COOPERATIVE INVENTORY OF
ENDANGERED, THREATENED, SENSITIVE AND RARE SPECIES
DANIEL BOONE NATIONAL FOREST

Somerset Ranger District

April 1988

COOPERATORS

United States Forest Service

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

INTRODUCTION

An important first step in the responsible stewardship of land, regardless of the purpose, is an inventory of the natural resources of the area to be managed. The information derived can be used to coordinate and implement conservation goals with activities planned for the area. The Daniel Boone National Forest, United States Department of Agriculture Forest Service, is committed to recovery of federally listed species on the Forest and ensure that sensitive species do not become threatened or endangered as a result of planned management activities. In early 1987, the national office of The Nature Conservancy, an international conservation organization committed to preserving natural diversity by identifying and protecting lands and water supporting the best examples of all elements of the natural world, granted $20,000 to the Kentucky Chapter for a public lands inventory. This was matched with a $20,000 Challenge Cost Share from the U.S. Forest Service to fund an inventory of the endangered, threatened, sensitive, and rare plants and animals of the Somerset Ranger District of the Daniel Boone National Forest.

The inventory funds were used to contract two botanists and a zoologist for the inventory, and to cover travel, supplies, and expenses. Administrative coordination was provided by the U.S. Forest Service (USFS) and The Nature Conservancy (TNC). Somerset Ranger District staff served as resource persons and arranged lodging at a USFS field station for the biologists.

State agencies played a critical role in supporting the inventory. The Kentucky Nature Preserves Commission (KNPC) provided a full-time zoologist for the project, coordinated the field effort and report development, conducted an aquatic inventory, and assisted with expenses. The Kentucky Department of Fish and Wildlife Resources (KDFWR) provided nongame staff for a rare bat inventory and developing nongame animal information for the District. This innovative partnership of federal, state and private agencies for rare species inventory is a first in Kentucky.

DESCRIPTION OF THE STUDY AREA

The Somerset Ranger District is one of seven management units of the Daniel Boone National Forest (Fig. 1). This District contains approximately 65,000 acres, or over a hundred square miles, and lies entirely in Pulaski and McCreary counties, Kentucky (Fig. 2). The National Forest tracts are fairly contiguous throughout much of the District, but private inholdings are scattered, and isolated Forest Service tracts are present along the National Forest periphery, especially along the District's western boundary. Lying within the District is the Beaver Creek Wilderness Area, encompassing nearly 4,900 acres in the drainage of Beaver Creek, a tributary of the Cumberland River. In addition, segments of the Cumberland and Rockcastle State Wild Rivers form a portion of the District's eastern boundary.

PHYSIOGRAPHY, TOPOGRAPHY, AND GEOLOGY

The Somerset Ranger District lies primarily within the Cumberland Plateau subsection of the Appalachian Plateaus Physiographic Province (Fenneman 1938; Fig. 3). The Cumberland Plateau covers the southern half of eastern Kentucky and is essentially similar in character to the more northern plateau subsection known as the Allegheny Plateau. The Cumberland Plateau is typically an area of rolling hills of similar elevation, more or less dissected by the erosive action of streams and rivers. A small portion of the District's extreme western edge lies along the poorly defined border between the Cumberland Plateau and the Highland Rim subsection of the Interior Low Plateaus Physiographic Province (Fenneman 1938). Although the edge of the Highland Rim is not well defined in this area, it is characterized by slightly lower elevation and less dissection of the terrain.

That portion of the Cumberland Plateau present in the Somerset Ranger District is essentially similar to other portions throughout southeastern Kentucky in that is underlain by Pennsylvanian rocks, mostly sandstones with some conglomerates, shales, and moderate amounts of coal. Along the District's western edge where the Cumberland Plateau meets the Interior Low Plateau, limestones of Mississippian age appear beneath the sandstone, and are exposed in some areas, especially along the entrenched gorges of the mainstem and South Fork of the Cumberland River. In the extreme northwestern portion of the District, sandstone is replaced completely by limestone, even at the highest elevations.

Most of the Somerset District lies within the Cliff Section of the Cumberland Plateau (Braun 1950, Fig. 3). This area is characterized as dissected and relatively rugged terrain. Massive sandstone outcrops line much of the Cumberland and Rockcastle rivers and their major tributaries, making access to many areas difficult. Sandstones outcrop at or near the highest points of some of the narrower ridges and hills, appearing as prominent formations such as the Dumpling Rocks and Natural Arch. To the north and west, the deeply entrenched, meandering gorges of the mainstem and South Fork of the Cumberland River provide the greatest relief in the District, where terraced limestone cliffs may reach several hundred feet in height.

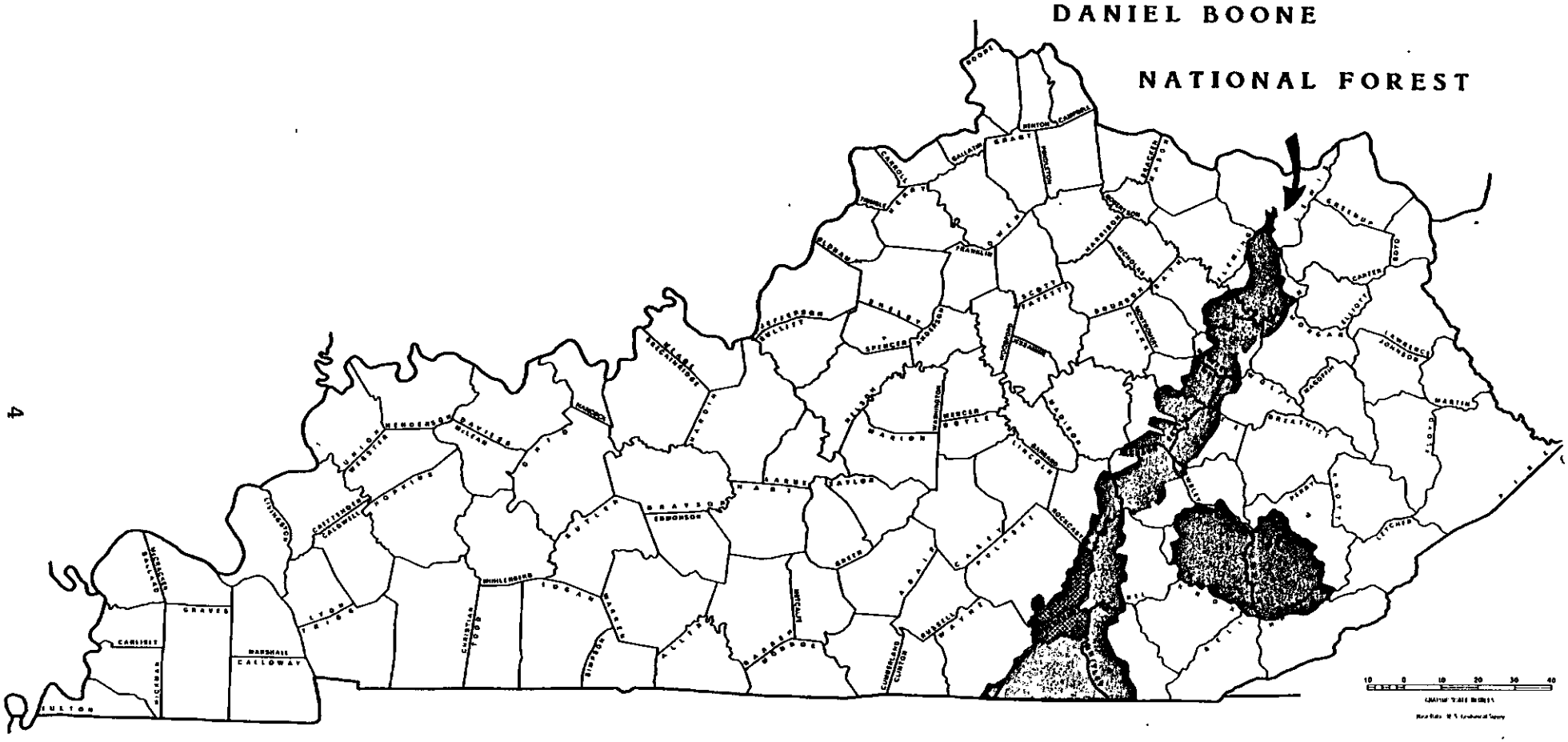


FIGURE 1: Map of Kentucky showing the Daniel Boone National Forest and the Somerset Ranger District.

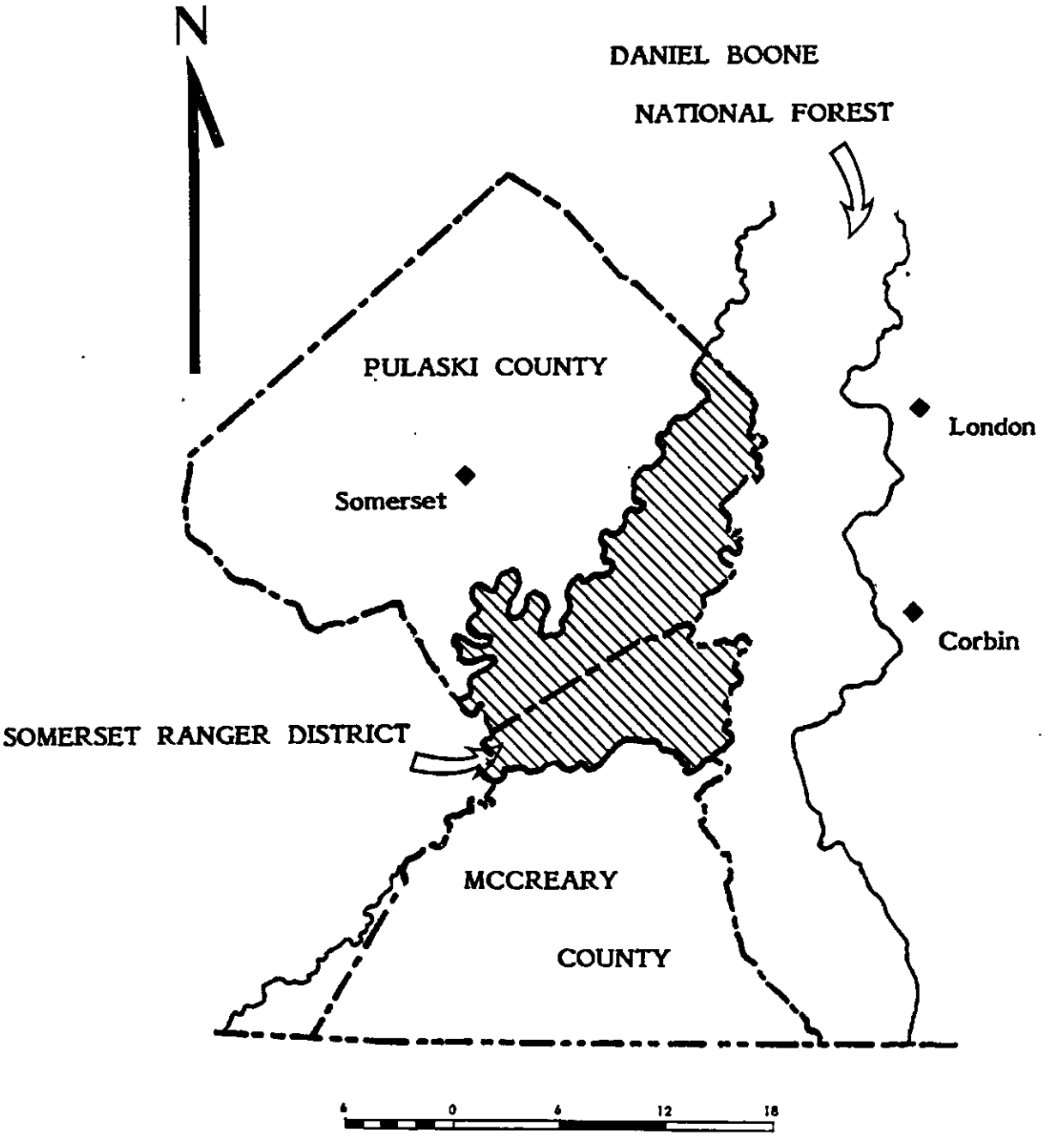


FIGURE 2: Map of McCreary and Pulaski counties showing the Somerset Ranger District.

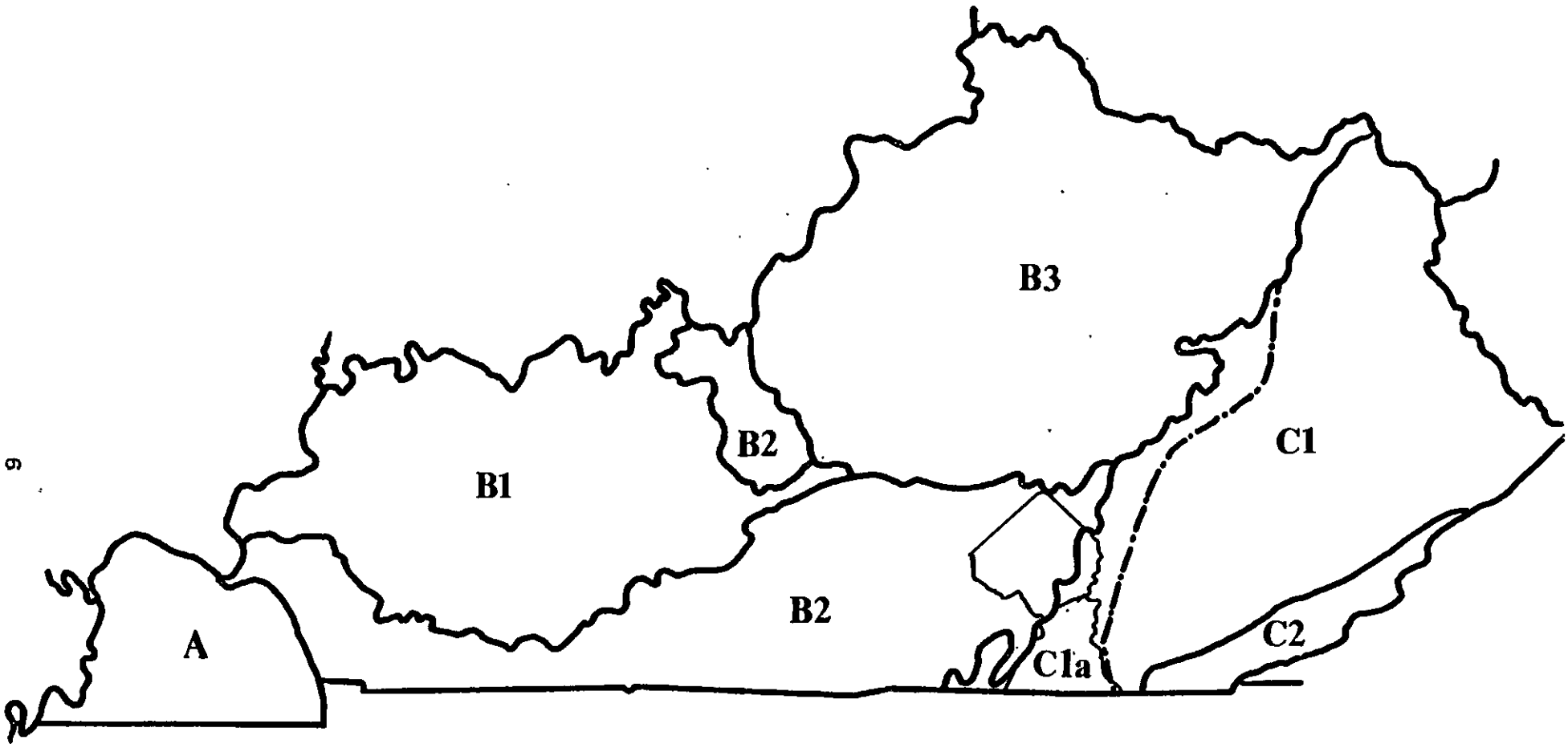


FIGURE 3: Map of Kentucky showing McCreary and Pulaski counties and the major Physiographic Provinces (adapted from Fenneman 1938) and the Cliff Section of the Cumberland Plateau (adapted from Braun 1950). A) Coastal Plain Physiographic Province; B) Interior Low Plateaus Physiographic Province, B1) Shawnee Hills Section, B2) Highland Rim Section, B3) Bluegrass Section; C) Appalachian Plateaus Physiographic Province, C1) Cumberland Plateau Section, C1a) Braun's Cliff Section, C2) Cumberland Mountains Section.

Elevation within the District ranges from approximately 1400 feet on the higher ridges in the southern portion of the District to less than 750 feet along the Cumberland River as it enters the Interior Low Plateau Physiographic Province.

CLIMATE

Climatic classification schemes depict the Appalachian Plateaus Physiographic Province as humid mesothermal, characterized by mild temperate rainy climates with no distinct dry season (Trewartha 1954). Precipitation in this region is generally a result of moisture-bearing low pressure formations which move from the western Gulf of Mexico and travel in a northeasterly direction across Kentucky. The fall season is generally the driest and the spring season the wettest. In this portion of Kentucky, the average annual precipitation from 1931-1971 was approximately 49 inches. Average annual snowfall at Somerset, Kentucky for the period 1931-1974 was 14.7 inches (Karan and Mather 1977).

The mean annual temperature in Somerset for the period 1931-1974 was recorded as 56.3 F. Summer months are commonly humid and in July summer temperatures may reach 100 F. with an average July temperature of 75.3 F. recorded at Somerset for the period 1931-1974. In January, temperatures of 20 F. or below can be expected with an average January temperature of 36.4 F. recorded at Somerset for the period 1931-1974. The average frost free period at Somerset during the period 1931-1974 was approximately 176 days with the average date of first fall freeze being 17 October and average date for final spring freeze being 23 April (Karan and Mather 1977).

SOILS

The Somerset Ranger District is wholly contained within Pulaski and McCreary counties, Kentucky. Soil surveys of these two counties have been completed, and provide a comprehensive account of the region's soils (Byrne et al. 1970, Ross et al. 1974). The soil classification systems used in the two county surveys differ, resulting in contrasting terminology. Upland soils of the Somerset District are summarized in Table 1, which is referred to in detail under accounts of individual natural vegetation types in Appendix C. Major trends in soil characteristics are related to bedrock, from acid sandy soils to calcareous soils, and to topographic position, from residual soils of ridges to colluvial soils on lower slopes.

BIOGEOGRAPHY: FLORA AND FAUNA

The flora in this region of Kentucky is particularly diverse, with at least 1500 vascular species known from Pulaski and McCreary counties combined. The remarkable mixture of northern and southern species, as first detailed by Braun (1937), is pronounced here in the southern Cumberland Plateau. This is exemplified by the overlap in ranges of northern tree species like Northern White Cedar (Thuja occidentalis),

Table 1. Upland soil series of the Somerset District and their major features*.

TYPICAL TOPOGRAPHY	SOIL PARENT MATERIAL			
	SANDSTONE	ACID SHALE +/- SANDSTONE, etc.	LIMESTONE + SOME SAND, etc.	LIMESTONE
	HAPLUDULTS pH 4.5-5	HAPLUDULTS pH 4.5-5	PALEUDULTS pH 4.5-6.5	PALEUDALFS pH 5-7
RESIDUUM ON BROAD RIDGES		Tilsit 3-5 ft. (F)		
2-20% SLOPE	Hartsells 2-4 ft.	Whitley 3-5 ft.	Mountview 6-8 ft.	Cumberland -Pembroke 6-8 ft.
	DYSTROCHREPTS pH 4.5-5	HAPLUDULTS pH 4.5-5	HAPLUDALFS pH 5-6	HAPLUDALFS pH 5-7
RESIDUUM ON UPPER SLOPES	Dekalb 2-3 ft. (D)	Muse 3-6 ft.	Talbott 2-4 ft.	Fredonia 2-3 ft.
6-20+% SLOPE	Outcrop 0-1 ft. (D)	Gilpin 1-3 ft.	Outcrop 0-1 ft. (D)	Outcrop 0-1 ft. (D)
	HAPLUDULTS pH 4.5-5	HAPLUDULTS pH 5-5.5	PALEUDULTS pH 4.5-6	HAPLUDALFS pH 6.5-7
COLLUVIUM ON LOWER SLOPES	Jefferson 3-10 ft.	Shelocta 3-10 ft.	Frederick 6-10 ft.	Brookside 5-6 ft.
6-50+% SLOPE		Monongahela 4-5 ft. (F)		

* Compiled from data in county soil surveys (Byrne et al. 1970, Ross et al. 1974).

Note changes in some series names from 1970 to 1974:
Clymer to Hartsells; Tate to Jefferson; Wellston to Whitley;
Colbert to Fredonia; and Trappist included in Gilpin (and Muse?).

Typical depth to bedrock is indicated below each series name (in feet).

(F) shows fragipan soils (FRAGIUDULTS), which are "moderately well-drained".
(D) shows soils that are "excessively well-drained".
All other soils are "well-drained".

Appalachian species like Fraser Magnolia (Magnolia fraseri) and Yellow-wood (Cladrastis kentukea), and southern species like Southern Shagbark Hickory (Carya ovata var. australis = C. carolinae-septentrionalis) and Sand Hickory (Carya pallida). There is also a minor component of more western flora, mostly on open, rocky ground near riverbanks. This mixture is illustrated by 111 of the rarer species in Kentucky that are known to occur in the area (see Results: Species Accounts). About 17 have ranges centered north of the glacial boundary; 5 have intermediate north-central ranges; 21 have Appalachian ranges (broadly defined); 6 are concentrated in the Cliff Section; 28 have southern (to east-coastal) ranges, centered no further north than the Piedmont; 15 have intermediate south-central (or southeast to Appalachian) ranges; about 6 have various east-central (mostly interior) ranges; 5 have ranges centered west of the Mississippi; and only 8 are widespread in Eastern North America.

Braun (1950) mapped most of this region in the Cliff Section of her Mixed Mesophytic Forest Region (Fig. 3). Also, some land along the northwest edge of the Somerset District is in the Mississippian Plateau Section of her Western Mesophytic Forest Region (Fenneman's Highland Rim Section of the Interior Low Plateaus Physiographic Province). As she described it, the natural vegetation in the Cliff Section of southern Kentucky contains: (a) swampy forests along upland stream heads; (b) widespread forests of pines, oaks, hickories and yellow poplar (tulip) on the general dissected uplands; (c) open forests of pines, oaks and heath (ericaceous shrubs) near sandstone cliffs; (d) mixed mesophytic forests on slopes below the cliffline, dominated by hemlock, beech or a mixture of deciduous species; and (e) modified mixed mesophytic with elm and cane, etc., on alluvial bottoms. On the adjacent Mississippian Plateau Section, she briefly noted modified mesophytic forest, with a general shift to beech and sugar maple and abundant Pachysandra on the ground, widespread oak forests, and local "cedar barrens" with prairie species on some hills.

These forest types are described in Appendix C, together with the open grassy vegetation types that occur in narrow zones along clifftops and along rocky riverbanks. Braun tended to minimize the differences between forests on soils derived from different geological substrates, at least within her definition of Mixed Mesophytic Forest. However, the transition in species composition from her Mixed Mesophytic Region to Western Mesophytic is strongly correlated with the shift from non-calcareous rocks of Pennsylvanian age to calcareous rocks of Mississippian age (Campbell 1987), a theme that pervades the vegetation accounts in this report.

Table 2 summarizes the current distribution of pre-1900 stands in the Somerset District, separated by forest and soil type, taken from data on file at District Headquarters. Table 3 presents early data on the region's timber, taken from Barton (1919). These tables, referred to in detail in Appendix C, suggest that oaks were predominant in the region about 1900. In contrast, Braun (1950) suggested that mesophytic species were predominant before settlement, at least on slopes in the Cliff Section. More historical data is needed to resolve this question.

Table 2. Pre-1900 stands in the Somerset District: SAF type and distribution*.

SAF TYPE (NUMBER)	NO.	MISS. OCC.	TOPOGRAPHY B	R	S	O	N	V	SOIL DISTRIBUTION Ha/Wh	De/Mu/Fr	Je/Sh/Br
Virginia pine +/- oak (16,33)	4	-	-	3	1	-	-	-	-/-	4/-/-	-/-/-
Yellow/pitch pine (32,38)	45	2 (4%)	2	25	14	4	-	-	10/7	5/5/-	14/2/-
Yellow pine-oak (12)	28	-	2	13	7	5	1	-	5/1	6/1/-	13/-/-
Chestnut/scarlet oak-yel. pine (45)	11	-	1	6	1	3	-	-	0/3	1/4/-	3/-/-
Chestnut/scarlet oak (52,59,60)	17	-	2	13	1	1	-	-	3/5	4/5/-	-/-/-
White/other oak-yel. pine (44,47)	28	4 (14)	-	9	8	11	-	-	5/1	3/4/-	11/5/-
White-red oak-hickory (53)	100	27 (27)	13	14	13	45	17	2	3/1	7/10/1	46/18/2
White oak (54)	10	4 (40)	1	6	1	3	-	-	-/-	-/-/-	4/6/-
Hemlock +/- hardwood (5,8,41)	45	1 (<1)	-	-	1	9	10	22	-/-	-/-/-	37/4/-
Yellow poplar-white/red oak (56)	29	8 (28)	1	1	1	11	12	3	-/-	-/1/-	18/6/1
Sugar maple-beech -birch (81)	4	4 (100)	-	-	-	2	1	1	-/-	-/-/-	2/1/1

* Compiled from data on file at Somerset District Headquarters. Forest type codes used by U.S. Forest Service are shown in parentheses after names. The types are combined in several cases with few data.

"No." shows numbers of stands (mean area is 25-30 acres; 90% are 10-50 acres.) "Miss. Occ." shows numbers (and percentages) of stands that occur on Mississippian bedrock, generally indicating some limestone influence.

Topographic symbols are: B = broad ridges (> ca. 1000 ft. between cliffs);
R = narrow ridges (< ca. 1000 ft. between cliffs);
S = S to SW facing slopes (> ca. 10% slope);
O = other slopes;
N = N to NE facing slopes;
V = ravine (< ca. 1000 ft. between cliffs).

Soil series symbols are: Ha = Hartsells; Wh = Whitley;
De = Dekalb; Mu = Muse; Fr = Fredonia;
Je = Jefferson; Sh = Shelocta; Br = Brookside.

Note: only the most extensive topographic position or soil series in each stand is referred to here; also, the soils in a few stands remain unknown.

Table 3: Percentage composition of standing timber ca. 1900 in and around the southern Cliff Section in Kentucky, as reported by Barton (1919).*

Species	Wayne Co.	Pulaski Co.	Laurel Co.	Whitley Co.
Yellow pine (*Pinus* sp.)	2.6%	8.3%	11.4%	11.6%
Cedar (*Juniperus*)	1.6	2.5	--	--
Chestnut oak (*Quercus montana*)	7.8	5.0	8.7	4.3
Chestnut (*Castanea*)	9.7	13.1	5.3	4.5
White Oak (*Q. alba*)	15.9	14.5	15.7	23.6
Black Oak (*Q. velutina*, etc.)	9.6	24.5	28.7	26.5
Hickory (*Carya* spp.)	7.6	4.5	9.3	3.2
Ash (*Fraxinus* spp.)	2.9	--	0.03	0.9
Locust (*Robinia*, *Gleditsia*)	0.6	--	--	--
Hemlock (*Tsuga*)	1.3	7.0	3.2	5.2
Cucumber (*Magnolia* spp.)	2.3	--	--	0.5
Poplar (*Liriodendron*)	8.8	9.5	3.0	7.3
Beech (*Fagus*)	3.5	5.1	1.6	5.0
Basswood (*Tilia*)	3.3	1.8	1.1	1.5
Buckeye (*Aesculus*)	1.8	--	0.3	0.7
Walnut (*Juglans*)	0.7	--	0.03	--
Maple (*Acer* spp.)	7.0	1.3	6.1	3.7
Gum (*Nyssa*, *Liquidambar*)	9.5	1.8	4.7	1.5
Sycamore (*Platanus*)	3.4	1.0	--	--
Other	--	--	0.9	0.06
Total (thousand board feet measure)	836,691	272,574	337,011	486,703

*Note: McCreary County was formed in 1912 from portions of Wayne, Pulaski and Whitley counties.

The fauna of this region of Kentucky is also rich and, as with plant species, the mixture of northern and southern components is pronounced. The occurrence of nesting birds exemplifies this trend. While the southern Cumberland Plateau is dominated by many temperate species such as Red-eyed Vireo (Vireo olivaceus) and Ovenbird (Seirus aurocapillus), wooded areas may also harbor northern species such as Black-throated Green Warbler (Dendroica virens) and Ruffed Grouse (Bonasa umbellus) and southern species like Red-cockaded Woodpecker (Picoides borealis) and Swainson's Warbler (Limnothlypis swainsoni). Likewise, mammal species with northern affinities like the Smoky Shrew (Sorex fumeus) are found in the same woodlands as more southern species like the Eastern Wood Rat (Neotoma floridana magister).

In many cases, faunal ranges within the area do not correspond closely with vegetation types. While certain species are associated more with moist forest types than dry types, the preferences exhibited by many species are not pronounced. For the most part, faunal components are distributed independent of the soil formation, however there are some examples of species associated exclusively with either calcareous or non-calcareous regions. For example, the Green Salamander (Aneides aeneus) is found almost exclusively on sandstone, while the development of underground cave systems in the limestone of the western portion of the District accounts for the much more widespread presence of most bat species there.

The aquatic fauna of the area is also diverse. Although most aquatic systems have been impacted to some degree by pollution from farming, mining and other activities, and most of the Cumberland River below the Falls and lower Rockcastle River have been severely altered by the construction of Cumberland Reservoir, the overall species diversity is still rather high. Numerous geological, climatic, and hydrological events have interacted to produce this diverse aquatic fauna. From the intermittent headwaters of the smaller tributaries, to the boulder-filled main channel of the Cumberland River upstream from its impounded portion, many aquatic habitats are present within the District. Underground stream systems in the limestone portion of the District account for the presence of a diverse aquatic cave fauna as well.

LITERATURE REVIEW

Although certain scientific literature was reviewed for reference and background information, a comprehensive review of the scientific literature available on the Somerset Ranger District was not completed. Most information on Endangered, Threatened, Sensitive and Rare species contained in the scientific literature has already been incorporated into the Kentucky Nature Preserves Commission's Natural Heritage Database. For this reason, only the most comprehensive sources of data are noted here.

VASCULAR FLORA

Despite frequent visits by botanists, the only widely available botanical publications covering this whole region are E. Lucy Braun's description of the natural forest vegetation (Braun 1950), and her various notes on collections made here during the 1930s and 1940s (Braun 1936, 1937, 1939, 1941, 1942, 1943). Several other collectors have worked in the area during the past century, as exhibited by specimens at the University of Kentucky, University of Louisville, Eastern Kentucky University and elsewhere. Rogers (1941) provided a flora of McCreary County, but his specimens at the University of Kentucky were all destroyed by fire in 1948.

The Kentucky Nature Preserves Commission collected botanical information from the area as part of an environmental assessment of the Eastern Kentucky Coalfield (Harker et al. 1979). Rob Jacobs did a botanical survey of the Rockcastle and Cumberland Wild River Corridors, as part of an environmental inventory for government agencies (Soil Systems Inc. 1979, 1980). Accounts of some species that are candidates for protection at the Federal level were prepared by Harker et al. (1981) and Hannan and Medley (1982). Also, some important plant discoveries in the area were reported by Cranfill and Medley (1981) and Medley et al. (1983). In this report, most of the previous rare plant occurrences in the District have been confirmed, and many more added.

TERRESTRIAL VERTEBRATE FAUNA

The terrestrial vertebrate fauna of the Somerset Ranger District has not previously been studied as a whole. However smaller studies and periods of field work have been conducted by a number of investigators in the region.

The herpetofauna of McCreary County was the topic of a recent Masters thesis (Stephens 1985), which included a comprehensive review of the literature, and Barbour (1971) included a few scattered records from both Pulaski and McCreary counties. Information compiled by the Nongame Wildlife Program of the Kentucky Department of Fish and Wildlife Resources accounts for the presence of many other species in the vicinity (J. MacGregor, pers. comm.)

The birdlife of McCreary and Pulaski counties was mentioned by Mengel (1965), who also included some specific records from field work conducted on scattered dates from 1948 to 1951. In addition, currently known sites for Red-cockaded Woodpecker activity have been documented through studies by Jackson (1976), Schmaltz (1981) and Murphy (1982), as well as annual field surveys by the U. S. Forest Service (K. Spielman, pers. comm.).

Information on the small mammals of the Somerset District is relatively meager in comparison to other vertebrates. Barbour and Davis (1974) included a few records for mammals from the area at a county level. Investigation of the bats in the area has been conducted on an irregular basis by the Nongame Wildlife Program of the Kentucky Department of Fish and Wildlife Resources and various caving groups (J. MacGregor, pers. comm.).

AQUATIC FAUNA

Recent field surveys have yielded much useful information regarding aquatic organisms within the District. Thompson (1985) sampled at five sites on the Rockcastle River for freshwater mussels and collected two species of national and state concern, Ptychobranchus subtentum and Villosa trabalis, at one site each. Twenty streams within the District were surveyed for fishes by O'Bara (1985), three of which were found to support populations of Phoxinus cumberlandensis, a federally Threatened species. More recently, Jones (1987) and D. Stephens (pers. comm.) discovered five additional populations of P. cumberlandensis while searching for trout habitat within the District. In addition to providing important distributional information, the findings of these workers also served to reduce the number of areas to be sampled during this effort.

The Kentucky Nature Preserves Commission has reported on the aquatic fauna and the importance of aquatic areas within the Somerset District (Hannan et al. 1982; Harker et al. 1979, 1980; Warren et al. 1982).

METHODS

Site selection for the Somerset Ranger District inventory attempted to utilize all available information sources in order to identify potential biologically significant sites. At the onset, lists of species of high priority to inventory were generated using information from the Kentucky Nature Preserves Commission's Natural Heritage Database and a literature review. These species included federally listed Endangered and Threatened species and species under consideration for federal listing (C1 and C2 candidates; United States Fish and Wildlife Service 1985), species listed as Endangered, Threatened, or Special Concern by the Kentucky Academy of Science and the Kentucky Nature Preserves Commission (KAS-KNPC), (Warren et al. 1986), and other species listed as Sensitive by the United States Forest Service (B. Knowles, pers. comm.).

Using 7.5 minute U.S.G.S. topographic maps, aerial photographs, U.S. Forest Service Continuous Inventory of Stand Conditions (CISC), Soil Survey Maps, and personal communications with U.S. Forest Service personnel, sites for these rare species, as well as unique or ecologically significant habitats within the Somerset Ranger District, were identified and ranked for field inventory. Areas depicted as wetlands, cliff areas, gorges, karst features, and other uncommon topographic features were identified from maps and aerial photographs. Old-growth forest stands (those >100 years old) were identified using CISC. Communication with U.S. Forest Service personnel and others familiar with the area yielded additional information identifying sites for visitation. A field schedule was then devised that prioritized the inventory effort using the lists of potential high interest species and sites.

Field inventory work commenced in late April 1987 and proceeded throughout the summer with some activity continuing into the fall and early winter. Small mammal trapping and cave inventory continued into January 1988. Approximately 120 man-days were devoted to botanical inventory. Approximately 60 man-days and 10 man-days were devoted to terrestrial and aquatic zoological inventory effort, respectively.

VASCULAR FLORA

Botanical field work was conducted in areas scattered over the entire District and in as many vegetation types as possible. The primary aim of this effort was to relocate previously recorded populations of rare species and to discover new ones. There were few repeated visits to the same sites, due to the limited time. However, through an accumulation of notes made during the year, a rudimentary quantification of the overall vegetation composition was made, with special emphasis on the areas containing rarer species (Appendix B: Tables B1-8). Such notes include comments on dominant species, and general species lists, though incomplete and with seasonal limitations. In addition, population estimates were made for some of the rarer species. Species lists were also made for each day's field work, so as to construct an overall list of the region's flora, with notes on frequencies and habitats (Appendix A).

It soon became clear that most rare species were concentrated in special habitats, distinct from the widespread upland forest types that cover most of the the District. These special habitats mostly occur along rivers, clifflines and flatter stream heads. Accordingly, much time was devoted to these areas. In traveling to many of these special areas, however, much of the more typical upland forest was covered as well. In addition, many roadsides were searched for rare species, some of which were concentrated on such sites, though sporadic.

Plant specimens were selectively collected throughout the inventory work, focusing on the federal and state listed species, other rare species of interest, and other plants that could not be readily identified in the field. Duplicates of the rare species are being deposited at the herbarium of Eastern Kentucky University, with some others at the University of Kentucky and the University of Louisville. Photographs were taken of many rare species and are being deposited at the Winchester and Somerset offices of the Daniel Boone National Forest.

The vascular plant nomenclature used in this report generally follows Kartesz & Kartesz (1980, unpublished). KAS-KNPC listed rare species' names all follow Kartesz & Kartesz (1980), though a few currently used synonyms have also been given in square brackets, as discussed briefly in the species accounts. For the rest of the flora, no strict standard has been followed, though virtually all names preferred here have been used in at least one of the standard manuals (Fernald 1950, Gleason & Cronquist 1963, Radford, Ahles & Bell 1968). Also, the overall floristic list indicates common synonyms. One of the more problematic cases is the genus Panicum, which is used here in the broad sense, including Dichanthelium as a subgenus.

TERRESTRIAL VERTEBRATE FAUNA

The list of rare animal species potentially occurring in the Somerset Ranger District was limited in number. Only a handful of federally listed or proposed species were known to occur within the vicinity including Green Salamander (Aneides aeneus); Red-cockaded Woodpecker, (Picoides borealis); Eastern Wood Rat (Neotoma floridana magister); and several species of bats including Gray Myotis (Myotis grisescens); Indiana Myotis (Myotis sodalis); Small-footed Myotis (Myotis subulatus leibii); and Rafinesque's Big-eared Bat (Plecotus rafinesquii). Potential habitats for these species were given high priority for field inventory.

Herptiles were sampled by overturning rocks and logs in a variety of habitat types. Special emphasis was placed on the sandstone outcrops with which Aneides aeneus is associated. Herptile specimens were deposited at Eastern Kentucky University.

Bird species were recorded using visual and auditory identification. An emphasis was placed on the nesting population of the District, although migratory species were also recorded.

Small mammals were sampled using pitfall traps placed in a variety of habitat types. Approximately 150 pitfalls were placed in at least five distinct habitat types including mesic bottomland forest, mesic slope forest, xeric slope forest, xeric upland forest, and mature pine forest (Appendix E). This effort resulted in over 30,000 trap-nights of sampling time. Small mammal specimens were deposited at Eastern Kentucky University. Bats were surveyed by field checking caves identified by sources as suspected for known historical bat utilization. Cave locations were obtained from several sources including Kim Speilman with the U.S. Forest Service, Bill Andrews with the Blue Grass Grotto, and Paul Unger of the Boone Karst Foundation/Miami Valley Grotto. Approximately twenty such caves were located and surveyed for bat use during the inventory (Appendix F).

AQUATIC FAUNA

Freshwater mussels and fishes monitored by the USFWS and/or KAS-KNPC were sought in the Somerset District on 28 April, 4-6 August, and 10-11 September 1987. Aquatic habitats that were excluded from consideration for sampling included: 1) the impounded Cumberland River and backwaters, and 2) streams previously sampled by O'Bara (1985). Mussel sampling was concentrated on the Rockcastle River between the old Highway 80 bridge and Highway 192, and Cumberland River immediately below Cumberland Falls. All habitats present at a site were sampled for mussels by snorkeling, scanning shallows with mussel viewing buckets, and/or searching the banks for shells. Empty shells of each species found at a site were retained as voucher specimens and deposited at the Ohio State University Museum of Zoology, except when live specimens could not be positively field identified.

Fishes were sampled by seining in available habitats, and also through observations made while snorkeling. All specimens collected will be deposited at Southern Illinois University at Carbondale.

RESULTS AND DISCUSSION

The major purpose of this effort was to inventory the Somerset Ranger District for the presence of endangered, threatened, sensitive and rare plants and animals. Prior to the inventory, the Kentucky Nature Preserves Commission had records for 18 species of endangered, threatened, sensitive and rare plants, 10 species of terrestrial vertebrates, and 14 aquatic species from the Somerset Ranger District (Table 4).

The inventory of the District generated nearly 300 new records for endangered, threatened, sensitive and rare species (Fig. 4). This represents a four-fold increase in the total records for these species on the District. During the course of the inventory, 13 of the 18 previously known rare plants were recorded; in addition 34 species were recorded that had not been previously known from the District (Table 4). This effort brought to 52 the total of rare plants known from the Somerset Ranger District. In addition, at least fifteen species or varieties that were previously unknown from the state were recorded (see section II. Other Species of Interest).

The general species lists compiled for each day's field work, allowed for the compilation of a fairly comprehensive floral list (Appendix A). The floral lists generated from field notes taken at many of the sites with rare plants and unusual vegetation were not complete, with seasonal limitations, but they include at least the most frequent species seen at each site. Most of these data have been condensed in Appendix B.

Seven natural vegetation formations occurring in the district were identified and broadly defined as: 1) grassy vegetation on dry ledges above cliffs, especially S-SW facing, 2) dry evergreen forest on ridges or clifftops, grading into moister oak types, 3) dry to moist deciduous forest, dominated by oaks and other ring-porous trees, 4) moist forest of coves, ravines, and N-NE facing slopes (mixed mesophytic types), 5) seasonal swampy forest at stream-heads and on terraces, 6) forested banks of creeks and rivers, grading into terraces or slope types, 7) rocky banks of rivers and major creeks, with grassy to shrubby vegetation. Each formation was divided into distinct vegetation types relative to geology and soils (Appendix C).

One previously unrecorded rare terrestrial vertebrate species was discovered on the District during the inventory. In addition, eight of the ten previously known rare species were recorded (Table 4). As a result of field inventory work, general lists of terrestrial vertebrates were generated for the District (Appendices D1-3).

One new rare aquatic species was discovered on the District during the inventory, but only three of the 14 previously known rare aquatic species were recorded (Table 4). Many of the freshwater mussels formerly known to occur in the major rivers on the District have been extirpated by the impoundment of the Cumberland River and pollution, while others were probably missed due to difficulty in sampling.

TABLE 4: USFWS And KAS-KNPC listed species and USFS sensitive species occurrences known from the Somerset Ranger District.

Species	Number of formerly known sites	Number of additional sites added by this inventory	Number of records in natural areas
VASCULAR FLORA			
Adiantum capillus-veneris Venus Hair Fern	—	3	1
Agalinis decemloba Purple False Foxglove	—	1	1
Aster concolor Aster	—	3	3
Aureolaria patula False Foxglove	—	1	—
Boykinia aconitifolia Brook Saxifrage	2	v	1
Calamagrostis cinnoides Cinna-like Reed Grass	—	9	3
Carex joorii Sedge	—	2	2
Carex picta Sedge	—	8	7
Carex stricta Sedge	—	5	4(+4*)
Carya ovata var. australis Southern Shagbark Hickory	—	4	2
Castanea pumila Chinquapin	1	—	—
Ceanothus herbaceus Redroot	1	2(+3*)	2(+3*)
Cladrastis kentukea Yellow-wood	3+	10+	1
Cleistes divaricata Spreading Pogonia	—	1	—
Clematis glaucophylla Leather Flower	—	2(+1*)	2(+1*)
Cypripedium kentuckiense Kentucky Lady's Slipper	2	v(+2*)	2(+2*)
Cystopteris fragilis var. mackayi Fragile Fern	—	6(+2*)	6(+2*)
Dichanthelium acuminatum var. villosum Panic Grass	—	10	6
Dichanthelium boreale Panic Grass	—	1	1
Dichanthelium sabulorum Panic Grass	—	5	4
Erigeron pulchellus var. brauniae Lucy Braun's Robin Plantain	—	4(+4*)	4(+4*)

TABLE 4 cont'd:

Species	Number of formerly known sites	Number of additional sites added by this inventory	Number of records in natural areas
Eupatorium luciae-brauniae Lucy Braun's White Snakeroot	1(+2*)	10(+1*)	6(+3*)
Gaylussacia brachycera Box Huckleberry	5	43	25+
Gymnopogon ambiguus Beardgrass	--	2	2
Helianthus atrorubens Sunflower	--	10	4
Hydrocotyle americana Water Pennywort	--	1	1
Hypericum stans St. John's Wort	--	1	1
Lathyrus palustris Marsh Pea	2(+1*)	1	3(+1*)
Liatris microcephala Blazing-star	2	13	8
Lilium philadelphicum Wood Lily	1	1	1
Malus angustifolia Crab Apple	--	6	3
Minuartia glabra Sandwort	--	6	4
Pachistima canbyi Mountain Lover	1	v(+2*)	1
Panax quinquefolius Ginseng	1+	5	3
Philadelphus hirsutus Mock Orange	2*	12	2
Philadelphus inodorus Mock Orange	1*	4	1
Platanthera integrilabia White Fringeless Orchid	1*	2	2
Podostemon ceratophyllum Riverweed	1	--	1x?
Polemonium reptans var. villosum Hairy Jacob's Ladder	--	5	5
Rhynchospora globularis Grass Beak Rush	--	1	1
Schwalbea americana Chaffseed	1	--	1x?
Scutellaria cf. leonardi Small Skullcap	--	1	--
Solidago spathulata Goldenrod	--	6(+3*)	6(+3*)
Sporobolus clandestinus Dropseed	--	1	1

TABLE 4 cont'd:

Species	Number of formerly known sites	Number of additional sites added by this inventory	Number of records in natural areas
Synandra hispidula			
Synandra	1	--	1
Tephrosia spicata			
Goat's-rue	1(+1*)	2	2(+2*)
Thalictrum mirabile			
Meadow Rue	--	15+	13(+3*)
Thuja occidentalis			
Northern White Cedar	3*	3(+3*)	1
Trichomanes boscianum			
Filmy Fern	2*	1	1
Ulmus serotina			
September Elm	--	1	1
Veratrum parviflorum			
False Hellebore	1	v	1
Viola tripartita			
Yellow Violet	1	6	1
TERRESTRIAL VERTEBRATE FAUNA			
Aneides aeneus			
Green Salamander	1(+2*)	7	--
Ophisaurus attenuatus			
Slender Glass Lizard	1	1*	--
Accipiter striatus			
Sharp-shinned Hawk	1	1	--
Picoides borealis			
Red-cockaded Woodpecker	4	1v	2
Microsorex hoyi winnemana			
Pygmy Shrew	--	2	1
Myotis grisescens			
Gray Myotis	1(+1*)	1	1
Myotis keenii			
Keen's Myotis	2	6	4
Myotis sodalis			
Indiana Myotis	1	3	4
Myotis subulatus leibeii			
Small-footed Myotis	1	--	--
Neotoma floridana magister			
Eastern Wood Rat	2	9	4
Plecotus rafinesquii			
Rafinesque's Big-eared Bat	3	4	3

TABLE 4 cont'd:

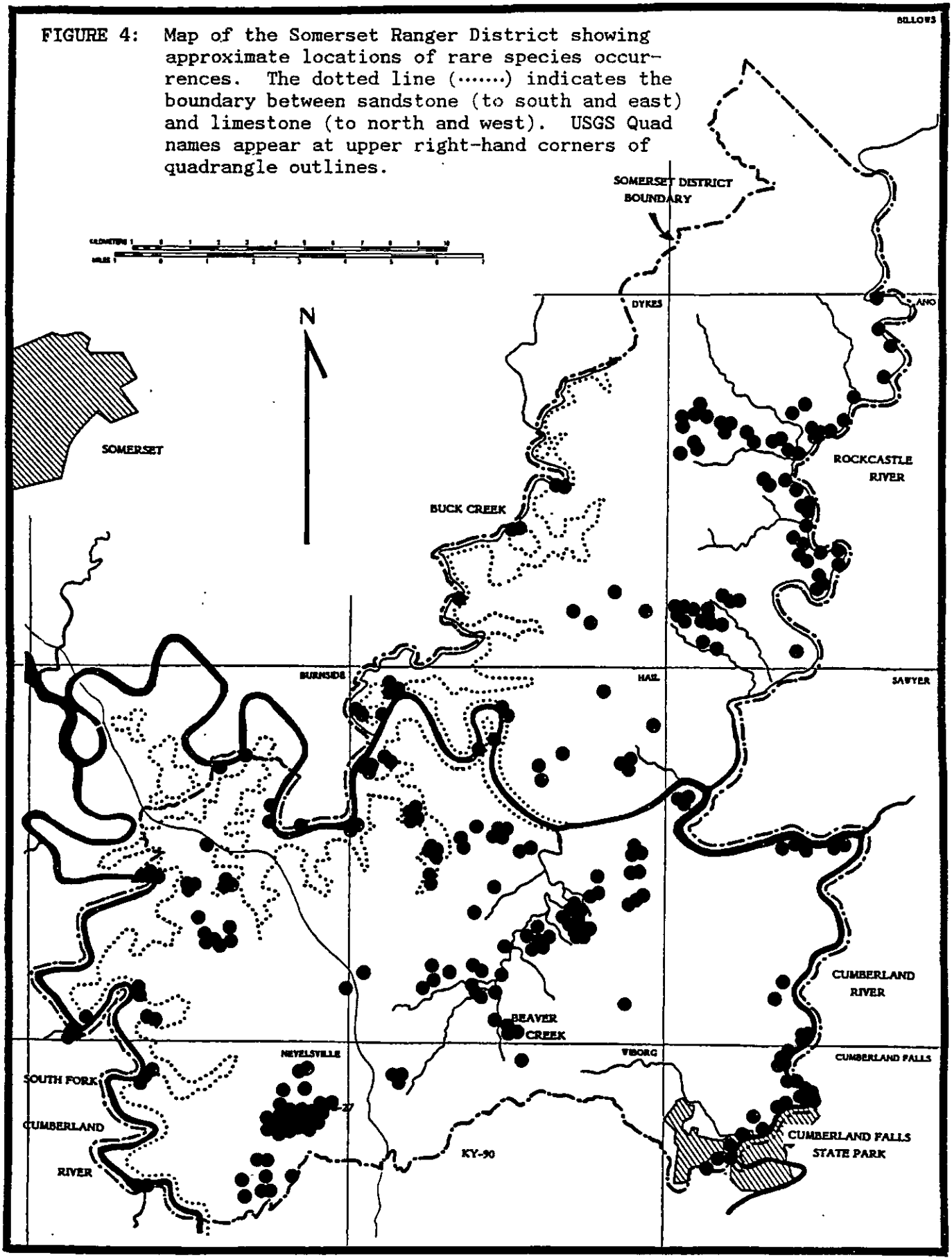
Species	Number of formerly known sites	Number of additional sites added by this inventory	Number of records in natural areas
AQUATIC FAUNA			
Orconectes australis Crayfish	2	2	4
Epioblasma brevidens Cumberland combshell	2	--	x?
Epioblasma capsaeformis Oyster mussel	3	--	1x?
Epioblasma haysiana Acornshell	1	--	x?
Fusconaia subrotunda subrotunda Long-solid	2	--	x?
Pleurobema oviforme Tennessee clubshell	1	--	x?
Ptychobranchus subtentum Fluted kidneyshell	2	--	1x?
Quadrula cylindrica Rabbitsfoot	1	--	x?
Villosa lienosa Little spectacle case	1	--	1x?
Villosa trabalis Cumberland bean mussel	5	4	8
Acipenser fulvescens Lake sturgeon	1	--	1x?
Etheostoma cinereum Ashy darter	--	2	2
Icthyomyzon greeylei Mountain brook lamprey	1	--	1
Phoxinus cumberlandensis Blackside dace	8	1	7
Cryptobranchus alleghaniensis Hellbender	1	--	1

v -- previously known sites verified although no new sites found.

* -- occurrences along boundaries of district or within several miles.

x? -- species not relocated; perhaps extirpated.

FIGURE 4: Map of the Somerset Ranger District showing approximate locations of rare species occurrences. The dotted line (.....) indicates the boundary between sandstone (to south and east) and limestone (to north and west). USGS Quad names appear at upper right-hand corners of quadrangle outlines.



The remainder of this section has been divided into discussions on the vascular flora, terrestrial vertebrate fauna, aquatic fauna, and natural areas recommended for protection. Appendix H contains Element Occurrence Records (EOR's) for endangered, threatened, sensitive and rare plants and animals discovered in and within several miles of the Somerset District during the inventory.

I. VASCULAR FLORA

IA. LISTED SPECIES

The following accounts summarize regional data on 52 listed rare species that have been reported on the Somerset District. Also included are accounts of sixteen species which are known to occur within several miles of the District (including several along its riverine boundaries), but which have not been actually recorded within the District, although they should be expected to be present; these are placed in square brackets []. Following each species' name, its official status is shown as follows (1/2/3):

(1) Status in Kentucky according to the Kentucky Academy of Science and the Kentucky Nature Preserves Commission (KAS-KNPC; Warren et al. 1986): E = Endangered, T = Threatened, S = Special Concern, or "-" = not listed.

(2) Status in Daniel Boone National Forest as listed by the USFS (B. Knowles, pers. comm.); "S" = species listed as Sensitive, "E" = species listed as Endangered, or "-" species not listed by the USFS in Daniel Boone National Forest. Shown with a "+" are those KAS-KNPC listed species that are documented herein for the first time on Forest Service Land or along its boundaries, including Districts adjacent to the Somerset District.

(3) Federal Status as designated by the United States Fish and Wildlife Service (1985); C1 or C2 = candidate for listing, Category 1 or 2. There are only nine of these: Aureolaria patula, Cypripedium kentuckiense, Eupatorium luciae-brauniae, Pachistima canbyi, Platanthera integrilabia, Polemonium reptans var. villosum, Schwalbea americana, Silene regia and Synandra hispidula (which is not listed by KAS-KNPC). No federally listed Endangered or Threatened plant species are known from Daniel Boone National Forest.

In parentheses after each species' name and status is shown the number of Kentucky counties where it is known, followed by the approximate number of known occurrences, based on data on file at Kentucky Nature Preserves Commission and other data of Julian Campbell and Max Medley. Such data may be used to help reassess the official status of some species.

[Acer spicatum Mountain Maple: T/-/- (5/5). This northeastern species has been reported from only five localities in Kentucky, mostly in the Cliff Section and the Cumberland Mountains, with very small populations. One site is at the mouth of Blowing Cave adjacent to Buck Creek just north of the Somerset District, in a sugar maple-hemlock forest (Harker et al. 1979). It should be looked for at the mouths of caves or other areas with cool microclimate within the District.]

[Aconitum uncinatum Monkshood: T/S/- (5/8). In Kentucky, this Appalachian species is scattered along the Cliff Section. Populations are usually small. There is one known site along the Rockcastle River in Laurel County, near the boundary of the Somerset District. It can be expected elsewhere along the Rockcastle River on sandy floodplains or terraces in forest of river birch and sycamore or yellow poplar, beech and hemlock.]

Adiantum capillus-veneris Venus Hair Fern: E/+/- (8/20). This southern species, widespread in the tropics, is reported from several areas of Kentucky on Mississippian limestone, but there are few recent records. Most of the recent records are now in or near the Somerset District. Here it occurs along the Cumberland River and the South Fork on wet dripping limestone, often with travertine deposits, where small streams or springs flow down cliffs. About 20 distinct patches were found during this survey, covering from about one to 50 square feet, but only one site was on Forest Service land. Site aspects ranged from west-facing through south to east, with none northerly. At most sites, tree cover was partially open or absent. The most frequent associates were Boehmeria, Hydrangea and Acer saccharum, and others included Lindera, Ulmus spp., Cladrastis, Platanus, Heuchera villosa, Fraxinus americana, Lobelia siphilitica, Aster cordifolius and Eulalia (Appendix B9).

Agalinis decemloba Purple False Foxglove: E/+/- (2/3). In Kentucky, this southern species is known from only two sites in the Somerset District and one in the Stearns District. The only recent record is from this survey, along Route 751 south of Burnside, growing on sandy soils along an open roadside, dominated by little bluestem (Andropogon scoparius). Associated rare species were Aster concolor and Gymnopogon ambiguus (see Appendix B2; Appendix C/2B).

Aster concolor Aster: E/+/- (4/8). In Kentucky, this southern species is known only on sandy soils in the southeast and the southwest. During this survey, it was found it at two localities, both along roads through Forest Service land. The locality along Route 751 had several patches scattered along about two miles of open roadside dominated by Andropogon scoparius, but the other population was small and more shaded. This species may have occurred in "barrens" before fire-suppresion, together with other rare species associated with it today (see Appendix B2; Appendix C/2B).

Aureolaria patula False Foxglove: E/-/Cl (2-3/4). This southern interior species occurs in Georgia, Alabama, Tennessee and Kentucky, generally on limestone river bluffs. In Kentucky, before this study, it was known from only one locality, in the Mammoth Cave National Park (Edmonson and perhaps Hart Co.). During this survey, it was found along the South Fork of Cumberland River, at two sites, near the edge of the Somerset District. Both sites were on west or southwest-facing bluffs, at the edge of oak-hickory or oak-ash forest, with some red cedar. The plants were 10-30 feet above the high water level of the impoundment, growing in openings that are at least partially artificial. Though not yet found on Forest Service land, it can be expected elsewhere in this region, since there is

much suitable habitat, and it may have been overlooked earlier in the survey due to its vegetative resemblance to Dasistoma macrophylla. Surveys by boat during the flowering season, have shown it to be locally frequent in Tennessee (Leo Collins, TVA, pers. comm.), and such surveys should also be done here. It is believed to be a partial root parasite, especially on white oaks.

Boykinia aconitifolia Brook Saxifrage: T/S/- (5/5). In Kentucky, this Appalachian species is restricted to more rugged sections of the Cumberland Mountains and Plateau. The most western site known is at the edge of the Somerset District along Eagle Creek, from its falls to about half a mile upstream, mostly in the Cumberland Falls Nature Preserve (in Cumberland Falls State Resort Park). Here it occurs on rocky banks in the partial shade of Acer rubrum, Liquidambar, Magnolia macrophylla, Viburnum cassinoides, Aronia spp. and shrubby Ericaceae, together with such species as Athyrium asplenioides, Trautvetteria, Chelone, Phlox maculata, Lobelia cardinalis, Solidago rugosa, Juncus effusus var. pylaei, Carex torta, Muhlenbergia sylvatica, Panicum clandestinum and P. microcarpon (Appendix B5/K).

Calamagrostis cinnoides Cinna-like Reed Grass: S/+/- (5/15). In Kentucky, this southern and east-coastal species is virtually restricted to the southern Cliff Section. It is known at eight sites scattered through the District. It occurs in seasonally wet, acid soils on broad Pennsylvanian ridges, generally in the partial shade of Acer rubrum and other trees, but sometimes abundant in clearings. Panicum microcarpon is often a dominant associate, and others include Osmunda regalis, Ilex verticillata, Rubus hispidus, Eupatorium spp. and Platanthera spp. (see Appendix B5/E-H; Appendix C/5A).

[Calopogon tuberosus Grass Pink: E/S/- (6/6). In Kentucky, this widespread eastern species is only known from the Cliff Section and Cumberland Mountains. There is a record near Whitley City, south of the District, at a boggy stream-head with Platanthera integrilabia and other rare plants.]

[Calycanthus floridus Sweet Shrub: T/S/- (2/8). In Kentucky, this southeastern to Appalachian species is largely restricted to the Big South Fork valley, but there is one disjunct site along Dog Slaughter Creek in Whitley County. It should be looked for on moist sandy terraces or lower slopes near the Cumberland River.]

Carex joorii Sedge: E/S/- (2/3). In Kentucky, this Coastal Plain species is known only from three small seasonal ponds in the southern Cliff Section. Two of the sites were found during this study. It grows in the partial shade of Acer rubrum, Liquidambar, Betula nigra, Oxydendron and Nyssa, together with such species as Osmunda cinnamomea, Thelypteris noveboracensis, Rhexia virginica, Ludwigia spp., Lycopus virginicus, Aster umbellatus, Juncus spp., Scirpus spp., Glyceria striata, Chasmanthium laxa, Leersia virginica and Panicum spp. (see Appendix B5; Appendix C/5A).

Carex picta Sedge: E/+/- (6/12). In Kentucky, this south-central interior species is known from scattered localities in the west and

southeast, all on Pennsylvanian bedrock. During this survey, it was found at about 8 sites, always on sandy soils, and generally on moderately dry slopes. The associated forest was mostly oak or successional pine, but not the driest pine forest near cliffs. Woody associates included Quercus spp. (with Q. alba often dominant), Pinus spp., Acer rubrum, Carya spp., Tsuga, Magnolia macrophylla, Fagus, Euonymus americanus, Viburnum acerifolium, Smilax spp. and Vaccinium vacillans. Common herbaceous species noted at one site in Pinus rigida forest (west of Big Cutoff) were Polystichum and Smilacina (codominant), Uvularia perfoliata, Mitchella, Chimaphila, Goodyera, Solidago arguta, S. caesia and Krigia biflora. Little pistillate material producing seeds was found, but staminate spikes producing pollen were frequent. The species forms patches by outwardly spreading rhizomes, often with dead centers filled by leaf litter.

Carex stricta Sedge: E/+/- (5/11). This widespread eastern species has only been reported from two other sites in Kentucky, prior to this project, but it may have been often overlooked due to absence of flowering material. All known plants appear to be var. elongata (= C. emoryi), except for those in Calloway County. It is generally restricted to banks of freeflowing rivers, especially on low bars with gravel or cobble. During this survey, it was found along several miles of the Rockcastle River, and perhaps (with no fertile material) on the Laurel River and the Cumberland River above the Falls (see also Soil Systems Inc. 1980, p. 275). In many places, it was found between a drier zone with big bluestem (Andropogon gerardii) and a wetter zone with water-willow (Justicia); see Appendix C/7. At some sites it occurs in pure stands, covering 1000 square feet or more at the mouth of Bunches Creek (above Cumberland Falls). At other sites, clumps were mixed with such species as Leersia oryzoides, Onoclea, Viola cucullata, Boehmeria, Saururus, Rhus radicans, Lycopus virginicus, Bidens frondosa, Eupatorium fistulosum, Solidago gigantea and Vernonia gigantea. Also scrubby individuals of Platanus, Betula nigra and Salix caroliniana were frequently associated.

Carya ovata var. australis [better known as C. carolinae-septentrionalis] Southern Shagbark Hickory: S/+/- (4/15). This southeastern interior species is known from scattered south-central areas of Kentucky, all on Mississippian limestone. It may have been often overlooked, and confused with typical C. ovata. During this survey, it was found in 10 or more localities, most frequently on dry south- to west-facing slopes, blufftops and hilltops near the Cumberland River and South Fork, where it appears to be a consistent major component of the vegetation. At several sites it was found to be dominant or codominant with Juniperus, Cercis, Quercus muhlenbergii, Q. shumardii, Ostrya, Fraxinus americana or F. quadrangulata (see Appendix B3; Appendix C/3C). Trees up to 2 feet in diameter were observed.

Castanea pumila Chinquapin: E/+/- (7-9/9-11). In Kentucky, this southern species is largely restricted to the Cumberland Mountains, with a few old records disjunct to the west. There is one old report from the Somerset District: "on Jim Ballou Farm near Sawyer, one tree 40

feet tall and 6 inches in diameter" (Rogers 1941), which has not been precisely relocated. Currently, it is not known wild in the District. It might be expected in dry thickets on sandy soil, perhaps maintained previously by fire (see notes under Appendix C/2B). The species is sometimes planted, which may lead to confusion when native ranges are considered.

Ceanothus herbaceus Redroot: E/S/- (2/5). This Great Plains species is known from only one general locality in Kentucky, along the Rockcastle River, where it was first found in 1979 (Soil Systems Inc. 1979). After intensive searches along the river during this survey, it was found at only five sites, in a three mile section from Pine Island Branch to the Narrows, all above the impoundment. It was growing on open, grassy cobble bars in the zone dominated by Andropogon gerardii, A. scoparius, Sorghastrum nutans, Baptisia australis and Zizia aurea (see Appendix C/7). At each site, it covered about 50-500 square feet, mostly in compact patches. The best site was at the north end of the Narrows on the west bank.

Cladrastis kentukea Yellow-wood: -/S/- (11/50-100). This east-central species is known from several areas of Kentucky, but it is extremely rare except on rocky limestone slopes along the Kentucky River in the Inner Bluegrass and along the Cumberland River system in the southern Cliff Section. In the District and nearby, it was found at more than 20 sites scattered along the Cumberland River, its South Fork, Buck Creek and Pitman Creek, all on limestone. It appears to be concentrated near small cliffs in otherwise relatively moist forest dominated by Acer saccharum, with Tilia americana, Fraxinus americana, Ulmus rubra, Quercus muhlenbergii and others. Many small stems up to 6 inches in diameter were seen, but none larger than about 12 inches in diameter.

Cleistes divaricata Spreading Pogonia: S/+/- (10/11). This southern species is known only from the Cliff Section and the Cumberland Mountains. Populations are generally small, often with only single plants observed. During this survey, it was found at only one site in the District, with three plants, and there are two other records nearby. Most records are from ridges in oak or pine forest, often rather young and scrubby.

Clematis glaucophylla Leather Flower: E/+/- (6/10). This southern taxon has been reported from a few scattered areas of Kentucky, though it may have been often overlooked. It is very similar to the widespread C. viorna, and perhaps should be combined. Material that keys to glaucophylla was found on the bouldery banks of the Cumberland River below the Falls, and perhaps (observed but not collected) along the Rockcastle River. These and other records in the state suggest that it is generally restricted to sandstone river banks, which may mean that it is indeed rare. However, further taxonomic study of this and related species in the Viorna group is needed in Kentucky.

[Comptonia peregrina Sweet Fern: E/S/- (2/2). This northern species is known from only two sites in Kentucky, along the Big South Fork and

the Rockcastle River. Rob Jacobs discovered the latter site in 1979 (Soil Systems Inc. 1979). Here, about 20 multiple-stemmed plants were found during this survey, scattered in groups of one to four within about 100 x 30 feet on the bouldery banks at the lower end of Beech Narrows, only on the east side. The plants were no more than about 2 feet tall, which is smaller than typical for the species. In this scrubby to grassy vegetation, woody associates included Liquidambar, Hamamelis, Ulmus alata, Vaccinium arboreum, Nyssa, Chionanthus, Fraxinus americana and Viburnum prunifolium. Herbaceous associates included Andropogon gerardii, A. scoparius, Sorghastrum, Trautvetteria, Euphorbia corollata, Ligusticum, Coreopsis tripteris, Solidago spathulata, S. uliginosa, Aster linariifolius and A. laevis var. concinnus.]

[Coreopsis pubescens Downy Coreopsis: S/+/- (3/5). In Kentucky, this southern species is known from a few sites in the southwest and southeast. It has been found on the Cumberland River banks at the Falls (var. robusta), and upstream at Pitch Rapids. However, after extensive searching near the Falls and downstream, it was not found during this survey. Perhaps the special topographic conditions at Pitch Rapids are important for this species. Further study of that area is needed. The separation of varieties also needs study.]

Cypripedium kentuckiense Kentucky Lady's Slipper: S/S/C2 (10/17). This southern to southwestern species is known from 10 counties in Kentucky and one in Tennessee, all in the Cliff Section. It is also known from scattered sites in Alabama, Arkansas, Louisiana, Mississippi, Oklahoma and Texas. At the edge of the Somerset District, six sites have been documented along the Rockcastle River, from the Narrows to Long Point. Each site had from one to about 150 plants. They were mostly near upper flood levels, in forest or shrubby back edges of boulder-cobble bars. Associated trees included Tsuga, Fagus, Liriodendron, Liquidambar, Platanus, Betula spp., Nyssa, Magnolia spp., Aesculus, Juglans cinerea, Tilia heterophylla and Acer spp. Shrubby species included Rhododendron spp., Kalmia, Clethra, Carpinus, Alnus, Asimina, Cornus florida, Chionanthus, Crataegus sp., Lindera, Hydrangea, Dirca, Sambucus, Viburnum cassinoides, Xanthorhiza, Clematis virginiana, Rhus radicans, Arundinaria and Smilax spp. Herbaceous species included Polystichum, Onoclea, Botrychium virginianum, Menispermum, Thalictrum pubescens, Ranunculus recurvatus, Laportea, Viola spp., Amphicarpa, Geum canadense, Impatiens pallida, Crytotaenia, Sanicula canadensis, Collinsonia, Galium spp., Rudbeckia laciniata, Verbesina spp., Senecio aureus, Solidago arguta, S. flexicaulis, Aster ontarionis, A. divaricatus, Cacalia, Uvularia grandiflora, Trillium sulcatum, Carex spp. (including amphibola), Brachyelytrum, Poa sylvestris, Festuca obtusa and Eulalia. The species seems to prefer some shade, so logging might be damaging (e.g., private operation observed at the site on north side of Long Point). Also, the large population south of Turkey Creek has declined from about 150 to 25 plants since 1980, which is at least partially due to a recent track created by off-road vehicle use, but decline has also occurred away from the road (M.E. Medley, pers. comm.). It is possible that the species requires occasional alluvial deposits, and the past few years have

been relatively dry. Another problem may be picking and digging, as reported in other regions (M. Evans, pers. comm.). Known populations should be monitored, and others searched for.

Cystopteris fragilis var. mackayi [correctly known as C. tenuis, see Moran 1983] Fragile Fern: S/-/- (7/11). In Kentucky, this northern species is known from western and eastern areas with Pennsylvanian sandstone cliffs. During this survey, what appears to be this taxon was found at seven or more sites. Most sites were in the Cumberland River ravine below the Falls, growing in moist sandy soil beneath sandstone cliffs, four with Eupatorium luciae-brauniae (Appendix B4). Similar plants were found in "The Gulf", a gap of a few feet in Day Ridge near Nevelsville. Some collections may be hybrids with C. bulbifera or even C. tennesseensis, and further taxonomic study is needed.

Dichanthelium acuminatum var. villosum [= Panicum villosissimum] Panic Grass: S/-/- (11/ca. 20). This widespread eastern species is known from at least 11 Kentucky counties, and has probably been overlooked often. During this survey, it was found at 11 sites in the District and others nearby, mostly on sandy soil along open roads and trails, though sometimes through woods with partial shade. A few sites were on, or close to, natural rocky openings with Talinum and Minuartia glabra.

Dichanthelium boreale [according to Kartesz & Kartesz (1980), this is synonymous with Panicum bicknellii, which the plants found here key to in existing manuals] Panic Grass: S/+/- (2-4/2-4). This northern species is known from only a few scattered records in Kentucky. During this survey, it was collected only on Grassy Gap Ridge, probably in open pine woods or rocky openings, but, with so many related species also collected, the exact location was not noted. Much more attention to these taxonomically difficult "panic" grasses is needed in Kentucky.

Dichanthelium sabulorum [according to Kartesz & Kartesz (1980), this includes Panicum columbianum var. thinium, which the plants here key to in existing manuals] Panic Grass: S/-/- (4/9). This is a north-central species, with little or no record in Kentucky until discovered during this survey. The collections appear to be var. thinium, though a few may be hybridized with P. acuminatum or other species. It was found at six or more sites in the District, mostly in very thin soil on open ledges above sandstone cliffs, with some along nearby paths and other disturbed areas with thin soil. It was associated with most other rare species of clifftops (see Appendix B1; Appendix C/1A).

Erigeron pulchellus var. brauniae Lucy Braun's Robin Plantain: S/-/- (8/15). This variety of the common species is virtually restricted to the Cliff Section, and most of its records come from Kentucky. During this survey, it was found in at least nine areas, and perhaps one atypical upland site with plants appearing transitional to the typical variety. Except for the latter site, these were mostly along the Rockcastle River in the sections with rocky banks, and

also along the Cumberland River below the Falls. Plants mostly occurred in patches within the transition from mesophytic forest, on lower slopes or terraces, to the shrubby river banks. In several places, it was concentrated along paths. Woody associates noted at a few sites included Tsuga, Fagus, Acer saccharum, A. rubrum, Liriodendron, Magnolia tripetala, Liquidambar, Nyssa, Quercus montana, Ilex opaca, Rhododendron maximum, Vaccinium corymbosum, Cornus florida, Carpinus, Alnus, Euonymus americanus, Rhus radicans and Xanthorhiza. Herbaceous associates included Hepatica americana, Trautvetteria, Viola cucullata, V. conspersa, V. cf. papilionacea, Tiarella, Potentilla simplex, Pachysandra, Ruellia cf. caroliniana, Hedyotis caerulea, Coreopsis auriculata, Solidago flexicaulis, S. arguta, Aster cordifolius, Elephantopus carolinianus, Tradescantia subaspera, Hypoxis, Luzula campestris, Brachyelytrum, Stipa and Eulalia.

Eupatorium luciae-brauniae Lucy Braun's White Snakeroot: E/S/C1 (5/20). This is restricted to sandstone rockhouses in the Cliff Section of Kentucky and Tennessee, with only about 25-30 sites known. This survey has doubled the known sites in Kentucky, now about 20, mostly in and around McCreary County, including the Somerset District. Eleven sites are along the Cumberland River, with some separated by only a few hundred feet, either under cliffs directly above the river slope or up to 1500 feet away in adjacent ravines. Much of the potential cliffline has not yet been searched. The other populations were isolated further up into tributary watersheds. The slopes adjacent to Eupatorium sites typically had mesophytic forest, including Fagus, Acer saccharum, A. rubrum, Tilia heterophylla, Fraxinus americana, Ilex opaca, Hamamelis and Asimina (Appendix B4). The virtual absence of Tsuga was notable, and Rhododendron maximum was only a minor associate, in contrast to most rockhouses upstream in narrower ravines. The predominance of deciduous trees might be significant for the Eupatorium, due to the light regime, and as an indication of relatively fertile soils. The sandy soil was generally bare of litter, moist or sometimes seeping, intermediate between the drier ground favored by Heuchera parviflora, and the wetter wet ground favored by Thalictrum mirabile. In addition to these two common species of rockhouses, frequent associates included Polystichum, Adiantum pedatum, Dryopteris spp., Athyrium spp., Aquilegia, Silene rotundifolia, Viola spp., Rhus radicans, Parthenocissus, Aster divaricatus, Arisaema triphylla and Agrostis perennans (Appendix B4). Trampling and digging of Indian artifacts have greatly disturbed some of the sites, and this threat is increasing. It appears that such activity has eliminated the population discovered by Braun at Natural Arch, where the large rockhouse just northeast of the Arch has had most vegetation destroyed. Disturbance has also eliminated the population near Dog Slaughter Falls in Whitley County, and it has damaged others along the Cumberland River, and the isolated population in Pulaski County just south of Mount Victory. Ways to restrict trampling and digging should be considered, though this may be difficult. Whether logging adjacent to rockhouses has positive or negative effects on this species is unknown. Three of the populations found in 1987 had adjacent forest clear-cut within the previous year, and the Eupatorium appeared

relatively vigorous. However, adverse hydrological effects are conceivable, and long-term monitoring is needed to assess impacts.

