approximately three miles south of the southernmost point of the study area. As the escarpment has a very irregular pattern in Todd County, some indentions may be found closer than three miles to the study area. In Todd County, the Dripping Springs Escarpment is a south-facing cuesta as is evidenced by the fact that the East Fork of Pond River, which has its beginning in the study area, flows in a northerly direction.

Soils and Geology

According to Wharton and Barbour (1971), many factors related to geology affect plant distribution in the state of Kentucky. Geologic structures determine what rock will outcrop in a given area, and the nature of the outcrop affects the physiography, as will be noted in comparing the geologic map and the physiographic diagram for any given area. Soil chemistry, especially whether the soil is basic, neutral, or acidic, is often significant, and can be related to the location of calcareous and noncalcareous rocks (Wharton and Barbour, 1971). Geology and physiography also affect the pattern of land use, and this drastically affects the flora (Wharton and Barbour, 1971). Substratum, by its influence on ground water, soil fertility, and topography, may augment or in part counteract climatic influences, may favor persistence of vegetation types no longer in accord with the climate, may modify, or may retard vegetational development (Braun, 1950).

According to Thornbury (1965), the Shawnee Hills Section has over twenty Upper Mississippean formations including limestones, shales, and sandstones, and an equal number of Pennsylvanian formations not quite so variable in lithology. The variable geology of the Shawnee Hills Section is expressed by great variety in topographic form. This section is also the least homogeneous geologically and topographically of any of the sections within the Interior Lowland Plateau Province (Thornbury, 1965). The Shawnee Hills Section is bounded by the Dripping Springs Escarpment on the east and south, and here the escarpment is characterized by a maturely dissected surface on sandstones and shales. The Dripping Springs Escarpment is made by the lowest strong stratum in the Chester series which in Kentucky is called Cypress Sandstone (Fenneman, 1938).

The lowest formation found within the study area is the Paint Creek limestone (Fig. III). It is exposed in only one location along a creek some two miles southeast of Allegre and covers only about one-quarter of an acre.

The formation that lies directly above the Paint Creek Limestone formation is the Cypress Sandstone formation. According to McFarlan (1943), in its typical development the Cypress Sandstone is a massive grey cliff-forming sandstone, commonly cross-bedded and frequently showing current ripple marks. Cypress Sandstone is well exposed all along Pond River within the study area as well as for short distances along smaller branches and creeks that lead into Pond River (Klemic, 1965). Although no cliffs are present within the study

SERIES	FORMATION AND MEMBER		THICKNESS IN FEET		DESCRIPTION
CHESTER	GLEAN DEAN FORMATION		65-105		LIMESTONE SANDSTONE SILTSTONE SHALE
	HARDINSBURG SANDSTONE		20-60		SANDSTONE SILTSTONE LIMESTONE SHALE
	GOLCONDA FORMATION	HANEY LIMESTONE MEMBER	20-65	100-155	LIMESTONE SHALE
		BIG CLIFTY SANDSTONE MEMBER	60-105		SANDSTONE SILTSTONE SHALE
	CYPRESS SANDSTONE		12-65		SANDSTONE SILTSTONE AND SHALE
	PAINT CREEK LIMESTONE		55-120		LIMESTONE SHALE

FIGURE III. Stratigraphic Diagram of the Study Area.

area itself, the exposed Cypress Sandstone forms bluffs that range from 10 to 40 feet in height. McFarlan (1943), states that the Cypress Sandstone formation is the most uniform in extent of any of the sandstones of the Chester series in Kentucky and forms the cap rock of the Dripping Springs Escarpment.

The formation that lies above the Cypress Sandstone is the Golconda formation. It has two members, the lower of which is the Big Clifty sandstone member and the dominant member of this formation present within the study area as it covers approximately 80 per cent of the area (Klemic, 1965). The Big Clifty sandstone member is well exposed along a roadcut near Pond River at the northern end of the study area (Klemic, 1965). The second member of the Golconda formation is the Haney limestone member which lies above the Big Clifty sandstone member. This is the second most abundant member within the study area, comprising approximately 15 per cent of the total surface area. The Golconda formation, made up of the Cypress Sandstone member and the Haney limestone member, would then comprise approximately 95 per cent of the study area.

The Hardinsburg Sandstone formation lies above the Golconda formation and forms a small cap above the Haney limestone member in six different locations within the study area (Klemic, 1965).

The Glen Dean formation lies above the Hardinsburg Sandstone formation and is exposed in only one location within the entire study area and covers slightly more than one acre (Klemic, 1965). The location of the Glen Dean formation is the highest point within the study area and reaches a height of 760 feet above sea level.

The soils as well as the vegetation of the Western Mesophytic Forest Region presents a mosaic pattern as gray-brown podzolic lateritic, and melanized soils together with certain intrazonal types (redzinas, planosals) may be found here (Braun, 1950).

The soils of Todd County are pedalfer soils which lack the presence of a lime carbonate layer formed by calcification (Oosting, 1956). The majority of the soils of Todd County are further classified as gray-brown podzolic soils which are characteristic of forested soils of humid temperate climates (Oosting, 1956). Alluvial deposits, which are azonal soils, occur in Todd County along streambanks and old streambeds. Regardless of the nature of the parent material, soils tend to become acid in reaction if percipitation is sufficient to cause downward percolation of water during much of the year. This is largely the result of leaching of soluable basic salts (Oosting, 1956). Rainfall, plus the nature of the parent material, tend to cause the majority of the soils of the study area to be acidic.

It was found that the soils within the study area were mainly of four types. Areas that were very steep, eroded, and associated with outcroppings of the Cypress Sandstone formation generally fell into the Frondorf-Weikert complex classification. The Frondorf-Weikert complex ranges from moderately deep silty or sandy soils with a moderately high productiviey potential to soils that have a high erosion hazard and very low organic content with low fertility and moderate droughtiness. Generally speaking, soils within the study area of the Frondorf-Weikert complex were severely eroded, well drained soils of sandstone and shale uplands having a very low productivity potential.

Soils of the fields and areas of less dissection generally were classified into three types. The most prominent soil type found near the perimeter of fields and areas where the slope of the surface increased greatly was a Sadler type soil. This is an acid soil with a silt loam surface and a pan at a depth of two feet that restricts soil drainage and rooting depth (United States Department of Agriculture, 1973). Yield potential of the Sadler soil is moderate for farming purposes and would support most all woody plants as well as a very wide variety of herbaceous flora unless restricted by the acidity factor.

The Zanesville soil type was found to be quite common in the uplands and fields. This soil is acid with a silt loam surface (U.S.D.A., 1973). The Zanesville soil has a pan depth of 28 inches. Yield potential is moderate for farming purposes. The Wellston soil was also quite common in the fields of the area (U.S.D.A., 1973). The Wellston soil is a deep, well drained, acid soil with a silt loam surface. Yield potential of the Wellston soil for farming purposes is quite high.

Three other soils were found to be associated with certain plant communities although they did not cover extensive areas. Two of the soils were associated with limestone outcroppings. The Pembroke soil is very rocky with a relatively firm texture. This soil has high erosion tendencies, is relatively shallow, and is quite low in organic matter content (U.S. D.A., 1973). Within the study area, this soil was associated only with outcroppings of the Haney limestone member. The Talbott soil was found at the site of the outcroppings of the Glen Dean formation. The Talbott is a droughty soil of limestone uplands with a relatively shallow root zone (U.S.D.A., 1973). The Huntington soil is a deep, high yielding bottom soil that was found along streams and areas of alluvial deposits within the study area.

