

A PRELIMINARY SURVEY OF THE VASCULAR FLORA OF UPPER
TYGARTS CREEK, CARTER COUNTY, KENTUCKY

A Thesis

Presented To

The Faculty of the School of Sciences and Mathematics
Morehead State University

In Partial Fulfillment

of the Requirements for the Degree
Master of Science in Biology

by

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July 1975

ABSTRACT

A PRELIMINARY SURVEY OF THE VASCULAR FLORA OF UPPER
TYGARTS CREEK, CARTER COUNTY, KENTUCKY

A preliminary survey of the vascular flora of a proposed nature area in Tygarts Gorge was initiated in March, 1974 and completed in June, 1975. This survey was conducted within the boundaries ascribed to the nature area by the United States Army Corps of Engineers in 1971. The survey produced one new state record, a form of the walking fern *Comptosorus rhizophyllus* forma *boycei* Wilson. A comparison with surveyed literature revealed 232 species not previously reported from Carter County. A total of 100 families, 313 genera, and 536 species and varieties were collected. Some notable species found in addition to the state record, were the Canadian yew (*Taxus canadensis* Marsh.), the mountain lover (*Pachystima canbyi* Gray), the mountain maple (*Acer spicatum* Lam.), the yellow birch (*Betula lutea* Michx., f.), the small green wood orchid [*Habenaria clavellata* (Michx.) Spreng.], the yellow fringed orchid [*Habenaria ciliaris* (L.) R. Br.], and the toadshade (*Trillium sessile* L.). Of these species, only *Taxus canadensis* Marsh., *Pachystima canbyi* Gray, and *Acer spicatum* Lam., have been previously reported. A checklist of species was compiled and presented.

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July 23, 1975
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Morehead State University, in partial fulfillment of the requirements
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ACKNOWLEDGEMENTS

I wish to thank Mr. Howard L. Setser, Dr. Jerry E. Howell, Jr., Mr. Woodrow W. Barber, and Dr. Madison E. Pryor for serving on my graduate committee and for help in preparing this thesis. I am especially grateful to Mr. Setser for serving as Committee Chairman and for his patient suggestions and attention and to Dr. Howell for his help in obtaining some of the financial assistance necessary to carry on the field work. Mr. Thomas McCoy's help was invaluable; he verified *Camptosorus rhizophyllus* forma *boycei* Wilson as a new state record and annotated several specimens.

I would also like to express my appreciation to Mr. Leslie E. Meade who accompanied me on several field trips and aided in Cyperaceae and Juncaceae identification, and to Mr. John Tierney, Carter Caves State Park Naturalist, who gave freely of his knowledge of the Tygarts Creek area and showed great interest in my survey of the area.

I also wish to thank the Huntington (West Virginia) District of the United States Army Corps of Engineers for their cooperation, and for the loan of a number of aerial photographs and maps of the area. Morehead State University allowed me the use of their facilities and granted the assistantship that helped make this research possible. Finally, I wish to thank my wife, Kathryn, for her patience and cooperation during the course of this study.

TABLE OF CONTENTS

	PAGE
LIST OF FIGURES	V
INTRODUCTION	1
LITERATURE REVIEW	8
MATERIALS AND METHODS	10
RESULTS	14
Species Collected (checklist)	14
Summary of Results	32
Typical Species by Habitat	33
DISCUSSION	
Disjunct Species	36
Other Notable Species	38
Habitat Changes	39
SUMMARY	40

LIST OF FIGURES

Figure	Page
1. Vicinity Map	2
2. Topographical Map of the Area	11
3. Primary Collecting Locales	12

INTRODUCTION

Description of the Study Area - Geography, History, Vegetation

The Kehoe Nature Area is proposed as a reserve for continuing biological research by the United States Army Corps of Engineers. The proposed 3725 acre nature area is located on Tygarts Creek in Carter County, Kentucky, and is a textbook example of the cliff section of eastern Kentucky. The area has some botanical species unique to Kentucky, and some found only in one or two similar areas in the state (United States Army Corps of Engineers, 1972).

The survey area is located between 83° 4' 30" and 83° 9' 30" west longitude and 38° 17' 30" and 38° 22' 30" north latitude. It occupies portions of the Tygarts Valley, Olive Hill, and Grahn Quadrangles, with the greater portion being in the upper northwest corner of the Grahn Quadrangle (see Figure 1).

Local relief is at a maximum in the area. Elevation ranges from a low of about 200 m. (675 feet) to a high of over 335 m. (1100 feet) above sea level. Sheer cliffs line the riparian areas, while narrow level flood plains are found on the inside curved portions and along some of the straight stretches of the stream. Other level areas are restricted to narrow ridge tops and cultivated or oldfields. Much of the land is sloping, limiting area farming primarily to grazing on presently cleared ground. Ridges are capped with Carter Caves Sandstone overlying Newman Limestone, while cliffs and outcrops are commonplace.

Lotic water is the dominating geological force in the area and the process is in the maturity stage with respect to meandering creeks and erosional pattern. The drainage system produces numerous wet-weather

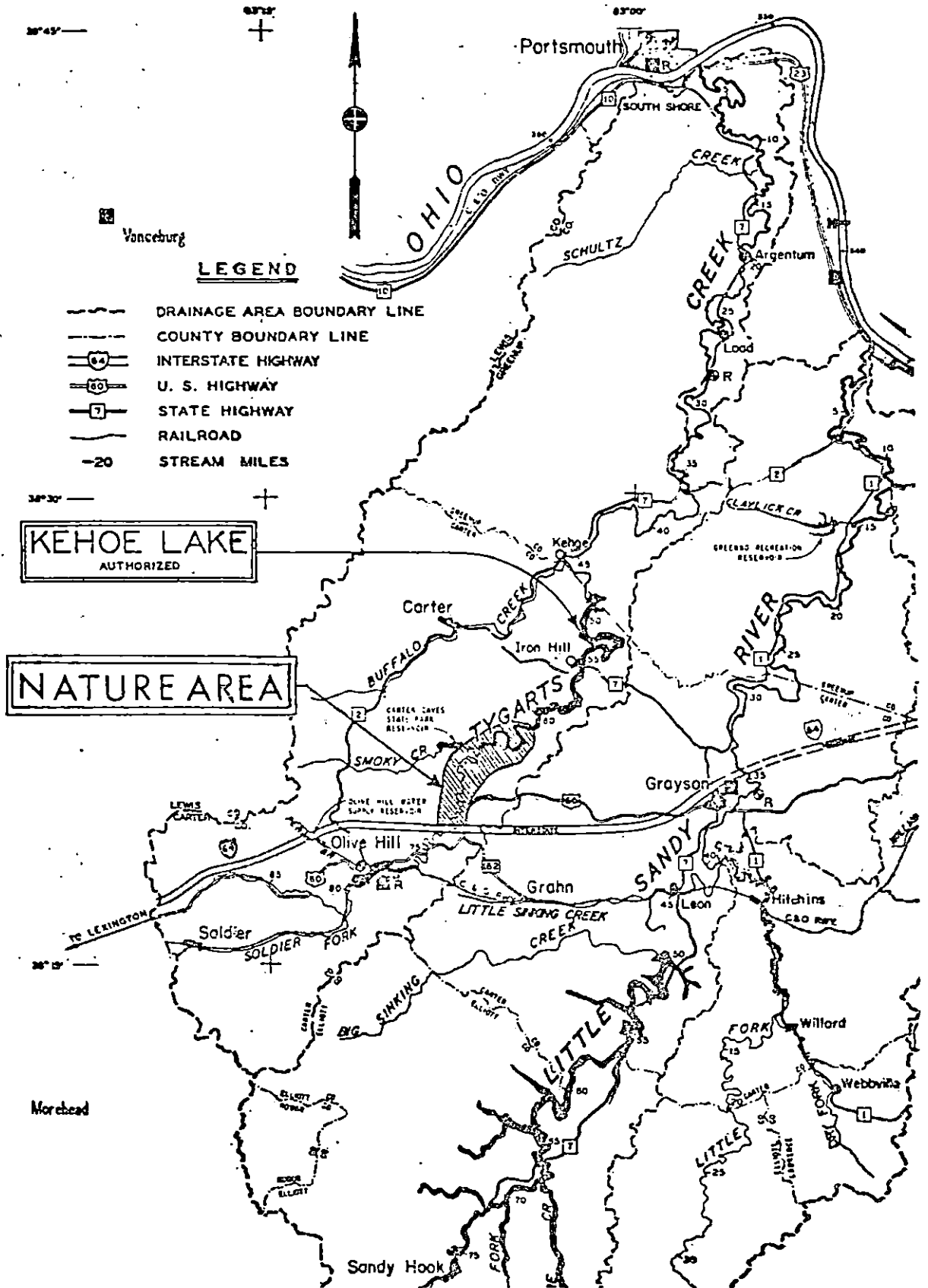


Figure 1. Vicinity Map

waterfalls over the cliffs, and there are areas where lotic action has cut into cliff strata producing many small undesignated streams.