Gaylussacia brachycera Box Huckleberry: S/-/- (5/60). In Kentucky, this Appalachian species is known only in the southern Cliff Section. It is common here, and locally abundant in suitable habitat. With this survey, it has now been documented at about 40 sites in the District, mostly in pine-oak forest near cliff-tops, especially on narrow ridges. At some sites, it has been found dominant on the ground over 10 acres or more. Other shrubby Ericaceae are generally associated, and it is often replaced by Vaccinium vacillans in oak forest further from cliffs (see Appendix C/2A). A distinct cluster of records occur along the Cumberland River below the Falls. Here small patches often occur in relatively moist forest on rocky slopes, down to the transition from pine and oak to hemlock, beech and sugar maple. There is much biological interest in the historical causes of this species' distribution, perhaps relict from a previous dry period, and in its reported lack of sexual reproduction (M.E. Medley, in prep.). Further study of its responses to disturbance and forest succession may be needed for long-term conservation. It was rarely found in open areas, and it appeared relatively infrequent in some recent clearcuts with dense regrowth of taller shrubs and trees.

[Gratiola pilosa Hedge Hyssop: E/S/- (2/3). In Kentucky, this southern species is known from only three records from the southern Cliff Section. It has been found just south of the District in a swampy stream-head near Whitley City, near Platanthera integrilabia and several other rare plants, and along the Cumberland River at Pitch Rapids.]

Gymnopogon ambiguus Beardgrass: S/+/- (6/11). This southern species is known from scattered sandy areas of southern Kentucky. During this survey, it was found only along Route 751, in two small patches on sandy soil on open grassy roadsides dominated by Andropogon scoparius. Associates included Agalinis decemloba and Aster concolor, two other rare southern species that may be relictual from "barrens" maintained by fire (see Appendix C/2B).

Helianthus atrorubens Sunflower: E/S/- (5/17). In Kentucky, this southeastern to Appalachian species is known only from sandy soils in the southeast. It is now known from 10 sites in the District and others nearby, mostly along dry, sandy upland roads and paths, in full sun to partial shade. Some sunny sites had several hundred plants. A few sites had non-flowering rosettes in thickets and young forest, especially along stream heads, where it may have persisted from old logging roads or other disturbance. It may have occurred in "barrens" before fire suppression (see Appendix C/2B).

Hydrocotyle americana Water Pennywort: S/+/- (2/2). This northern species is known from only two Kentucky sites, near northern and southern ends of the Cliff Section (both collected by E.L. Braun). This survey relocated the southern site, which is in the District along Spruce Creek NNW of Natural Arch. About 100-150 plants

occurred here in forest at the mouth of a small tributary stream and at the springy base of the adjacent slope, within an area of about 10 x 40 feet. The soil was seeping, black and organic, with Thuidium and other mosses. Woody plants included Tsuga, Fagus, Liquidambar, Betula nigra, Carpinus and Acer rubrum. Herbaceous associates included Tiarella, Athyrium asplenioides, Phlox maculata, Viola cucullata, Festuca obtusa, Chelone, Solidago rugosa, Carex torta and others typical of acid streamsides (see Appendix B5/J; Appendix C/6A).

Hypericum stans St. John's Wort [corrected in Kartesz & Kartesz (unpublished) to H. crux-andreae, St. Andrew's Cross]: S/+/- (8/8). In Kentucky, this southern species is scattered in south-central areas, growing in seasonally wet grassy openings on sandy soils. During this survey, it was found only on Goodin Ridge, with about 10-15 plants in one patch. There it was associated with Panicum anceps, P. microcarpon, Rhexia mariana, Platanthera ciliaris and Liatris spicata, with adjacent thickets of Liquidambar and Acer rubrum (see Appendix C/5A).

Lathyrus palustris Marsh Pea: S/S/- (5/7). In Kentucky, this northern (circumboreal) species is known from two localities along the Ohio River and two along rivers in the Cliff Section. In the District, it is now known from four sites on rocky banks of the Cumberland River below the Falls, though the original site discovered here (Soil Systems Inc. 1980) could not be relocated during this survey. The Dog Slaughter Ridge site had about 15 plants in one patch, growing in sandy fill between boulders about 20 feet above the water. The plants were in the transition from open grassy vegetation to the shrubby back edge of the banks. Woody associates included Alnus, Diospyros, Rhododendron arborescens, Smilax glauca, Vitis rotundifolia, Xanthorhiza and Rubus Section Flagellares. Herbaceous associates included Osmunda regalis, Andropogon gerardii, Sorghastrum, Iris cristata, Trautvetteria, Oenothera tetragona, Ligusticum, Ipomaea pandurata and Aster lateriflorus. The other three recorded sites were in similar vegetation (see Appendix C/7).

[Leiophyllum buxifolium Sand Myrtle: E/-/- (1/1). This southeastern to Appalachian species has only been found once in Kentucky, on the ridge east of Cumberland Falls during the 1940s. Attempts to relocate it have been unsuccessful. It might be expected on dry open cliff tops in the Somerset District. It is possible that fire previously promoted this low shrub.]

Liatris microcephala Blazing-star: S/-/- (2/20). In Kentucky, this southeastern to Appalachian species is known only from McCreary County and nearby, but it is fairly frequent in suitable habitat. It is now known at 12 sites in the District, all on dry open sandstone ledges, mostly above high cliffs. It was the most frequent species restricted to such sites, except for the dominant Danthonia sericea (see Appendix B1; Appendix C/1A).

Lilium philadelphicum Wood Lily: S/-/- (7/10). In Kentucky, this species is definitely known only along the Cliff Section, all as the Appa-

lachian var. philadelphicum (var. andinum was reported by Fernald (1950) but no collection has been located). In southern counties, the species appears most often at the edge of successional pine-oak forest along roadsides on sandy ridges. In the District, it has been found in 1986-87 at only two sites, in powerline cuts near the Old Whitney Road and Route 751. Also, it was reported as "common along the road to Bauer" by Rogers (1941), but it could not be found there in 1987. It is possible that the shrubby vegetation along that road has overgrown the Lilium. This may be another declining species that was formerly more frequent in openings caused by fires (see Appendix C/2B).

Malus angustifolia Crab Apple: S/+/- (6/11). This southern species is reported from scattered sandy areas of Kentucky in the west and the east. During this survey, it was found at five sites clustered in a 15 square mile area on ridges both sides of lower Beaver Creek, and at another site on rocky banks of the Cumberland River below the Falls. The only site where more than two or three trees were seen was at the end of Grassy Gap ridge. Here the open forest was generally dominated by Pinus virginiana, but Malus angustifolia, Crataegus spp. and Prunus americana are unusually frequent, forming a few thorny thickets.

Minuartia glabra [commonly known as Arenaria g.] Sandwort: E/+/- (3/7). In Kentucky, this Appalachian species is known from only a few sites in the southern Cliff Section and Cumberland Mountains. During this survey, it was found in three areas. Two had plants scattered over about a mile of cliffline, and the other has several hundred plants concentrated within 300 square feet on a narrow ridgetop. All sites were on open sandstone outcrops. The plants were mostly growing in extremely thin soil with lichens and little other vascular plant cover, though Hypericum gentianoides was frequent. These sites were often adjacent to thicker soils with grasses. In two areas, Talinum treretifolium was growing in similar situations, though not consistently with the Minuartia, which appeared concentrated on more sloping sites with increased drainage (see Appendix B1; Appendix C/1A).

[Muhlenbergia cuspidata Prairie Satin Grass: E/-/- (3-4/3-4). In Kentucky, this Great Plains species is known only from a few extremely dry, open limestone clifftops. The site discovered by Braun on the South Fork was relocated in 1987, near Cox Bend, half a mile downstream from Forest Service land. Here at least 100 clumps were scattered along 0.3 miles of south to southwest-facing cliffline, overhanging the crest of cliffs and in cracks on the cliffs. Andropogon scoparius and Rudbeckia cf. truncata are the most frequent associates, these being dominant on broader ledges with more soil. Other species included Carex eburnea, Sporobolus asper, Manfreda and Aster oblongifolius. Associated woody plants, with very sparse cover, included Juniperus, Ulmus spp., Celtis tenuifolia, Carya ovata. var. australis [C. carolinae-septentrionalis], Fraxinus spp., Cercis, Ostrya, Rhus aromatica, Philadelphus hirsutus, Rosa carolina and Hypericum frondosum (see Appendix B2/D-E; Appendix C/1B).]

[Oenothera perennis Small Sundrops: E/-/- (3/3). In Kentucky, this north-central species is known from a few sites scattered over the south. It was collected by Braun about six miles south of the Somerset District along the Alum Creek Road ridge (Route 700), but has not been reported in the region since.]

[Orontium aquaticum Golden Club: T/S/- (4/7). This southern species is known only from the southeast. It grows in shallow water along the marshy banks of rivers and larger creeks. It has been found at Bunches Creek and Marsh Creek along the Cumberland River above the Falls (Soil Systems Inc. 1980, Doug Stevens, pers. comm.). However, in 1987 it could not be found at the Bunches Creek site, or below the Falls.]

Pachistima canbyi [properly spelled Paxistima c., see Uttal 1986] Mountain Lover E/S/C2 (6/8). This Appalachian species is known only from limestone regions in Pennsylvania, West Virginia, Virginia, Ohio, Kentucky and Tennessee. In Kentucky, it is known from a few localities, mostly less than one acre, on narrow, rocky points in or near the Cliff Section. At the western edge of the District, it is now known from three sites along the South Fork of Cumberland River, all on the points where tributaries meet the river at a sharp angle. The rocky slopes had a general slope of 60-80°, with relatively flat ridgetops no more than 10-15 ft wide. Pachistima was restricted to ridgetops and ledges as much as 30 feet below. Patches covered up to 1000 square feet or more, mostly in the partial shade of Juniperus, Cercis, Quercus muhlenbergii, Ostrya, Philadelphus hirsutus, Rhamnus and others, less often in sugar maple forest on moister ledges below, or on completely open drier ledges. It was most extensive at the mouth of Cedar Sinking Creek, extending over almost an acre (see Appendix B3; Appendix C/2C). The species generally occurred in some shade. In addition to logging, another potential threat may be from people developing paths to and from the water's edge, together with camping or other disturbance. However, these sites have so far escaped serious damage. Every effort should be made to maintain their pristine condition.

Panax quinquefolius Ginseng: -/S/- (50/>100). This north-central species is known from many areas of Kentucky, but it is increasingly hard to find due to the intensive harvesting that has occurred since settlement. During this survey, it was found at only five sites, with only one plant at each site. There are at least 10 more records from the District or nearby, including old data. We have little doubt that harvesting is keeping the species at extremely low densities in the District. Also, Rob Jacobs found only two mature plants and two groups of seedlings during 4 weeks of field work along the Cumberland River, and nine plants during 3 weeks along the Rockcastle River (Soil Systems 1979, 1980). We know of only one place nearby where a sizeable population (more than 10-20 plants) has been found, but this is on private land well north of the District. In general, the plants occur on slopes in mixed mesophytic forest, mostly within a mile of rivers or larger creeks, sometimes in transitions to drier types. The species was probably associated with beech, yellow poplar and perhaps moister oak forest before settlement.

Panicum bicknellii. See Dichanthelium boreale.

Panicum columbianum. See Dichanthelium sabulorum.

Panicum villosissimum. See Dichanthelium acuminatum var. villosum.

Philadelphus hirsutus Mock Orange: E/+/- (6/ca. 30). This southeastern interior species is known from only six Kentucky counties, but it is frequent on rocky limestone slopes of the Cumberland River system in this region. In or adjacent to the Somerset District, it has been found in 25 or more localities, mostly along limestone slopes of the Cumberland River and South Fork, and, much less frequently, along Buck Creek. It was a major component of the open scrubby forest on drier rocky slopes, with Juniperus, Quercus muhlenbergii, Fraxinus quadrangulata, etc. (see Appendix B3; Appendix C/2C,3C). Less often, it was found near outcrops within moister forest of sugar maple.

Philadelphus inodorus Mock Orange: E/+/- (3/12). In Kentucky, this Appalachian species has been reported in the wild (excluding probable escapes from cultivation) only from rocky limestone slopes of the Cumberland River system. During this survey, what appears to be this species was found at about seven sites in the District or in the adjacent Burnside area. No more than five plants were seen at each site. However, it may be difficult to distinguish from P. hirsutus in some cases. Little flowering was encountered, and the smoother leaves of inodorus were relied on for identification. These rarer glabrous plants are all on slopes that have typical hirsutus as well, but they are often in moister places, lower on the slopes and along streams. The associated forest was generally oak-ash or sugar maple type (Appendix C/3C,4C).

[Philadelphus cf. pubescens Mock Orange: T/-/- (2-4/2-4). In Kentucky, this southwestern (Tennessee to Arkansas) species is definitely known from only two western counties. A few collections from the southeast show some similarity, or they may be hybrids between P. hirsutus and P. inodorus. These include one flowering collection made near the District (Medley No. 16336, 21 May 87), from a dry road cut near Burnside.]

Platanthera integrilabia White Fringeless Orchid: E/S/C2 (3/4). This southern to Appalachian species it most frequent in the Cliff Section of Tennessee, and there are scattered sites in Mississippi, Alabama, Georgia and the Carolinas. In Kentucky, there are only two currently known localities (each with more than one record) plus two old records, all from the southern Cliff Section. It is restricted to mossy stream-heads on broad Pennsylvanian ridges. After many searches during this survey, it was found only on Hindsfield Ridge, south of Mount Victory. Two or three groups of about 100-400 plants occurred here, but mostly not flowering, and not all reliably distinguished from P. ciliaris. They were about 1000 feet down from stream-heads, with adjacent slopes of 10-30 degrees and 40-60 feet of relief. The forest was seasonally wet, with Acer rubrum (some var. trilobum), Nyssa, Ilex verticillata, Aronia arbutifolia and

Cephalanthus, mixed with species of drier ground like Liriodendron, Quercus alba, Ilex opaca, Oxydendron and Fagus (Appendix B5). Patches of Sphagnum were frequent on the ground, though not dominant. One site was largely shaded, but only three plants flowered here in 1987, associated with sparse Osmunda spp., Carex intumescens, Panicum microcarpon, Rubus hispidus, Lycopus virginicus, Ludwigia alternifolia, Aster umbellatus, etc. The largest population, with about 40 flowering in 1987, was in a grassy to brushy opening of about 75 x 40 feet, dominated by Lygodium, Carex bromoides, Panicum microcarpon, Rhexia virginica, Eupatorium fistulosum and Solidago rugosa. Sprouts of red maple and other trees were scattered in the opening, about 5-10 feet tall, apparently having died back periodically. Clemon Garrison, a local resident and USFS employee, informed us that this area has been open as long as he can remember. Although most known sites with this species are in partial shade, the Hindsfield Ridge sites showed that small openings can support vigorous populations. However, at these sites, many plants of this species and P. ciliaris had flowering stems wilted by drought or eaten (probably by deer). Populations may have been overlooked due to lack of successful flowering. There should be further searches in the region, as well as monitoring plants on Hindsfield Ridge.

Podostemon ceratophyllum Riverweed: T/+/- (8/10). This Appalachian species has been found in several central and eastern areas of Kentucky, growing on rocks in rapids of rivers and creeks. However, the records are mostly old, with only one or two since 1980, and water pollution may account for much of its apparent decline (Meijer 1976). There are two records from the eastern edge of the Somerset District: "growing on rocks in swift water above Cumberland Falls" (Rogers 1941), and more recently it was reported near the Rockcastle River in Cane Creek, a stream with little sediment load (Harker et al. 1979). It was not found during this survey, but more concentrated searching is needed.

Polemonium reptans var. villosum Hairy Jacob's Ladder: S/+/C2 (9/16). This is restricted to southern Ohio and Kentucky, mostly along rivers and larger streams near the western edge of the Cumberland Plateau. However, there may also be intermediates to the typical var. reptans. It is now known (possibly with intermediates) from at least six localities in the District, on the Rockcastle River bottomland, and in the sinking valley of Cave Creek near the edge of the limestone exposure. In contrast, var. reptans is only known further west on the limestone. In general, var. villosum occurs on low slopes or terraces in beech or yellow poplar forest, often transitional to sycamore near the water. From observations here and elsewhere in Kentucky, it may tolerate some disturbance in woods, such as along paths, but it does not occur in completely cleared areas. Sites known in the District mostly have no serious threats. Continued study of its taxonomic status, range and abundance has greater priority than management considerations.

[Polygala polygama Purple Milkwort: E/S/-. (1/3). In Kentucky, this northern and Coastal Plain species is known only from three sites in

McCreary County, including one just south of the Somerset District on Route 700. There, about 50 plants occurred next to a parking lot on a sandy ridge, in a short cut-over thicket mixed with grasses and tall herbs (Appendix B2/J). It should be looked for in similar places within the District.]

[Rhynchosia tomentosa Erect Rhynchosia: E/+/- (3/3). This southern species is known from only two localities in Kentucky, in the southwest (Christian Co.) and southeast (Whitley Co.). The latter record is from the 1940s along Route 92 east of Cumberland Falls. Cursory searches here in 1987 were unsuccessful. It should be looked for in dry, open sandy soil. It seems likely that this was another species once favored by fire.]

Rhynchospora globularis Grass Beak Rush: E/+/- (4/4). This southern species is known from a few areas of Kentucky in the southwest and southeast. During this survey, it was found at one site, on Grassy Gap Ridge next to a small seasonal stream just above a tall sandstone cliff. Only one clump was seen, but further searching is needed at this locality. In general, the vegetation here was open forest dominated by Pinus virginiana, but some components of seasonally wet vegetation occur upstream (see Appendix C/5A).

Schwalbea americana Chaffseed: E/S/C2 (1/2). This is restricted to the Coastal Plain from New England to Texas, except for a few old collections in Tennessee and Kentucky. In Kentucky, it is known only from two collections of E.L. Braun in McCreary County: "sandstone flat, Natural Bridge" (4 September 1934); and "sandstone knob, Alum Creek Road" (15 June 1935). Later, she described its habitat as "Dry sandy soil on knobs and sandstone plateau margins" (Braun 1943). The second record comes from the Stearns District, but the first site refers to Natural Arch in the Somerset District, based on Braun's catalogue (see also Hydrocotyle americana). Recent searches of flat sandstone areas on and near Natural Arch have been unsuccessful. It is possible that this species requires extreme drought or fire to remove competing plants, since it is typical of pine-savannahs on the Coastal Plain. Perhaps such conditions were more frequent during the 1930s in this part of the District, where other rare plants of sandy openings are concentrated. Also, the species is believed to be a partial parasite, further complicating its ecology. More searches should be made in suitable habitat, with special attention to recently burned areas. If study of the species throughout its range shows that there is a relationship with fire, an experimental burning regime might be considered for this and other rare species (see Appendix C/2B).

Scutellaria cf. leonardi Small Skullcap: S/-/- (10/10). This mid-western species is known from at least 10 Kentucky counties, mostly on limestone in the west. It is typical of rocky prairies and cedar glades. During this survey, it was noted at one site on a dry, rocky limestone roadside. Unfortunately, it was not collected, so this eastern extension of its range must remain uncertain. It is

possible that the plants in this region are all S. parvula, which may intergrade with S. leonardi in Kentucky.

[Silene regia Royal Catchfly: E/+/C2 (4/10). In Kentucky, this south-central interior species is known mostly from the former Big Barrens region. There is also an old record (with three collections reported) from "edge of sandy field by South Fork River at Alum Creek" (Rogers 1941), a few miles south of the Somerset District. It might be expected on uplands in association with other species typical of natural openings (see note under Appendix C/2B).

Solidago spathulata [eastern plants separated as S. glutinosa by Ringius 1985] Goldenrod: S/S/- (4/ca. 20). As the eastern subspecies randii, this species is known in Kentucky only along sandstone banks of the Cumberland River and its major tributaries. During this survey, it was found to be scattered along about three miles of the Cumberland River, mostly below the Falls, and along about four miles of the Rockcastle River. It was typical of the drier open zone typified by Andropogon gerardii, also growing in cracks on boulders. Although widespread in this habitat, it was never abundant (see Appendix B7,B8; Appendix C/7). Plants from here all have seeds with little or no pubescence, in contrast those along the Big South Fork. Also, some plants here have highly branched inflorescences. Thus, they may be a distinct variety, perhaps similar to S. plumosa from the Yadkin River in North Carolina, which has not been collected recently (Cronquist 1980, p. 122).

Sporobolus clandestinus Dropseed: E/+/- (5/5). This widespread eastern species is known from a few sites in Kentucky, mostly western. During this survey, it was found at one site, near the edge of Forest Service land, on the dry, southwest-facing limestone point at the mouth of Cain Creek, below the area with Pachistima. It was frequent in a treeless area of roughly 50 x 30 feet, and on smaller open ledges within the adjacent forest. The forest, mostly upslope, was composed of Juniperus, Ostrya, Cercis, Rhamnus, Physocarpus, Quercus muhlenbergii and Fraxinus quadrangulata. Low shrubby plants of Celtis tenuifolia, Philadelphus hirsutus, Rosa carolina, Hypericum frondosum and Bignonia were scattered in the opening. Associated herbaceous species included Andropogon scoparius, Panicum flexile, P. boscii, Carex eburnea, Euphorbia corollata, Tragia urticifolia, Lithospermum canescens, Blephilia ciliata, Helianthus hirsutus, Coreopsis major, Rudbeckia cf. trunctata, Eupatorium sessilifolium and Aster oblonifolius (see also Appendix C/B6).

[Styrax grandifolia Storax: E/+/- (1/1). In Kentucky, this southern species has only been reported recently by Rob Jacobs (Soil Systems Inc. 1980, pers. comm.). Little (1977) mapped it for five other counties, but without giving sources. Jacobs noted just one tree in talus slope forest along the Cumberland River below the Falls in Whitley County, between Bark Camp Creek and Fishing Creek. There has been no attempt to relocate this site.]

Synandra hispidula Synandra: -/S/C2 (ca. 35/>100). This east-central species occurs in Kentucky and more rarely, in most adjacent states. It has been reported from many areas of Kentucky, but it may only be frequent along the Kentucky and Ohio Rivers in the Bluegrass Region. At the eastern edge of the District, there are two records from near the Rockcastle River, but it was not seen during this survey. From general observations in Kentucky, it is concentrated on base-rich soils in forest transitional from sugar maple on slopes to sycamore on alluvium (Appendix C/4C,6B). It generally occurs in areas with little human disturbance, but it can also survive along shaded roadsides. It is biennial, which is unusual for woodland plants. Flowering years like 1987 have been largely synchronized over central Kentucky and elsewhere (Carol & Jerry Baskin, pers. comm.). Possible interactions of this life-cycle with natural and artificial changes in the environment need further study. Further search in the District would be easiest during May and June in good flowering years.

Tephrosia spicata Goat's-rue: E/-/- (2/7). In Kentucky, this south-eastern species is only known from McCreary and Whitley Counties, mostly on sandstone banks and nearby uplands along the Cumberland River and the Big South Fork. Five patches are now known along the Cumberland River, mostly below the Falls. Each patch had about 5-50 plants scattered over 10-200 square feet, generally growing in sandy alluvium between boulders and cobble. Woody cover was mostly absent at these sites, though there was some adjacent or mixed shrubby growth, including Liquidambar, Platanus, Betula nigra, Liriodendron, Quercus spp., Pinus spp., Ulmus alata, Fraxinus americana, Diospyros, Robinia pseudoacacia, Albizzia, Acer rubrum, Nyssa, Catalpa bignonioides, Alnus, Cornus obliqua, Rhus glabra, Rhododendron periclymenoides, Lyonia, Vaccinium arboreum, Cephalanthus and Xanthorhiza. Vines were often present, such as Vitis spp., Campsis, Clematis virginana, Wisteria, Rubus Section Flagellares and Smilax spp. Herbaceous species included Andropogon gerardii, A. scoparius, Sorghastrum, Panicum spp., Tradescantia ohiensis, Hypericum denticulatum, Euphorbia corollata, Schrankia, Orbexilum pedunculata, Desmodium spp., Lespedeza spp. (native and exotic), Stylosanthes, Lysimachia lanceolata, Scutellaria integrifolia, Pycnanthemum tenuifolium, Ruellia caroliniana, Diodia virginiana, Ipomaea pandurata, Lobelia puberula, Chrysopsis mariana, Coreopsis tripteris, Aster spp., Solidago spp., Eupatorium spp. and Liatris spicata. Composition was highly variable, though grasses, legumes and composites generally dominate (see also Appendix B7; Appendix C/7). One exceptional site (with about 35 plants) was in a small flat woodland clearing well above the water, with Eupatorium semiserratum (see section II. Other Species of Interest).

Thalictrum mirabile [perhaps = T. clavatum, see Keener 1976] Meadow Rue: S/-/- (ca. 9/30). In Kentucky, what generally are called T. mirabile and T. clavatum do not appear distinct. It is not prudent

to separate records without more detailed taxonomic study, which may well show them to be synonymous. Both these Appalachian taxa are reportedly widespread on the Cumberland Plateau (15 counties), at least in the Cliff Section, and they are also reported from western areas with sandstone cliffs (2 counties). In the Somserset District, plants generally have "mirabile" type seeds, and were found in at least 18 areas, always in wet soil below sandstone cliffs, especially under waterfalls at the heads of ravines. It was scattered over 1000 square feet or more at some sites, and was associated with other species typically growing under cliffs (see Appendix B4; Appendix C/4A).

Thuja occidentalis Northern White Cedar: S/+/- (5/13). In Kentucky, this northern species is known mostly from the Cumberland River system. At least seven sites are known along the northwestern edge of the Somerset District, but only one is on Forest Service land. These records are all from rocky limestone slopes adjacent to the Cumberland River, its South Fork, or Buck Creek. Moisture conditions appeared to vary considerably, with noted associates ranging from Pachistima (Appendix B3) to Adiantum capillus-veneris (Appendix B6). However, most records are from north- to east-facing slopes, and none are from south-facing. The two sites with most stems, about 50-100 scattered over half an acre, face north or northwest. At these sites, it was found codominant with Acer saccharum, Fraxinus americana, Ostrya or Philadelphus hirsutus. Other species here included Juniperus, Hamamelis, Pachysandra, Parthenocissus, Solidago flexicaulis, Aster cordifolius and Dioscorea quaternata (see Appendix B6/S,T).

Trichomanes boscianum Filmy Fern: S/-/- (17/ca. 20). This Appalachian species is scattered in eastern and western areas of Kentucky with sandstone, but populations are always small and restricted to deep, dark, humid cracks in cliffs, especially in rockhouses. It is now known at two sites along the eastern edge of the District, one each side of the Cumberland River gorge below the Falls, both on the back walls of small rockhouses along the upper cliffline. The patches were about 6-18 inches wide and 6-10 feet long, with no other vascular plants. In 1987, about half the plants at the Whitley County site were brown and dead, with no obvious cause (perhaps winter-killed).

Ulmus serotina September Elm: S/+/- (5/8). This southern interior species is known from about scattered areas of southern Kentucky, on Mississippian limestone. During this survey, it was found in four areas on dry rocky slopes of the South Fork at the northwest edge of the District, with one on Forest Service land. Only one to five individuals were seen at each site. It was concentrated on the driest, south-facing slopes above cliffs, with open forest of Juniperus, Quercus spp., Fraxinus spp., Carya ovata var. australis [C. carolinae-septentrionalis] and other Ulmus spp.

Veratrum parviflorum [listed as Melanthium p. in Kartesz & Kartesz, unpublished] False Hellebore: T/+/- (4/5). In Kentucky, this Appalachian species is known only from the Cliff Section and Cumberland Mountains. It is only known from one site in the southern Cliff Section, in the Cumberland River gorge below the Falls, at the east edge of the District. Here in 1980, Rob Jacobs found a patch of four or five somewhat damaged by deer, near a trail at the base of a lower east-facing slope (Soil Systems Inc. 1980). The site was relocated during this survey, but there were only two plants. The forest here was young mixed mesophytic, with Acer saccharum, Fagus, Liquidambar, Liriodendron, Magnolia tripetala, Tsuga, Ilex opaca, Rhododendron maximum, Cornus florida and Hydrangea. The herbaceous cover was sparse, with only Polystichum and Sanicula sp. nearby.

Viola tripartita Yellow Violet: E/+/- (4/8). As var. glaberrima, this southeastern to Appalachian species is known from three Kentucky counties in the southern Cliff Section. Also, var. tripartita is known from the northern Cliff Section, in Carter County. The former is now known from five sites scattered in the Somerset District, and at other sites nearby. It generally occurs in relatively moist oak-hickory forest. Most sites were on broad ridges near stream-heads, and on northerly (NW-N-NE) slopes. Plants mostly occurred with low density, and sometimes only one was seen, but the larger populations had at least 30-50 plants scattered over 100-300 square feet. Associated trees included Quercus alba, Q. velutina, Q. montana, Carya glabra, Nyssa, Acer rubrum, Cornus florida, Pinus spp. and Juniperus. On two lower slopes close to limestone, other noted species were Quercus muhlenbergii, Carya cordiformis, Fraxinus americana, Magnolia acuminata, Lindera and Cercis. Frequent associates on the ground included Polystichum, Potentilla simplex, Desmodium nudiflorum, Parthenocissus, Solidago caesia and Dioscorea quaternata. Others included Botrychium dissectum, Thelypteris hexagonoptera, Hexastylis, Geranium maculatum, Viola triloba, Passiflora lutea, Amphicarpa, Desmodium rotundifolium, Rubus allegheniensis, Sanicula smallii, Gentiana villosa, Scutellaria elliptica, Pycnanthemum pycnanthemoides, Helianthus microcephalus, Coreopsis spp., Aster macrophyllus, Disporum, Smilax glauca, Carex spp., Scleria nitida, Festuca obtusa and Panicum boscii.

IB. OTHER SPECIES OF INTEREST, INCLUDING NEW RECORDS FOR KENTUCKY

The following species are not currently listed as Endangered, Threatened, or Special Concern by KAS-KNPC (Warren et al. 1986) or as Sensitive by the Daniel Boone National Forest (B. Knowles, pers. comm.), but most deserve consideration for listing. Some have little or no previous record in Kentucky; some are reported widely but with a low density of records; and some are restricted to small sections of Kentucky but are locally common. Species that deserve the most serious consideration include the twelve or so with no proper record before in Kentucky (at least not verified and published), which are shown by asterisks (*) in the left margin below. Some of the others probably do not deserve consideration, but further study is warranted. After each species' name, the number of Kentucky counties where it is known is shown in parentheses, followed by the approximate number of individual records. These data can be compared with the listed species in the previous section. Once again, a few species have been included that were not found within the Somerset District, but were found within several miles; these species accounts are enclosed in square brackets [].

Anemone quinquefolia Wood anemone (10/ca. 30). This northern species is restricted to more rugged sections of the Cumberland Plateau. It appears to be rare, except in the Cumberland Mountains. During this survey, only two patches were found, on sandy terraces next to Beaver Creek and Rock Creek, in hemlock forest. Each patch covered only about 10-30 square feet.

Asclepias amplexicaulis Blunt-leaved milkweed (9/ca. 30). This widespread eastern species is scattered over southern Kentucky. During this survey, it was found at 10 sites, mostly in the open, along roads and paths on dry sandy ridges.

*Aster laevis var. concinnus Smooth aster (5/13). This distinct southeastern variety has not been previously reported from Kentucky, except in a recent study of the Cumberland Gap National Historical Park (Pounds et al. 1987). It was found on rocky sandstone banks of the Cumberland River, the Big South Fork, the Rockcastle River and the Laurel River. It was restricted to the open zone typified by Andropogon gerardii, growing in sandy alluvium among cobble and boulders (see Appendix C/7 and Appendix B7-8).

*Aster sp. nov. Rockcastle aster (2/6). During the survey, a species of Aster that is apparently new to science was discovered, to be published by Campbell and Medley (in preparation). It is closely related to the northeastern A. radula, which is unknown in Kentucky. It was found only along the Rockcastle River, in Pulaski and Laurel Counties. Patches of 10-2000 square feet were scattered along at least three miles from Beech Narrows to Pine Island, with the largest patch at the back of Pine Island. It was largely restricted to the shrubby transition from open rocky banks with big bluestem (Andropogon gerardii) to adjacent terrace or slope forest, often dominated by hemlock. It appeared to form large clones with long stolons in sandy alluvium overlying boulders and cobble. In several places, Alnus and Xanthorhiza were abundant woody species in these

open thickets, together with Liquidambar, Betula nigra, Carpinus, Rhododendron arborescens, Hamamelis, Chionanthus, Viburnum spp., Rhus radicans and others. However, on Pine Island, separated from the river banks by a high channel of the river, Cornus obliqua, Hypericum prolificum and Viburnum cf. cassinoides were among the most frequent woody plants. The most frequent herbaceous associates included Osmunda regalis, Apios americana, Desmodium perplexum, Aruncus, Lysimachia ciliata, Collinsonia, Rudbeckia laciniata, Solidago rugosa, Aster umbellatus, Senecio aureus and, on Pine Island, Chasmanthium latifolium and Silphium perfoliatum. Other associates included most of the remaining species typical of forest edges along these rocky banks (Appendix B8).

Aster cf. schreberi Large-leaf aster (5/ca. 10). In Kentucky, this northern species is definitely known only from Kenton County. During this survey some non-flowering plants that are probably this species (according to Almut Jones, pers. comm.) were found along Buck Creek at three sites, including one on Forest Service land. These plants were on rocky limestone slopes in relatively moist woods with Acer saccharum abundant, and, at two sites, with Thuja occidentalis. Aster macrophyllus, which may be confused with A. schreberi in the vegetative state, was observed at several other locations in the District, also never flowering. Further study of these two taxa is needed in Kentucky.

[Astragalus canadensis Canadian Milk-vetch (13/ca. 15). This widespread (North American) species has been found in scattered areas of Kentucky. But many records are old, and recently discovered populations have mostly been small. Rob Jacobs (Soil Systems Inc. 1980) discovered it on the Whitley County side of the Cumberlanmd River below the Falls, on a southwestfacing slope "in sand with a little humus under a pine-hardwood canopy" (collection at Eastern Kentucky University). It was not found on this survey, despite intensive search on both sides of the river. There are no other records from the southern Cliff Section.]

Baptisia australis var. australis Blue False Indigo (5-7/ca. 30). This eastern variety has scattered records in central Kentucky, while the southwestern var. minor is reported from three western counties. The eastern populations are restricted to short sections of rocky riverbanks, and the only large secure populations known are in the southern Cliff Section. At the northern edge of the District it was found along about seven aerial miles of the Rockcastle River, where it was locally codominant with big bluestem (Andropogon gerardii) on the open banks, in sandy soil among cobble and boulders (see Appendix C/7, Appendix B7-8). Also, a few plants were found at one site next to Buck Creek, on limestone banks with some sandy alluvium.

Bartonia paniculata Screwstem (10/ca. 20). This southern and east-coastal species is scattered over southern Kentucky. In the east, populations may generally be small and restricted to seasonally wet acid forests. However, it is easily overlooked. During this

survey, it was found at two sites, both along mossy banks of small stream heads on broad sandy ridges, in forest transitional from the wet red maple type (Appendix C/5A) to upland oak or hemlock.

Cardamine rotundifolia Mountain Watercress (16/ca. 25). This Appalachian species occurs throughout the Cliff Section and the Cumberland Mountains, but with a low density. There are only two known sites in the District, in a small gully near the Rockcastle River and in Beaver Creek. Both patches were observed at the sandy edges of streams running through forest of hemlock and other mesic species, covering a few square feet. Associated herbaceous species included Carex torta and C. prasina.

Carex bromoides Sedge (6-7/ca. 10). This widespread eastern species is known from a few scattered sites in Kentucky, mostly on wet sandy soils. It was found at one site in the District, in the apparently natural opening on Hindsfield Ridge with the large flowering population of Platanthera integrilabia (see Appendix C/5A, Appendix B5). Also, it was found in a roadside thicket along a stream within 0.3 miles of the P. integrilabia site in the Stearns District. This coincidence suggests that C. bromoides has a similar ecology to that rare orchid.

Carex communis Sedge (10-15?/?). This northern species has been reported from several northern and eastern areas of Kentucky, but there appears to have been much confusion with related species. There are no verified collections at the University of Kentucky or Eastern Kentucky University. During this survey, it was found at four sites, mostly in old-growth hemlock or former oak-chestnut forest, often just below sandstone cliffs. Further study of Kentucky plants is needed to see if this is another northern species that only occurs in small relict populations, associated with old-growth.

Carex hirtifolia Sedge (9/ca. 15). In Kentucky, this northern species is known from scattered areas, mostly on limestone. Here, it was found at one site in the Cave Creek valley, in open woods near a limestone sinkhole. It has probably been overlooked elsewhere in the state.

Carex laxiculmis Sedge (>5/ca. 20). In Kentucky, this north-central species is known mostly from the Cliff Section, but it has probably been overlooked elsewhere. During this survey, it was found in at least five localities (two others not collected). Most of these sites were in old hemlock or hemlock-beech forest on moist lower slopes and stream terraces in sandstone ravines.

Carex lucorum (= C. pennsylvanica var. distans) Sedge (4/ca. 5). In Kentucky, this northern species is known only from the Cliff Section. During this survey, it was found at three sites, mostly on slopes below sandstone cliffs in old-growth hemlock forest, or in the transition to oak types upslope.

*Carex projecta Sedge (5/ca. 10). In Kentucky, this northern species

appears to have been found at only a few sites, mostly in the southern Cliff Section (with collections at the University of Kentucky). However, the taxonomy of the Carex Section Ovales, including this species, is difficult, so that records remain somewhat tentative. During this survey, it was found at four sites, all on sandy banks of streams and larger creeks, but not along the major rivers. It grows mostly in fairly dense vegetation of Carex spp., Panicum spp. and other tall herbaceous species, under somewhat open streamside forest.

Carex purpurifera (= C. laxiflora var. p.) Sedge (7-10/ca. 15). This Appalachian species is reported from scattered sites in eastern and central Kentucky, though there has been some confusion with C. gracilescens (C. laxiflora var. gracillima). During this survey, it was found at only two sites, one on a limestone slope of the Cumberland River in moist forest, and the other at the shrubby back of a sandstone boulder-cobble bar on the Rockcastle River. Further study of Carex Section Laxiflorae is needed in Kentucky, but this species does seem to be one of the less common members of this group.

Carex scabrata Sedge (7/ca. 15). In Kentucky, this northern species is known mostly from the Cliff Section. During this survey, it was found at five sites, all in forested sandstone ravines at the edges of streams, either on the ravine bottom or on slopes below dripping cliffs. It spreads by long rhizomes in sandy alluvium, forming small patches of a few square feet, but remaining a minor component of the streamside vegetation. Tsuga, Fagus, Betula spp., Magnolia spp. and Acer rubrum were generally frequent trees at these sites. Associated species included Carex lurida, C. torta, C. intumescens, Boehmeria, Lycopus virginicus, Thalictrum cf. mirabile, Cystopteris fragilis var. mackayi [C. tenuis] and Hydrangea.

Carex striatula (= C. laxiflora var. angustifolia) Sedge (5/ca. 20). In Kentucky, this south-central species is known mostly from the Cliff Section. During this survey, it was found in at least 11 sites, mostly on sandy soils in hemlock-beech or adjacent oak forest. Further study is needed to see if this species is as common further north as it is here.

Carex styloflexa Sedge (5/5). This southern species is known from only four Kentucky counties, in the Knobs and the Cliff Section. During this survey, it was found at only one site, on moist to wet, lower forested slopes near the middle of Eagle Creek.

Carya pallida Sand hickory (6/ca. 30). In Kentucky, this southern species is known mostly from the southeast. In the Somerset District, it was found in about 20 areas, mostly on moderately dry sandy ridges, associated with various oaks and pines. Further study is needed to see if it is as common elsewhere in the state as it is here.

*?Catalpa bignonioides Catalpa (2/4). This southern species has not previously been reported wild in Kentucky. During this survey, it

was found scattered in open shrubby vegetation along the rocky sandstone banks of the Cumberland River, above and below the Falls. These trees may have escaped from cultivation, but, because there are other southern species with disjunct occurrences in the region, native status is possible and should be investigated further.

Cirsium carolinianum Carolina thistle (3-5/ca. 10). This southern species is reported from scattered areas of Kentucky, mostly in the transition from Mississippian to Pennsylvanian bedrock. During this survey, it was found at five sites in the District, all within a 20 square mile area along the Cumberland River in the transition from limestone to shale and sandstone. Plants were scattered on rocky limestone slopes near the river, mostly along paths and the lakeshore, in thickets or at forest edges. Also, scattered plants were found along limestone gravel roads up to two miles from the river on non-calcareous uplands. The sporadic distribution of this species, together with its concentration in openings, suggests that presettlement disturbance patterns might have influenced it.

Crataegus uniflora Hawthorn (>2/ca. 10?). This south-central species occurs in several limestone areas of southern Kentucky, according to Johnnie Varner (pers. comm.). However, there are few collections available. During this project, it was found at four sites near the western edge of the District, mostly in young oak-ash or oak-hickory forest on limestone. No more than two or three individuals were seen at each site.

Crotonopsis elliptica Rushfoil (8/ca. 10). In Kentucky, this southern species is known mostly from western sandstone regions. During this survey, it was found in the Somerset District, on a clifftop at the end of a narrow ridge near "The Dumplings" rocks, and, about 3 miles to the southeast in the Stearns District, on a narrow saddle between two ridges. Both sites were on relatively flat sandstone outcrops, which probably hold water somewhat longer than typical clifftops. The former site has only a single patch of Crotonopsis, covering about three square feet. Here it occurred with lichens (mainly Cladonia), mosses (mainly Polytrichum) and Danthonia sericea, with a little Panicum polyanthes and Liatris microcephala. The latter site had several patches scattered within about 2000 square feet, mostly disturbed by a recently built limestone gravel road. Here it occurred with the same associates, plus Talinum teretifolium, Dichanthelium sabulorum [Panicum columbianum] and several more common or weedy species.

Cypripedium pubescens Yellow lady's-slipper (ca. 40/>100). This widespread eastern species is known from many areas of Kentucky, but populations are mostly small. There is a continual danger of harvesting for ornamental and medicinal use. During this survey, it was found at five sites, mostly near the Cumberland River or its larger tributaries. There were only 1-4 plants at each site (totalling less than the C. kentuckiense plants found during the survey). It generally occurred on low slopes in mixed mesophytic or moister oak-hickory forest.

Danthonia compressa Wild oat-grass (6-7/ca. 10). In Kentucky, this north eastern species is known mostly from the Cumberland Mountains and the Cliff Section. During this survey, it was found in two or three localities, all along trails through oak or oak-pine woods on sandy ridges. It is easily confused with other Danthonia species, and may turn out to be widespread, but more data are needed to determine its status.

[Dentaria maxima Toothwort (2/2). In Kentucky, this northern species is only known only from two records of Braun (1943), with collections from Estill and Whitley Counties. The latter record was from the Cumberland Falls area. It was not seen during this survey, but there is a need for more taxonomic work on Dentaria in this region, given the possibility of hybridization.]

Dichanthelium aciculare. See Panicum aciculare.

*Dichanthelium dichotomum var. tenue (group). See Panicum albomarginatum.

Dichanthelium dichotomum var. dichotomum (group). See Panicum yadkinense.

*Epilobium ciliatum ssp. ciliatum (var. adenocaulon). Willow-herb (1-2/1-2). There is no published record of this northern species in Kentucky. During this survey, it was found at one site, at the mouth of Flat Branch in McCreary County. Here just two or three plants were noted, growing on a south-facing, seeping sandy area below a sandstone cliff, a few feet out from a small rockhouse. The forest was dominated by hemlock, but the canopy was somewhat open at this particular site. Thalictrum cf. mirabile is dominant on the ground, with Carex gracillima and Leersia virginica also present.

*Eupatorium hyssopifolium var. hyssopifolium Thoroughwort (2/2). This variety, largely distributed on the Coastal Plain, has only been reported once before in Kentucky (Barren Co., Braun 1950). During this survey, it was found only along the Rockcastle River, on Pine Island, growing in the open grassy zone on boulders and cobble. The controversial taxonomic status of this variety needs clarification, however, before it can be proposed for listing as a rare plant in Kentucky.

[*Eupatorium semiserratum Thoroughwort (2-3/2-3). This southern species has been rarely reported in western and eastern Kentucky. Rob Jacobs collected it on the west bank of the Cumberland River below the Falls (Soil Systems Inc. 1980). When relocated during this survey, this site had only three plants, which were rather small, with only one flowering. They occurred in a small opening on a ledge above the high flood level, growing in mat of lichen (Cladonia) and moss (Polytrichum) on very thin soil over a flat sandstone rock. Solidago erecta and Chrysopsis mariana were generally dominant in the opening, together with much Tephrosia spicata. Clematis glaucophylla is also present. The surrounding forest included Tsuga, Quercus spp., Pinus spp., Kalmia, Vaccinium vacillans, Gaylussacia brachycera, Cornus florida, Viburnum acerifolium

and Pteridium. Eupatorium semiserratum is probably intolerant of shade, and may be lost here as forest encroaches.]

Geum virginianum Yellow avens (11/ca. 25). In Kentucky, this species of the east-central U.S. has been reported from several north-central areas, but it has not been reported recently and there are no specimens in local herbaria. During this survey, it was found at about 10 sites, though some are uncertain due to general absence of flowers or fruits. More comparative study with the closely related Geum canadense is needed to determine the status of this species.

Glyceria septentrionalis var. septentrionalis Manna grass (7/ca. 10). This widespread eastern species is known from 12 or more Kentucky counties, mostly in the Cliff Section and along the Ohio River, but western plants may all be var. arkansanas (at least collections of R. Athey and M. Evans). The more eastern typical variety is known from only a few small populations. During this survey, it was found at only one site, with a patch of only 2-3 square feet in a small (50 x 20 feet) seasonal pond on a Pennsylvanian ridge. The pond was largely shaded by Acer rubrum, Liquidambar and Nyssa sylvatica. Other species in the pond included Sparganium americanum, Carex lurida and Polygonum hydropiperoides.

Hydrastis canadensis Goldenseal (60/>100). This north-central species is known from many areas of Kentucky, but it is generally rare due to harvesting for medicinal use. During this survey, it was found at five sites, and others are known nearby. All sites were within a mile of the Cumberland River and its major tributaries. Only two sites with more than 10 plants were found, and one of these patches was harvested in 1987. In general, the species occurred in moist oak-hickory forest transitional to rich mixed mesophytic, with such species as Quercus alba, Q. rubra, Fagus, Liriodendron, Carya spp., Acer saccharum, A. rubrum, Fraxinus americana, Cornus florida, Viburnum spp. and Lindera. At the two larger patches, with 100-1000 or more plants in half an acre or so, the dominant herbaceous species included Hydrastis itself at the best site (near mouth of Indian Cave Branch), Polystichum, Thelypteris hexagonoptera, Desmodium nudiflorum and Diarrhena. Other species included Cimicifuga, Polygonum virginianum, Amphicarpa, Tiarella, Geum virginianum, Agrimonia rostellata, Parthenocissus, Helianthus decapetalus, Coreopsis major, Solidago caesia, Smilax spp., Disoscorea quaternata, Carex cf. digitalis and Agrostis perennans.

Hypericum hypericoides (var. h.) Shrubby St. Andrew's cross (5/ca. 10). In Kentucky, this southern species is known from sandy soils in the southwest and southeast. During this survey, it was found at three sites near Cumberland Falls, and one site near the Rockcastle River. The plants were mostly within 10-30 feet of sandstone clifftops, in open pine or pine-oak forest. Another site was on the rocky banks of the Cumberland River. No more than 5-10 plants were noted at each site.

Ilex montana var. beadleyi Hairy mountain-winterberry (3/ca. 5). This Appalachian species is scattered throughout more rugged areas of

Kentucky with sandy soils, but the hairy var. beadleyi has only been reported from three counties. During this survey, this variety was found at three sites. Further taxonomic study is needed. Kartesz & Kartesz (1980) listed this taxon as a seperate species (including var. mollis), but Jones (1985) did not consider it to have any taxonomic merit, even as a variety.

Juncus canadensis Rush (5/ca. 5). In Kentucky, this north-central species is known from a few areas in the southwest and southeast. During this survey, it was found at only one site, in a small wet opening along an acid stream head, with the large Platanthera integrilabia population.

Juncus coriaceus Rush (7/ca. 10). In Kentucky, this southern species is known mostly from south-central to southeast areas. During this survey, it was found at only one site, at the northwest edge of the District, in the transition from calcareous to non-calcareous rocks. It occurred in an old road bed crossing a wet gully, growing with other Juncus spp., Leersia virginica, Eulalia, Mimulus alatus, Ludwigia spp. and others.

*Juniperis communis Common juniper (1-3/1-3). This northern (circumboreal) species has been reported twice before in Kentucky (Greenwell 1935, and Elwood Carr, pers. comm.), but not verified. In the Somerset District, Clemon Garrison (USFS) found it on sandstone clifftops along Turkey Creek, near the Rockcastle River. Upon revisiting the site during this survey, at least 75 plants were found, scattered along half a mile of south- to west-facing cliffline, with one concentration of about 50 plants in an acre at the head of a small gully. All plants were within 50 feet of the clifftop, except for one on the end of the ridgetop. They range from seedlings to bushes 20-30 feet across and 4-6 feet high. They occurred in open forest dominated by small Pinus virginiana trees, about 40 years old, and along the open clifftop itself. Other woody associates and subshrubs included Quercus stellata, Q. montana, Q. velutina, Q. coccinea, Acer rubrum, Nyssa sylvatica, Ilex opaca, Kalmia, Vaccinium spp., Amelanchier, Aronia arbutifolia, Hypericum (Ascyrum) spp. and Smilax glauca. Herbaceous species, mostly on the open clifftops, included Hypericum gentianoides, Minuartia glabra, Viola pedata, Coreopsis major, Aster surculosus, A. dumosus, Danthonia sericea, Panicum spp., especially P. depauperatum, and Andropogon scoparius.

Leavenworthia uniflora Glade cress (13/ca. 30). This south-central interior species is scattered over south-central Kentucky, generally on Mississippian limestone and often in more or less naturally open cedar glades. During this survey, it was found at three sites at the northwestern edge of the District. Two of the sites, with no more than 50 plants in 20 square feet, were on flat outcrops above cliffs along the Cumberland River, next to a small path in one case, and a driveway in the other. Juniperus virginiana and other trees were adjacent. Another site has many plants scattered on an old quarry floor, and, further north in Pulaski County, this species is also known from disturbed rocky pastures and roadsides near Buck Creek.

Lithospermum tuberosum Gromwell (6/ca. 20). In Kentucky, this southern species is known only from the eastern part of the Mississippian Plateau dissected by the the Cumberland River system. During this survey, it was found at 14 sites scattered along the Cumberland River and its South Fork, mostly just northeast of Forest Service land. It occurred on rocky limestone slopes and bluff-tops, typically in somewhat open oak-ash-hickory forest (Appendix C/3C). Often it was scattered on eroding soil and next to paths. It appears frequent but never forming patches larger than a few square feet.

Lonicera dioica var. glaucescens Honeysuckle (4/ca. 10). This widespread eastern species is scattered over central Kentucky, mostly on rocky limestone slopes, but the hairy var. glaucescens is known only from the edge of the Cumberland Plateau. During this survey, it was found at four sites, and the typical var. dioica at two sites, all along the Cumberland River and its South Fork. Further study may be warranted, but the taxonomic status of these varieties needs careful review first.

Magnolia fraseri Fraser magnolia (6/ca. 20). In Kentucky, this Appalachian species is known mostly from the Cumberland Mountains. There is also a disjunct cluster of five sites near the Rockcastle River, with four discovered during this study. These sites were mostly in small sandstone ravines and hollows, but one was on the Rockcastle River bottomland itself. At each site from 2 to about 30 stems were observed, mostly 2-8 inches in diameter. The forest was typically dominated by Tsuga, Betula spp., Magnolia spp., Rhododendron maximum, Fagus and Liriodendron, with Acer rubrum, A. saccharum, Tilia heterophylla and Ilex opaca also present. Dryopteris intermedia, Polystichum, Tiarella and others were frequent on the ground. Some of the sites were in forest only about 40 years old.

Orbexilum onobrychis (Psoralea o.) Scurf-pea (7/7). In Kentucky, this mid-western to Appalachian species is known mostly from more eastern limestone regions. Currently known populations are mostly small, and its sporadic distribution may be related to patterns of presettlement disturbance by Indians and large herbivores. During this survey, it was found at one site, just north of Forest Service land. It was abundant for 200-300 feet along an old gravel road on rolling limestone uplands near the mouth of Buck Creek.

Orbexilum pedunculatum var. pedunculatum (Psoralea psoralioides var. p.) Scurf-pea (4/ca. 10). In Kentucky, this southern variety has only been found in a few southwestern and southeastern counties. During this survey, it was found at five sites, either in open areas on sandy ridges, or among boulders on open riverbanks. The separation and rarity of this variety needs more study in Kentucky.

Oxalis montana Common Wood-sorrel (8/ca. 15). In Kentucky, this northern species is known only from the Cumberland Mountains and the Cliff Section. At the eastern edge of the Somerset District, it occurred along streams making small ravines as they flow through the sand-

stone cliffline into the Cumberland and Rockcastle Rivers, typically in forest dominated by Tsuga and Rhododendron maximum. Rob Jacobs first reported this species along these rivers (Soil Systems Inc. 1979, 1980). During this survey, one site was relocated near the Cumberland River, with only three plants observed on streamside boulders in hemlock forest. Another site was discovered at the mouth of Flat Branch, with at least three patches totalling 100 square feet or more. These patches were in a particularly narrow ravine, on boulders and bottoms next to the stream. At the largest patch, the forest was dominated by Tsuga, Rhododendron maximum and Liriodendron, with Betula allegheniensis, Acer saccharum, Hamamelis and Hydrangea also present. On the ground, Oxalis was codominant with mosses (including much Thuidium), Dryopteris intermedia and Viola blanda. Other species included Lycopodium lucidulum, Athyrium thelypteroides, Polygonum virginianum, Boehmeria, Impatiens capensis, Amphicarpa, Tiarella, Rubus allegheniensis, Circaea canadensis, Parthenocissus, Lycopus virginicus, Mitchella, Bidens frondosa, Arisaema triphylla, Leersia virginica and Panicum microcarpon. About 100 feet downstream, the rare Epilobium ciliatum was found.

Panax trifolius Dwarf ginseng (8/ca. 15). In Kentucky, this northern species is known mostly from the Cliff Section. There are eight records from the District or nearby, mostly on slopes next to the Rockcastle and Cumberland Rivers, or in tributary ravines within half a mile of these rivers. It generally occurred in small patches on lower slopes with moist sandy soil, in forest of hemlock, beech and associated species.

Panicum aciculare Panic grass (4/ca. 5). This Coastal Plain species is known from sandy regions of southwestern and southeastern Kentucky. During this survey, it was found at only one site in the Somerset District, and, nearby, at one site in the London District. No more than 5-10 clumps were seen at each site. Both sites were in dry pine woods on ridges, with an abundance of grass on the ground, instead of the usual ericaceous shrubs (see Appendix C/2A).

Panicum albomarginatum Panic grass (1/5). This southern species was unknown in Kentucky until found in McCreary County on this survey. The plants here are probably referable to this species, or at least some other taxon in the Ensifolia section of Panicum (Hitchcock & Chase 1950). However, the treatment in Kartesz & Kartesz (1980) does not list P. albomarginatum, and combines most species in that section under under Dichanthelium dichotomum var. ensifolium or var. tenue. It was found at several sites near Natural Arch and the Dumpling Rocks, also on Grassy Gap Ridge near Beaver Creek, and at one site just south of the District. All these sites were on exposed sandstone at the top of cliffs or on narrow ridges. The plants were mostly in very thin soil, growing with lichens, mosses, Danthonia sericea, Liatris microcephala and other species typical of this habitat (Appendix B1; Appendix C/1A).

Panicum yadkinense Panic grass (5/ca. 15). In Kentucky, this south-central species is known from the Ohio River and on sandy banks of

the Cumberland River system. During this survey, it was found at 12 or more sites on the banks of Cumberland River, Laurel River, Rockcastle River and Buck Creek. Some collections may be intermediate to P. microcarpon or P. dichotomum, and all three names are combined under Dichanthelium dichotomum var. dichotomum in Kartesz & Kartesz (1980). However, they are generally distinct in this region and tend to occupy different habitats. P. yadkinense was largely restricted to the shrubby transition from open rocky banks to adjacent terrace or slope forest, with a great variety of associated species (Appendix B7-B8; Appendix C/7).

Phaseolus polystachios Wild bean (12/ca. 15). This south-central species is known from widely scattered areas of Kentucky, but populations may generally be small. It is known from two sites just outside the District, on slopes next to the Cumberland River. It generally grows in moist oak-hickory forest, perhaps somewhat open near cliffs and riverbanks, but no detailed notes have been made.

Phlox amoena Phlox (7/ca. 10). This southeastern interior species is known only from a few south-central areas. During this survey, it was found at six sites, mostly in open woods above limestone bluffs or along nearby roads, occasionally along roads on sandy soil. Although populations generally contain a few hundred stems, the species is clearly not widespread here at the edge of its range.

[*Physostegia sp. nov. False dragonhead (1/1). An odd Physostegia was found on sandstone boulder-cobble bars at the mouth of Bunches Creek. M.E. Medley (in preparation) is considering this to be a new species for science. It superficially resembles P. intermedia (listed by the state as endangered), which is known in Kentucky from only one old report ("Barrens of Kentucky"), but it is extremely small for that species, and has whitish flowers spotted with purple. It was observed in sparsely vegetated (washed out?) areas of the bars. Only six flowering stems were found. Many other vegetative stems appear to be present, though P. virginiana was also common here. Other associated species, though with little cover, were Hypericum mutilum, Boehmeria, Viola cucullata, Desmodium cf. perplexum, Ludwigia alternifolia, Justicia, Apocynum, Campsis, Phyla, Diodia virginiana, Lobelia cardinalis, Senecio pauperculus, Aster cf. dumosus, Eupatorium coelestinum, Vernonia, Muhlenbergia cf. frondosa and Spartina.]

Physostegia virginiana ssp. virginiana False dragonhead (5/ca. 30). In Kentucky, this southeastern subspecies is known only from the southern Cliff Section, plus an old record from the Falls of the Ohio. In and near the Somerset District, it was found to be locally frequent along sandstone banks of major rivers, being a typical component of the open grassy zone (see Appendix C/7).

Platanthera lacera Ragged orchid (10/ca. 15). In Kentucky, this widespread eastern species is known from much of the Cliff Section or nearby, but with a low density. During this survey, it was found at only one site, with one plant. Though perhaps not warranting special consideration, more data on this species should be gathered

during searches for rarer Platanthera spp., which tend to occur in similar habitats along acid stream-heads (Appendix C/5A).

Poa alsodes Mountain bluegrass (8/ca. 15). In Kentucky, this northeastern species is known mostly from the Cumberland Mountains and the Cliff Section, though it appears to be rare outside the Mountains. During this survey, it was found at only two sites, both below sandstone cliffs in moist sandy soil. The forest at both sites was mostly old-growth hemlock or beech.

[Porteranthus trifoliatus (Gillenia t.) Indian physic (4-5/ca. 10). In Kentucky, this Appalachian species is known mostly from rugged areas in the southeast. During this survey, it was found it at only one site, at the southern edge of the District, on a sandstone knob in open pine forest. It is known from two more sites just south of the District, and from the rocky banks of the Big South Fork of Cumberland River.]

Rhododendron arborescens Riverbank azalea (5/ca. 30). In Kentucky, this Appalachian species is known only in the southeast, mostly on rocky sandstone banks of the Cumberland River and its major tributaries. During this survey, it was found along about three aerial miles of the Cumberland River from the Falls downstream, along seven aerial miles of the Rockcastle River, and along the Laurel River below the dam. It was frequent, and locally dominant, in the shrubby transition from open grassy vegetation to forest on adjacent terrraces and slopes (Appendix B7-B8; Appendix C/7).

Rhododendron catawbiense Mountain rose-bay (7/ca. 10). This Appalachian species is known mostly from the Cumberland Mountains, but also in at least two small areas of the Cliff Section, in the Red River Gorge-Natural Bridge area and the Natural Arch-Dumpling Rocks area (McCreary Co.). During this survey, about 10 bushes were found around Natural Arch itself, and one or two bushes on each of three narrow ridges up to two miles away, near the Gulf and the Dumpling Rocks. The plants all occurred within 10 feet of sandstone cliffs, in the open or in open pine forest, with other ericaceous shrubs nearby.

[Rhododendron minus Heath-bald Azalea (2/2). This Appalachian species is known from only two sites in Kentucky, both in the southeast. The Whitley County site is just east of the Somserset District, in Cumberland Falls State Resort Park. During this survey, a few plants were relocated along Route 90 on the sandstone ridge near the Park facilities, and it has been suggested that these were planted. However, there is also an old Park record of Leiophyllum buxifolium (see section IA: listed species), which is associated with this Rhododendron on heath balds in the main Appalachian part of their ranges. The Leiophyllum cannot be found here today, and the Rhododendron has declined greatly in the last decade, apparently due to shading from the vigorous forest of yellow poplar and other trees along the road. There is an urgent need to study this site, look for others, and to search for historical clues.]

Robinia hispida var. rosea Rose-acacia (5-6/ca. 10). This Appalachian taxon and its relatives are poorly understood in Kentucky. The var. fertilis is frequent, mostly in the east, but all escaped from cultivation. The var. rosea (= R. boyntonii) is known only from the southeast, where it appears to be native. During this survey, the latter was found in a 2-3 square mile section of the District, between Natural Arch, the Gulf and the Dumpling Rocks. Here it was scattered in thickets and young pine or pine-oak forest, flowering only in the open. It has also been found just east of Cumberland Falls, on a small sandstone knob in open pine-oak forest, and reported from thickets adjacent to garbage dumps south of Route 90 in McCreary County (J. MacGregor, pers. comm.).

Scutellaria saxatilis Skullcap (8/ca. 10). In Kentucky, this Appalachian species is known mostly from the northeast and the southeast. During this survey, it was found only in one area, on the west side of the Cumberland River, and it is also known from the east side (Rob Jacobs collection at EKU). It occurred in mixed mesophtyic forest, growing mostly on sandstone boulders. Most of the observed plants were concentrated in about half an acre of talus slope near a small stream. Here Acer saccharum was dominant in the canopy, with Fagus, Tsuga, Liriodendron, Juglans cinerea, Ilex opaca and Rhododendron maximum also present. S. saxatilis was locally dominant on the rocks, and other species on the ground included Dryopteris intermedia, D. marginalis, Polypodium virginanum, Cimicifuga, Hepatica americana, Hexastylis, Impatiens cf. pallida, Viola blanda, Tiarella, Sedum ternatum, Actaea, Geum cf. canadense, Circaea canadensis, Vitis vulpina, Rhus radicans, Parthenocissus and Arisaema triphylla.

Scutellaria serrata Skullcap (7/ca. 10). In Kentucky, this Appalachian species is known mostly from the Cliff Section. During this survey, it was found only once, at the east edge of the District along the Rockcastle River, and it is also known further upstream near this river. Only 5-10 plants were seen, scattered along less than 100 feet in the transition from slope to terrace, near the upper flood level, in mixed mesophytic forest with hemlock, beech and other trees.

*Senecio pauperculus Ragwort (2/3). This northern and western species was first discovered in this region by Rob Jacobs, at two sites along the Cumberland River, above and below the Falls (Soil Systems Inc. 1980). The only other record from Kentucky is an old collection from the Blue Licks area (Robertson Co., Braun 1943). During this survey, it was not found below the Falls, but the other site was relocated. This was on boulder-cobble bars at the mouth of Bunches Creek, where it is locally common in sparsely vegetated areas with Physostegia sp. nov. (see above). Also, a small patch occurred here on a shrubby levee, with Platanus, Liquidambar, Betula nigra, Cornus obliqua, Cephalanthus, Onoclea, Apios americana, Helianthus decapetalus and Eupatorium fistulosum.

Solidago speciosa var. speciosa Goldenrod (4-5/ca. 10). This eastern variety is scattered along the western edge of the Cumberland

Plateau. During this survey, it was found at three sites in or near the District. One site, with no more than two or three plants noted, was by a path in open red cedar or oak-ash-hickory forest on a limestone point near the South Fork. Another site, also with few plants, was along a gravel road on uplands near Buck Creek, next to pine-oak forest. The most extensive site was along the Rockcastle River, in the open shrubby transition from open rocky banks to forested terraces or slopes. Here at least 10 plants were noted along about half a mile, all on the west bank.

*Solidago uliginosa Goldenrod (2/6). This northern species has not been reported in Kentucky, before this survey. It was found along about one mile of the Rockcastle River, and along the Laurel River below the dam. It was frequent along the Rockcastle on open bouldery banks, mostly in the zone dominated by Andropogon gerardii, A. scoparius and Sorghastrum, but sometimes also in the shrubby transition to forest on terraces or slopes (Appendix B8; Appendix C/7).

*Spiraea corymbosa (S. betulifolia var. c.) Mountain Spiraea (2/2). This Appalachian species has only been reported once before in Kentucky, with no locality given (Short et al. 1833). During this survey, it was found at one or two sites along the Rockcastle River, in shrubby vegetation on the bouldery banks (collected only at site P in Appendix B8). Only one plant was noted at each site, about 3-4 feet tall.

*Stenanthium gramineum var. micranthum Featherbells (2/ca. 5). In Kentucky, this south-central species is known from at least seven counties as var. robustum, but only two as var. micranthum. During this survey, the latter variety was found at one site in the District and at two other sites nearby. No more than 10-20 plants were noted at each site. It grows on seasonally wet sandy soils by upland stream-heads, and one plant was found on sandy banks of the Cumberland River. Some plants were in the shade of seasonal swampy or streamside forest (Appendix C/5A,6A), but the most vigorously flowering plants were in a clearcut and on the riverbank.

Stewartia ovata Mountain Camellia (5/>100). In Kentucky, this southern Appalachian species is known only from the southeast, but it is locally frequent. During this survey, it was found at 20 or more sites, mostly on sandy soil in oak forest or transitions to hemlock or pine.

Stipa avenacea (Piptochaetium a.) Black oat-grass (6/>100). In Kentucky, this southern Appalachian species is known only from the southeast, but it locally abundant. During this survey, it was found at 20 or more sites, mostly on sandy soil in open oak or pine forest, and often in clearings.

*Talinum teretifolium Fame-flower (2/8). This Appalachian species has not been reported previously in Kentucky. During this survey, it was discovered it at eight sites in Pulaski and McCreary Counties, mostly in the Somerset District. All these sites were on relatively

flat sandstone outcrops on narrow points or saddles, with no tree cover. These openings were probably all natural in part, but most were disturbed and expanded by dirt or gravel roads along the ridge-tops. The Talinum has probably been damaged by such disturbance at most sites, though it may persist and spread locally in the shallowest soil next to tracks. Most sites are mapped on S.C.S. soil surveys as "rock outcrops", and, after checking most sites mapped this way in and near the District, about a third were found to have Talinum. It is likely that further sites will be found in the Stearns District. Population sizes range from about 50 to 2500 plants, covering from 20 to 1000 square feet. Most plants occurred in very thin soil with lichens, mosses, Hypericum gentianoides and, at two sites, Minuartia glabra. This vegetation often grades into thicker soil dominated by Danthonia spp., Andropogon spp., and Panicum spp., with Aster surculosus, Coreopsis major, Senecio anonymus, and Rubus Section Flagellares also frequent (Appendix C/1A). Adjacent forest is generally dominated by Pinus virginiana.

Trachelospermum difforme Climbing dogbane (8/ca. 30). In Kentucky, this southern species is known mostly from riverbanks and floodplain woods in the west. In the east, it is known only from rocky sandstone banks of the Cumberland River and the Big South Fork. During this survey, it was found near Cumberland Falls, and scattered along about three miles downstream, mostly in grassy to shrubby vegetation within 5-10 feet above the normal water level. Though scattered through much of this section, it was not abundant.

*Tragia urticifolia Nettle-leaved tragia (1/1). This southern to southwestern species was unknown in Kentucky until this survey. It was found at one site, in rocky limestone openings on the southwest-facing point with Pachistima, just east of the mouth of Cain Creek at the South Fork. Roughly 20-30 plants were seen, mostly in the larger opening low on the point. It was associated with Sporobolus clandestinus (see section IA: Listed Species).

*Triosteum angustifolium var. eamesii Horse-gentian (1/1). This hairy variety of the east-central species is reported only from Connecticut to New Jersey and North Carolina (Gleason & Cronquist 1963). During this survey, it was found for the first time in Kentucky, in a wooded limestone gully close to the Cumberland River.

Tripsacum dactyloides Gamma-grass (15/ca. 30). In Kentucky, this south-central (and tropical) species is known mostly in the west, where there are many records, but several records are old. The species does not appear to spread into recently disturbed areas, unlike some other grasses of natural openings. The only locality known east of the former "Big Barrens" region is along the Cumberland River below the Falls. During this survey, about 25 plants were found, scattered along 200 feet on the west bank at the back edge of the bouldery zone with open shrubby vegetation, just below the slope forest. Woody species here included Liquidambar, Alnus, Carpinus, Ulmus alata, U. rubra, Robinia pseudoacacia, Crataegus cf. Tenuifoliae, Nyssa sylvatica, Chionanthus and Fraxinus americana, with vines locally dominant, including Vitis rotundifolia, V.

vulpina, Rhus radicans and Campsis. Herbaceous species included Impatiens capensis, Desmodium cf. perplexum, Lespedeza cuneata, Apios, Helianthus decapetalus, Coreopsis tripteris, Solidago altissima, S. gigantea, Eupatorium fistulosum, Lactuca floridana, Dioscorea quaternata, Panicum yadkinense and Eulalia. Also, a single clump was found on the east bank near the Falls, in more open vegetation among boulders. Other western grasses in Kentucky that were found here on riverbanks are Panicum virgatum and Spartina pectinata.

Viburnum dentatum var. dentatum Southern arrow-wood (6/ca. 10). In Kentucky, the typical variety of this south-central species is known mostly in the Cliff Section. Related taxa (including V. recognitum) may be rarer, though they increase the known range of this group. During this survey, var. dentatum was found at only two sites, both in shrubby woods on rocky ground near rivers. Further study may be warranted, though the taxonomic status of the various related forms needs careful review first.

Viola rotundifolia Round-leaved violet (12/ca. 50). This northeastern species is known mostly from the Cumberland Mountains and the Cliff Section. It may be locally frequent, but, during this survey, it was only found at three or four sites, mostly in old-growth hemlock forest. Though probably not deserving special protection, this is another species of local biogeographic interest, here at the edge of its range.

*Vitis rupestris Sand-grape (2-3/ca. 10). This southwestern species has not been reported before in Kentucky, except in a thesis on the flora of Calloway County (Woods 1983). It was found frequently along about seven aerial miles of the Rockcastle River, mostly growing on sand and cobble within 5 feet of the water level. Associated species range from Andropogon gerardii, Baptisia australis and others typical of open grassy bars, to streamside scrub with Cornus obliqua, Salix caroliniana and Platanus (Appendix B8; Appendix C/7).

[Waldsteinia fragarioides Barren strawberry (17/ca. 20). This north-central species is known from 17 Kentucky counties, but it appears to have a low density. The var. parviflora is known from only four counties, all in the southeast. During this survey, the species was seen only once, without flowers, and there is a record just north of the District, both in woods on dry limestone points or slopes. Further study of flowering material is needed to determine the status of the two varieties in Kentucky.]

Wisteria frutescens (sensu lato) Wisteria (11/ca. 50). In Kentucky, native Wisteria occurs mostly in the west, and the only known eastern sites are in the southern Cliff Section, along rocky banks of the Cumberland River and the Big South Fork. During this survey, it was found to be scattered along the Cumberland River from the Falls, on sandstone, downstream at least as far as Burnside, on limestone. Although it may not deserve official listing, more study of its taxonomy may be needed. A recent study suggested

that W. macrostachya should be combined with W. frutescens (Larry Stretch, Southern Illinois University, pers. comm.). Both species have been reported in Kentucky, but the extent of their genetic and ecological separation has not been addressed.

II. TERRESTRIAL VERTEBRATE FAUNA

The following accounts summarize the status of the 14 listed rare terrestrial vertebrate species that have been reported on the Somerset District. Also included are accounts of five additional species which are known to occur nearby, but which have not been documented within the District; these accounts are placed in square brackets []. Following each species' name, its official status is shown as follows (1/2/3):

(1) Status in Kentucky according to the Kentucky Academy of Science and the Kentucky Nature Preserves Commission (KAS-KNPC), see Warren et al (1986); E = Endangered, T = Threatened, S = Special Concern or "-" = monitored but not listed.

(2) Status in Daniel Boone National Forest as listed by the USFS (1985); "S" = species listed as Sensitive; "E" = species listed as Endangered; and "-" = species not listed by the USFS in the Daniel Boone National Forest. Also shown with a "+" are those KAS-KNPC listed species that have now been documented as occurring on the Somerset District of the Daniel Boone National Forest or along its boundaries.

(3) Federal Status as designated by the United States Fish and Wildlife Service (1985); E = Endangered, T = Threatened, and C1 or C2 = candidate for listing, Category 1 or 2; or "-" = not listed.

Amphibians

Aneides aeneus Green Salamander: (-/S/C2). This species ranges throughout the Appalachian region from Pennsylvania and Maryland south to Alabama and Mississippi. It usually occurs in rock crevices, but can also be found within or beneath the bark of standing or fallen dead trees or in cavities in living trees. Eggs are laid in moist rock crevices or beneath loose tree bark. The larval period is passed in the egg without an aquatic stage. In Kentucky it can be found locally throughout the Cumberland Plateau and Mountains with records from at least 25 counties, generally associated with outcrops of sandstone. The Green Salamander is known from at least eight sites on the Somerset District, seven of which were located during this effort. All new sites were along sandstone outcrops where individuals were usually observed in narrow cracks and fissures in the sandstone formations. Based on present knowledge, it is likely that populations of this salamander exist throughout the District where sandstone outcrops occur. In Kentucky, Green Salamanders are largely dependent upon the sandstone outcrop habitats. Essential to their survival are deep crevices which remain damp throughout the year. In order to maintain Green Salamander populations, it is important to restrict the building of campfires in rock shelters and to maintain the tree and shrub canopy adjacent to the cliffs and rock outcrops. Exposure of sandstone outcrops to the sun may affect temperature and humidity levels along the rocks enough to eliminate the species due to drying conditions.

Reptiles

[Eumeces anthracinus anthracinus Northern Coal Skink: (S/-/-). This species has been recorded from only 8 counties in Kentucky. It is known from two sites near the Somerset District just south of SR-90 in eastern McCreary County and NW of Bald Rock in Laurel County. The species is possible along talus or other slopes with rocks and some degree of open woodland, or along open, rocky stream margins.]

[Lampropeltis triangulum elapsoides Scarlet Kingsnake: (S/-/-). This poorly known species has been found in at least a dozen counties in Kentucky. It is known from near the Somerset District in Whitley County in the vicinity of Cumberland Falls on the basis of several records. This species spends a large amount of time under the ground or within rotten logs and stumps, and it is very difficult to find. Road kill records account for at least half of the known sightings, and the species may be more numerous than has been documented.]