Climate

Todd County is located in the humid subtropical climate area of North America (Atwood, 1940). This is a very general classification that includes all areas with an average annual rainfall of 40 to 80 inches. Todd County lies on the northern boundary of the humid subtropical region. Therefore, it falls into the end of the range very close to 40 inches. The term "subtropical" may be deceiving as Todd County is borderline as to classification, being on the extreme northern boundary of the region.

Climatic data were obtained from the Fort Campbell, Kentucky weather station, which is located some twenty miles south but is the station closest to the study area. The coldest month is January with a mean daily maximum temperature of 45° F. and a mean daily minimum temperature of 27° F. The warmest month is July with a mean daily maximum temperature of 89° F. and a mean daily minimum temperature of 68° F. The annual mean daily maximum temperature is 69° F. and the mean daily minimum temperature is 48° F. The mean number of days in which the temperature reached a maximum greater than 80° F. was 132 per year. The mean number of days per year in which the temperature reached a minimum of less than 32° F. was 85.

The mean total rainfall was greatest in the month of March with a total of 5.4 inches. Mean total rainfall was least in the month of October with a value of only 1.8 inches. The annual mean total rainfall for the Fort Campbell area was 45.6 inches.

Vegetation

Deciduous forests cover the larger part of Kentucky as well as most of the eastern portion of the United States. Braun (1950), divides the forests of Kentucky into two major divisions, the Western Mesophytic Forest Region and the Mixed Mesophytic Forest Region. The forests of Todd County are a part of the Western Mesophytic Forest Region, a transition region which lies between the Mixed Mesophytic Forest Region to the east and the Oak-Hickory Region to the west (Braun, 1950).

The Western Mesophytic Forest Region extends from the western escarpment of the Cumberland and Allegheny Plateaus to the loess bluffs of the Mississippi River. Very little of the Western Mesophytic Forest remains in virgin condition as most of it has been lumbered or otherwise disturbed. According to Braun (1950), the vegetation of the region is a mosaic of unlike climaxes and subclimaxes and thus may be thought of as an ecotone. Braun (1950), also states that the mosaic situation is the result of present influences and of past influences operative within recent enough time that their effects on vegetation have not yet been eliminated and that the pronounced influence of underlying rock, early recognized by geologists, is evidence of the lack of complete climatic control.

Physiography undoubtedly has played a major role in the determination of the vegetation of the Western Mesophytic Forest Region. According to Braun (1950), a physiographic pattern, and a pattern of forest distribution similar to that of the present had been attained by the close of the Tertiary in the area which is now unglaciated eastern America. Fossil and vegetational evidence are in accord, both indicating that the deciduous forest was not displaced south of the glacial boundary, except in a band of varying width along the ice front, thus permitting continuance of the pattern of distribution which had been attained by the close of the Tertiary. It is quite evident that certain changes have occurred that are related to the Pleistocene glaciation even though the vegetation was not displaced as such by the glacial changes. According to Braun (1950), the presence of these unlike climaxes in close association with each other is indicative of past events--of climatic shrinkage of the mixed Tertiary forest, of depauperization of mixed mesophytic communities, of expansion of oak-hickory forest, of prairie migrations, and, least pronounced, of migrations of northern vegetation. A number of northern species occur more or less isolated south of the glacial border, and in only a few instances do we find these grouped into distinct communities. A pronounced mingling of floristic elements is noted in almost all localities where northern species occur (Braun, 1950).

According to Braun (1950), it is possible that interglacial migrations during periods when very mild temperatures prevailed in the north led to the population of the Nashville Basin, there to give rise to certain of the endemics of the Cedar Glades. These events may be related to the population of certain areas in western Kentucky that are referred to as "barrens". Braun (1943), refers to these areas in western Kentucky as areas that were formerly largely occupied by prairie communities.

III. RESULTS

Some 374 species of flowering plants, ferns, and fern allies were identified from the study area. This group represents 97 families.

The following preliminary annotated checklist contains the flowering plants, ferns, and fern allies that were collected and identified from the study area. Genera within each family are listed in alphabetical order.

EQUISETACEAE

Equisetum arvense L. Rare: open creekbanks.

SELAGINELLACEAE

Selaginella apoda (L.)Fern. Infrequent: shaded moist rocks.

OPHIOGLOSSACEAE

Botrychium virginianum (L.)Sw. Frequent: deep, rich, shaded woods.

OSMUNDACEAE

Osmunda cinnamomea L. Rare: moist soil along streambanks in deep woods.

POLYPODIACEAE

Adiantum pedatum L. Frequent: shaded woods.

Asplenium platyneuron (L.)Oakes Common: throughout area.

Asplenium pinnatifidum Nutt. Rare: restricted to outcroppings of the Cypress Sandstone formation.

Cystopteris bulbifera (L.)Bernh. Rare: moist, shaded, mosscovered rocks.

Dryopteris hexagonoptera (Michx.)Weatherby Infrequent: deep woods along rocky branches in sandy soil.

Dryopteris marginalis (L.)Gray Infrequent: deep woods.

Pellaea atropurpurea (L.)Link Infrequent: restricted to outcroppings of limestone

Polypodium polypodioides (L.)Watt Infrequent: in woods on sandstone boulders.

Polystichum acrostichoides (Michx.) Schott Common: in woods throughout.

Woodsia obtusa (Spreng.)Torr. Common: in woods throughout.

PINACEAE

Pinus Taeda L. Common: introduced in old fields and waste places.

Juniperus virginiana L. Common: on calcareous soils.

TYPHACEAE

Typha latifolia L. Common: edge of ponds.

ZOSTERACEAE

Potamogeton diversifolius Raf. Common: along banks of lake.

ALISMATACEAE

Alisma subcordatum Raf. Common: in edge of ponds.

Sagittaria australis (J.B. Sm.)Small Common: in edge of ponds.

GRAMINEAE

Andropogon virginicus L. Common: throughout in fields.

Arundinaria gigantea (Walt.)Shapm. Common: along streambanks.

Echinochloa muricata (Michx.)Fern. Common: throughout.

Hordeum pusillum Nutt. Common: throughout in fields.

Hystrix patula Moench Common: along streambanks.

Melica mutica Walt. Common: in fields and along roads.

Panicum commutatum Schult. Common: in fields throughout.

Panicum microcarpon Muhl. Common: throughout.

Paspalum ciliatifolium var. *Muhlenbergii* (Nash)Fern. Common: sandy woods and fields.

Triodea flava (L.)Smyth Common: throughout in fields.

Uniola latifolia Michx. Common: along streambanks.

CYPERACEAE

Cyperus strigosus L. Common: wet places.

Cyperus ovularis (Michx.)Torr. Common: wet places near old springs and wells.

Scirpus lineatus Michx. Common: moist places.

ARACEAE

Arisaema triphyllum (L.)Schott. Common: shaded woods.

Arisaema dracontium (L.)Schott. Frequent: deep woods.

COMMELINACEAE

Commelina communis L. Common: along edge of woods and streams.

Tradescantia virginiana L. Common: moist shaded areas.

JUNCACEAE

Juncus effusus L. Frequent: moist places.

Luzula campestris (L.)D.C. Frequent: moist, mosscovered sandstone rocks.

LILIACEAE

Allium vineale L. Common: throughout.

Chamaelirium luteum (L.)Gray Frequent: along rocky, well drained, sandstone bluffs.

Erythronium americanum Ker. Common: rich, moist, shaded alluvial flats.

Hemerocallis fulva L. Common: escaped from cultivation. Found near old homesites and along roadsides.