The vegetation belongs to the temperate deciduous forest biome; the trees represented are typical of the mixed mesophytic type. Approximately 65% of the area is tree-covered, with the remainder being in some stage of cultivation or old-field succession. Several plant associations are well represented in the area; some of which, such as the hemlock, rhododendron, and mixed mesophytic associations, represent climax communities, while others such as the pine, cedar, and old-field associations represent successional communities.

Description of the Study Area - Geology and Soils

Northcentral Carter County is located in the northwestern portion of the eastern Kentucky coalfield. Higher elevations in the area are capped by a cliff-forming sandstone which produces the rugged topography. This sandstone, a unique feature of the area, was previously referred to as the Lee Sandstone, but was renamed Carter Caves Sandstone by Englund and Windolph in 1971.

The formation was named after Carter Caves State Resort Park (including the Cascade Caves region and Box Canyon) where the sandstone, underlain by cavernous limestone, is well exposed on the fringes of box canyons. This sandstone was previously dated from the Pennsylvanian Period, but based on a survey of the marine invertebrate fauna in overlying strata, it was redesignated Late Mississippian (Sheppard and Dobrovolny, 1963). The Carter Caves Sandstone formation varies in width from two-eight miles and extends north-northeast from western Elliott County across Carter County and into Greenup County for approximately thirty miles (Englund and Windolph, 1971). This particular sandstone is

composed of 96% quartz and contains minor amounts of clay, limonite, carbonate cement, and occasional heavy mineral grains (McGrain, 1956).

Underlying the sandstone cliffs, and on the valley floors, are 100-150 feet thick layers of limestones and shales collectively referred to as Newman Limestone. This formation contains the limestone precursors of the extensive cave systems found in the area.

Tygarts Creek, the principal geological force in the gorge, is an entrenched meandering stream that flows under cliffs over 150 feet high. Carter Caves State Resort Park borders the area and Cascade Caves, a portion of the State Park, is situated within the area.

The Mississippian and Pennsylvanian outcrops total about 800 feet in thickness and are divided into five formations - Borden, Newman, Carter Caves, Lee, and Breathitt (Englund and Windolph, 1971). Found within the Borden Formation are calcareous siltstones and minor amounts of shales. This formation underlies the study area with thick portions exposed at the northeastern end of the study area. The Newman Formation, composed of a lower limestone unit and an upper shale unit, contains chert nodules, oolites, and fine- to medium-grained quartz sand. The Lee Formation is made up of sandstones, shales, and siltstones with discontinuous beds of mixed coal and clay, while the Breathitt Formation, also composed of shales, sandstone, and siltstone, occupies hilltop areas (Englund and Windolph, 1971). These formations contain the area's soil parent material.

The exposure of these formations presents a wide variety of chemical and physical properties which influence the soils and biotic environments. Locally, the area contains numerous caves, rock houses, and other expressive geological features, such as several exposed

interfaces of sandstones atop limestones. Plants typically found only in soils influenced by one or the other of these two different rock types are found growing together on the exposed contact microhabitats.

Braun (1950) used Wilde's scheme of forest soil provinces and vegetational correlations in describing the area. The gray-brown podzolic soils of the area are "melanized" and are considered characteristic of central deciduous forests. Melanized soils are the mull, humus darkened soils of rich mixed mesophytic forests. Geographically, they occupy a position between the podzols and podzolized soils to the north of the region and the typically lateritic soils of the south. Leaching in these soils is limited to only the most soluble compounds, and melanized soils of this type are considered among the most productive forest soils on the continent (Braun, 1950).

Individual soils within each of the collecting sites must be considered, if their vegetational influence is to be understood. In the study area more than one soil type is often found; where this condition exists, vegetational admixtures occur.

Rationale for the Study

No thorough systematic botanical survey has ever been conducted in the study area, or even in adjacent areas. The lack of distributional data for some species is directly attributable to insufficient detailed survey work, and this study was an attempt to alleviate this problem.

There were other reasons for undertaking the study in addition to the lack of an extant taxonomic survey. The existing diversity of habitats in the area, basically created by geomorphological processes and increased by the varied past cultural uses made of the area, provided a continuum of successional vegetational types, ideally suited for

investigation. The possibility of discovering previously unreported species also existed.

The Corps of Engineers has proposed an impoundment (Kehoe Lake), scheduled to be completed in 1977, adjacent to the study area. Although the area proper will not be inundated by the lake, it could affect the flora of upper Tygarts Creek indirectly by slowing the stream flow, raising area humidity, and/or by causing an influx of exotic flora and fauna into the area. Because of these possibilities, it was felt a 1974-75 preimpoundment floral survey would be beneficial. In addition, such a survey would provide a basis for future ecological studies, which is a Corps objective for the area.

Another reason for undertaking the study rested in the geography, geology, and biotic uniqueness of the area. The area is located in the broad Appalachian Plateau Province and is characteristic of a portion of the cliff section of the unglaciated Allegheny Plateau. The cliff section begins in southcentral Ohio and extends as a narrow ribbon across Kentucky and Tennessee to northeastern Alabama (United States Army Corps of Engineers, 1972). It has an extreme topographic diversity and contains a variety of habitats; thus, a high potential for significant biological diversity exists.

With respect to biotic regions, the area represents a floral overlap zone between the northern extremes of southern species and the southern extremes of the more northern species. It is the wide variety of local habitats, including the cool areas produced at cave mouths and the existence of elevation and moisture extremes, that predisposes the area as suitable habitat for both southern and northern plant groups.

The uniqueness of the area and the previously mentioned reasons for initiating the study formed the bases for this investigation.

REVIEW OF THE LITERATURE

A literature search revealed a lack of intensive investigations of the flora of the area. However, McCoy (1938), in his Masters Thesis, listed a total of 32 species of ferns and fern allies as being from unspecified Carter County areas. The present existence of several of these ferns is now questionable. Massey (1940) reported a find by A. N. Leeds of *Pachystima canbyi* Gray on an exposed cliff top ledge one-half mile south of Carter Caves. Braun (1941c) also listed *P. canbyi* from a different locale in Tygarts Creek Gorge. In an earlier work (Braun, 1940), she listed several new plants from Kentucky. None of these, however, were designated from Carter County. Similarly, in two separates published a year later, she listed new locations for several plants. Her first article mentioned several of these, but none pertained to Carter County or Tygarts Creek (1941a).

The second separate (1941b) dealt with some new county records of grasses, but listed no Carter County records. She later listed ten new plants for the state, with five of these ten definitely having been found within Tygarts Gorge (Braun, 1941d). Several of these species have not been found in the area since. Braun (1942) also reported twelve species and varieties of *Solidago* extant in Carter County.

McFarland's (1942) Kentucky vascular plant catalogue listed a total of 1702 species, varieties, and forms, but the listings were not annotated regarding informational sources or county locations; thus, the list is unusable except in establishing state records. He also discussed the deserved need for intensive statewide work. A year later, Braun's

(1943) Annotated Catalogue of the Spermatophytes of Kentucky admirably coalesced habitat and county record information. In this volume, Braun listed 364 species and varieties from Carter County, with some records containing detailed locality descriptions within Tygarts Gorge and the Cascade Caves region.