Ophisaurus attenuatus longicaudus Eastern Slender Glass Lizard: (S/-/-). This legless lizard is found throughout the southeastern United States, and occurs more or less locally throughout its range. In Kentucky it has been recorded from only 8 counties in the central part of the state with most records from central McCreary County. This species was known from the District on the basis of several road kill records near Cumberland Falls. The species appears to be much more common south of SR-90 in the southern half of McCreary County. One Slender Glass Lizard was found during the inventory, approximately two miles south of the District along SR-700 (within the Stearns Ranger District). This species has been found fairly frequently within a small portion of central McCreary County (Stephens 1985), but is apparently not numerous north and west of Cumberland Falls State Park. Slender Glass Lizards may be more frequent in the southeastern portion of the Somerset District than is presently known, but the species is largely fossorial and difficulty in detection is a major problem in determining its status there. This species may be sensitive to habitat degredation associated with surface mining when sandy topsoils are replaced by rock and clay.

[Pituophis m. melanoleucus Northern Pine Snake: (S/-/-). This species has been found in 8 counties in Kentucky. It is known from near the Somerset District on the basis of several obscure records. The relict old-growth pine stands on ridges in the District would appear to be prime habitat for this species, although the lack of documentation would suggest that the species must be quite rare, if present. Being a rodent-eater, the species should do well in young forest provided that soils are loose and sandy.]

Birds

Accipiter striatus Sharp-shinned Hawk (S/+/-). This species is present throughout the northern U.S. as a breeding bird, usually in association with forests. In Kentucky its breeding occurrence is poorly documented, having been confirmed in only three counties. It was formerly known from the District in summer on the basis of a sight record of a single bird south of Mt. Victory above Addison Branch. During the inventory, a pair of adult Sharp-shinned Hawks was observed in flight over the Beaver Creek Wildlife Managment Area in June, probably indicating nesting in the immediate vicinity. It is likely that the species nests at a few scattered locations within the southern Cumberland Plateau, including the Somerset Ranger District, in mixed pine-hardwood forest. Tracts of mature mixed forest appear to be the favored nesting habitat.

Picoides borealis Red-cockaded Woodpecker (E/E/E). This species is found locally throughout pine and mixed pine-hardwood forests of the southern Appalachians and Coastal Plain of the southeastern U.S. west to eastern Texas. In Kentucky, it is currently restricted to the southern Cumberland Plateau in Laurel, Pulaski, McCreary and Whitley counties where it is associated with old-growth pine stands. The Red-cockaded Woodpecker is presently known only from the Daniel Boone National Forest, where numbers have been declining over the past several decades. The future of the Red-cockaded Woodpecker in Kentucky is very much in doubt; the species presently survives in only a small portion of its former range, and dramatic management activity will be necessary to assure its continued existence within the Daniel Boone National Forest. Red-cockaded Woodpeckers have been known from two distinct areas on the Somerset Ranger District: the upland ridges between the Cumberland River and Mt. Victory and at scattered points along the western side of the Beaver Creek gorge. Cavity trees have been known for some years in these areas, and biannual surveys for activity in the vicinity of these cavity trees have been undertaken by the USFS for the past ten years. Only one Red-cockaded Woodpecker was observed during the inventory work, near the end of Bowman Ridge in an area where woodpecker activity had not been detected over the last several years. No Red-cockaded Woodpeckers were detected at any other formerly known sites within the District (although some sites were visted only once), and no new sites of activity were discovered. There are many threats to the continued existence of this species on the Daniel Boone National Forest. The encroachment of understory vegetation and the loss of proper old-growth age class pines are probably the two major factors responsible for the birds' decline. Continued monitoring of currently-known sites is essential, but more importantly, searches for new sites of activity must be initiated. A District-wide inventory for this species would probably be warranted. It is apparent that intensive management of large tracts of nesting and foraging habitat must be undertaken in order to keep this species from disappearing from the Daniel Boone National Forest.

Mammals

Microsorex hoyi winnemana Pygmy Shrew: (-/+/C2). This species is found throughout the eastern U.S. in a variety of wooded habitats. In Kentucky, it is known from at least thirteen counties in the central and eastern portions of the state. Prior to this inventory, the Pygmy Shrew had not been documented within the District. Pygmy Shrews were trapped at two locations in the District, along the ridge at Three Forks of Beaver Overlook and in the old-growth pine forest NE of the head of Addison Branch. It is likely that this species occurs in other areas throughout the District, probably in a variety of upland forest types. Further trapping of potential habitats should clarify the species' status in the District.

Myotis grisescens Gray Myotis: (E/E/E). This species is found locally throughout the southeastern United States from southern Illinois and Indiana to northern Florida. In Kentucky it is found in cave regions, mostly in the south-central portion of the state in approximately 25 counties (with many colonies apparently extirpated). Prior to the inventory, this species was known from the Sloans Valley Cave system at the "Minton Hollow", "railroad tunnel", and "garbage pit" entrances, and near to the District at Blowing Cave in Pulaski County. Summer colonies appear to have been extirpated in the Sloans Valley Cave system, but a summer population of approximately 200 individuals appears to persist at Blowing Cave where evidence indicates a much larger population formerly present. One individual, apparently a transient, was observed in early winter in the Minton Hollow Entrance during this effort. It is likely that the Gray Myotis uses a few caves in the Somerset District during spring and fall migration periods, and there is a good chance that an undiscovered maternity colony is present, probably along Buck Creek. The species is extremely intolerant of human disturbance and will abandon caves which are frequently visited by spelunkers. The Gray Myotis will often abandoned gated caves, as well. Caves harboring this species can be marked with warning signs and gated with "half-gates" to discourage visitation by cave explorers during critical times of the year.

Myotis keenii Keen's Myotis: (S/-/-). This species is found locally throughout the eastern and central United States from New England west to the Dakotas and south to northern Florida. Although the species is fairly widespread, little is known concerning its life history. In Kentucky it is found locally throughout the eastern three-fourths of the state and known from at least 19 counties. The habits of this species are largely unknown; in winter, occasional individuals are found in caves, usually in crevices. The species can be mist-netted in good numbers in cave entrances, especially in spring and fall. In summer, Keen's Myotis inhabits woodlands, caves, mines and buildings where they live singly or in small colonies. Prior to the inventory effort, Keen's Myotis was known from two sites in the Somerset Ranger District. During the inventory work, the species was found at several caves in the western portion of the District and in a sandstone rockhouse in the Indian Cave Branch gorge, a tributary of Beaver Creek. Individuals

were netted at the entrances to two caves in late summer just off USFS land in the Cave Creek and Sloan's Valley cave systems. In addition, another was observed in early winter in an entrance to the Cave Creek Cave system. Like Rafinesque's Big-eared Bat, Keen's Myotis is probably present in small numbers throughout the District. During the summer, the species is probably present in small numbers in woodlands throughout the region, and may be susceptible to management activities at that time of the year. Protection of winter hibernation sites in caves and abandoned mines is essential to successful management of the species.

Myotis sodalis Indiana Myotis: (E/E/E). This species is found locally throughout the eastern United States from southern New England west to Oklahoma and south to northern Florida. In Kentucky, it is found locally in the cave regions throughout the eastern two-thirds of the state and is known from at least 26 counties. The Indiana Myotis was formerly known from two caves in the Somerset District. The species was relocated at both of these sites and found at three new sites in cave entrances to the Cave Creek Cave system in Pulaski County. Most cave entrances examined during the winter were too warm for this species, but the early December total of 300+ individuals in the South Goldson entrance to Cave Creek Cave represents a fairly substantial hibernating population. Although this species has not been detected in the Somerset District during the summer, it is possible that the species occurs in the woodlands in this area. In addition, groups of males are known to spend the summer at hibernation sites (Barbour and Davis 1969). In early September, approximately 20 individuals were observed in the North Goldson entrance to Cave Creek Cave well before the normal commencement of hibernation period. Persistent use of caves by humans is known to reduce the numbers of hibernating bats present. Protection of winter hibernation sites from human disturbance, the maintenance of riparian woodlands for summer foraging habitat, and the protection of woodlands adjacent to significant hibernacula are essential to successful management of the species. The installation of properly-designed cave gates to protect winter colonies is often an effective management tool.

Myotis subulatus leibii Small-footed Myotis: (E/S/C2). This species is found locally throughout the U.S. from Maine to California. Its habits have not been closely studied, and little is known regarding its life history. In Kentucky it is known from only a few scatterd counties. It has been recorded along the District's boundary on one occasion in expansion joints in the KY 192 bridge over the Rockcastle River. This species is not well known, but it is possible that it is regular in the Somerset District.

Neotoma floridana magister Eastern Wood Rat (-/S/C2). This species is found from the Alleghany Mountains of Pennsylvania south through the Appalachians to Louisiana and Florida, and west to eastern Colorado and central Texas. In Kentucky, it is found in the cave regions of the eastern two-thirds of the state and throughout the Cumberland Plateau and Mountains and is known from at least 25 counties. The species occurs in a variety of habitats including caves, old mines,

rockhouses and outcrops. Prior to the inventory effort the Eastern Wood Rat was known from only two sites in the District. During the inventory, this species was found at nine new sites. The Wood Rat is a fairly conspicuous inhabitant of caves in the region and was found relatively frequently in caves censused during the inventory and occasionally along sandstone bluffs where caves were not found. It is likely that Wood Rats are frequent in caves throughout the District wherever they occur and are less frequent, but still scattered, in small numbers along the sandstone bluffs throughout the southern and eastern portions of the District. While persistent visitation of caves by humans is usually detrimental to bat populations, most human use probably does little harm to wood rats. Any managment plan for enhancement of the protection of bat species would probably be advantageous to this species, as well.

Plecotus rafinesquii Rafinesque's Big-eared Bat (T/S/C2). This species is found locally throughout the southeastern United States. In Kentucky it is found throughout the cave regions of the eastern two-thirds of the state and locally elsewhere except the Bluegrass and is known from more than 20 counties. This species occurs in caves, old mines, rockhouses, hollow trees and abandoned buildings in summer, and is generally found in caves in winter. Prior to the inventory effort, the Rafinesque's Big-eared Bat was known from the District on the basis of three records in caves and mine portals. During the inventory, this species was found at six new sites on the District, four on private land adjacent to USFS land, and at one site just within the boundary of USFS land at Hyden's Cave in the Cave Creek Cave system. These sites included four caves, an abandoned mine portal, and an old building (in summer). The winter colony in Hyden's Cave (53) represents one of the largest known in the state and deserves high priority for protection. Like the Keen's Myotis, this species apparently occurs at many sites within the District, but is generally found in very small numbers at each. Persistent winter visitation of caves by humans causes disturbance to hibernating individuals. Protection of winter hibernation sites and summer foraging areas are essential to successful management of the species.

[Plecotus townsendii virginianus Virginia Big-eared Bat: (E/E/E). This species is known from approximately a half-dozen counties in Kentucky including two sites in Rockcastle County. It is unlikely that a large population of this species is present in the Somerset District, but it is possible that occasional individuals occur in the caves of the area.]

[Spilogale putorius Spotted Skunk (S/-/-). The occurrence of this little-known species has been documented at several sites in McCreary and Wayne counties just south of the Somerset District. It is possible that the species occurs in woodlands on the District, but the lack of road kill records suggests that, if present, that the species must be quite rare.]

III. AQUATIC FAUNA

Twenty sites in the Rockcastle River drainage and six mainstem Cumberland River tributary sites were sampled for USFWS and KAS-KNPC listed freshwater mussels and fishes.

The following accounts summarize the status of the three listed rare aquatic species that were recorded on the Somerset District or along its riverine boundaries during this inventory. Following each species' name, its official status is shown as (1/2/3):

(1) Status in Kentucky according to the Kentucky Academy of Science and the Kentucky Nature Preserves Commission (KAS-KNPC), see Warren et al. (1986); E = Endangered, T = Threatened, S = Special Concern, or "-" = not listed.

(2) Status in Daniel Boone National Forest as listed by the USFS (1985); "S" = species listed as Sensitive; "E" = species listed as Endangered; and "-" = species not listed by the USFS in the Daniel Boone National Forest. Also shown with a "+" are those KAS-KNPC listed species that have now been documented as occurring on the Somerset District of the Daniel Boone National Forest or along its boundaries.

(3) Federal Status as designated by the United States Fish and Wildlife Service (1985); E = Endangered, T = Threatened, C1 or C2 = candidate for listing, Category 1 or 2; or "-" = not listed.

Orconectes australis (Crayfish) (T/+/-). This blind, white troglobitic crayfish was observed in the Minton Hollow entrance to the Sloan's Valley Cave System and the North Firestone entrance to the Cave Creek Cave System. Although this species was previously known from both cave systems, these records represent new sites.

Villosa trabalis (Cumberland bean mussel) (E/E/E). This species was found in the Rockcastle River at RM 10.8, 12.6, 19.7, 20.3, 21.5, 22.0, 24.4, and 24.55. All sites fall on the border between the London and Somerset Ranger Districts.

Etheostoma cinereum (Ashy darter) (T/+/-). This species was collected on the Rockcastle River at RM 10.8 and 12.6. Both sites fall on the border between the London and Somerset Ranger Districts.

Comments

Caution should be exercised when interpreting the results of aquatic faunal surveys. First, manpower and time constraints limit the number of sites that can be investigated and the intensity of work at a given site. A great deal of time is necessary to thoroughly survey all streams and appropriate habitats in a given study area.

Secondly, although a given species may not have been found at a site, additional sampling may reveal the species if undertaken, for example, during a different season or under different field conditions. For example, Jones (1987) and Stephens (pers. comm.) discovered populations of Phoxinus cumberlandensis in streams found to be devoid of the species by O'Bara (1985). This is especially true of freshwater mussels which are difficult to adequately sample. Several rare mussels known from with the District that were not collected during this effort may in fact persist in the mainstem Rockcastle River and the unimpounded portion of the Cumberland River between the Falls and Rock Branch.

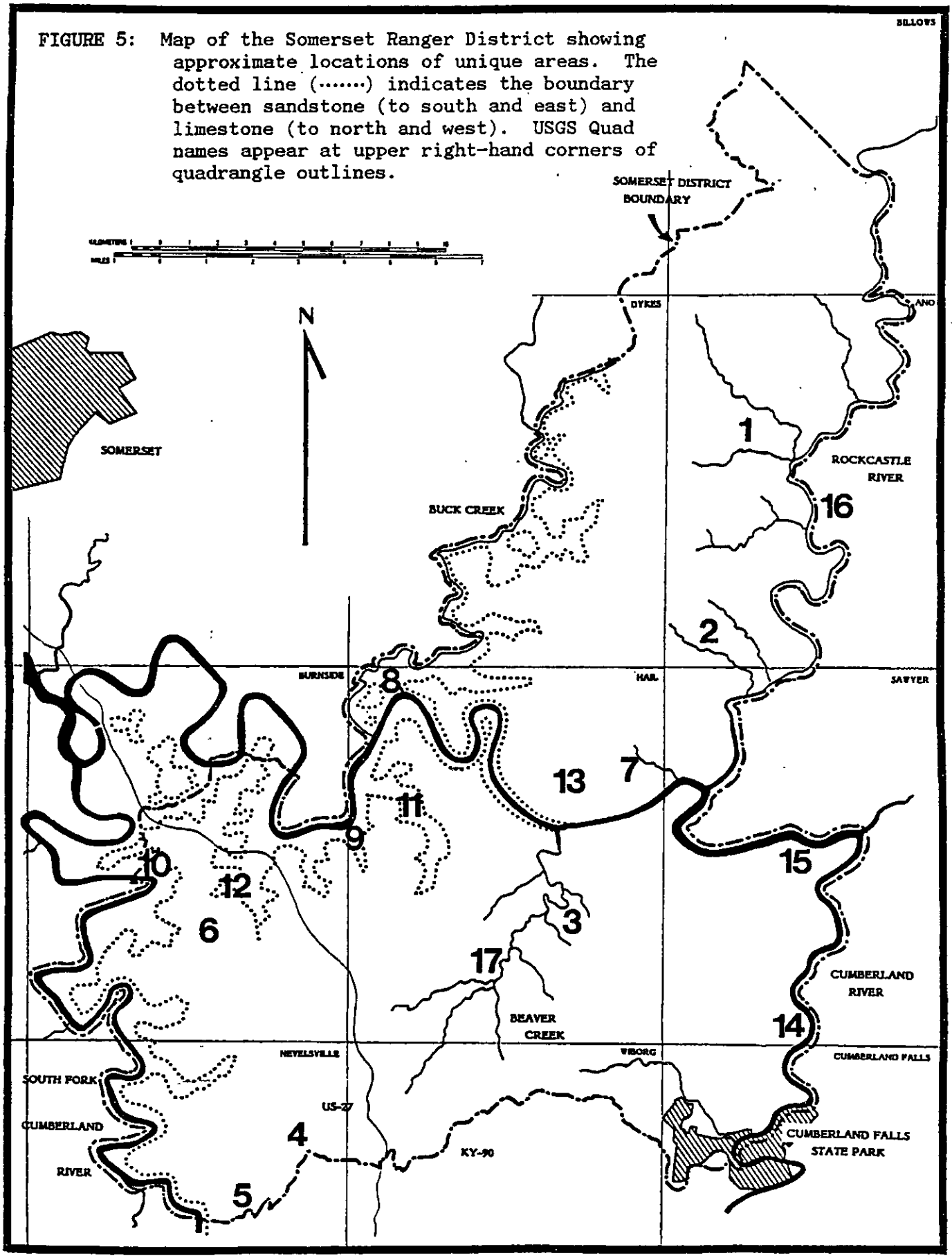
IV. UNIQUE AREAS

In addition to the individual species occurrences, fifteen (15) areas were identified which contained clusters of rare species or unusual vegetation (Fig. 5). These areas may require special management provisions to consolidate ownership as well as protect and improve habitat conditions in support of unique qualities. Each area significantly contributes to the biological diversity of the Forest, and effective management and protection will ensure the long-term survival of the majority of the rare species found in this study (see Table 4).

In the following summary of unique areas, continuous lines mark the recommended regions for consideration for further study and/or special designations. The boundaries delineated on Fig's. 6-16 are based on field surveys of the areas. However, the entire areas surrounding these sites should be targeted for further research since it was impossible to visit each site more than a few times during this effort, and not all potential areas could be visited within the delineated areas. Broader areas for further study are designated on the site maps by dashed (- -) lines.

This is not meant by the authors to diminish the importance of protecting occurrences of rare species not found within these fifteen identified areas, because it is assumed that all such information would be integrated into the planning process for the management of the Forest. Areas of old-growth are not comprehensively covered, but general consideration should be given to preserving the few remaining stands older than 100-150 years.

FIGURE 5: Map of the Somerset Ranger District showing approximate locations of unique areas. The dotted line (·····) indicates the boundary between sandstone (to south and east) and limestone (to north and west). USGS Quad names appear at upper right-hand corners of quadrangle outlines.



1. Stepping Rock Ridge

This approximately 55 acre area is composed mainly of narrow sandy ridges and cliffs (Fig. 6). These clifftops have the only Juniperus communis currently known in Kentucky, together with the rare Minuartia glabra and Dichanthelium sabulorum [Panicum columbianum] (see Appendix C/1A). Also, some parts of the ridge have Gaylussacia brachycera, Danthonia compressa, and near some streamheads, Viola tripartita. Below the cliffs (Fig. 6A), in tributary ravines of Turkey Creek, Neotoma floridana magister (Eastern Wood Rat), Poa alsodes, Magnolia fraseri and Carex scabrata are found.

2. Hindsfield Ridge

This approximately 115 acre area contains narrow ridges, a ravine, and relatively flat stream heads (Fig. 7). The only populations of Platanthera integrilabia found in the District are located in the moist stream heads, along with Calamagrostis cinnoides, Carex bromoides and Juncus canadensis (Appendix C/5A). Aster concolor and Helianthus atrorubens occur along the road, and some narrow promontories have large patches of Gaylussacia brachycera (Fig. 7A). Along the adjacent ravine of Upper Troublesome Creek, there are Liatris microcephala, Eupatorium luciae-brauniae and Magnolia fraseri (Fig. 7B).

3. Grassy Gap Ridge

Located adjacent to the Beaver Creek Wilderness Area is this 180 acre area composed of cliffs and ravines (Fig. 8). On narrow promontories here, there are two relatively undisturbed areas of rocky openings with Talinum teretifolium and Minuartia glabra (Appendix C/1A). Liatris microcephala is frequent on clifftops. Several rare Dichanthelium [Panicum] species occur in these openings or in adjacent pine woods (D. sabulorum [P. columbianum], D. boreale [P. bicknellii], D. aciculare and D. dichotomum var. tenue [P. albomarginatum]). Also, Malus angustifolia is relatively frequent in thickets, and there are patches of Gaylussacia brachycera (Appendix C/2A). Along streams, there are Rhynchospora globularis and Calamagrostis cinnoides, and there is a natural seasonal pond with Carex joorii (Appendix C/5A).

4. Natural Arch Area

This area, composed of nearly 1200 acres, includes Spruce Creek, Natural Arch, the Big Cutoff and the Gulf (Fig. 9). Several rare species occur on the open, grassy clifftops of this region (Appendix C/1A), including Liatris microcephala, Dichanthelium sabulorum [Panicum columbianum], D. dichotomum var. tenue [P. albomarginatum], Danthonia compressa, Phaseolus polystachios, Ilex montana var.

beadleyi, and Rhododendron catawbiense. There is an old record for Schwalbea americana from this area as well (Braun 1936). In dry woods and thickets on narrow ridges, there are large areas of Gaylussacia brachycera, scattered Robinia hispida var. rosea, and occasional Helianthus atrorubens (Appendix C/2A-2B). The cliffs of this area provide habitat for Neotoma floridana magister (Eastern Wood Rat) and Aneides aeneus (Green Salamander). Eupatorium luciaebrauniae formerly occurred near Natural Arch, but may have have been destroyed. Patches of Viola tripartita and Carex picta occur on slopes in dry to moist forest (Appendix C/3A-4A). Also, along Spruce Creek is the only population of Hydrocotyle americana currently known in the state (Appendix C/6A).

5. Dumpling Rocks

This area of approximately 1000 acres is similar to the preceding one (Fig. 9). It has most of the same rare species known in the Natural Arch area except for Hydrocotyle americana, but one rare species, Crotonopsis elliptica, was found here that was not found at Natural Arch.

6. Route 751 roadsides

This 175 acre area contains several rare species that are typical of pine-savanna or other southern grasslands: Helianthus atrorubens, Agalinis decemloba, Aster concolor and Gymnopogon ambiguus (Fig. 10). Also, Lilium philadelphicum occurs on the roadside. It seems likely that these roadsides, mostly covered with native species, are relictual from some type of open grassy pine woods or "barrens" maintained by fire in the past (Appendix C/2B). Also, there is a natural pond with Carex joorii on the adjacent Curt Pond Ridge (Appendix C/5A). The Forest Service might consider establishing this area as an experimental demonstration project where a burning regime is implemented to create and maintain a pine savanna habitat. Such an effort it appears would be justifiable since these fire associated species now are clustered along the road right of way where artificial openings are maintained.

7. Big Lick Branch

This ravine area of 30 acres contains an old-growth hemlock stand dated "1820" by the U.S. Forest Service (Fig. 11). Features of interest in or near this stand (Appendix C/4A-6A) include Carex picta, C. scabrata, Panax quinquefolius, Eastern Wood Rat (Neotoma floridana magister) and Green Salamander (Aneides aeneus). Blackside Dace (Phoxinus cumberlandensis) occurs in lower portions of the creek.

8. Barnett Bend

This 30 acre area of limstone slopes and cliffs lies near the mouth of the small ravine opposite Barnett Bend on the Cumberland River (Fig. 12). Under the small waterfall is the only Adiantum capillus-veneris site on Forest Service land. The adjacent forested slopes nearby contain several other rare species, including Philadelphus hirsutus, P. inodorus, Cladrastis kentukea, Carya ovata var. australis [C. carolinae-septentrionalis], Triosteum angustifolium var. eamesii, and Lithospermum tuberosum (Appendix C/2C,3C,4C).

9. Lick Branch

This limestone area along the Cumberland River composed of 10 acres contains the only Thuja occidentalis found on Forest Service land in the Somerset District (Fig. 12). The Thuja population is relatively dense, covering approximately an acre. Some Philadelphus hirsutus and Cladrastis kentukea occur here, also (Appendix C/4C,3C).

10. Cain Branch

This area south of Cain Branch contains 40 acres and the only Pachistima canbyi site on Forest Service land in the Somerset District (Fig. 10). Additional rare species found in this area include Tragia urticifolia (first record for Kentucky), Sporobolus clandestinus, Ulmus serotina, Philadelphus hirsutus, Carya ovata var. australis [C. carolinae-septentrionalis] and Lithospermum tuberosum (Appendix C/1B,2C,3C,4C).

11. Cave Creek Cave System

This 200 acre area was previously part of a larger region evaluated for possible Wilderness Area designation but was not found to qualify (Fig. 13). Several rare bat species including Indiana Myotis (Myotis sodalis), Keen's Myotis (Myotis keenii), and Rafinesque's Big-eared Bat (Plecotus rafinesquii) are known to utilize caves in the area. In addition, Orconectes australis, a crayfish, and Eastern Wood Rat (Neotoma floridana magister) are present in this cave system. Several entrances are not presently owned by USFS. In the forest around some of the sinkholes, and nearby, there is Polemonium reptans var. villosum, Panax quinquefolius and Carex hirtifolia (Appendix C/4C).

12. Minton Hollow

This 120 acre area includes the Minton Hollow entrance to the Sloans Valley Cave system, presently the system's most important for rare bats, including Indiana Myotis (Myotis sodalis), Keen's Myotis (Myotis keenii), Gray Myotis (Myotis grisescens), and Rafinesque's Big-eared

Bat (Plecotus rafinesquii). In addition,. Orconectes australis, a crayfish, and Eastern Wood Rat (Neotoma floridana magister) are also present in this system (Fig. 10). The Minton Hollow entrance is not presently owned by USFS.

13. Ridges north of the Mouth of Beaver Creek

This large area apparently harbors the best population of Redcockaded Woodpeckers in the District, and it should be targeted by the U.S. Forest Service for intensive survey and management for this Endangered Species (Fig. 11). The area has apparently supported a population of woodpeckers for many years; this fact, along with its isolation and relatively large number of old-growth pine stands make it especially suitable for management of the species. This area should be intensively surveyed for Red-cockaded Woodpeckers and a long-term management plan established for recovery of the species in this area.

14. Cumberland River — Unimpounded portion:

Although the entire river valley, including adjacent ravines and ridges, has a general concentration of rare species, the main area of interest starts at the mouth of Rock Branch (approximately river mile 557.4) and extends upstream to just above Cumberland Falls (Fig. 14), and is, thus, largely contained within the Cumberland Wild River corridor. This area of more than 900 acres contains one of the highest concentrations of rare plants and animals in Kentucky. Current protection and management afforded this area by the U.S. Forest Service together with the regulations of the state Wild River and Kentucky State Parks will probably protect the rare species there except for approximately 1.2 mile segment from the northern terminus of the State Wild River Corridor downstream to Rock Branch. Rare species on the rocky banks upstream from Rock Branch include Clematis glaucophylla, Hypericum hypericoides, Malus angustifolia, Lathyrus palustris, Tephrosia spicata, Senecio pauperculus, Solidago spathulata, Aster laevis var. concinnus, a variety of Dichanthelium dichotomum [Panicum yadkinense], Stenenthium gramineum var. michanthum, Tripsacum dactyloides, Trachelospermum difforme, Wisteria frutescens and Catalpa bignonioides (if native). There is an old record of Podostemon ceratophyllum from near the Falls, and at the mouth of Eagle Creek there is a good population of Boykinia aconitifolia. In dry open woods just above the banks, Phaseolus polystachios, Eupatorium semiserratum and Astragalus canadensis are known from one site each. Adjacent slopes, up to the cliffline, have much old hemlock or beech forest, with Veratrum parviflorum, Carex scabrata, Scutellaria saxatilis, Oxalis monatana, Epilobium ciliatum, Panax spp., Erigeron pulchellus var. brauniae, Cystopteris fragilis var mackayi [C. tenuis] and much Eupatorium luciae-brauniae. Some of these rare species occur below the State Wild River Corridor, especially those typical of small tributary ravines and gullies cutting through the sandstone cliffline. On sandstone ridges adjacent

to the river valley, there are a few open rocky sites with Talinum teretifolium. Several species of rare freshwater mussels have been known historically from the Wild River section of the Cumberland River below the Falls. It is likely that some species still exist in the area although difficulty in sampling precluded confirmation.

15. **Cumberland River -- Sites along the clifflines on slopes above impounded portion from above mouth of the Laurel River to the mouth of the Rockcastle River:**

Downstream of the unimpounded portion of the Cumberland River, there are virtually no rare species present along the banks. However, Eupatorium luciae-brauniae and other species of interest were found along the cliffline at several sites (Fig. 15 A,B). Also, Epilobium ciliatum and much Oxalis montana occur at the mouth of Flat Branch (Fig. 15C).

16. **Rockcastle River Wild River**

This area corresponds to the 15.9 mile Rockcastle State Wild River corridor, which contains approximately 3500 acres (Fig. 16). It is also an extremely important area with many rare species, including several not shared with the mainstem of the Cumberland River. Rare species on the rocky banks from "The Narrows" to Long Point include Spiraea corymbosa, Baptisia australis, Ceanothus herbaceus, Vitis rupestris, Solidago spathulata, S. uliginosa, S. speciosa, Aster laevis var. concinnus, Aster sp. nov., Carex stricta and a variety of Dichanthelium dichotomum [Panicum yadkinense]. Podostemon ceratophyllum is known from lower Cane Creek. On adjacent forested bottoms, slopes and mouths of tributary ravines, there are Cypripedium kentuckiense, Polemonium reptans var. villosum, Aconitum uncinatum, Erigeron pulchellus var. brauniae, Synandra hispidula, Panax spp., Cardamine rotundifolia, Oxalis montana, Scutellaria serrata and some rare sedges. The Green Salamander (Aneides aeneus) was located at one site along the bluffs above the river. Rare aquatic species are also present in the river including Villosa trabalis and Etheostoma cinereum which were both located during this inventory.

17. **Beaver Creek Wilderness Area**

Although already protected below the cliffline, there are several adjacent areas with rare species not represented within the Wilderness Area (Fig. 17). The biological features of the area should be noted for continued monitoring, in case of external disturbance (especially water quality), and as a reference for comparison with more disturbed areas elsewhere. This large area deserves much more exploration than was possible in this study. As already noted, the adjacent Grassy Gap Ridge has several rare species in openings, some of which occur elsewhere just outside the Wilderness Area boundaries. On some of the narrow promontories from the main ridges, there are particularly large

patches of Gaylussacia brachycera, and on a nearby ridge, Cleistis divaricata (Appendix C/2A-3A). There are at least two colonies of Red-cockaded Woodpeckers (Picoides borealis) present above the cliffs, also. Along the sandstone clifflines and outcrops, there are Green Salamanders (Aneides aeneus). On slopes below the cliffs, especially the ravines with old-growth hemlock, several rare species can be expected. On slopes Poa alsodes, Carex picta and other rare sedges were found, and on a terrace Anemone quinquefolia. On the wet banks of Hurricane Fork, Cardamine rotundifolia was found. The mainstem and several tributaries harbor good populations of Phoxinus cumberlandensis. The mouth of Beaver Creek, below the Wilderness Area, has limestone areas with Viola tripartita, Hydrastis canadensis, Cirsium carolinianum and Lithospermum tuberosum. The old-growth (>100 years) stands in the Wilderness Area deserve further study from a general ecological perspective to determine how well they represent the region's primeval forests, and to see how much other old-growth outside the Wilderness Area is needed to preserve representatives of all forest types present on the Forest.

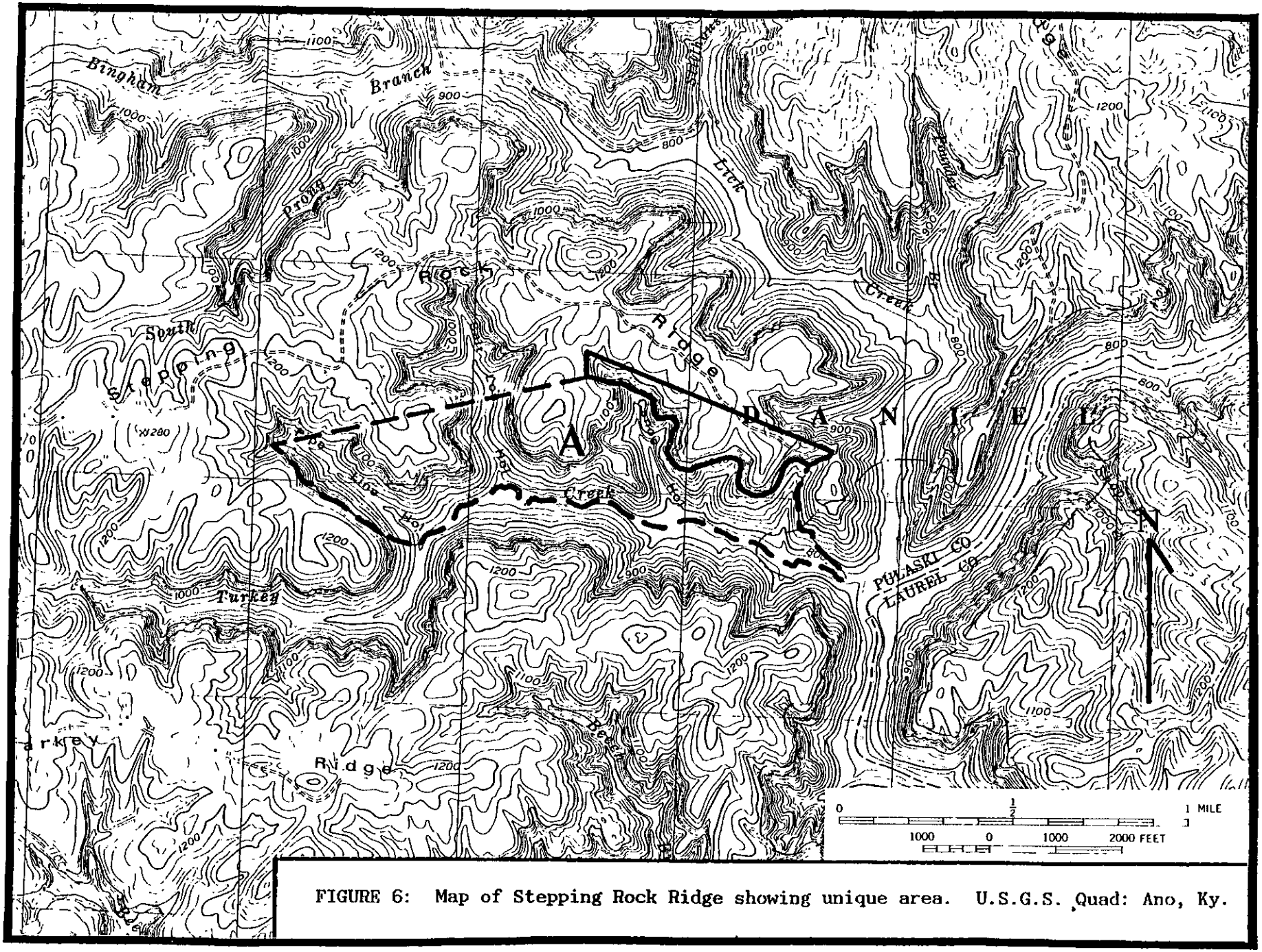


FIGURE 6: Map of Stepping Rock Ridge showing unique area. U.S.G.S. Quad: Ano, Ky.

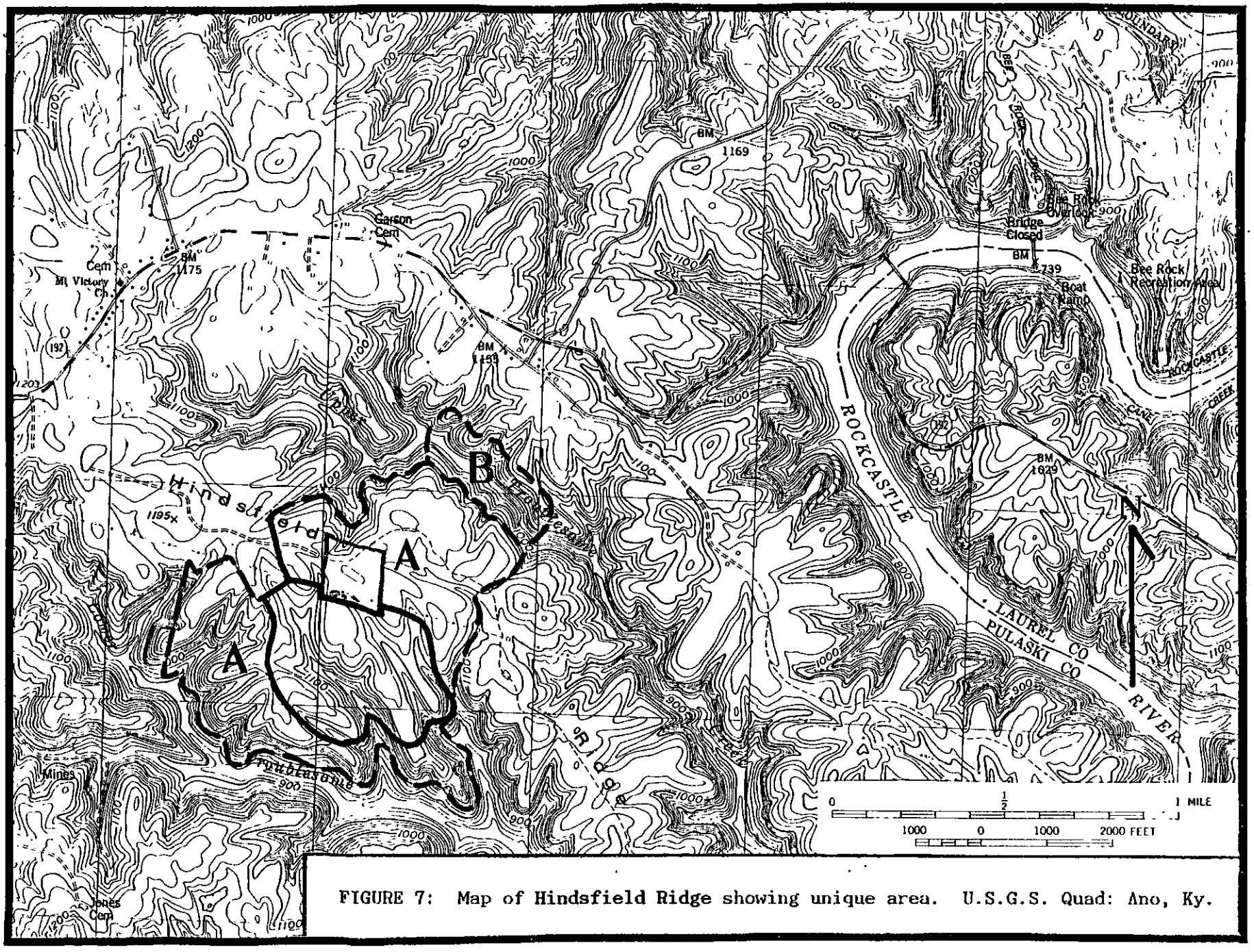


FIGURE 7: Map of Hindsfield Ridge showing unique area. U.S.G.S. Quad: Ano, Ky.

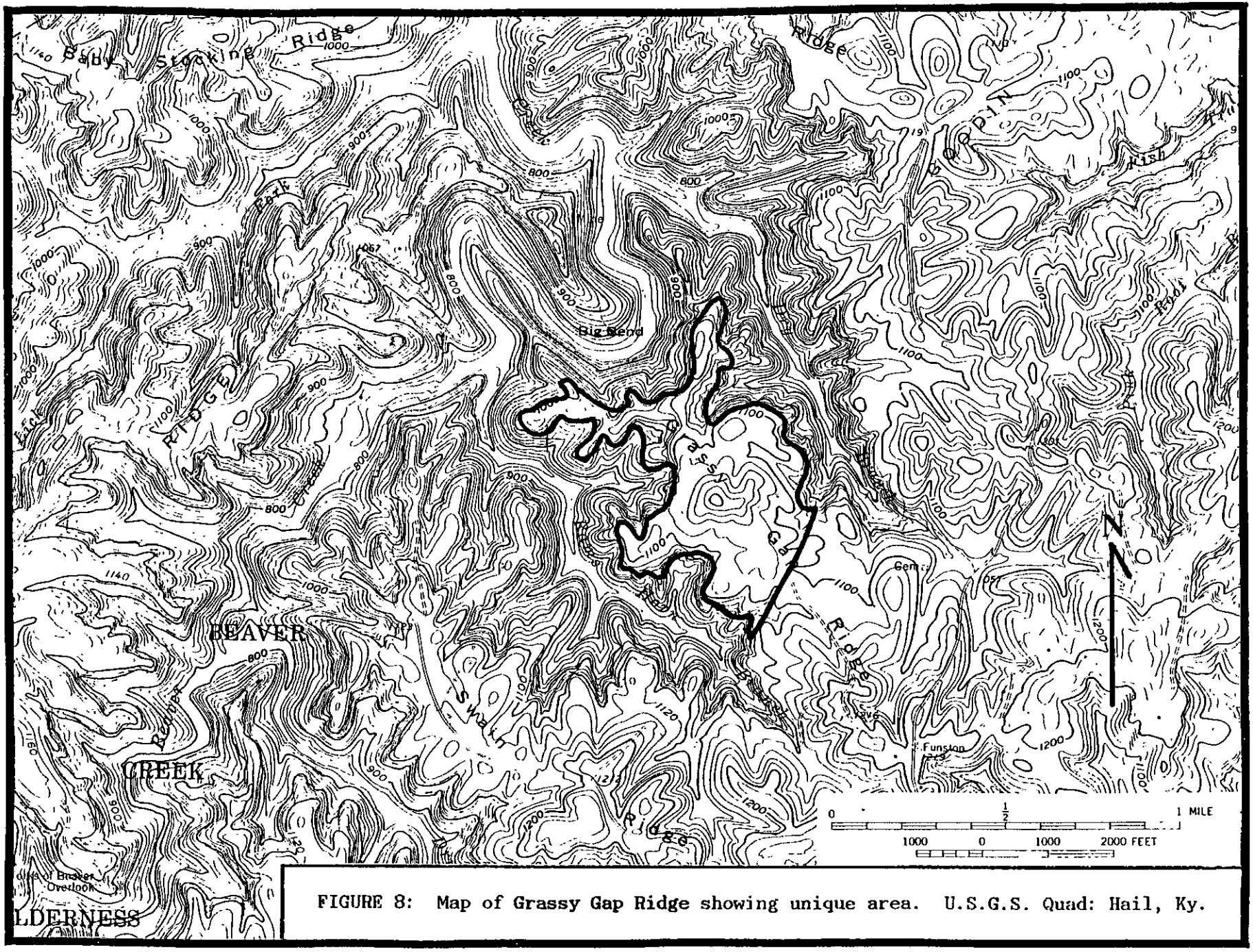


FIGURE 8: Map of Grassy Gap Ridge showing unique area. U.S.G.S. Quad: Hail, Ky.

FIGURE 9: Map of A) the area surrounding Natural Arch and B) the area surrounding the Dumpling Rocks showing unique areas. U.S.G.S. Quad: Nevelsville, Ky.

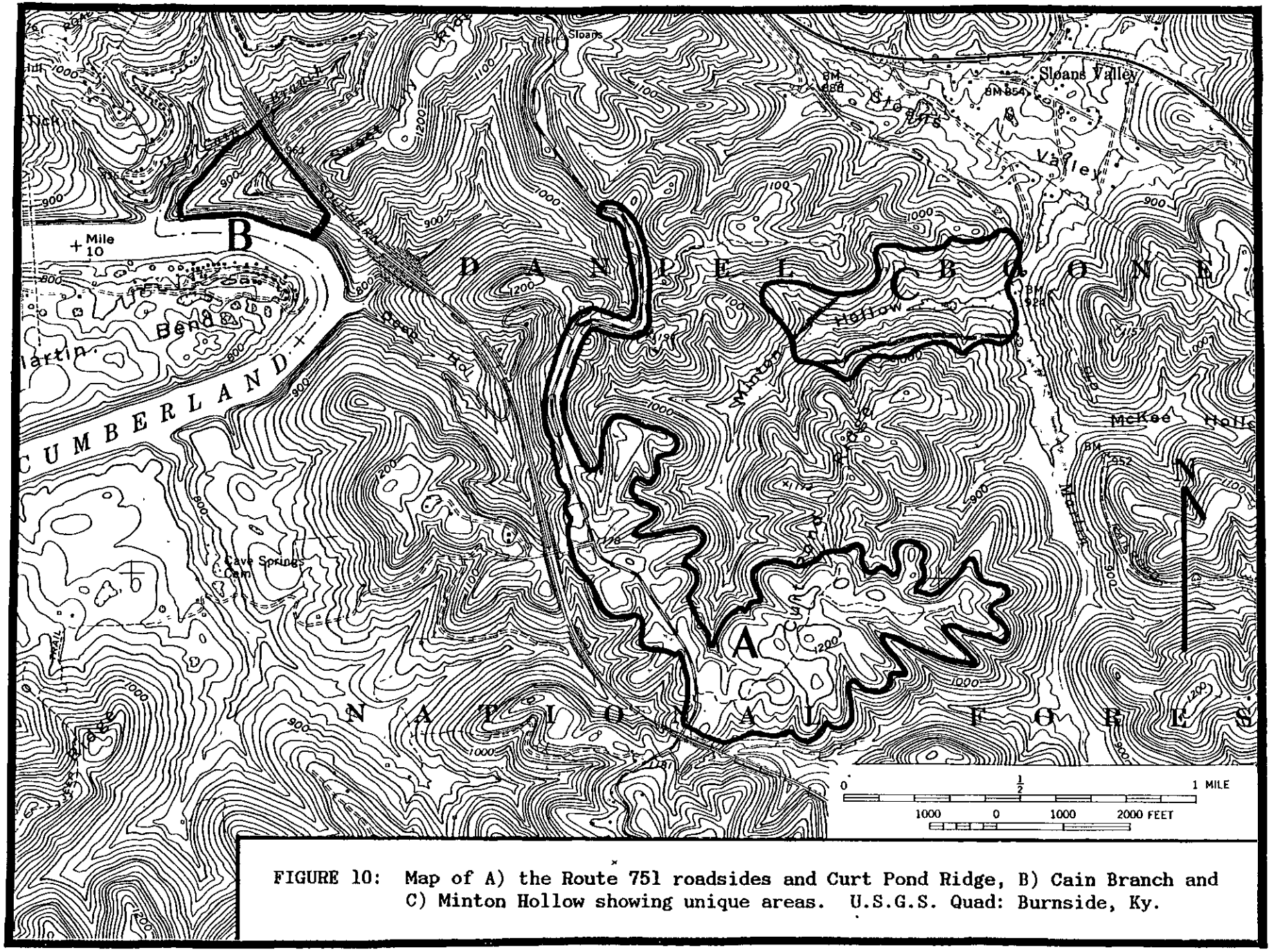


FIGURE 10: Map of A) the Route 751 roadsides and Curt Pond Ridge, B) Cain Branch and C) Minton Hollow showing unique areas. U.S.G.S. Quad: Burnside, Ky.

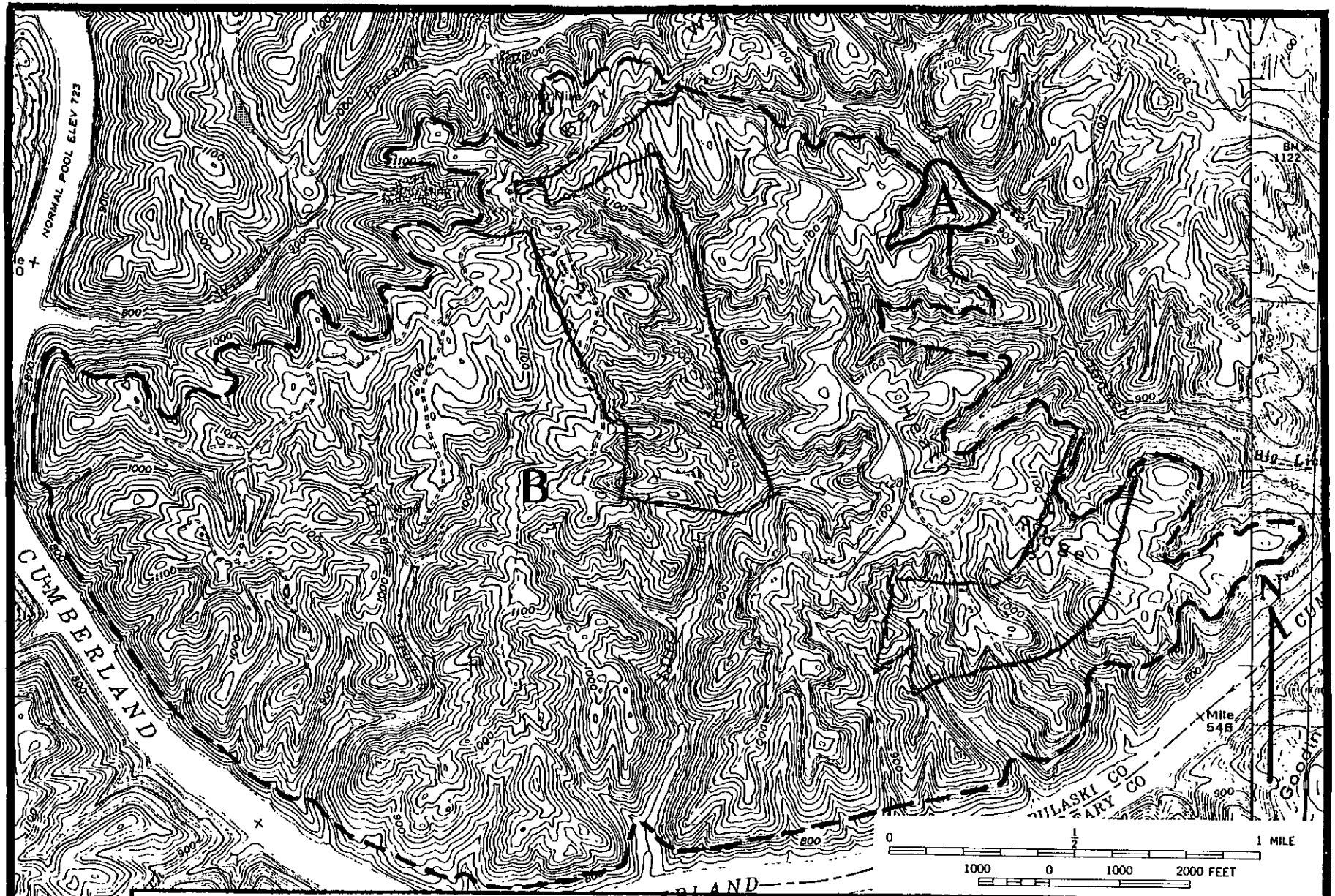


FIGURE 11: Map of A) Big Lick Branch, and B) ridges north of the mouth of Beaver Creek showing unique areas. U.S.G.S. Quad: Hail, Ky.

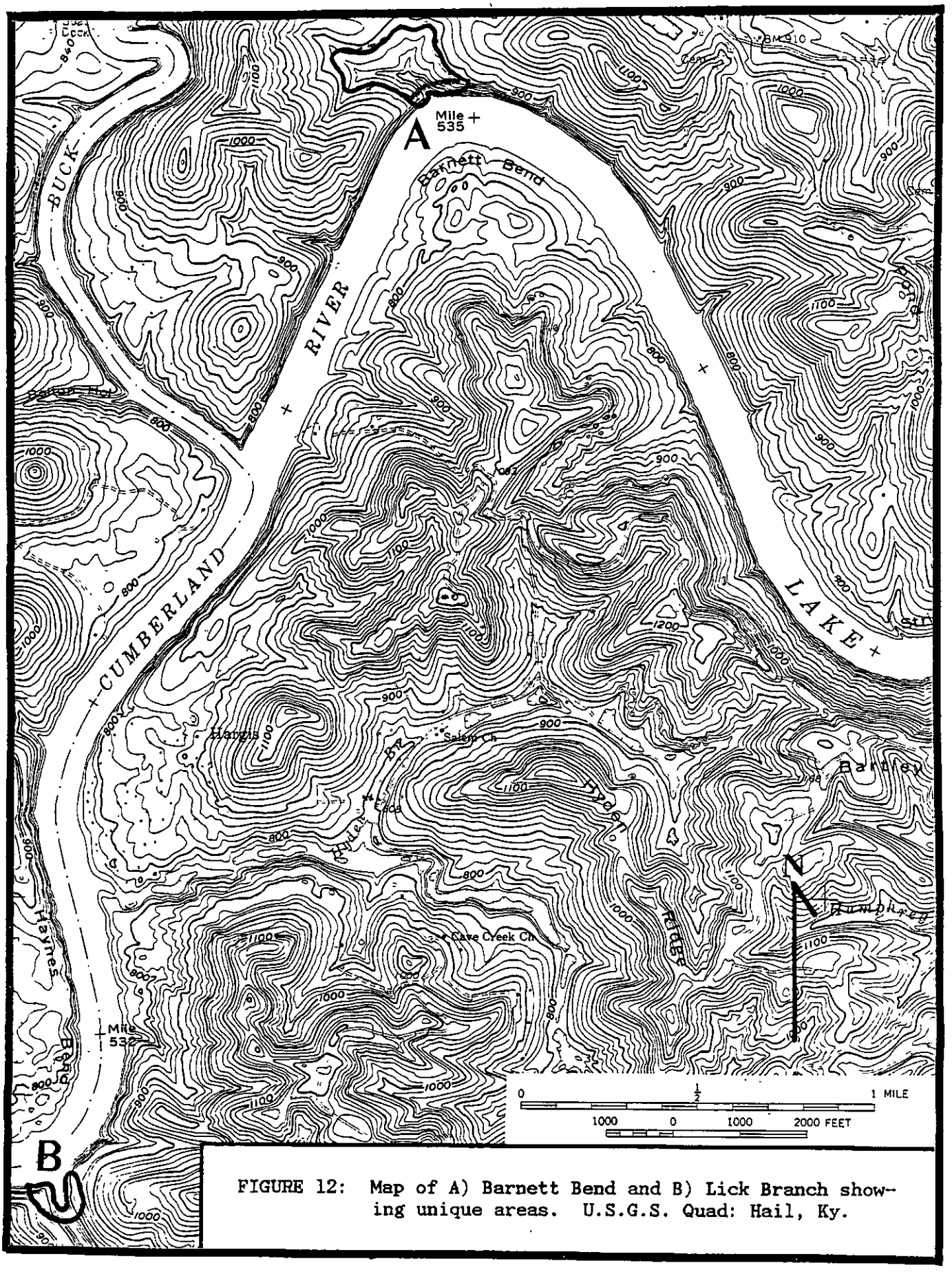


FIGURE 12: Map of A) Barnett Bend and B) Lick Branch showing unique areas. U.S.G.S. Quad: Hail, Ky.

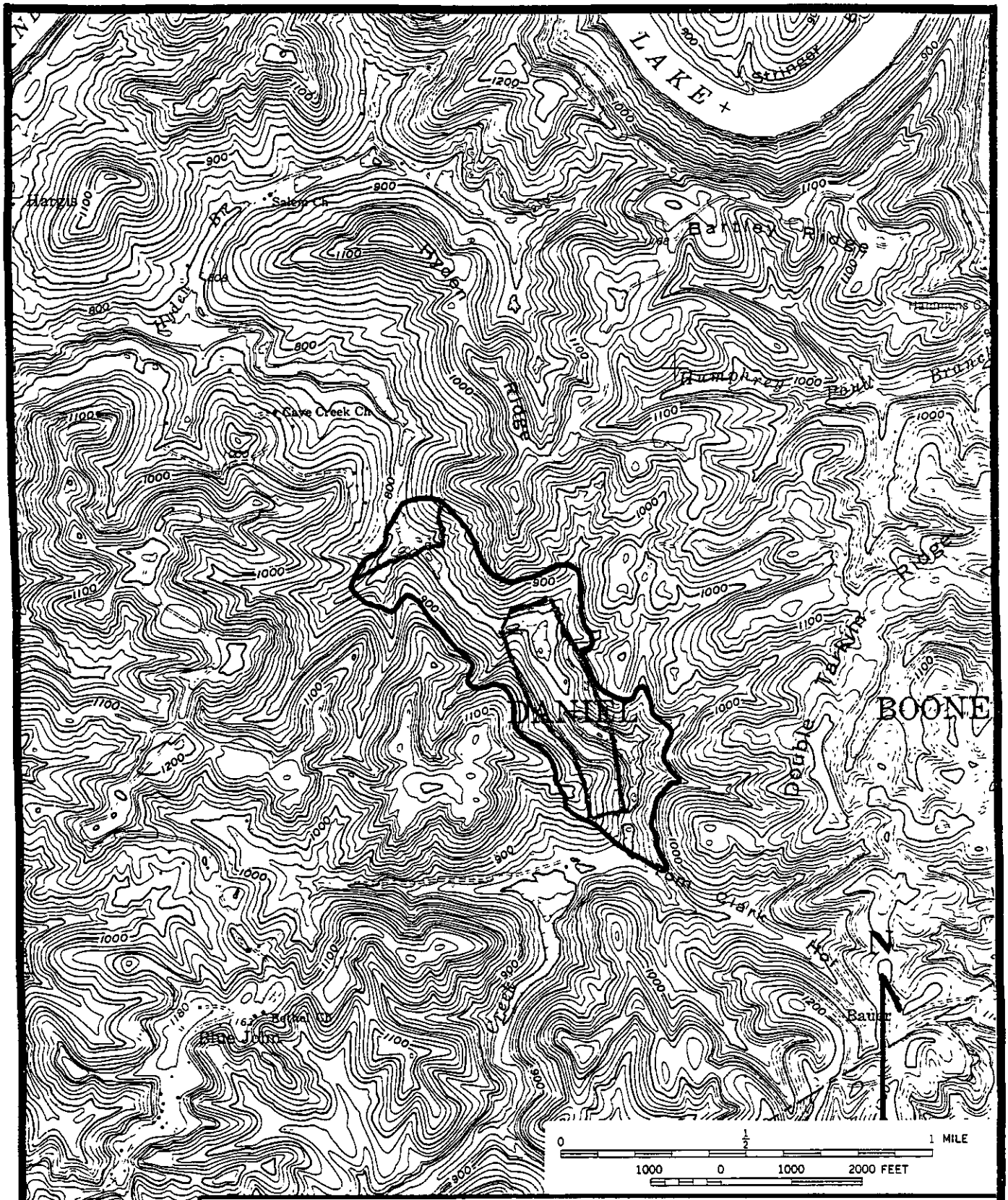


FIGURE 13: Map of Cave Creek Hollow showing unique area. U.S.G.S. Quad: Hail, Ky.

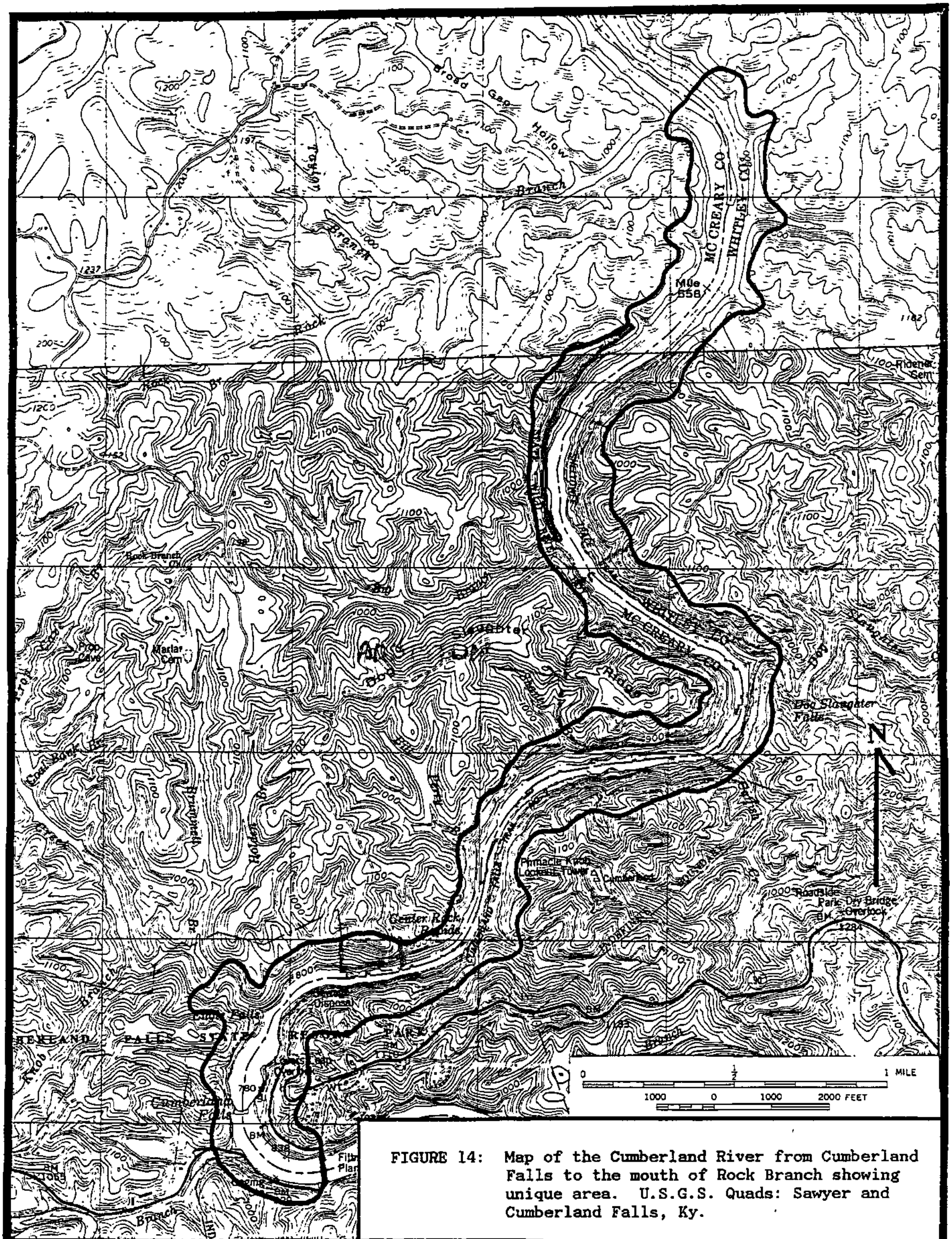


FIGURE 14: Map of the Cumberland River from Cumberland Falls to the mouth of Rock Branch showing unique area. U.S.G.S. Quads: Sawyer and Cumberland Falls, Ky.

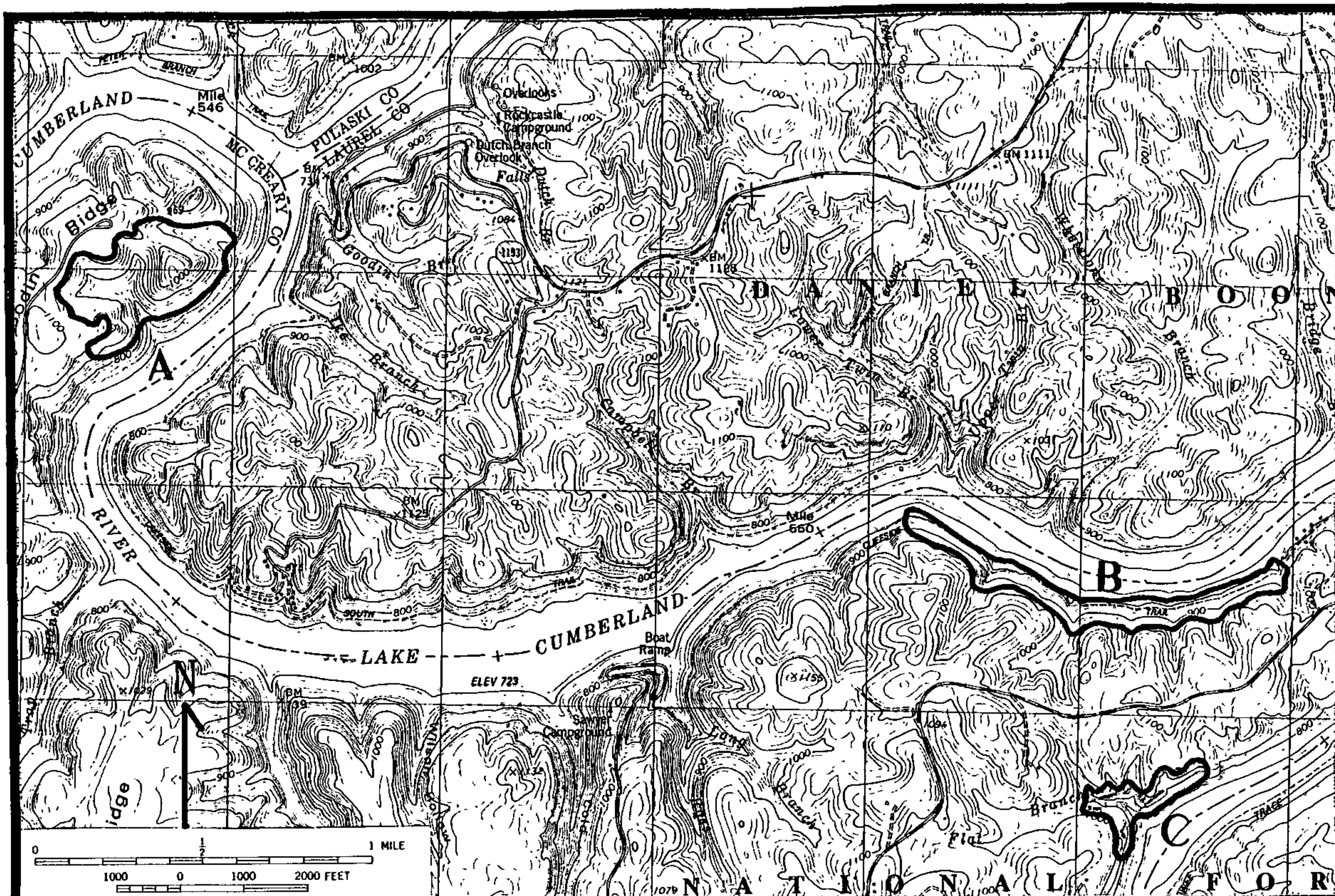


FIGURE 15: Map of the Cumberland River from above the mouth of the Laurel River to the mouth of the Rockcastle River showing unique areas: A) and B) sandstone rockhouses above the Cumberland River, C) mouth of Flat Branch. U.S.G.S. Quad: Sawyer, Ky.

FIGURE 16: Map of the Rockcastle River Wild River, from Long Point to Bee Rock, showing diverse associa habitat. U.S.G.S. Quad: Ano, Ky.

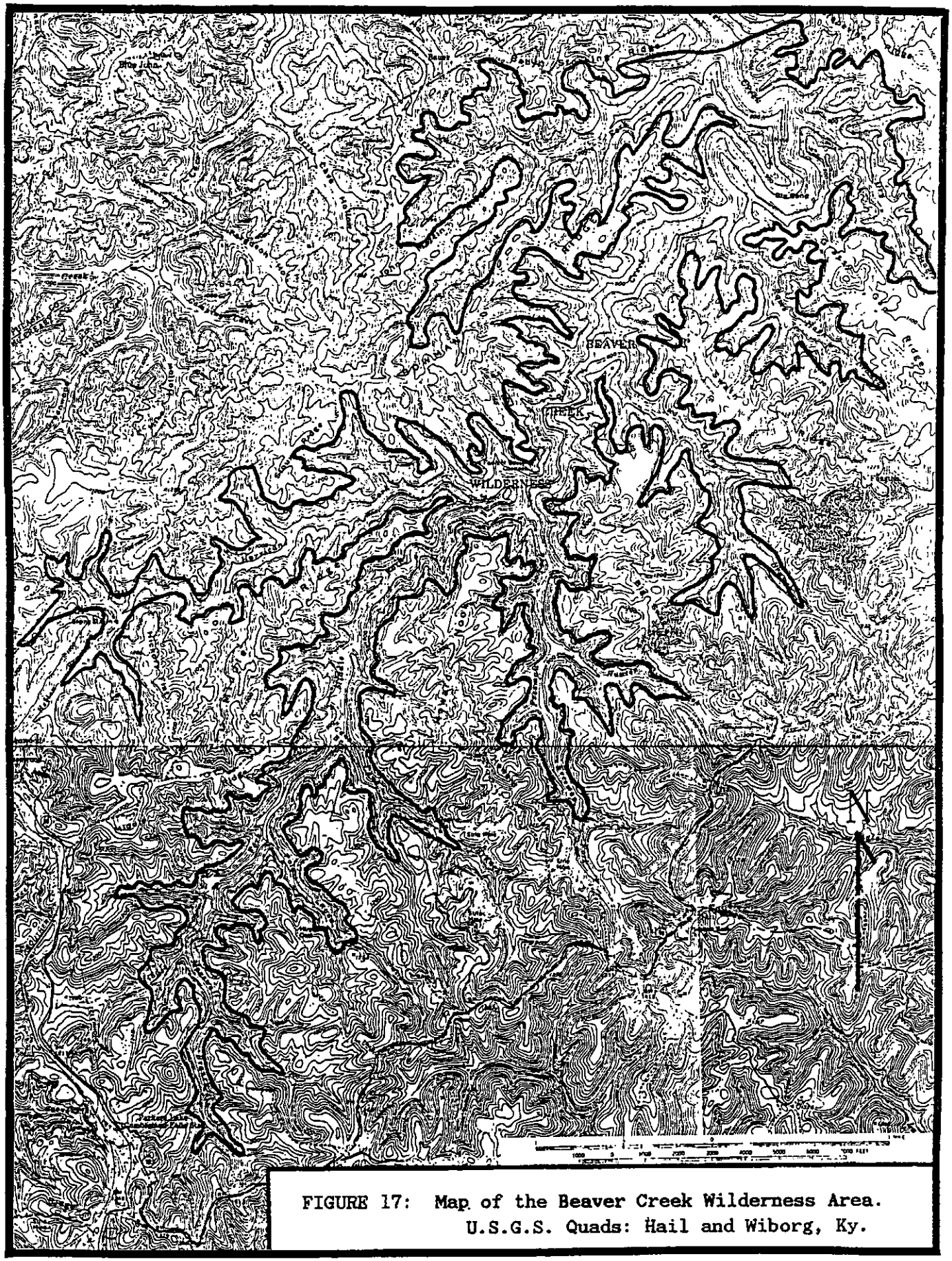


FIGURE 17: Map of the Beaver Creek Wilderness Area.
U.S.G.S. Quads: Hail and Wiborg, Ky.

SUMMARY

The results of the Cooperative Inventory of Endangered, Threatened, Sensitive and Rare Species in the Daniel Boone National Forest, which are summarized in this report, have greatly enriched the knowledge of rare flora, fauna and natural communities in the southern portion of the Daniel Boone National Forest. Information provided by the report will assist Daniel Boone National Forest staff in making wise protection and management decisions.

Generally, the Inventory of Endangered, Threatened, Sensitive and Rare Species on the Somerset Ranger District was considered a great success. Nearly 300 occurrences of rare plants and animals were discovered, multiplying the known occurrences of these species in the Somerset District fourfold. While new animal records were few in number, two new rare species were added to the fauna known from the Somerset District. In contrast, many new rare plant species were recorded on the District for the first time, including at least a dozen additions to the state flora and two species which appear to be previously unknown to science. In addition, much information was obtained for a number of other species of interest, e.g. those species not presently listed, but which are in need of further study and consideration for listing by KAS-KNPC. Also, the first detailed summary of the natural vegetation types in the Somerset District was compiled. This summary will be a useful tool in management planning for rare plant communities.

The inventory has been an excellent opportunity to combine the expertise and resources of several conservation agencies, forming a partnership that greatly multiplied actual dollars invested. It is estimated that less than 1% of the Commonwealth's land remains in a relatively undisturbed condition. Creative partnerships of public and private conservation agencies have a great opportunity, and responsibility, to safeguard Kentucky's remaining natural treasures through cooperative ventures such as this inventory.

It is hoped that the effort to cooperatively inventory the Daniel Boone National Forest will be an ongoing one. Continued support, both in funds and in-kind services, will help clarify the status of the Forest's unique species and natural communities, and will contribute to Forest Service efforts to protect and provide for unique natural resources for all publics.

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APPENDIX A

ANNOTATED FLORISTIC LIST

AN ANNOTATED LIST OF VASCULAR PLANTS FOUND IN AND NEAR THE SOMERSET DISTRICT

This list is largely based on the Somerset District Inventory of 1987, plus a few records from other recent work in the area, but excluding data of E.L. Braun and others before 1950. Note: this list does not cover disturbed agricultural, roadside or urban habitats as thoroughly as more natural vegetation.

Species. Nomenclature generally follows Kartesz & Kartesz (1980, and unpublished update), though with several exceptions. Asterisks (*) indicate cases where recent treatments differ from each other (including Fernald 1950, and other commonly used floras). Common synonyms are generally shown in parentheses, with commonly used segregate genera inserted between genus and species, and misapplied names shown in quotation marks ("...").

County. M = McCreary; P = Pulaski; W = Whitley; L = Laurel.
Dots following each of these county symbols indicate that there is a collection with Max E. Medley at University of Louisville (upper dots) or with Julian J.N. Campbell at University of Kentucky (lower dots). These collections have not been completely processed as of February, 1988, and a revised version of this list may be issued in the future. Counties without dots should be treated as sight records in the meantime.

Frequency.. This is the number of localities where each species was observed (largely data of J.J.N.C.); most localities were covered by a field-trip ranging from about one to six hours. Following these numbers, "f" indicates that the species is only identifiable in flower or fruit, for a minor portion of the growing season, and "F" indicates that it is identifiable only for about a month. In these cases, frequencies are under-estimates. With a total of about 80 localities, a frequency of 25-50 or more generally suggests "abundant"; 10-25 suggests "common"; 5-10 suggests "occasional"; and less than 5 suggests "uncommon". The "D" or "R" symbols indicate species which are generally "dominant" or "rare" within the areas where they occur, with "d" or "r" indicating less consistent trends.

Mississippian. Under this column is shown the frequency (as defined above) in the subset of areas with Mississippian bedrock, which are at least partially calcareous. About a third of the areas visited were Mississippian. Overall concentration on base-rich or acid soils is indicated by "B" or "A", with less pronounced trends suggested by "b" or "a".

Habitat. Typical moisture-regimes are coded as follows (see also Appendix C):
1 = grassy rock outcrops too dry for trees;
2 = dry evergreen forest of pine or red cedar, or nearby clearings;
3 = dry to moist forest of oaks or other ring-porous trees, or nearby clearings;
4 = moist (mesophytic) forest of hemlock, beech, etc, or nearby clearings;
5 = seasonally wet forest of stream-heads and terraces, or nearby clearings;
6 = forested banks of watercourses and seeps, or nearby clearings;
7 = rocky banks of rivers and major creeks, with grassy to shrubby vegetation.
Other symbols are as follows (lower cases indicate weaker concentrations):
O = mostly on rock outcrops; U = mostly under overhangs or in rockhouses;
W = mostly rooted in soil that is below water for much of the year.

Open. ** indicates concentration in full sun; * in partial sun.

Exotic. "E" = not native to North America;
"e" = native to North America, but probably not to this region.