Muscari botryoides (L.)Mill. Infrequent: near old homesites.

Ornithogalum umbellatum L. Common: throughout.

Polygonatum biflorum (Walt.)Ell. Common: woods and roadsides throughout.

Smilacina racemosa (L.)Desf. Common: woods and roadsides throughout.

Smilax Bona-nox L. Frequent: sandy, dry soils.

Smilax rotundifolia L. Common: throughout.

Trillium cuneatum Raf. Frequent: shaded woods.

Trillium recurvatum Beck. Frequent: shaded woods.

DIOSCOREACEAE

Dioscorea quaternata (Walt.)J.P. Gmel. Frequent: throughout.

AMARYLLIDACEAE

Agave virginica L. Frequent: old fields and homesites.

Hymenocallis occidentalis (LeConte)Kunth Frequent: along streambanks and edge of moist woods.

Hypoxis hirsuta (L.)Coville Common: moist woods throughout.

Narcissus pseudonarcissus L. Common: escaped from cultivation.

ORCHIDACEAE

Corallorhiza odontorhiza (Willd.)R. Brown Rare: sandy slopes in beech woods.

Goodyera pubescens (Willd.)R. Brown Frequent: shaded sandy hillsides.

Orchis spectabilis L. Rare: deep, rich woods.

Tipularia discolor (Pursh)Nutt. Infrequent: shaded sandy hillsides.

SALICACEAE

Populus alba L. Infrequent: moist flats near old homesites.

Populus deltoides Marsh. Infrequent: along streambanks.

Salix caroliniana Michx. Infrequent: in edge of water in slow-moving streams.

Salix nigra Marsh. Common: along streambanks and moist places.

JUGLANDACEAE

Carya cordiformis (Wang.)K. Koch Common: dry uplands.

Carya ovata (Mill.)K. Koch Common: moist hillsides.

Carya tomentosa Nutt. Common: hillsides on sandy soils.

CORYLACEAE

Alnus serrulata (Ait.)Willd. Frequent: along streambanks.

Carpinus caroliniana Walt. Common: along streambanks and edge of rich woods.

Corylus americana Walt. Infrequent: along streambanks and edges of woods.

Ostrya virginiana (Mill.)K. Koch Common: edges of woods throughout.

FAGACEAE

Fagus grandifolia Ehrh. Common: along streams and on north-facing slopes.

Quercus alba L. Common: throughout.

Quercus falcata Michx. Frequent: dry slopes.

Quercus imbricaria Michx. Common: mesophytic areas throughout.

Quercus rubra L. Common: mesophytic sites throughout.

Quercus stellata Wang. Infrequent: dry slopes of calcareous soils.

ULMACEAE

Celtis laevigata Willd. Frequent: along streambanks and edges of lake.

Celtis occidentalis L. Frequent: moist hillsides.

Ulmus alata Michx. Common: along rocky bluffs near streams.

Ulmus rubra Muhl. Common: edge of fields and dry slopes.

MORACEAE

Maclura pomifera (Raf.)Schneid. Frequent: near old homesites.

Morus rubra L. Common: throughout along streams and shaded hillsides.

URTICACEAE

Pilea pumila (L.)Gray Frequent: along edge of shaded streams.

LORANTHACEAE

**Phoradendron flavescens* (Pursh)Nutt. Infrequent: parasitic on trees.

ARISTOLOCHIACEAE

Asarum canadense L. Common: in leaf litter in shaded and moist woods.

POLYGONACEAE

Polygonum Persicaria L. Common: moist soil along creeks.

Polygonum punctatum Ell. Common: along edge of ponds and dry creekbeds.

Polygonum scandens L. Frequent: in shaded thickets.

Tovara virginiana (L.)Raf. Frequent: shaded thickets along streams and edge of fields.

Rumex acetosella L. Common: throughout in old fields.

Rumex crispus L. Common: in fields along streams.

CHENOPODIACEAE

Chenopodium ambrosioides L. Common: open disturbed habitats and barnyards.

AMARANTHACEAE

Amaranthus spinosus L. Common: throughout in old fields.

Amaranthus retroflexus L. Common: throughout in old fields.

PHYTOLACCACEAE

Phytolacca americana L. Common: edge of woods and in thickets.

PORTULACACEAE

Claytonia virginica L. Common: throughout.

CAROPHYLLACEAE

Cerastium semidecandrum L. Infrequent: edge of fields.

Cerastium nutans Raf. Common: throughout in fields.

Dianthus Armeria L. Infrequent: along dry roadbanks.

Silene virginica L. Frequent: shaded hillsides.

Stellaria pubera Michx. Common: throughout in fields.

RANUNCULACEAE

Actaea pachypoda Ell. Frequent: rich, shaded hillsides.

Anemone virginiana L. Infrequent: open, dry limestone soils.

Anemonella thalictroides (L.)Spach Common: shaded hillsides throughout.

Delphinium tricorne Michx. Infrequent: deep woods and slopes near lake.

Ranunculus abortivus L. Common: throughout.

Ranunculus recurvatus Poir. Infrequent: shaded hillsides along creek.

Thalictrum dioicum L. Infrequent: dry slopes on limestone soils.

BERBERIDACEAE

Podophyllum peltatum L. Common: throughout.

MENISPERMACEAE

Calycocarpum Lyoni (Pursh)Gray Infrequent: shaded slopes near lake.

MAGNOLIACEAE

Lirodendron tulipifera L. Common: creekbanks and mesic slopes.

ANNONACEAE

Asimina triloba (L.)Dunal Frequent: deep woods.

LAURACEAE

Lindera benzoin (L.)Blume Frequent: along shaded streams.

Sassafras albidium (Nutt.)Nees Common: throughout.

PAPAVERACEAE

Sanguinaria canadensis L. Frequent: shaded hillsides.

FUMARIACEAE

Dicentra Cucullaria (L.)Bernh. Rare: rich soil along wooded streams.

CRUCIFERAE

Arabidopsis thaliana (L.)Heynh. Frequent: open, moist soil near streams.

Arabis canadensis L. Infrequent: dry limestone slopes.

Armoracia rusticana (Lam.)Gaertn., Mey. & Scherb. Common: escape from cultivation throughout.

Capsella bursa-pastoris (L.)Medic. Common: throughout.

Cardamine douglasii (Torr.)Britt. Infrequent: wooded, mesic hillsides.

Cardamine parviflora L. Frequent: open mesic slopes.

Dentaria heterophylla Nutt. Common: mesic wooded slopes.

Dentaria laciniata Muhl. Common: throughout.

Draba brachycarpa Nutt. Common: open mesic exposures.

Draba verna L. Common: open exposures throughout.

Lepidium virginicum L. Frequent: moist shaded hillsides.

Sibara virginica (L.)Rollins Common: pastures and exposed habitats.

Sisymbrium officinale (L.)Scop. Common: along roadsides.

SAXIFRAGACEAE

Heuchera americana L. Common: along shaded bluffs and rocky streams.

Hydrangea arborescens var. *Deamii* St. John Common: along shaded streams.

Saxifraga virginiensis Michx. Common: throughout on rocky slopes and moss-covered stones.

HAMAMELIDACEAE

Hamamelis virginiana L. Rare: along riverbanks.

Liquidambar styraciflua L. Frequent: along streams.

PLATANACEAE

Platanus occidentalis L. Common: along creeks.

ROSACEAE

Agrimonea gryposepala Wallr. Infrequent: shaded, moist habitat in deep woods.

Agrimonea parviflora Ait. Frequent: along shaded streambanks.