Anderson (1947) listed new county distributional records for 357 species, but evidently did not include Carter County in his study; no new area records were given. Davies (1953) stressed the importance and need for better identification keys, habitat descriptions, county distributional records, and plant abundance indices in Kentucky. Reed (1958) combined the work of 35 collectors and listed 81 ferns and fern allies, 42 of which were reported from Carter County. In a similar paper, Reed (1962a) also listed new county records for 61 Kentucky fern species and varieties, but reported no new listings for Carter County. Reed (1962b), in a paper concerning *Trillium* in Kentucky, reported only two species [*Trillium grandiflorum* (Michx.) Salisb. and *Trillium erectum* L.] from Carter County.

Brown (1963) reported 76 additional or new Kentucky county flora records from the work of ten collectors, but again none were reported from Carter County. Similarly, he later (1967) listed new state records and rarities for 38 species from the collections of 26 botanists, but listed no new species from Carter County.

Duncan (1967) in a survey of the collections of 36 herbaria reports 53 species of woody vines; fourteen are listed as occurring in Carter County.

The fragmented literature record lends credence to the necessity of this study.

MATERIAL AND METHODS

The area was studied between March, 1974, and June, 1975, and was confined to the boundaries of the proposed nature area as determined by the Corps of Engineers (1971) (See Figure 2). Before actual collecting began, the area was reconnoitered several times to determine locations most likely to offer habitats varying in elevation, terrain, soil moisture, rock types, and dominant plants; accessibility was also a factor in site selection.

The primary collecting locales are designated in Figure 3. Numerous trips were made to each of these locales and to adjacent areas, as time permitted. A 6.5 mile canoe trip from the Interstate 64 bridge over Tygarts Creek to the Route 182 bridge near Carter Caves State Resort Park was made to broaden the collection of riparian species, and to investigate any unusual formations or habitats not easily accessible by foot.

Collecting trips were generally made to each area at least once a week. More attention was given a particular collecting locale, if warranted, due to unusual associations or the presence of new records. The "Stations" indicated in Figure 3 are broad collecting areas and the paths to each of these areas were also surveyed. On several occasions trips were taken primarily to obtain species from particular families, i.e. Cyperaceae and Juncaceae. Thus, sampling was selective. When possible, specimens (including tree leaves and stems) were collected with flower and/or fruit. If several specimens were present, the plants deemed "most typical" were collected.