Species	County	Frequ.	Miss.	Habitat	Open	Ex.
Acalypha rhomboidea	M°P W°	4	1	3-4	**	
Acalypha virginica	M P.	7	4	3-4	**	
Acer negundo	M P L	8 d	2 b	6		
Acer rubrum var. rubrum	M°P W L	49 d	9 a	3-2		
Acer rubrum var. trilobum	M°P° L	8 D	0 A	5		
Acer saccharinum	M P W L	16 D	6	6		
Acer saccharum var. s.	M P W L	46 D	21 b	4		
Acer spicatum	P	1 R	1	4u		
Achillea millefolium	M P	11	2	3-4	**	
Actaea alba	M P	15	2 a	4		
Adiantum capillus-veneris	P:	3	3 B	6-40	*	
Adiantum pedatum var. p.	M°P L	30	8 b	4		
Aesculus flava* (octandra)	M P	23	15 b	4		
Agalinis* decemloba (G. obtusifolia)	P.	1 f	0 A	2-3	**	
Agalinis* tenuifolia v.t. (Gerardia t.)	M°P° L°	6	2	1-3	**	
Agalinis* purpurea (Gerardia p.)	W°	1	0	7	**	
Agrimonia parviflora	M P L°	10	0 a	5	*	
Agrimonia pubescens	M°P:	18	9 b	3		
Agrimonia rostellata	M.P.	17	11 b	4		
Agrostis perennans	M.P. L	29 f	4 a	3-4	*	
Agrostis stolonifera var. major (A. gigantea)	M.P	7 f	2	4-3	**	E
Ailanthus altissima	M P	8	4 b	3-4	*	E
Albizzia julibrissin	M°P	6 r	4	3/7	*	E
Aletris farinosa	M°P:	15 d	0 A	2-3	**	
Alisma subcordatum	M P	5	1	5-6W	**	
Allium canadense var. c.	P° L°	4 f	0	6		
Allium cernuum	M P	6	6 B	1-2	*	
Allium vineale	M P	3	1	4	**	E
Alnus serrulata	M P W L	17 D	2 A	7-5	*	
Ambrosia artemisiifolia var. elatior	M P	21	6	4-2	**	
Ambrosia trifida var. t.	M P L	17 d	6	6-4	**	
Amelanchier arborea var. a.	M:P	37	13	2-3		
Amorpha fruticosa var. f.	M:P°	5	1	6-7	**	
Ampelopsis cordata	P	2	2 B	4-6	*	
Amphicarpa bracteata var. b.	M P	32 d	8	4-6	*	
Amphicarpa bracteata var. comosa	M°	1 d	0	4-6	*	
Andropogon (Schizochyrium) scoparius	M P W°L°	42 D	12	1-3/7	**	
Andropogon gerardii (furcatus)	M°P°W°L	25 D	8	7/3	**	
Andropogon glomeratus var. hirsutior*	L:	1	0 a	3	**	
Andropogon gyrans* ("elliottii")	P.	1 f	0	2	**	
Andropogon ternarius	M.P°	3 f	0 A	1-3	**	
Andropogon virginicus var. v.	M°P	22 f D	4	2-4	**	
Anemone quinquefolia (var. q.?)	M	2	0 A	4-6		
Anemone virginiana var. v.	M P W	27	12	3-4	*	
Anemonella thalictroides	M P	12 f	2	4-3		
Angelica venenosa	M P°W°	16	2 A	3	*	
Antennaria plantaginifolia	M P	14 d	5	3-2	*	
Antennaria solitaria	M P°	2 f	1	3	*	
Anthemis cotula	M°	1	0	3-2	**	E
Anthoxanthum odoratum	P°	1 f r	0	6	**	E
Apios americana var. a.	M°P°W°L	21 d	1 A	6	*	
Aplectrum hyemale	M P°	6	3	4		
Apocynum cannabinum	M°P L	20 D	7	3-4/7	**	
Aquilegia canadensis	M P	19 d	3	3-4ou		
Arabis laevigata	P°	10	8 b	3o		
Aralia racemosa	M P°	5 R	0 a	4		

Species	County	Frequ.	Miss.	Habitat	Open	Ex.
Aralia spinosa	M•P	22	1 A	3-5	*	
Arapidopsis thaliana	P.	1 f	0 A	3-4U		E
Arctium minus	M	1	0	4	**	E
Arenaria (Minuartia) glabra*	M•P•	4	0 A	1-2r	**	
Arenaria (Minuartia) patula	M P•	6	6 B	1-2r	**	
Arisaema dracontium	M P	5 r	2 b	4-6		
Arisaema triphyllum var. t.	M•P•	26	5	4		
Aristida dichotoma	M:P•	4 f	0 A	2-3	**	
Aristida longespica	P•	1 f	0 A	2-3	**	
Aristida purpurascens var. virgata	P•	1 f	0	2-3	**	
Aristolochia macrophylla* (durior)	M•P	8 r	7 B	4-6	*	
Aristolochia serpentaria	M•P L•	18 r	5 a	3		
Aronia arbutifolia	M:P:	10 d	0 A	1/5-6	*	
Aronia cf. arbutifolia x melanocarpa	M•	4	0 A	1-2/6	*	
Aronia melanocarpa	M•P W	9 d	0 A	1/5-6	*	
Arthraxon hispidus	M•P W•L•	4	0	7	*	E
Aruncus dioicus	M P.W•L	10	3	4-6	*	
Arundinaria gigantea var. g.	M.P W L	37 D	19 b	6	*	
Asarum canadense	M P•	19 d	8 b	4		
Asclepias amplexicaulis	M•P L•	12	0 A	3	**	
Asclepias exaltata	W•	1	0	3	**	
Asclepias incarnata	M	2	0	6	*	
Asclepias quadrifolia	P.	4 f	4 B	3		
Asclepias syriaca	P L	6	4 b	3-4	**	
Asclepias tuberosa	M P•	9	3	3	**	
Asclepias variegata	M:P.	15	0 A	3	*	
Asclepias verticillata	P:	3 R	3 B	1-3	**	
Asclepias viridiflora	P:	2 R	2 B	1-3	**	
Asimina triloba	M P L	38 d	12	4-6	*	
Asplenium bradleyi	M•	1	0 A	20		
Asplenium cf. rhizophyllum x bradleyi	M•	1	0 AO	3-2	*	
Asplenium montanum	M:P.	16	0 A	3-40		
Asplenium pinnatifidum	M	2	0 A	3-40		
Asplenium pinnatifidum x montanum (X trudellii)	M•	2	0 A	3-40		
Asplenium platyneuron var. bacculum-rubrum	P	1	0 a	3	*	
Asplenium platyneuron var. p.	M•P• L	26 d	12	2-3	*	
Asplenium resiliens	M•P•	5 r	4 B	2-30		
Asplenium rhizophyllum	M•P• L	19	8 b	40		
Asplenium ruta-muraria var. cryptolepis	P•	7	7 B	20		
Asplenium ruta-muraria var. ohionis	M•	1	0 BO	1-2	*	
Asplenium trichomanes	M:	2 R	0 A	3u		
Aster cf. schreberi	P:	3 d	3 B	4		
Aster cf. simplex var. s.	M P L:	8	2	6	**	
Aster cf. tradescanti (dumosus var. strictior)	P•	1	0	7	**	
Aster cf. vimineus var. subdumosus	P:	1 f	0	6w	**	
Aster concolor	P:	3 d	0 A	2-3	**	
Aster cordifolius	M P: L•	14 d	9 b	4-6		
Aster divaricatus	M P:W•L•	29 D	6	4		
Aster dumosus (var. coridifolius)	M•P:W•L	25 d	3 a	2-4	**	
Aster infirmus	M•P	14	6	3	*	
Aster laevis var. concinnus	P:W•L:	5	0 A	7	**	
Aster laevis var. laevis	P: L•	12 d	10 B	1-3	*	
Aster lateriflorus var. l.	M P. L	25	6	3-4	*	
Aster linariifolius	M P• L•	14 d	1 A	2-1	**	

Species	County	Frequ.	Miss.	Habitat	Open	Ex.
Aster macrophyllus	M P L•	8 d	3	4-3		
Aster novae-angliae	P•	2	2 B	3	**	
Aster oblongifolius	P	8 D	8 B	1-2	**	
Aster ontarionis	M P: L•	20 d	9 b	6-5	*	
Aster patens var. patens	M•P: L•	33 D	8 a	2-3	**	
Aster patens var. phlogifolius	P.	1	1 b	3-4	*	
Aster paternus (Sericocarpus asteroides)	M•P W•	14 f	1 A	3-2	*	
Aster paternus x solidagineus	W•	1 r	0 A	3-2	*	
Aster pilosus var. demotus	M:	1	0 a	3	**	
Aster pilosus var. p.	M P L•	18 D	7	3-4	**	
Aster prenanthoides	M P: L•	9 d	4 b	6-4		
Aster sagittifolius	P:	3	3 B	3	*	
Aster shortii	M P:	14 d	14 B	3		
Aster solidagineus (Sericocarpus linifolius)	M.P W•	5 f	0 A	2-3	**	
Aster sp. nov. (aff. radula)	P: L:	2 f d	0 a	7	*	
Aster surculosus	M•P	21 D	0 A	1-3	**	
Aster umbellatus var. u.	M•P• L•	11 d	0 A	5-6	*	
Aster undulatus	M•P:	23 d	4 a	3	*	
Athyrium asplenioides*	M P	21 d	0 A	4-5		
Athyrium* (Deparia) thelypteroides	M•P L	17	2 a	4		
Athyrium* (Diplazium) pyncocarpon	M•P L•	7	0	4		
Aureolaria cf. flava	M P	2	2 B	2-3		
Aureolaria laevigata	M•P• L	22	3 A	3		
Aureolaria patula	P•	2	2 B	3	*	
Aureolaria virginica	M•P	12	6	3		
Baptisia australis var. a.	P• L•	7 D	1 a	7	**	
Barbarea vulgaris	M P	3	1	3-4	**	E
Bartonia paniculata	M•P	2 f r	0 A	4-6w		
Betula allegheniensis* (lutea) var. a.	P M L	17 d	1 A	4-5		
Betula lenta	M•P	30 d	2 A	4-3		
Betula nigra	M P•W L	22 D	3 A	6w	*	
Bidens aristosa	P.	2	1	3	**	
Bidens bipinnata	M P.	3	2 b	3	**	
Bidens comosa	M P.	7	2	6-5w		
Bidens frondosa	M: P. W• L•	22	6	5-6w	**	
Bidens polylepis	M: P. W•	9 f D	3	3-6w	**	
Bidens tripartita (sensu stricto)	P.	1 r	0	6w		
Bignonia* (Anisostichus) capreolata	M P•	33	15 b	3-4	*	
Blephilia ciliata	P	7 d	7 B	3	*	
Blephilia hirsuta	P	2	2 B	4-6		
Boehmeria cylindrica	M P L	38 d	11	6-5w	*	
Botrychium dissectum var. obliquum	M•P	9	0	3-4		
Botrychium virginianum	M P	24	9 b	4		
Boykinia aconitifolia	M•	1 d	0 A	6ow		
Brachyelytrum erectum	M P L	33 D	9	3-4		
Brasenia schreberi	M•	2	0 A	5W		
Brickellia (Kuhnia) eupatorioides v.e.	P:	6	5 b	3-1	**	
Bromus altissimus* ("purgans")	M P	15	14 B	3		
Bromus inermis	P•	1	1 B	3-2	*	E
Bromus japonicus	M P.	7 f	5 B	2-3u	**	E
Bulbostylis capillaris	P•	1 f	0 A	2	**	
Cacalia atriplicifolia	M P W•	24	7	4-3		
Cacalia muhlenbergii	P. L	2 R	1	4-6		
Calamagrostis cinnoides	M: P: L:	10 f d	0 A	5	*	

Species	County	Frequ.	Miss.	Habitat	Open	Ex.
Calycanthus floridus var. glaucus	W°	1	0	6-4		
Campanula americana	M.P	3	0 b	4		
Campanula divaricata	M.P W°	13	0 A	4-30		
Campsis radicans	M P L	17 d	8 b	3-4/7	*	
Cardamine bulbosa		1	0	7	*	
Cardamine hirsuta	M P L°	3 f	1	3-4	**	E
Cardamine pensylvanica	M.P:	8 f	0 a?	6u	*	
Cardamine rotundifolia	M P°	2 r	0 A	6w		
Carex albursina* (laxiflora var. latifolia)	P:	3	2 b	4		
Carex amphibola (vars. a. + rigida)	M:P: L	9 f	2	4-6	*	
Carex amphibola var. grisea*	P°	1 f	0	4		
Carex annectans	M.	1 f	1	3 ?	**	
Carex artitecta* (nigro-marginata var. muhlenbergii)	M:P: L°	10 f D	4	2-3/7	*	
Carex blanda* (laxiflora var. b.)	M P°	12 f	5 b	4-6	*	
Carex bromoides	M P	2 d	0 A	5-6	**	
Carex careyana	P:	1 f	1 B	4		
Carex cephalophora	M P:	10 f	4	3-2	*	
Carex cf. festucacea	P.	1	0 a	5	*	
Carex cf. projecta	M.P.	5 f d	1	6	*	
Carex communis	M:P:	5 f	1 a	4-6		
Carex complanata var. complanata	M:P°	6 f	2	3-5	*	
Carex complanata var. hirsuta (C. hirsutella)	M:P:	9 f	4 b	3-5	*	
Carex crinita var. c.	M°P W	8 f d	0 A	5-6	*	
Carex debilis var. pubera	P°	1 f	0 A	6	*	
Carex debilis var. rudgei	M:P:	12 f d	0 A	5-4		
Carex digitalis	M:P: L°	17 f d	6	3		
Carex eburnea	P	11 D	11 B	1-2	*	
Carex frankii	P° L°	3 f	1	5-6	**	
Carex glaucodea	M°P:	3	0 A	3-5	*	
Carex gracilescens* (laxiflora var. gracillima)	P:	5 f	1	4-6?		
Carex gracillima	M:P:	9 f d	0 A	4-6		
Carex grayii	M.	1 f	0 A	6		
Carex hirtifolia	P:	1	1 B	3-4 ?		
Carex intumescens	M:P:	6 f	0 A	5-6		
Carex jamesii	P:	2 f d	1 b	4-6	*	
Carex joorii	M:P°	2 f D	0 A	5W	*	
Carex laxiculmis	M:P:	4 f	0 A	4		
Carex laxiflora* (laxiflora var. l.)	M:P:	16 f	3	4		
Carex lucorum* (pensylvanica var. distans)	M.P.	3 f	0 A	3-4		
Carex lupulina	P.W.	2 f	0	5-7w	**	
Carex lurida	M:P: L°	25 f D	2 a	6-5w	*	
Carex muhlenbergii var. m.	P:	1 f	1	3	**	
Carex oligocarpa	P:	2 f	2 B	4	*	
Carex pensylvanica (var. p.)	M.P:	10 f D	5	3-4		
Carex picta	M:P:	7 D	0 A	3		
Carex plantaginea	M:P L	14	0 A	4		
Carex platyphylla	M P:	7	4 b	3-4		
Carex prasina	M:P:	10 f D	0 A	6	*	
Carex purpurifera* (laxiflora var. p.)	P° L°	2 f	0 a?	4-6		
Carex rosea	M P: L°	12 f	3	4		
Carex scabrata	M:P:	5	0 A	6w		
Carex sparganioides var. s.	M P.	2 f	1	6 ?	*	
Carex squarrosa	M	1 f	0	6-7w	**	

Species	County	Frequ.	Miss.	Habitat	Open	Ex.
Carex striatula* (laxiflora var. angustifolia)	M:P:	14	2 a	3-4		
Carex stricta var. elongata (C. emoryi)	P:W L•	5 D	0	7w	**	
Carex styloflexa	M•	1 f	0 A	6 ?		
Carex torta	M•P L	12 D	0 A	6w	*	
Carex virescens var. swanii*	M:P• L•	8 f	1 a	2-3	**	
Carex virescens var. v.	M:P•	10 f	1 a	4-3	*	
Carex vulpinoidea	P: L•	5 f	3 b	5-6	**	
Carex willdenovii	M.P:	4 f d	2 b?	3		
Carpinus caroliniana	M P L	31	10	4-6		
Carya carolinae-septentrionalis* (ovata var. australis)	P:	12 D	12 B	3-2		
Carya cf. ovata x glabra (C. ovalis)	M P	5	4 b	3		
Carya cordiformis	M P•	17	12 B	4-3		
Carya glabra	M:P L	35 D	11	3		
Carya laciniosa	M P	5 r	3 B	6		
Carya ovata (var. o.)	M P	24	16 b	3-4		
Carya pallida	M:P L•	25 D	0 A	3-2		
Carya tomentosa	M:P L	30 d	9	3-5		
Cassia (Chamaecrista) fasciculata	M P.	6 f d	2 b	3	**	
Cassia (Chamaecrista) nictitans	M•P•W	17 f d	1 A	3	**	
Cassia (Senna) cf. hebecarpa	P	1	0	7	**	
Cassia (Senna) marilandica	M•P. L	10	5 b	3	**	
Castanea dentata	M•P	23 r	0 A	3		
Catalpa bignonioides	M• W	4	0	7	*	e?
Caulophyllum thalictroides	M P	5 f	0 b	4		
Ceanothus americanus	M P	9	6 b	2-3	*	
Ceanothus herbaceus	P: L•	2 d	0 A	7	**	
Celastrus scandens	M P•	10	7 b	3-4	**	
Celtis occidentalis	M P	5 d	4 B	4-5		
Celtis tenuifolia	M P•	12 d	8 b	2		
Celtis tenuifolia x occidentalis	M P	7	6 B	2-3	*	
Cephalanthus occidentalis	M P W•	16	6	6W	*	
Cerastium cf. fontanum* (vulgatum)	M P	4 f	2	3-4	**	E
Cerastium nutans	P•	1 f	1	4	**	
Cercis canadensis	M P W L	38 d	16 b	2-3	*	
Chamaelirium luteum	M•P	6 R	0 A	3-4		
Chasmanthium* latifolium (Uniola l.)	M P•W•L•	24 d	12 b	6	*	
Chasmanthium* laxum (Uniola l.)	M P•W•L•	19 D	0 A	5-3		
Chelone glabra var. montana*	M P L•	13	1 A	6-4		
Chenopodium (hybridum ssp.) gigantospermum	M:P•	10	4	3-4U		
Chenopodium album	M P	3	2 b	3-6	**	E
Chenopodium ambrosioides	M P	2	1	7w		e
Chimaphila maculata	M P	25	5 a	3		
Chionanthus virginicus	M P• L•	14 r	5	2-3o/7	*	
Chrysanthemum*leucanthemum (L. vulgare)	M P	17 d	8 b	3-4	**	E
Chrysopsis (Pityopsis) graminifolia	M P•	18 d	0 A	2-3	**	
Chrysopsis mariana	M•P•	19	2 A	3	*	
Cichorium intybus	M P	14 D	5	3-4	**	E
Cicuta maculata	M P L.	13	2 a	6	*	
Cimicifuga racemosa	M•P	35 d	10 a	4		
Cinna arundinacea	M•P L	13 f	2 a	6		
Circaea (lutetiana ssp.) canadensis* (quadrisulcata)	M•P	22	3 a	4-3		
Cirsium carolinianum	M:P:	7 f	4 b	3-4	*	
Cirsium discolor	M P	17	9 b	3-4	**	
Cirsium vulgare	P:	2 f	1	3	**	

Species	County	Frequ.	Miss.	Habitat	Open	Ex.
Cladrastis kentukea* (lutea)	P•	14 r	14 B	4-3o		
Claytonia caroliniana	M P	5 F	0 a?	4		
Claytonia virginica	M P	4 F d	0 b?	4		
Cleistes divaricata	M• W	2 R	0 A	2-3		
Clematis cf. glaucophylla	M: W•	3 r	0	7	**	
Clematis cf. versicolor	P•	1	1 B	2-3	**	
Clematis cf. viorna	P	6 r	6 B	3	**	
Clematis virginiana	M•P L:	8	2	4	**	
Clethra acuminata	M•P W L	31	0 A	4-3		
Clintonia umbellulata	M P	3 F	0 A	4		
Clitoria mariana	M•P	15	1 A	3-2	*	
Cocculus carolinus	P•	6 d	6 B	3-4	*	
Collinsonia canadensis	M P L•	16 d	4 a	4-3		
Commelina communis	M	1	0	4-6	**	E
Commelina virginica	M.P W	6	1	7	**	
Comptonia peregrina* (Myrica asplenifolia)	L•	1	0 a	7	**	
Conopholis americana	M P	16	11 b	3		
Convolvulus (Calystegia) sepium var. communis	M.P	4	2	7	**	
Convolvulus (Calystegia) sepium var. sepium	M P	2	1	3-4	**	E
Convolvulus (Calystegia) spithamneus	M•P	8 f d	1 A	3	**	
Corallorhiza odontorhiza	P•	1 f R	0 A	4-3		
Coreopsis auriculata	M•P•	18 d	9	3-4	*	
Coreopsis major	M P	31	8 a	2-3	*	
Coreopsis tinctoria	M•	1	0	3	**	e
Coreopsis tripteris	M P•W•L	19 d	4 a	3/7	**	
Cornus alternifolia	P	7	3	4		
Cornus amomum (or a. x obliqua?)	P:	3	2	5-6w	*	
Cornus drummondii	M•P•W•	6	4 b	3-6	*	
Cornus florida	M P W L	49 D	13	3		
Cornus obliqua* (purpusi)	M:P:W•L•	23 D	6	7-6w	**	
Coronilla varia	P	1 D	1 B	3	*	E
Corylus americana	M P W•L•	16	5	3	*	
Crataegus Section Crus-galli (mostly crus-galli)	M:P:	8	7 b	3-4	*	
Crataegus cf. Section Intricatae (intricata?)	M:P:	11 r	4	3-7	*	
Crataegus cf. Section Pruinosae (pruinosa?)	M:P:	2	0 A	1-2	*	
Crataegus cf. Section Tenuifoliae (cf. macrosperma?)	M:P:	6 r	2	3-7	*	
Crataegus cf. calpodendron	L:	2 R	0	7	*	
Crataegus uniflora	P:	4 R	4 B	3-2	*	
Croton glandulosus var. septentrionalis	M	1	0	3	**	
Croton monanthogynus	M	9 d	9 B	2-3R	**	
Crotonopsis elliptica	M•	2	0 A	1R	**	
Cryptotaenia canadensis	M P	10 d	2	6		
Cuphea petiolata	P•	1 r	1 B	3	**	
Cuscuta cuspidata	M: W•	1 f	0	7	**	
Cuscuta pentagona	M: W•	1 f	0	3	**	
Cynanchum (Ampelamus) albidus	P	2	2 B	4-6	**	
Cynoglossum virginianum var. v.	M P	11	10 b	3		
Cyperus esculentus	P•	1 f	1	7w	**	
Cyperus flavescens	M P	2 f	0 A	4-5w	**	
Cyperus retrofractus var. dipsaciformis	M•P•	5 f	0 A	2-3/7	**	
Cyperus retrofractus var. retrofratus	M•P•W•L•	5 f	0 A	2-3	**	

Species	County	Frequ.	Miss.	Habitat	Open	Ex.
Cyperus strigosus	M:P·W·	12 f	3	5-7	**	
Cyperus (Kyllinga) tenuifolius	W·	1 f	0	7	*	
Cypripedium acaule	M P·	16	0 A	3-4		
Cypripedium kentuckiense	P· L·	2	0 a	4-6		
Cypripedium pubescens* (caleolus v.p.)	M·P·	4 R	2	4		
Cystopteris bulbifera	M P	12	11 B	3-4u		
Cystopteris tennesseensis	P:	1	1 b	4u		
Cystopteris tenuis* (fragilis var. mackayi)	M: W·L·	7	0 A	4U		
Dactylis glomerata	M P	15 f	5	3-6	**	E
Danthonia compressa	M·P:	2 f	0 A	3	*	
Danthonia sericea	M·P.	15 D	0 A	1	**	
Danthonia spicata	M:P	26 D	12	2-3	*	
Dasystoma macrophylla	M P	13 d	12 B	3-4	*	
Datura stramonium	M P	3	1	4-6	**	E
Daucus carota	M P	27 d	6	3-4	**	E
Delphinium tricorne	P	1 f	1 B	4	*	
Dennstaedtia punctilobula	M·P L	17	0 A	4-5o	*	
Dentaria diphylla	M P·	10	1 b	4		
Dentaria heterophylla (= x diphylla?)	M P·	5 f	2 a?	4		
Dentaria laciniata	M·P	5 f	2	4-3		
Dentaria multifida	P	1 f R	0	4-6		
Descurainia pinnata var. brachycarpa	P.	1 f	0 A	3-4U		
Desmodium cf. cuspidatum var. c.	M P	4	3 b	3	**	
Desmodium ciliare	M.P:	9	1 A	3-2	**	
Desmodium cuspidatum var. longifolium	P.	2	2 B	6	*	
Desmodium glabellum* (not humifusum)	M.P. L.	21 d	3 a	3	**	
Desmodium glutinosum	M P	10	7 b	4		
Desmodium laevigatum	M:P·	20 d	4 a	3	*	
Desmodium marilandicum	M·P· L.	7	1	3	**	
Desmodium nudiflorum	M P L	27 D	5 a	3-4		
Desmodium paniculatum (sensu stricto)*	M P·	34 d	9	3-4	*	
Desmodium perplexum* ("dillenii")	M:P:W.L.	32 d	7	3-4	**	
Desmodium rigidum	M.P.	6	0 A	3-2	**	
Desmodium rotundifolium	M P	15	4	3	*	
Desmodium viridiflorum	M:P:W·L	12	2 A	3	*	
Dianthus armeria	M P	5	2	3-4	**	E
Diarrhena americana	M P	2	2 B	3		
Dicentra cucullaria	P	1 f	0 b	4-6		
Digitaria ischaemum	M P L.	4 f	0	3	**	E
Digitaria sanguinalis	M·P	9 f d	2	3-6	**	E
Diodia teres	M·P	19 D	3 A	2-3	**	
Diodia virginiana	M·P W·	12 D	2 a	6-5w	**	
Dioscorea batatas	P L	8 d	4 b	4-6	*	E
Dioscorea quaternata	M P	31 d	12 b	4-3	*	
Dioscorea villosa	P L	1 d	0	6	*	
Diospyros virginiana	M P W L	29	9	2-3	*	
Dirca palustris	M·P L	13	4	4		
Disporum lanuginosum	M P	21	3 A	4		
Dodecatheon meadia	P	7	7 B	3u		
Dryopteris cf. intermedia x carthusiana*	M·P L·	3	0 A	4u		
Dryopteris goldiana	P.	1	1 b	4		
Dryopteris intermedia*	M·P· L	23 D	1 A	4		
Dryopteris marginalis	M·P	20 d	2	4		
Echinacea purpurea var. p.	P·	2	2 B	3	**	
Echinochloa crus-galli (sensu stricto)	M· W	3	0	6	**	

Species	County	Frequ.	Miss.	Habitat	Open	Ex.
Echinochloa muricata var. microstachya*	M.	1 f	0	3	**	
Echinochloa muricata var. muricata*	M.P.	4 f	1	3-4	**	
Echium vulgare	L•	1	0 B	3-4	**	E
Eclipta alba	W•	1	0	7	**	
Eleocharis obtusa var. detonsa* (engelmannii)	P.	1 f	0 A	5	**	
Eleocharis obtusa var. obtusa*	M•P• L•	12 f	0 a	5-7w	**	
Elephantopus carolinianus	M•P L	26 d	8	3-6	*	
Elephantopus tomentosus	M•P	16 d	2 A	3-6	*	
Eleusine indica	M P	4 f	1	3-6	**	E
Elymus cf. intermedius*	M•P•W•	4 f R	2	6	*	
Elymus glabriflorus*	M•P: L•	10 f	5 b	3	*	
Elymus hystrix x glabriflorus	P	1	0	3	*	
Elymus* hystrix (H. patula)	M P•	13 f	9 b	3	*	
Elymus interior* R. Brooks ined.	P	1 f	1 B	6-4		
Elymus riparius	M•P	11 f	0 A	6	*	
Elymus villosus	M P• L	7	6 B	3-4		
Elymus virginicus (s.s.)*	M•P•W•	15 f	7 b	4-6	*	
Epifagus virginiana	M•P• L	13	3	4		
Epigaea repens	M P W	22 d	0 A	3-2	*	
Epilobium ciliatum ssp. c.* (adenocaulon)	M.	1 R	0 A	4-6u	*	
Epilobium coloratum	L•	1	0	7 ?		
Equisetum arvense	M P W	3	1 a	6	**	
Equisetum hyemale	P	1	1	6	**	
Eragrostis cilianensis	M.	1 f	0	3	**	E
Eragrostis curvula	M P	2	0 A	2-3	**	E
Eragrostis frankii	M.P.	4 f	2 B	2-6	**	
Eragrostis hypnoides	M P	2 f D	0	6	**	
Eragrostis pectinacea	M•P.	2 f	1 b	3	**	
Eragrostis poaoides	P.	1 f	1 B	3	**	E
Eragrostis spectabilis	M P	4 f	2 b	2-3	**	
Erechtites hieracifolia	M P	15 D	3 a	3-4	**	
Erianthus alopecuroides	M P• L	25 d	10	3	**	
Erigenia bulbosa	M P	3 F	2 b	4		
Erigeron annuus	M P	8	3	4-3	**	
Erigeron philadelphicus	M P	9 f	4 b	4-3	*	
Erigeron pulchellus var. brauniae	M•P•W•L•	7 d	1	4-6	*	
Erigeron pulchellus var. pulchellus	M•P	17 d	10 b?	4-3	*	
Erigeron strigosus var. s.	M P	13 d	5	3-2	**	
Erigeron* (Conyza) canadensis var. c.	M.P	15 D	5	4-3	**	
Erigeron* (C.) canadensis var. pusilla	M:P•	13 D	2 a	3-2	**	
Eryngium yuccifolium	P	1 r	1 B	3	*	
Erythronium americanum	M.P	8 F	4 b	4		
Eulalia* (Microstegium) viminea	M P L	49 D	18 b	6-5	*	E
Euonymus alatus	P•	1	1	3	*	
Euonymus americanus	M P• L	39 d	11	4-3		
Euonymus atropurpureus	M P	3 R	2 b	3-4	*	
Euonymus fortunei	W	1	0	7	*	E
Euonymus obovatus	M	1	1 B	2-3		
Eupatorium album	M•P• L•	15	0 A	2-3	**	
Eupatorium altissimum	P:	5	5 B	3-2	**	
Eupatorium aromaticum	M.P:	9	0 A	3	*	
Eupatorium coelestinum	M P•W•L	22 D	7	5-4	**	
Eupatorium fistulosum	M P W•L	27 d	8	6-5	**	
Eupatorium hyssopifolium var. h.	L•	1	0	7	**	
Eupatorium hyssopifolium var. laciniatum	P:	3	1	3-2	**	

Species	County	Frequ.	Miss.	Habitat	Open	Ex.
Eupatorium incarnatum	P•	5	5 B	4-3	*	
Eupatorium luciae-brauniae("deltoides")	M•P:W•	6 d	0 a	4U		
Eupatorium perfoliatum	M P L	7	2	5-6	**	
Eupatorium purpureum	M P	10	3	4	*	
Eupatorium rotundifolium var. saundersii	M•	1	0	7?	**	
Eupatorium rotundifolium vars. r. + ovatum	M P•	26	3 A	2-5	**	
Eupatorium rugosum var. r.	M•P.W•L	30 d	13 b	4	*	
Eupatorium semiserratum	W•	1	0 A	7-1	**	
Eupatorium serotinum	M P W•L	33 d	11	5-3	**	
Eupatorium sessilifolium	M P	17 d	13 b	3		
Euphorbia (Chamaesyce) chamaesyce (C. prostrata)	M P:	2 f	1	3-4	**	e
Euphorbia (Chamaesyce) nutans* (preslii)	M:P. L	17 d	7	3-4	**	
Euphorbia (Chamaesyce) supina*	P.	5 f d	3 b	4-6	**	
Euphorbia commutata	P	2	2 B	3-4		
Euphorbia corollata (vars. c. + mollis)	M•P•W•L	24 d	6	1-3/7	**	
Euphorbia dentata	M P	3	2 b	3	**	e
Fagus grandifolia	M P W L	53 D	16	4		
Festuca elatior (ssp. pratensis + arundinacea)	M P	6 D	5 b	3-4	**	E
Festuca obtusa	M P L	14	5 b	4		
Festuca (Vulpia) dertonensis (V. bromoides)	M:	2 f	0 A	3	**	E
Festuca (Vulpia) octoflora	M•P	3 f	0 A	1-3	**	E
Fimbristylis autumnalis	M P•W•	4 f	0 A	5-7w	**	
Forsythia cf. suspensa	M	1	0	2o	*	E
Fragaria virginiana var. v.	M P	9	6 b	3	**	
Frasera* caroliniensis (Swertia c.)	P	5	5 B	3-2	*	
Fraxinus americana var. americana	M P	36 d	17 b	3-4		
Fraxinus americana var. biltmoreana	M•P•W L•	13	5 b	2-3		
Fraxinus pensylvanica var. subintegerrima	M P•W L•	18 d	9 b	7-5		
Fraxinus quadrangulata	M•P	17 d	17 B	3-2		
Galactia volubilis	M:P:W•	18 d	7	3-2	**	
Galax urceolata (aphylla)	M•P W•L•	9 d	0 A	3		
Galearis* spectabilis (Orchis s.)	M•P•	11 f	2 a	4		
Galium aparine	M P	5	2 b	4-6	*	
Galium circaezans	M P	22	9	3		
Galium concinnum	M P	17 d	15 b	3-4		
Galium lanceolatum	M.P.	4 r	1 a?	4		
Galium pilosum var. p.	M•P	10	5	2-3	**	
Galium tinctorium* (trifidum var. ti.)	M:P	6	0 A	6-4		
Galium triflorum	M P L•	27	9	4-6		
Gaultheria procumbens	M P•	18 d	0 A	3-2		
Gaura filipes	P:	4	4 B	3-1	**	
Gaylussacia baccata	M•P W	12 D	0 A	2	*	
Gaylussacia brachycera	M:P:W•L•	26 D	0 A	2-3		
Gentiana quinquefolia	P.	1 R	1 B	3	*	
Gentiana villosa	M.	2 R	1	3	*	
Geranium carolinianum	M P	3	0	2-4	**	
Geranium maculatum	M P	21	7	4-3		
Geum canadense	M P L	17	8 b	4-3	*	
Geum vernum	M P	2 f	1 b	4	*	

Species	County	Frequ.	Miss.	Habitat	Open	Ex.
Geum virginianum	M:P.	12	4 a?	4-3		
Glechoma hederacea	P	3	1	4-6	*	E
Gleditsia triacanthos	M P	9 r	7 B	3	*	
Glyceria septentrionalis	P:	1 f R	0 A	5W		
Glyceria striata	M P W	11 f	4 b	6-5w	*	
Gnaphalium obtusifolium	M P• L	16	3 a	3-2	**	
Gnaphalium purpureum	M.P.	8 f	0 A	3-2	**	
Goodyera pubescens	M•P• L•	29	4 a	3-4		
Gratiola neglecta	P	2	0	5w	*	
Gratiola pilosa	M	1 r	0	7	*	
Gratiola virginiana	M•P•	8	0 A	6w		
Gymnopogon ambiguus	P:	1 f	0 A	2	**	
Hackelia virginiana	P	1	1 b	4	**	
Hamamelis virginiana	M P L•	38	10	2-4		
Hedeoma pulegioides	M P	4	1	3-4	**	
Hedera helix	P•	2 D	2 B	3-2		E
Hedyotis* caerulea (Houstonia c.)	M P L•	17 f d	0 A	3-4	*	
Hedyotis* canadensis (Houstonia c.)	P.	11	10 B	1-3	*	
Hedyotis* cf. longifolia (Houstonia l.)	P.	2	2 B	1-2	*	
Hedyotis* nigricans (Houstonia n.)	P•	8 D	8 B	1	**	
Hedyotis* purpurea var. calycosa (Houstonia lanceolata)	M•P.	8	4 b	3-4	*	
Hedyotis* purpurea v.p. (Houstonia p.)	M P• L•	20	5 a	3-4	*	
Helenium autumnale (all var. parviflorum?)	P•W•L•	5 d	1	7-6	*	
Helenium flexuosum	M P W•L•	11	4	5-6	**	
Helianthus annuus	M P	2	1	3	**	
Helianthus atrorubens var. a.	M:P:W•	9 d	0 A	3-2	*	
Helianthus decapetalus	M P W•L.	15 d	5	4-6	*	
Helianthus divaricatus	M P	22 D	6 a	3	*	
Helianthus giganteus	P:	2 f r	0	7	**	
Helianthus grosseserratus	P•	1 r	1 B	6	**	
Helianthus hirsutus	M P•W•	13	4	3-2	**	
Helianthus maximiliani	P:	1	1 B	3	**	e
Helianthus microcephalus	M P•	37 D	14	3	*	
Helianthus tuberosus	M P• L.	7 d	2	6-4	**	
Heliopsis helianthoides ssp. h.	P• L:	4	1	6	*	
Hemerocallis fulva	M P	8	2	4-7	**	E
Hepatica acutiloba (nobilis var. acuta)	M P	11	7 b	4		
Hepatica americana (n. var. obtusa)	M P•	20 d	3 a	4		
Heuchera americana var. a.	M P•	11	7 b	3-4		
Heuchera cf. longiflora	M.	3	0 a?	3-4		
Heuchera parviflora var. p.	M P L	27 D	0 A	3-4U		
Heuchera villosa var. macrorhiza	M P	8 d	8 B	4-3o		
Heuchera villosa var. villosa	M•P	5	1	4o		
Hexalectris spicata	M•	1 f R	0 a	3-2	*	
Hexastylis arifolia var. ruthii	M:P	18	3 A	4		
Hibiscus cf. moscheutos	W	1	0	7W	**	
Hieracium gronovii	M P•	12	2 a	3	**	
Hieracium paniculatum	M• W•	2	0 A	3	*	
Hieracium venosum	M•P	8	1 a	3	*	
Holcus lanatus	M	2	0 A	3	**	E
Hybanthus* concolor (Cubelium c.)	M P	6	4 b	4-3		
Hydrangea arborescens	M P	26 d	11	6-4	*	
Hydrastis canadensis	M P•	5 d	5 b	4-3		
Hydrocotyle americana	M•	1	0 A	6-5		

Species	County	Frequ.	Miss.	Habitat	Open	Ex.
Hydrophyllum canadense	M P L	6 d	2	4-6		
Hypericum denticulatum var. recognitum*	M P W L	10	1 a	7	**	
Hypericum dolabriforme	M P	11 d	9 B	2-3r	**	
Hypericum frondosum	P	9 d	9 B	2-1	*	
Hypericum gentianoides	M P	13	1 A	1-2	**	
Hypericum mutilum	M P L	16	2 A	5-7	**	
Hypericum perforatum	P L	2	1	3	**	E
Hypericum prolificum	M P W L	14	2 a	7/3-2	*	
Hypericum punctatum	M P	17	9	3-4	**	
Hypericum* (Triadenum) tubulosum	M P L	6 d	1 a	6w	*	
Hypericum* (Ascyrum) crux-andreae (stans)	M	1 r	0 A	5	*	
Hypericum* (Ascyrum) hypericoides (sensu stricto)	M P W	3	0 A	2-1	*	
Hypericum* (Ascyrum) stragalum* (multicaule)	M P W	32	7 a	3-2		
Hypoxis hirsuta	M P W L	8 f	1 a	3/7	**	
Ilex montana var. beadleyi (mollis)	M	3 R	0 A	3-2		
Ilex montana var. montana	M P	7 R	0 A	3-2		
Ilex opaca	M P W L	40 d	3 A	3-5		
Ilex verticillata var. padifolia	M P	3 d	0 A	5-7		
Ilex verticillata var. verticillata	M P W L	11 d	0 A	5-7		
Impatiens capensis* (biflora)	M P L	19 f d	4	6	*	
Impatiens pallida	M P	8 f d	2 b	4-6		
Ipomaea hederacea	M P	2	1	3	**	E
Ipomaea lacunosa	P	3 f	3 B	7-4	**	
Ipomaea pandurata	M P L	21	6	2-3/7	**	
Ipomaea purpurea	P W	1 f	1	3	**	E
Ipomaea (Quamoclit) coccinea	W	1	0	7w	**	
Iris cristata	M P L	41 D	8 a	4-6		
Iris virginica* var. shrevei	P	1 R	1	6	**	
Isotria verticillata	P	3 r	0 A	3		
Itea virginica	M P L	10	0 a	7w	*	
Iva ciliata	P	1	0	3	**	
Jeffersonia diphylla	M	1	1 B	3		
Juglans cinerea	M P	10 r	3	4		
Juglans nigra	M P	25	14 B	4		
Juncus acuminatus	M P W	9 f	0 A	5	**	
Juncus canadensis	P	1 f	0 a	5	**	
Juncus coriaceus	P	1 f	1	4-6	**	
Juncus debilis	M P	5 f	0 A	5	**	
Juncus diffusissimus	M P W	4 f	0 A	5	**	
Juncus dudleyi	W	1 f	0	7	**	
Juncus effusus var. pylaei	M P	7 d	0 A	6w	*	
Juncus effusus var. solutus	M P L	16 d	2 a	5-6w	**	
Juncus marginatus var. biflorus*	M P	5	1 a	5	**	
Juncus marginatus var. marginatus*	M P W	6 f	1 a	5	**	
Juncus tenuis	M P W L	21 f	2	5-3	*	
Juniperus communis (var. depressa)	P	1 d	0 A	1-2		
Juniperus virginiana	M P	37 D	17 b	1-3	*	
Jussiaea decurrens	P	1	0	6W		
Justicia americana	M P W L	11 D	3	7W		
Kalmia latifolia	M P W L	41 D	6 A	3-2	*	
Krigia biflora	M P	17	4 a	3		
Krigia virginica	M	3 f	0 A	2-3	**	
Lactuca biennis	P	1 R	0	3	*	
Lactuca canadensis (with vars.)	M P W	10	1	3-4	**	
Lactuca floridana	M P	11	2	4-3	*	

Species	County	Frequ.	Miss.	Habitat	Open	Ex.
Lactuca serriola	P	2	1	3	**	E
Laportea canadensis	M P	19 d	4	6-4		
Lathyrus cf. latifolius	M P	3	2	3	**	E
Lathyrus palustris var. myrtifolius	M•	2 R	0	7		
Leavenworthia uniflora	P•	3 f	3 B	1-2R	**	
Lechea racemulosa	M: P. W. L•	21	0 A	1-3	**	
Leersia oryzoides	M P	6 d	2	6w	*	
Leersia virginica	M P L	32 d	9	6-3	*	
Lepidium campestre	P.	3 f	3 B	3	**	E
Lepidium virginicum	M P	4	0	3-4	**	
Lespedeza (Kummerowia) stipulacea	M P:	11 d	3	3	**	E
Lespedeza (Kummerowia) striata	M P: L	9	1	3	**	E
Lespedeza cf. bicolor	W•	2	0	7	**	E
Lespedeza cf. thunbergii	M• P•	5	1	3	**	E
Lespedeza cuneata	M• P L	38 D	6 a	3-7	**	E
Lespedeza hirta	M• P:	25 D	3 A	3-2	**	
Lespedeza intermedia	M. P. L•	30 d	5 a	3-2	*	
Lespedeza intermedia f. hahnii	M. P.	3	1	3-2	*	
Lespedeza intermedia x repens	M.	1	0 a	3-2	**	
Lespedeza intermedia x virginica	M. P	3	0 a	3	**	
Lespedeza procumbens	M P.	23 d	5 a	3	*	
Lespedeza repens	M. P W.	17 d	1 A	3-2	**	
Lespedeza violacea	P:	11 d	10 B	3-2	*	
Lespedeza virginica	M: P• L•	14	3 a	2-3/7	**	
Liatris aspera	M: P.	3	0 A	2-3	**	
Liatris microcephala	M: P	10 d	0 A	1	**	
Liatris spicata	M: P• W•	8	1 a	3-7	*	
Liatris squarrosa var. hirsuta	P•	1	1 B	1-2	**	
Liatris squarrulosa	P:	8	4 b	1-3	**	
Ligusticum canadense (+ narrow leaved var. by rivers)	M• P• W• L•	13	4	3-4/7	*	
Lilium canadense	P•	1 F r	1	3	*	
Lilium philadelphicum var. p.	P. L•	2 F r	0	2-3	*	
Lindera benzoin	M P	28 d	13 b	6-4		
Lindernia dubia var. d.	M• P L	5	1	5-6w	*	
Linum medium	P.	1 f	1 B	1r	**	
Linum striatum	M P• W•	13	0 A	6-5w	*	
Linum virginianum	M• P:	9	1 a	3	*	
Liparis liliifolia	M• P	5 f r	2	4		
Liquidambar styraciflua	M P W L	30 d	5 a	7-5		
Liriodendron tulipifera	M• P W L	58 D	17	4		
Lithospermum canescens	P•	5	5 B	1-2	**	
Lithospermum tuberosum	M• P:	15	15 B	3	*	
Lobelia cardinalis	M P• W• L	11	0 A	6w		
Lobelia inflata	M P:	18	3	4-3	**	
Lobelia puberula var. simulans	M• P• W•	22	4 a	3-5	**	
Lobelia siphilitica	M P W L	17	10 b	4-6	*	
Lobelia spicata (vars. s. + leptostachys)	P:	7	7 B	1-3	**	
Lonicera dioica var. d.	P.	4	4 B	3o	*	
Lonicera dioica var. glaucescens	M P.	4	4 B	3o	*	
Lonicera japonica	M P	24 D	11 b	3-4	*	E
Lonicera tatarica	M•	1 R	0	4	*	E
Lorinseria* areolata (Woodwardia a.)	M• P.	2	0 A	5-3		
Ludwigia alternifolia	M P W•	18	2 A	5	**	
Ludwigia palustris	M P	3	1	5-6W	**	
Luzula acuminatus var. carolinae	M: P:	7 f r	0 A	4-6		
Luzula campestris var. bulbosa	M.	1	0 A	4		

Species	County	Frequ.		Miss.	Habitat	Open	Ex.
Luzula campestris var. echinata	M·P·	15		1 A	3-4		
Lycopersicon esculentum	W·	1		0	7	**	E
Lycopodium digitatum* ("flabelliforme")	M·P L·	12	d	1	3-4	*	
Lycopodium lucidulum	M·P.	12		0 A	4		
Lycopodium obscurum var. o.	M P:W	13	r	1 a	4		
Lycopodium porophilum	M·P·	4		0 A	40		
Lycopodium tristachyum	M:P:	6	R	0 A	2-3		
Lycopus americanus	M·P	4		3 b	6	*	
Lycopus virginicus	M.P:W·L·	32	d	6	6-5	*	
Lygodium palmatum	M P· L	24	D	0 A	5-3	*	
Lyonia ligustrina var. l.	M·P W·	6	r	0 A	5-7	*	
Lysimachia ciliata	P. L	8	d	3	6		
Lysimachia lancéolata	M·P· L·	12		4	1-3/7	**	
Lysimachia quadrifolia	M P	7		2	3-5	*	
Maclura pomifera	P	2	R	2 B	6	*	E
Magnolia acuminata	M·P L	35		16 b?	4		
Magnolia fraseri	P· L·	4		0 A	4		
Magnolia macrophylla	M P W L	34	d	0 A	4-3		
Magnolia tripetala	M P L	25		1 A	4-6		
Malaxis uniflora	M·	1	f R	0 a	4		
Malus* angustifolia	M:	6		0 A	3-2	*	
Malus* coronaria	M:P· L·	5	r	0 a	3	*	
Malus* sylvestris*	M P	2	R	1	3	*	E
Manfreda* virginica (Agave v.)	P·	13	D	13 B	1-2	**	
Matelea (Gonolobus) obliquus	M P.	7	r	6 B	2-3	*	
Medeola virginiana	M P·	26	d	1 A	4-3		
Medicago lupulina	M P	4		1	3	**	E
Meehania cordata	M P·	14	D	1 a	4		
Melica mutica	M P·	21	f	14 b	3-2		
Melilotus alba	M P	7	d	1	3	**	E
Melilotus officinalis	M P	6		2	3-6	**	E
Menispermum canadense	P	6		2 b	4-6	*	
Mertensia virginica	P	1	f	0 b	4-6		
Mimulus alatus	M P L·	7		3	6w		
Mimulus ringens	M P	2	r	2 A	6-5	*	
Mitchella repens	M P L	29	D	4 A	4-5		
Mitella diphylla	P	2		1 b	4		
Mollugo verticillata	M P W	5		2	4-6	**	E
Monarda clinopodia	P L	9		4 b	6-4		
Monarda fistulosa (var. mollis?)	P·	5		5 B	3-4	**	
Monotropa hypopithys	M·P:	7	R	1 A	3		
Monotropa uniflora	M P·W·	6	R	0 a	4-3		
Morus alba	P	1	R	1 B	3	**	E
Morus rubra	M P W	11	r	8 b	4	*	
Mosla dianthera	M·P·W·L·	10	d	0 A	3-5	**	E
Muhlenbergia cuspidata	P:	1		1 B	10	**	
Muhlenbergia frondosa	M.P.W	8	f	3	6	*	
Muhlenbergia schreberi	M P	8		4 b	3-6	*	
Muhlenbergia sobolifera	P·	11	d	11 B	3		
Muhlenbergia sylvatica	M.P. L:	10	f	4	4-6		
Muhlenbergia tenuifolia	M: W.L.	6	f	0 A	3-4		
Myosotis macrosperma	P.	2	f	2 B	4	*	
Myosotis micrantha	P.	1	f	1 B	3	**	E
Nasturtium officinale	P·	2		2 B	6W	**	E
Nepeta cataria	P	1		0	3	**	E
Nyssa sylvatica var. s.	M P L	45	d	10 a	3-5		
Obolaria virginica	M·P·	3	f r	2 b	4-3		
Oenothera biennis	M P	21		8	3-4	**	

Species	County	Frequ.	Miss.	Habitat	Open	Ex.
Oenothera speciosa	M·	1 d	0	3	**	e
Oenothera tetragona var. t.	M·P	7	0 a	7	*	
Onoclea sensibilis	M P L	16 d	1 A	7-5	*	
Ophioglossum pycnostichum	M·	2 f	1	4	*	
Opuntia compressa	P	1	1 B	1	**	
Orbexilum* onobrychis (Psoralea o.)	P:	1 D	1 B	3	**	
Orbexilum* pedunculata var. p. (Psoralea psoralioides var. p.)	M·P·W·	5 d	0 A	3/7	**	
Orobanche (Thalesia) uniflora	M·P·	3 f	0	4-3	*	
Orontium aquaticum	W	1 R	0	7W	**	
Osmorhiza claytoni	M P	10	2	4		
Osmorhiza longistylis	P	1	1 B	4		
Osmunda cinnamomea	M P	25 D	0 A	5-7		
Osmunda claytoniana	M·P· L·	13	0 A	4-7		
Osmunda regalis	M P L	24 D	0 A	7-5	*	
Ostrya virginiana	M P W L	23 D	15 b	2-4		
Oxalis acetosella	M P	2 d	0 A	4-6		
Oxalis cf. dillenii ("stricta")	M P	15	4	2-4/7	*	
Oxalis cf. fontana ("europaea")	M·	1	0	3	**	E
Oxalis grandis	M P	4	2 b	4-3		
Oxalis violacea	M P	3 r	0 a	3		
Oxydendron arboreum	M P	38 d	5 A	3		
Oxypolis rigidior	M·P W·L·	5 r	0 A	5-7	*	
Pachysandra procumbens	M·P·	21 D	13 b	4		
Panax quinquefolius	M P	4 R	2	4		
Panax trifolius	M·P·	4 F	0 A	4		
Panicum anceps	M.P. L	26 D	7 a	3-4	**	
Panicum capillare var. campestre (P. gattingeri)	M:	2 f	1 B	3	**	
Panicum dichotomiflorum	M.P.	4	0	3-4	**	
Panicum flexile	M.P. L	12 f	4 b	2-3	**	
Panicum ramosum	M.	1 f	0	3	**	E
Panicum rigidulum* var. r. (agrostoides)	M·P·W·L·	6 f	0 A	5w	**	
Panicum verrucosum	P:	2 f	0 A	5-6w	**	
Panicum virgatum	P·W·L:	3 f R	0	7	**	
Panicum (Dichanthelium) aciculare	M. L.	2 R	0 A	2		
Panicum (D) acuminatum* var. fasciculatum	M:P:W·L·	17	4	3-4	**	
Panicum (D) acuminatum* var. tennesseense	M.P.	5	1	3-4	**	
Panicum (D) albomarginatum	M:	5	0 A	1	**	
Panicum (D) bicknellii (= boreale?)	M:	1 f	0	2 ?		
Panicum (D) boscii	M·P·	28 d	10	3		
Panicum (D) clandestinum	M·P L·	28 D	6	6-4	**	
Panicum (D) columbianum var. thinium (sabulorum var. t.)	M:P.	7	0 A	1-2	**	
Panicum (D) commutatum var. ashei	M·P.	10	0 A	1-3	*	
Panicum (D) commutatum var. commutatum	M·P.	23	4 a	3-4	*	
Panicum (D) depauperatum	M:P:	11	1 a	1-2	**	
Panicum (D) dichotomum (sensu stricto)	M:P:W:	26	2 a	3		
Panicum (D) laxiflorum (xalapense)	M·P: L·	27 D	5 a	2-3	**	
Panicum (D) lindheimeri* (acuminatum var. l.)	M:P: L·	8	0 A	1-3	**	
Panicum (D) microcarpon* (nididum var. ramulosum)	M:P.W L·	32 D	4 A	5-6	*	
Panicum (D) polyanthes* (sphaerocarpon var. isophyllum)	M:P: L·	18 d	0 A	5-2	*	

Species	County	Frequ.	Miss.	Habitat	Open	Ex.
Panicum (D) scoparium	P·	1	0 A	5	**	
Panicum (D) scribnerianum* (oligosanthes var. s.)	P:	2 f	0 A	2 ?	*	
Panicum (D) sphaerocarpon (sensu str.)	M:P:	19 d	0 A	1-3	**	
Panicum (D) villosissimum* (acuminatum var. villosum)	M:P.W.L·	13	0 A	2-4	**	
Panicum (D) yadkinense	M:P:W:L·	8	1 A	7	*	
Parietaria pensylvanica	M P	10	4	3-4U	*	
Paronychia canadensis ?	M	1 f	0	4U		
Parthenium integrifolium var. i.	M· W·	2 r	0 a	3	**	
Parthenocissus quinquefolia	M P	32 d	17 b	4-3o	*	
Paspalum dilatatum	M: W	2 f	0	3	**	
Paspalum fluitans	M	1	0	7W	**	
Paspalum laeve var. l.	M·P· L·	11 f	2 a	2-4	**	
Paspalum laeve var. pilosum	P.	1	1	3	**	
Paspalum pubiflorum	P·	1 f	0	3	**	
Paspalum setaceum var. longepedunculatum	L·	1	0	7	**	
Passiflora incarnata	P	1	1 B	6	**	
Passiflora lutea var. glabriflora	M·P W·	16	6	3-6	*	
Paulownia tomentosa	P	1	1	3	*	E
Paxistima canbyi (Pachistima c.)	M·P·	3 D	0 B	2-1	*	
Pedicularis canadensis	M P·	14 d	8 b	3	*	
Pellaea atropurpurea	M·P·	12	11 B	2-3o	*	
Penstemon brevisepalus (= pallidus?)	P:	3 f	2	3	*	
Penstemon cf. hirsutus	M P	2	2 B	1	**	
Penstemon pallidus	M.P:	18	15 B	3	*	
Penstemon digitalis	P·	1	1 B	3-2	**	
Penthorum sedoides	M.P	7	1 a	6w	*	
Perilla frutescens	M P	8	5	3-4	*	E
Phacelia bipinnatifida	M	2	0 b	4o		
Philadelphus cf. pubescens (or inodorus x hirsutus?)	P:	1	1 B	10	**	
Philadelphus hirsutus (var. h.?)	M:P:	20 d	20 B	2-30	*	
Philadelphus inodorus (var. grandiflorus?)	M:P:	8 r	8 B	40		
Phleum pratense	M P	10 f	3	4-3	**	E
Phlox amoena	M·P	6	4	3	*	
Phlox divaricata var. d.	M P·	11 d	7 b	4		
Phlox glaberrima ssp. triloba*	P:	2	2 B	3-2	*	
Phlox maculata	M:P. L·	17	1 A	6	*	
Phlox paniculata	P. L·	9 d	4 b	6		
Phlox pilosa var. p. (virens)	P.	1	1 B	1-3	**	
Phoradendron serotinum (flavescens)	P	2 R	2 B	4-6	**	
Phryma leptostachya	M·P	8 r	4 b	4-3		
Phyla lanceolata (Lippia l.)	W L	2	0	6W	**	
Phyllanthus carolinensis	P:	2	1	5-6w	**	
Physalis heterophylla var. h.	M:P.	3	1	3-4	**	
Physalis pubescens var. grisea ("pruinosa")	P.	1 f	0	4	**	
Physalis virginiana	M.P.	3 f	1	3	*	
Physocarpus opulifolius	M P L·	15	9 b	1-2/7	*	
Physostegia sp. nov. (aff. intermedia?)	W·	1	0	7w	**	
Physostegia virginiana ssp. praemorsa	P·	4	4 B	1-3	**	e?
Physostegia virginiana ssp. virginiana	M·P·W·L·	8	0	7	**	
Phytolacca americana	M P L	21	5	4	*	

Species	County	Frequ.	Miss.	Habitat	Open	Ex.
Pilea pumila	M P L	16 d	4	6w		
Pinus echinata	M P W L:	34 D	6 a	2-5	*	
Pinus rigida	M P W	24 D	0 A	2-3		
Pinus strobus	M L	2	0 A	3-4		
Pinus virginiana	M·P·W L	46 D	11 a	1-3	*	
Plantago aristata	M·P	11 d	0 A	2-3	**	
Plantago lanceolata	M P	9	1	3-4	**	E
Plantago rugelii	M P	11	4	3-6w	**	
Plantago virginica	M P	7 f d	2 a	3-2	**	
Platanthera* ciliaris (Habenaria c.)	M·P:	5 f r	0 A	5	*	
Platanthera* clavellata (Habenaria c.)	M·P:	5 r	0 A	5-6		
Platanthera* flava var. f. (Haben. f.)	W.	1 f d	0 a	5		
Platanthera* integrilabia* (H. blepharioglottis var. i.)	P·	1 f	0 A	5	*	
Platanthera* lacera (Habenaria l.)	P·	1 f R	0 a	3-5		
Platanus occidentalis	M P W L	37 D	16	6		
Poa alsodes	M.P.	2 f R	0 A	4u		
Poa annua	P.	1 f	1 B	4	**	E
Poa autumnalis	M P.	8 f	1 a	4		
Poa compressa	P	3 f	2 b	1-3u	**	E
Poa cuspidata	M:P	15 f	5	3-4		
Poa pratensis	M·P	5 +	3 b	4	**	E?
Poa sylvestris	M P. L	13 f d	6 b	4		
Podophyllum peltatum	M P	19 f	5	4-3		
Polemonium reptans var. r.	P.	1	1 B	4		
Polemonium reptans var. villosum	P:	6 d	1 a	4-6		
Polygala curtissii	M: P:	7 f	0 A	1-2	**	
Polygala polygama	M·	1 f	0 a	3	*	
Polygala sanguinea	M: L·	2 f	0 A	3-2	**	
Polygala senega var. latifolia	M·P·	4	4 B	3-4		
Polygala verticillata (all var. isocycla?)	M·P:	4	2	1-2	**	
Polygonatum biflorum var. b.*	M P L	29 d	8	3-4		
Polygonatum biflorum var. commutatum* (canaliculatum)	M P L	3	2 b	4-6	*	
Polygonatum pubescens	P	1	0	4		
Polygonum caespitosum var. longisetum	M·P·W·L·	16 f d	3	5-7w	**	E
Polygonum cuspidatum	P M	2	0	3-6	**	E
Polygonum hydropiperoides var. h.	P.	3 f	0	5-6W	*	
Polygonum lapathifolium	W·	1	0	7	**	E
Polygonum pensylvanicum	M· W·L·	4	0	3-4/7w	**	
Polygonum persicaria	L	1	0	7	**	E
Polygonum punctatum	M.P.	6 f	0	5-7	**	
Polygonum sagittatum	M P· L·	4	0 A	5	*	
Polygonum scandens (vars. s. + cristatum?)	P:	4	1	6	*	
Polygonum virginianum	M P L	22	7	4	*	
Polymnia canadensis var. c.	P·	12	12 B	3-4		
Polymnia uvedalia	M P·	12	10 B	4	*	
Polypodium polypodioides var. michauxianum	P·	3	3 B	2-30		
Polypodium virginianum	M P W·	23	3 a	40		
Polystichum acrostichoides (+ f. incisum)	M·P L	55 D	13	3-4		
Populus alba	P	1	1 B	3	**	E
Populus deltoides	M	1	0	3	*	
Populus grandidentata	M·P·	9	1 a	2-3	*	

Species	County	Frequ.	Miss.	Habitat	Open	Ex.
Porteranthus trifoliatus (Gillenia t.)	M*	1	0 A	3-2		
Portulaca oleracea	P	3	3 B	2-3R	**	E
Potentilla canadensis var. c.	M P	22 d	5 a	3-2	*	
Potentilla norvegica	L*	1	0	7	**	E
Potentilla simplex var. s.	M P	19 d	6	3-4	*	
Prenanthes altissima	M: P: L*	15	4	4	*	
Prenanthes serpentaria	M: P: W* L*	20	2 a	3	*	
Prunella vulgaris cf. var. hispida	M P L*	3	1	6-5	*	
Prunella vulgaris var. lanceolata	M. P L*	30	9	6-3	*	
Prunus americana var. lanata	M* P*	12	7 b	3	*	
Prunus angustifolia	P.	1 R	1	3	*	
Prunus cf. cerasus	M:	1 r	0	3-4	**	E
Prunus munsoniana	M* P	5	3 b	3-4	*	
Prunus persica	M* P	3 r	1	3	*	E
Prunus serotina	M: P	25	13 b	4-3		
Ptelea trifoliata	M P*	14	14 B	2-3	*	
Pteridium aquilinum var. latiusculum	M* P* W L*	28 d	0 A	2-3	*	
Pteridium aquilinum var. pseudocaudatum	P*	1	0 a	3	**	
Pueraria lobata	P	1 D	0	3	**	E
Pycnanthemum cf. incanum	P.	1 f	0 A	5	**	
Pycnanthemum pycnanthemoides var. p.	M: P:	28	7 a	5-6	*	
Pycnanthemum tenuifolium	M* P* W*	15	0 A	5-7	**	
Pyrrhopappus carolinianus	M: P	3 f	0 a	3	**	
Pyrularia pubera	M P W*	11	0 A	4		
Pyrus communis	P*	2 R	2 B	3	*	E
Quercus alba	M P W L	59 D	20	3		
Quercus alba x montana	M P	3 R	0 A	3	*	
Quercus alba x muhlenbergii	P*	1	1 b	3		
Quercus alba x stellata	P W*	2	1	3	*	
Quercus coccinea	M P	30 d	2 A	3-2		
Quercus falcata	M* P	28	9	3-5		
Quercus imbricaria	P*	1	1 B	3	*	
Quercus marilandica	M* P w	11 R	2 a	2		
Quercus montana* ("prinus")	M* P* W L	38 D	3 A	3		
Quercus muhlenbergii* (acuminata)	M P	24 D	22 B	3		
Quercus rubra* var. r. (borealis var. maxima)	M P L*	30 d	12 a	4-3		
Quercus shumardii	P	13	13 B	3-5		
Quercus stellata	M P	33 d	13	3-2		
Quercus velutina	M P	31 d	8	3		
Ranunculus abortivus	M P	2	0	6w	*	
Ranunculus hispidus var. hispidus*	M P	8	5 b	4		
Ranunculus hispidus var. nitidus* (septentrionalis)	P*	1	0	7w		
Ranunculus recurvatus	M P	18	4	6-4	*	
Rhamnus caroliniana var. c.	M* P	18	15 B	2-3	*	
Rhexia mariana	M L	4	0 A	5	**	
Rhexia virginica	M P* L*	5 d	0 A	5	**	
Rhododendron arborescens	M P* L	7 d	0 A	7	*	
Rhododendron catawbiense	M:	4 r	0 A	20	*	
Rhododendron cf. calendulaceum	M. P.	4	0 A	3-2		
Rhododendron cumberlandense (bakeri)	M:	1 f	0 A	3-5		
Rhododendron maximum	M* P: W L	36 D	1 A	4		
Rhododendron periclymenoides* (nudiflorum)	M* P*	20 d	0 A	3		
Rhus aromatica var. a.	M P	14	14 B	2-3	*	
Rhus copallina	M P L	27 D	3 A	2-3	*	
Rhus glabra	M* P	25 d	9	3-4	*	

Species	County	Frequ.	Miss.	Habitat	Open	Ex.
Rhus (Toxicodendron) radicans	M P L	41 D	15	3-6	*	
Rhynchospora capitellata	M P W L	5 f d	0 A	5	**	
Rhynchospora globularis var. recognita	M	1 f	0 A	2-5	*	
Rhynchospora glomerata	M P	2 f D	0 A	5-6	**	
Ribes cf. cynosbati	P	2 R	2 B	3-4o		
Robinia cf. hispida var. h. x var. rosea	M	1	0	2-3	*	e?
Robinia hispida var. fertilis	M P	3	2	3	**	e
Robinia hispida var. rosea* (boyntonii)	M W	3 d	0 A	2-3	*	
Robinia pseudoacacia	M P W	17	4	3-4/7	*	
Rorippa cf. islandica	P	3	2	7w	**	E
Rosa carolina	M P L	25 d	16 b	2-3	*	
Rosa multiflora	M P L	11	2	3-4	*	E
Rosa palustris	P	1 R	1 B	6w	*	
Rosa setigera	P	3	3 B	4-7	**	
Rotala ramosior	M P	2 r	1	5-7w?	**	
Rubus Section Argutae	M P	30	10	4-3	**	
Rubus Section Flagellares	M P L	15	5	3-7	**	
Rubus allegheniensis var. a.	M P	30	10	4-3	*	
Rubus hispidus	M P L	5 d	0 A	5-6	*	
Rubus occidentalis	P	2	2 b	4-3	*	
Rudbeckia cf. truncata*/tenax*	P	13 D	12 B	1-3	**	
Rudbeckia fulgida var. fulgida	M P	15	6	3-4	**	
Rudbeckia fulgida var. spathulata	P L	3 f	1	6-3	**	
Rudbeckia fulgida var. umbrosa	P	11	7 b	4-6	*	
Rudbeckia hirta var. serotina	M P	8	2	3-4	**	
Rudbeckia laciniata	M P	12 d	3	6		
Rudbeckia triloba var. t.	P	7 d	6 B	3-4	*	
Ruellia caroliniensis	M P	18	7	2-3	**	
Ruellia humilis	P	2	2 B	1	**	
Ruellia strepens	P	1	1 B	6	*	
Rumex acetosella	M P	10	1 A	3-1	**	E
Rumex crispus	M	2	0	3-4	**	E
Rumex obtusifolius	M P	3	2	4-6	**	E
Sabatia angularis	M P	9 f	1 a	3-5	**	
Sagina decumbens	M	1	0 a	3	**	
Sagittaria australis* ("longirostra")	M P W	4	0	5-6W	**	
Sagittaria latifolia	P	1	0	7W	**	
Salix caroliniana	M P W L	13 D	4	7w		
Salix exigua* (interior)	P L	4	3 B	6-7w	**	
Salix humilis var. humilis*	M P	12	2 a	2-3	**	
Salix humilis var. microphylla* (tristis)	P	1	0	3	**	
Salix nigra	M P	27 d	10 b	6-7w	*	
Salix sericea	M	1	0 A	6-7w	**	
Salvia lyrata	M P	23 d	12 b	2-4	**	
Sambucus canadensis	M P	19	5 b?	6-4	*	
Samolus floribundus	P L	3	2 B	6w	*	
Sanguinaria canadensis	M P	10	1 b?	4-3		
Sanicula canadensis	M P W	29	10	6-3	*	
Sanicula gregaria	M P	8	4 b	4-3		
Sanicula smallii	M P	14	4 a	3		
Saponaria officinalis ?	M	1	0	3	**	E
Sassafras albidum	M P L	37	7	2-4	*	
Satureja (Clinopodium) vulgaris	M P L	6	3 b	3-4	**	E
Saururus cernuus	P W L	5 D	0	7W		
Saxifraga virginiana	P	1	1 B	4o		
Schrankia microphylla	M P W	14	1 A	3	**	

Species	County	Frequ.	Miss.	Habitat	Open	Ex.
Scirpus americanus	P:	1 d	0	5W	**	
Scirpus atrovirens var. atrovirens	M•	1 f	0	5	**	
Scirpus atrovirens var. georgianus	M P. W•	9 f	1 a	5-7w	**	
Scirpus cyperinus	M.P L•	17 d	0 a	5-7w	**	
Scirpus lineatus	M.P:	4 f	3 b	5-7w	**	
Scirpus polyphyllus	M P	8 d	1 a	5	*	
Scirpus tabernaemontanii* (validus)	P	1	0 a	5W	**	
Scleria nitida	M•P:	13 f d	7 b?	3	*	
Scleria pauciflora	M.	1 f	0	7	**	
Scleria triglomerata	P•	1 f	0	3-5		
Scrophularia marilandica	P	5	3 b	6-4	*	
Scutellaria elliptica var. hirsuta.	M•P.	20	8	3		
Scutellaria incana (all var. punctata?)	M•P• W•	10	1 A	5-7	*	
Scutellaria integrifolia	M•P L	5 r	0 A	7-5	*	
Scutellaria lateriflora	M•P	2	1	6	*	
Scutellaria nervosa	P	1	0	4		
Scutellaria parvula (+ leonardii?)	P•	2	2 B	1-3	**	
Scutellaria saxatilis	M: W	2 d	0 b	40		
Scutellaria serrata	P:	1	0 A	4-6		
Sedum pulchellum	P	1	1 B	2o	*	
Sedum ternatum	M P	31	13 b?	4o		
Selaginella apoda	M•P L•	8 R	0 A	4-7u	*	
Senecio anonymus* (smallii)	M P. L	28 D	7 a	2-3	**	
Senecio aureus	M P L	11 d	3	6	*	
Senecio obovatus	M P	14	12 B	3-4o		
Senecio pauperculus	M W•	2	0	7w	**	
Setaria faberi	M P	8 f	5 b	3-4	**	E
Setaria geniculata	P•	1 f	1 B	3	**	e
Setaria pumila* (glauca)	M P L•	7 f	3 b	3-4	**	E
Setaria viridis	M•P	3 f	2 b	3-4	**	E
Sicyos angulata	P W L	5	1	6	*	
Sida spinosa	M P	6	2	3-6	**	E
Silene rotundifolia	M P• L•	23	8	3-4U		
Silene stellata	M P• L	3	0	4	*	
Silene virginica	M P	11 f	4	3		
Silphium (asteriscus ssp.) trifoliatum	M•P•	16	10 b	1-3/7	**	
Silphium perfoliatum var. p.	P L•	6	0	6	*	
Sisyrinchium angustifolium	M P.	5 f	0 A	5-7	**	
Sisyrinchium cf. albidum	L•	1	0	3	**	
Sisyrinchium cf. mucronatum	M P.	2 f	1	3/7	**	
Sisyrinchium graminoides	M P.	9 f	3	3/7	**	
Smilacina racemosa	M P L	32 d	9	4-3		
Smilax bona-nox	M P L	18	9 b	3/7	*	
Smilax ecirrhata var. hugeri*	M:P:	17	8 b	3-4		
Smilax glauca	M•P L	29 d	4 A	2-3	*	
Smilax herbacea	M P L•	6 r	2	3-4	*	
Smilax hispida	M P	6	3 b	4-6	*	
Smilax rotundifolia	M•P	39 d	10	2-4	*	
Solanum carolinense	M P	10	2	3-4	**	
Solanum nigrum	M P	5	3	4-6	**	
Solidago altissima* (canadensis var. scabra)	M•P L	27 D	6	3-4	**	
Solidago arguta var. a.*	M.P: W• L•	26	5 a	4-3	*	
Solidago arguta var. bootii*	M•P• W•	5 f	0 A	3-5		
Solidago bicolor	M:P:	11	1 A	3	**	
Solidago caesia	M.P L•	27	5	3-4		
Solidago erecta	M P: W• L•	29	4 a	2-3	**	

Species	County	Frequ.	Miss.	Habitat	Open	Ex.
Solidago flexicaulis	M P: L•	23 d	10 b	4		
Solidago gigantea vars. g. + serotina	M• P• W• L	17 d	2	6-4	**	
Solidago hispida	P:	1 f	0 a	3	**	
Solidago nemoralis var. n.	M• P• W• L•	28 D	4 a	2-3	**	
Solidago odora	M• P• W•	26	2 A	3	*	
Solidago rugosa (all var. aspera?)	M• P• L	28 D	3 A	5-7	**	
Solidago spathulata ssp. randii var. plumosa new comb.	M• P: W• L•	6	0 A	7	**	
Solidago speciosa var. s.	P:	3	1	3/7	**	
Solidago sphacelata	M P W.	15 d	14 B	2-1	*	
Solidago uliginosa (with hairy seeds)	P: L•	2	0 A	7	**	
Solidago ulmifolia	P: L.	12	10 b	3	*	
Solidago (Euthamia) graminifolia var. nuttallii	M P:	4	1	3	**	
Sonchus cf. arvensis	M•	1	0	4	**	E
Sorghastrum nutans	M• P• W• L	33 D	9	2-3/7	**	
Sorghum halepense	M P	9	4 b	3-4	**	E
Sparganium americanum	M. P	3 d	0	5W	**	
Spartina pectinata	W•	1 d	0	7w	**	
Specularia* (Triodanis) perfoliata	M P	8	1 a	3	**	
Sphenopholis intermedia	P.	2 f R	2 B	4	*	
Sphenopholis nitida	M• P•	9 f	5	3	*	
Spigelia marilandica	P	6	6 B	4-3	*	
Spiraea (betulifolia ssp.) corymbosa	P L	2 R	0	7	**	E
Spiranthes lacera cf. var. gracilis	P:	3 f R	1	2-3	**	
Sporobolus asper	M P•	8 D	8 B	1-2	**	
Sporobolus clandestinus	P	1 f d	1 B	1	**	
Sporobolus indicus* (poiretii)	M:	1 f	0 A	2	**	E
Sporobolus vaginiflorus var. neglectus*	P• L	6 f	4 B	2-3	**	
Sporobolus vaginiflorus var. v.	P•	5 f	4 B	2-3	**	
Stachys riddellii	M P	4	3	4		
Stachys tenuifolia	M P	3	1	6		
Staphylea trifolia	M P	4	4 B	4-3		
Stellaria media	M P W•	5	2 b	4-6	**	E
Stellaria pubera var. p.	M P	10	4	3-4		
Stellaria pubera var. silvatica* (S. corei)	P	5 d	2 b	4		
Stenanthium gramineum var. micranthum*	M• W•	3 r	0 A	5-6	*	
Stewartia ovata	M: P:	26	0 A	4-3		
Stipa (Piptochaetium) avenacea	M• P• L	26 D	6 a	2-3	*	
Stylophorum diphyllum	P	2	1 b	4-6		
Stylosanthes biflora	M• P•	11 r	1 A	3/7	**	
Symphoricarpos occidentalis	M P L•	16	6 b?	3-4u/7	*	
Taenidia integerrima	P•	2	2 B	3		
Talinum teretifolium	M• P•	7	0 A	1-2R	**	
Taraxacum officinale	M P	3	1	4	**	E
Tephrosia spicata	M: W•	4	0 A	7		
Tephrosia virginiana var. v.	M• P W L	27 d	2 A	2-3/7	*	
Teucrium canadense var. virginicum	M• P	2	1	3-6	**	
Thalictrum dioicum	M P	6	4 b	4		
Thalictrum mirabile (= clavatum?)	M• P. W L	23 D	0 A	4-6U		
Thalictrum pubescens* var. p. (polygamum)	M. P. W• L•	17	2 a	6	*	
Thalictrum revolutum	M P: L	6 r	1	3-5	*	
Thaspium barbinode (vars. b. + angustifolium)	M P•	14	11 B	4-3	*	
Thaspium trifoliatum var. flavum	M	1 f	1 B	4-3		
Thaspium trifoliatum var. t.	M• P:	5	2	4-3		

Species	County	Frequ.	Miss.	Habitat	Open	Ex.
Thelypteris (Phegopteris) hexagonoptera	M P	25	6	4		
Thelypteris noveboracensis	M P• L	32 D	0 A	5-4		
Thuja occidentalis	P•	4 d	4 B	4o		
Tiarella cordifolia	M P L	28 D	2 a	4		
Tilia americana (mostly var. neglecta)	M P	11	8 B	4		
Tilia heterophylla	M•P L	21	7	4		
Tipularia discolor	M P•W•L•	20	2 a	4-3		
Trachelospermum difforme	M• W	4	0	7w	**	
Tradescandtia ohiensis	M P W L•	8 r	0	7	*	
Tradescandtia subaspera cf. var. montanum	M:P	9	1 a	4-6		
Tradescandtia virginiana	M•	1	0	3	*	
Tragia urticifolia	P:	1	1 B	1	**	
Trautvetteria carolinensis	M•P W•L•	12	0 A	7	*	
Trichomanes boscianum	M• W•	2	0 A	3-4I		
Trichostema dichotoma	M•P.	5 d	0 A	2-3	**	
Trichostema* (Isanthus) brachiata	P:	4	4 B	2-3R	**	
Tridens* flavus (Triodia f.)	M P	25 f D	14 b	3-6	**	
Trifolium agreste* (procumbens)	M P	3	1	3	**	E
Trifolium pratense	M P L	19	6 b	3-4	**	E
Trifolium repens	M P	12	4	3-4	**	E
Trillium cuneatum var. cuneatum*	M:P.	11 f	5 b	4		
Trillium cuneatum var. luteum*	M:P:	14 f d	8 b	4		
Trillium grandiflorum	M P.	3 F d	0 a	4		
Trillium sulcatum* (+ some erectum?)	M•P• L	18 f	1 A	4		
Triosteum angustifolium var. a.	M P:	9	9 B	3-4		
Triosteum angustifolium var. eamesii	P:	1	1 B	3		
Tripsacum dactyloides	M: W•	2 R	0	7	*	
Tsuga canadensis	M P W L	44 D	8 A	4		
Typha angustifolia	P•	5 D	1	5W	**	
Typha latifolia	M•P W L	9 D	1	5W	**	
Typha latifolia x angustifolia	M•P•	3	1	5W	**	
Ulmus alata	M P•	31	17 b	2-3	*	
Ulmus americana	M P• L	19	10 b	6		
Ulmus rubra	M P W L	34	16 b	4-3		
Ulmus serotina	P:	3 r	3 B	2		
Uvularia grandiflora	P	7	6 B	4		
Uvularia perfoliata	M P	20	8	3-4		
Vaccinium arboreum	M•P	35 D	6 A	2	*	
Vaccinium corymbosum	M•P L	25 d	1 A	2-4	*	
Vaccinium stamineum (+ neglectum)	M•P• L•	33	7 a	3		
Vaccinium vacillans	M.P W L	43 D	6 A	3		
Valeriana pauciflora	P	1	0 b	4-6		
Valerianella cf. radiata	P	1 f	0	7	*	
Veratrum (Melanthium) parviflorum	M•	1 R	0 A	4		
Verbascum blattaria	P	1	1 B	3-4	**	E
Verbascum thapsus	M P	16	7 b	3-4u	**	E
Verbena simplex	M P	5	2	2-3	**	
Verbena urticifolia	M P	11	5 b	6-3	**	
Verbesina (Actinomeris) alternifolia	M P	9 d	3	6	*	
Verbesina occidentalis	M P	26 D	9	3	**	
Verbesina virginica	P	12	11 B	3	*	
Vernonia gigantea* ssp. g. (altissima)	M P W•L	20 d	5	3-6	**	
Veronica arvensis	M P	3	1	3	**	E
Veronica officinalis	M P	3	0 a	3	*	E
Veronica serpyllifolia var. s.	M P•	2	0	5	**	E
Veronicastrum virginicum	L•	1 R	0	7	*	
Viburnum acerifolium	M P	33 d	7 a	3-4		

Species	County	Frequ.	Miss.	Habitat	Open	Ex.
Viburnum cassinoides	L•	2 R	0 a	7	*	
Viburnum dentatum var. d.	P.	3	2	4-6	*	
Viburnum prunifolium	M P•	10	5 b	4	*	
Viburnum rafinesquianum var. affine	P.	8	8 B	3-2		
Viburnum rafinesquianum var. r.	P:	2	2 B	3		
Viburnum rufidulum	M P	8	8 B	2-3	*	
Vicia angustifolia	M	1 f	1	3	**	E
Vicia caroliniana	M P	11	3	4-3		
Vicia cf. dasycarpa	M	1 f	1	3	**	E
Viola "emarginata"	M•P W•L•	15	0 A	2-3	**	
Viola affinis (latiuscula)	M•P	6 f	1 a	3-6		
Viola blanda	M•P W	28 D	3 A	4		
Viola canadensis	M•P	4 f	1	4		
Viola conspersa	M P•	8 f	1 a	6		
Viola cucullata	M P• L	17	1 A	6w	*	
Viola hastata	M:P	14	0 A	3		
Viola hirsutula	M•P	12	2 a	3		
Viola hirtsutula x palmata var. dilatata	P•	1	0	4		
Viola lanceolata var. l.	P•	1	0 A	5	**	
Viola palmata var. dilatata* (V. "palmata")	M P•	2	0 a?	4 ?		
Viola palmata var. p.* (V. triloba)	M P	22	12	3-4		
Viola papilionacea	M P	6	3 b	4-6	*	
Viola pedata	M P W L•	16 d	0 A	2-3/7	**	
Viola primulifolia	M P L	11	0 A	5-6		
Viola pubescens var. eriocarpa	M P	2 f	0	4		
Viola rostrata	M P	26 D	9	4		
Viola rotundifolia	M•P	4 d	0 A	4		
Viola sororia	M P	10	8 B	3-4		
Viola striata	M P• L	7 f d	2 b	6-4		
Viola tripartita var. glaberrima	M•P: L•	8 r	2	3		
Vitis aestivalis (mostly var. argentifolia)	M.P. L•	24 d	6	2-3/7	*	
Vitis cf. riparia	M:	3 d	0	7		
Vitis rotundifolia	M•P	34 d	6 a	2-3/7	*	
Vitis rupestris	P: L•	5 d	0 a	7w		
Vitis vulpina	M P•	18	12 b	3-4	*	
Vittaria lineata	P.	2	0 A	4U		
Waldsteinia fragarioides ssp. doniana (var. f.?)	M	1 R	1 B	1-2		
Wisteria frutescens (+ macrostachya?)	M:P•W	14 d	4	7/3	**	
Woodsia obtusa	P•	1	1 B	4	*	
Xanthium strumarium (sensu lato)	M P•W•	9 D	3	6-4	**	
Xanthorhiza simplicissima	M•P L•	17 d	0 A	6-7		
Yucca cf. flaccida	P•	2	1	3	**	E
Zanthoxylum americanum	P	4 d	4 B	2-3	*	
Zizia aptera	M P:	5	5 B	2-3		
Zizia aurea	P• L•	7 D	1	7-6	*	

APPENDIX B

SPECIES LISTS FOR UNUSUAL VEGETATION TYPES

(arrangement follows Thorne, 1981)

Table B1. Species composition of open grassy vegetation with rare species on sandstone outcrops, and adjacent pine forest edges (Vegetation Types 1A, 2A).