Amelanchier arborea (Michx.)Fern. Frequent: along banks of streams.

Aruncus dioicus (Walt.)Fern. Frequent: edge of woods near lake in mesic habitat.

Fragaria virginiana Duchesne Common: throughout on sandy open exposures.

Geum canadense Jacq. Frequent: open woods.

Gillenia stipulata (Muhl.)Baill. Frequent: open slopes on limestone soils.

Potentilla canadensis L. Common: on sandy soils throughout.

Potentilla simplex Michx. Common: open sandy soils.

Prunus serotina Ehrhart Common: fencerows and near old homesites.

Rosa multiflora Thunb. Common: escaped from cultivation in fencerows and fields throughout.

Rubus argutus Link Common: throughout forming thickets and in fencerows.

LEGUMINOSAE

Baptisia australis (L.)R. Brown Frequent: along roadsides.

Cassia fasciculata Michx. Common: along roadsides and in fields.

Cercis canadensis L. Common: throughout in disturbed areas and open woods and thickets.

Clitoria mariana L. Infrequent: along roadsides and in shaded dry woods.

Crotalaria sagittalis L. Common: open dry fields.

Desmodium canescens (L.)D.C. Common: shaded dry woods.

Desmodium glutinosum (Muhl.)Wood Common: woods and along roadsides.

Desmodium rotundifolium D.C. Frequent: open dry wooded slopes.

Gleditsia tricanthos L. Common: along streams and shaded moist hillsides.

Lathyrus latifolius L. Common: near old gardens and homesites.

Lespedeza bicolor Turcz. Frequent: escape from cultivation on sandy dry areas.

Lespedeza cuneata (Dumont)G. Don Common: escape from cultivation throughout.

Lespedeza virginica (L.)Britt. Frequent: dry slopes.

Medicago sativa L. Common: escape from cultivation.

Melilotus alba Desr. Common: along roadsides.

Melilotus officinalis (L.)Lam. Common: along roadsides.

Petalosteum candidum (Willd.)Michx. Frequent: dry limestone uplands.

Robinia Pseudo-Acacia L. Infrequent: limestone soils.

Stylosanthes biflora (L.)B.S.P. Frequent: open, exposed areas in fields.

Trifolium pratense L. Common: fields and roadsides.

Trifolium procumbens L. Common: fields and roadsides.

Vicia dasycarpa Tenore Common: escape from cultivation in fields and along roadsides.

LINACEAE

Linum striatum Walt. Frequent: shaded hillsides.

OXALIDACEAE

Oxalis stricta L. Common: woods and edges of fields.

Oxalis violaceae L. Common: shaded moist woods.

GERANIACEAE

Geranium maculatum L. Common: woods and moist roadsides.

POLYGALACEAE

Polygala sanguinea L. Frequent: edge of old fields.

EUPHORBIACEAE

Acalypha virginica L. Frequent: open dry slopes.

Croton capitatus Michx. Common: open dry fields.

Euphorbia commutatus Englm. Frequent: moist thickets and along old roadbeds.

Euphorbia corollata L. Common: dry uplands and fields.

Euphorbia maculata L. Common: open, dry, sandy exposures.

Euphorbia supina Raf. Common: throughout in fields and waste places.

ANACARDIACEAE

Rhus copallina L. Common: in edges of woods and thickets.

Rhus glabra L. Common: forms thickets on sandy hillsides and on waste places.

Rhus radicans L. Frequent: in thickets and on old buildings near homesites.

CELASTRACEAE

Euonymus americanus L. Common: mesophytic woods.

<u>Euonymus</u> <u>atropurpureus</u> Jacq. Common: shaded woodland slopes.

<u>Euonymus</u> <u>obovatus</u> Nutt. Common: shaded mesic slopes.

ACERACEAE

<u>Acer</u> <u>Negundo</u> L. Infrequent: moist alluvial flats.

<u>Acer</u> <u>rubrum</u> L. Common: along streams.

<u>Acer</u> <u>saccharum</u> Marsh. Common: throughout in mesic situations.

HIPPOCASTANACEAE

<u>Aesculus</u> <u>glabra</u> Willd. Frequent: along streams.

BALSAMINACEAE

<u>Impatiens</u> <u>capensis</u> Meerb. Common: moist alluvial soils and along creekbanks.

RHAMNACEAE

<u>Ceanothus</u> <u>americanus</u> L. Infrequent: dry woodland slopes.

<u>Rhamnus</u> <u>caroliniana</u> Walt. Infrequent: dry woodland slopes on calcareous soils.

VITACEAE

<u>Parthenocissus</u> <u>quinquefolia</u> (L.)Planch. Common: on dry wooded slopes.

<u>Vitis</u> <u>aestivalis</u> Michx. Common: mesic woods and thickets.

<u>Vitis</u> <u>Labrusca</u> L. Common: rocky woodland slopes.

MALVACEAE

<u>Abutilon</u> <u>Theophrasti</u> Medic. Infrequent: edges of fields.

<u>Sida</u> <u>spinosa</u> L. Common: in edges of cultivated fields.

GUTTIFERAE

Ascyrum Hypericoides L. Common: dry, sandy soils.

Hypericum densiflorum Pursh Common: rocky woodland slopes of sandy soil.

Hypericum dolabriforme Vent. Frequent: open dry fields.

Hypericum Drummondii (Grev. & Hook.)T. & G. Infrequent: open fields on sandy soils.

Hypericum gentianoides (L.)B.S.P. Frequent: open exposures along sandy branches.

Hypericum perforatum L. Common: open dry soils.

Hypericum punctatum var. *subpetiolatum* (Bickn.)Fern. Frequent: open, dry, sandy soils.

Hypericum sphaerocarpum Michx. Frequent: open woods on limestone soils.

VIOLACEAE

Viola papilionaceae Pursh Common: alluvial soil and in shaded woods.

Viola pennsylvanica Michx. Common: shaded woodland slopes and alluvial flats.

Viola Rafinesquii Greene Common: mesic woodland slopes.

Viola triloba Schwein. Common: moist woodland slopes.

Viola triloba var. *dilatata* (Ell.)Brainerd Frequent: shaded, moist alluvial flats.

PASSIFLORACEAE

Passiflora incarnata L. Common: roadsides and old fields.

Passiflora lutea L. Frequent: dry uplands on both calcareous and noncalcareous soils.

CACTACEAE

**Opuntia humifusa* Raf. Frequent: shaded calcareous soils.

LYTHRACEAE

Cuphea petiolata (L.)Koehne Frequent: dry, rocky habitats on calcareous soils.

NYSSACEAE

Nyssa sylvatica Marsh. Frequent: on wooded hillsides near lake and streams.

ONAGRACEAE

Circaea quadrisulcata var. *canadensis* (L.)Hara Frequent: wooded mesic slopes.

Gaura biennis L. Frequent: open exposed limestone habitats.

Ludwigia alternifolia L. Common: swampy habitats.

Oenothera biennis L. Common: throughout in fields.

Oenothera laciniata Hill Common: dry sandy soils.

HALORAGACEAE

Myriophyllum pinnatum (Walt.)B.S.P. Frequent: in water along edge of lake.

ARALIACEAE

Aralia spinosa L. Common: mesic woodland slopes.

UMBELLIFERAE

Chaerophyllum Tainturieri Hook. Common: rocky, exposed habitats to mesic situations throughout.

Cryptotaenia canadensis (L.)D.C. Common: mesic situations throughout.

Daucus carota L. Common: fields and roadsides throughout.