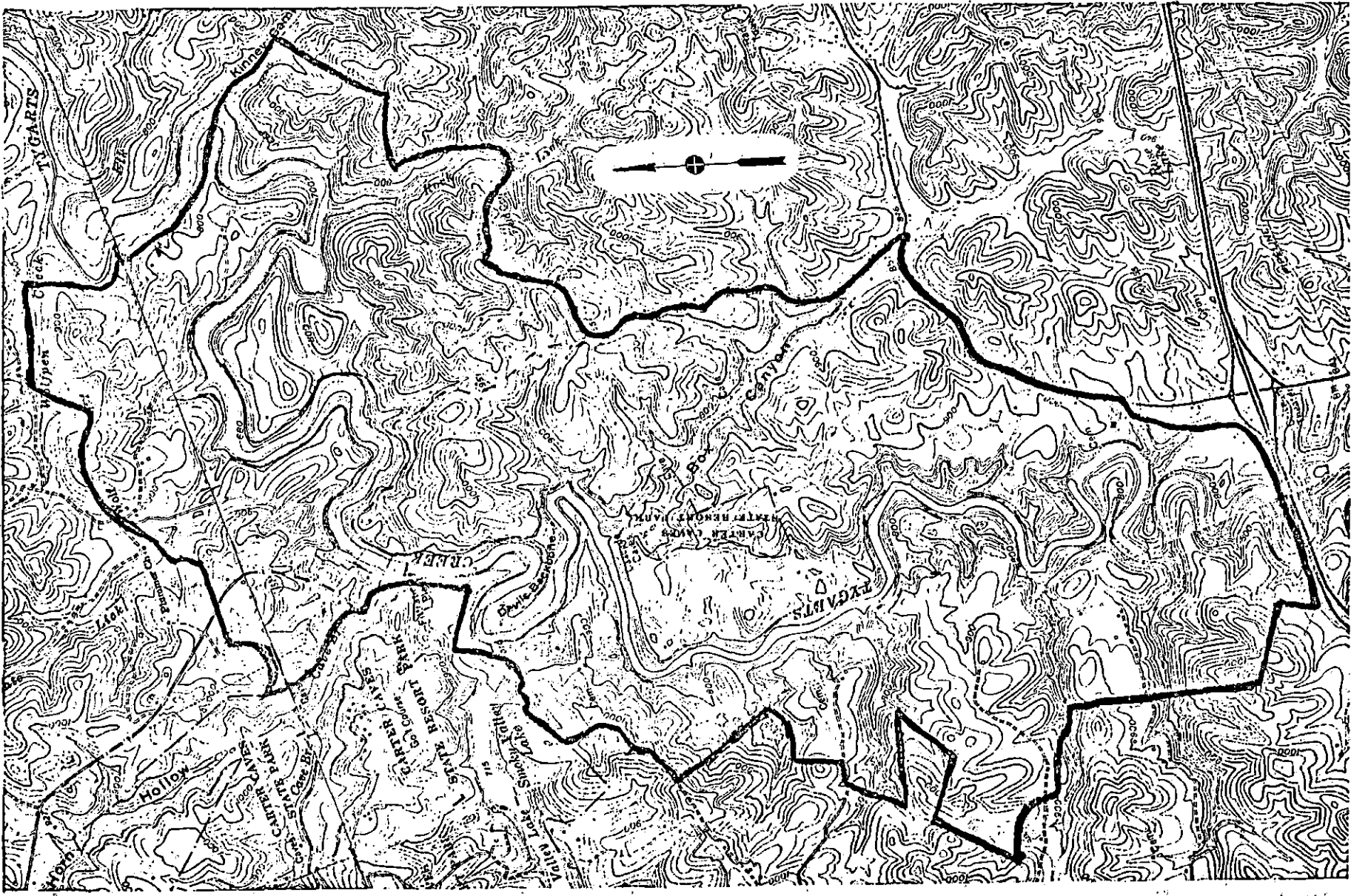


Figure 2. Topographic Map of the Area

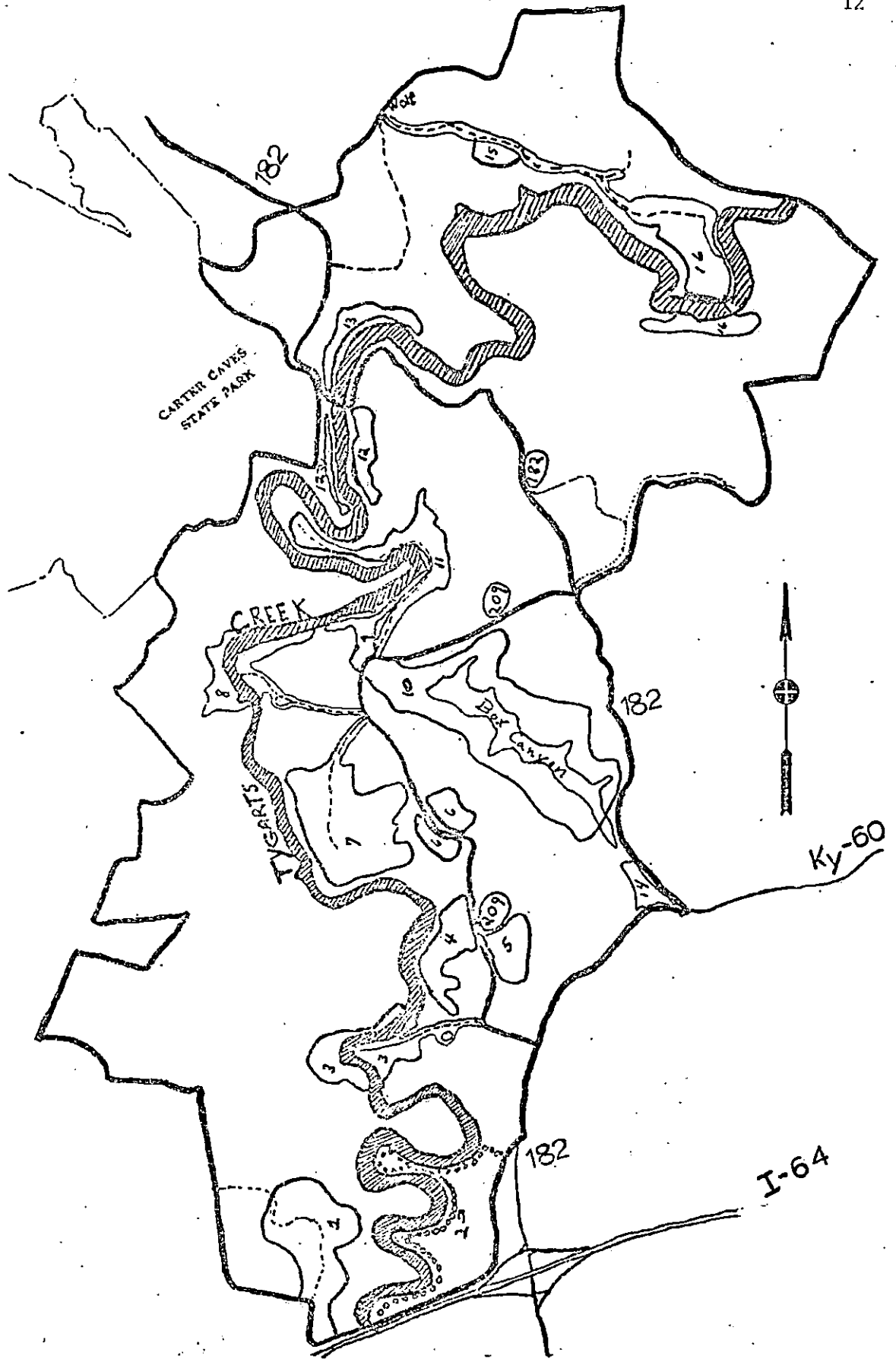


Figure 3. Primary Collecting Locales

Plant pressings were numbered, and collected specimens were recorded in a log book and card system with their corresponding soil type, location, abundance, flower color, and collection date. Specimens were identified by the use of keys prepared by Gleason (1963). Labels with pertinent data for each collected specimen were prepared and placed with the specimen for mounting at a later date. Several specimens from Braun's collections stored in the Smithsonian Institution herbaria were photographed for use as a comparative record.

Specimens are housed in the Morehead State University Herbarium, and duplicates of some specimens will be sent to other herbaria.

RESULTS

The results of this study are presented as a checklist, with pertinent notations. These notations are subjectively made by the author as to species frequency and other significant information. The frequency data is based solely on personal observation. Unless otherwise indicated, the terms used will be defined as follows:

- Rare:** Not under immediate threat of extinction, but occurring in such small numbers and/or in such a restricted or specialized habitat that they could quickly disappear (Miller, 1972). Observed in only one to two locales in the nature area.
- Frequent:** Observed in three to five locales, but not widespread in numbers or locations.
- Common:** Observed in more than five varied locations or in abundance.

Species Collected

In this checklist, family, genera, and species sequences are modeled after Gleason (1963). Those species indicated by a single asterisk were collected by the author, and have not been previously reported from Carter County in the literature surveyed. Those species denoted by a double asterisk are species previously reported from the nature area by other investigators and were not collected by the author. The name and date following the species name denote the literature in which the occurrence was cited.

FERN AND FERN ALLIES**Lycopodiaceae**

- **Lycopodium complanatum* L. var. *flabelliforme* Fern. Frequent,
covering several square meters when found.

Equisetaceae

- Equisetum arvense* L. Common.
Equisetum hyemale L. Common.

Ophioglossaceae

- Botrychium dissectum* Spreng. var. *obliquum* (Muhl.) Clute.
Frequent.
Botrychium virginicum (L.) Sw. Frequent.

Osmundaceae

- Osmunda regalis* L. Rare, found one place on cliffs near Box
Canyon.
Osmunda cinnamomea L. Frequent.

Polypodiaceae

- Pteridium aquilinum* (L.) Kuhn. Frequent.
Adiantum pedatum L. Common.
Pellaea atropurpurea (L.) Link. Frequent, limestone crevices.
Polypodium vulgare L. Frequent on sandstone.
Onoclea sensibilis L. Common.
Asplenium pinnatifidum Nutt. Frequent.
Asplenium ruta-muraria L. Rare, on limestone cliffs.
Asplenium platyneuron (L.) Oakes. Common.
Camptosorus rhizophyllus (L.) Link. Frequent.
**Camptosorus rhizophyllus* (L.) Link forma *boycei* Wilson. Rare,
only found one place on a moist limestone outcrop. A
new state record.
Athyrium pycnocarpon (Spreng.) Tidest. Frequent.
Athyrium filix-femina (L.) Roth. Frequent.
Woodsia obtusa (Spreng.) Torr. Frequent.
Cystopteris bulbifera (L.) Bernh. Common.
Cystopteris fragilis (L.) Bernh.
Thelypteris hexagonoptera (Michx.) Weatherby. Common.
Thelypteris noveboracensis (L.) Nieuwl. Frequent.
Dryopteris austriaca (Jacq.) Woynar. Frequent.
Dryopteris marginalis (L.) Gray. Common.
Polystichum acrostichoides (Michx.) Schott. Common.

GYMNOSPERMAE**Taxaceae**

Taxus canadensis Marsh. Common.

Pinaceae

Tsuga canadensis (L.) Carr. Common

Pinus strobus L. Frequent.

Pinus echinata Mill. Frequent.

Cupressaceae

Juniperus virginiana L. Common.

ANGIOSPERMAE

MONOCOTYLEDONEAE

Typhaceae

Typha latifolia L. Common around ponds and swampy roadside ditches.

Alismataceae

**Sagittaria latifolia* Willd. Rare, found at edge of swampy old field.

Gramineae

**Bromus japonicus* Thunb.

**Festuca elatior* L.

Uniola latifolia Michx. Common.

**Dactylis glomerata* L.

**Triodia flava* (L.) Smyth.

**Elymus virginicus* L.

**Hystrix patula* Moench. Common.

Holcus lanatus L.

Phleum pratense L.

Brachyelytrum erectum (Schreb.) Beauv.

**Eleusine indica* (L.) Gaertn.

**Paspalum ciliatifolium* Michx.

**Panicum anceps* Michx.

Panicum sp.

**Echinochloa muricata* (Beauv.) Fern.

**Setaria glauca* (L.) Beauv.

**Setaria fuberii* Herrm.

**Erianthus alopecuroides* (L.) Ell.

Andropogon scoparius Michx.

Andropogon virginicus L. Common.

Sorghastrum nutans (L.) Nash. Common.

Cyperaceae

**Cyperus retrofractus* (L.) Torr. Frequent.

**Cyperus ovularis* (Michx.) Torr.

**Cyperus strigosus* L. Common.

**Eleocharis obtusa* (Willd.) Schult. Common.

**Eleocharis tenuis* (Willd.) Schult. Common.

**Scirpus validus* Vahl. Frequent around ponds in area.

**Scirpus atrovirens* Willd.

**Scirpus polyphyllus* Vahl.

Scirpus lineatus Michx.

Rhynchospora capitellata (Michx.) Vahl.

**Carex cephalophora* Muhl.

**Carex annectens* (Bichn.) Bichn.

**Carex vulpinoidea* Michx. Common.

**Carex scoparia* Schx. Frequent.

- **Carex tribuloides* Wahl.
- Carex plantaginea* Lam. Common.
- **Carex platyphylla* Carey.
- **Carex lasiflora* Lam.
- **Carex swanii* (Fern.) Mackenzie.
- **Carex complanata* Torr. and Hook. var. *hirsuta* (Bailey) Gl. Common.
- **Carex luxida* Wahl.
- **Carex frankii* Kunth.

Araceae

- Arisaema triphyllum* (L.) Schott. Common.
- Arisaema dracontium* (L.) Schott. Common, flood plains.

Commelinaceae

- Tradescantia ohiensis* Raf. Common.
- **Commelina communis* L. Common.