+ = present; * = local dominant; e = mostly at edges; E = dominant at edges (e/E not used in M-P, which are mostly in open pine forest or clifftop scrub).

A = Clifftops at end ridge W or SW of Long Hollow in Dumpling Rocks area.
Nevelsville Quad. Area = ca. 50 x 30 feet. 22 May 1987.
(With small patch of Crotonopsis elliptica on SW side.)

B = Clifftops on west side of ridge NNE of the Gulf.
Nevelsville Quad. Area = ca. 100 x 10 feet. 21 Jul 1987.
(With frequent Liatris microcephala.)

C = Clifftops NW of the Big Cutoff.
Nevelsville Quad. Area = ca. 200 x 20 feet. 18 Jun 1987.
(With frequent Liatris microcephala.)

D = Glade just S of track from US 27 to dam at head of Middle Fork of Beaver.
Wiborg Quad. Area = ca. 30 x 30 feet. 21 Jul 1987.
(Perhaps not a natural opening; with frequent Liatris microcephala.)

E = Glade on gravel road at saddle west of Franklin Hollow, SSE of Flat Rock.
Wiborg Quad. Area = ca. 150 x 75 feet. 7 Aug 1987.
(Mostly destroyed by road; with ca. 100 Talinum plants, Crotonopsis, etc.)

F = Glade on dirt road at saddle on Dog Slaughter Ridge, 0.5 miles W of river.
Cumberland Falls Quad. Area = ca. 50 x 50 feet. 19 Jun 1987.
(Half destroyed by road; with ca. 300 Talinum plants.)

G = Bed of dirt road on point down to Mill Cr. and branch, 1 mile E of Funston.
Hail Quad. Area = ca. 20 x 3 feet. 26 Jun 1987.
(Perhaps not a natural opening; with ca. 50 Talinum between road ruts.)

H = Glades at S end of SW branch of Grassy Gap Ridge, 1 mile NNW of Funston.
Hail Quad. Area = ca. 500 x 100 feet. 24 Jun 1987.
(With two patches of ca. 50 and 12 Talinum, and scattered Minuartia glabra.)

I = Glade at N end of most N branch of Grassy Gap Ridge, 1.7 miles N of Funston.
Hail Quad. Area = ca. 75 x 25 feet. 10 Jul 1987.
(Perhaps disturbed in past by an old road; with ca. 2500 Talinum plants.)

J = Glade on slight peak at N end of Grassy Gap Ridge, 1.6 miles N of Funston.
Hail Quad. Area = ca. 10 x 10 feet. 10 Jul 1987.
(With ca. 15 Minuartia glabra plants.)

K = Glade by gravel road on Hewling Ridge, 0.55 miles WSW of Beaver Creek mouth.
Hail Quad. Area = ca. 20 x 15 feet. 5 Aug 1987.
(Some destroyed by road; with ca. 300 Talinum plants.)

L = Glade on ridge trail NNE of Rockcastle River mouth, 300 ft. from road's end.
Sawyer Quad. Area = ca. 30 x 10 feet. 1 Sep 1987.
(Some disturbed by trail; with ca. 150 Talinum and 1000 Minuartia glabra.)

M = Clifftops on NE side of upper Canoe Hollow, SW side of Stepping Rock Ridge.
Ano Quad. Area = ca. 500 x 20 feet. 17 Jun 1987.
(With ca. 9 Juniperus communis bushes and scattered Minuartia glabra.)

N = Clifftops in gully NE side of Canoe Hollow, 0.3 miles N of Hollow's mouth.
Ano Quad. Area = ca. 300 x 50 feet. 16 Jul 1987.
(With ca. 50 Juniperus communis bushes and seedlings, Minuartia nearby.)

O = Clifftops E of large gully N of Turkey Creek, 0.5 miles NW of Creek mouth.
Ano Quad. Area = ca. 40 x 30 feet. 16 Jul 1987.
(Around large Juniperus communis bush, ca. 30 x 20 feet.)

P = Top of Stepping Rock Ridge within 30 feet of dirt road's end.
Ano Quad. Area = ca. 30 x 30 feet. 16 Jul 1987.
(Around Juniperus communis bush ca. 20 feet across, Minuartia by road.)

Species	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
PTERIDOPHYTA																
Lycopodium tristachyum													+			
Pteridium aquilinum var. latius.	e															
Asplenium platyneuron						e		+	+		e					
GYMNOSPERMAE																
Tsuga canadensis							e						+			
Pinus rigida		e											+	+		
Pinus virginiana	E	e	E	E	E	E		E	E	E		E	+	*	*	*
Juniperus communis var. depressa													+	*	+	+
Juniperus virginiana			e				e	E	e			E	+			
ANNONIFLORAE																
Liriodendron tulipifera								e								
Sassafras albidum	e												+			
THEIFLORAE																
Ilex opaca	e						e	e					+	+		+
Hypericum* (Ascyrum) hypericoides														+		
Hypericum* (Ascyrum) stragalum*	+				+	+		+					+			+
Hypericum gentianoides				+	+	+	+	+	+	+	+	+	+	+		
Rhododendron maximum													+			
Rhododendron catawbiense		+														
Kalmia latifolia	e					e		e					+		+	
Oxydendron arboreum	e															
Epigaea repens	e												+			
Gaultheria procumbens	+												+			
Gaylussacia baccata	E		E		e											
Gaylussacia brachycera	e												+			
Vaccinium stamineum								e								
Vaccinium arboreum	E	e	E			e		E					+			
Vaccinium vacillans	e	e	e	E	e	e		e							+	*
Vaccinium corymbosum	e	e											+		+	
Diospyros virginiana	e															
Lysimachia lanceolata									+							
Rumex acetosella							+	+	+							
CHENOPODIIFLORAE																
Cerastium cf. fontanum* (vulgatum)						?										
Arenaria (Minuartia) glabra*								+		+		+	+	+		
Dianthus armeria							+									
Talinum teretifolium						+	+	+	+	+		+	+			
GERANIIFLORAE																
Oxalis cf. dillenii ("stricta")							+	+	+			+				
Geranium carolinianum								+								
Polygala curtissii															+	
SANTALIFLORAE																
Euonymus americanus							e					+				
VIOLIFLORAE																
Viola pedata				+		+						+	+			
Viola cf. emarginata							?									+
Passiflora lutea							e		+							
MALVIFLORAE																
Lechea racemulosa	+					+			+		+					
Ulmus alata												+				
Celtis tenuifolia								e								
Crotonopsis elliptica	+					+										

Species	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
RUTIFLORAE																
Rhus (Toxicodendron) radicans						e			+		+					
Rhus copallina					e	e			E	e	+	+				
Rhus glabra											+					+
Carya tomentosa						e										
Carya glabra						e										
Carya pallida									E							+
Acer saccharum var. s.							e									
Acer rubrum var. rubrum	e	e	e			e		e				+	+	+	+	+
Cercis canadensis						e			e							+
Trifolium repens							+									
Trifolium agreste* (procumbens)					+											
Lespedeza repens									+		?					
Lespedeza procumbens						e			+							
Lespedeza virginica									+							
Lespedeza hirta												+				
Lespedeza cuneata									+							
Tephrosia virginiana	+							+		e		+				
Robinia hispida var. rosea*		e														
Galactia volubilis				+					+							
HAMAMELIDIFLORAE																
Hamamelis virginiana	e															
Liquidambar styraciflua						e										
Quercus alba						e	e		e						+	
Quercus stellata				e		e				e		+	+		+	
Quercus montana* ("prinus")	e	e	e	e			e	e				+	+		*	
Quercus marilandica			e	e												
Quercus velutina	e	e				e		e	+	e		+	+		+	
Quercus coccinea	e	e	e			e		e				+	+			
Carpinus caroliniana								E								
Betula lenta	e															
ROSIFLORAE																
Potentilla canadensis						+		+		+						+
Rubus Flagellares (group)							+	+	+		+	+	+			
Rubus allegheniensis var. a.						+										
Rubus Argutae (group)						+		e								
Rosa carolina								+	+	+						
Prunus americana var. lanata										+						
Malus* angustifolia										e						
Aronia arbutifolia			e				e						+	+	?	+
Aronia melanocarpa								e								
Crataegus cf. pruinosa									e		e					
Crataegus cf. macrosperma									?							
Amelanchier arborea var. arborea	e		E			e		e		e			+		*	

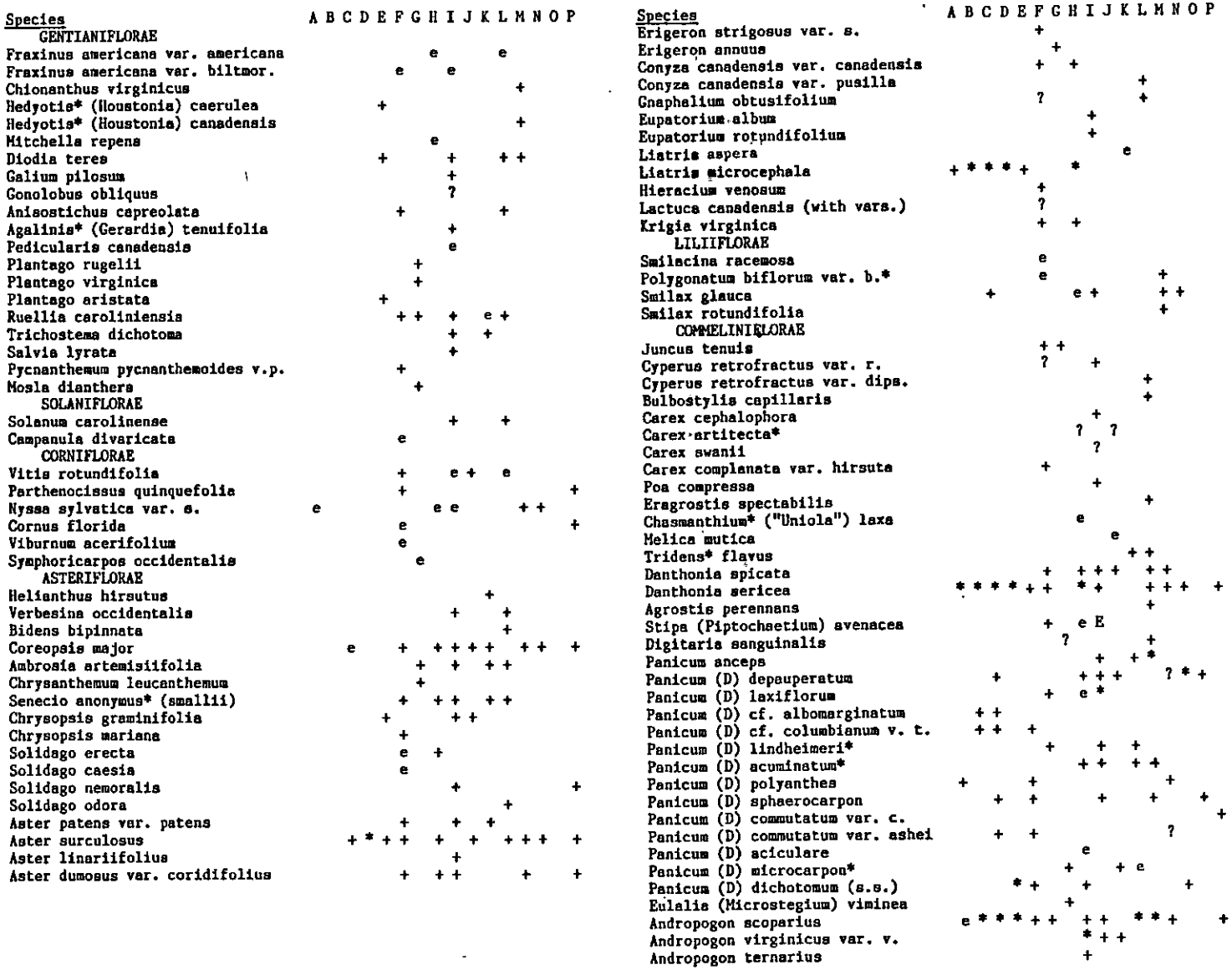

Species
A B C D E F G H I J K L M N O P
GENTIANIFLORAE
Fraxinus americana var. americana
Fraxinus americana var. biltmor.
Chionanthus virginicus
Hedyotis* (Houstonia) caerulea
Hedyotis* (Houstonia) canadensis
Mitchella repens
Diodia teres
Galium pilosum
Gonolobus obliquus
Anisostichus capreolata
Agalinis* (Gerardia) tenuifolia
Pedicularis canadensis
Plantago rugelii
Plantago virginica
Plantago aristata
Ruellia caroliniensis
Trichostema dichotoma
Salvia lyrata
Pycnanthemum pycnanthemoides v.p.
Mosla dianthera
SOLANIFLORAE
Solanum carolinense
Campanula divaricata
CORNIFLORAE
Vitis rotundifolia
Parthenocissus quinquefolia
Nyssa sylvatica var. s.
Cornus florida
Viburnum acerifolium
Symphoricarpos occidentalis
ASTERIFLORAE
Helianthus hirsutus
Verbesina occidentalis
Bidens bipinnata
Coreopsis major
Ambrosia artemisiifolia
Chrysanthemum leucanthemum
Senecio anonymus* (smallii)
Chrysopsis graminifolia
Chrysopsis mariana
Solidago erecta
Solidago caesia
Solidago nemoralis
Solidago odora
Aster patens var. patens
Aster surculosus
Aster linariifolius
Aster dumosus var. coridifolius
Species
A B C D E F G H I J K L M N O P
Erigeron strigosus var. s.
Erigeron annuus
Conyza canadensis var. canadensis
Conyza canadensis var. pusilla
Gnaphalium obtusifolium
Eupatorium album
Eupatorium rotundifolium
Liatris aspera
Liatris microcephala
Hieracium venosum
Lactuca canadensis (with vars.)
Krigia virginica
LILIIFLORAE
Smilacina racemosa
Polygonatum biflorum var. b.*
Smilax glauca
Smilax rotundifolia
COMMELINIFLORAE
Juncus tenuis
Cyperus retrofractus var. r.
Cyperus retrofractus var. dips.
Bulbostylis capillaris
Carex cephalophora
Carex artitecta*
Carex swanii
Carex complanata var. hirsuta
Poa compressa
Eragrostis spectabilis
Chasmanthium* ("Uniola") laxa
Melica mutica
Tridens* flavus
Danthonia spicata
Danthonia sericea
Agrostis perennans
Stipa (Piptochaetium) avenacea
Digitaria sanguinalis
Panicum anceps
Panicum (D) depauperatum
Panicum (D) laxiflorum
Panicum (D) cf. albomarginatum
Panicum (D) cf. columbianum v. t.
Panicum (D) lindheimeri*
Panicum (D) acuminatum*
Panicum (D) polyanthes
Panicum (D) sphaerocarpon
Panicum (D) commutatum var. c.
Panicum (D) commutatum var. ashei
Panicum (D) aciculare
Panicum (D) microcarpon*
Panicum (D) dichotomum (s.s.)
Eulalia (Microstegium) viminea
Andropogon scoparius
Andropogon virginicus var. v.
Andropogon ternarius

Table B2. Species composition of grassy to brushy roadsides with rare species on sandy ridges (possible remnants of Vegetation Type 2B).

+ = present; * = local dominant.

A = Route 751, E side 0.25 miles N of railroad crossing, E of Curt Pond.
Burnside Quad. Area around Aster concolor. 13 Oct 1987.
(Under powerline; with ca. 50 A. concolor plants and Gymnopogon ambiguus.)

B = Route 751, W side 0.35 miles N of railroad crossing.
Burnside Quad. Area around Aster concolor. 13 Oct 1987.
(Next to recent clearcut; with 8 A. concolor plants.)

C = Route 751, E side 0.85 miles N of railroad crossing, W of Minton Hollow.
Burnside Quad. Area around Aster concolor. 13 Oct 1987.
(On W-facing 20° slope; with 16 A. concolor plants.)

D = Route 751, W side 0.95 miles N of railroad crossing, W of branch to M.H.
Burnside Quad. Area around Aster concolor. 13 Oct 1987.
(Under powerline; with ca. 10 A. concolor plants.)

E = Route 751, E side 1.75 road miles S of US 27, E of Minton Hollow mouth.
Burnside Quad. Area of ca. 50 x 20 feet. 8/13 Oct 1987.
(On W-facing 10-40° slope; with ca. 200 A. concolor and Gymnopogon.)

F = Route 751, E side 1.2 road miles S of US 27, on curve.
Burnside Quad. Area of ca. 70 x 20 feet. 8/12 Oct 1987.
(On SW-facing 10-30° slope; with ca. 40 Aster concolor plants.)

G = Route 751, W side 0.9 road miles S of US 27.
Burnside Quad. Area around Aster concolor. 12 Oct 1987.
(With one A. concolor plant.)

H = By dirt road in old field on E branch of Curt Pond Ridge.
Burnside Quad. Area around Aster concolor. 13 Oct 1987.
(Steep slope with one A. concolor plant.)

I = Dirt road on Hindsfield Ridge, near old house 1 SE of Route 192.
Ano Quad. Area of ca. 70 x 20 feet. 14 Oct 1987.
(With ca. 11 A. concolor plants.)

J = Route 700, S edge of parking lot by Sand Hill Church 5.5 miles S of Rt. 92.
Wiborg Quad. Area of ca. 100 x 10 feet 24 Jun 1987.
(With scattered Polygala polygama.)

K = Route 192, N/W side 1.15-1.25 miles E of Craig's Creek Road.
London SW Quad. Areas with Lilium philadelphicum. 23 Jun 1987.
(With ca. 14 Lilium plants in three patches.)

L = Route 192, N side 1.1 miles E of Route 1193, original "Bald Rock" area.
Ano Quad. Area = ca. 100 x 10 feet. 23 Jun/14 Oct 1987.
(Including a flat outcrop ca. 30 x 20, with vegetation mostly destroyed.)

Species	A	B	C	D	E	F	G	H	I	J	K	L
PTERIDOPHYTA												
Pteridium aquilinum var. lat.				+	+							
Asplenium platyneuron					+							
Polystichum acrostichoides					+						+	
GYMNOSPERMAE												
Pinus rigida								+			+	
Pinus virginiana	+	+	+	+		+	+		+		+	
Pinus echinata				+	+	+				+	+	
Juniperus virginiana	+					+						
ANNONIFLORAE												
Liriodendron tulipifera				+	+						+	
Sassafras albidum					+					+	+	
Anemone virginiana				+							+	
THEIFLORAE												
Ilex opaca									+			
Hypericum* (Ascyrum) stragalum					+	+						+
Hypericum gentianoides												+
Oxydendron arboreum	+			+		+						
Vaccinium stamineum											+	+
Vaccinium arboreum	+	+	+		+	+						
Vaccinium vacillans	+				+					+	+	
Diospyros virginiana				+						+		
Lysimachia lanceolata												+
Lysimachia quadrifolia											+	
Rumex acetosella										+		
GERANIIFLORAE												
Linum virginianum											+	
Polygala polygama										+		
SANTALIFLORAE												
Celastrus scandens					+							
VIOLIFLORAE												
Viola pedata						+						+
Viola cf. emarginata										+		+
Viola tripartita var. glab.											+	
Lepidium virginicum										+		
MALVIFLORAE												
Lechea racemulosa						+						?
Rhamnus caroliniana							+					
Euphorbia corollata	+									+		
RUTIFLORAE												
Rhus (Toxicodendron) radicans											+	
Rhus copallina			+	+	+	+			+	+	+	
Carya tomentosa										+		
Carya pallida			?	?	+	?						+
Acer rubrum var. rubrum	+	+	+	+	+	+	+	+		+	+	
Schrankia microphylla											+	
Cassia (Chamaecrista) nictitans										+	+	+
Desmodium ciliare						+					+	
Desmodium marilandicum	+				+							
Desmodium paniculatum (s.s.)*											+	+
Desmodium glabellum*							?		?		?	
Desmodium laevigatum				+						+	+	
Lespedeza repens						+						
Lespedeza virginica			+	+								
Lespedeza intermedia			+		+	+			+			
Lespedeza int. x virginica						+						
Lespedeza hirta			+			+	+					+
Lespedeza cuneata						+						
Stylosanthes biflora			+									+
Tephrosia virginiana var. v.	+	+	+		+							+

Species	A	B	C	D	E	F	G	H	I	J	K	L
Clitoria mariana										+		
Amphicarpa bracteata var. b.											+	
Galactia volubilis					+				+	+		
HAMAMELIDIFLORAE												
Quercus alba	+	+	+							+	+	
Quercus stellata			+			+			+			
Quercus montana* ("prinus")	+					+					+	
Quercus falcata			+		+	+						
Quercus marilandica					+	+	+					
Quercus velutina	+		+		+	+	+		+		+	
Quercus coccinea		+			+				+	+	+	
ROSIFLORAE												
Fragaria virginiana var. v.					+	+						
Potentilla simplex var. s.										+	+	+
Potentilla canadensis var. c.	+	+				+						
Rubus Flagellares (group)		+	+							+	+	
Rubus Argutae (group)					+				+	+		
Prunus serotina		+	+									
Amelanchier arborea var. a.		+										+
MYRTIFLORAE												
Oenothera biennis					+							
GENTIANIFLORAE												
Hedyotis* purpurea var. p.										+		
Galium pilosum var. p.					+					+	+	
Apocynum cannabinum											+	
Asclepias amplexicaulis										+		
Agalinis* cf. decemloba*					+							
Pedicularis canadensis					+							
Plantago rugelii		+										
Prunella vulgaris var. lanc.					+							
Satureja (Clinopodium) vulgaris												+
Pycnanthemum pycnanthemoides	?											
Mosla dianthera												+
SOLANIFLORAE												
Lobelia puberula var. simulans	+		+			+		+			+	
Lobelia inflata												+
CORNIFLORAE												
Vitis aestivalis	+									+		
Vitis vulpina										+		
Parthenocissus quinquefolia										+		
Nyssa sylvatica var. s.	+					+	+			+		
Cornus florida			+		+		+	+	+		+	
Sanicula canadensis											?	
Daucus carota										+		
ASTERIFLORAE												
Helianthus atrorubens var. a.									+			
Helianthus divaricatus					+					+		
Helianthus microcephalus		+			+					+	+	
Helianthus hirsutus	+	+		+	+				+			+
Rudbeckia fulgida var. fulgida					+							+
Rudbeckia triloba var. t.	+											
Coreopsis major	+	+	+	+	+	+	+	+	+	+	+	+
Parthenium integrifolium var. i.										+		
Chrysanthemum leucanthemum		+								+	+	
Senecio anonymus* (smallii)	+	+			+		+	+	+			
Chrysopsis (Pityop.) graminifolia		+		+	+			+	+	+		
Chrysopsis mariana	+	+		+	+	+	+					+
Solidago erecta	+	+	+		+	+		+	+		+	+
Solidago nemoralis	+	+	+		+	+		+	+			+
Solidago arguta var. a.*									+			

Species	A	B	C	D	E	F	G	H	I	J	K	L
Solidago odora	+	+		+		+	+	+	+			
Solidago gigantea vars. g. +						?						
Solidago altissima*		+		+								
Solidago graminifolia var. nut.						+						
Aster undulatus		+			+	+					+	
Aster patens var. patens	+	+	+		+	+	+		+	+		+
Aster surculosus		+						+				+
Aster concolor	+	+	+	+	+	+	+	+				
Aster linariifolius		+		+	+							
Aster solidagineus	+				+							
Aster pilosus var. pilosus		+	+			+						+
Aster lateriflorus												+
Aster dumosus var. coridifolius	+	+	+	+		+		+				?
Erigeron annuus										+	+	
Conyza canadensis var. pusilla												+
Gnaphalium obtusifolium		+	+		+	+						+
Antennaria plantaginifolia		?			?	?					+	
Eupatorium fistulosum				+	+							
Eupatorium album	+					+						+
Eupatorium rotundifolium	+	+				+		+	+			
Eupatorium aromaticum		+				+		+		+	+	
Eupatorium rugosum var. r.			+									
Liatris squarrulosa					+	+			+			
Prenanthes serpentaria					?	?						
Hieracium venosum						+					+	
LILIIFLORAE												
Lilium philadelphicum var. p.											+	
Uvularia perfoliata											?	
Smilax glauca	+	+			+				+	+		
Smilax bona-nox		+										
Smilax rotundifolia				+			+				+	
COMMELINIFLORAE												
Carex swanii												+
Bromus japonicus											+	
Festuca elatior (sensu lato)						+						
Elymus glabriflorus *												+
Danthonia spicata		+										+
Stipa (Piptochaetium) avenacea											+	+
Aristida dichotoma					+							
Aristida longespica	+											
Aristida purpurascens var. virg.		+										
Gymnopogon ambiguus	+				+							
Panicum flexile						+						+
Panicum anceps		+	*	+	+			+				
Panicum (D) laxiflorum											+	+
Panicum (D) lindheimeri*												+
Panicum (D) acuminatum*/villos.					+		+					+
Panicum (D) polyanthes												+
Panicum (D) boscii	+	+					+					
Panicum (D) microcarpon*											+	
Panicum (D) dichotomum (s.s.)	+				+	+						+
Setaria geniculata						+						
Erianthus alopecuroides						+						
Andropogon scoparius	*	+	*	*	*	+	+		+	+		+
Andropogon gerardi	*		+	*								
Andropogon virginicus var. v.					+	+				+	+	+
Andropogon ternarius					+	+						
Sorghastrum nutans	*		+	*	+	+			+			

Table B3. Species composition of forests and grassy openings with rare species on rocky limestone sites (Vegetation Type 1B,2C,3C).

+ = present; * = local dominant; o = mostly in open; O = local dominant in open.

A = Narrow point NE of mouth of Little South Fork at Big South Fork.
Nevelsville Quad. Area = ca. 50 x 30 feet 18 Sep 1987.
(Three separate areas with Paxistima canbyi.)

B = Narrow point E of mouth of Sinking Creek at the South Fork (mile 16.6).
Burnside Quad. Area = ca. 500 x 50 feet 18 Sep 1987.
(Area with Paxistima canbyi and a few Thuja occidentalis.)

C = Narrow point and S slopes E of mouth of Cain Cr. at South Fork (mile 10.3).
Burnside Quad. Area = ca. 300 x 100 feet 8 Apr/8-12 Oct 1987/
(Area with Paxistima canbyi and opening on point with Tragia urticifolia.)

D = S-facing bluffs of South Fork at river mile 3.6-3.8.
Burnside Quad. Area = ca. 1200 x 200 feet 30 Sep 1987.
(Area with scattered Muhlenbergia cuspidata.)

E = SW- to W-facing bluffs of South Fork at river mile 3.8-4.0.
Burnside Quad. Area = ca. 1200 x 200 feet 30 Sep 1987.
(Area with scattered Muhlenbergia cuspidata.)

F = S-facing point at confluence of Cumberland River and its South Fork.
Burnside Quad. Area = ca. 300 x 100 feet 25 Jun 1987.
(Including slope forest, open ledges and disturbed clifftop forest.)

G = SSE-facing bluffs of Cumberland River, at river mile 516.8.
Burnside Quad. Area = ca. 200 x 20 feet 29 Sep 1987.
(Clifftops only, behind Cumberland Heights subdivision.)

H = SW-facing bluffs of Cumberland River at river mile 521.1.
Burnsaide Quad. Area = ca. 500 x 100 feet 25 Jun 1987.
(Mostly open grassy ledges.)

I = SW-facing bluffs of Cumberland River at river mile 526.3.
Burnside Quad. Area = ca. 2500 x 200 feet 7 Oct 1987.
(Slope forest with small open ledges.)

J = Glade on point NE of mouth of Buck Creek at Cumberland Rv. (mile 523.8).
Hail Quad. Area = ca. 60 x 30 feet 6 Jul 1987.
(Unusually large opening above steepest slopes.)

K = Glade on point just N of small stream into Cumberland River at mile 534.5.
Hail Quad. Area = ca. 40 x 30 feet 6 Jul 1987.
(Unusual opening above steepest slopes.)

L = Glade above S-facing bluffs of Cumberland River at mile ca. 535.
Hail Quad. Area = ca. 30 x 20 feet 23 Jun 1987.
(Unusual opening above steepest slopes.)

M = Glade on top of Bald Knob, between Routes 80 and 39, 3 miles NE of Somerset.
Bobtown Quad. Area = ca. 200 feet diameter 1 Sep 1987.
(Perhaps natural, but evidence of old earthworks or digging.)

N = Knob between Burnside and Tateville, between US 27 and railroad.
Burnside Quad. Area = ca. 2000 feet diameter 1 Oct 1987.
(Forest with small artifical or partially natural openings.)

O = Open roadside in "Paradise Acres" area 0.3 miles NW of Buck Creek mouth.
Hail Quad. Area = ca. 50 x 50 feet 6 Jun 1987.
(Area with Lilium canadense and Scutellaria cf. leonardi.)

P = Low hill just N of bluff at South Fork, river mile 3.7.
Burnside Quad. Area = ca. 1000 x 200 feet 30 Sep 1987.
(Area with abundant Carya carolinae-septentrionalis.)

Q = Small point just S of small stream at Cumberland River, mile 534.4.
Hail Quad. Area = ca. 10 ft diameter 23 Jun 1987.
(Area around 4 trees of Carya carolinae-septentrionalis.)

R = Roadside of Route 1247, 1 mile NE of US 27, at SW end of Cedar Grove knob.
Somerset Quad. Area = ca. 30 x 20 feet 30 Sep 1987.
(Area around scattered Carya carolinae-septentrionalis.)

Species	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
PTERIDOPHYTA																		
Botrychium virginianum												+						
Pellaea atropurpurea	+	+	+	+	o	+			+	o	o		+					
Polypodium polypodioides				+	o													
Asplenium ruta-muraria	+	+	+	+	o													
Asplenium resiliens		+	+					+					+					
Asplenium platyneuron		+	+		+								0		+			
Asplenium rhizophyllum		+																
Polystichum acrostichoides		+													+			
GYMNOSPERMAE																		
Tsuga canadensis	+																	
Pinus virginiana	+	+	+	+	+		+		+	+								
Thuja occidentalis		+																
Juniperus virginiana	+	*	*	*	+	+	+	+	*	+	+	+	+			*	+	+
ANNONIFLORAE																		
Magnolia acuminata	+							+										
Liriodendron tulipifera												+						
Asimina triloba				+											+			
Aristolochia serpentaria												+						
Cocculus carolinus						+												
Aquilegia canadensis	+	+	+		+	+		+										
Thalictrum dioicum			+	+														
Thalictrum revolutum															+			
Anemone virginiana				o	+			+				+						
Hepatica acutiloba		+																
Clematis cf. viorna			?															
THEIFLORAE																		
Hypericum* (Ascyrum) stragalum*				o					o						+			
Hypericum prolificum					+													
Hypericum frondosum			+	o	0		o	*				o			+			
Hypericum dolabriforme				+	o	+	o				o							
Hypericum punctatum								+										
Vaccinium stamineum	+				o				o									
Vaccinium arboreum					o				o									
Vaccinium vacillans										o								
Diospyros virginiana	+	+	+	+	+	+			+	+		+						
Dodecatheon meadia								+										
CHENOPODIIFLORAE																		
Chenopodium hybridum					+													
Arenaria (Minuartia) patula	o	o		o	o	+	o	o		o	o							
Silene rotundifolia				+		+												
GERANIIFLORAE																		
Linum medium												o						
Oxalis cf. dillenii ("stricta")				o														
Polygala verticillata									o									
SANTALIFLORAE																		
Celastrus scandens					o											+		
Euonymus atropurpureus													+					
Euonymus americanus		+																
Paxistima canbyi	+	*	*															
Euonymus obovatus		+																
VIOLIFLORAE																		
Viola pedata						o												
Viola sororia			+	+														
Viola hirsutula			+															
Viola cf. latiuscula			?															
Viola palmata var. p.* (triloba)		+		o	o			+										
Passiflora lutea var. glabriflora							o	o										
Arabis laevigata		+	+		o													
MALVIFLORAE																		
Ulmus americana					+													
Ulmus rubra			+	+	+	+			+			+	+			+	+	
Ulmus alata			+	+		+			+		+	+	+			+	+	+

Species	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
Ulmus cf. serotina				+	+	+												
Celtis occidentalis	+				+													
Celtis tenuifolia x occidentalis	+				+				+									
Celtis tenuifolia	+	+	o	+	o	+		o		o	+							
Morus rubra																+		
Parietaria pensylvanica				+		+		+	+									
Ceanothus americanus											o	o	+		o			
Rhamnus caroliniana	+	*	+	+	+	+	+		+	+		+	+					
Croton monanthogynus			o	o	o		o											
Acalypha virginica		?																
Tragia urticifolia			o															
Euphorbia (Chamaesyce) preslii*				o														
Euphorbia corollata			+	+	o			o	o		o	o	o					
RUTIFLORAE																		
Zanthoxylum americanum														*				
Ptelea trifoliata	+	+	+	+	o			o		o	o	o				+	+	
Rhus (Toxicodendron) radicans		+	+		o	+			+	o	o		+			+	+	
Rhus aromatica var. a.		+	+	o	o	+	o	o	*		o	o	+			+		
Rhus copallina			o															
Rhus glabra					o													
Juglans nigra				+					+			+				+		
Carya tomentosa											+							
Carya carolinae-septentrionalis				+	*	*	+	+		*	+			+	*		*	+ *
Carya ovata (var. o.)			+	+						+							+	
Carya glabra			+		+					+						+	+	
Acer saccharum var. s.	+	*	+	+	+	*	+		*	+	+	+		+		*	+	
Aesculus flava* (octandra)																+		
Cercis canadensis			*	*	*	*	+	+	+	+	+	+	+			*	+	+
Gleditsia triacanthos										+								
Cassia (Chamaecrista) nictitans						o												
Cladrastis kentukea* (lutea)					+	+			+	+						+		
Melilotus officinalis					?													
Desmodium rotundifolium												o						
Desmodium paniculatum (s.s.)					o													
Desmodium perplexum* ("dillenii")					o				+			o				+		
Lespedeza repens							o											o
Lespedeza procumbens		+		o	o													
Lespedeza violacea			+	o	o													
Lespedeza virginica							o			o	o			o				
Lespedeza intermedia					o	?												
Lespedeza cuneata						o												
Lespedeza (Kummerowia) striata						o												
Stylosanthes biflora						o						o						
Tephrosia virginiana												o	o					
Robinia pseudoacacia									+									
Clitoria mariana		+										o						
Amphicarpa bracteata var. b.						o												
Galactia volubilis						o	+			o	o	o						o
HAMAMELIDIFLORAE																		
Hamamelis virginiana	+		+										•					
Platanus occidentalis					+													
Quercus alba									+			+	+			+	+	+
Quercus cf. alba x stellata												+						
Quercus stellata			+	+		+		+		+		+		+		+		+
Quercus muhlenbergii*	+	*	*	*	+	+	+	+	*	+		+	*	+		*		+
Quercus imbricaria																		+
Quercus falcata					+	+		+										+
Quercus marilandica								+				+						
Quercus velutina			+									+				+		
Quercus rubra* var. r.	+	+	+	+		+			+				+					
Quercus shumardii				+	+	+	*	+		+	+	+		+		+		+
Ostrya virginiana	*	*	*	+	+		+		*	+	+	+				*	+	
Carpinus caroliniana						+												

Species	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
ROSIFLORAE																		
Physocarpus opulifolius	+		+	*	o			o	+									
Fragaria virginiana var. v.					+											+		
Waldsteinia fragarioides		?																
Potentilla canadensis var. c.					o					o	o							
Rubus Flagellares (group)											o							
Rubus Argutae (group)																+		
Agrimonia rostellata									+							+		
Agrimonia pubescens					+				+				+					
Rosa carolina	+	+	+		o		o	o			o			o				
Prunus serotina	+	+	+		+				+							+		
Prunus americana var. lanata			+															
Crataegus cf. crus-galli		+							+									
Crataegus cf. intricata					?					?	?			?		?		
Amelanchier arborea var. a.	+	+	+		+				+		+	+				+		
Sedum ternatum		+			o				+									
Sedum pulchellum ?				?														
Heuchera villosa var. macrorhiza		+																
Heuchera americana var. a.			+						+									
Philadelphus cf. hirsutus	+	*	*	+	o	+		o	*	o	o	o						
Pachysandra procumbens	+	+						+										
MYRTIFLORAE																		
Gaura filipes											o	o						
GENTIANIFLORAE																		
Fraxinus americana var. amer.		+	+		+	*			+	+	+	+	+		*		*	
Fraxinus americana var. bilt.								+										
Fraxinus quadrangulata	+	+	+	*	+	+	+	+	*				+		+	+		
Chionanthus virginicus		+							+	o								
Spigelia marilandica		+																
Hedyotis* canadensis (Houstonia)			o						+			o						
Hedyotis* nigricans (Houstonia)	o	o	O	o	o	+	o	o					o					
Galium circaezans	+		+	o	o				+									
Galium pilosum					o								+					
Galium concinnum	+	+																
Asclepias tuberosa								o		o								
Asclepias verticillata					o		o				o							
Asclepias viridiflora													o					
Gonolobus obliquus													+					
Frasera* caroliniensis (Swertia)												o						
Bignonia* (Anisost.) capreolata	+	+	+	o	o	+			+							+		
Verbascum thapsus					o													
Penstemon cf. hirsutus				?														
Penstemon cf. pallidus ?	+	+	+		o	+	o		+									
Dasistoma macrophylla		+						o				o						
Aureolaria virginica			+															
Aureolaria laevigata												o						
Aureolaria cf. flava										o	o							
Agalinis* tenuifolia var. t.							o											
Ruellia humilis						+							o					
Ruellia caroliniensis					o					o	o							
Verbena simplex		+			o	+												
Phryma leptostachya													+					
Trichostema* brachiatus		o			o													
Scutellaria elliptica var. hira.					+				+							+		
Scutellaria parvula					o										o			
Physostegia virginiana ssp. pr.								?			?		?					
Salvia lyrata				o						o								
Blephilia ciliata		+	+										+					

Species	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
SOLANIFLORAE																		
Lithospermum canescens			+	o		o		o			O	o		o	o			
Lithospermum tuberosum			+	+						o	+		o	o				
Ipomaea pandurata					o						+	o	o	o				o
Phlox pilosa var. pilosa (virens)													+	+				
Phlox divaricata var. d.											+							
Lobelia spicata (vars.)															0	o		
CORNIFLORAE																		
Vitis aestivalis			+	+							+	o	o	o				
Vitis vulpina					o											+		
Parthenocissus quinquefolia			+	+		+					+		o			+		
Cornus florida			+											+		+		
Senicula canadensis				+	o						+			+				
Taenidia integerrima													o					
Zizia aptera			+	+								+	o	o				
Thaspium barbinode	+	+									+	o	o					
Thaspium trifoliatum				?														
Viburnum acerifolium				+														
Viburnum rufidulum			+		+	+					+			+	+			
Viburnum prunifolium	+												+					
Viburnum rafinesquianum	+	+																+
Lonicera japonica					+													
Lonicera cf. dioica var. glauc.			+															
Symphoricarpos occidentalis					o											+		
ASTERIFLORAE																		
Helianthus microcephalus			+	+									+					
Helianthus hirsutus				o							o	o	o		o			
Verbesina virginica				o	o							o				+		
Verbesina occidentalis						+	+									+		
Rudbeckia cf. truncata*				0	0	0	0		0		0	0	o		0	o		
Rudbeckia triloba						+										+		
Coreopsis tripteris													o					
Coreopsis major			+									o						
Polymnia canadensis						+										+		
Silphium asteriscus* ssp. trif.			+					o			o	o	o		o			
Ambrosia artemisiifolia			o		+	o												
Chrysanthemum leucanthemum					+	o												
Senecio obovatus			+	+	o	o					+							
Senecio anonymus* (smallii)			+											+		+		
Erechtites hieracifolia			+															
Cacalia atriplicifolia														+				
Solidago erecta												o						
Solidago caesia			+	+														
Solidago nemoralis			+			o		o						0		+		
Solidago arguta var. a.*			+										o					
Solidago ulmifolia			+		+	o		o		*				o				
Solidago sphacelata	+		0	0	o	+				+		o	o					
Solidago altissima*					o									o				
Aster undulatus					o													
Aster shortii					o	+				+				o				
Aster cordifolius			+	?										o				
Aster patens var. patens	+	+	o									o	o					
Aster oblongifolius	o	o	o		o	+	o	o	0				o					
Aster laevis			+	o	o													
Aster infirmus			+										o					
Aster paternus													o					
Aster pilosus var. pilosus					o													
Aster lateriflorus																+		
Aster dumosus var. coridifolius														o				
Erigeron pulchellus var. p.											*							
Conyza canadensis var. c.		o																
Conyza canadensis var. pusilla					o													
Gnaphalium obtusifolium					o													

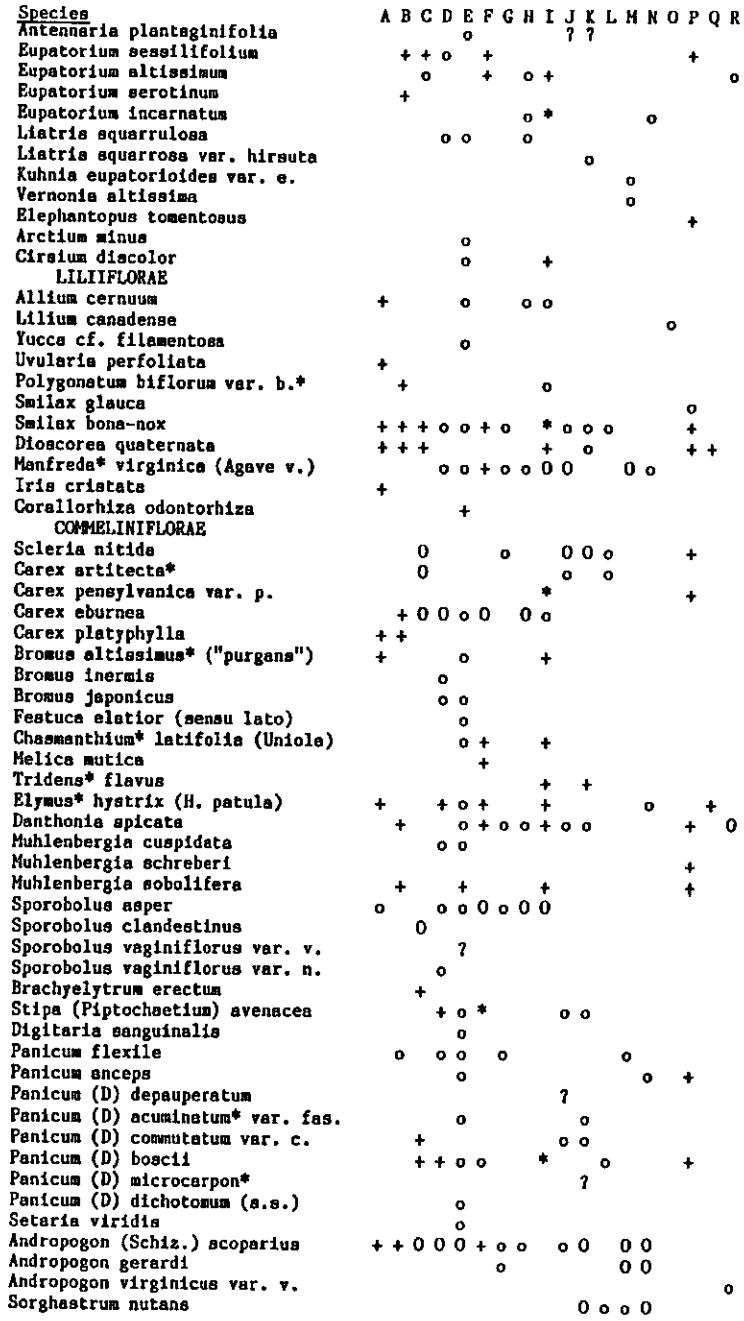

Species
A B C D E F G H I J K L M N O P Q R
Antennaria plantaginifolia
Eupatorium sessilifolium
Eupatorium altissimum
Eupatorium serotinum
Eupatorium incarnatum
Liatris squarrulosa
Liatris squarrosa var. hirsuta
Kuhnia eupatorioides var. e.
Vernonia altissima
Elephantopus tomentosus
Arctium minus
Cirsium discolor
LILIIFLORAE
Allium cernuum
Lilium canadense
Yucca cf. filamentosa
Uvularia perfoliata
Polygonatum biflorum var. b.*
Smilax glauca
Smilax bona-nox
Dioscorea quaternata
Manfreda* virginica (Agave v.)
Iris cristata
Corallorhiza odontorhiza
COMMELINIFLORAE
Scleria nitida
Carex artitecta*
Carex pensylvanica var. p.
Carex eburnea
Carex platyphylla
Bromus altissimus* ("purgans")
Bromus inermis
Bromus japonicus
Festuca elatior (sensu lato)
Chasmanthium* latifolia (Uniola)
Melica mutica
Tridens* flavus
Elymus* hystrix (H. patula)
Danthonia spicata
Muhlenbergia cuspidata
Muhlenbergia schreberi
Muhlenbergia sobolifera
Sporobolus asper
Sporobolus clandestinus
Sporobolus vaginiflorus var. v.
Sporobolus vaginiflorus var. n.
Brachyelytrum erectum
Stipa (Piptochaetium) avenacea
Digitaria sanguinalis
Panicum flexile
Panicum anceps
Panicum (D) depauperatum
Panicum (D) acuminatum* var. fas.
Panicum (D) commutatum var. c.
Panicum (D) boscii
Panicum (D) microcarpon*
Panicum (D) dichotomum (s.s.)
Setaria viridis
Andropogon (Schiz.) scoparius
Andropogon gerardi
Andropogon virginicus var. v.
Sorghastrum nutans

Table B4. Plants growing with patches of Eupatorium luciae-brauniae, on beneath sandstone rockhouses or overhanging cliffs (see Vegetation Type 4B).

+ = present; * = local dominant.

A = W-facing rockhouse by Cumberland River just upstream of Center Rock Rapids.
Cumberland Falls Quad. Back parts of rockhouse. 6 Sep 1987.
(With 150-200 Eupatorium plants, mostly small and lacking vigor.)

B = W-facing cliffs with rockhouses by Cumberland River S of Dog Slaughter Cr.
Cumberland Falls Quad. Areas along ca. 1000 feet. 6 Sep 1987.
(With 1000s of Eupatorium plants, moderately good vigor.)

C = SE-facing cliffs by Cumberland River ca. 0.8 miles S of Rock Branch.
Sawyer Quad. Areas along ca. 500 feet. 7 Sep 1987.
(With 100s of Eupatorium plants, small and lacking vigor.)

D = SE-facing cliffs by Cumberland River ca. 0.8 miles S of Rock Branch.
Sawyer Quad. A relatively wet area. 7 Sep 1987.
(Wet sandy slope with seeps, and a few plants in rockhouse wall above.)

E = NW-facing rockhouse by Cumberland River at mile 551.4 (Cliffside Trail).
Sawyer Quad. Floor of rockhouse 7 Sep 1987.
(With 400-500 Eupatorium plants, of medium vigor.)

F = N-facing rockhouse by Cumberland River at mile 551.3 (Cliffside Trail).
Sawyer Quad. Floor ca. 200 feet long. 7 Sep 1987.
(With about 100 Eupatorium plants, of poor to fair vigor.)

G = NNE-facing rockhouse by Cumberland River at mile 550.4 (Cliffside Trail).
Sawyer Quad. Floor ca. 400 feet long. 7 Sep 1987.
(With 1000s of Eupatorium plants, of good vigor.)

H = N-facing rockhouse by Cumberland River at mile 550.3 (Cliffside Trail).
Sawyer Quad. Floor of rockhouse. 7 Sep 1987.
(With 1000s of Eupatorium plants, of poor to fair vigor.)

I = NE-facing rockhouse 1000 feet E of Bauer Road at head of Indian Cave Branch.
Hail Quad. Floor ca. 250 feet long. 8 Sep 1987.
(With ca. 1000 Eupatorium plants, of very good vigor - clearcut adjacent.)

J = NE-facing rockhouse 1300 feet SW of Goodin Ridge road's end.
Sawyer Quad. Area of ca. 40 x 20 feet. 5 Aug 1987.
(With 100s of Eupatorium, of medium vigor- clearcut adjacent.)

K = S-facing rockhouse 500 feet SE of Goodin Ridge road's end.
Sawyer Quad. Area of ca. 20 x 5 feet. 8 Jul 1987.
(With about 100 Eupatorium plants, of poor vigor.)

L = SE-facing rockhouse 700 feet E of Goodin Ridge road's end.
Sawyer Quad. Area ca. 30 x 10 feet. 8 Jul 1987.
(With about 200 Eupatorium plants, of fair vigor - clearcut adjacent.)

M = SW-facing rockhouse by Upper Troublesome Cr. 1 mile ESE of Mt Victory Ch.
Ano Quad. Area of ca. 30 x 10 feet 6 Aug 1987.
(With 100-200 Eupatorium plants, in area disturbed by diggers.)

Species	A	B	C	D	E	F	G	H	I	J	K	L	M
PTERIDOPHYTA													
Vittaria sp.									+				
Dennstaedtia punctilobula				+	+								
Adiantum pedatum							*	+	+	+			
Athyrium (Diplazium) pyncocarpon							*						
Athyrium (Diparia) thelypteroides							*	+					
Athyrium asplenioides*									*				
Cystopteris cf. fragilis var. m.	+	+		+			+						
Thelypteris noveboracensis								+					
Dryopteris carthusiana*							*						
Dryopteris intermedia*					+	+	*	+		+			
Dryopteris marginalis	+		+				+						
Polystichum acrostichoides	+	+				+	+	+	+	+	+		
ANNONIFLORAE													
Magnolia tripetala									+				
Magnolia macrophylla		+			+								
Liriodendron tulipifera									+				
Asimina triloba			+		+			+		+			
Hexastylis arifolia var. ruthii			+										
Lindera benzoin									+				
Cimicifuga racemosa										+			
Aquilegia canadensis		+	+	+					+		+	+	
Thalictrum mirabile (= clavatum?)	+	+	+	+			+	+	+				
Hepatica acutiloba		+											
Hepatica americana			+										
THEIFLORAE													
Ilex opaca					+			+	+				+
Clethra acuminata					+		+						+
Rhododendron maximum					+	+	+						
CHENOPODIIFLORAE													
Chenopodium hybridum											+		
Silene rotundifolia					+		+	+		+	+	+	+
GERANIIFLORAE													
Oxalis cf. dillenii ("stricta")									?		?		
Impatiens capensis* (biflora)									*				
Impatiens pallida							+						
SANTALIFLORAE													
Euonymus americanus	+		+				+						
VIOLIFLORAE													
Viola hirsutula											+		
Viola blanda							+	+	+	+			
Viola canadensis			?	?			?						
MALVIFLORAE													
Tilia heterophylla				+			+		+	+			
Laportea canadensis								+					
Boehmeria cylindrica	+			+						+			
Pilea pumila					+		+		+	+			
Parietaria pensylvanica											+	+	
RUTIFLORAE													
Rhus (Toxicodendron) radicans	+	+	+	+			+	+		+	+	+	
Juglans nigra									+				
Acer saccharum var. s.		+	+					+		+			
Acer rubrum var. rubrum					+	+		+	+				
Amphicarpa bracteata var. b.				+									
HAMAMELIDIFLORAE													
Hamamelis virginiana	+	+	+						+				+
Fagus grandifolia		+	+						+	+		+	
Quercus rubra var. r.												+	+

Species	A	B	C	D	E	F	G	H	I	J	K	L	M
Ostrya virginiana								+					
Carpinus caroliniana	+												
Betula lenta									+				
ROSIFLORAE													
Geum canadense									+				
Rubus allegheniensis var. a.									+				
Rubus Argutae (group)								+		+			
Amelanchier arborea var. a.									+				
Tiarella cordifolia								+					
Heuchera parviflora var. p.		+	+	+	+	+	+	+	*	+	+	+	-
Heuchera americana		?											
Hydrangea arborescens		+							+				
Galax urceolata				+									
MYRTIFLORAE													
Circaea lutetiana ssp. canadensis*									+				
GENTIANIFLORAE													
Fraxinus americana var. a.		+	+	+		+		+	+				
Mitchella repens		+		+		+							
Anisostichus capreolata	+	+			+						+		
Collinsonia canadensis									+				
SOLANIFLORAE													
Specularia* (Triodanis) perfoliata												+	
Lobelia siphilitica				+									
Lobelia inflata									+				
CORNIFLORAE													
Vitis rotundifolia					+								
Vitis vulpina		+											+
Parthenocissus quinquefolia		+		+	+		+	+	+				
Cornus florida		+		+					+				
Viburnum acerifolium		+		+		+			+				
ASTERIFLORAE													
Solidago caesia		+	+							+			
Aster divaricatus		+	+					+	+	+			
Aster cordifolius			?										
Aster ontarionis		+											
Eupatorium luciae-brauniae	+	*	+	+	+	+	*	*	*	+	+	+	+
Prenanthes altissima		?		?									
LILIIFLORAE													
Smilacina racemosa													+
Polygonatum biflorum var. b.*										+			
Smilax glauca		+											
Smilax rotundifolia			+		+								+
Dioscorea quaternata									+				
ARIFLORAE													
Arisaema triphyllum var. t.	+	+		+		+	+	+					
COMMELINIFLORAE													
Luzula campestris var. echinata												+	
Carex rosea			+										
Carex blanda*											+		
Carex laxiflora (s.s.)*	?	?								+			
Carex virescens												+	
Poa cuspidata											?		
Poa sylvestris										?			
Poa autumnalis						+	+						
Dactylis glomerata									+				
Agrostis perennans									*	+	+		+
Brachyelytrum erectum		+	+										
Leersia virginica		+							*	+			

Table B5. Species composition of seasonal ponds, streamheads and streamsides on sandy soil, mostly with rare species (Vegetation Types 5A,6A).

+ = present; * = local dominant; e = at drier edges; dominant at drier edges.

A = Snake Pond on Snake Pond Ridge 0.3 miles W of gravel road S of Route 192.
Hail Quad. Pond ca. 50 x 20 feet. 6 Aug 1987.
(With patch of Glyceria septentrionalis.)

B = Pond on Grassy Gap Ridge 800 feet W of dirt road, 0.9 miles N of Funston.
Hail Quad. Pond ca. 50 feet diameter 16 Sep 1987.
(With large patch of Carex joorii.)

C = Curt Pond on Curt Pond Ridge 0.3 miles ENE of turn off Route 751.
Burnside Quad. Pond ca. 200 x 50 feet. 13 Oct 1987.
(With abundant Carex joorii at edges and on central hummocks.)

D = Streamhead on Halsey Rough 500 feet NE of branch in dirt roads.
Billows Quad. Area of ca. 10 x 10 feet. 11 Sep 1987.
(Around a single Platanthera ciliaris.)

E = Streamhead on Halsey Rough 1000 feet NE of branch in dirt roads.
Billows Quad. Area of ca. 100 x 20 feet. 11 Sep 1987.
(With frequent Calamagrostis cinnoides.)

F = Streamhead on Halsey Rough, E side of dirt road, 800 feet NE of branch.
Billows Quad. Area of ca. 20 x 20 feet. 11 Sep 1987.
(Opening with abundant Calamagrostis cinnoides.)

G = Streamhead on Hindsfield Ridge 0.5 miles SE of turn off Route 192.
Ano Quad. Area of ca. 200 x 100 feet. 14 Aug 1987.
(Powerline cut with Platanthera sp. and abundant Calamagrostis cinnoides).

H = Streamhead on Hindsfield Ridge 1000 ft SE from SE corner of large field.
Ano Quad. Areas within 200 x 50 feet. 6 Aug 1987.
(Patches of Platanthera integrilabia, totalling 100 or more.)

I = Streamhead on Hindsfield Ridge 800 feet WSW of SE corner of large field.
Ano Quad. Area of ca. 100 x 50 feet 18 Aug 1987.
(Opening with about 400 Platanthera integrilabia, Carex bromoides, etc.)

J = Bottom of Spruce Creek 0.8 miles from its mouth, by small gully to S.
Nevelsville Quad. Area of ca. 40 x 10 feet. 7 Jul 1987.
(With 100-150 Hydrocotyle americana plants on mossy streambanks and seep.)

K = Banks of Eagle Creek from its falls upstream for 0.4 miles to an old road.
Cumberland Falls Quad. Within 5 feet of banks. 14 Sep 1986.
(With scattered Boykinia aconitifoia.)

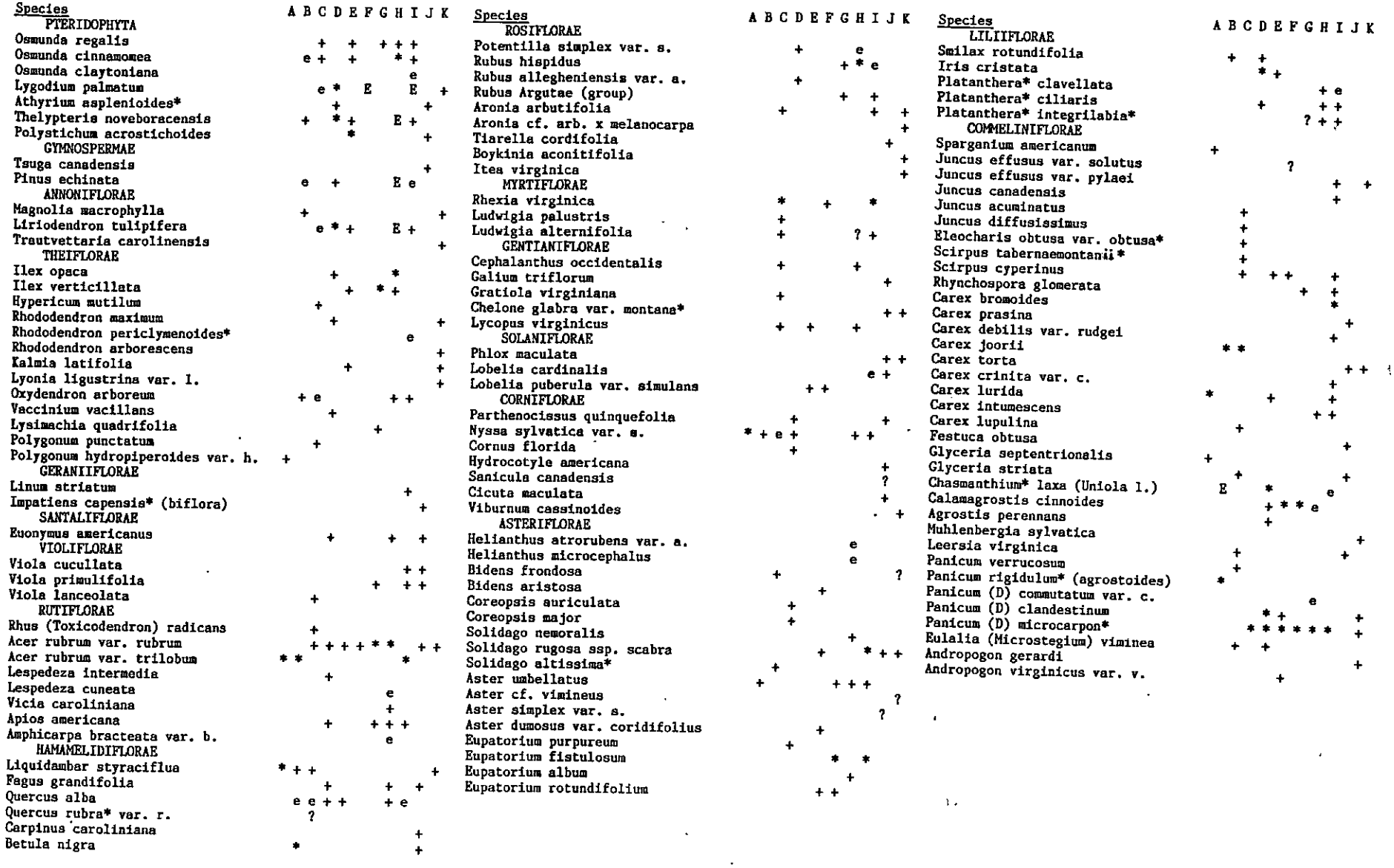

Species
A B C D E F G H I J K
PTERIDOPHYTA
Osmunda regalis
Osmunda cinnamomea
Osmunda claytoniana
Lygodium palmatum
Athyrium asplenioides*
Thelypteris noveboracensis
Polystichum acrostichoides
GYMNOSPERMAE
Tsuga canadensis
Pinus echinata
ANNONIFLORAE
Magnolia macrophylla
Liriodendron tulipifera
Trautvettaria carolinensis
THEIFLORAE
Ilex opaca
Ilex verticillata
Hypericum mutilum
Rhododendron maximum
Rhododendron periclymenoides*
Rhododendron arborescens
Kalmia latifolia
Lyonia ligustrina var. l.
Oxydendron arboreum
Vaccinium vacillans
Lysimachia quadrifolia
Polygonum punctatum
Polygonum hydropiperoides var. h.
GERANIIFLORAE
Linum striatum
Impatiens capensis* (biflora)
SANTALIFLORAE
Euonymus americanus
VIOLIFLORAE
Viola cucullata
Viola primulifolia
Viola lanceolata
RUTIFLORAE
Rhus (Toxicodendron) radicans
Acer rubrum var. rubrum
Acer rubrum var. trilobum
Lespedeza intermedia
Lespedeza cuneata
Vicia caroliniana
Apios americana
Amphicarpa bracteata var. b.
HAMAMELIDIFLORAE
Liquidambar styraciflua
Fagus grandifolia
Quercus alba
Quercus rubra* var. r.
Carpinus caroliniana
Betula nigra
Species
A B C D E F G H I J K
ROSIFLORAE
Potentilla simplex var. s.
Rubus hispidus
Rubus allegheniensis var. a.
Rubus Argutae (group)
Aronia arbutifolia
Aronia cf. arb. x melanocarpa
Tiarella cordifolia
Boykinia aconitifolia
Itea virginica
MYRTIFLORAE
Rhexia virginica
Ludwigia palustris
Ludwigia alternifolia
GENTIANIFLORAE
Cephalanthus occidentalis
Galium triflorum
Gratiola virginiana
Chelone glabra var. montana*
Lycopus virginicus
SOLANIFLORAE
Phlox maculata
Lobelia cardinalis
Lobelia puberula var. simulans
CORNIFLORAE
Parthenocissus quinquefolia
Nyssa sylvatica var. s.
Cornus florida
Hydrocotyle americana
Sanicula canadensis
Cicuta maculata
Viburnum cassinoides
ASTERIFLORAE
Helianthus atrorubens var. a.
Helianthus microcephalus
Bidens frondosa
Bidens aristosa
Coreopsis auriculata
Coreopsis major
Solidago nemoralis
Solidago rugosa ssp. scabra
Solidago altissima*
Aster umbellatus
Aster cf. vimineus
Aster simplex var. s.
Aster dumosus var. coridifolius
Eupatorium purpureum
Eupatorium fistulosum
Eupatorium album
Eupatorium rotundifolium
Species
A B C D E F G H I J K
LILIIFLORAE
Smilax rotundifolia
Iris cristata
Platanthera* clavellata
Platanthera* ciliaris
Platanthera* integrilabia*
COMMELINIFLORAE
Sparganium americanum
Juncus effusus var. solutus
Juncus effusus var. pylaei
Juncus canadensis
Juncus acuminatus
Juncus diffusissimus
Eleocharis obtusa var. obtusa*
Scirpus tabernaemontanii*
Scirpus cyperinus
Rhynchospora glomerata
Carex bromoides
Carex prasina
Carex debilis var. rudgei
Carex joorii
Carex torta
Carex crinita var. c.
Carex lurida
Carex intumescens
Carex lupulina
Festuca obtusa
Glyceria septentrionalis
Glyceria striata
Chasmanthium* laxa (Uniola l.)
Calamagrostis cinnoides
Agrostis perennans
Muhlenbergia sylvatica
Leersia virginica
Panicum verrucosum
Panicum rigidulum* (agrostoides)
Panicum (D) commutatum var. c.
Panicum (D) clandestinum
Panicum (D) microcarpon*
Eulalia (Microstegium) vimínea
Andropogon gerardi
Andropogon virginicus var. v.

Table B6. Species composition of calcareous seeps, springs and waterfalls with Adiantum capillus-veneris, along bluffs of the Cumberland River and its South Fork (mostly 20-30 feet above water) (see Vegetation Type 6B); also, slopes with Thuja occidentalis (see Vegetation Type 4C).

+ = present; * = local dominant.

A = Under waterfall at mouth of small creek NW of Cumberland River, mile 534.4.
Hail Quad. Area of ca. 30 x 5 feet 23 Jun 1987.
(Main patch of Adiantum ca. 10 x 2 feet, about 20 feet above river.)

B = SSE-facing bluff of Cumberland River at mile 530.25, on travertine seep.
Burnside Quad. Area of ca. 25 x 10 feet. 25 Jun 1987.

C = E-facing bluff of Cumberland River at mile 529.6, on seep.
Burnside Quad. Area of ca. 10 x 5 feet. 25 Jun 1987.

D = WSW-facing bluff of Cumberland River at mile 527.7, on seep.
Burnside Quad. Area of ca. 15 x 5 feet. 25 Jun 1987.

E = WSW-facing bluff of Cumberland Rv. at mile 527.6, on mossy travertine seep.
Burnside Quad. Area of ca. 10 x 5 feet. 25 Jun 1987.

F = SW-facing bluff of Cumberland River at mile 527.5, on small travertine seep.
Burnside Quad. Area of ca. 5 x 2 feet. 25 Jun 1987.

G = SW-facing bluff of Cumberland River at mile 527.4, on travertine seep.
Burnside Quad. Area of ca. 20 x 10 feet. 25 Jun 1987.

H = WNW-facing small gully at Cumberland River mile 524.5, on dripping cliff.
Burnside Quad. Areas within ca. 15 x 5 feet. 25 Jun 1987.
(Two Adiantum patches of about 3-5 feet across.)

I = E-facing bluff of Cumberland Rv. at mile 525.1 in small dripping rockhouse.
Burnside Quad. Area of ca. 5 x 3 feet. 25 Jun 1987.
(Patch of Adiantum only 5-6 feet above river.)

J = S-facing gully N of Cumberland River at mile 519.7, on dripping ledge.
Somerset Quad. Area of ca. 10 x 5 feet. 25 Jun 1987.

K = SSE-facing bluff of Cumberland River at mile 519.6, in dripping rockhouse.
Somerset Quad. Areas within ca. 10 x 5 feet. 25 Jun 1987.
(Two Adiantum patches of 1-3 feet across.)

L = WNW-facing bluff of Cumberland River at mile ca. 519.1, seep under overhang.
Somerset Quad. Area of ca. 5 x 3 feet. 25 Jun 1987.