Erigenia bulbosa (Michx.)Nutt. Frequent: moist shaded hillsides.

Osmorhiza longistylis (Torr.)D.C. Common: fields and roadsides.

Sanicula marilandica L. Common: mesic woodland slopes.

Torilis japonica (Houtt.)D.C. Common: dry fields and along roadsides.

CORNACEAE

Cornus florida L. Common: rocky limestone slopes to mesic situations throughout.

PYROLACEAE

Chimaphila maculata (L.)Pursh Frequent: shaded sandy hillsides and beech communities.

Monotropa uniflora L. Rare: mesophytic beech woods.

ERICACEAE

Kalmia latifolia L. Frequent: sandy, well-drained soils. Restricted to north-facing slopes.

Oxydendrum arboreum (L.)D.C. Infrequent: moist, shaded, rocky slopes on noncalcareous soils.

Vaccinium stamenium L. Infrequent: rocky, well-drained slopes on noncalcareous soils.

PRIMULACEAE

Anagallis arvensis L. Common: throughout in moist situations to open fields.

Dodecatheon Media L. Infrequent: sandy, wooded hillsides.

Lysimachia lanceolata Walt. Infrequent: shaded limestone uplands.

Samolus parviflorus Raf. Frequent: moist, shaded environments usually near moss-covered rocks.

EBENACEAE

Diospyros virginiana L. Common: throughout on dry slopes.

OLEACEAE

Fraxinus americana L. Frequent: along creekbanks.

LOGANIACEAE

Spigelia marilandica L. Frequent: rocky woodland slopes.

GENTIANACEAE

Gentiana saponaria L. Infrequent: moist, mossy hillsides.

Sabatia angularis (L.)Pursh Infrequent: edges of fields and woods on calcareous soils.

Swertia caroliniensis (Walt.)Ktze. Infrequent: fields on calcareous soils.

APOCYNACEAE

Vinca minor L. Frequent: escape from cultivation on roadbanks and near old homesites.

ASCLEPIADACEAE

Asclepias syriaca L. Common: roadsides.

Asclepias tuberosa L. Common: along dry roadbanks and open limestone soils.

Asclepias verticillata L. Frequent: open calcareous soils.

CONVOLVULACEAE

Cuscuta campestris Yuncker Common: parasitic in hayfields and tobacco plantbeds.

Ipomoea coccinea L. Frequent: along sandy riverbanks.

Ipomoea lacunosa L. Common: in cultivated fields and edges of fields.

Ipomoea pandurata (L.)G.F.W. Mey. Common: roadsides and waste places.

POLEMONIACEAE

Phlox divaricata L. Common: shaded alluvial flats and hillsides.

Polemonium reptans L. Common: deep, rich, shaded woodland flats.

BORAGINACEAE

Cynoglossum virginianum L. Common: shaded, rocky hillsides.

Mertensia virginica (L.)Per. Frequent: alluvial soil along shaded creekbanks.

Myosotis macrosperma Engelm. Frequent: shaded woodland hillsides.

Myosotis verna Nutt. Frequent: mesic slopes and fields.

VERBENACEAE

Verbena simplex Lehm. Common: along roadsides.

Verbena urticifolia L. Common: old fields and waste places.

LABIATAE

Collinsonia canadensis L. Common: mesic woodland slopes.

Lamium amplexicaule L. Common: roadsides and fields.

Lycopus americanus Muhl. Frequent: swampy areas.

Lycopus virginicus L. Frequent: swampy areas.

Monarda fistulosa L. Frequent: open calcareous soils.

Prunella vulgaris L. Common: roadsides and fields throughout.

Pycnanthemum pycnanthemoides (Leavenw.)Fern. Common: open dry fields.

Pycnanthemum tenuifolium Schrad. Frequent: shaded woodland hillsides.

Salvia lyrata L. Common: roadsides and dry soils.

Salvia urticifolia L. Common: dry uplands of calcareous soils.

Scutellaria elliptica Muhl. Common: dry woodland slopes.

Scutellaria elliptica var. *hirsuta* (Short)Fern. Common: mesic woodlands.

Stachys tenuifolia Willd. Common: throughout in edges of fields and along streambanks.

Teucrium canadense L. Common: along sandy streambanks.

Trichostema dichotomum L. Frequent: along wooded streambanks in moist soil.

SOLANACEAE

Datura stramonium L. Common: old fields and waste places.

Physalis angulata L. Frequent: open fields.

Solanum americanum Mill. Frequent: edges of fields and moist places.

Solanum carolinense L. Common: throughout in old fields.

SCROPHULARIACEAE

Gerardia flava L. Frequent: wet, swampy places.

Gratiola neglecta Torr. Frequent: moist flats.

Lindernia anagallidea (Michx.)Pennell Frequent: moist swampy areas.

Mimulus alatus Ait. Infrequent: swampy flats.

Paulownia tomentosa (Thunb.)Steud. Infrequent: near old homesites.

Pedicularis canadensis L. Common: mesic hillsides.

Penstemon digitalis Nutt. Common: fields and roadsides.

Penstemon grandiflorus Nutt. Common: moist shaded streambanks.

Penstemon hirsutus (L.)Willd. Common: roadbanks and edges of fields.

Penstemon Smallii Heller Frequent: roadbanks and fields.

Verbascum thapsus L. Common: dry banks and along roadsides and in dry fields.

Veronica arvensis L. Common: fields and roadsides.

BIGNONIACEAE

Campsis radicans (L.)Seem. Common: fencerows throughout.

OROBANCHACEAE

Epifagus virginiana (L.)Bart. Common: parasitic in shaded beech woods.

ACANTHACEAE

Justicia americana Fern. Frequent: shallow, slow-moving water.

Ruellia caroliniensis (Walt.)Steud. Common: dry, sandy slopes.

Ruellia humilis Nutt. Frequent: dry roadsides in calcareous soils.

Ruellia purshiana Fern. Common: along roadsides.

Ruellia strepens L. Common: shaded dry woodlands.

PHRYMACEAE

Phryma leptostachya L. Frequent: mesophytic woods.

PLANTAGINACEAE

Plantago aristata Michx. Common: dry banks and fields.

Plantago lanceolata L. Common: lawns and fields.

Plantago Rugelii Dcne. Common: lawns and fields.

Plantago virginica L. Common: pastures and roadsides.

RUBIACEAE

Cephalanthus occidentalis L. Common: along branches and streams on moist sandy soils.

Diodea teres Walt. Common: edge of cultivated fields and waste places.

Galium aparine L. Common: edges of pastures and fields.

Galium circaezans Michx. Frequent: moist, shaded woodlands.

Galium triflorum Michx. Frequent: shaded woodlands.

Houstonia caerulea L. Common: wooded hillsides of sandy soils.

Houstonia purpurea L. Frequent: sandy soils in open woods.

Mitchella repens L. Frequent: on moss-covered and moist rocks. Restricted to sandstone areas.

CAPRIFOLIACEAE

Sambucus canadensis L. Frequent: sandy and alluvial soils along streams.

Lonicera japonica Thunb. Common: forming thickets and in fencerows throughout.

Symphoricarpos orbiculatus Moench Common: dry uplands and in fencerows.

Triosteum agustifolium L. Frequent: dry limestone uplands.

Viburnum rufidulum Raf. Frequent: dry, wooded uplands.

CAMPANULACEAE

Specularia perfoliata (L.)A. DC. Common: open fields.

LOBELIACEAE

Lobelia cardinalis L. Infrequent: swampy areas.

Lobelia inflata L. Frequent: moist, swampy areas.