Juncaceae

- Juncus effus* L. var. *solutus* Fern. and Wieg.
- **Juncus tenuis* Willd. Common.
- **Juncus biflorus* Ell. Common.
- **Juncus canadensis* J. Gay.
- Luzula campestris* (L.) Dc.
- **Luzula acuminata* Raf. var. *carolinae* (Wats.) Fern.
- **Luzula luzuloides* (Lam.) Dandy and Wilmott.

Liliaceae

- **Hemerocallis fulva* L. Common.
- **Allium vineale* L.
- Allium cernuum* Roth.
- **Allium canadense* L.
- **Lilium canadense* L. Rare.
- Erythronium americanum* Ker. Frequent.
- **Yucca filamentosa* L. Rare, only observed in one location.
- Smilacina racemosa* (L.) Desf. Common.
- Disporum lanuginosum* (Michx.) Nicholson. Frequent.
- Uvularia perfoliata* L. Frequent.
- Uvularia grandiflora* Sm. Frequent.
- **Polygonatum biflora* (Walt.) Ell. Common.
- Trillium grandiflorum* (Michx.) Salisb. Common.
- **Trillium sessile* L. Rare, found in only one location.
- Medeola virginiana* L. Frequent.
- Smilax glauca* Walt. Common.
- Smilax rotundifolia* L.

Dioscoreaceae

- **Dioscorea villosa* L. Common.
- **Dioscorea quaternata* (Walt.) Gmel. Common.
- **Dioscorea batatas* Dcne.

Amaryllidaceae

- Hypoxis hirsuta* (L.) Cov.

Iridaceae

Iris verna L. Common.

***Iris cristata* Ait. Tierney (57) collected Cascade Caves region.

**Sisyrinchium graminoides* Bickn. Common.

Moraceae

Morus rubra L.

Orchidaceae

***Cypripedium calceolus* L. Rare, Braun (1943). I observed only three specimens in area across from building at Cascade Caves.

Orchis spectabilis L. Rare.

**Habenaria clavellata* (Michx.) Spreng. Rare, found in one location.

**Habenaria ciliaris* (L.) Br. Rare, found in one location.

Spiranthes sp.

Goodyera pubescens (Willd.) R. Br. Common.

Tipularia discolor (Pursh.) Nutt. Frequent.

ANGIOSPERMAE

DICOTYLEDONEAE

Salicaceae

- **Populus grandidentata* Michx. Rare.
- Salix caroliniana* Michx.
- Salix nigra* L.
- Salix interior* Rowlee. Frequent.

Juglandaceae

- Juglans nigra* L.
- Juglans cinerea* L.
- Carya tomentosa* (Poir.) Nutt.
- Carya ovata* (Mill.) K. Koch.

Betulaceae

- Corylus americana* Walt. Frequent.
- Ostrya virginiana* (Mill.) K. Koch. Common.
- Carpinus caroliniana* Walt. Common.
- **Betula lutea* Michx. Rare, found on rich mesophytic slope near end of Box Canyon.
- Betula lenta* L. Frequent.
- Betula nigra* L. Common along creek.
- Alnus serrulata* (Ait.) Willd.

Fagaceae

- Fagus grandifolia* Erch. Common.
- Castanea dentata* (Marsh.) Borkh. Frequent, only small plants were observed.
- Quercus alba* L. Common.
- Quercus stellata* Wang.
- Quercus prinus* L.
- **Quercus prinoides* Willd. Common.
- Quercus imbricaria* Michx.
- Quercus marilandica* Muenchh.
- **Quercus palustris* Muenchh.

Ulmaceae

- Ulmus americana* L.
- Ulmus rubra* Muhl.

Urticaceae

- **Urtica dioica* L.
- Laportea canadensis* (L.) Gaud.
- Pilea pumila* (L.) Gray. Common.

Loranthaceae

- **Phoradendron flavescens* (Pursh.) Nutt.

Aristolochiaceae

Asarum canadense L.

Polygonaceae

- **Rumex acetosella* L. Frequent.
- **Rumex obtusifolius* L.
- **Polygonum pennsylvanicum* L. Common.
- **Polygonum punctatum* Ell. Common.
- **Polygonum persicaria* L. Common.
- **Polygonum caespitosum* Blume. Common.
- **Polygonum sagittatum* L. Frequent.
- Polygonum virginianum* L. Common.

Chenopodiaceae

- **Chenopodium album* L. Common.
- Chenopodium hybridum* L. Common.

Phytolaccaceae

- **Phytolacca americana* L. Common.

Aizoaceae

- **Mullugo verticillata* L.

Portulacaceae

- Claytonia virginica* L. Common.
- Claytonia caroliniana* Michx.

Caryophyllaceae

- Stellaria pubera* Michx. Common.
- **Stellaria media* (L.) Cyrill.
- Lychnis coronaria* (L.) Desr. Common.
- **Silene stellata* (L.) Ait. f. Frequent.
- Silene virginica* (L.) Common.
- Silene rotundifolia* Nutt. Frequent.
- Saponaria officinalis* L. Common along creek.
- **Dianthus armeria* L.

Magnoliaceae

- Magnolia acuminata* L. Common.
- Magnolia tripetala* L. Common.
- Liriodendron tulipifera* L. Common, probably the most abundant species of tree in the area.

Annonaceae

- Asimina triloba* (L.) Dunal. Common.

Ranunculaceae

- Hydrastis canadensis* L. Rare.
- Cimicifuga racemosa* (L.) Nutt. Common.
- Actaea alba* (L.) Mill. Common.
- Aquilegia canadensis* L. Common.
- Delphinium tricorne* Michx. Rare, found in only one location, approximately 10-20 plants.

**Delphinium ajacis* L. Rare, found in only one location along edge of creek.

**Ranunculus abortivus* L. Common.

Ranunculus hispidus Michx. Frequent.

Thalictrum dioicum L. Frequent.

**Thalictrum polygamum* Muhl. Frequent.

Anemone virginiana L. Common.

Hepatica acutiloba Dc. Common.

Hepatica americana (Dc.) Ker. Frequent.

Anemonella thalictroides (L.) Spach. Common.

Clematis virginiana L. Frequent.

**Clematis versicolor* Small. Rare, found only in one location along trail out Devils Backbone.

Berberidaceae

Podophyllum peltatum L. Common.

Jeffersonia diphylla (L.) Pers. Frequent.

Caulophyllum thalictroides (L.) Michx. Common, in alluvial plains and moist hillsides.

Lauraceae

Sassafras albidum (Nutt.) Nees. Common, along roads and edges of wooded areas.

Lindera benzoin (L.) Blume. Common.

Papaveraceae

Sanguinaria canadensis L. Common.

Fumariaceae

***Dicentra cucullaria* (L.) Bernh. Tierney collected Cascade Caves.

Corydalis flavula (Raf.) Dc. Frequent, in alluvial plains.

Cruciferae

**Brassica campestris* L.

**Lepidium campestre* (L.) R. Br.

**Capsella bursa-pastoris* (L.) Medic. Common.

Cardamine douglasii (Torr.) Britt. Common.

Cardamine hirsuta L. Common.

Dentaria laciniata Muhl. Common.

***Dentaria diphylla* Michx. Tierney (71), Cascade Caves region.

Dentaria heterophylla Nutt. Common.

Arabis laevigata (Muhl.) Poir.

**Barbarea vulgaris* R. Br. Common.

**Alliaria officinalis* Andr. Common.

Crassulaceae

Sedum ternatum Michx.

Saxifragaceae

Mitella diphylla L. Common.

**Heuchera villosa* Michx. Frequent.

Heuchera parviflora Bartl. Frequent.

**Heuchera americana* L. Common.

- Hydrangea arborescens* L. Common.
Ribes cynosbati L. Frequent.

Hamamelidaceae

- Hamamelis virginiana* L. Frequent.

Platanaceae

- Platanus accidentalis* L. Common.