M = E-facing bluff of South Fork at mile 2.6, large travertine seep.
Burnside Quad. Areas within ca. 30 x 20 ft. 18 Sep 1987.
(One large Adiantum patch and several smaller ones.)

N = SE-facing bluff of South Fork at mile 6.7, travertine seeps under overhang.
Burnside Quad. Areas within ca. 30 x 10 ft. 18 Sep 1987.
(Scattered medium to large patches of Adiantum.)

O = SE-facing bluff of South Fork at mile 6.8, seeps on cliff.
Burnside/Frazer Quad. Areas within ca. 200 x 30 ft. 18 Sep 1987.
(About six main Adiantum patches scattered along cliffs.)

P = SW-facing bluff of South Fork at mile 7.8, seeps on ledges and cliff.
Burnside Quad. Areas within 30 x 20 feet. 18 Sep 1987.
(Small patches of Adiantum above and below ledge.)

Q = E-facing bluff of South Fork at mile 8.3, large travertine seeps.
Burnside Quad. Two areas 5-10 feet across. 18 Sep 1987.
(Including Thuja occidentalis on top of the travertine deposits.)

R = S-facing bluff of South Fork at mile 9.3, travertine seeps.
Burnside Quad. Two areas 5-10 feet across. 18 Sep 1987.

S = N-facing bluff of Cumberland River (mile 531.5) at Lick Branch mouth.
Hail Quad. Area of ca. 300 x 100 feet. 25 Jun 1987.
(With 100s of Thuja occidentalis stems, dominant in this area.)

T = NW-facing bank of Buck Creek below Route 1097 0.5 miles SW of Route 192.
Dykes Quad. Area of ca. 60 x 20 feet. 7 Oct 1987.
(With Thuja occidentalis, 12 stems of 5-15 inches d.b.h. plus smaller ones.)

Species	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
PTERIDOPHYTA																				
Adiantum pedatum																				+
Adiantum capillus-veneris	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
Cystopteris bulbifera												+							*	
Cystopteris tennesseensis													+							
Polystichum acrostichoides																				+
GYMNOSPERMAE																				
Tsuga canadensis																				+
Thuja occidentalis																	+		*	*
Juniperus virginiana																	+	+	+	+
ANNONIFLORAE																				
Magnolia acuminata		+																		
Liriodendron tulipifera																				+
Asimina triloba						+							+							
Aristolochia macrophylla* (durior)																				+
Lindera benzoin				+				+	+					+		+				
Aquilegia canadensis									+							+	+			
Thalictrum dioicum														+						
Anemone virginiana									+											+
Hepatica acutiloba									+											+
THEIFLORAE																				
Hypericum frondosum						+											+			
Dodecatheon meadia						+										+				
Samolus floribundus	+	+																		
GERANIIFLORAE																				
Impatiens capensis* (biflora)	?											+	+	+						
SANTALIFLORAE																				
Celastrus scandens																				+
Euonymus americanus																				+
MALVIFLORAE																				
Tilia americana (neglecta)																				+
Ulmus americana				+				+		+							+			
Ulmus rubra		+							+		+									+
Celtis tenuifolia						+											+			
Morus rubra		+																		
Boehmeria cylindrica	+	+		+			+	+	+	+	+	+	+	+	+					
Pilea pumila	+						+				+									
Rhamnus caroliniana																				+
Dirca palustris																				+
RUTIFLORAE																				
Ptelea trifoliata																				+
Rhus (Toxicodendron) radicans	+					+														+
Carya ovata (var. o.)															?					+
Acer saccharum var. s.			+	+	+	+			+		+	+		+		+	+	+	*	*
Acer rubrum var. rubrum																				+
Aesculus flava* (octandra)		+																		+
Cercis canadensis											+			+			+	+		
Cladrastis kentukea* (lutea)										+		+					+	+	+	
Wisteria frutescens	+										+									
Amphicarpa bracteata var. b.																				+
HAMAMELIDIFLORAE																				
Hamamelis virginiana			+																	+
Platanus occidentalis		+						+		+							+		+	
Fagus grandifolia																				+
Ostrya virginiana		+							+										*	*
Quercus muhlenbergii																				+

Species	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
ROSIFLORAE																				
Physocarpus opulifolius					+	+														
Rosa palustris	+																			
Rosa carolina																				+
Prunus americana var. lanata																				+
Amelanchier arborea var. a.																				+
Sedum ternatum	+																			+
Heuchera villosa var. macrorhiza	+											+			+	+		+	*	
Philadelphus cf. hirsutus																			+	*
Hydrangea arborescens	+	+	+	+			+			+	+			+	+	+		+	+	+
Pachysandra procumbens																				+
GENTIANIFLORAE																				
Fraxinus americana var. a.			+	+	+			+			+								*	+
Hedyotis* canadensis (Houstonia)										+										
Bignonia* (Anisost.) capreolata	+						+													
Verbascum thapsus											+					+				
Penstemon pallidus		?																		
Scutellaria lateriflora															+					
Pycnanthemum pycnanthemoides										?										
Lycopus virginicus	?																			
Lycopus americanus		+					+													
SOLANIFLORAE																				
Lobelia siphilitica	+	+											+	+	+	+		+		
CORNIFLORAE																				
Parthenocissus quinquefolia			+								+									+
Cornus florida																				+
Cornus obliqua* (purpusi)	?									+										
Sanicula canadensis											+									?
Cicuta maculata	+																			
Thaspium barbinode																				+
Viburnum acerifolium																				+
Lonicera cf. dioica var. d.																				+
ASTERIFLORAE																				
Verbesina occidentalis											+									
Verbesina alternifolia															+					
Rudbeckia fulgida var. umbrosa	+																			
Rudbeckia fulgida var. fulgida																		+		
Rudbeckia cf. truncata*					+	+					+									
Bidens frondosa				?									?	?						
Senecio obovatus																				+
Solidago flexicaulis			+								+									+
Solidago caesia															+					
Aster macrophyllus																				*
Aster divaricatus																				*
Aster shortii										+										
Aster cordifolius	+									+	+			+	+				?	+
Aster laevis																		+		
Aster lateriflorus																				+
Aster simplex var. s.	?																			
Eupatorium fistulosum																				+
Eupatorium serotinum		+										+				+				
Eupatorium rugosum var. r.																				+
Prenanthes altissima																				?

Species	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
LILIIFLORAE																				
Dioscorea quaternata																	+		+	+
Iris cristata																				+
Sisyrinchium graminoides	?																			
COMMELINIFLORAE																				
Carex vulpinoides	+																			
Carex eburnea							+										+		+	
Carex platyphylla																				+
Carex laxiflora* (var. l.)			?							?										
Carex glaucodea							?													
Arundinaria gigantea																	+			
Bromus altissimus* ("purgans")																				+
Bromus japonicus							+													
Festuca elatior (sensu lato)				+	+													+		
Glyceria striata					+															
Poa pratensis													?	+						
Chasmanthium* latifolia (Uniola)	+				+															
Dactylis glomerata					+															
Elymus virginicus var. v.														+		+				
Elymus* hystrix (H. patula)	+										+	+								
Sphenopholis intermedia												+								
Muhlenbergia sobolifera	+																			
Muhlenbergia frondosa	?											+								
Muhlenbergia sylvatica																+	+		+	
Leersia virginica	+															+				
Panicum (D) acuminatum* var. fas.				?	?															
Setaria faberi																		+		
Eulalia (Microstegium) vimines	+		+								+	+	+							*
Andropogon virginicus var. v.															+					

Table B7. Species composition of rocky banks along the Cumberland River and some of its tributaries (Vegetation Type 7).

+ = present; * = local dominant; e = in shrubby transition to slope forest.

A = Bars on Cumberland River at mouth of Bunches Creek, opposite Blue Bend.
Cumberland Falls Quad. Area of ca. 300 x 200 feet. 9/16 Sep 1987.
(Complex of silt bars and boulder-cobble bars, with Physostegia sp. nov.)

B = N banks of Cumberland River from Route 90 bridge upstream for 0.5 miles.
Cumberland Falls Quad. Area of ca. 2000 x 30 feet. 22 Jul 1987.
(With a few Tephrosia spicata plants below picnic area.)

C = Boulder-cobble bar on Cumberland River at mouth of Eagle Creek.
Cumberland Falls Quad. Area of ca. 200 x 50 feet. 14 Sep 1986.
(With Lathyrus palustris seen on previous visit.)

D = W banks of Cumberland River from Center Rock Rapids to Shanty Branch.
Cumberland Falls Quad. ca. 1 mile x 50 ft. 9 Jul 1987.
(With about 10 Tephrosia spicata plants near Shanty Branch.)

E = E banks of Cumberland River from the Falls to Dog Slaughter Creek.
Cumberland Falls Quad. ca. 2 miles x 50-100 ft. 6 Sep 1987.
(With one Tripsacum dactyloides clump near Falls.)

F = W banks of Cumberland River between Shanty Branch and Big Branch.
Cumberland Falls Quad. ca. 1.5 miles x 50-100 ft. 19 Jun/1 Oct 1987.
(With Lathyrus palustris at end of Dog Slaughter Ridge.)

G = E banks of Cumberland Falls from Dog Slaughter Cr. to 0.8 miles downstream.
Cumberland Falls Quad. ca. 0.8 miles x 50-100 ft. 15 Sep 1987.
(With Tephrosia spicata and Eupatorium semiserratum on ledge above banks.)

H = W banks of Cumberland River from Big Branch to 0.6 miles downstream.
Cumberland Falls Quad. ca. 0.6 miles x 50-100 ft. 28 May/7 Sep 1987.
(With scattered Tephrosia spicata and Tripsacum dactyloides.)

I = Small bar on W side of Beaver Creek ca. 1500 ft. S of Dry Branch.
Hail Quad. Area of ca. 50 x 30 feet. 27 May 1987.
(Nearby bar on E side is dominated by Apocynum cannabinum.)

J = Banks of Laurel River from dam to 0.5 miles downstream.
Sawyer Quad. ca. 0.5 miles x 100 feet. 23 Jun/17 Sep 1987.
(With scattered patches of Solidago uliginosa.)

K = W banks of Buck Creek, from Route 192 bridge to 500 feet upstream.
Dykes Quad. Area of ca. 500 x 20 feet. 7/15 Oct 1987.
(With a few Thuja occidentalis trees at back edge.)

L = Banks and bars of Buck Creek ca. 0.6 miles E of Route 192 bridge.
Dykes Quad. Area of ca. 300 x 100 feet. 15 Oct 1987.
(With Andropogon gerardi on rocky banks and Salix spp. on bars.)

Species	A	B	C	D	E	F	G	H	I	J	K	L
PTERIDOPHYTA												
Selaginella apoda										+		
Equisetum arvense										+		
Osmunda regalis			+	+		+		+	+	*		
Osmunda claytoniana						+						
Pteridium aquilinum		+			+	e	e					
Onoclea sensibilis	+			+		+		+				
Asplenium platyneuron					+	e						
Athyrium asplenioides*						+				+		
Polystichum acrostichoides						e		+		+		
GYMNOSPERMAE												
Tsuga canadensis						e	e					e
Pinus rigida							e					
Pinus virginiana						e	e	+		+		
Pinus echinata		e								+		
Thuja occidentalis											+	
Juniperus virginiana												e
ANNONIFLORAE												
Magnolia macrophylla						e	+					
Liriodendron tulipifera						e	e	+			+	
Aristolochia serpentaria							e					
Sassafras albidum												e
Lindera benzoin											+	
Saururus cernuus	*	+										+
Xanthorhiza simplicissima		+	+			e	e			+		
Ranunculus hispidus var. nitidus*										+		
Thalictrum pubescens* var. p.		+			+	+		+		+		
Trautvettaria carolinensis		+	+	+	+	e		+		*		
Anemone virginiana												+
Clematis virginiana		+	+			+		+		+		
Clematis glaucophylla						+	?	+				
THEIFLORAE												
Ilex verticillata var. padifolia									+			
Hypericum* (Ascyrum) hypericoides						+						
Hypericum* (Ascyrum) stragalum*				+		e	e					
Hypericum prolificum	+	+	+	+	+	+	+	+		+	+	+
Hypericum punctatum						+		+		+	+	+
Hypericum denticulatum		+		+		+		+	+			
Hypericum mutilum	+		+					+		+		
Clethra acuminata			+							+		
Rhododendron maximum						e						
Rhododendron periclymenoides*		+				+		+				
Rhododendron arborescens		+	+			+	+	+		+		
Kalmia latifolia					e	e	e	+				
Lyonia ligustrina var. l.					+	+		+		+		
Oxydendron arboreum						e						
Gaultheria procumbens							e					
Gaylussacia brachycera							e					
Vaccinium arboreum		e		+	+	e	+	+				
Diospyros virginiana		+			+	+		+			+	
Lysimachia ciliata	e										e	+
Lysimachia lanceolata	+					+	e	+		+		
Lysimachia quadrifolia					+							
Samolus floribundus										+		

Species	A	B	C	D	E	F	G	H	I	J	K	L
Rumex acetosella										+		
Rumex crispus					?					+		
Rumex obtusifolius	?											
Polygonum cf. lapathifolium		?										
Polygonum pensylvanicum	+	+	+				+					
Polygonum punctatum		+										
Polygonum caespitosum	?	+	+		?	+		+			+	*
Polygonum sagittatum										+		
Polygonum virginianum										+		
Polygonum cuspidatum						+						
CHENOPODIIFLORAE												
Phytolacca americana							+				+	
Mollugo verticillata						+						
Chenopodium ambrosioides							+				+	
Chenopodium album						+						
Silene stellata					+	e						
GERANIIFLORAE												
Linum virginianum		+										
Linum striatum		+		+						+		
Oxalis cf. dillenii ("stricta")					?		?				?	
Impatiens capensis* (biflora)		+	+		e		e			+	+	
SANTALIFLORAE												
Euonymus americanus					+	+						
Pyrularia pubera					e							
VIOLIFLORAE												
Viola pedata		+										
Viola cf. papilionacea		?				?				?		?
Viola sororia					?							
Viola cucullata	+	+				+		+		+	?	
Viola blanda									+			
Viola primulifolia							+					
Viola striata												+
Viola conspersa						+				+		
Passiflora lutea var. glabriflora					+	+		+				
Salix caroliniana	+					+		+		+	*	*
Salix nigra	+		+			+					+	+
Salix exigua* (interior)										+		*
Salix sericea								+				
Sicyos angulata		e				+						+
Rorippa cf. islandica												+
Barbarea vulgaris										+		
MALVIFLORAE												
Sida spinosa			+				+					+
Hibiscus cf. palustris	+											
Ulmus americana		e						+			+	e
Ulmus rubra								e			+	
Ulmus alata		e	+	+		+	+	e	+			+
Celtis tenuifolia								+				
Boehmeria cylindrica	+	+	+		+	+	+	+	+	+	+	+
Pilea pumila												+
Ceanothus americanus							e					
Elaeagnus umbellata										+		
Acalypha rhomboidea		?										+
Acalypha virginica						+		+				
Euphorbia (Chamaesyce) preslii*						+		+			+	+
Euphorbia corollata		+	+	+		+	+	+		+		

Species	A	B	C	D	E	F	G	H	I	J	K	L
RUTIFLORAE												
Ailanthus altissima						+		+				
Rhus (Toxicodendron) radicans	+	+	+		+	+	+	*			e	+
Rhus copallina						e		+				
Rhus glabra						+		+				
Carya tomentosa				e		e						
Carya pallida							e					
Acer rubrum var. rubrum	+	e			+	e	e	+				
Acer saccharinum						+		+				+
Acer negundo						e					+	+
Albizzia julibrissin	+			e	+	+		+				
Schrankia microphylla		+		+		+	e	+				
Cassia (Chamaecrista) fasciculata						+						
Cassia (Chamaecrista) nictitans		+			+			+				
Cladrastis kentukea* (lutea)											e	
Baptisia australis											+	
Trifolium pratense										+		
Trifolium repens			+			+						
Melilotus alba						+						
Melilotus officinalis	?					+		?		+		?
Orbexilum pedunculatum		+				+		+				
Amorpha fruticosa var. f.		+		+		+		*				
Desmodium paniculatum (s.s.)						e		+				
Desmodium perplexum* ("dillenii")	?	?	?	?	?	+		e				+
Desmodium laevigatum								+				
Lespedeza repens								+				
Lespedeza violacea												+
Lespedeza virginica		+		+	e	+	+	+				
Lespedeza intermedia						+						+
Lespedeza cuneata		+	+		+	+	+	+		+	+	
Lespedeza cf. bicolor		?		?								
Lespedeza (Kummerowia) striata								+		+		
Stylosanthes biflora		+		+	+	+	+	+				
Vicia caroliniana						e						
Lathyrus palustris var. myrt.			+			+		+				
Tephrosia spicata		+		+			e	+				
Wisteria frutescens		+	+	*		+		*				
Robinia pseudoacacia		+	+	+		e	+	e				
Clitoria mariana							e					
Apios americana var. a.	+	+			+	+		+	+			
Amphicarpa bracteata var. b.		+			+	+					+	e
Galactia volubilis							e					
HAMAMELIDIFLORAE												
Hamamelis virginiana						e						
Liquidambar styraciflua	+	e	+	+	+	+	e	e	+		e	
Platanus occidentalis	+	+	+	+		+	+	+	+	+	*	*
Fagus grandifolia						e						
Quercus alba							e	e				
Quercus cf. alba x stellata							+					
Quercus stellata						e						
Quercus montana* ("prinus")				e								
Quercus velutina							e					
Quercus rubra* var. r.						e	+					
Carpinus caroliniana						e		e		+	e	e
Betula lenta						+						
Betula nigra	+	+	+	+	+	+	+	+	+	*	+	+
Alnus serrulata		+	+			+	+	+	+			

Species	A	B	C	D	E	F	G	H	I	J	K	L
ROSIFLORAE												
Physocarpus opulifolius												+
Aruncus dioicus										+		
Potentilla simplex var. s.		?										
Potentilla norvegica										+		
Rubus Flagellares (group)	+	+			+	+	+	+		+		
Rubus Argutae (group)						+			+	+		
Agrimonia parviflora										+		
Rosa setigera											*	+
Rosa carolina											+	+
Prunus americana var. lanata		e										
Malus* angustifolia						+						
Crataegus cf. macrosperma						+		e				
Amelanchier arborea var. a.							+					
Penthorum sedoides												+
Sedum ternatum								+				
Philadelphus cf. hirsutus												e
Hydrangea arborescens						e					+	+
Itea virginica			+		+	+		+	+	+		
Galax urceolata					e	e						
Staphylea trifolia											e	e
MYRTIFLORAE												
Rotala ramosior												+
Ludwigia palustris												+
Ludwigia alternifolia	+	+	+		+			+		+		
Epilobium coloratum										?		
Oenothera biennis		+				e		+	+		+	+
Oenothera tetragona var. t.		+		+		+		+				
GENTIANIFLORAE												
Fraxinus americana var. amer.	+	e	+			+	+	+		+		
Fraxinus americana var. bilt.											e	e
Fraxinus pensylvanica								+			+	+
Chionanthus virginicus								e	+	+		
Hedyotis* caerulea				+		+				+		
Hedyotis* purpurea var. p.						+			+	+		
Cephalanthus occidentalis	e	+	+	+		+	+	+	+	+	+	+
Diodia virginiana	+	+	+	+		+		+				
Galium pilosum var. p.						+						
Galium triflorum									+	+		
Galium obtusum var. o.			?									
Trachelospermum difforme		+		+		+						
Apocynum cannabinum	*	+				+	+	+	*			
Asclepias incarnata								+				
Campsis radicans	*	+		*		+	+	*			*	+
Bignonia* (Anisost.) capreolata				+		+						+
Catalpa bignonioides				+	+	e		+				
Mimulus ringens			+							?		
Mimulus alatus												+
Lindernia dubia	+											
Chelone glabra var. montana*		+								+		
Scrophularia marilandica												+
Agalinis* tenuifolia var. t.								?				
Agalinis purpurea		?										
Plantago rugelii	e					+				+	+	+
Plantago lanceolata										+		+
Ruellia caroliniensis		+				+						
Justicia americana	*	+	+	+		+	+				*	+

Species	A	B	C	D	E	F	G	H	I	J	K	L
Verbena urticifolia											+	+
Phyla lanceolata (Lippia l.)	+											+
Scutellaria incana					+	+		+				
Scutellaria integrifolia						+		+				
Scutellaria lateriflora				e								
Prunella vulgaris var. lanc.		+							+	+	+	+
Prunella vulgaris var. hispida								+				
Physostegia virginiana ssp. v.	+				+	+				+		
Physostegia sp. nov.	+											
Salvia lyrata				+		+			+			+
Pycnanthemum tenuifolia		+			+	+		+		+		
Pycnanthemum pycnanthemoides												?
Lycopus virginicus	+		+			+		+		+		+
Lycopus americanus		?										
Collinsonia canadensis						+				+		
Perilla frutescens											+	+
SOLANIFLORAE												
Solanum nigrum												+
Solanum carolinense								+	+			
Ipomoea (Quamoclit) coccinea							+					
Ipomoea hederacea							+					
Ipomoea pandurata	+	+		+	+	+	+	+		+		
Ipomoea lacunosa	+							+	+	+		
Convolvulus sepium			?		?	?		+				
Cuscuta cuspidata	?	?		?		?		+				
Phlox paniculata												+
Phlox maculata	+		+	+		+		+		+		
Specularia* perfoliata								+				
Lobelia cardinalis	+		+							+		
Lobelia siphilitica	e										+	+
Lobelia puberula var. simulans							+	e	+			
Lobelia inflata			+									
CORNIFLORAE												
Vitis rotundifolia		+	+	*		+	+	E				
Vitis aestivalis							+	*				
Vitis vulpina	?	?		*		?	?	?		?		
Vitis cf. riparia				?		?		?				
Parthenocissus quinquefolia					+	+					+	+
Nyssa sylvatica var. s.	+					+	e	e				
Cornus florida						e	e					
Cornus obliqua* (purpusi)	+		+	+	+	+	+	*	+	+	*	e
Sanicula canadensis		?										
Cryptotaenia canadensis							+					
Daucus carota										+		e
Zizia aurea											+	+
Ligusticum canadense		+				+	+			+		
Cicuta maculata		+		+				+				
Oxypolis rigidior										+		
Viburnum cassinoides			+		+					+		
Viburnum prunifolium											+	
Sambucus canadensis										+		
Lonicera japonica								+				

Species	A	B	C	D	E	F	G	H	I	J	K	L
ASTERIFLORAE												
Helianthus divaricatus		+										
Helianthus microcephalus		+				+				+	+	+
Helianthus hirsutus				e								
Helianthus decapetalus	e			+		e						e
Helianthus tuberosus												+
Verbesina occidentalis			+				+					
Verbesina alternifolia				+		+				+	+	
Rudbeckia fulgida var. umbrosa												+
Rudbeckia fulgida var. fulgida		+										
Rudbeckia laciniata			+				+			+	+	+
Helenium autumnale var. a.				+						*		+
Helenium flexuosum	+	+			+		+					+
Bidens cernua												+
Bidens discoidea	?					?						
Bidens frondosa	+	?	?			?				?	+	+
Bidens aristosa	+											
Coreopsis tripteris		+	+	+	+	+	+	+		+	+	
Coreopsis major						e						
Silphium asteriscus* ssp. trif.				+				+				
Iva ciliata		+									+	
Ambrosia trifida			+				+			+		+
Ambrosia artemisiifolia		+					+			+	+	+
Xanthium strumarium	+				+	+	+					+
Chrysanthemum leucanthemum										+	+	
Senecio pauperculus	+							+				
Senecio aureus	e					e					+	+
Erechtites hieracifolia						+					+	
Cacalia atriplicifolia							+	+	+			
Chrysopsis graminifolia						e						
Chrysopsis mariana						e						
Solidago spathulata ssp. randii		+		+	+	+	+					
Solidago erecta						e						
Solidago uliginosa										+		
Solidago flexicaulis											+	
Solidago caesia						e				+	+	
Solidago nemoralis		+			e	+		*		e		
Solidago arguta var. a.*				e								
Solidago ulmifolia												e
Solidago sphacelata											+	+
Solidago odora					e							
Solidago rugosa ssp. scabra		+				+		+	+	+		
Solidago gigantea	+	+			+	e		e			+	+
Solidago altissima*							+	+		+	+	+
Aster divaricatus			+	*	e					+		
Aster cordifolius												e
Aster patens var. patens		+		+		+	e	+				
Aster patens var. phlogifolius												e
Aster surculosus						e						
Aster laevis var. laevis											+	+
Aster laevis var. concinnus		+			+		+			+		
Aster prenanthoides		+				+		+			*	+
Aster linariifolius		+										
Aster umbellatus										+		
Aster pilosus var. pilosus										+	+	e
Aster ontarionis	e					e	+			+	e	+

Species	A	B	C	D	E	F	G	H	I	J	K	L
Aster lateriflorus		+				e				+	+	+
Aster cf. vimineus			?									
Aster dumosus	+	+		+	+	+		+		+		
Erigeron philadelphicus						+						+
Erigeron strigosus var. s.										+		
Erigeron annuus								+		+		
Erigeron* (Conyza) canadensis						+						
Gnaphalium obtusifolium						e						
Eupatorium purpureum						+						
Eupatorium fistulosum	+	+	+		+	+	+	+	+	+		+
Eupatorium rotundifolium								+				
Eupatorium semiserratum							e					
Eupatorium hyssopifolium var. h.					?							
Eupatorium perfoliatum										+	+	+
Eupatorium serotinum	+		+		+	+		+	+	+	+	+
Eupatorium coelestinum	+	+									+	+
Listris spicata					+	+		+				
Vernonia gigantea* ssp. g.					+	+						+
Elephantopus carolinianus							+	+				
Hieracium gronovii							e					
Taraxacum officinale										+		+
Lactuca floridana								e				
LILIIFLORAE												
Stenanthium gramineum var. mic.*				+								
Hemerocallis fulva						e		+				
Allium canadense						+						
Allium cernuum											+	
Smilacina racemosa					e							
Smilax herbacea									+			
Smilax glauca				+		+		+				
Smilax bona-nox		+						+				+
Smilax rotundifolia		e					e					
Dioscorea quaternata						?		+				
Hypoxis hirsuta		+				+				+		
Iris cristata						+				+		
Sisyrinchium angustifolium										+		
ALISMATIFLORAE												
Alisma subcordatum		+										+
Sagittaria australis*		+										
ARIFLORAE												
Orontium aquaticum	+											
TYPHIFLORAE												
Typha latifolia		+										
COMMELINIFLORAE												
Juncus effusus var. solutus		+							+			
Juncus tenuis								+		+		
Juncus dudleyi		+										
Juncus acuminatus		+										
Cyperus flavescens										+		
Cyperus retrofractus							?					
Cyperus strigosus	?		?		?							+
Eleocharis obtusa var. obtusa*						?				+		
Fimbristylis autumnalis		+										
Scirpus cyperinus								+				
Scirpus atrovirens var. atrovirens								?		?		
Scirpus polyphyllus										+		
Rhynchospora capitellata					+							

Species	A	B	C	D	E	F	G	H	I	J	K	L
Scleria pauciflora								+				
Carex vulpinoidea								+		+		
Carex cf. artitecta*								?				
Carex blanda*									+			
Carex stricta var. s.	*											
Carex torta										*		
Carex frankii										+		
Carex lurida								+		+		
Carex lupulina		+										
Tradescandtia ohiensis				+	+	+		+				
Commelina virginica		+				+		+				
Arundinaria gigantea var. g.				e		e		+			+	e
Festuca elatior										+		
Glyceria striata										*		
Poa autumnalis								+	+			
Chasmanthium* latifolia	e		+			+		+	?		e	e
Tridens* flavus (Triodia f.)												e
Elymus riparius	+					+					+	+
Elymus intermedius *						+					+	+
Elymus virginicus (s.s.)*								?		+		
Danthonia spicata								+				
Agrostis stolonifera var. major										+		
Agrostis perennans	e		+							+	+	
Cinna arundinacea	e										+	+
Muhlenbergia schreberi												+
Muhlenbergia sobolifera											+	+
Muhlenbergia frondosa		+	+			?				+	+	+
Eleusine indica						+						
Spartina pectinata	+											
Leersia oryzoides		+									+	+
Leersia virginica	+	+			+	+				+	+	
Digitaria sanguinalis		+										+
Digitaria iachaemum			+							+		
Paspalum fluitans			+									
Paspalum laeve var. l.		+								?		
Panicum rigidulum* var. r.	+					+						
Panicum virgatum	+											
Panicum (D) lindheimeri*										+		
Panicum (D) acuminatum* var. ten.								+				
Panicum (D) acuminatum* var. fas.						+	e					
Panicum (D) polyanthes		+								?		
Panicum (D) sphaerocarpon						+				+		
Panicum (D) commutatum var. c.								+				
Panicum (D) clandestinum	e	+	+		+	+		+		+	+	
Panicum (D) boscii						+						+
Panicum (D) microcarpon*		+	+			+		+	+	+		
Panicum (D) dichotomum (s.s.)						?		?				
Panicum (D) yadkinense		+				+		e		+	+	e
Echinochloa crus-galli	?	?										
Setaria pumila* (glauca)										?		
Eulalia (Microstegium) vimina	e	*				+		e		+	*	*
Arthraxon hispidus		+						+		+		
Andropogon scoparius	+	+	+			+	+	+			e	e
Andropogon gerardi	*	+	+	+	+	+	+	*	+	+	*	*
Sorghastrum nutans		+	+		+	+	+	+				
Tripsacum dactyloides					+			e				

Table B8. Species composition of rocky banks along the Rockcastle River (Vegetation Type 7). Most of these sites are short sections of river banks that are distinct in having boulders with open grassy vegetation; some of them are true bars, often with more cobbles and gravel, near mouths of tributary streams or abrupt bends in the river. We attempted to survey most of the larger and more distinctly open grassy banks with rarer species like Baptisia australis, Vitis rupestris and Ceanothus herbaceus, except in areas where such banks are more or less continuous for 1000s of feet.

+ = present; * = local dominant; e = in shrubby transitions to slope forest.

A = Boulders on W bank ca. 1700 feet downstream from old Route 80 bridge.
Billows Quad. Area of ca. 100–150 x 30–50 ft. 19 May 1987.

B = Boulders on W bank, N side of Long Point, 2000 feet E of bend to E.
Ano Quad. Area of ca. 200 x 100 feet. 19 May 1987.

C = Bar on W bank, 1000 feet SE of gully at bend to SE, S of Long Point.
Ano Quad. Area of ca. 75 x 40 feet. 19 May 1987.

D = Boulders on W bank 3500 feet SE of gully at bend to SE, S of Long Point.
Ano Quad. Area of ca. 100 x 50 feet. 20 May 1987.

E = Boulders on W bank, 1700 feet downstream from Grassy Shoal Branch.
Ano Quad. Area of ca. 200 x 75 feet. 20 May 1987.

F = Boulders on E bank, 2000 feet downstream from Blair Branch.
Ano Quad. Area of ca. 100 x 30 feet. 20 May 1987.

G = Pine Island, bar at mouth of Pine Island Branch.
Ano Quad. Area of ca. 500 x 150 feet. 20 May/14 Oct 1987.
(With Ceanothus herbaceus and large patch of Aster sp. nov.)

H = Bar on E bank 3000 feet downstream from Pine Island Branch.
Ano Quad. Area of ca. 100 x 50 feet. 20 May/14 Oct 1987.
(With Ceanothus herbaceus and Aster sp. nov.)

I = Bar on W bank 2900 feet downstream from Pine Island Branch.
Ano Quad. Area of ca. 100 x 50 feet. 20 May 1987.

J = Bar on W bank 2500 ft down from Turkey Creek, just below gully a turn to E.
Ano Quad. Area of ca. 100 x 40 feet. 20 May 1987.

K = Bar on E bank 1500 feet down from above (J) gully and turn to E.
Ano Quad. Area of ca. 100 x 30 feet. 20 May 1987.
(Bouldery banks becoming more continuous downstream from here to O.)

L = Bar on E bank at small narrows 2300 feet upstream of Beech Creek.
Ano Quad. Area of ca. 200 x 50 feet. 20 May/2 Oct 1987.
(With Ceanothus herbaceus, Aster sp. nov. and Solidago uliginosa.)

M = Bouldery banks between above narrows and area opposite mouth of Beech Creek.
Ano Quad. Area of ca. 2000 x 30 feet. 2 Oct 1987.
(With scattered Aster sp. nov. and Solidago uliginosa.)

N = Boulders on E bank 1000 feet downstream from Beech Creek.
Ano Quad. Area of ca. 150 x 50 feet. 20 May/2 Oct 1987.
(With Cypripedium kentuckiense at back edge.)

O = Boulders on both side of Beech Narrows, 1700 feet down from Beech Creek.
Ano Quad. Area of ca. 300 x 100 feet. 20 May/2 Oct 1987.
(With Comptonia peregrina at lower end of E bank, Aster sp. nov., etc.)

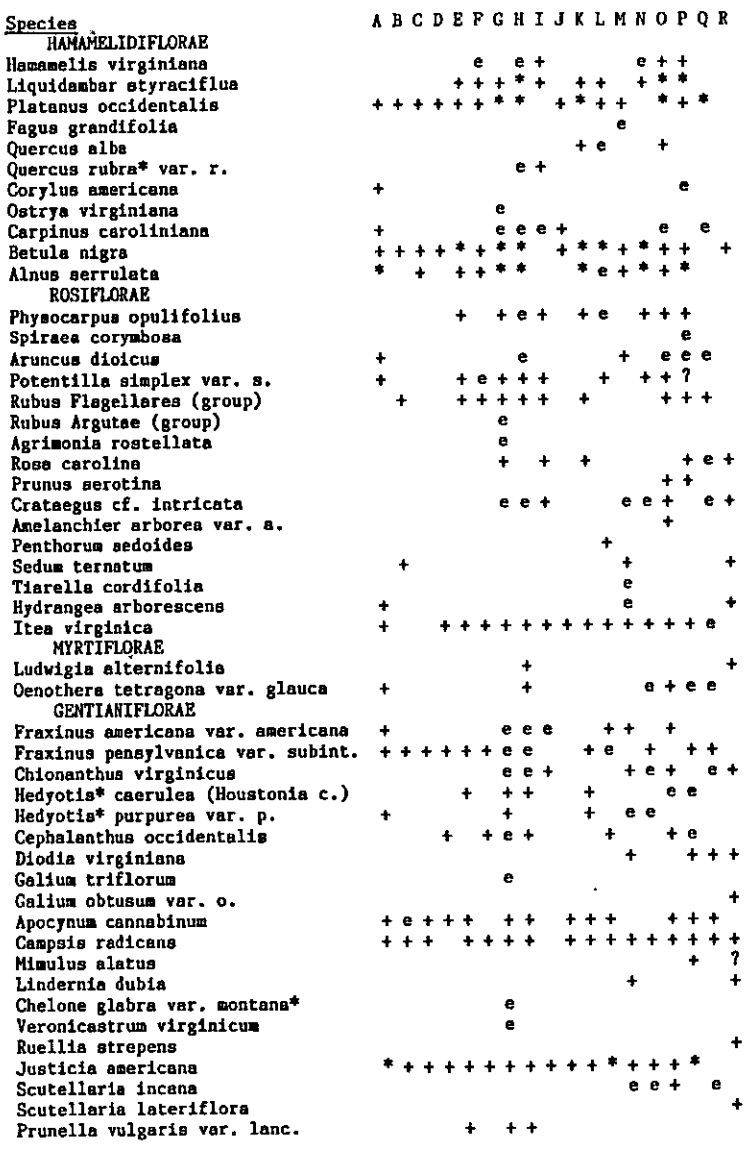
P = Bar on W bank 300 feet E of turn to E that is 2500 feet down of Beech Cr.
Ano Quad. Area of ca. 150 x 50 feet. 20 May/2 Oct 1987.
(With Ceanothus herbaceus and Solidago uliginosa.)

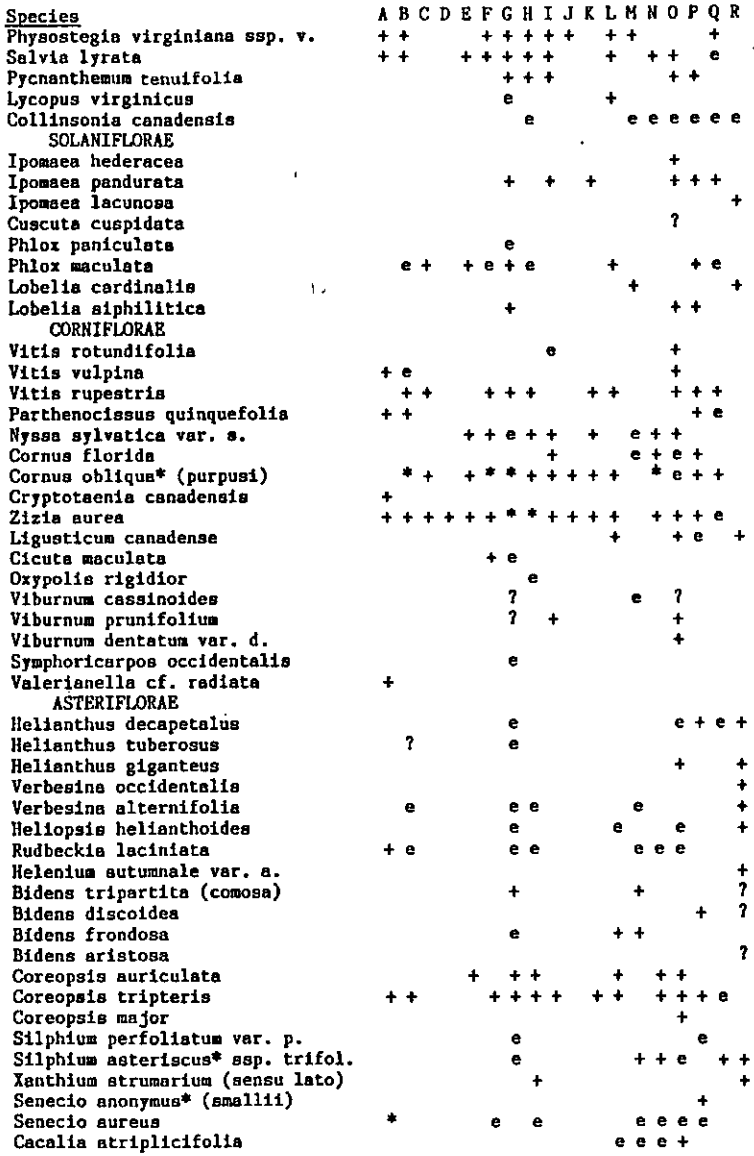
Q = Bar on W bank at upper end of "The Narrows" (W of Dead End Pool.)
Ano Quad. Area of ca. 100 x 50 feet. 20 May/4 Aug 1987.
(With much cobbles and Ceanothus herbaceus.)

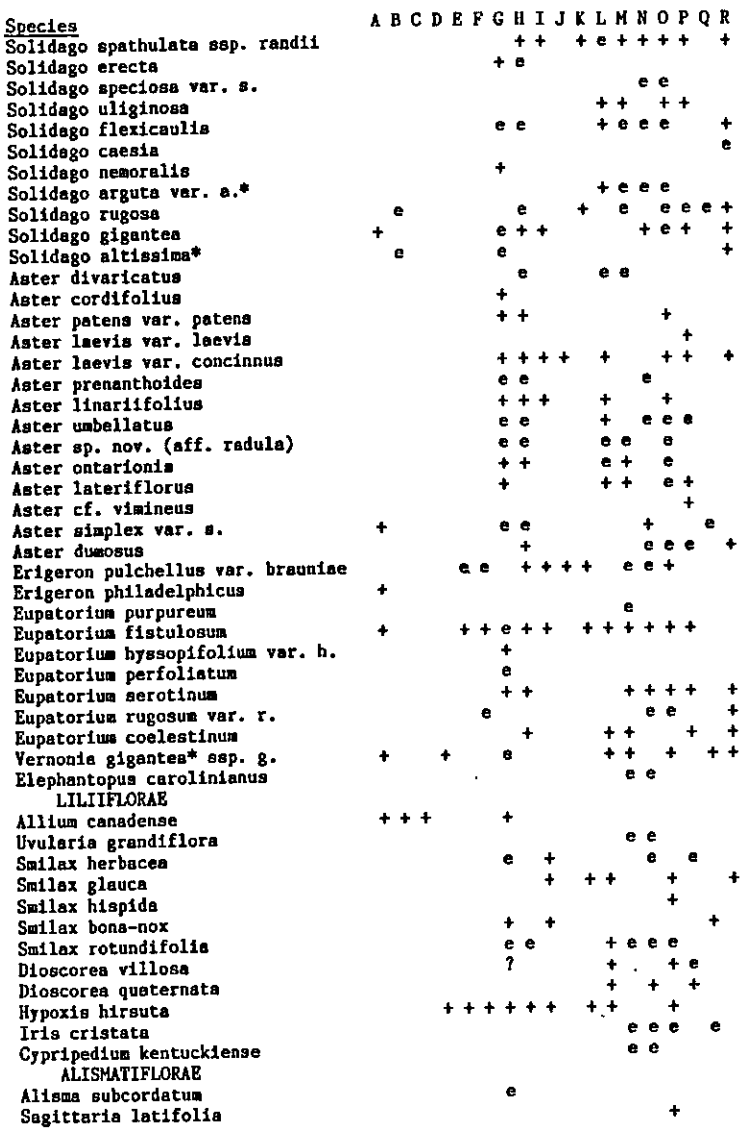
R = Bouldery banks on W side of upper half of "The Narrows".
Ano Quad. Area of ca. 3000 x 50 feet. 15 Apr/16 Sep 1987.

Species	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
PTERIDOPHYTA																		
Selaginella apoda																		+
Osmunda regalis var. spectabilis			+	+	+	+	+	e	+	+		+	+	+	+	+	e	
Osmunda cinnamomea								e										e
Osmunda claytoniana																e		
Pteridium aquilinum var. latius.																e		
Onoclea sensibilis				+		+	e	+				+	e	+		+		
Asplenium platyneuron				+														
Dryopteris intermedia*													e					
Polystichum acrostichoides						e							+	e	+			+
GYMNOSPERMAE																		
Tsuga canadensis								e	e			e			+			
Pinus virginiana															+			+
Pinus echinata							+											
ANNONIFLORAE																		
Magnolia acuminata													e					
Liriodendron tulipifera		e						e				e			+	+		+
Asimina triloba														e				
Lindera benzoin													e					
Saururus cernuus												+						
Xanthorhiza simplicissima	+			+		e	e	+		+		e	e	e		e	+	
Ranunculus recurvatus													e					
Ranunculus hispidus var. nitidus*	+						e							+	+	+		
Ranunculus hispidus var. hispidus*											+							
Thalictrum pubescens* var. p.		e					e	e						e	e	e	e	
Trautvetteria carolinensis				+	+	e	e					+	+	e	e	e	e	+
Anemone virginiana															+			
Clematis virginiana	+	+					e	e				+				+		
Clematis cf. viorna												+			+			
THEIFLORAE																		
Ilex verticillata																+		
Hypericum* (Ascyrum) stragalum*							+	+				+						
Hypericum prolificum	+	+		+	+	+	+	+	+	+	+	+		+	+	+		+
Hypericum denticulatum var. rec.							+					+						
Hypericum mutilum													+		+			+
Hypericum* (Triadenum) tubulosum							e					+	+				+	
Clethra acuminata								e					e	e		e		
Rhododendron maximum													e	e	e			
Rhododendron periclymenoides*													e	e	+			+
Rhododendron arborescens		+			+	+		+	+	+	+		e	+	+	+	e	
Kalmia latifolia									e				e		+			+
Lyonia ligustrina var. l.																e		
Vaccinium stamineum							+	+										
Vaccinium arboreum															+			
Diospyros virginiana	+	+		+	+		e	+	+	+	+	+	+		+	+		
Lysimachia ciliata	+	e					e	e								+	e	
Lysimachia lanceolata							+								+			+
Polygonum pensylvanicum							e						+					
Polygonum punctatum															+			
Polygonum coespitosum				?			e	+				+	+			+	+	
Polygonum sagittatum													+					+
CHENOPODIIFLORAE																		
Silene stellata																		e

Species	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
GERANIIFLORAE																		
Linum striatum												+						+
Oxalis cf. dillenii ("stricta")							?								?		?	
Geranium maculatum																e	e	
Impatiens capensis* (biflora)							e									+	+	+
SANTALIFLORAE																		
Euonymus americanus							e	+		+		+						
VIOLIFLORAE																		
Viola pedata							+	+	+		+	+				+		
Viola sororia							e								?	e		
Viola cucullata	+		+	+	+	+	+	+		+		+				+	+	
Viola striata	+														e			
Passiflora lutea var. glab.																+		
Salix caroliniana	+	+	+	+	+	+	*	*		+		+	+			+	+	
Salix nigra							e										+	
Salix humilis var. h.*								+										
Sicyos angulata																		+
Cardamine bulbosa	+																	
Cardamine cf. hirsuta							?											
Rorippa cf. islandica																+		
MALVIFLORAE																		
Sida spinosa															+			
Ulmus americana	+																+	
Ulmus alata							e		+	+		+				+	+	
Boehmeria cylindrica	+			+	+	+	e					+	+			+	+	
Pilea pumila															+			
Ceanothus herbaceus							*	+				+					+	*
Acalypha rhomboidea															e	e	+	
Euphorbia corollata		+	+	+	+	+	+	+	+	+	+	+				+	+	+
Dirca palustris															+	+		
RUTIFLORAE																		
Rhus (Toxicodendron) radicans	*	+	+	*		e	e	e	+	+		+	+	+	+	+	+	
Rhus copallina																	+	
Juglans nigra																		
Comptonia* peregrina* (Myrica)																	+	
Acer rubrum var. rubrum																	+	
Acer saccharinum	+			+			+	+		+	+	+						
Acer negundo	+																	
Cercis canadensis							+	+								e		
Gleditsia triacanthos		+															+	
Cassia (Senna) cf. hebecarpa							e											
Cassia (Chamaecrista) nictitans																		+
Baptisia australis		*	+	+	*	+	*	*	+	+		+		+	+	+	*	+
Desmodium glutinosum	+															e		
Desmodium perplexum* ("dillenii")	+			+		e	+	+				+						
Lespedeza intermedia	?					?										?		
Lespedeza cuneata	+	+				+	+	+		+								+
Stylosanthes biflora							+	+	+			e	e	+				+
Tephrosia virginiana var. v.							+									+		
Robinia pseudoacacia						+				+						+		
Apios americana var. a.	+	e		+		e	+	+		+	+			+	e	+		
Amphicarpa bracteata var. bract.	+											e	e	e				
Amphicarpa bracteata var. comosa							e											


Species
A B C D E F G H I J K L M N O P Q R
HAMAMELIDIFLORAE
Hamamelis virginiana
Liquidambar styraciflua
Platanus occidentalis
Fagus grandifolia
Quercus alba
Quercus rubra* var. r.
Corylus americana
Ostrya virginiana
Carpinus caroliniana
Betula nigra
Alnus serrulata
ROSIFLORAE
Physocarpus opulifolius
Spiraea corymbosa
Aruncus dioicus
Potentilla simplex var. s.
Rubus Flagellares (group)
Rubus Argutae (group)
Agrimonia rostellata
Rose caroline
Prunus serotina
Crataegus cf. intricata
Amelanchier arborea var. s.
Penthorum sedoides
Sedum ternatum
Tiarella cordifolia
Hydrangea arborescens
Itea virginica
MYRTIFLORAE
Ludwigia alternifolia
Oenothera tetragona var. glauca
GENTIANIFLORAE
Fraxinus americana var. americana
Fraxinus pensylvanica var. subint.
Chionanthus virginicus
Hedyotis* caerulea (Houstonia c.)
Hedyotis* purpurea var. p.
Cephalanthus occidentalis
Diodia virginiana
Galium triflorum
Galium obtusum var. o.
Apocynum cannabinum
Campsis radicans
Mimulus alatus
Lindernia dubia
Chelone glabra var. montana*
Veronicastrum virginicum
Ruellia strepens
Justicia americana
Scutellaria incana
Scutellaria lateriflora
Prunella vulgaris var. lanc.


Species
A B C D E F G H I J K L M N O P Q R
Physostegia virginiana ssp. v.
Salvia lyrata
Pycnanthemum tenuifolia
Lycopus virginicus
Collinsonia canadensis
SOLANIFLORAE
Ipomaea hederacea
Ipomaea pandurata
Ipomaea lacunosa
Cuscuta cuspidata
Phlox paniculata
Phlox maculata
Lobelia cardinalis
Lobelia siphilitica
CORNIFLORAE
Vitis rotundifolia
Vitis vulpina
Vitis rupestris
Parthenocissus quinquefolia
Nyssa sylvatica var. s.
Cornus florida
Cornus obliqua* (purpusi)
Cryptotaenia canadensis
Zizia aurea
Ligusticum canadense
Cicuta maculata
Oxypolis rigidior
Viburnum cassinoides
Viburnum prunifolium
Viburnum dentatum var. d.
Symphoricarpos occidentalis
Valerianella cf. radiata
ASTERIFLORAE
Helianthus decapetalus
Helianthus tuberosus
Helianthus giganteus
Verbesina occidentalis
Verbesina alternifolia
Heliopsis helianthoides
Rudbeckia laciniata
Helenium autumnale var. a.
Bidens tripartita (comosa)
Bidens discoidea
Bidens frondosa
Bidens aristosa
Coreopsis auriculata
Coreopsis tripteris
Coreopsis major
Silphium perfoliatum var. p.
Silphium asteriscus* ssp. trifol.
Xanthium strumarium (sensu lato)
Senecio anonymus* (smallii)
Senecio aureus
Cacalia atriplicifolia


Species
A B C D E F G H I J K L M N O P Q R
Solidago spathulata ssp. randii
Solidago erecta
Solidago speciosa var. s.
Solidago uliginosa
Solidago flexicaulis
Solidago caesia
Solidago nemoralis
Solidago arguta var. a.*
Solidago rugosa
Solidago gigantea
Solidago altissima*
Aster divaricatus
Aster cordifolius
Aster patens var. patens
Aster laevis var. laevis
Aster laevis var. concinnus
Aster prenanthoides
Aster linariifolius
Aster umbellatus
Aster sp. nov. (aff. radula)
Aster ontarionis
Aster lateriflorus
Aster cf. vimineus
Aster simplex var. s.
Aster dumosus
Erigeron pulchellus var. brauniae
Erigeron philadelphicus
Eupatorium purpureum
Eupatorium fistulosum
Eupatorium hyssopifolium var. h.
Eupatorium perfoliatum
Eupatorium serotinum
Eupatorium rugosum var. r.
Eupatorium coelestinum
Vernonia gigantea* ssp. g.
Elephantopus carolinianus
LILIIFLORAE
Allium canadense
Uvularia grandiflora
Smilax herbacea
Smilax glauca
Smilax hispida
Smilax bona-nox
Smilax rotundifolia
Dioscorea villosa
Dioscorea quaternata
Hypoxis hirsuta
Iris cristata
Cypripedium kentuckiense
ALISMATIFLORAE
Alisma subcordatum
Sagittaria latifolia


Species
A B C D E F G H I J K L M N O P Q R
COMMELINIFLORAE
Cyperus retrofractus
Cyperus strigosus
Cyperus esculentus
Eleocharis obtusa var. o.*
Fimbristylis autumnalis
Scirpus cyperinus
Carex artitecta*
Carex purpurifera* (laxiflora)
Carex gracilescens* (laxiflora)
Carex stricta
Tradescantia ohiensis
Commelina virginica
Arundinaria gigantea var. g.
Poa sylvestris
Chasmanthium* latifolia (Uniola)
Elymus villosus
Elymus riparius
Elymus virginicus (sensu stricto)
Cinna arundinacea
Muhlenbergia frondosa
Muhlenbergia sylvatica
Brachyelytrum erectum
Leersia oryzoides
Leersia virginica
Panicum virgatum
Panicum (D) acuminatum* var. fas.
Panicum (D) clandestinum
Panicum (D) microcarpon*
Panicum (D) yadkinense
Echinochloa crus-galli
Eulalia (Microstegium) viminea
Andropogon (Schiz.) scoparium
Andropogon gerardii
Sorghastrum nutans

APPENDIX C

NATURAL VEGETATION TYPES

NATURAL VEGETATION TYPES

The following accounts describe natural vegetation types that appear distinct in the field. The terminology and definition of types generally follows Braun (1950), with modifications suggested by recent analysis of compositional gradients (Campbell 1987). Definitions rely mostly on the dominant species, while recognizing that much intergradation between dominants exists. The classification used by the U.S. Forest Service makes further divisions, especially among pine and oak types (Table 2). These divisions are often equivalent to intermediates between the broad types defined below, or to successional phases. Here, the composition of old-growth stands is emphasized, with notes on environment, including soils (Table 1), and on history, referring to Barton's (1919) survey (Table 3). Successional trends are not detailed. In general, disturbance tends to increase oaks, pines and red cedar relative to the mesophytic species, though this trend is highly variable in its extent, and in its coordination among species. Under each type, the most frequent typical species are listed. Also, associated rare species are noted, including the listed species (shown in bold type) and others of special interest (see Results and Discussion, sections IA,IB). For further details of species composition, see Appendix A and Appendices B1-8. Finally, the potential for conservation of each type is briefly discussed, focusing on the least disturbed examples of each type, and areas with clusters of rare species.

1. OPEN GRASSY VEGETATION ON ROCK OUTCROPS.

1A. SANDSTONE OUTCROPS. Along the top of many clifflines, especially south to west-facing, there are narrow grassy zones without trees, apparently maintained by extremely thin, dry soils. These zones are up to 20-30 feet wide at some sites. Similar vegetation that appears at least partially caused by thin soils, as opposed to recent disturbance, also exists on top of a few narrow ridges or points, as glades surrounded by trees. Here, the slight temporary ponding of water on flatter rocks may cause some differences in the vegetation. These flatter areas often grade into more disturbed vegetation, especially where roads run along ridges. Some of the more extensive areas of both topographic types are mapped as "rock outcrop" in Soil Surveys, but others are not differentiated from the Dekalb soils that predominate on ridges near cliffs.

Typical species: General dominants include lichens, especially Cladonia, and grasses, especially Danthonia sericea, Andropogon scoparius and Panicum (Dichanthelium) spp. Composites are frequent, especially Aster surculosus, Coreopsis major in shrubby transitions, and Liatris microcephala above cliffs in the south. Hypericum gentianoides is also widespread, especially next to bare rock or eroded areas on flatter sites. The adjacent scrubby forest is typically dominated by Virginia pine (Pinus virginiana) and Ericaceae, often with much Polytrichum and other mosses (see 2A below). Appendix B1 has further details.

State rarities: These include Liatris microcephala, Dichanthelium sabulorum [Panicum columbianum var. thinum], Panicum albomarginatum and Juniperus communis (in one area). On a few flatter sites, especially on narrow ridges, there are Crotonopsis elliptica, Minuartia glabra and Talinum teretifolium. Most of these species have southern distributions, and, in Kentucky, most are restricted to the southeast (see Results and Discussion, section IA, IB).

Conservation potential: Sites most important for conservation include the cliffs on the south side of Stepping Rock Ridge (with the Juniperus), Grassy Gap Ridge (with the least disturbed Talinum glades), cliffs from Natural Arch to the Gulf (with much Liatris), and the Dumpling Rocks (with the Crotonopsis). The other Talinum sites also deserve protection, though most have been disturbed already. The greatest threat to these sites is from dirt or gravel roads, which have largely destroyed some sites. Logging of adjacent forest, itself, may have little effect on these sites. Some of the typical species, especially little bluestem (Andropogon scoparius), may spread into disturbed areas due to removal of woody competition, but none of the rare species noted above appear to have spread significantly.

1B. LIMESTONE OUTCROPS. Parts of the Cumberland River system are bordered by steep rocky limestone slopes. The cliffs are generally smaller than on sandstone, being interrupted by ledges, so that dry and moist sites are intimately mixed. However, a few slopes have relatively large cliffs and dry ledges with open grassy vegetation. On soil maps, these ledges are not distinguished from the general Fredonia soil series typical of steep upper slopes.

Typical species: Local dominants in the openings include Andropogon scoparius, Sporobolus asper, Danthonia spicata, Carex eburnea, Aster oblongifolius, Rudbeckia cf. truncata, Houstonia nigricans and Manfreda virginica. Other frequent species include Panicum flexile, Scleria nitida, Minuartia patula, Hypericum dolabriforme, Euphorbia corollata, Lespedeza spp., Galactia, Lithospermum canescens, Ipomaea pandurata, Solidago sphacelata, Helianthus hirsutus, Verbesina virginica and Silphium trifoliatum (Appendix B3). Apart from these open cliffs, no other natural openings on limestone, or remnants thereof, were found, except perhaps for some areas noted below (under Veg. Type 2B).

State rarities: Those on cliffs and ledges include Muhlenbergia cuspidata (on one of the driest cliffs), Sporobolus clandestinus and Tragia urticifolia (both on a single point growing with Pachistima, see Veg Type. 2B). In more disturbed areas by paths on cliffs and in a nearby quarry Leavenworthia uniflora was found. These species tend to be more frequent further west, with the Muhlenbergia and Tragia centered in prairie regions. Rudbeckia truncata might also be rare in Kentucky, though apparently common in this region, but its taxonomy needs further study (see Results and Discussion, section IB).

Conservation potential: Sites most important for conservation include the South Fork-Cain Branch point (with the Sporobolus and Tragia), the bluffs opposite Woodson Bend of the South Fork (with Muhlenbergia) and other areas well beyond Forest Service land. In general, such areas are relatively inaccessible to people and there is little danger of excessive disturbance. However, there is some potential for uncontrolled trail-development on some ridges and points, especially near boat ramps and houses. Also, feral goats were observed at two sites along the South Fork, with evidence of considerable grazing in the vegetation. Logging of adjacent forest may have little effect on this vegetation. Some species of these outcrops have spread along nearby roads and into rocky old fields, including Rudbeckia cf. truncata and perhaps Leavenworthia uniflora. However, the other rare species noted above appear restricted to natural openings.

2. DRY EVERGREEN FOREST ON CLIFFTOPS OR RIDGES, GRADING INTO MOISTER OAK TYPES.

2A. PINE OR PINE-OAK FOREST ON NON-CALCAREOUS SOIL (USFS types 12,16,32, 33,38). Pines dominate in various situations, but always on non-calcareous soils (Table 2). They are most abundant on the driest ridges and clifftops, where Virginia pine (Pinus virginiana) and pitch pine (P. rigida) are probably the climax dominants in many areas. However, they have spread onto moister sites due to human disturbance, especially after soil erosion. Even at the beginning of the century, about 8-12% of the region's timber was "yellow pine", most of which may have been Pinus echinata (Table 3). This percentage is probably greater than the area with climax pine on dry ridges. Also, white pine is said to have been frequent on moderately moist sites before logging (Clemon Garrison, pers. comm.), though no convincingly native stands could be found during this survey. Less is known about the extent of pine forests at the time of settlement. However, a few old accounts of eastern Kentucky suggest that wildfire did occasionally burn large areas before settlement, probably favoring pines (J. Campbell, unpublished).

Typical species: On Dekalb soil, Pinus virginiana is dominant near sandstone clifftops, near natural glades and in recently disturbed areas. It often forms a natural pine-heath, with thickets of Vaccinium arboreum, V. corymbosum, Gaylussacia baccata and other Ericaceae. Other frequent species include Juniperus virginiana (at low density), Rhus copallina, Acer rubrum, Quercus montana, Q. coccinea, Q. velutina, Amelanchier and Aronia arbutifolia (Appendix B1). On sandstone ridgetops with deeper Dekalb or Hartsells soils, Pinus rigida, Quercus spp. and Acer rubrum tend to replace P. virginiana, often with large mats of Gaylusacia brachycera on the ground, also frequent Kalmia, Vaccinium vacillans, Gaultheria and other Ericaceae. Far from cliffs, several old-growth pine stands also occur on broader ridges or dry colluvial slopes, with soils derived from shale as well as sandstone. Such stands may have been initiated and maintained by disturbance, including fire. They often have more Pinus echinata, grading into oak-hickory forest or even

mesophytic forest types. Frequent herbaceous associates of various pine types, mostly in openings, include Lycopodium tristachyum, Pteridium aquilinum, Viola emarginata, Coreopsis major, Chrysopsis graminifolia, Aster solidagineus, Panicum commutatum var. ashei and many of the species of clifftops (Veg. Type 1A) or former oak-chestnut forest (Veg. Type 3A). Some stands are relatively grassy, with abundant Andropogon scoparius, Stipa, Tephrosia virginiana, Aster patens, Solidago erecta, and other species in the most open areas (see also Veg. Type 2B).

State rarities: These include Rhododendron catawbiense, Gaylussacia brachycera, Robinia hispida var. rosea, Malus angustifolia, Ilex montana var. beadleyi, Porteranthus trifoliata, Hypericum hypericoides, Stipa avenacea, Dichanthelium aciculare [Panicum a.] and D. boreale [P. bicknellii]. Most of these have Appalachian distributions and, in Kentucky, are restricted to the southeast. Some other rare shrubs with Appalachian to southeastern ranges have been found in or near the District, but may now be extirpated: Castanea pumila, Rhododendron minus and Leiophyllum buxifolium. Fires in the past may have promoted some of these species, most of which occur in thickets or more open woods (except Gaylussacia).

Conservation potential: About 70 pre-1900 pine stands remain in the District, but only a few are protected. Most are probably in a successional state towards oak types, needing disturbance of some kind for maintenance or regeneration. A few are being managed with fire for red-cockaded woodpecker habitat. Such management deserves further study in relation to rare plants that may also benefit. However, most of the rare species noted above do not appear to have spread into heavily disturbed areas. Some may even decline after logging, as appeared to be case for Gaylussacia brachycera in some recent clearcuts, though this species remains widespread and secure.

2B. REMNANTS OF MORE OPEN GRASSY PINE OR PINE-OAK WOODS. A more open type of pine or pine-oak forest or "barrens" may have existed before 1940, when annual burning was a common practice on uplands. In the Cliff Section of southern Kentucky, Braun (1950, p. 102) made a relevant note: "Instead of this pine-heath or pine-oak-heath community, some of the promontaries are occupied by open pine woods (the three species of pine) with a grassy layer of Andropogon scoparius (little bluestem), A. glomeratus (broom-segde), and Sorghastrum nutans (Indian grass), in which are a few scattered forbs. Fires have modified most (perhaps all) of these pine summits, although the abundance of large Cladonia (lichen) mats is an indication that there has been no fire for many years." Similar vegetation may have extended onto relatively moist sites, where droughts still occurred often enough to spread fires.

Typical species: Little is known about what species occurred in such woods. However, Rogers (1941) noted some plants in "a moist flat of pine-oak barrens" along the road to Bauer: Salix humilis (vars. humilis and microphylla), Hypericum punctatum, Eryngium yuccaefolium*, Liatris scariosa [probably L. squarrulosa*] and L. spi-

cata*; and he noted Helianthus atrorubens* in "pine-oak barrens at the Tennessee State Line." Also near the Bauer Road, he noted several species typical of openings or edges, all in "woods" unless noted: Andropogon gerardii ("common"), Robinia hispida*, Lespedeza virginica, L. capitata*, Polygala verticillata, Oxypolis rigidior, Angelica villosa, Cuscuta campestris, Solidago caesia, Aster patens var. phlogifolius* and A. solidagineus; Pycnanthemum pycnanthemoides, Helianthus hirsutus and Coreopsis major var. stellata (all "dry woods"); Anemone virginiana ("dry pine-oak woods"); Lobelia puberula ("wet woods"); Lilium philadelphicum* ("common along road"), Coreopsis tripteris var. deamii ("by the road"); Hypericum frondosum* ("low, moist, shaley soil in open thicket"). In 1987, big bluestem (Andropogon gerardii) is still common along the road to Bauer. But nothing like the open woods or barrens suggested by Rogers' notes was found, and, of the rarer species (shown by *), only Helianthus atrorubens was encountered.

Nevertheless, there are, today, a few other upland grassy roadsides that do have some rarer openings, together with a notably low frequency of exotics (Appendix B3). The most interesting area discovered during this survey was along Route 751 between Burnside and Keno, on a ridge with Hartsells and Whitley soils. In addition to the typically dominant Andropogon scoparius, A. gerardii and Sorghastrum, frequent species here include Tephrosia virginiana, Lobelia puberula, Helianthus hirsutus, Coreopsis major, Senecio anonymus, Chrysopsis spp., Solidago erecta, S. nemoralis, S. odora, Aster patens, A. concolor, A. dumosus, Gnaphalium obtusifolium, Eupatorium rotundifolium, E. aromaticum, Panicum anceps and Andropogon virginicus. Adjacent forest is dominated by pines (Pinus spp.), oaks (Quercus spp.) and red maple (Acer rubrum).

State rarities: Those occurring along Route 751 are Agalinis decemloba, Aster concolor, Helianthus atrorubens, Lilium philadelphicum and Gymnopogon ambiguus. The only one of these found at more than one other site in the District is H. atrorubens, which appears able to spread along roads and paths, sometimes persisting temporarily in shade. Another species possibly associated with open woods in the past is Schwalbea americana, which E. Lucy Braun collected at one site in this District and one site in the Stearns District, both in openings on dry ridges. This Federal Candidate has not been found in Kentucky since then. Other rare species found in sandy roadsides and fields just outside the District include Polygala polygama, Rhynchosia tomentosa and Silene regia, though the latter two have not been found since 1950. Most of these rare species have southern ranges. More widespread species of marginal concern, scattered over the District in disturbed sandy sites, include Asclepias amplexicaulis and Dichanthelium acuminatum var. villosum [Panicum villosissimum].

Conservation potential: Further historical work is needed to examine whether open grassy pine woods were a part of the landscape at the time of settlement, and if fires started by lightning or Indians were involved in maintaining them. It seems probable that the rarer species noted above did not all migrate into the region since

settlement. In any case, maintenance of the rare species will probably need repeated burning or cutting of the roadsides where they occur, like along Route 751. Whether they can be restored at recent historical sites, like the Bauer Road, or actually spread into open woods after burning will require further study.

2C. RED CEDAR OR RED CEDAR-OAK FOREST ON LIMESTONE CLIFFS (USFS types 11,35). Red cedar (Juniperus virginiana) appears to be a stable climax dominant only in a narrow zone above dry limestone cliffs, on Fredonia soils mixed with outcrops. There is much intermixing with oak forest types (3C,3B). At the beginning of this century, only about 1-2% of standing timber in the region was red cedar (Table 3), probably concentrated along these cliffs. However, young successional stands of red cedar are widespread today on limestone uplands, especially abandoned pastures, tending to be replaced by oaks, ashes, hickories and other trees. These young stands generally have an incomplete complement of the following species.

Typical species: Frequently associated small trees and shrubs include Diospyros (at low density), Celtis tenuifolia, Rhamnus caroliniana, Rhus aromatica, Ptelea, Hypericum frondosum, Philadelphus hirsutus, Physocarpus, Rosa carolina, Amelanchier and Viburnum rufidulum (Appendix B3). Typical herbaceous species include Pellaea atropurpurea, Asplenium ruta-muraria, Aquilegia, Zizia aptera, Houstonia canadensis, Solidago sphacelata, Aster laevis var. laevis, and many others typical of the intermixed open ledges (Veg. Type 1B) and oak forest (Veg. Type 3C). A few of these species occur less frequently on rocky sandstone sites.

State rarities: Those typical of this type, or transitions to oak-ash, are Pachistima canbyi [Paxistima c.], Ulmus serotina, Philadelphus hirsutus and perhaps Waldsteinia fragarioides. These species have ranges centered in the Interior Low Plateaus to the Appalachians.

Conservation potential: No pre-1900 red cedar stands are known in the District, though it would be interesting to do more accurate aging of stunted clifftop trees in the few tracts owned by the Forest Service. In any case, stand age itself may not be important for the rare species of this vegetation. Sites with most need of protection from excessive disturbance are along the South Fork, especially the area east of Cain Branch (on Forest Service land) and the two other Pachistima sites. Successional stands on flatter uplands have little or no conservation value, unless remnants of natural cedar-glades are ever discovered in the region.

2D. POSSIBLE REMNANTS OF CEDAR-GLADES, PRAIRIES OR BARRENS ON LIMESTONE UPLANDS Back from the cliffs of the Cumberland River system, no convincing remnants of natural openings are known in McCreary or Pulaski County, except perhaps for "Bald Knob". This is northeast of Somerset on private land, but similar sites could exist in the District. The feature of interest here is a grassy opening of 1-2

acres on top of the knob, with abundant little bluestem (Andropogon scoparius), big bluestem (A. gerardii), Solidago nemoralis, Euphorbia corollata, Lobelia spicata and Manfreda virginica (Appendix B3). Invasion of red cedar and other trees is clearly limited by the thin soils here. However, there is evidence of some human disturbance, with a large hole dug in the center, and it is possible that there has been soil erosion in the past. This site appears to be a remnant of what Braun (1950, p. 153) called "cedar barrens". However, there are no rare species here.

On or near Forest Service land, on upland fields and roadsides with at least partially calcareous soil, there are a few sites with rare or unusual plants typical of natural openings: Leavenworthia uniflora, Orbexilum onobrychis, Solidago speciosa var. speciosa, Cirsium carolinanum, Echinacea purpurea, Eryngium yuccaefolium, Lilium canadense, and perhaps Scutellaria leonardi (uncertain identification). These are mostly near Buck Creek, though the Cirsium is also scattered along impounded banks of the Cumberland River. Before settlement, such species may have been maintained by disturbance from fires, Indians or large herbivores. There should be more historical work on this question, and more search for natural openings in the District.

3. DRY-TO-MOIST DECIDUOUS FOREST DOMINATED BY OAKS AND OTHER RING-POROUS TREES

3A. FORMER OAK-CHESTNUT FOREST ON VERY ACID SOILS, WITH CHESTNUT OAK, SCARLET OAK AND TRANSITION TO OAK-HICKORY (USFS types 45,52,59,60). This forest type typically occupies ridges between the clifftops with pine, on Dekalb and Hartsells soils derived from sandstone, or more often on Muse and Whitley soils derived from sandstone and shale. Until the 1930s blight, chestnut (Castanea dentata) was formerly abundant here, or perhaps mostly in the transition to hemlock forest down into ravines. In about 1900, about 5-13% of the region's timber was chestnut, and, together with chestnut oak (Quercus montana), scarlet oak (Q. coccinea) and other associated oaks, this type probably made up about 10-20% of the timber (Table 3). Today only small infrequent chestnut sprouts remain, with red maple (Acer rubrum), hickories (Carya spp.) and other trees being frequent replacements in addition to the oaks.

Typical species: Quercus montana or Q. coccinea are the typical dominants in old-growth today. Other frequent trees include Acer rubrum, Nyssa sylvatica and Carya pallida. There is also much intergradation with typical oak-hickory forest (3B), and pines are common in young stands. Frequent shrubby species include Oxydendron, Kalmia, Vaccinium vacillans, V. stamineum, Rhododendron periclymenoides, Epigaea, Ilex montana, Vitis rotundifolia and Smilax glauca, and, in moister transitions, Ilex opaca, Stewartia and Aralia spinosa. Frequent herbaceous species, mostly in openings or on better soils with less undergrowth of Ericaceae, include Aristolochia serpentaria, Hypericum stragalum, Chimaphila maculata, Viola hastata, V. hirsutula, Desmodium viridiflorum, D. laevigatum,

Lespedeza intermedia, L. procumbens, Clitoria mariana, Potentilla canadensis, Hedyotis caerulea, Aureolaria laevigata, Sanicula smallii, Angelica, Chrysopsis mariana, Solidago odora, Aster undulatus, A. paternus, Eupatorium aromaticum, Elephantopus tomentosus, Prenanthes serpentaria, Hieracium venosum, Krigia biflora, Agrostis perennans, Panicum dichotomum, P. commutatum var. ashei, Luzula campestris, Carex striatula, Cypripedium acaule and Goodyera pubescens.

State rarities: Those that generally occur in this forest type, or its transitions, are Cleistes divaricata, Danthonia compressa, Stewartia ovata, Carex picta and perhaps Carex striatula. These species have southern ranges, except for the Danthonia.

Conservation potential: Only about 25 pre-1900 stands of chestnut oak or scarlet oak remain in the District. However, no areas with notable clusters of rare species were found. Logging may have little effect on the rare plants noted above, which were observed in young woods as well as old.

3B. OAK-HICKORY FOREST ON AVERAGE SOILS, WITH WHITE OAK AND BLACK OAK. (USFS types 44,47,53,54). At the beginning of this century, white oak, black oak and hickories made up about 30-50% of timber in this region (Table 3), as also indicated by remaining pre-1900 stands (Table 2). Oak-hickory forest is still widespread in the District, occurring on most geological, topographic and edaphic situations. However, it is concentrated on slopes of moderate exposure (E and W more than N and S), mostly on colluvial Jefferson or Shelocta soils, and also on upper slopes or broader ridges with Muse or other soil series (Table 1). These soils are mostly derived from sandstone and shale. Since this forest type occupies average soil conditions, it intergrades with most other forest types.

Typical species: The typical dominant in old-growth is Quercus alba, with Q. velutina, Carya glabra, C. tomentosa, Acer rubrum and Nyssa sylvatica also frequent. Flatter phases on broad ridges have frequent Q. stellata, especially on drier sites, and Q. falcata, especially in transitions to seasonally wet forest (Veg. Type 5A). In disturbed areas, Pinus spp., Diospyros and Sassafras are frequent. Moister phases, grading into yellow poplar or beech forest (see Veg. Type 4B), have frequent Q. rubra, Carya ovata, C. cordiformis, and, in disturbed areas, Robinia pseudoacacia, Prunus serotina and Rhus glabra. Cornus florida is often dominant in the understory, and other frequent shrubby species include Hamamelis, Corylus, Prunus americana, Vitis aestivalis, Viburnum acerifolium and Smilax rotundifolia. Frequent herbaceous species include Lycopodium digitatum, Asplenium platyneuron, Polystichum, Silene virginica, Viola palmata, Desmodium nudiflorum, D. rotundifolium, Potentilla simplex, Scutellaria elliptica, Aureolaria virginica, Galium circaezans, Hedyotis purpurea, Helianthus microcephalus, Coreopsis auriculata, Solidago caesia, Aster lateriflorus, A. infirmus, Erigeron pulchellus, Antennaria plantaginifolia, Smilacina, Uvularia perfoliata, Polygonatum biflorum, Brachyelytrum, Poa

cuspidata, Panicum boscii, P. commutatum, Carex cephalophora, C. artitecta, C. digitalis, C. wildenovii and C. complanata.

State rarities: The only rare species (at least the only officially listed species) typically found here is Viola tripartita var. glaberrima. Also, Phlox ameona is found in open stands and along edges, while Hydrastis canadensis, Phaseolus polystachios and Geum virginianum may be typical of the transition to beech forest.

Conservation potential: About 130 pre-1900 oak-hickory stands remain in the District, but only a few, in the Beaver Creek Wilderness Area, are protected. Viola tripartita and a particularly large patch of Hydrastis occur in an area of mature oak-hickory forest near the mouth of Beaver Creek on moist, calcareous soils, transitional to oak-ash and sugar maple forest. This area (marked for logging) and other old-growth areas deserve more careful survey.