Lobelia siphilitica L. Infrequent: swampy areas.

Lobelia spicata Lam. Infrequent: dry limestone uplands.

COMPOSITAE

Achillea millefolium L. Common: fields and roadsides on dry exposures.

Ambrosia artemesiifolia L. Common: fields and roadsides.

Ambrosia trifida L. Common: fields and roadsides on dry exposures.

Antennaria plantaginifolia (L.)Hook. Common: dry sandy exposures.

Antennaria solitaria Rydb. Infrequent: mossy hillsides that are mesic and well shaded.

Articum minus (Hill)Hernh. Frequent: near old barns and homesites.

Astranthium integrifolium (Michx.)Nutt. Common: dry, open fields.

Bidens bipinnata L. Common: edges of fields and woodlands on mesic exposures.

Chrysanthemum *leucanthemum* L. Common: fields throughout.

Cichorium *intybus* L. Frequent: roadsides on limestone soils.

Cirsium *altissimum* (L.)Spreng. Frequent: fields and roadsides.

Cirsium *vulgare* (Savi)Tenore Common: fields and roadsides.

Elephantopus *carolinianus* Willd. Common: along shaded hillsides in mesic woodlands.

Echinacea *pallida* Nutt. Frequent: dry limestone soils.

Erigeron *annuus* (L.)Per. Common: fields and roadsides.

Erigeron *canadensis* L. Common: fields and waste places.

Erigeron *strigosus* Muhl. Common: fields and open woodland hillsides.

Eupatorium *aromaticum* L. Common: dry, wooded hillsides.

Eupatorium *coelestinum* L. Common: moist soils along woodland branches.

Eupatorium *fistulosum* Barratt Frequent: base of moist wooded hillsides.

Eupatorium *serotinum* Common: throughout.

Eupatorium *sessilifolium* L. Frequent: rocky, shaded, mesic slopes.

Gnaphalium *obtusifolium* L. Common: dry fields and woods.

Gnaphalium purpureum L. Frequent: dry, sandy fields.

Helenium tenuifolium Nutt. Common: old barnlots, pastures and roadsides.

Helianthus hirsutus Raf. Common: fields and roadsides.

Hieracium grovonii L. Frequent: open, rocky woods.

Krigia biflora (Walt.)Blake Frequent: wooded rocky slopes.

Krigia oppositifolia Raf. Infrequent: open, dry fields.

Lactuca floridana (L.)Gaert. Common: roadsides.

Liatris squarrosa (L.)Michx. Frequent: limestone uplands.

Parthenium integrifolium L. Frequent: wooded limestone uplands.

Pyrrhopappus carolinianus (Walt.)D.C. Common: dry roadsides on limestone soils.

Ratibida pinnata (Vent.)Barnh. Frequent: roadbanks on limestone soils.

Rudbeckia heliopsidis T. & G. Frequent: sandy roadsides.

Rudbeckia hirta L. Common: throughout in fields.

Senecio glabellus Pioret Common: moist, shaded, sandy soils.

Sericocarpus linifolius (L.)BSP. Frequent: open, dry woods.

Silphium astericus L. Common: dry roadsides and fields.

Solidago altissima L. Common: fields and roadsides.

Solidago caesia L. Common: mesic woodlands.

Solidago Curtisii T.& G. Common: sandy woodlands.

Solidago nemoralis var. decemflora (DC.)Fern. Common: dry roadsides and waste places.

Taraxacum officinale Weber Common: throughout in fields and lawns.

Verbesina helianthoides Michx. Frequent: open, dry roadsides.

Verbesina occidentalis (L.)Walt. Common: edges of woods and along roadsides.

Verbesina virginica L. Frequent: open, dry fields.

Vernonia missurica Raf. Common: rocky, woodland slopes.

Xanthium strumarium L. Common: creekbottoms near areas of cultivation.

* Denotes sight identification only.

IV. DISCUSSION

Not only is the state of Kentucky a transition region but, Todd County itself could perhaps be considered a transition region floristically in many respects. Braun (1950), refers to the Western Mesophytic Forest Region, of which Todd County is a part, as a transition region from a standpoint of woody flora. The forests of the region exhibit a mosaic pattern and show no definite climaxes. *Hypericum dolabriforme* is an endemic of this transition region (Braun, 1950). This species was found to be relatively common within the study area.

Not only does the county as a whole exhibit the characteristics of a transition area, but the northern and southern portions show transition tendencies that are unique in themselves. The southern portion of the county is a part of the Highland Rim Section of the Mississippean Plateau and is characterized by frequent limestone outcroppings and by calcareous soils. The northern portion of the county is a part of the Shawnee Hills Section and is characterized by very frequent outcroppings of sandstone and by noncalcareous soils. The northern portion of the county is of Pennsylvanian origin geologically (Braun, 1943).

The Shawnee Hills Section is distinguished vegetationally by a large amount of mixed mesophytic forests on its slopes, and floristically by its strong Appalachian element (Braun, 1950). According to Braun (1950), the rugged slopes of the Shawnee Hills Section contain several species that are associated with Mixed Mesophytic Forests such as beech, oaks, shellbark hickories, mulberry, tuliptree, red maple, sugar maple, and sourwood, all of which were found within the study area. Several other species that are associated with the Mixed Mesophytic Forests are found within the Shawnee Hills Section but were not found within the study area.

According to Braun (1950), many Appalachian species extend locally beyond the western escarpment of the Appalachian Plateau. Heaths are almost absent from the extended limestone areas of the Western Mesophytic Forest Region, thus their ranges are abruptly interrupted at the regional boundary (Braun, 1950). Although the study area lies only three or four miles from the Mississippean Plateau, almost totally limestone in makeup, several heaths were found within the study area. According to Braun (1950), _Kalmia_ is conspicuous in the undergrowth of the rugged slopes of the Shawnee Hills Section that contains trees normally associated with Mixed Mesophytic forests. _Kalmia latifolia_ was found within the study area to be very prominent in the understory of certain communities.

Vaccinium stamineum, squaw huckleberry, is very common in eastern Kentucky and is generally considered an Appalachian species. Oxydendrum arboreum, sourwood, is also quite common on the Appalachian Plateau of eastern Kentucky and is another member of the heath family that is generally considered an Appalachian species. Both were found within the study area and were quite frequent.

Of particular significance is the presence of Asplenium pinnatifidum, the lobed spleenwort, within the study area. Asplenium pinnatifidum is found only in the cracks and crevices of sandstone bluffs and is relatively uncommon in western Kentucky. It is however, quite common in eastern Kentucky east of the Cumberland and Allegheny Plateaus and is clearly an Appalachian species (Wharton and Barbour, 1971).

Several plant communities were apparent within the study area. Each community was recognizable in most cases by the presence of certain indicator species. Only a few of the indicator species will be mentioned for each community discussed.

Two related communities were quite evident within the study area. These communities were confined to areas of limestone outcroppings. The communities were not extensive due to the small portion of the area that was composed of calcareous soils. Both were wooded and fairly well shaded. Certain indicator species were noted within the community.