Rosaceae

- Physocarpus opulifolius* (L.) Maxim. Common.
Aruncus dioicus (Walt.) Fern. Common.
 **Gillenia stipulata* (Muhl.) Trel. Common, abundant locally.
Fragaria virginiana Duchesne.
Duchesnea indica (Andr.) Focke.
 **Potentilla simplex* Michx. Common.
Potentilla recta L. Common.
Geum canadense Jacq.
 **Geum virginianum* L.
Rubus allegheniensis Porter. Common.
 **Agrimonia rostellata* Wallr.
 **Agrimonia parviflora* Ait.
 **Agrimonia pubescens* Wallr.
 **Rosa setigera* Michx.
Rosa carolina L. Common.
Prunus americana Marsh.
Amelanchier canadensis (L.) Medic. Common.

Caesalpiaceae

- Cercis canadensis* L. Common.
 **Gleditsia tricanthos* L. Frequent, along old roads.
Cassia fasciculata Michx.
Cassia nictitans L.
 **Cassia marilandica* L.

Fabaceae

- **Trifolium pratense* L. Common.
 **Trifolium repens* L. Common.
 **Trifolium procumbens* L. Common.
 **Trifolium dubium* Sibth. Common.
 **Melilotus alba* Desr. Common.
 **Melilotus officinalis* (L.) Desr. Common.
Coronilla varia L. Frequent, abundant locally.
Desmodium nudiflorum (L.) Dc.
Desmodium glutinosum (Muhl.) Wood.
 **Desmodium laevigatum* (Nutt.) Dc.
Lespedeza procumbens Michx.
 **Lespedeza virginica* (L.) Britt.
 **Lespedeza intermedia* (Wats.) Britt. Common.
 **Lespedeza nuttallii* Darl.
 **Lespedeza hirta* (L.) Hornem.
 **Lespedeza cuneata* (Dumont.) G. Don.
 **Lespedeza striata* (Thumb.) H. and A.

- Stylosanthes biflora* (L.) BSP. Frequent.
 **Vicia villosa* Roth.
 **Vicia dasycarpa* Tenore.
Vicia caroliniana Walt.
 **Lathyrus odoratus* L.
 **Robinia hispida* L. Frequent, along old roadsides.
 **Amphicarpa bracteata* (L.) Fern. Common.

Oxalidaceae

- **Oxalis stricta* L.
Oxalis corniculata L.
Oxalis grandis Small.

Geraniaceae

- Geranium maculatum* L.
Geranium carolinianum L.

Linaceae

- **Linum medium* (Planch.) Britt. Frequent.

Polygalaceae

- **Polygala sanguinea* L. Common, in old fields.
 **Polygala ambigua* Nutt.

Euphorbiaceae

- Euphorbia preslii* Guss.
Euphorbia maculata L. Common.
Euphorbia corollata L. Common.
Euphorbia dentata Michx.

Anacardiaceae

- Rhus radicans* L. Common.
Rhus aromatica Ait. Frequent.
 **Rhus copallinum* L.
Rhus glabra L. Common.

Aquifoliaceae

- **Ilex opaca* Ait. Rare, observed in only two locations; both times only one tree was present.

Celastraceae

- Celastrus scandens* L. Common.
Euonymus atropurpureus Jacq. Frequent.
Pachystima canbyi Gray. Frequent, found growing in large colonies in several places along Tygarts Creek. Only known occurrence in the state is here.

Staphyleaceae

- Staphylea trifolia* L. Common.

Aceraceae

- Acer saccharum* Marsh. Common.
Acer spicatum Lam. Rare, collected only one place in nature area from a single tree.

- Acer rubrum* L. Common.
Acer saccharinum L. Common.
Acer negundo L. Common.

Hippocastanaceae

- Aesculus octandra* Marsh. Frequent.

Balsaminaceae

- **Impatiens biflora* Willd. Common.
 **Impatiens biflora* Willd. forma *albiflora* Rand and Redf. Rare,
 found only one place in alluvial plains, along creek.
Impatiens pallida Nutt. Common.

Rhamnaceae

- Ceanothus americanus* L. Frequent

Vitaceae

- Vitis aestivalis* Michx. Frequent.
Parthenocissus quinquefolia (L.) Planch. Frequent.

Malvaceae

- **Abutilon theophrasti* Medic. Frequent.

Hypericaceae

- Ascyrum hypericoides* L. Common.
Hypericum prolificum L. Frequent.
 **Hypericum perforatum* L. Common.
 **Hypericum mutilum* L.
 **Hypericum spathulatum* (Spach.) Steud.

Violaceae

- Viola papilionacea* Pursh.
Viola eriocarpa Schw. Frequent.
Viola striata Ait. Common.
Viola rostrata Pursh. Common
Viola rafinesquii Greene. Frequent.
Cubelium concolor (Forst) Raf.

Passifloraceae

- Passiflora lutea* L.

Melastomataceae

- Rhexia virginica* L.

Onagraceae

- **Ludwigia alternifolia* L. Common.
 **Oenothera biennis* L. Common.
 **Oenothera strigosa* (Rydb.) Mackenzie and Bush.
Oenothera laciniata Hill. Frequent.
 **Oenothera tetragona* Roth.
 **Circaea quadrisulcata* (Maxim.) Franch. and Sav. Common.

Araliaceae

- **Aralia racemosa* L. Frequent.
- Aralia spinosa* L. Frequent.
- Panax quinquefolium* L. Rare.

Umbelliferae

- **Sanicula marilandica* L.
- **Cryptotaenia canadensis* (L.) Dc.
- Osmorhiza longistyllis* (Torr.) Dc.
- **Chaerophyllum procumbens* (L.) Crantz.
- Daucus carota* L. Common.
- Zizia aurea* (L.) Koch.
- **Zizia trifoliata* (Michx.) Fren.
- Zizia aptera* (Gray) Fern.
- **Cicuta maculata* L.
- Aethusa cynapium* L.
- Angelica venenosa* (Greenway) Fern. Common.

Cornaceae

- Cornus florida* L. Common.
- Cornus alternifolia* L. F. Common.
- Cornus purpusi* Koehne. Frequent.

Ericaceae

- **Monotropa uniflora* L. Rare, only a few specimens seen, rich woods.
- Rhododendron maximum* L. Common.
- Kalmia latifolia* L. Common.
- Oxydendrum arboreum* (L.) Dc. Common.
- Epigaea repens* L. Frequent.
- Gaultheria procumbens* L. Common.
- Vaccinium stamineum* L.

Primulaceae

- Dodecatheon meadia* L. Frequent.
- Lysimachia ciliata* (L.) Raf. Common.
- Lysimachia nummularia* L. Frequent.
- **Lysimachia quadrifolia* L. Common.

Sapotaceae

- **Bumelia lycioides* (L.) Pers.

Ebenaceae

- Diospyros virginiana* L.

Oleaceae

- Fraxinus americana* L. var. *americana*.
- **Fraxinus americana* L. var. *baltimoreana* (Beadle) J. Wright.
- ***Fraxinus quadrangulata* Michx. Braun (1943). Author observed only one specimen near Ky. 182 bridge over Tygarts.
- **Fraxinus pennsylvanica* var. *subintegerrima* (Vahl.) Fern. Frequent, along edge of creek.
- Chionanthus virginicus* L. Frequent
- **Ligustrum vulgare* L.

Gentianaceae

- Sabatia angularis* (L.) Pursh.
 ***Gentiana quinquefolia* L. Tierney (284), collected in the Cascade
 Caves region.

Apocynaceae

- **Apocynum cannabinum* L. Common.

Asclepiadiaceae

- **Asclepias tuberosa* L. Common.
 **Asclepias incarnata* L. Common.
 **Asclepias purpurascens* L. Common.
Asclepias quadrifolia Jacq. Common.
 **Asclepias variegata* L. Common.

Convolvulaceae

- **Ipomoea purpurea* (L.) Roth. Common.
 **Ipomoea hederacea* (L.) Jacq. Common.
 **Ipomoea pandurata* (L.) G.F.W. Meyer. Common.
 **Convolvulus sepium* L. Common.
 **Cuscuta gronovii* Willd. Common.

Polemoniaceae

- Phlox divaricata* L.
Phlox paniculata L.
 **Phlox maculata* L.
Polemonium reptans L.

Hydrophyllaceae

- Hydrophyllum macrophyllum* Nutt.
Hydrophyllum canadense L.

Boraginaceae

- Cynoglossum virginianum* L.
 **Hackelia virginiana* (L.) Johnst.
Mertensia virginica (L.) Pers.