3C. OAK-ASH FOREST ON CALCAREOUS SOILS, WITH YELLOW OAK, SHUMARD OAK AND TRANSITION TO OAK-HICKORY (USFS type 43). This forest type occurs on various limestone soils in the District, especially the residual Fredonia series on upper slopes and the colluvial Brookside series on steep rocky slopes. Some variants of the type may also occur on flatter ground of the Mississippian Plateaus, even on alluvial soils, but mostly outside the District. The extent of this type before settlement is not clear, since the typical species of oak were generally not identified in old surveys. At the beginning of this century, the percentage of ash in the region's timber was only about 1-3% (Table 3), and it is likely that this forest type, like red cedar (Veg. Type 2C), was mostly confined to steeper slopes near rivers and creeks. Today, it often grades into oak-hickory forest above the steepest slopes, either on more deeply weathered limestone, on old sandy terraces, or on less calcareous bedrock.

Typical species: Dominants include yellow oak (Quercus muhlenbergii), shumard oak (Q. shumardii), southern shagbark hickory (Carya ovata var. australis [C. carolinae-septentrionalis], blue ash (Fraxinus quadrangulata), white ash (Fraxinus americana, in moister transitions) and winged elm (Ulmus alata). Except for the latter two, these species are largely restricted to limestone. Ostrya is often dominant in the understory, and other frequent shrubby species include Cercis, Celastrus, Vitis vulpina, Viburnum rafinesquianum and those typical of rocky openings (see Veg. Type 2C). Frequent herbaceous species in this type include Viola sororia, Arabis laevigata, Lespedeza violacea, Heuchera americana, Agrimonia pubescens, Blephilia ciliata, Dasistoma, Lithospermum tuberosum, Polymnia canadensis, Verbesina virginica, Senecio obovatus, Solidago ulmifolia, Aster shortii, Diarrhena, Bromus altissimus, Muhlenbergia sobolifera and Smilax bonanox. Species that may be most frequent in the transition to oak-hickory include Penstemon pallidus, Pedicularis, Conopholis, Galium concinnum, Cynoglossum, Eupatorium sessilifolium, Scleria nitida, Carex pennsylvanica, Melica mutica and Elymus hystrix.

State rarities: Those generally found in this type or its transitions are Aureolaria patula, Philadelphus inodorus, Carya ovata var. australis [C. carolinae-septentrionalis], Lonicera dioica var. glaucescens and Lithospermum tuberosum. In Kentucky, these southern species are mostly restricted to the Cumberland River system. Also, Crataegus uniflora occurs infrequently in successional stands.

Conservation potential: The Forest Service owns few areas of this type, and no pre-1900 stands are known in the District. No particular clusters of rare species were found in this type, but together with intermixed zones of red cedar or sugar maple, there are several sites with overall clusters that are important to conserve (see Veg. Types 1B,2C,4C).

4. MOIST (MESOPHYTIC) FOREST CONCENTRATED IN RAVINES AND ON N-NE SLOPES. Pure types are described here for reference, but they intergrade extensively. They fit Braun's (1950) definition of mixed mesophytic forest, except for the sugar maple type on limestone, which is better called western mesophytic.

4A. EVERGREEN HEMLOCK FOREST ON ACID SANDY SOILS, AND TRANSITION TO BEECH. (USFS types 5,8,41). This type is virtually restricted to steep colluvial slopes with Jefferson soils derived from sandstone, mostly in narrow ravines or on lower north-facing slopes. In about 1900, hemlock (Tsuga canadensis) made up roughly 3-5% of the region's timber (Table 3), but there is a higher percentage in the District's remaining old-growth (Table 2), which is biased towards less accessible ravines.

Typical species: In addition to the dominant hemlock, other characteristic trees include birches (Betula spp.), magnolias (Magnolia spp.) and holly (Ilex opaca), most of which are more common in transitional or disturbed phases. The dominant shrub is Rhododendron maximum, with Clethra also frequent. Dryopteris intermedia, Carex plantaginea and Tiarella are often dominant on the ground. Other frequent associates include Lycopodium lucidulum, Athyrium asplenioides, Viola blanda, Mitchella, Medeola and Carex communis. Species that are frequent in the transition to beech-yellow poplar forest (Veg. Type 4B) include Lycopodium obscurum, Cimicifuga, Hepatica americana, Hexastylis arifolia, Meehania, Solidago arguta, Disporum, Trillium sulcatum, Iris cristata, C. gracillima, C. virescens and Galearis. The special habitat beneath overhanging sandstone cliffs and rockhouses often occurs within or adjacent to hemlock forest. Frequent species here include Heuchera parviflora on drier sites, and Thalictrum mirabile (or clavatum) on wetter sites. Some species just occur in cracks on the cliffs, notably Asplenium montanum. Other species are found under both sandstone and limestone cliffs, including Aquilegia, Silene rotundifolia, Chenopodium gigantospermum and Parietaria (see also Veg. Types 4B,4C).

State rarities: These include Veratrum parviflorum, Magnolia fraseri, Anemone quinquefolia, Panax trifolius, Oxalis montana, Viola

rotundifolia, Epilobium ciliatum, Scutellaria serrata, Poa alsodes, Carex laxiculmis, C. lucorum and perhaps C. communis. Most occur on moist seeps, terraces or bottoms of streams flowing into more rugged sections of the Cumberland and Rockcastle Rivers. Also, found beneath overhangs or rockhouses are Trichomanes boscianum and Cystopteris fragilis var. mackayi [C. tenuis]. All of these have northern or Appalachian ranges, with a few small disjunct populations here in the Cliff Section at the edge of the range, mostly in relatively old, undisturbed forest.

Conservation potential: About 40 pre-1900 stands of this type remain in the District, including several with rare species. A few of the oldest are protected in the Beaver Creek Wilderness Area, but others are scattered elsewhere. Special attention is needed for sites near the Rockcastle and Cumberland Rivers, including the remarkable area at the mouth of Flat Branch, with Epilobium ciliatum and much Oxalis montana. It is possible that logging, with consequent hydrological and microclimatic changes, has adverse effects on such rare species in their cool, moist refugia. Old-growth stands all deserve careful surveys for rare species, and logged areas should be compared to learn about effects.

4B. BEECH AND YELLOW POPLAR FOREST ON AVERAGE SOILS (USFS type 56). This type is concentrated on lower colluvial slopes, with some concentration on north-facing aspects. Typical soil series are Jefferson and Shelocta, derived from sandstone and shale, but some stands also occur on limestone covered by non-calcareous material on colluvial benches or alluvial terraces. In both sandstone and limestone country, beech (Fagus grandifolia) is particularly abundant near rivers and major creeks. Though not shown on District maps, it is locally dominant, especially in transition to hemlock. However, human disturbance appears to have converted most beech forest to yellow poplar (Liriodendron tulipifera) or, especially on eroded soils, oak-hickory and pine. Even around the turn of the century, yellow poplar was almost twice as abundant as beech (Table 3).

Typical species: In addition to the two dominants, frequent species include Magnolia acuminata, Tilia heterophylla, Juglans cinerea, and several others in the extensive transitions to oak-hickory (Veg. Type 3B) and sugar maple (Veg. Type 4C) forests. In the understory of undisturbed forest, there are few shrubs, except near streams. However, Carpinus, Euonymus americanus, Dirca and others (see Veg. Types 4C,6) are relatively frequent. There is a rich herbaceous layer. Abundant species include Erythronium americanum, Podophyllum, Viola rostrata, Aster divaricatus, and other frequent species include Adiantum pedatum, Thelypteris hexagonoptera, Dryopteris marginalis, Anemonella, Polygonum virginianum, Geranium maculatum, Vicia caroliniana, Actaea, Circaea canadensis, Collinsonia, Epifagus, Galium triflorum, Sanicula canadensis, Osmorhiza claytoni, Eupatorium purpureum, Helianthus decapetalus, Aster macrophyllus, Cacalia atripicifolia, Lactuca floridana, Prenanthes altissima, Arisaema triphylla, Muhlenbergia sylvatica, Carex rosea, C. laxiflora, C. amphibola, Tipularia, and others in transitions

(see Veg. Types 4A,4C,3B). Sandstone rockhouses also occur adjacent to beech forest or related ypes, with most of the typical species already noted under hemlock forest (Veg. Type 4A). In addition, Eupatorium luciae-brauniae occurs at several sites, generally in larger ravines and on the Cumberland River slopes. For associated species see Appendix B4.

State rarities: Eupatorium luciae-brauniae (a Federal Candidate) is the most important rare species associated with this type, below sandstone cliffs. Also, Erigeron pulchellus var. brauniae, Polemonium reptans var. villosum, Calycanthus floridus and perhaps Carex purpurifera generally occur in beech or yellow poplar forest on lower slopes near rivers and creeks. These four species are mostly restricted to the Cliff Section, at least in Kentucky. Less rare species generally found in this forest type, or in transitions to oak types, include Panax quinquefolius, Hydrastis canadensis and Cypripedium pubescens, which may all be threatened by harvesting.

Conservation potential: About 25 pre-1900 stands mapped as yellow poplar (USFS type 56) occur in the District. These include much beech, as do some of the old hemlock stands. A few old stands of this type occur in the protected Beaver Creek Wilderness Area, and some occur in State Wild River Corridors. Notable clusters of rare species were not found in this type, but there is a general concentration on the river slopes. Logging may have little long-term effect on most rare species here, which often occur in disturbed or young woods as well as old. However, other special problems are excessive trampling in recreational areas near the rivers, and harvesting of the merchantable herbs.

4C. SUGAR MAPLE FOREST ON BASE RICH SOILS, WITH TRANSITIONS TO BEECH AND OAKS. (USFS type 81). Sugar maple (Acer saccharum) is locally dominant on lower colluvial slopes near major rivers and creeks, with Jefferson or Shelocta soils on sandstone and shale, and, more widely, below limestone cliffs on Brookside soils. Often it is greatly mixed with beech (Fagus) and oaks, especially northern red oak (Quercus rubra), or replaced by more successional stands with white ash, black walnut and others. Probably no more than 3-4% of timber in about 1900 was sugar maple (Table 2; Table 3), and it may be much less today.

Typical species: In addition to Fagus grandifolia and Quercus rubra, frequent associates include Tilia spp., Ulmus rubra, Morus, Juglans spp., Carya cordiformis, Cladrastis, Aesculus flava and Fraxinus americana. In undisturbed forest there are few shrubs, except along streams with Asimina, Hydrangea, Viburnum prunifolium and others (see Veg. Types 4B,6B). There is a rich herbaceous layer, with Asarum, Pachysandra and Eupatorium rugosum (in somewhat disturbed areas) often local dominants. Other frequent species include Botrychium virginianum, Hepatica acutiloba, Sanguinaria, Dentaria diphylla, Desmodium glutinosum, Sedum ternatum, Geum canadense, Agrimonia rostellata, Sanicula gregaria, Thaspium barbinode, Phlox divaricata, Polymnia uvedalia, Rudbeckia umbrosa, Solidago flexi-

caulis, Aster cordifolius, Erigeron philadelphicus, Trillium cuneatum, Smilax ecirrhata, Dioscorea quadrifolia, Poa sylvestris, Festuca obtusa and Carex blanda. Limestone cliffs often occur above slopes with this forest type. There are no species restricted to sites directly under these cliffs, but Dodecatheon meadia mostly occurs at such sites in this region. Asplenium rhizophyllum, Cystopteris bulbifera and Heuchera villosa var. macrorhiza generally occur on ledges and cracks on limestone cliffs. Other species occur under both limestone and sandstone cliffs (see Veg. Type 4A).

State rarities: In special variants of this type, Scutellaria saxatilis occurs on sandstone boulders in transition to beech-hemlock forest; Cladrastis kentukea is scattered along moist limestone cliffs; and Thuja occidentalis occurs on some dry or seeping outcrops, often in transition to oak-ash forest. Also, Acer spicatum occurs by a cave north of the District along Buck Creek, in an unusual forest with sugar maple and hemlock codominant (Harker et al. 1979). Other possible rarities in this type are Carex hirtifolia and Aster schreberi.

Conservation potential: Only 4 pre-1900 stands are mapped in the District as dominated by sugar maple, together with beech (USFS type 81). However, small stands of old sugar maple are scattered in other mapped types. These deserve further survey, since some rare species noted above may be best represented in old-growth. Sites with northern white-cedar (Thuja occidentalis) may deserve special protection from logging, including the site on the Cumberland River slope at the mouth of Lick Creek. Old-growth sugar maple may also occur on nearby private land, but most of the flatter, less rocky land that is potentially dominated by sugar maple is highly disturbed or cleared already, due to the rich soils being valuable for agriculture. Little is known about the natural vegetation of such land and what rare species might occur here.

5. SEASONALLY WET FOREST AND NATURAL OPENINGS OF STREAM-HEADS OR TERRACES. In this region, these forest types generally occur in small areas, with tree composition often not clearly distinct from adjacent types. They do not include oaks like pin-oak (Quercus palustris) and swamp white oak (Q. bicolor), which are typical associates further west in Kentucky. However, the herbaceous layer in these types, and in the few associated natural openings and ponds, is highly distinct.

5A. RED MAPLE FOREST, WITH BLACKGUM OR SWEETGUM, ON ACID SOILS (not mapped as a distinct USFS type in this District). This forest type generally occurs as thin strips grading into adjacent slopes or streamsides, with highly variable hydrology and species composition. It occurs on various soils derived from sandstone and shale. At stream-heads on broad ridges, county soil surveys often do not indicate such sites as distinct from the general "well-drained" soils, but the typical series of wetter sites appears to be Tilsit, which is "moderately well-drained" with a fragipan. Several other soil series occur on small bottoms and alluvial terraces, a situa-

tion too complex to be treated here, though potentially related to the vegetation. It is difficult to estimate the overall extent of such forest before settlement. At the beginning of this century roughly 5-10% of the region's timber was "maple" or "gum" (Table 3), but this must have been largely in well-drained forest types (see above).

Typical species: The most abundant trees are red maple (Acer rubrum, often var. trilobum), blackgum (Nyssa sylvatica), and, in wetter places, sweetgum (Liquidambar styraciflua). Frequent shrubs include Ilex verticillata and, in wetter openings, Alnus serrulata. In drier phases, frequent herbaceous species include Thelyperis noveboracensis (especially in transitions to beech or hemlock), Osmunda claytoniana, Lygodium, Carex debilis and Chasmanthium laxa. In wetter phases, frequent species include Osmunda cinnamomea, O. regalis, Viola primulifolia, Carex intumescens and C. crinita. In more open phases, Panicum microcarpon is often dominant, with frequent Hypericum mutilum, Rubus hispidus, Rhexia spp., Ludwigia alternifolia, Pycnanthemum spp., Solidago rugosa, Aster umbellatus, Eupatorium fistulosum, Platanthera spp., Calamagrostis cinnoides, Panicum polyanthes and Rhynchospora spp. Also, Juncus spp., Eleocharis obtusa and Scirpus cyperinus are frequent in ponds and ditches. For details of special sites, see Appendix B5/A-I.

State rarities: These are Hypericum stans [H. crux-andreae], Calamagrostis cinnoides, Glyceria septentrionalis and Carex joorii (both found in partially shaded seasonal ponds), C. bromoides, Juncus canadensis and Platanthera integrilabia (the latter three together in a small wet opening), and perhaps P. lacera. Also, Calopogon tuberosus and Gratiola pilosa have been found six miles south of the District. Most of these species are southern, and, within Kentucky, concentrated in the southern Cliff Section. Most occur in small openings or at edges.

Conservation potential: No notable old-growth stands are known, except for a few small areas about 50-100 years old, but the rare species are not typically concentrated in older forest. The most important areas with rare species include the stream-heads on Hindsfield Ridge, and the few natural ponds. Further surveys are needed, especially during the flowering season of Platanthera spp., to see if other important areas exist. Small seasonal wetlands like these need to be mapped more accurately in terms of their soil and vegetation. With so little known about the hydrology and ecology of this forest type, and the occurrence of several rare species, including a strong Federal Candidate (Platanthera integrilabia), there should be careful study of management options. Some species might benefit from artifically increasing the forest openings, but the degree of disturbance in openings is probably critical.

5B. GREEN ASH FOREST WITH WHITE ELM OR HACKBERRY ON BASE-RICH SOILS (USFS type 63). This type is difficult to define in the District, and it is largely covered here by the description of silver maple-sycamore forest (Veg. Type 6B). Much suitable habitat has been impounded,

drained or cleared. Green ash (Fraxinus pennsylvanica) is scattered along the major rivers and creeks and occasionally forms small stands on wetter terraces, often with elm (Ulmus americana) and perhaps hackberry (Celtis occidentalis) in the drier transition. As far as is known, no rare species are strongly associated.

A remarkable stand, at least 150 years old, exists on the Pitman Creek bottom opposite Bradley Chapel, east of Somerset. Though on private land north of the District, it is relevant to understanding of the region's forests. Similar stands probably used to occur on bottoms of the Cumberland River system before impoundment. Parts of this stand consist of sycamore and other streamside trees, with some green ash and white elm. The better drained areas are dominated by hackberry (Celtis occidentalis) and yellow oak (Quercus muhlenbergii), with some shumard oak (Q. shumardii) and bitternut hickory (Carya cordiformis). Also, some typical mesophytic trees are present, including beech (Fagus), yellow buckeye (Aesculus flava) and black walnut (Juglans nigra), but there is little or sugar maple (Acer saccharum). The ground vegetation includes Arundinaria, Elymus "interior", Laportea, Impatiens pallida, Aster ontarionis, Rudbeckia laciniata and other typical streamside species (see 6B). On better drained sites, Asarum canadense and Pachysandra procumbens are dominant, with other mesophytic species. This complex composition may be interpreted as transitional from streamside forest (Veg. Type 6B) to oak-ash-hickory forest (Veg. Type 3C), with some terrace (Veg. Type 5B) and mesophytic (Veg. Type 4C) components. It should be studied further.

6. FORESTS BY WATERCOURSES AND SEEPS, WITH HERBACEOUS EXTENSIONS UPSTREAM. Most shrubby and herbaceous species in these types extend up smaller streams to seeping slopes and ditches, far beyond the zone with sycamore. Also, there is much mixing of the two following types.

6A. RIVER BIRCH-SYCAMORE FOREST ON ACID SANDY ALLUVIUM (USFS type 72). This forest type is generally restricted to streams below the cliffline. Sycamore (Platanus occidentalis) tends not to extend as far upstream as river birch (Betula nigra), and even the latter does not extend as far as some of the herbaceous species listed below. Smaller streams above the cliffline are generally lined with hemlock (Tsuga), yellow poplar (Liriodendron), holly (Ilex opaca), red maple (Acer rubrum) and other trees.

Typical species: Along smaller streams and creeks, Carex torta is often dominant in the streambed, and other frequent species include Viola cucullata, Linum striatum, Chelone glabra, Lobelia cardinalis, Lycopus virginicus, Phlox maculata, Platanthera clavellata, Carex prasina and C. lurida. Along larger streams and rivers, grading into silver maplesycamore (Veg. Type 6B), frequent species include Onoclea, Thalictrum pubescens, Ranunculus recurvatus, Apios americana, Viola conspersa, Lysimachia ciliata, Cicuta, Senecio aureus, Cinna arundinacea, Elymus riparius and Carex cf. projecta. For details of some special sites, see Appendix B5/J-K.

State rarities: Those typical of smaller streams and creeks are Carex scabrata, Cardamine rotundifolia and Hydrocotyle americana. Those along rivers are Cypripedium kentuckiense and Aconitum uncinatum, both on the Rockcastle River bottom, and typical of the transition to beech or yellow poplar (4B). These species mostly have northern or Appalachian ranges. In Kentucky, they are largely restricted to a few watersheds in the Cliff section, and each is known at only 1-5 sites in the District. Some rare or southern species may also be typical of mossy acid streamsides, but mostly in transitions to more upland vegetation: Rhynchospora globularis, Carex styloflexa, Bartonia paniculata and Stenanthium graminifolium var. micranthum. These were found at only one or two sites each, and further study is needed to determine their status.

Conservation potential: No pre-1900 stands of this type are known in the District, but frequent disturbance from flooding is a natural factor tending to keep stands youthful. The regime of stream-flow and siltation is probably a major factor controlling species composition. Thus, watershed management may be important for protection, as well as avoiding excessive disturbance from roads and logging. Most of the above rare species have sparse unpredictable distributions in this region, perhaps due to vagaries of hydrological history, and more systematic survey of streams is needed to look for concentrations. The single site with Hydrocotyle americana deserves special protection. Also, the Rockcastle River bottom has general importance for Aconitum uncinatum, Cypripedium kentuckiense, Polemonium reptans var. villosum (see Veg. Type 4B), Erigeron pulchellus var. brauniae (see Veg. Type 4B) and others (see Veg. Type 7). The Cypripedium and Polemonium are Federal Candidates, and they occur south of Turkey Creek in an area recently damaged by extension of a dirt road. They also occur on the north side of Long Point, where private logging occured in 1987 contrary to State regulations.

6B. SILVER MAPLE-SYCAMORE FOREST ON BASE-RICH ALLUVIUM (SAF type 76), ETC. This forest type is restricted to the banks of rivers and larger streams, generally on silty soil rather than sandy. Silver maple (Acer saccharinum) is concentrated on banks next to deeper pools. Some of the following herbaceous species are particular widespread above watercourses in damp forested gullies (e.g., Impatiens pallida, Laportea), and others occur in more disturbed areas like roadside ditches (e.g., I. capensis, Boehmeria).

Typical species: Frequently associated trees are Acer negundo, Ulmus americana and Fraxinus pennsylvanica (see also Veg. Type 5B). Shrubs include Arundinaria, Lindera and, in openings, Sambucus. Also, Salix nigra and Cephalanthus are frequent in low wet open areas, especially along muddy shores of the impounded rivers. Frequent herbaceous species include Pilea, Boehmeria, Laportea, Impatiens spp., Viola striata, V. papilionacea, Amphicarpa, Phlox paniculata, Monarda clinopodia, Cryptotaenia, Lobelia siphilitica, Rudbeckia laciniata, Aster ontarionis, Chasmanthium latifolium, Leersia spp. and Panicum clandestinum. Also, Xanthium, Bidens spp.,

Diodia virginiana and Eragrostis hypnoides are abundant on the impounded mudbanks.

State rarities: None are restricted to silver maple-sycamore itself, but some occur along smaller streams or various upland transitions. Synandra hispidula has been found along the Rockcastle River, probably on seeping talus slopes or gullies. In a special microhabitat, Adiantum capillus-veneris occurs along the Cumberland River and South Fork, where small streams and seeps flow over open limestone cliffs (see Appendix B6). Also, Juncus coriaceus was found on a wet dirt-road bed in a small limestone gully.

Conservation potential: No pre-1900 stands of this type are known in the District, and no particular clusters of rare species are known. Further search of the upper Rockcastle River, Buck Creek, Pitman Creek and other streams would be needed to locate the best areas for conservation.

7. ROCKY BANKS OF RIVERS AND MAJOR CREEKS, WITH GRASSY TO SHRUBBY VEGETATION. Sections of the Cumberland River and the Rockcastle River that have rocky banks, often with open bars of boulders and cobbles, have unique vegetation. Similar vegetation occurs along the Laurel River and Buck Creek, though much reduced by impoundment. Except for Buck Creek, the rocks are sandstone. Big bluestem (Andropogon gerardii) is a typical dominant in grassy vegetation on these open rocky banks, forming a zone up to 50-100 feet wide in some places, especially on well-drained bars. Other zones can be tentatively described, but there is much variation and mixing. For overall species lists, see Appendix B7-8.

Typical species:

(a) Shrubby back edges. There is usually a shrubby zone transitional from open floodplain to terrace or slope forest. Some areas here have a wet terrace component (see Veg. Type 6), especially Liquidambar, Alnus serrulata and Osmunda regalis. Vines are frequent, including Vitis spp., Rhus radicans, Campsis and, on the Cumberland River, Wisteria*. In more open sites, there are common early successional trees and tall herbs, including Robinia pseudoacacia, Diospyros, Ulmus alata, Solidago altissima, S. gigantea, Eupatorium fistulosum, E. serotinum and Panicum clandestinum. Other species are largely restricted to this habitat in the region, including Rhododendron arborescens, Chionanthus, Xanthorhiza, Trautvetteria, Ligusticum canadense (perhaps a distinct variety*), Tradescantia ohiensis and Panicum yadkinense*. Also, Amorpha fruticosa occurs along the Cumberland, and, on the Rockcastle River, there is an undescribed species of Aster* (related to A. radula).

(b) Grassy openings. In more open grassy zones, codominants with Andropogon gerardii often include A. scoparius and Sorghastrum. These and other associates are also frequent in open upland sites, including Euphorbia corollata, Lespedeza virginica (especially Cumberland River), Stylosanthes, Apocynum cannabinum, Salvia lyrata

(especially Rockcastle River), Ipomaea pandurata and Coreopsis tripteris. Other species here are virtually restricted to river banks in this region, including Hypericum prolificum, H. denticulatum, Physostegia virginiana ssp. virginiana, Solidago spathulata [S. glutinosa] ssp. randii (a distinct variety*), Aster laevis var. concinnus*, and, absent from the main Cumberland River, Baptisia australis* and Zizia aptera. Carex stricta* is locally dominant on wetter ground, and, above the Cumberland Falls at the mouth of Bunches Creek, there is a unusually low wet bar with Spartina pectinata locally dominant, though found nowhere else in the region.

(c) Shrubby streamsides. Concentrated near the water's edge, Salix caroliniana, Platanus and Betula nigra (see 6A) generally form a shrubby zone, frequently with Cornus obliqua, Itea virginica and Cephalanthus occidentalis. Herbaceous species include Apios americana, Boehmeria and Viola cucullata. In addition, Vitis rupestris* is frequent along the Rockcastle River, mostly in the transition from streamside to grassy zones.

(d) Aquatic vegetation. Rooted in running water for most of the year, Justicia americana forms large stands. In some slightly higher places with more stable substrate and slower water, there are also adjacent zones with Leersia oryzoides and Saururus cernuus.

*State rarities: In the preceding section, asterisks indicate species that are frequent along at least one of these river sections, but generally rare or localized in the State. Several rarer species also occur here. In open pine-oak woods on ledges just above the banks, Astragalus canadensis and Eupatorium semiserratum are known at one site each along the Cumberland River. In the open shrubby back edges of rocky banks, there are Tripsacum dactyloides, Lathyrus palustris, Malus angustifolia, Hypericum hypericoides and perhaps Catalpa bignonioides (naturalized?) on the Cumberland River; Comptonia peregrina, Spiraea corymbosa and Solidago speciosa var. speciosa on the Rockcastle River; Viburnum dentatum and perhaps Clematis glaucophylla on both rivers.

In open grassy or low shrubby zones, there are Tephrosia spicata, Senecio pauperculus and Trachelospermum difforme on the Cumberland River; Ceanothus herbaceus and Solidago uliginosa on the Rockcastle River. Also, above Cumberland Falls, there are Gratiola pilosa, Coreopsis pubescens, Spartina pectinata (at the edge of its western range), an undescribed Physostegia (perhaps related to P. intermedia), and, rooted in water, Orontium aquaticum. On rocks in the running water itself, there are old reports of Podostemon ceratophyllum near the Falls and in Cain Creek near the Rockcastle River.

Only eight of these rare species (or 11 including banks above the Falls) are listed, but there has been little previous study of these riverbanks. Several others deserve listing, at least those with virtually no previous reports in Kentucky, i.e., Vitis rupestris, Spiraea corymbosa, Physostegia sp. nov. (aff. P. intermedia), Aster sp. nov. (aff. radula), A. laevis var. concinnus, Solidago

uliginosa, S. spathulata [S. glutinosa] ssp. randii var. nov. (or perhaps = S. plumosa).

Conservation potential: This vegetation has the most concentration of rare species in the region, and it is among the most important types for conservation in the State. The special combination of rocky banks and seasonal scouring appears essential for this vegetation and its rare species. Most of it occurs in State Wild River Corridors. However, recreational use of these corridors has resulted in some minor damage to the vegetation, due to trampling and camping, and such use is likely to increase. Because so many rare species have been recently discovered here, more detailed surveys of plant distributions and human disturbance are needed. It is unfortunate that virtually no botanical work was done in areas that are now impounded.

APPENDIX D

TERRESTRIAL VERTEBRATE LISTS

D1: Herptiles
D2: Birds
D3: Mammals

APPENDIX D1: HERPTILES OF THE SOMERSET RANGER DISTRICT.

Species	Abundance	Habitat(s)
Amphibians		
Salamanders		
Ambystoma maculatum (Spotted Salamander)	fc*	Woodlands.
[Ambystoma opacum] (Marbled Salamander)	uc	Woodlands.
[Ambystoma texanum] (Smallmouth Salamander)	ra	Woodlands.
Aneides aeneus (Green Salamander)	uc*	Sandstone outcrops.
[Cryptobranchus a. alleganiensis] (Eastern Hellbender)	uc	Streams; rivers.
Desmognathus f. fuscus (Northern Dusky Salamander)	co*	Headwater streams.
Desmognathus m. monticola (Appalachian Seal Salamander)	fc*	Headwater streams.
[Desmognathus ochrophaeus] (Mountain Dusky Salamander)	ra	Seepages.
[Desmognathus welteri] (Black Mountain Salamander)	ra	Headwater streams.
Eurycea b. bislineata (Northern Two-lined Salamander)	uc	Streams.
Eurycea l. longicauda (Longtail Salamander)	fc*	Rock outcrops; caves; streams.
Eurycea lucifuga (Cave Salamander)	fc*	Limestone outcrops; caves.
[Gyrinophilus porphyriticus duryi] (Kentucky Spring Salamander)	ra	Springs; seeps.
Hemidactylium scutatum (Four-toed Salamander)	uc*	Woodlands.

APPENDIX D1 cont'd.

Species	Abundance	Habitat(s)
[Necturus m. maculosus] (Mudpuppy)	ra	Rivers; streams.
Notophthalmus v. viridescens (Red-spotted Newt)	co*	Woodlands.
Plethodon d. dorsalis (Eastern Zig-zag Salamander)	fc*	Woodlands.
Plethodon g. glutinosus (Slimy Salamander)	uc*	Woodlands.
[Plethodon kentucki] (Cumb. Plateau Woodland Salamander)	ra	Woodlands.
[Plethodon richmondi] (Ravine Salamander)	ra	Woodlands.
[Pseudotriton m. montanus] (Eastern Mud Salamander)	ra	Springs; seeps.
Pseudotriton r. ruber (Northern Red Salamander)	uc*	Woodlands; springs.
Frogs and Toads		
[Acris c. crepitans] (Northern Cricket Frog)	uc	Marshes; ponds.
Bufo a. americanus (Eastern American Toad)	co*	Ubiquitous.
Bufo woodhousii fowleri (Fowler's Toad)	co*	Ubiquitous.
Gastrophryne carolinensis (Eastern Narrowmouth Toad)	uc*	Marshy areas.
Hyla chrysoscelis (Cope's Gray Treefrog)	co*	Woodlands; edges.
Hyla c. crucifer (Spring Peeper)	co*	Edges; woodlands.
Pseudacris brachyphona (Mountain Chorus Frog)	fc*	Woodlands; streams.

APPENDIX D1 cont'd.

Species	Abundance	Habitat(s)
[Pseudacris triseriata feriarum] (Upland Chorus Frog)	uc	Marshes; ponds.
Rana catesbeiana (Bullfrog)	co*	Ponds; marshes; rivers.
Rana clamitans melanota (Green Frog)	fc*	Ponds; streams.
Rana palustris (Pickerel Frog)	fc*	Ponds; caves; streams.
[Rana sphenocephala] (Southern Leopard Frog)	ra	Marshes; ponds.
Rana sylvatica (Wood Frog)	co*	Woodlands.
Scaphiopus h. holbrookii (Eastern Spadefoot)	uc*	Sandy ridges and floodplains.
Reptiles		
Turtles		
[Chelydra s. serpentina] (Common Snapping Turtle)	uc	Ponds; lakes.
[Chrysemys picta marginata] (Midland Painted Turtle)	uc	Ponds; lakes.
Graptemys geographica (Map Turtle)	uc	Lakes; rivers; ponds.
[Graptemys ouachitensis] (Ouachita Map Turtle)	uc	Lakes; rivers.
[Pseudemys concinna] (River Cooter)	ra	Lakes; rivers.
Pseudemys scripta elegans (Red-eared Slider)	uc*	Ponds; rivers.
[Sternotherus odoratus] (Stinkpot)	uc	Ponds; lakes.

APPENDIX D1 cont'd.

Species	Abundance	Habitat(s)
Terrapene c. carolina (Eastern Box Turtle)	co*	Ubiquitous.
Trionyx s. spiniferus (Eastern Spiny Softshell)	ra	Rivers; lakes; streams.
Lizards		
[Eumeces a. anthracinus] (Northern Coal Skink)	ra	Edges; outcrops.
Eumeces fasciatus (Five-lined Skink)	co*	Edges; fields.
Eumeces inexpectatus (Southeastern Five-lined Skink)	ra	Edges; fields.
Eumeces laticeps (Broadhead Skink)	ra	Edges; open woods.
Ophisaurus attenuatus longicaudus (Eastern Slender Glass Lizard)	uc*	Edges; fields.
Sceloporus undulatus hyacinthinus (Northern Fence Lizard)	co*	Edges; fields.
Scincella lateralis (Ground Skink)	fc*	Edges; fields.
Snakes		
Agkistrodon contortrix mokeson (Northern Copperhead)	fc*	Ubiquitous.
Carphophis amoenus (Worm Snake)	fc*	Ubiquitous.
Cemophora coccinea copei (Northern Scarlet Snake)	ra	Woodlands; edges.
Coluber constrictor (Racer)	co*	Edges; fields.
Crotalus horridus (Timber Rattlesnake)	uc*	Woodlands.

APPENDIX D1 cont'd.

Species	Abundance	Habitat(s)
Diadophis punctatus edwardsii (Northern Ring-necked Snake)	fc*	Ubiquitous.
Elaphe o. obsoleta (Black Rat Snake)	co*	Ubiquitous.
Heterodon platyrhinos (Eastern Hognose Snake)	fc*	Edges; fields.
[Lampropeltis triangulum elapsoides] (Scarlet Kingsnake)	ra	Edges; fields.
Lampropeltis getulus niger (Black Kingsnake)	uc*	Edges; fields.
Lampropeltis triangulum triangulum (Eastern Milk Snake)	uc*	Edges; fields.
Nerodia s. sipedon (Northern Water Snake)	uc*	Ponds; streams; marshy areas.
Opheodrys aestivus (Rough Green Snake)	uc*	Woodlands; edges.
[Pituophis m. melanoleucus] (Northern Pine Snake)	ra	Pine or mixed woods.
Regina septemvitatta (Queen Snake)	uc	Streams.
Storeria dekayi (Brown Snake)	co*	Edges; fields.
Storeria o. occipitomaculata (Northern Redbelly Snake)	uc*	Ubiquitous.
[Tantilla coronata] (Southeastern Crowned Snake)	ra	One old occurrence.
Thamnophis s. sirtalis (Eastern Garter Snake)	co*	Ubiquitous.
Virginia v. valeriae (Eastern Earth Snake)	uc*	Edges; fields; rocky woods.

Key to Appendix D1:

[ ] -- indicates species not documented from the Somerset District, but occurring nearby within McCreary/Pulaski counties.

* -- indicates species was observed or collected during Somerset District Inventory.

Key to Abundances: co -- common; fc -- fairly common; uc -- uncommon; ra -- rare.

APPENDIX D2: BREEDING BIRDS RECORDED DURING INVENTORY OF THE SOMERSET RANGER DISTRICT.

Species	Abundance	Habitat(s)
Great Blue Heron	uc	Riverbanks.
Green-backed Heron	fc	Riverbanks; ponds.
Wood Duck	uc	Rivers and ponds.
Black Vulture	uc	Woodlands and bluffs.
Turkey Vulture	co	Farmland; over woodlands.
Sharp-shinned Hawk	ra	Woodlands.
Red-shouldered Hawk	fc	Wooded ravines.
Broad-winged Hawk	fc	Woodlands.
Red-tailed Hawk	uc	Farmland and woodlands.
American Kestrel	uc	Farmland and roadsides.
Ruffed Grouse	fc	Woodlands.
Wild Turkey	uc	Woodlands; wildlife openings.
Northern Bobwhite	uc	Farmland; wildlife openings.
Killdeer	uc	Farmland.
American Woodcock	uc	Successional woodlands; openings.
Mourning Dove	fc	Farmland.
Yellow-billed Cuckoo	co	Woodlands.
Black-billed Cuckoo	ra	Woodlands.
Eastern Screech-Owl	uc	Woodlands.
Whip-poor-will	fc	Woodlands.
Chimney Swift	fc	Farmland.
Ruby-throated Hummingbird	fc	Woodlands.
Belted Kingfisher	uc	Rivers and ponds.
Red-bellied Woodpecker	uc	Woodlands.
Downy Woodpecker	co	Woodlands.
Hairy Woodpecker	uc	Woodlands.
Red-cockaded Woodpecker	ra	Pine/mixed woodlands.
Northern Flicker	uc	Openings in woods.
Pileated Woodpecker	fc	Woodlands.
Eastern Wood-Pewee	fc	Woodlands.
Acadian Flycatcher	fc	Woodlands.
Eastern Phoebe	fc	Riverbanks; woodland openings.
Great Crested Flycatcher	uc	Woodlands.
Eastern Kingbird	fc	Farmland.
Northern Rough-winged Swallow	uc	Strip mines; farmland.
Barn Swallow	fc	Farmland.
Blue Jay	co	Woodlands.
Common Crow	co	Woodlands.
Carolina Chickadee	co	Woodlands.
Tufted Titmouse	fc	Woodlands.
White-breasted Nuthatch	fc	Woodlands.
Carolina Wren	fc	Woodlands; farmland.
Blue-gray Gnatcatcher	fc	Woodlands.
Eastern Bluebird	fc	Farmland.
Wood Thrush	co	Woodlands.
American Robin	fc	Farmland.
Gray Catbird	uc	Farmland.
Northern Mockingbird	fc	Farmland.

APPENDIX D2 cont'd.

Species	Abundance	Habitat(s)
Brown Thrasher	uc	Farmland.
Cedar Waxwing	uc	Pine/mixed woodlands.
European Starling	co	Farmland.
White-eyed Vireo	fc	Clearcuts and successional tracts.
Solitary Vireo	ra	Woodlands.
Yellow-throated Vireo	fc	Woodlands.
Red-eyed Vireo	co	Woodlands.
Blue-winged Warbler	ra	Clearcuts; successional habitats.
Northern Parula	fc	Wooded ravines.
Yellow Warbler	uc	River banks; farmland.
Black-throated Green Warbler	fc	Wooded ravines with hemlocks.
Yellow-throated Warbler	fc	Pine/mixed woodlands.
Pine Warbler	fc	Pine/mixed woodlands.
Prairie Warbler	co	Clearcuts; successional habitats.
Cerulean Warbler	ra	Woodlands.
Black-and-white Warbler	fc	Woodlands.
Prothonotary Warbler	uc	Riverbanks.
Worm-eating Warbler	co	Woodlands.
Swainson's Warbler	ra	Wooded ravines.
Ovenbird	co	Woodlands.
Louisiana Waterthrush	fc	Woodland streams.
Kentucky Warbler	fc	Woodlands.
Common Yellowthroat	co	Farmland; clearcuts.
Yellow-breasted Chat	fc	Farmland; clearcuts.
Summer Tanager	fc	Woodlands.
Scarlet Tanager	co	Woodlands.
Northern Cardinal	co	Woodlands; farmland.
Blue Grosbeak	fc	Farmland.
Indigo Bunting	co	Woodland borders; farmland.
Rufous-sided Towhee	fc	Woodlands; farmland.
Chipping Sparrow	fc	Pine/mixed woodland; farmland.
Field Sparrow	uc	Farmland.
Grasshopper Sparrow	ra	Farmland.
Red-winged Blackbird	uc	Farmland; ponds.
Eastern Meadowlark	fc	Farmland.
Common Grackle	uc	Farmland.
Brown-headed Cowbird	uc	Farmland.
Orchard Oriole	uc	Farmland; successional habitats.
Northern Oriole	uc	Farmland; woodlands.
American Goldfinch	fc	Successional habitats.
House Sparrow	fc	Farmland.

Key to Abundances: co -- common; fc -- fairly common; uc -- uncommon; ra -- rare.

APPENDIX D3: MAMMALS OF THE SOMERSET RANGER DISTRICT.

Species	Abundance	Habitat(s)
Blarina brevicauda (Short-tailed Shrew)	co*	Ubiquitous.
Canis latrans (Coyote)	uc	Farmland; open woods.
Castor canadensis (Beaver)	fc	Streams; rivers.
Cryptotis parva (Least Shrew)	ra*	Edges; fields.
Dama virginianus (White-tailed Deer)	fc*	Woodlands; edges.
Didelphis virginiana (Virginia Opossum)	co*	Ubiquitous.
Eptesicus fuscus (Big Brown Bat)	co*	Caves; buildings.
[Felis concolor] (Mountain Lion)	ra	Woodlands.
Glaucomys volans (Southern Flying Squirrel)	fc*	Woodlands.
Lasionycteris noctivagans (Silver-haired Bat)	ra*	Caves.
Lasiurus borealis (Red Bat)	fc*	Woodlands.
[Lutra canadensis] (River Otter)	ra	Rivers; large streams.
Lynx rufus (Bobcat)	uc*	Woodlands.
Mephitis mephitis (Striped Skunk)	co*	Ubiquitous.
Microsorex hoyi winnemana (Pygmy Shrew)	uc*	Woodlands.
[Microtus ochrogaster] (Prairie Vole)	uc	Fields; edges.

APPENDIX D3 cont'd.

Species	Abundance	Habitat(s)
[Microtus pennsylvanicus] (Meadow Vole)	ra	Edges; fields.
[Microtus pinetorum] (Pine Vole)	uc	Edges; pine or mixed woodlands.
Mus musculus (House Mouse)	co	Habitations; fields.
[Mustela frenata] (Long-tailed Weasel)	uc	Edges; fields.
Mustela vison (Mink)	uc	Edges; fields.
Myotis keenii (Keen's Myotis)	fc*	Caves; mines; rock-houses; woodlands.
Myotis lucifugus (Little Brown Myotis)	co*	Caves; woodlands and buildings (summer).
Myotis sodalis (Indiana Myotis)	uc*	Caves; woodlands.
Myotis subulatus leibii (Small-footed Myotis)	ra	Caves; woodlands.
[Napaeozapus insignis] (Woodland Jumping Mouse)	ra	Edges; fields.
Neotoma floridana magister (Eastern Wood Rat)	co*	Caves; rockhouses; clifflines.
[Nycteris cinerea] (Hoary Bat)	ra	Woodlands.
Nycticeus humeralis (Evening Bat)	ra	Buildings?
[Ochrotomys nuttalli] (Golden Mouse)	uc	Woodlands; thickets.
Ondatra zibethicus (Muskrat)	fc*	Ponds; streams.
Parascalopus breweri (Hairy-tailed Mole)	uc	Woodlands; edges.

APPENDIX D3 cont'd.

Species	Abundance	Habitat(s)
Peromyscus leucopus (White-footed Mouse)	co*	Ubiquitous.
[Peromyscus maniculatus bairdii] (Prairie Deer Mouse)	uc	Edges; fields.
Pipistrellus subflavus (Eastern Pipistrelle)	co*	Caves; woodlands.
Plecotus rafinesquii (Rafinesque's Big-eared Bat)	fc*	Caves; mines; buildings; woodlands.
[Plecotus towsendii virginianus] (Virginia Big-eared Bat)	ra	Caves.
Procyon lotor (Raccoon)	co*	Ubiquitous.
[Rattus novegicus] (Norway Rat)	uc	Habitations; dumps.
[Reithrodontomys humulis] (Eastern Harvest Mouse)	uc	Fields; edges.
Scalopus aquaticus (Eastern Mole)	co*	Ubiquitous.
Sciurus carolinensis (Gray Squirrel)	fc*	Woodlands.
Sciurus niger (Fox Squirrel)	fc*	Woodlands.
Sorex fumeus (Smoky Shrew)	fc*	Rich woodlands.
[Sorex longisrostris] (Southeastern Shrew)	ra	Edges; fields.
[Spilogale putorius] (Spotted Skunk)	ra	Woodlands; edges.
Sylvilagus floridanus (Eastern Cottontail)	co*	Edges; fields.
[Synaptomys cooperi] (Southern Bog Lemming)	uc	Fields; edges.

APPENDIX D3 cont'd.

Species	Abundance	Habitat(s)
Tamias striatus (Eastern Chipmunk)	co*	Edges; woodlands.
[Urocyon cinereoargenteus] (Gray Fox)	co	Farmland; woodlands.
[Ursus americanus] (Black Bear)	ra	Woodlands.
[Vulpes vulpes] (Red Fox)	uc	Farmland; woodlands.
[Zapus hudsonius] (Meadow Jumping Mouse)	ra	Edges; fields.

[ ] -- indicates species not documented from the Somerset District, but known to occur close enough to be likely on the District.

* -- indicates species was observed or collected during Somerset District Inventory.

Key to Abundances: co -- common; fc -- fairly common; uc -- uncommon; ra -- rare.

APPENDIX E

COLLECTION DATA

1. Herptiles
2. Mammals

APPENDIX E1: HERPTILES CAPTURED IN PITFALL TRAPS DURING INVENTORY OF THE SOMERSET RANGER DISTRICT.

Site: Old growth forest in Beaver Creek Wilderness Area SW of end of Swain Ridge Road.

Habitat: Mesic old growth hemlock-hardwood slope forest.

Species:
Notopthalmus viridescens (Red-spotted Newt)
Pseudotriton ruber (Red Salamander)

Site: Upland woods just NW of gated end of Swain Ridge Road.

Habitat: Mixed pine-hardwood forest with Gaylussacia ground cover.

Species:
Eumeces fasciatus (Five-lined Skink)
Scincella laterale (Ground Skink)

Site: Rockcastle Narrows upstream from Bee Rock Recreation Area along E-facing slope above Rockcastle River.

Habitat: Mesic hemlock-hardwood forest slope and floodplain.

Species:
Bufo woodhousei (Fowler's Toad)
Notopthalmus viridescens (Red-spotted Newt)
Pseudotriton ruber (Red Salamander)

Site: Upland NE of head of Addison Branch.

Habitat: Old growth mixed pine-hardwood forest.

Species:
Bufo americanus (American Toad)
Carphophis amoenus (Worm Snake)
Eumeces fasciatus (Five-lined Skink)
Storeria occipitomaculata (Red-bellied Snake)
Thamnophis sirtalis (Eastern Garter Snake)

APPENDIX E1 cont'd.

Site: Upland, 0.25 mi NE of Swain Ridge Road.

Habitat: Old growth mixed pine-hardwood forest.

Species:
Bufo americanus (American Toad)
Pseudotriton ruber (Red Salamander)
Scaphiophus holbrookii (Eastern Spadefoot Toad)

Site: Recent clear-cut approx. 0.25 mi NW of jct. SR-700 and SR-90.

Habitat: Recent clear-cut on upland.

Species:
Hemidactylium scutatum (Four-toed Salamander)
Rana clamitans (Green Frog)
Storeria dekayi wrightorum (Brown Snake)

Site: Upland along N edge of Big Swag heliport.

Habitat: Open grassy area on edge of second-growth upland hardwood forest.

Species:
Bufo americanus (American Toad)
Carphophis amoenus (Eastern Worm Snake)
Storeria occipitomaculata (Red-bellied Snake)

APPENDIX E2: SMALL MAMMALS CAPTURED IN PITFALL TRAPS DURING INVENTORY OF THE SOMERSET RANGER DISTRICT.

Site: Old growth forest in Beaver Creek Wilderness Area SW of end of Swain Ridge Road.

Habitat: Mesic old growth hemlock-hardwood slope forest.

Species:
Blarina brevicauda (Short-tailed Shrew)
Sorex fumeus (Smokey Shrew)

Site: Upland woods just NW of gated end of Swain Ridge Road.

Habitat: Mixed pine-hardwood forest with Gaylussacia ground cover.

Species:
Peromyscus leucopus (White-footed Mouse)

Site: Ridge and upper slope SW of Three Forks of Beaver Overlook Trail, approximately 0.1-0.2 mi NW of terminus of the trail.

Habitat: Upland mixed pine-hardwood forest with understory of Kalmia and ground cover of Gaylussacia.

Species:
Sorex fumeus (Smokey Shrew)
Microsorex hoyi winnemana (Pygmy Shrew)

Site: Rockcastle Narrows upstream from Bee Rock Recreation Area along E-facing slope above Rockcastle River.

Habitat: Mesic hemlock-hardwood forest slope and floodplain.

Species:
Blarina brevicauda (Short-tailed Shrew)
Sorex fumeus (Smokey Shrew)

Site: Upland NE of head of Addison Branch.

Habitat: Old growth mixed pine-hardwood forest.

Species:
Microsorex hoyi winnemana (Pygmy Shrew)

APPENDIX E2 cont'd.

Site: Recent clear-cut approx. 0.25 mi NW of jct. SR-700 and SR-90.

Habitat: Recent clear-cut on upland.

Species:
Blarina brevicauda (Short-tailed Shrew)
Cryptotis parva (Least Shrew)
Peromyscus leucopus (White-footed Mouse)

APPENDIX F

CAVE INVENTORY DATA

APPENDIX F: RESULTS OF CAVE INVENTORIES ON THE SOMERSET RANGER DISTRICT.

Site	Date	Pip	BigB	Red	Gray	Keen	LitB	Ind	Raf	WRat	Orc
'Addison Branch mine portals	5-02-84	--	--	--	--	4	--	--	1+	--	--
" "	7-03-87	--	--	--	--	--	--	--	1	sign	--
Barnett's Cave	12-03-87	16	--	--	--	--	2	--	--	--	--
Beaver Creek WMA mine portals	4-24-87	--	--	--	--	--	--	--	--	--	--
Blowing Cave	7-07-87	--	--	--	200	--	--	--	--	sign.	--
" "	10-00-87	--	--	--	--	--	--	--	20	--	--
" "	12-02-87	5	1	--	**	--	--	--	2	--	--
Cave Creek Cave North Firestone Ent.	1-15-88	5	1	--	--	1-2	100	1	--	--	sign
Cave Creek Cave North Goldson Ent.	9-01-87	15	--	--	--	--	10	20	1	--	--
" "	12-02-87	16	--	--	--	--	10	2	--	--	--
'Cave Creek Cave South Firestone Ent.	1-00-82	--	--	--	--	--	--	--	colony	--	--
Cave Creek Cave South Goldson Ent.	9-01-87	3	--	--	--	2	--	--	--	--	--
" "	12-02-87	29	3	--	--	1	428	317	--	--	--
" "	1-15-88	32	5	--	--	1	555	304	--	--	--
Cave Creek Cave South Humongous Ent.	8-31-87	3	--	--	--	--	--	--	--	--	--
Dykes Cave	2-13-88	5	15	--	--	1	1	--	--	--	--
Grand Canyon Cave	8-13-87	--	--	--	--	1	--	--	--	sign	--
" "	12-03-87	1	--	--	--	--	--	--	--	sign	--
Hail Cave	2-13-88	28	2	--	--	1	2	35	1	--	--
Hargis Saltpeter Cave River Entrance	12-03-87	8	1	--	--	--	--	--	2	sign	--
Hargis Saltpeter Cave Upper Entrance	12-03-87	--	--	--	--	--	--	--	--	sign	--
" "	1-15-88	1	--	--	--	--	--	--	1?	sign	--
Hyden's Cave (Cave Creek Cave)	1-15-88	1	--	--	--	--	--	--	53	--	--
Caves near mouth Indian Cave Branch	7-15-87	--	--	--	--	1	--	--	--	sign	--
'Sloans Valley Cave Garbage Pit Ent.	0-00-60	--	--	--	*	--	--	--	--	--	--
'Sloans Valley Cave Minton Hollow Ent.	3-02-86	--	--	--	--	6	--	131	--	--	--
" "	8-31-87	11	1	2	--	15+	9+	--	--	obs	--
" "	12-02-87	1	3	--	1	--	238	26	1	--	sev
" "	1-14-88	48	6	--	--	--	351	46	1	--	sev
Sloans Valley Cave Railroad Tunnel Ent.	8-13-87	3	--	--	--	1	--	--	--	sign	--
" "	12-02-87	1	--	--	*	--	--	--	--	sign	--

APPENDIX F cont'd.

Site	Date	Pip	BigB	Red	Gray	Keen	LitB	Ind	Raf	WRat	Orc
Smith Recluse Cave	4-24-87	14	--	--	--	--	--	--	--	--	--
" "	9-01-87#	8	--	2	--	12	2	--	--	obs	--
'Wildcat Branch mine portals	1-00-85	--	--	--	--	--	--	--	*	--	--

' — denotes surveys done prior to this effort and/or by other persons.
— denotes surveys done using mist-nets in cave entrance.
* — denotes historical sign (e.g., Gray Bat Stains and/or guano).
** — denotes fresh sign (e.g., stains and/or guano).

Key to species:

BigB — Big Brown Bat
Gray — Gray Myotis
Ind — Indiana Myotis
Keen — Keen's Myotis
LitB — Little Brown Myotis
Pip — Eastern Pipistrelle
Raf — Rafinesque's Big-eared Bat
Red — Red Bat
Orc — Orconectes australis (cave crayfish)
WRat — Eastern Wood Rat

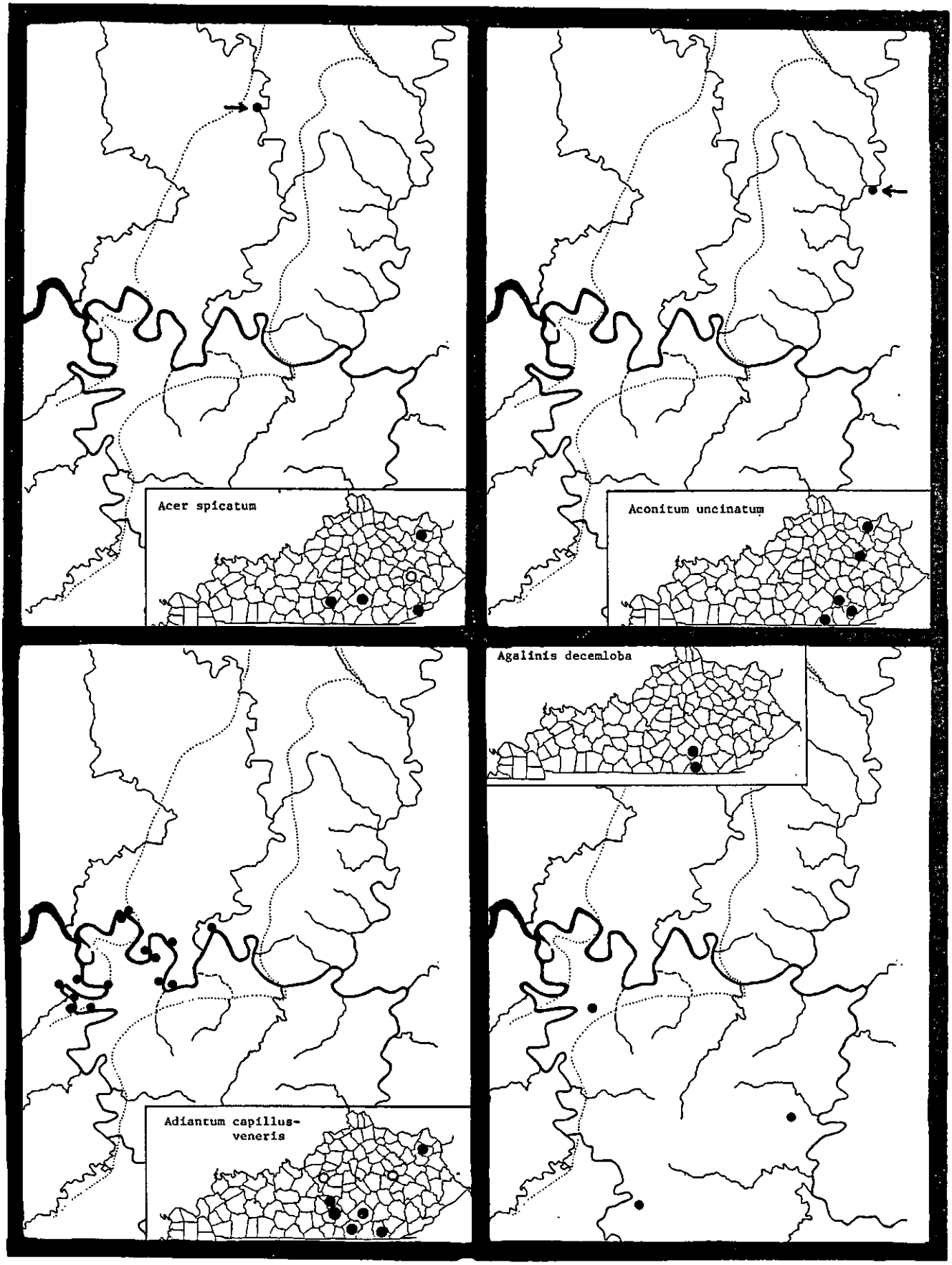
APPENDIX G

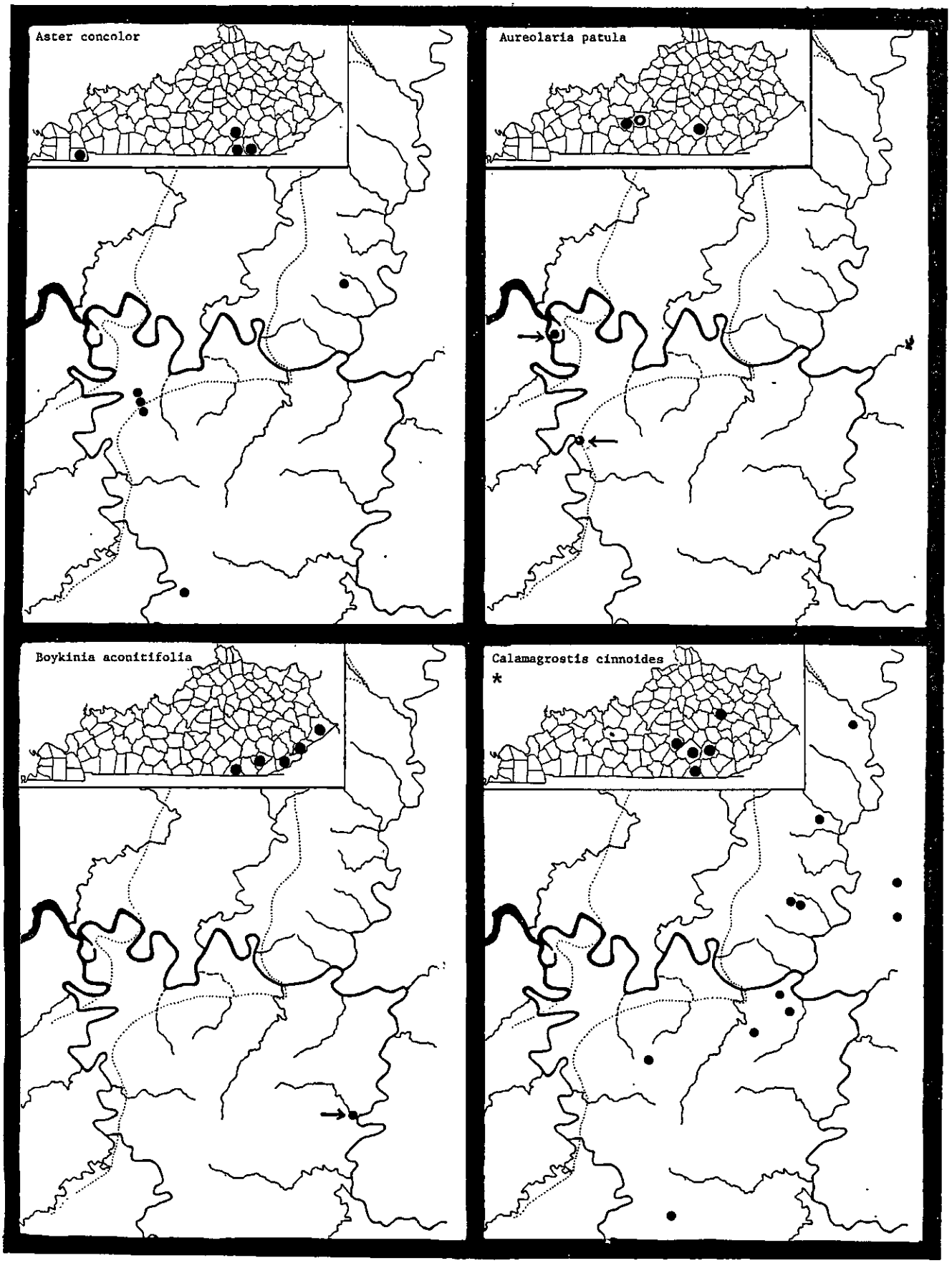
SPECIES DISTRIBUTION MAPS

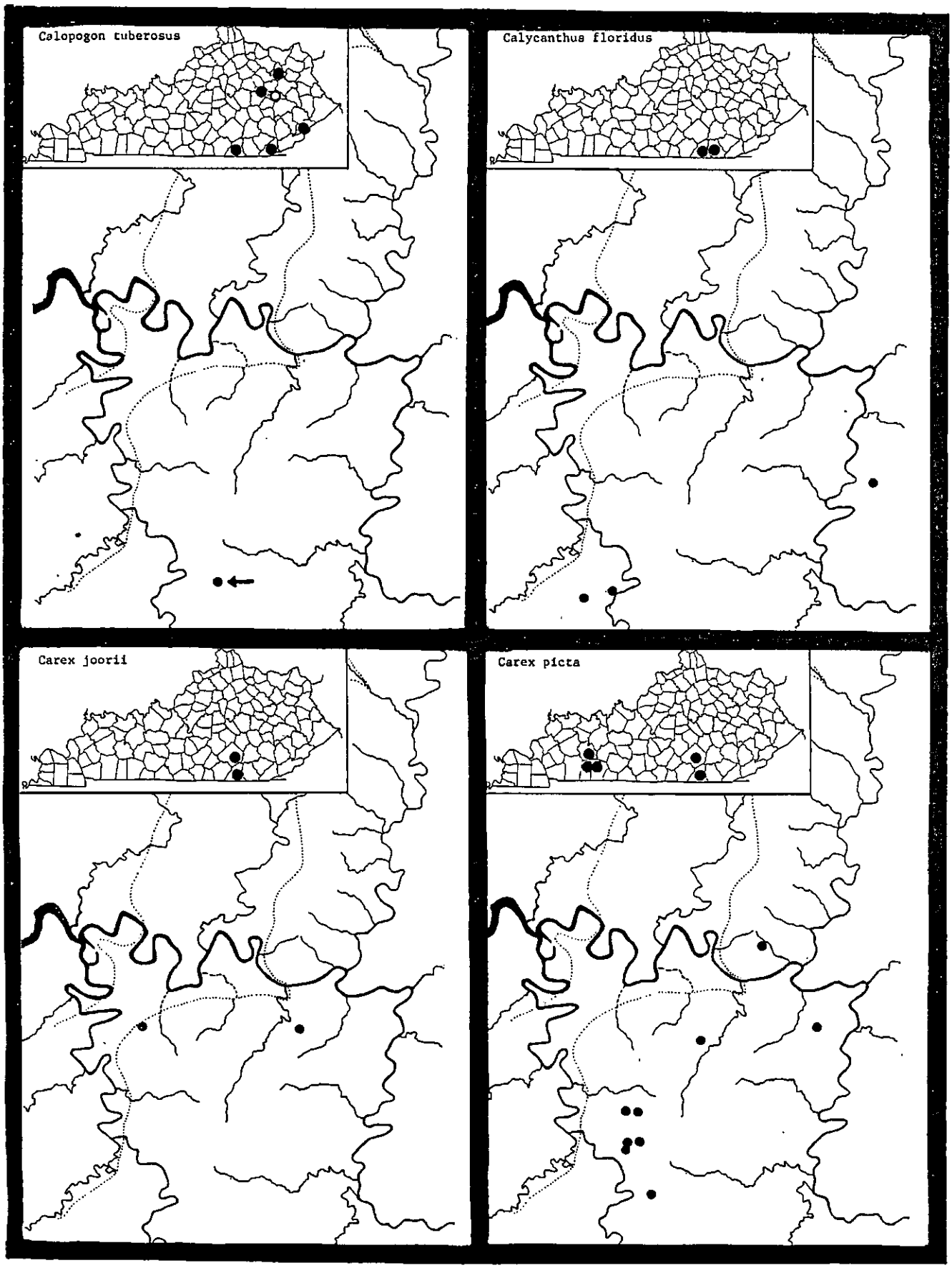
These maps are in alphabetically ordered series corresponding to the sections of species accounts, i.e. listed plant species, other plant species of interest, and listed terrestrial vertebrates (distribution maps of aquatic species are not included).

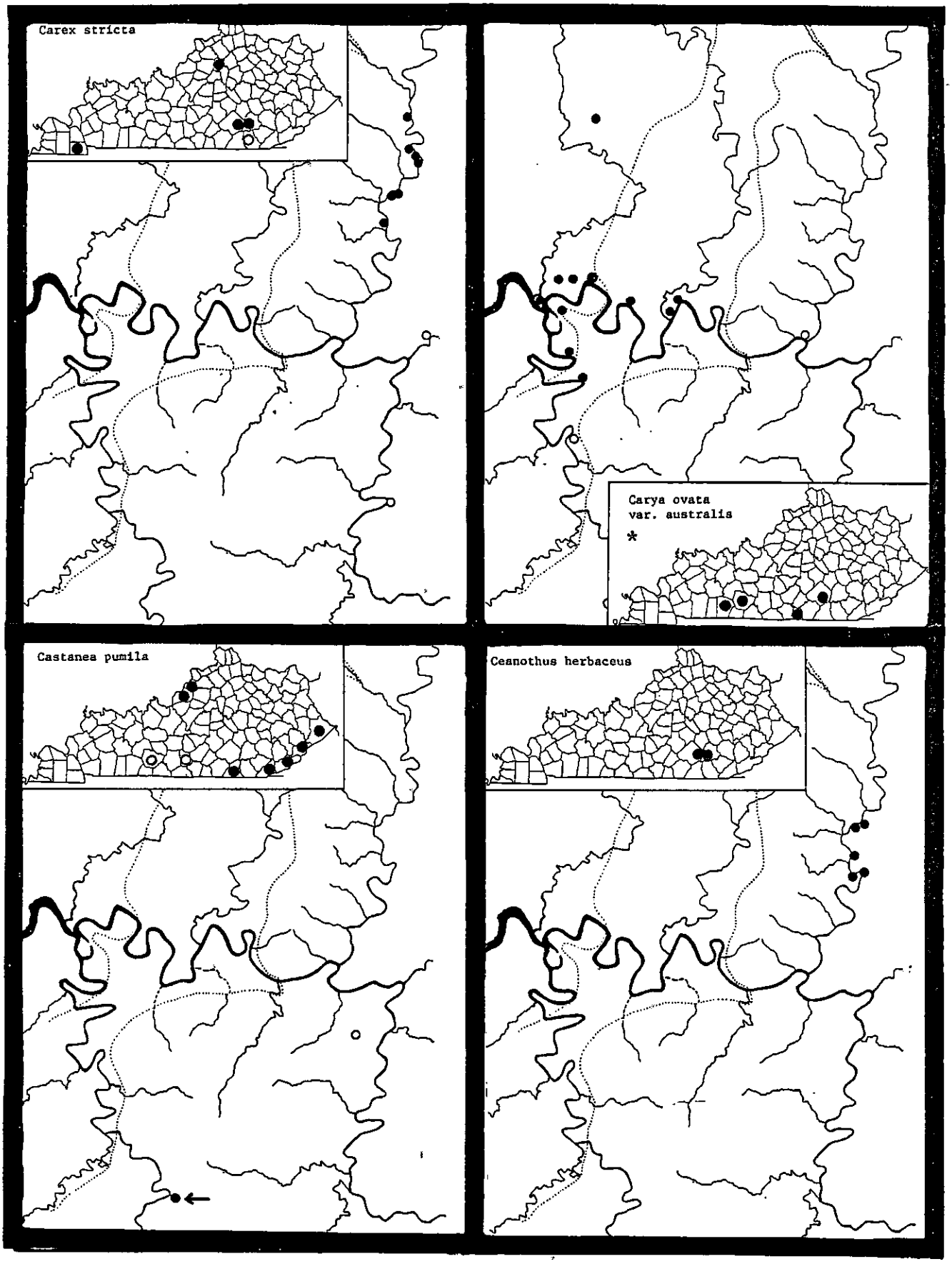
The base map in front of the individual species maps shows the District Boundary, major watercourses and generalized geological zones (dotted lines): from largely Mississippian limestone (to the upper left), through a transitional zone, to largely Pennsylvanian sandstone and shale (to the lower right). Also shown are the combined records for all of the plant species, excluding those noted with "*" following their names on the individual maps. On the base map, "x" indicates listed species and "+" indicates other species of interest. On the individual plant species maps, "●" indicates reliable records; "o" indicates tentative records; and "x" indicates populations that have probably disappeared.