Pellaea atropurpurea, the purple cliffbrake, was found in only one location within the study area. This was the site of the only outcrop of the Glen Dean formation, predominately limestone, within the study area. This outcrop is found approximately one-quarter mile southeast of Allegre, Kentucky. According to Wharton and Barbour (1971), the habitat of P. atropurpurea consists of limestone ledges and cliffs. Each specimen collected within the study area was found growing from the cracks and crevices of the limestone outcroppings of the Glen Dean formation. The soil was found to be a Talbott soil at the site of the outcroppings of the Glen Dean formation (U.S.D.A., 1973). Opuntia humifusa, the prickly pear cactus, was found in only two locations within the study area. One of the two locations was the area of the outcroppings of the Glen Dean formation previously mentioned. The other location was an outcrop of the Haney limestone member of the Golconda formation, also predominately limestone in makeup. In both cases O. humifusa was found growing on very dry, thin soil. The second situation in which O. humifusa was collected, the soil was found to be a Pembroke soil (U.S.D.A., 1973). *Juniperus virginiana* was found growing abundantly in both locations with *O. humifusa*. These two locations of limestone outcroppings were disdinctly separate in floral makeup from any surrounding areas. Each of the communities was very rocky, dry, and quite well drained. *Opuntia humifusa*, *Pellaea atropurpurea*, and *Juniperus virginiana* are all indicative of the particular habitat consisting of limestone outcroppings and very thin, dry soil.

It was noted that certain plant communities were associated with steep, rocky slopes composed of well-drained, acid soils. These communities were most abundant along the streams that entered Pond River as well as in certain areas along the lake formed by Pond River. Two indicator species of this community were noted in particular. *Chamaelirium luteum*, blazing star, was found growing in two locations within the study area. In both situations it was found growing on very steep slopes along the banks of Pond River in almost bluff-like conditions. Very little soil covered the prominent outcroppings of the Cypress Sandstone formation and the soil was extremely well drained. *Kalmia latifolia*, mountain laurel, was found in association with *C. luteum* in this community. *Kalmia latifolia* provided a very dense shrub layer as it was very abundant in each of the two locations in which C. luteum was found. Each of the habitats in which the two were found were relatively small. Both were less than two hundred yards long and only ten to fifteen yards in width. Neither C. luteum nor K. latifolia were found in any other parts of the study area. No soil tests were taken but it may be assumed that the soils were acid as both C. luteum and K. latifolia are usually found on well drained soils that are acid (Wharton and Barbour, 1971). The soils of the slopes of this community were members of the Frondorf-Weikert complex (U.S.D.A., 1973). The soils of this particular community were members of the Frondorf-Weikert complex that are severely eroded, well drained, and have a very low productivity potential (U.S.D.A., 1973). This soil has a high erosion hazard and a very low organic matter content. All soils of the Frondorf-Weikert complex in Todd County are associated with sandstone and are acid (U.S.D.A., 1973). Only plants that are associated with acid soils were found in this community. This community posessed many characteristics of an Appalachian community in floral makeup and soil characteristics.

Locations within the study area that were very moist and well shaded provided suitable habitats for specific plant communities. These communities were quite small in size in comparison to other plant communities within the study area. Generally, they were restricted to areas of sandstone outcroppings in deeply wooded areas. Mosses were quite prevalent in these communities. Selaginella apoda, meadow spikemoss, was found in a very moist environment on the underside of an overhanging sandstone shelf where it was not exposed to the direct rays of the sun. Water seeped steadily over the rock and the rock was also carpeted on much of the underside with moss. This provided a very suitable environment as S. apoda is normally found growing on wet rocks (Gray, 1950). Mitchella repens, partridge berry, was also found in this location as well as in other similar habitats. According to Wharton and Barbour (1971), M. repens covers small banks in a moist environment on acid soil. The environment in which it was found was extremely well drained and sandy and most likely quite acidic. All soils in the vicinity of this small community were members of the Frondorf-Weikert complex, which is entirely acidic in northern Todd County (U.S.D.A., 1973).

Another community that was easily recognizable was found near the river and streams of the study area.

It was associated with well shaded woods and rich soils with an accumulation of humus. It was evident that the organic matter content was relatively high here as compared to the rest of the study area. Dicentra cucullaria, Dutchmen's breeches, is found growing in deep humus in rich mesophytic woods. Within the study area, D. cucullaria was collected in oak-hickory woods along Pond River. Two other species were found growing in the same habitat that were not found in other sections of the study area. Orchis spectabilis, the showy orchis, was also found in the oak-hickory woods along Pond River as was Tipularia discolor, the cranefly orchid. According to Correll (1950), O. spectabilis is normally found in rich hardwood forests where there is an accumulation of humus. Tipularia discolor is also found where there is an accumulation of humus in rich, damp woods (Correll, 1950). None of the three species, D. cucullaria, O. spectabilis, or T. discolor are common in or near the study area and might be considered somewhat rare. Dicentra cucullaria and O. spectabilis are especially rare and one would expect to find them only in the most secluded and undisturbed habitat. It should be noted that this community was not in an area that was accessable to livestock or near any areas of active cultivation.

Aquatic communities were also present within the study area. Two indicator species were identified from a totally aquatic community. According to Gleason and Cronquist (1963), *Myriophyllum pinnatum*, water milfoil, is found submerged in quiet water or rooting on muddy shores. *Potamogeton diversifolius*, pondweed, is also found in similar conditions in shallow water (Gleason and Cronquist, 1963). Both species were collected around the perimeter of Settle's Lake in very shallow water. Neither was found in those sections of the lake where the bank dropped off sharply into deep water. Both were found in water no more than two to three feet in depth. They were found to be more common near the dam of the lake than in other parts.

Semi-aquatic communities were also noted within the study area. Certain indicator species were found consistently within the communities. According to Wharton and Barbour (1971), *Osmunda regalis* var. *spectabilis*, the royal fern, is found near springs or other wet places. A very closely related species, *Osmunda cinnamomea*, the cinnamon fern, is also normally found near swamps, wet depressions in woods and on wooded stream banks (Wharton and Barbour, 1971). Within the study area, both were found growing along a small spring branch that entered Pond River. Water seeping from the bank provided a very moist environment even during periods when no water was traveling in the branch as such. The area in which they were found was surrounded by beech, *Fagus grandifolia*, and was very well shaded. The third species found to be indicative of this community was *Onoclea sensibilis*, the sensitive fern. According to Wharton and Barbour (1971), *O. sensibilis* is found in swamps, muddy depressions, and seepage areas either in the shade or in the sun. The water seeping from the rocks and moss covered bank provided a very suitable habitat for *O. sensibilis* as well. According to Gleason and Cronquist (1963), *O. regalis* var. *spectabilis* is found mostly on acid soils. Even though the environment in which it was found was very moist, it was also well drained due to the slope of the bank on which it was found and numerous outcroppings of sandrocks of the Cypress Sandstone formation. It is assumed that the area was acidic due to being sandy and very well drained. The soils of this community are Weikert soils of the Frondorf-Weikert complex (U.S.D.A., 1973). This particular member of the complex is a very shallow, acid soil that is quite stony with some silty loam tendencies (U.S.D.A., 1973). *Osmunda regalis* var. *spectabilis* was also collected along the edge of Settle's Lake along a very steep bank. The soil type was the same as in the previous location mentioned. The semi-aquatic communities are capable of supporting a wide range of plants that range from almost totally aquatic to those plants that are adapted to merely a moist environment. These communities provide an excellent variety of plants.