Verbenaceae

- **Verbena urticifolia* L.
 **Verbena hastata* L.
 **Verbena simplex* Lehm.

Labiatae

- **Teucrium canadense* L.
 **Scutellaria ovata* Hill.
 **Scutellaria incana* Biehler. Frequent
 **Scutellaria elliptica* Muhl. Common.
 **Scutellaria integrifolia* L. Frequent.
Meehania cordata (Nutt.) Britt.
 **Nepeta cataria* L. Frequent.
 **Glechoma hederacea* L. Common.
 **Prunella vulgaris* L. Common.
 **Lamium amplexicaule* L.

- **Lamium purpureum* L. Frequent.
- Salvia lyrata* L. Common.
- Monarda fistulosa* L. Frequent.
- **Monarda clinopodia* L. Frequent.
- Pycnanthemum flexuosum* (Walt.) Bsp. Common.
- Pycnanthemum pycnanthemoides* (Leavenw.) Fern. Common.
- Cunila origanoides* (L.) Britt. Common.
- **Lycopus virginicus* L.
- Collinsonia canadensis* L.

Solanaceae

- **Nicandra physalodes* (L.) Gaertn. Common in old fields.
- **Physalis peruviana* L.
- **Solanum nigrum* L.
- **Solanum carolinense* L. Common.
- **Datura stramonium* L. Common.

Scrophulariaceae

- Mimulus ringens* L. Frequent.
- **Verbascum blattaria* L. Frequent.
- **Verbascum thapsus* L. Common.
- **Chelone glabra* L. Frequent, along edge of creek.
- **Penstemon digitalis* Nutt. Frequent, abundant in a few old fields.
- **Linaria vulgaris* Hill. Seen in abundance in one place.
- **Veronica persica* Poir.
- **Veronica officinalis* L. Frequent.
- **Aureolaria virginica* (L.) Pennell.
- Gerardia tenuifolia* Vahl.
- Pedicularis canadensis* L.

Bignoniaceae

- **Campsis radicans* (L.) Seem.

Orobanchaceae

- **Orobanche uniflora* L. Frequent.
- Conopholis americana* (L.) Wallr.
- Epifagus virginiana* (L.) Bart. Rare, collected only one place on an old beech tree.

Acanthaceae

- **Ruellia caroliniensis* (Walt.) Steud. Common.
- Justicia americana* (L.) Vahl. Frequent.

Phrymaceae

- **Phryma leptostachya* L. Frequent.

Plantaginaceae

- **Plantago rugellii* Decne. Common.
- **Plantago major* L.
- **Plantago lanceolata* L. Common.
- **Plantago aristata* Michx. Common
- **Plantago virginica* L.

Rubiaceae

- Mitchella repens* L. Frequent.
Cephalanthus occidentalis L. Common.
 **Diodia teres* Walt.
Houstonia caerulea L.
Houstonia canadensis Willd.
 **Houstonia purpurea* L.
Galium aparine L.
 **Galium lanceolatum* Torr.
 **Galium concinnum* T. and G.

Caprifoliaceae

- **Viburnum opulus* L.
Viburnum acerifolium L. Common.
 **Viburnum lentago* L. Frequent.
Viburnum prunifolium L.
Viburnum rafinesquianum Schult.
Sambucus canadensis L.
 **Lonicera japonica* Thunb. Common.
Lonicera dioica L. Frequent.
Triosteum angustifolium L. Frequent.

Dipsacaceae

- **Dipsacus sylvestris* Huds. Frequent, along road sides.

Cucurbita

- **Sicyos angulatus* L. Rare, found on one alluvial plain, along creek.

Campanulaceae

- Campanula americana* L. Common.
 **Triodanis perfoliata* (L.) Nieuwl.

Lobeliaceae

- Lobelia cardinalis* L. Rare, only seen in a few places one of which was a field that was later mowed.
 **Lobelia siphilitica* L. Frequent.
Lobelia puberula Michx. Common.
 **Lobelia inflata* L. Common.
Lobelia spicata Lam. Common.

Compositae

- **Helianthus microcephalus* T. and G.
 **Helianthus strumosus* L.
 **Helianthus decapetalus* L.
Helianthus tuberosus L.
Verbesina alternifolia (L.) Britt.
 **Heliopus helianthoides* (L.) Sweet.
 **Rudbeckia hirta* L. Common.
 **Rudbeckia fulgida* Ait.
 **Rudbeckia triloba* L.
Echinacea purpurea (L.) Moench.
Helenium autumnale L.
 **Helenium flexuosum* Raf.

- **Galinsoga ciliata* (Raf.) Blake.
 **Bidens frondosa* L.
 **Bidens bipinnata* L.
 **Bidens aristosa* (Michx.) Britt.
 **Bidens polylepis* Blake.
 Coreopsis auriculata L.
 Coreopsis major Walt.
 Polymnia wedalia L.
 Silphium perfoliatum L. Frequent.
 Silphium trifoliatum L. Common.
 **Ambrosia trifida* L.
 **Ambrosia artemisiifolia* L.
 Achillea millefolium L. Common.
 Chrysanthemum leucanthemum L. Common.
 Senecio obovatus Mulh.
 **Senecio smallii* Britt.
 **Cacalia suaveolens* L.
 **Cacalia muhlenbergii* (Schultz-Bip.) Fern.
 **Cacalia atriplicifolia* L.
 Chrysopsis mariana (L.) Ell.
 **Solidago erecta* Pursh. Common.
 Solidago flexicaulis L. Frequent.
 Solidago caesia L. Frequent.
 Solidago nemoralis Ait.
 Solidago juncea Ait. Common.
 Solidago graminifolia (L.) Salisb.
 Aster divaricatus L. Common.
 **Aster undulatus* L.
 Aster shortii Lindl.
 Aster cordifolius L.
 Aster patens Ait. Common.
 Aster prenanthoides Muhl.
 Aster infirmus Michx.
 **Aster umbellatus* Mill.
 Aster paternus Cron.
 **Aster vimineus* Lam. Frequent.
 Aster dumosus L.
 Aster simplex Willd. Frequent.
 **Erigeron annuus* (L.) Pers.
 **Erigeron strigosus* Muhl.
 Erigeron pulchellus Michx.
 **Erigeron philadelphicus* L.
 Gnaphalium obtusifolium L. Common.
 Anaphalis margaritacea (L.) Benth. and Hook.
 **Antennaria plantaginifolia* (L.) Richards.
 Eupatorium purpureum L.
 **Eupatorium fistulosum* Barratt.
 Eupatorium sessilifolium L.
 **Eupatorium rotundifolium* L. Common.
 **Eupatorium perfoliatum* L.
 **Eupatorium serotinum* Michx. Frequent.
 Eupatorium rugosum Houtt.
 Eupatorium coelestinum L.

- Liatris squarrosa* (L.) Michx. Var. *hirsuta* (Rydb.) Gaiser.
**Vernonia altissima* Nutt.
Elephantopus carolinianus Willd. Frequent.
**Arctium minus* Schk.
**Cirsium discolor* (Muhl.) Spreng.
**Cirsium altissimum* (L.) Spreng.
**Centaurea maculosa* Lam.
Hieracium venosum L.
**Hieracium gronovii* L.
**Taraxacum officinale* Weber.
**Lactuca canadensis* L. Common.
**Lactuca biennis* (Moench.) Fern.
**Cichorium intybus* L. Common.
Krigia biflora (Walt.) Blake. Common.

SUMMARY OF RESULTS

TOTAL NUMBER OF FAMILIES COLLECTED	100
TOTAL NUMBER OF GENERA COLLECTED	313
TOTAL NUMBER OF SPECIES AND VARIETIES	536

Typical Species by Habitat

In each of the primary study areas designated in Figure 3 (page 12), there were a wide array of habitats. This section will try to describe some of the principle habitats found and some species one might reasonably expect to find represented in each. Many of the common species overlap from one area into another, and are, in such cases, listed in both.