The north-facing slopes of the study area supported distinct communities. Of particular note are the communities that were associated with the presence of the american beech, Fagus grandifolia. Certain indicator species bear out the distinctness of this community. According to Wharton and Barbour (1971), Chimaphila maculata, spotted wintergreen, is found in beech woods in noncalcareous soil. Epifagus virginiana, beech drops, is parasitic on the roots of beech trees (Wharton and Barbour, 1971). Monotropa uniflora, Indian pipe, was found growing in the presence of both C. maculata and E. virginiana. Although M. uniflora was found in only one location, C. maculata and E. virginiana were found in several locations but in each case they were found only in the presence of F. grandifolia and only on north-facing slopes. It is possible that each of the three was more dependent upon the conditions due to the presence of the beech trees than dependent upon the north facing slope for existance. It is perhaps true that the beech trees are found only on north facing slopes in this region and since _C. maculata_ and _E. virginiana_ are normally found in the presence of beech trees, they would in turn naturally be found on north facing slopes. In all of the communities in which _F. grandifolia_ was prominent, the soils were found to be members of the Frondorf-Weikert complex (U.S.D.A., 1973). They were silty loam soils and were acid with a low to moderate yield potential.

It was found that _Acer negundo_, box elder, is indicative of a specific community. _Acer negundo_ is normally found on flood plains and along creeks (Braun, 1943). Within the study area, it was found that the community occupied by _A. negundo_ was typical of the type described by Braun (1943). _Acer negundo_ was found only at the upper end of Settle's Lake in a very flat and low area that floods with each rain and forms what might be considered a small floodplain. The area in which the community was observed lies between the two creeks that merge to form the beginning of Settle's Lake, which is also the beginning of Pond River. The area is very wet and the soil is almost totally alluvial and very muddy. The soil type of this community was found to be a Huntington soil (U.S.D.A., 1973). The area almost has the appearance of a swamp. _Acer ne-_

gundo was found to be very common here and only in this community. Perhaps a reason for its abundance in this community as well as the soil conditions would be that the area is undisturbed by livestock and cultivation by man. According to Jackson (1955), A. negundo is prolific in reproduction but is easily destroyed by grazing and cultivation.

One other unique community was quite evident within the study area. This community was somewhat of an aquatic community but was restricted to slow-moving water as opposed to still waters or a very moist habitat. According to Gleason and Cronquist (1963), Salix caroliniana, swamp willow, is found in rocky soil along streams. Justicia americana, water willow, is normally found in shallow water of slow streams (Braun, 1943). The two were found growing in the streambed of Pond River between the dam of Settle's Lake and the bridge that crosses Pond River some 350 yards below the dam. The community comprised an area of about one hundred yards along Pond River at this point and was not found in any other parts of the study area. The environment was very moist and both indicator species were growing in a mixture of soil and fine gravel in the streambed and not along the banks. The soil of the area is a Huntington soil.

Although it might not be considered a community within itself, one other microhabitat was noted within the study area that was quite unique. *Asplenium pinnatifidum*, the lobed spleenwort, was found in two locations within the study area. In both cases it was found growing from cracks and crevices of outcroppings of the Cypress Sandstone formation along the banks of Pond River. *Asplenium pinnatifidum* is normally found in cracks or small crevices of sandstone rocks (Shaver, 1954). According to Shaver (1954), *A. pinnatifidum* is largely confined to the sandstone escarpment of the Cumberland Plateau. This plant then might be considered somewhat rare for the region of the state in which it was found as it is several hundred miles from the escarpment of the Cumberland Plateau.

V. CONCLUSIONS

It is significant that 97 families would be represented in such a relatively small area. The large number of families is an indication of a wide range of communities and microhabitats within the study area. Perhaps the variety of plant life within the study area is in part due to it being located within a major transition region, the Western Mesophytic Forest Region. A transition region would include species from more than one area. Even more likely is that not only is Todd County a part of a transition region, but is also a transition area within itself. Two distinct areas, the noncalcareous Shawnee Hills Section to the north, and the calcareous Mississippean Plateau Section to the south, are found within the county. The two areas have a distinct margin, the Dripping Springs Escarpment, which runs in an east-west direction dividing the county into two different physiographic sections. Each section is characterized by a flora that is unique to its soil and geological conditions. According to Braun (1943), the location of calcareous and noncalcareous rock strongly affects species distribution. The county would then be a definite transition region from the standpoint of transition from a calcareous flora to a noncalcareous flora. Areas along the border of the regions would contain specimens that were indicative of each region.

According to Braun (1950), the rugged slopes of the Shawnee Hills Section contain several species that are associated with Mixed Mesophytic Forests such as beech, oaks, shellbark hickories, mulberry, tuliptree, red maple, sugar maple, and sourwood, all of which were found within the study area. The Mixed Mesophytic Forest is associated with the mountainous areas of eastern Kentucky. The presence of certain Appalachian species would also indicate the wide range of communities and microhabitats found within the study area.

Kalmia latifolia was very abundant on certain north-facing slopes that were very steep and rocky and well drained. It is clearly an Appalachian species as it is found in almost all mountain counties of eastern Kentucky (Braun, 1943). That it was found only on north-facing slopes may be due to the study area being located on the western limits of its range. As a result, only certain microhabitats provided suitable conditions for its propagation and survival. That the rugged slopes which resemble Mixed Mesophytic Forests form a disjunct community is evident (Braun, 1950). In aspect and floristic composition it resembles communities of gorges of the Cliff Section at the western margin of the Mixed Mesophytic Forest Region (Braun, 1950).

Vaccinium stamineum, squaw huckleberry, and *Oxydendrum arboreum*, sourwood, are each ericaceous and quite common on the Appalachian Plateau of eastern Kentucky and generally considered Appalachian species. Both were found within the study area to be quite frequent. According to Braun (1943), the Appalachian area is the principal area of ericaceous plants. A more or less attenuated Appalachian flora occurs in western Kentucky in areas of exposure of Pennsylvanian noncalcareous sediments. The presence of the ericaceous plants as well as certain Appalachian species could then be related to the presence of the Pennsylvanian noncalcareous sediments. These sediments are found from the border of the Dripping Springs Escarpment northward in Todd County and encompasses the study area.

Of particular significance is the presence of *Asplenium pinnatifidum*, within the study area. *Asplenium pinnatifidum* is found only in the cracks and crevices of sandstone bluffs and is relatively uncommon in western Kentucky. It is however, quite common in eastern Kentucky east of the Cumberland and Allegheny Plateaus (Wharton and Barbour, 1971). It, too, is clearly an

Appalachian species. The presence of these Appalachian species undoubtedly is indicative of a very varied flora. According to Braun (1950), a pronounced mingling of floristic elements is noted in almost all localities where northern species occur within this section of Kentucky.

It is quite evident that many species of plants are present within the study area that are associated with the Appalachian element. The presence of the Appalachian species representing eastern Kentucky, as well as certain prairie remnants, coupled with the flora of southcentral Kentucky, provides for a diversity of plants within the study area. The area of northern Todd County is an excellent area for study in that it may provide a general picture for the flora in parts of Kentucky not directly adjoining the general area of study. The study area encompasses all creeks and branches that combine to form the East Fork of Pond River. As it is well known that creeks and rivers serve as a major means of seed dispersal, a study of the flora of an area at the beginning of a creek or river system might possibly give an indication of the plants to be found downstream in other areas. Pond River becomes quite large before emptying into Green River, one of the major rivers of western Kentucky.

No doubt, a major reason for the abundance and variety of plant life in northern Todd County lies in the geology and physiography of the area. Dissection of the land tends to lessen cultivation which in turn provides more chance for survival of a wide variety of plant life. Northern Todd County is quite dissected with many creeks, branches, and bluffs. Outcroppings of rock is very common. Much of the land is not suitable for tillage and appears to be of little or no commercial value. All these factors taken collectively have a bearing upon the human population of the area. The area of northern Todd County is sparsely populated which would in turn enhance the chance for survival of a wider variety of plant life.

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