Riparian Edges. The water level of Tygarts Creek is highly variable, not only with seasonal fluctuations, but also due to rapid changes during periods of heavy rainfall. These fluctuations influence the distribution of those species which may not be rooted deeply enough to prevent their being washed away. Along the creek edges, river birch, sycamore, silver maple, box elder, an occasional hemlock, and several species of dogwood, ash, and willow were found.

Alluvial Plains. The moist sandy soil in these areas is excellent for producing lush growth. In the duff layers of these areas, trilliums, violets, mustards, jack-in-the-pulpit, phlox, equisetums, wingstems, cup-plants, jewelweed, and many other herbaceous species, varying with the seasons, can be found. The woody understory flora consisted of spice bush, pawpaw, redbud, the saplings of tulip, red and silver maples, and box elder trees. The composition of the overstory or dominant plants in these areas varied. The dominants included numerous red and silver maples and box elders, along with a large number of tulip trees.

Rocky Slopes. These areas were between the alluvial plains and the numerous sheer cliffs present in the area. The topsoil was thin and

the moisture content varied widely. On these slopes, violets, wild ginger, trillium, iris and bellwort can be found. The understory trees were mainly tulip tree and sugar maple saplings, with dogwoods and redbud trees frequently interspersed. Tulip trees, sugar maples and hemlocks were major overstory trees.

Bases of Cliffs. A variety of species were found along the bases of cliffs and at the top of rocky slopes. The composition depended upon moisture influx via clifftops, the amount of sunlight, and the type of cliff (either sandstone or limestone). In several areas where waterfalls exist, a lush growth occurred at the cliff base, with liverworts, mosses, ferns and clearweeds being common. In the spring, columbines and shooting stars were frequent. Many of the ferns reported from the state were found in the area because of the presence of both the sandstone and limestone material and the rugged diverse nature of these cliffs.

Mountain Slopes and Moist Coves. These were numerous in the area, with tulip trees, beech, sugar maples and hemlocks frequent. The understory growth here included both the american and hop-hornbeams, redbud trees, and both flowering and alternate leaf dogwoods, in addition to many others.

Ridge Tops. These areas included the expanses just above the cliffs and the terrain beyond. They varied from being typically xerophytic to moist and cool, providing conditions for a wide variety of vegetation. Great rhododendron thickets on or near sandstone outcrops were common. Oaks and hickories were prevalent on the dryer ridges, while the undergrowth consisted of deerberries, mountain laurel and greenbriars.

Old Fields. These were frequent in the area, and provided nearly a continuum of plant succession. There were fields present in the earliest stages with grasses and weeds common, while the more mature old fields were thickly covered with briars and sumacs. Still older fields were populated with cedars and pines. Deciduous trees formed the climax sere.

DISCUSSION

Disjunct Species

Several species marked by a distinct range separation were found in the area. All were disjunct from a typically northern distribution pattern. The Canadian yew, *Taxus canadensis* Marsh., was reported by Braun (1943) as only occurring within the state in Tygarts Gorge. It has since been found in at least two similar gorge areas in the state, Mammoth Cave and Red River Gorge, and is considered to be a northern relict (Wharton and Barbour, 1973). In Tygarts Gorge, it is very common and abundant.

The mountain lover, *Pachystima canbyi* Gray, is reported only from Carter County in Kentucky and is very abundant in localized areas on Devils Backbone and at the base of limestone cliffs a mile or so from the Kentucky 182 bridge on both sides of Tygarts Creek, near the entrance to Carter Caves State Park (Massey, 1940; Braun, 1941c).

The mountain maple, *Acer spicatum* Lam., is a shrubby maple typical of boreal forests. It extends into the southern states only in the high Appalachian mountains, and although reported a century ago in four Kentucky counties, is now known to occur only within Tygarts Gorge (Wharton and Barbour, 1973). The only specimens noted during this study were at the point where James branch leaves Cascade Caves.

The yellow birch, *Betula lutea* Michx, f., was found growing in a lush cove near Box Canyon. This birch has been reported from very mesophytic conditions, generally in deep ravines or coves (Braun, 1943). Braun (1943) also listed four counties in which it reportedly occurred. Wharton and Barbour (1973) reported the species as being northern with

a southern extension in the Appalachian Mountains, and as being found in the southeastern Cumberland Plateau mountains and a few dispersed localities in southern Kentucky.

The walking fern, *Camptosorus rhizophyllus* (L.) Link., a species found growing only on limestone, has been reported from many areas of the state. In 1935, an unusual form of this fern was found growing in Vermont and was designated *Camptosorus rhizophyllus* (L.) Link, forma *boycei* C. L. Wilson (Wilson, 1935). The fern was described as "differing from the species in having auricles deeply lobed, margins of fronds irregularly dissected, with obtuse teeth 1-3 mm. long" (Wilson, 1935). Charette, after a literature search, failed to find any other reports of the fern's occurrence. In 1962, Charette (1964) observed two specimens of forma *boycei* Wilson in the Yale University Herbarium. These specimens were collected in Connecticut some 17-30 years prior to the date the fern was described and named. The type station, visited by Charette in 1962, was described as "an open woodland with light underbrush and is liberally strewn with large limestone boulders and out crops" (Charette, 1964). This described area was very similar to the Tygarts Gorge location where the author found this forma in June, 1974. Several specimens have been annotated by Thomas N. McCoy, a specialist in the field of ferns and fern allies. Mr. McCoy indicated that this is a new state record for Kentucky (McCoy, personal communications, June 24, 1975). A literature search supported this contention and it was determined from subsequent communications with Mr. McCoy that this forma has not been reported from any adjacent state.

The theory projected by many sources is that the disjunct species present in this and similar areas are a result of Pleistocene glaciation. The principle thesis is that, with glacier recession, the northern species remained, and were able to establish and reproduce themselves because of local environmental conditions.

Other Notable Species

One rare species found was the small green wood orchid, *Habenaria clavellata* (Machx.) Spreng., reported from only two counties by Braun (1943) and since collected in Fleming County by Setser, Meyer, and Meade in August, 1974. The Setser specimens were housed in the Morehead State University and the University of Kentucky herbaria. This species was listed by Braun (1943) as being found in Sphagnum swamps. In the study area, a small colony of about 25 plants was found in moist, rich soil beside an old road, under an overhanging hemlock tree on a slope high up from the creek. A single specimen of the yellow fringed orchid, *Habenaria ciliaris* (L.) R. Br., was found in the alluvial plain area downstream from the Kentucky 182 bridge over Tygarts Creek. In this same alluvial plains area, a small colony of *Trillium sessile* L. consisting of approximately 30 plants was found. None of these species have been previously reported from Carter County.

An association between the Canadian yew (*Taxus canadensis* Marsh) and the hemlock (*Tsuga canadensis* (L.) Carr) has been hypothesized by several investigators. The author, based solely on personal observation, found in all instances wherever the Canadian yew was found in an area, at least one hemlock was found in the same locale.

Habitat Changes

There have been several man-caused encroachments in the area since the termination of this study. An old swampy field containing numerous sedges, rushes, ladies tresses, and the Cardinal lobelia has been mowed. A house has been completed near the Cascade Caves area, and a road has been bulldozed through a forested area to a field to be used for agricultural purposes. All the undergrowth of a Cedar-Pine association in one portion of the nature area has been removed to cater to a recreational overflow during rock festivals, etc., at Carter Caves State Park.

Continued unrestricted public use of the land will undoubtedly upset and destroy the fragile habitats containing species that, once lost from the area, cannot be restored. It is the author's opinion that the area most definitely should be protected with or without the construction of the proposed lake.

SUMMARY

Extensive collecting in the nature area provided the data necessary to compile checklists. It is readily apparent that the flora of the area is unique when compared to other portions of the state. Habitat diversity in the area can only possibly be excelled in the Red River Gorge, located in Powell, Wolfe, and Menifee Counties in Kentucky. The checklist is incomplete; a great deal more work must be done in Tygarts Gorge. Additional studies should include the deficiencies of this study, the families Gramineae and Compositae.

This study is of value: (1) as a checklist for investigators who are interested in the vascular flora of the proposed nature area; (2) as a preliminary survey of the vascular flora of Carter County; (3) as an aid in planning the future of the Kehoe Lake and nature area project; (4) as an aid in increasing the knowledge of the Kentucky distribution of certain plant species.

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