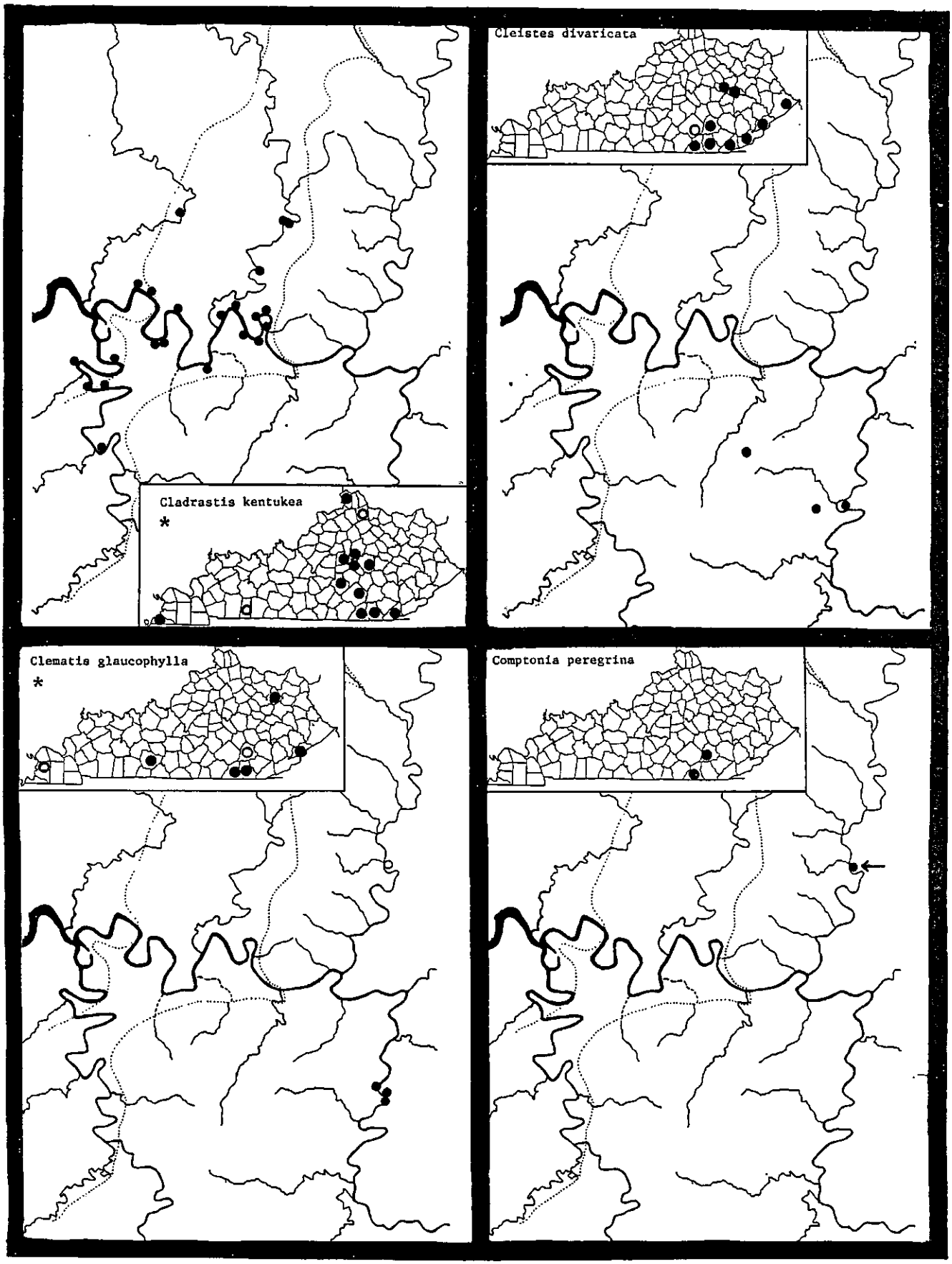
SOUTH FORK
PITMAN CREEK
SOMERSET DISTRICT BOUNDARY
BUCK CREEK
CUMBERLAND RIVER
ROCKCASTLE RIVER

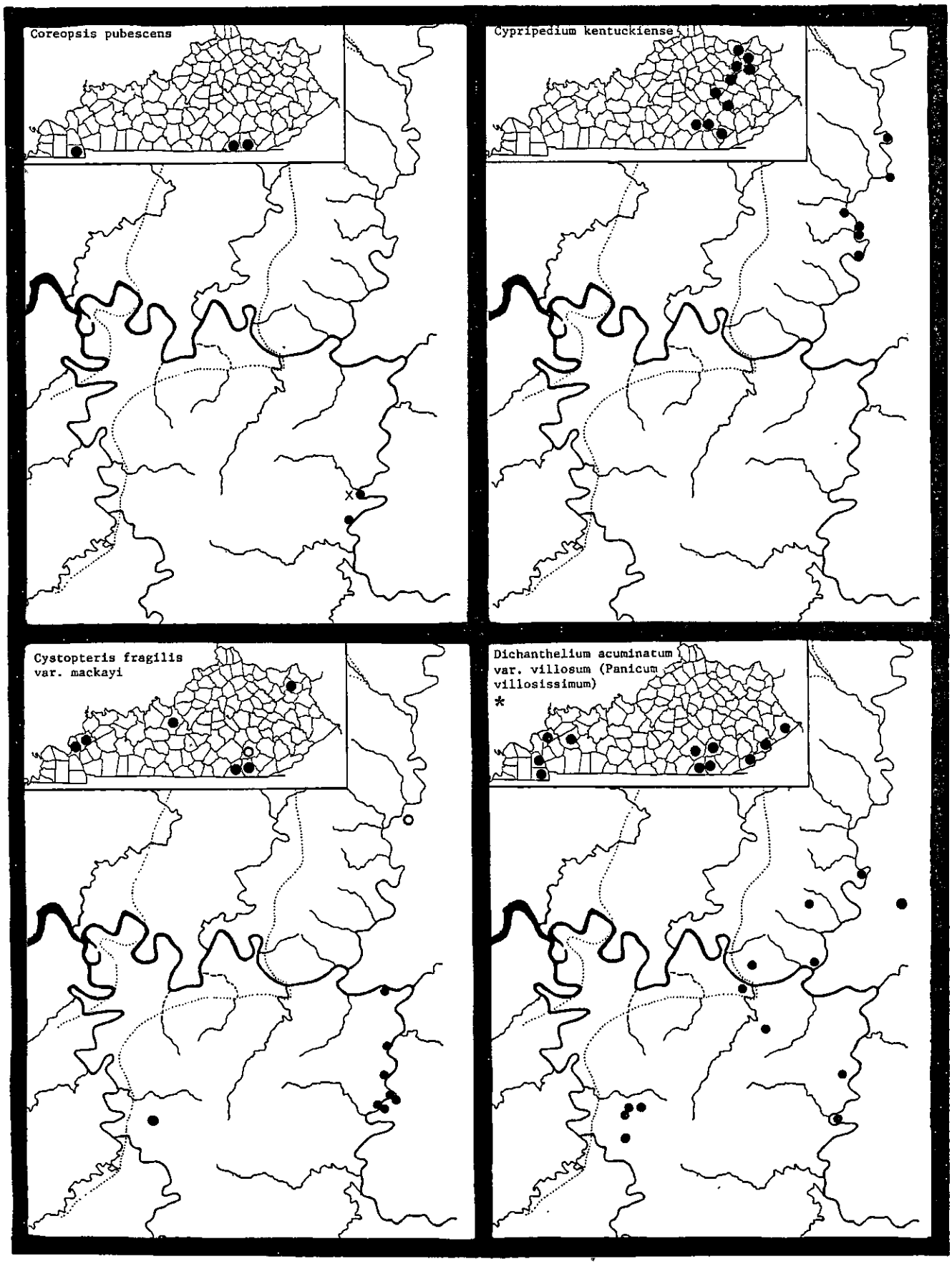

Acer spicatum
Aconitum uncinatum
Agalinis decemloba
Adiantum capillus-
veneris

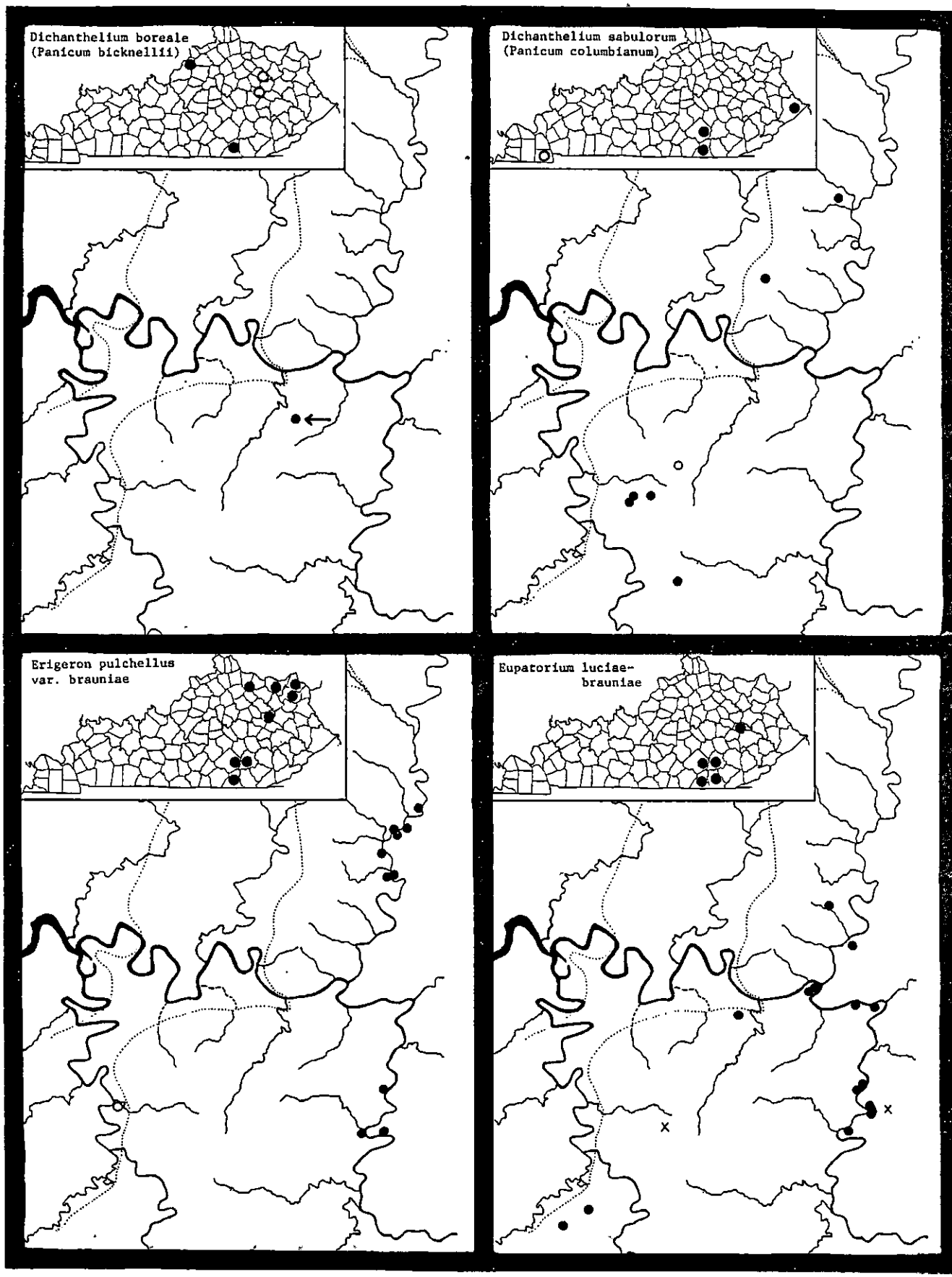

Aster concolor
Aureolaria patula
Boykinia aconitifolia
Calamagrostis cinnoides
*

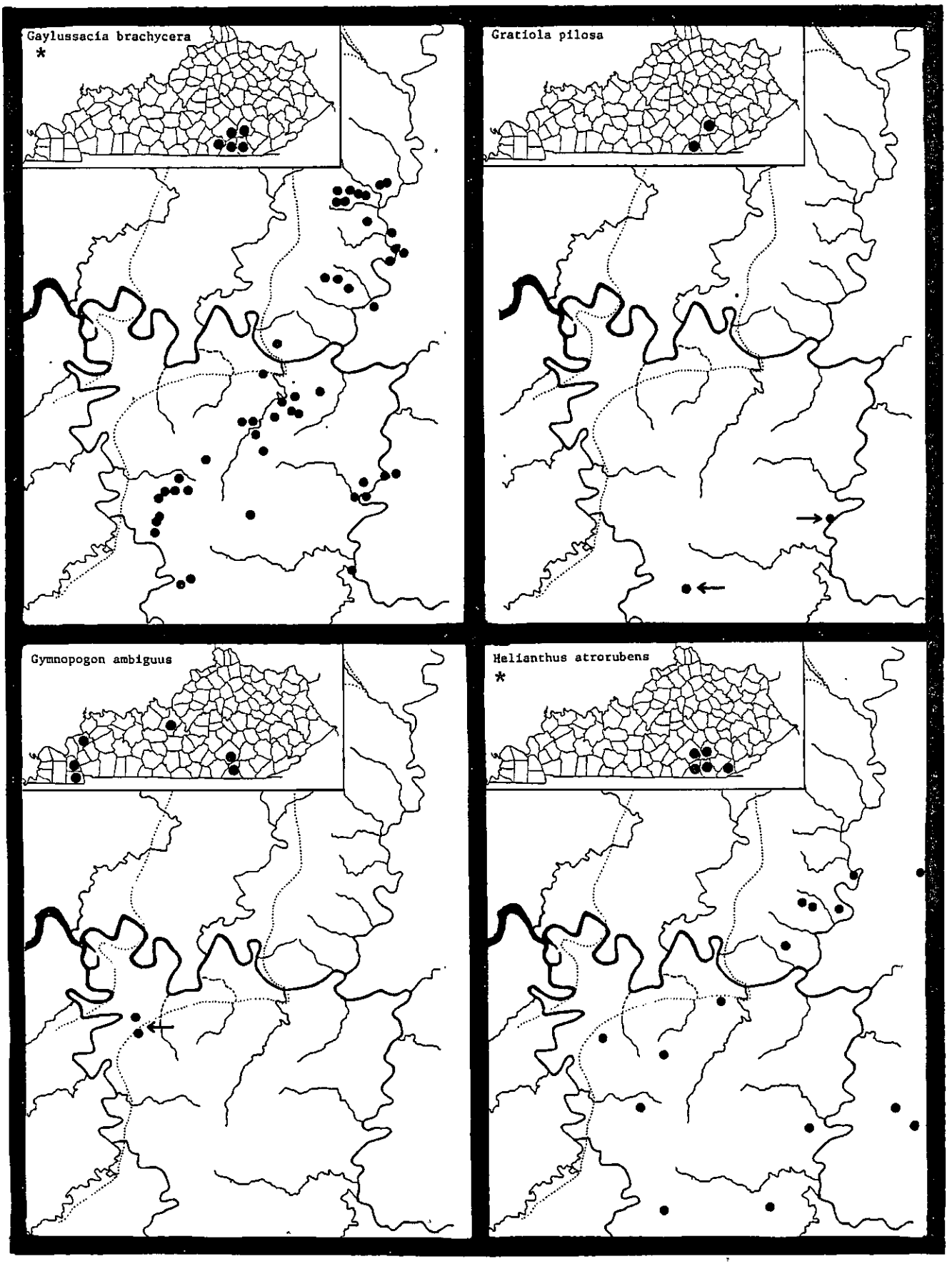

Calopogon tuberosus
Calycanthus floridus
Carex joorii
Carex picta

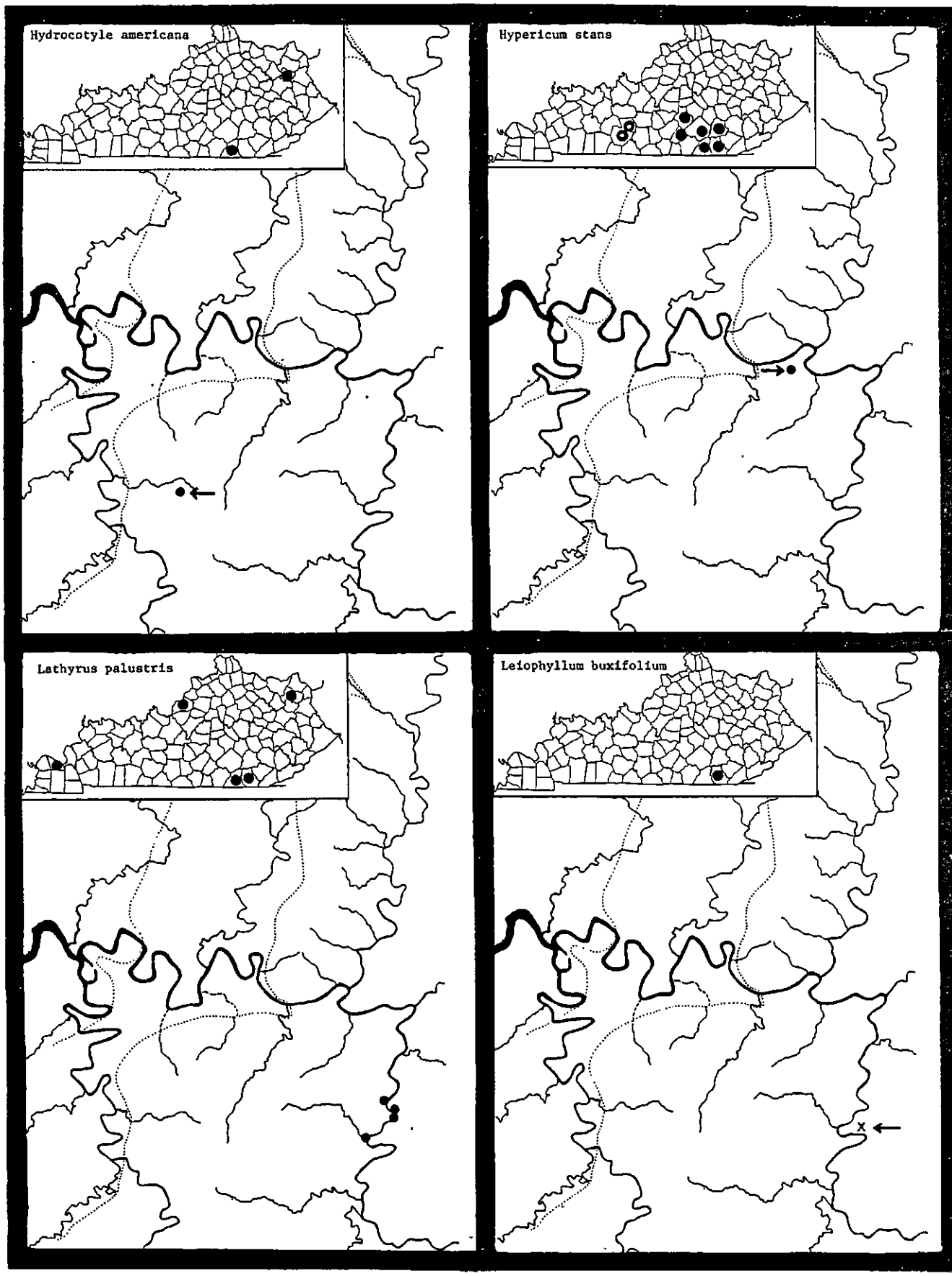

Carex stricta
Carya ovata
var. australis
*
Castanea pumila
Ceanothus herbaceus

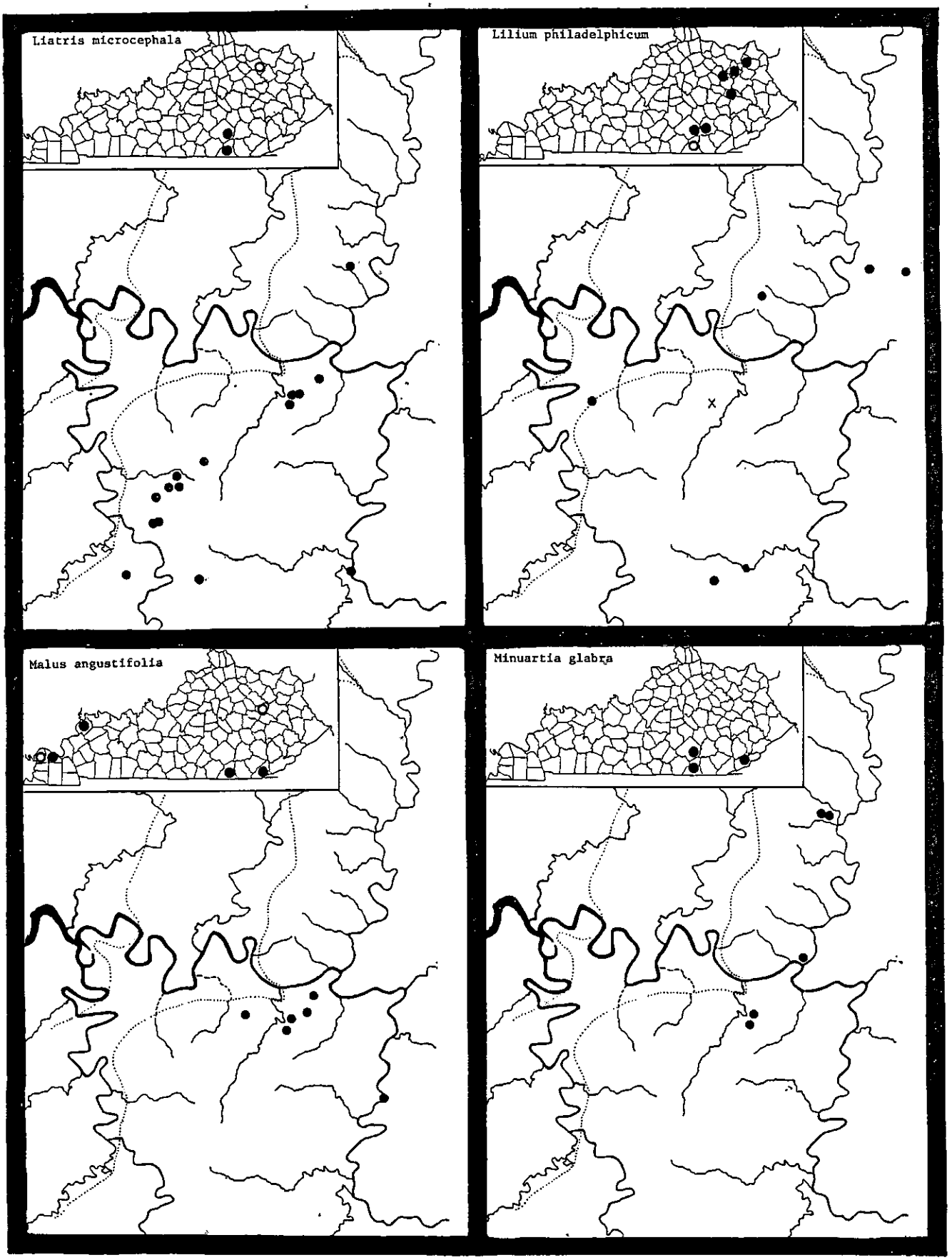

Cleistes divaricata
Cladrastis kentukea
*
Clematis glaucophylla
*
Comptonia peregrina

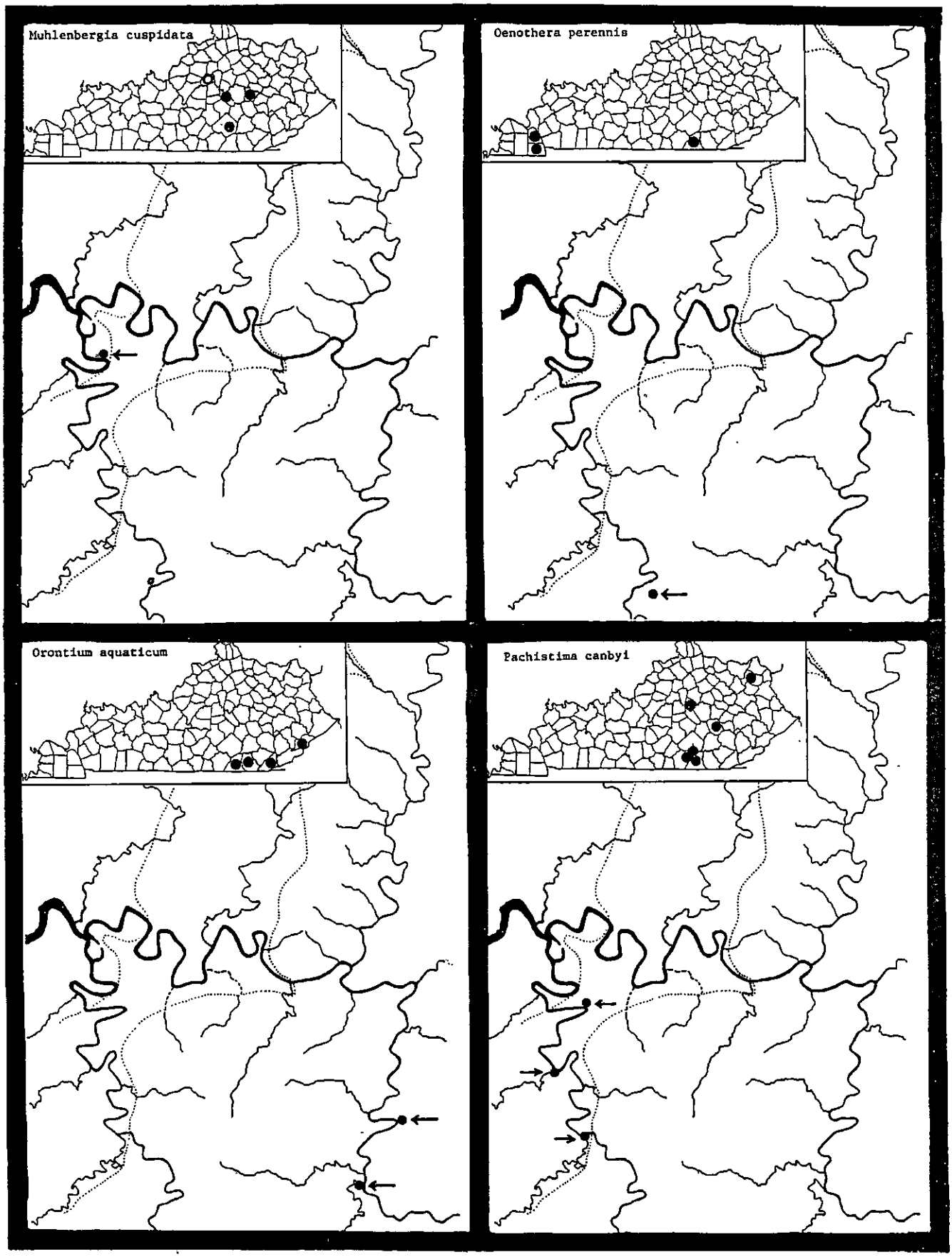

Coreopsis pubescens
Cypripedium kentuckiense
Cystopteris fragilis
var. mackayi
Dichanthelium acuminatum
var. villosum (Panicum
villosissimum)
*


Dichanthelium boreale
(Panicum bicknellii)
Dichanthelium sabulorum
(Panicum columbianum)
Erigeron pulchellus
var. brauniae
Eupatorium luciae-
brauniae

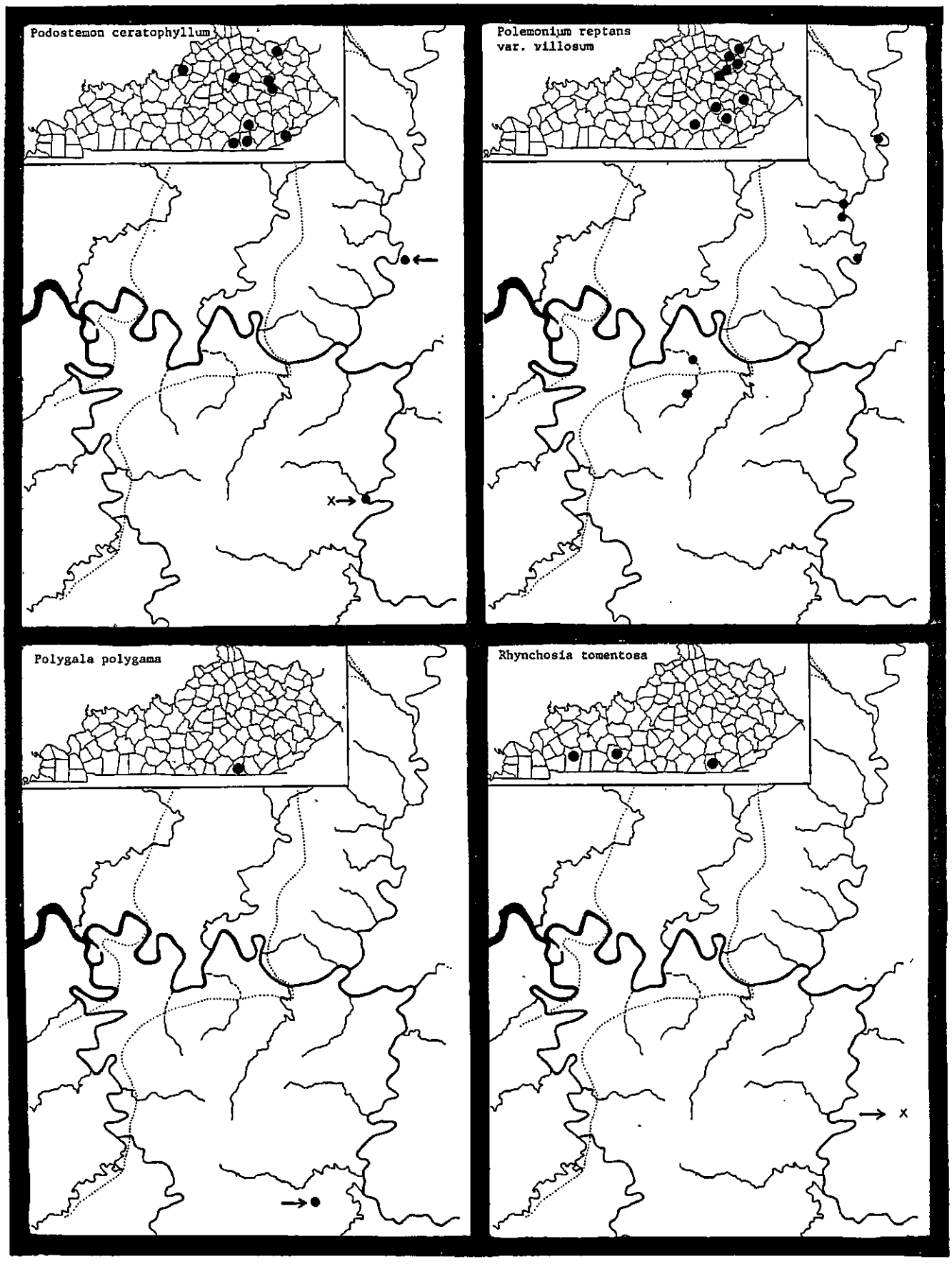

Gaylussacia brachycera
*
Gratiola pilosa
Gymnopogon ambiguus
Helianthus atrorubens
*

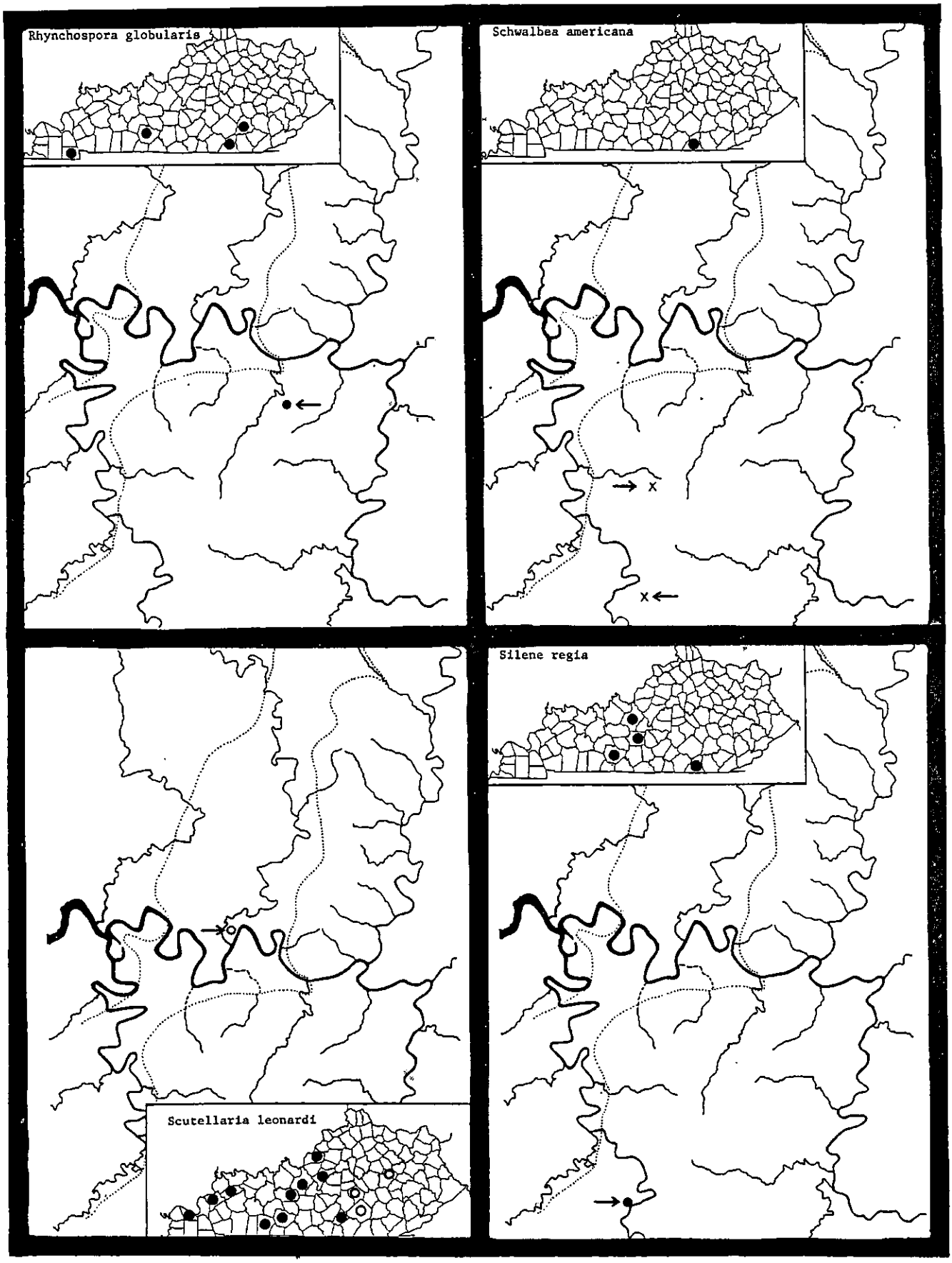

Hydrocotyle americana
Hypericum stans
Lathyrus palustris
Leiophyllum buxifolium

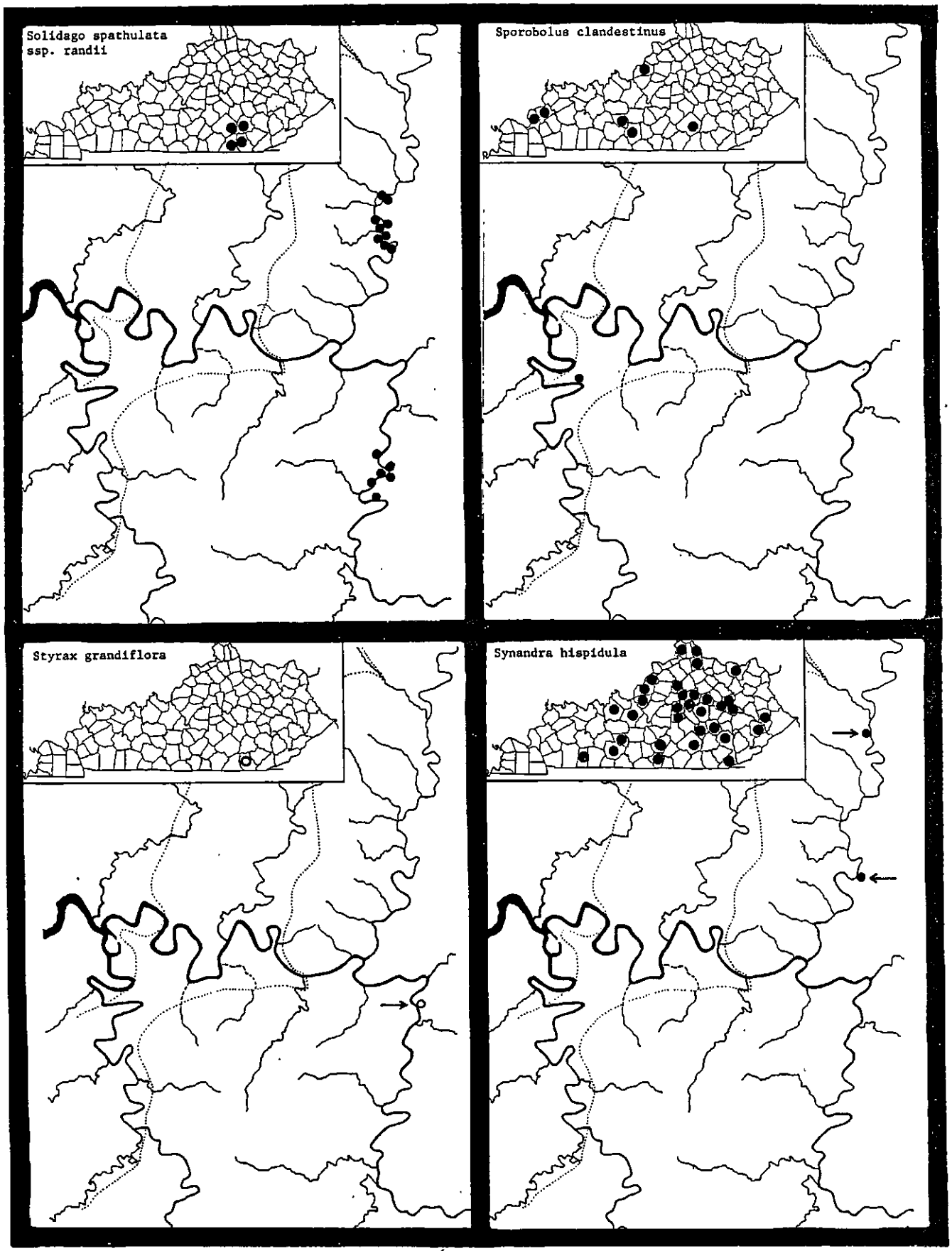

Liatris microcephala
Lilium philadelphicum
Malus angustifolia
Minuartia glabra

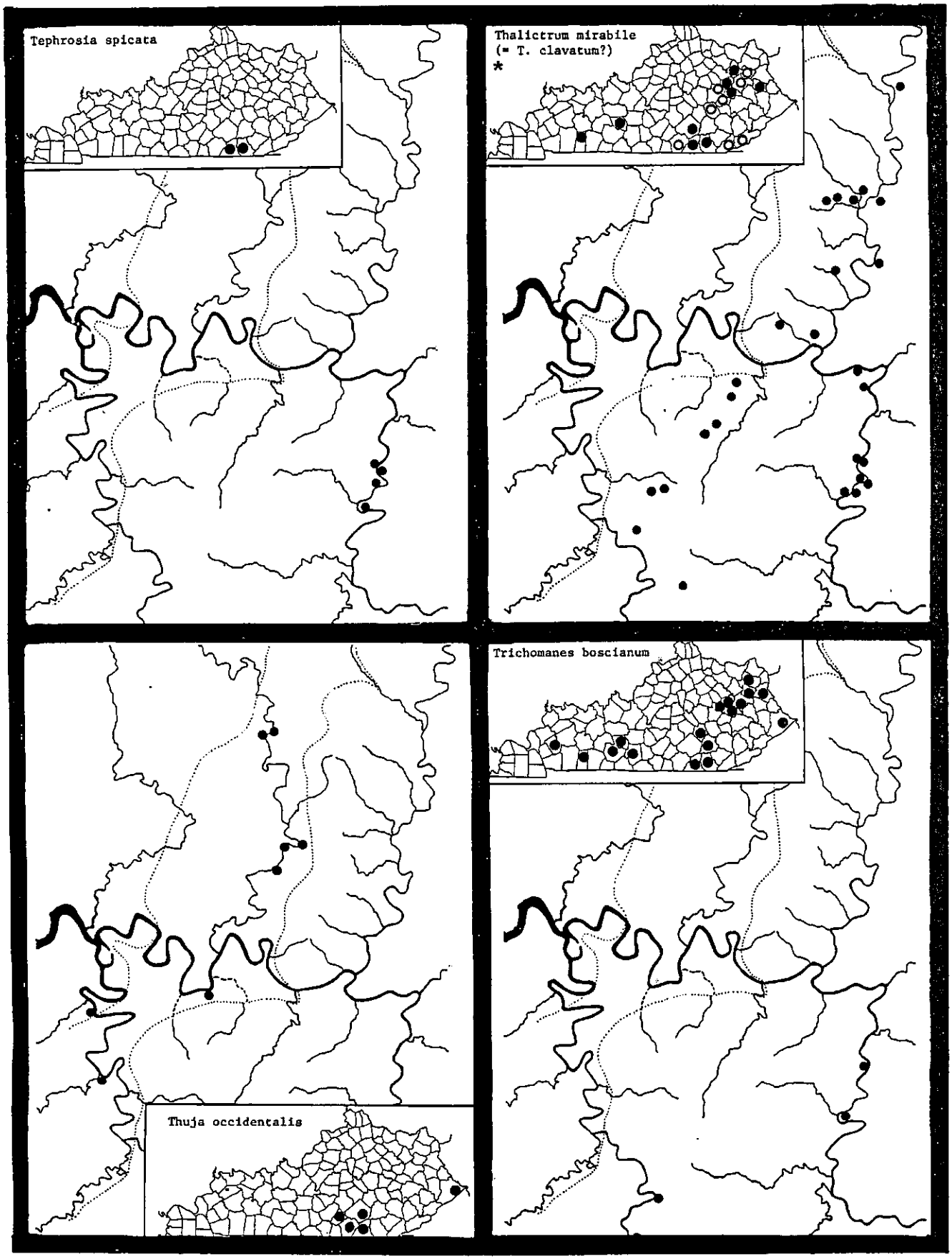

Muhlenbergia cuspidata
Oenothera perennis
Orontium aquaticum
Pachistima canbyi

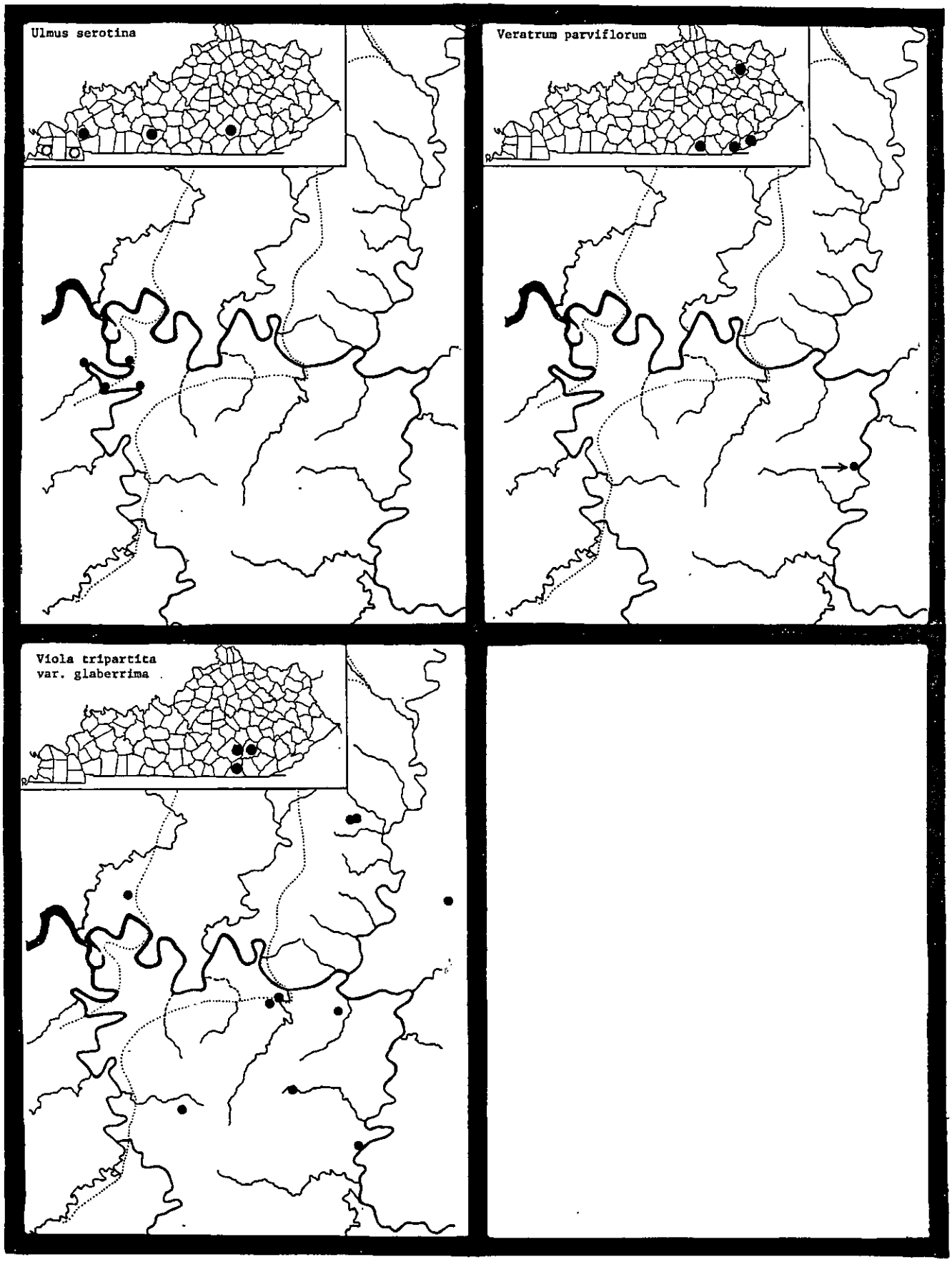

Panax quinquefolius
*
Platanthera integrilabia
Philadelphus hirsutus
*
Philadelphus inodorus

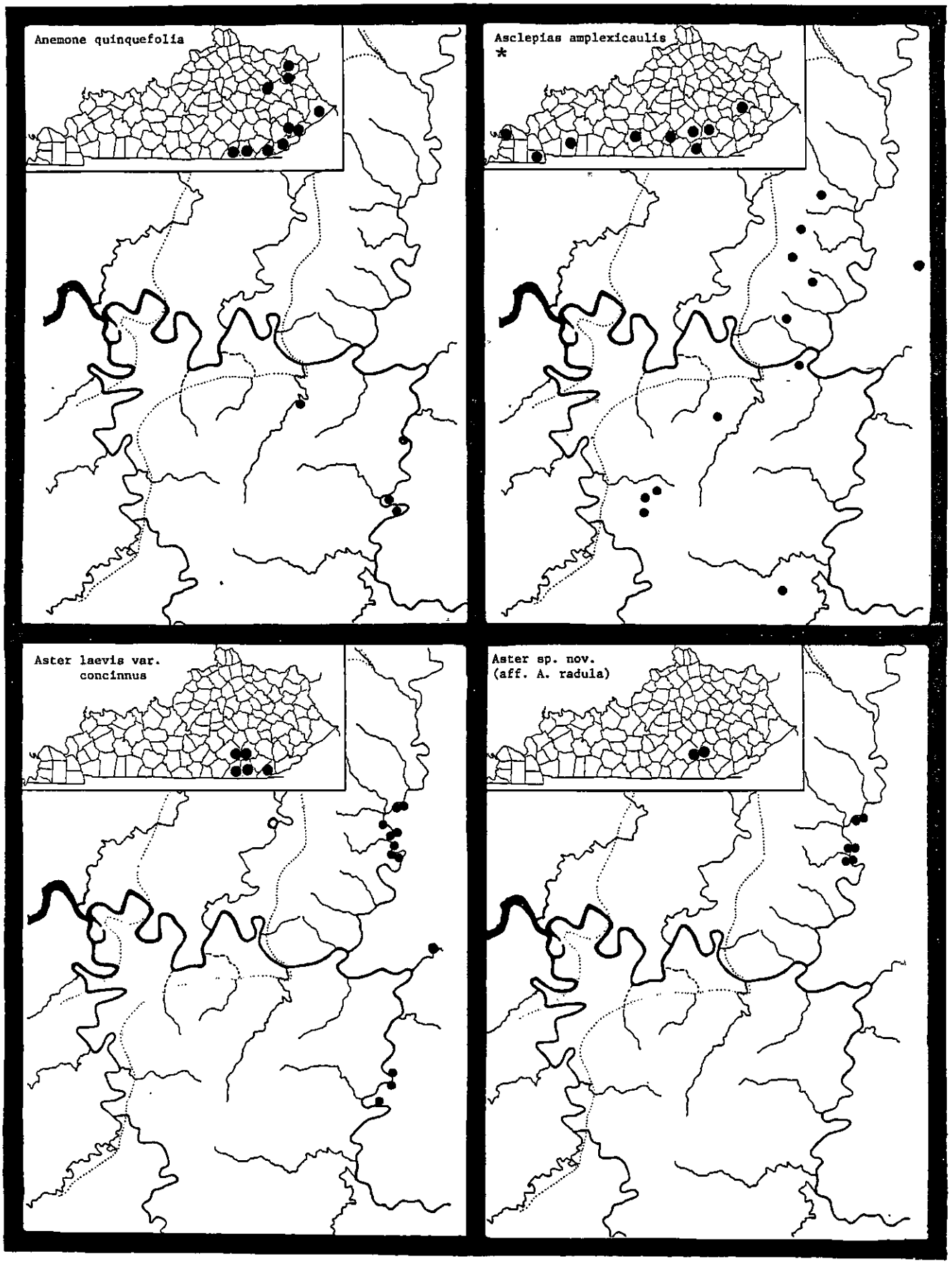

Podostemon ceratophyllum
Polemonium reptans var. villosum
Polygala polygama
Rhynchosia tomentosa

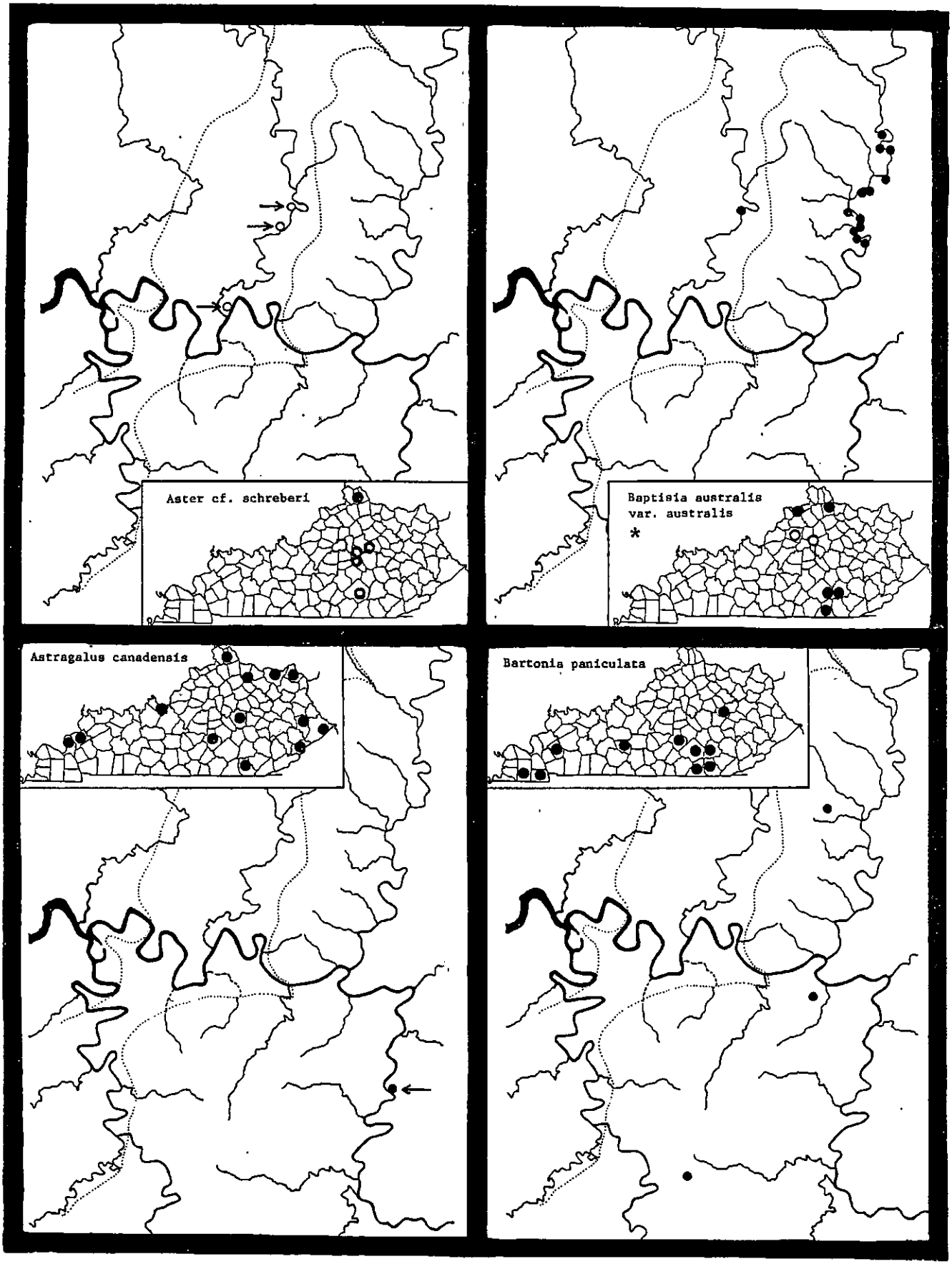

Rhynchospora globularis
Schwalbea americana
Silene regia
Scutellaria leonardi

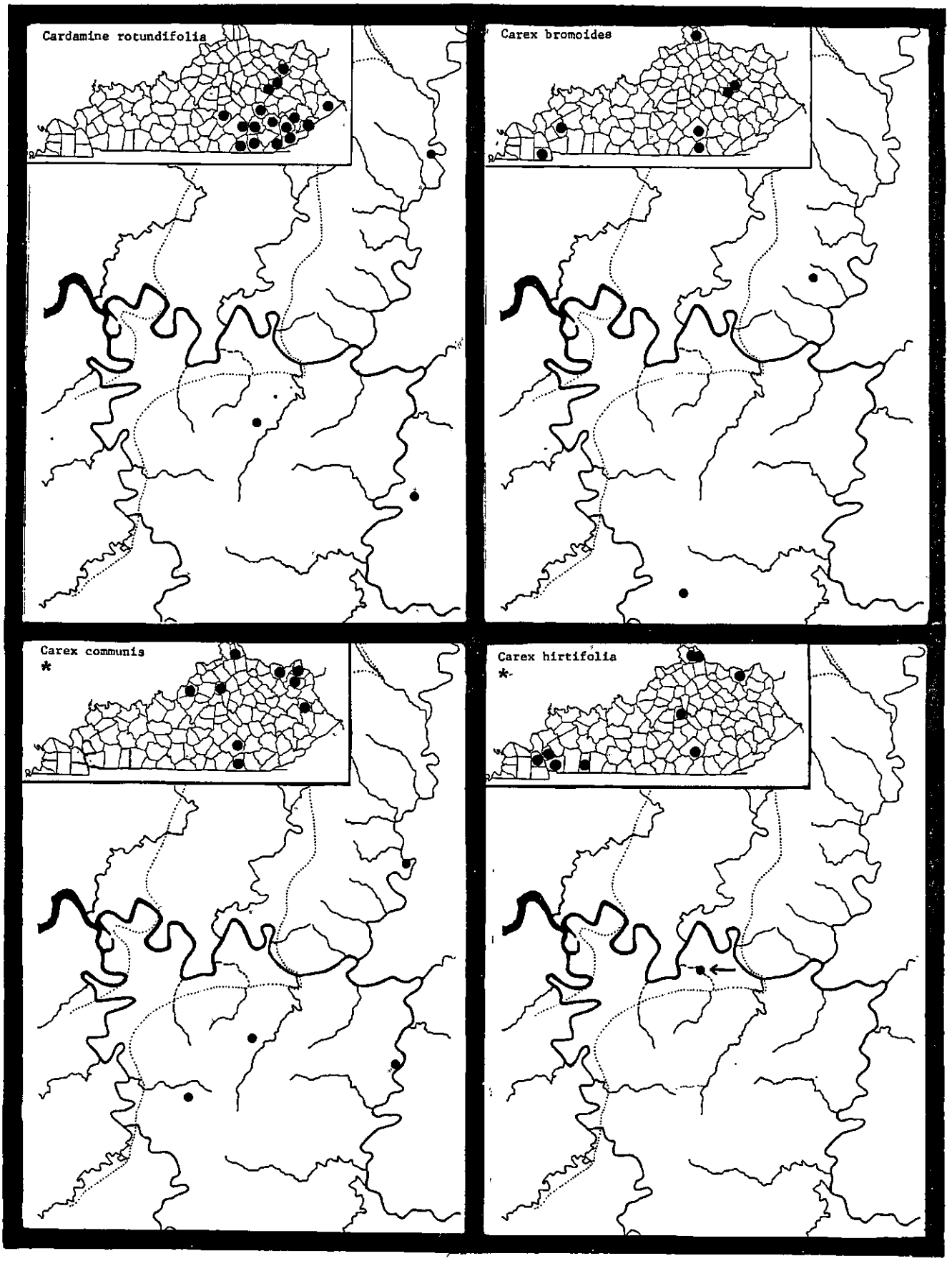

Solidago spathulata
ssp. randii
Sporobolus clandestinus
Styrax grandiflora
Synandra hispidula

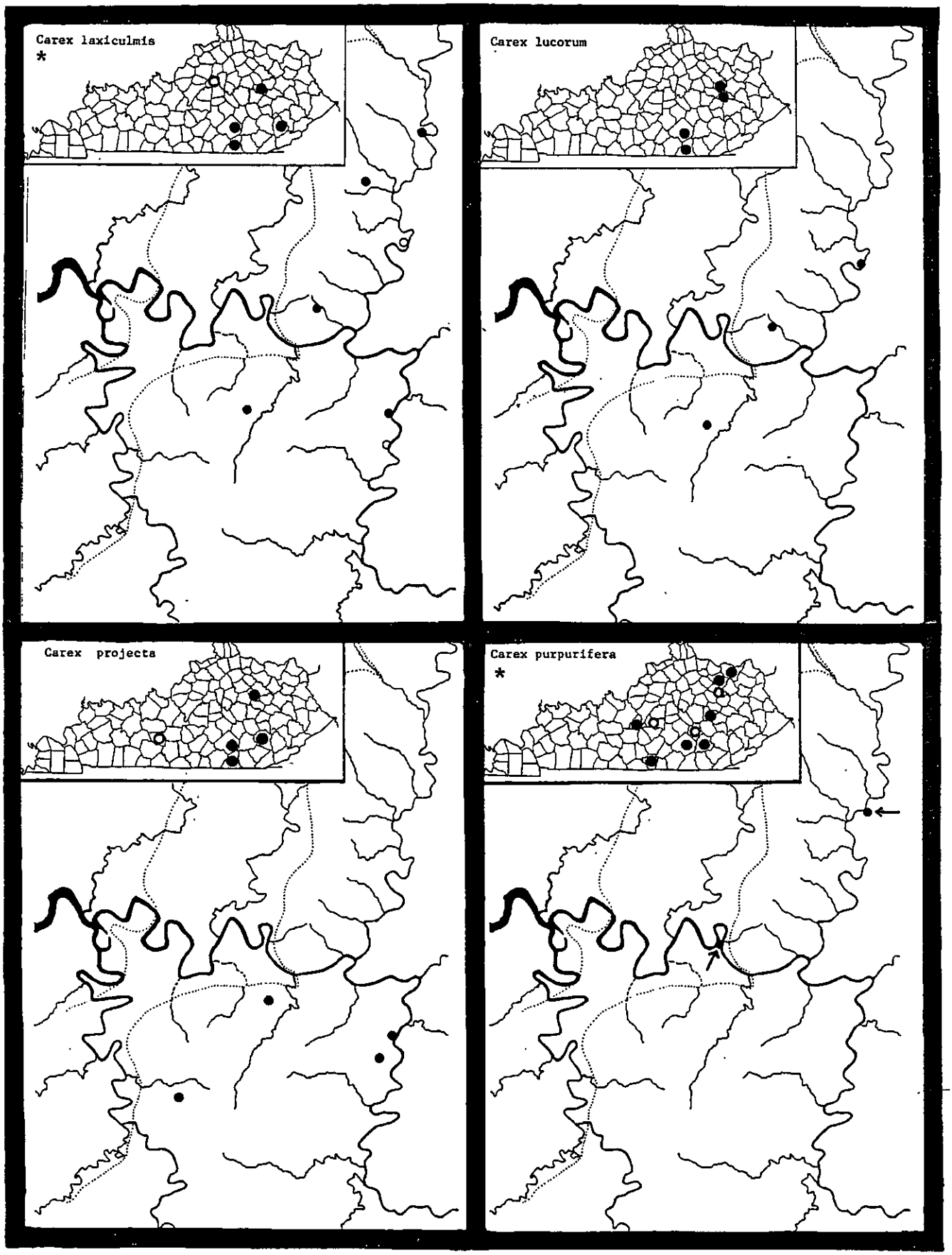

Tephrosia spicata
Thalictrum mirabile
(= T. clavatum?)
*
Trichomanes boscianum
Thuja occidentalis

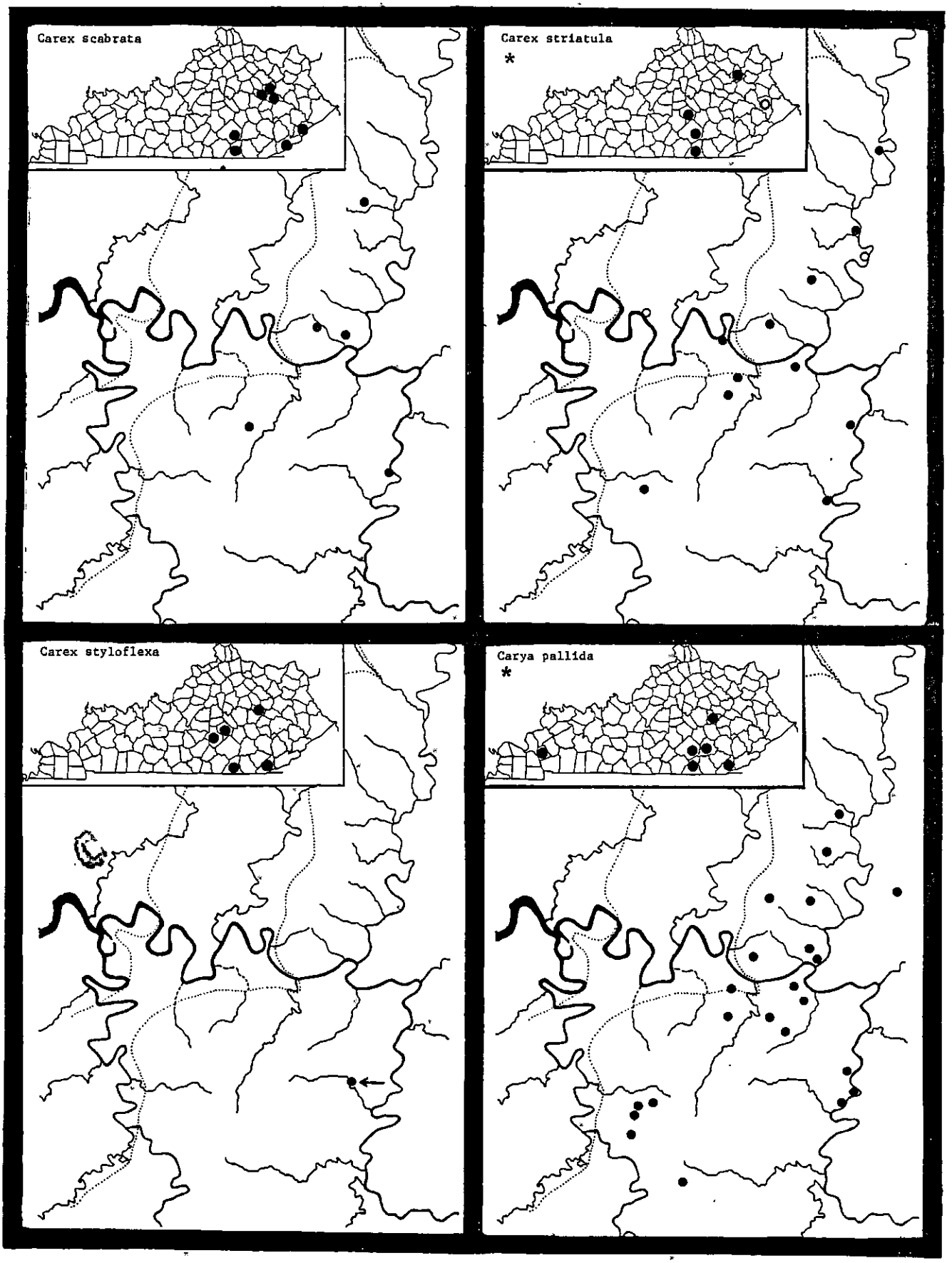

Ulmus serotina
Veratrum parviflorum
Viola tripartita
var. glaberrima

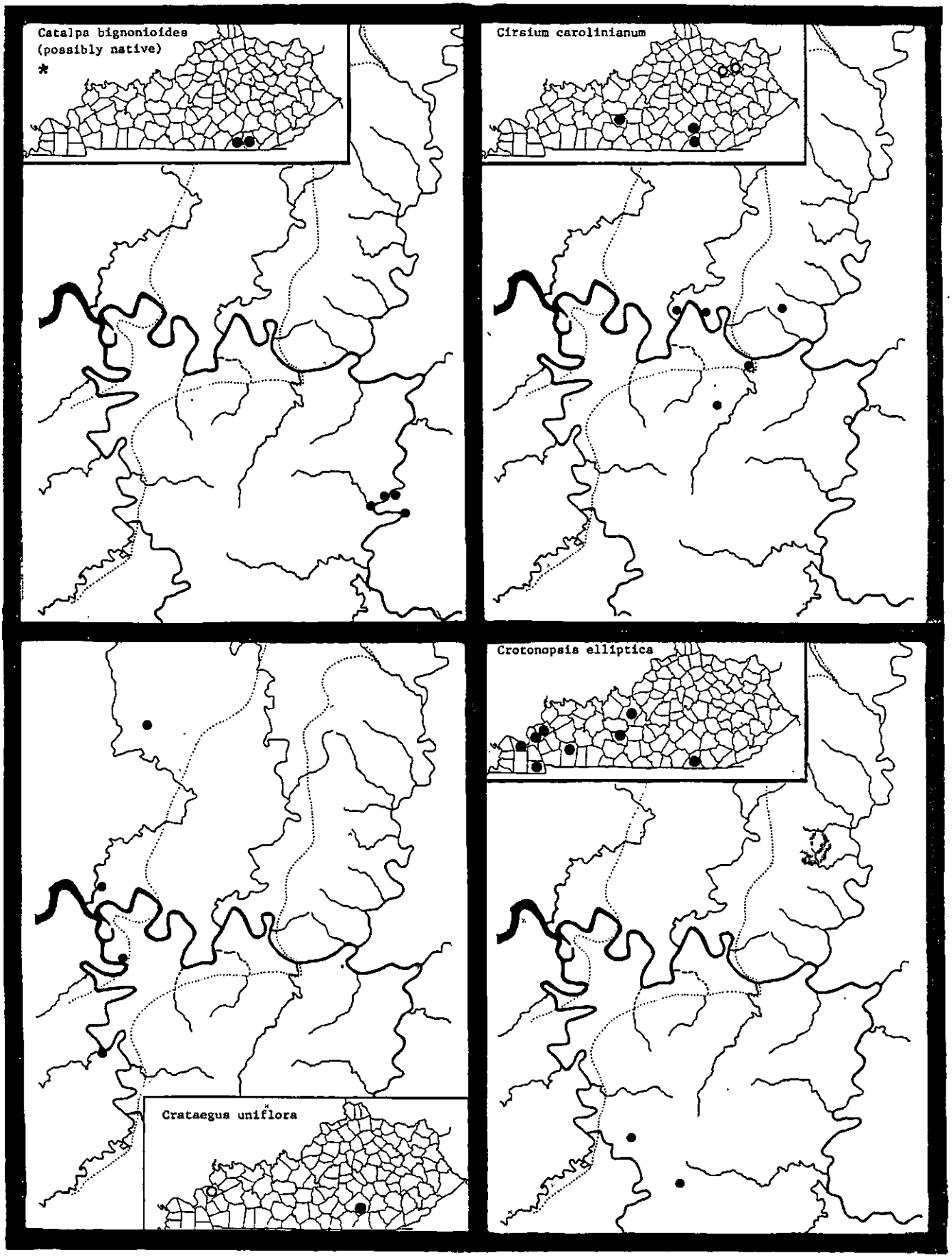

Anemone quinquefolia
Asclepias amplexicaulis
*
Aster laevis var.
concinnus
Aster sp. nov.
(aff. A. radula)

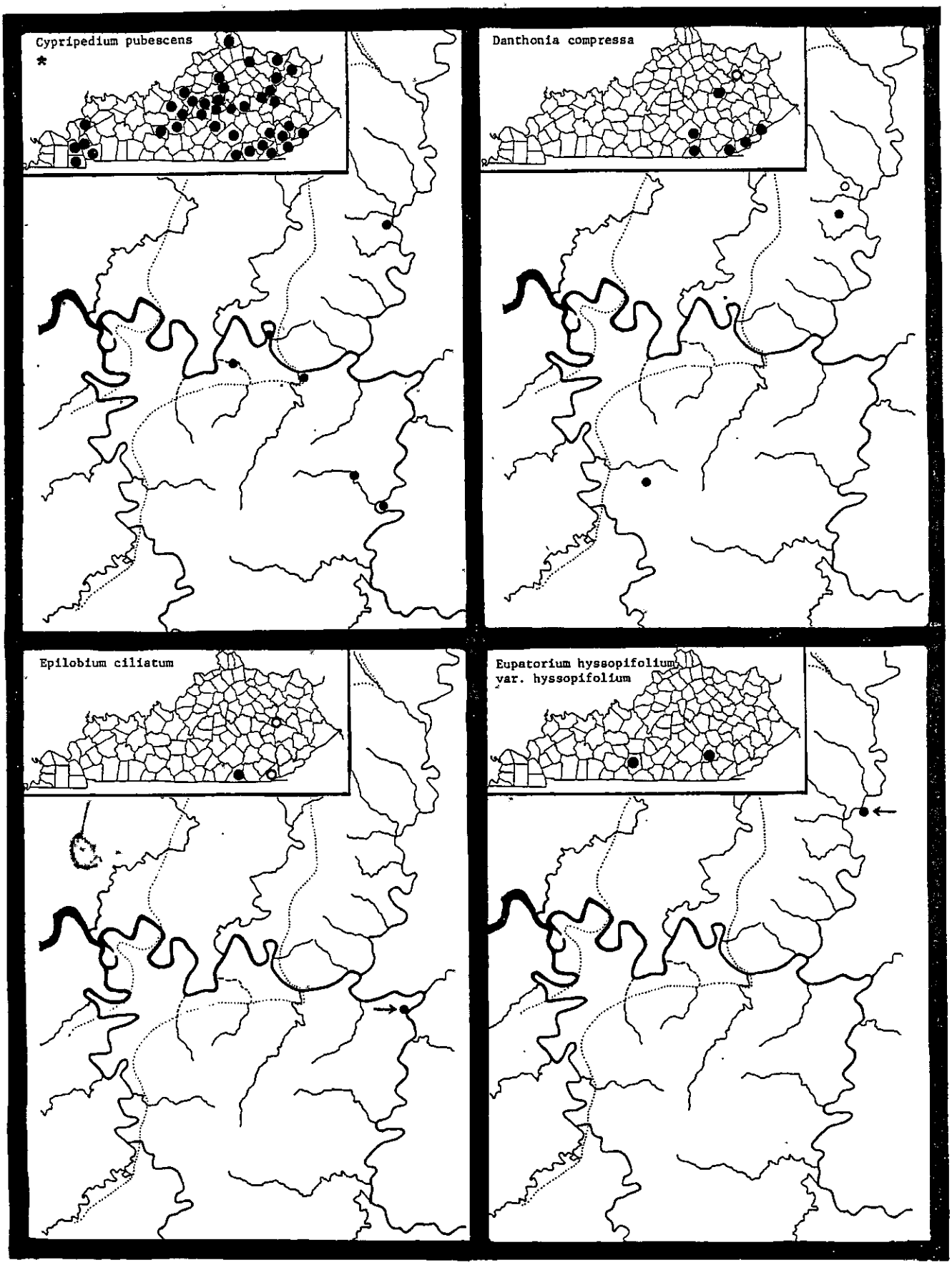

Aster cf. schreberi
Baptisia australis
var. australis
*
Astragalus canadensis
Bartonia paniculata

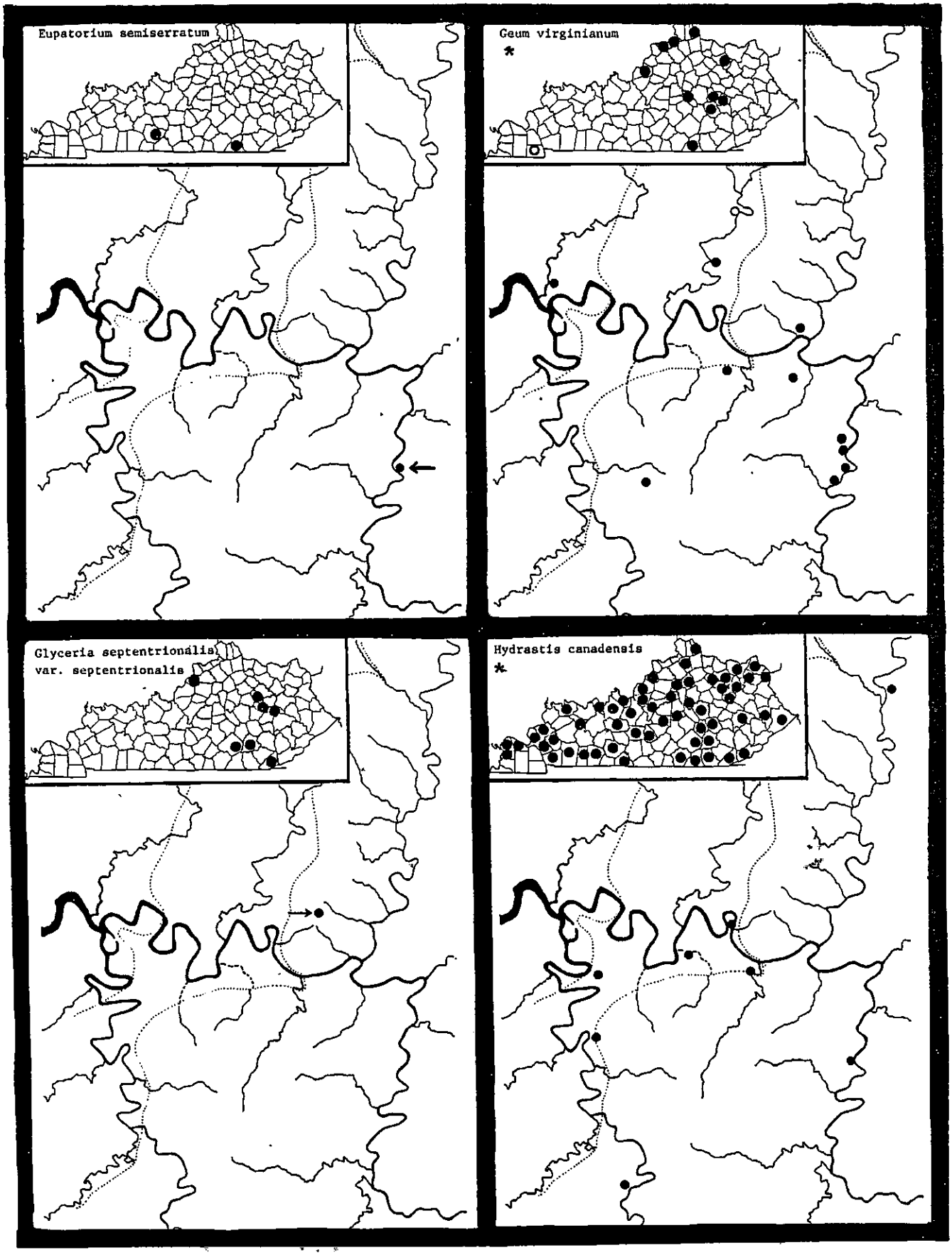

Cardamine rotundifolia
Carex bromoides
Carex communis
*
Carex hirtifolia
*

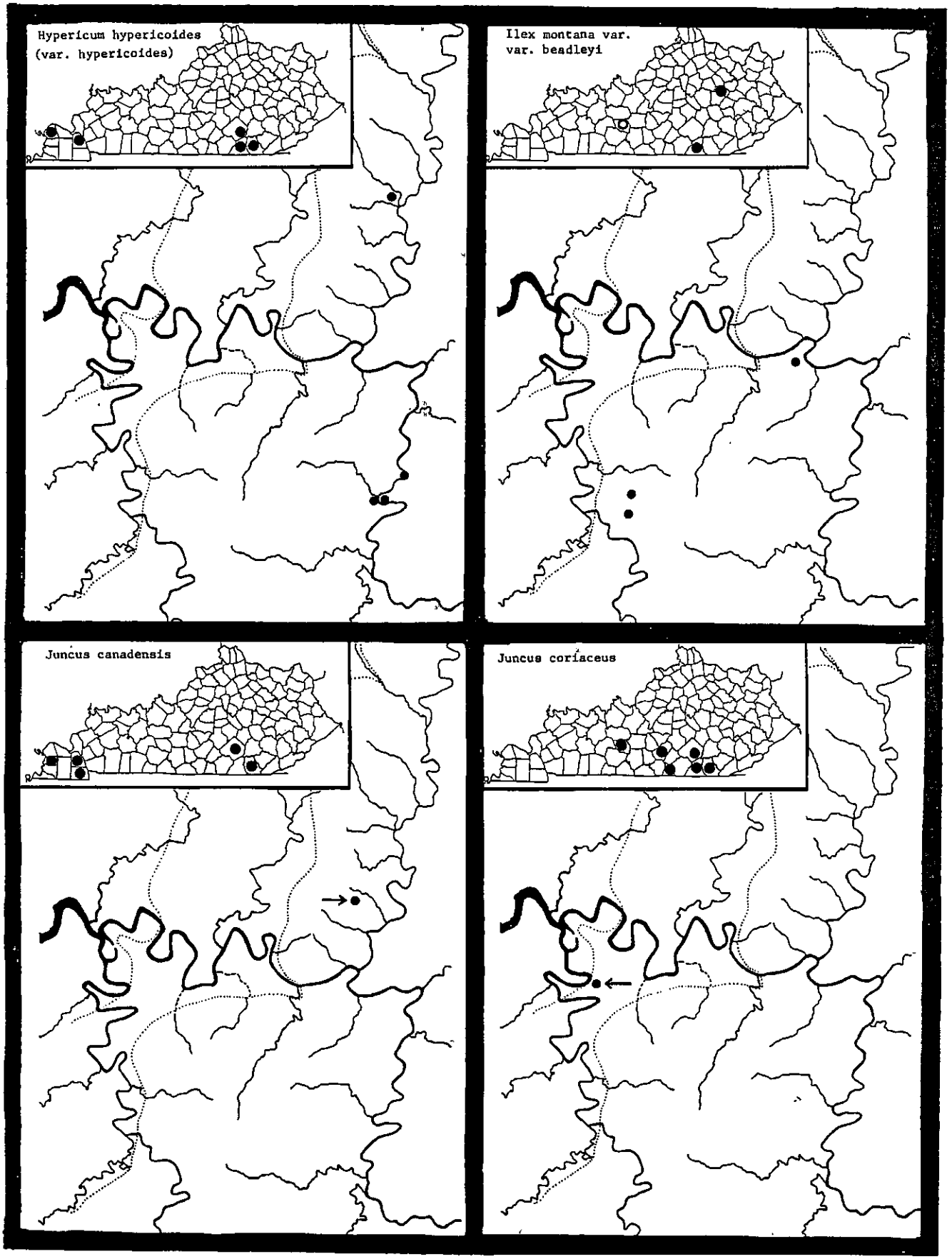

Carex laxiculmis
*
Carex lucorum
Carex projecta
Carex purpurifera
*

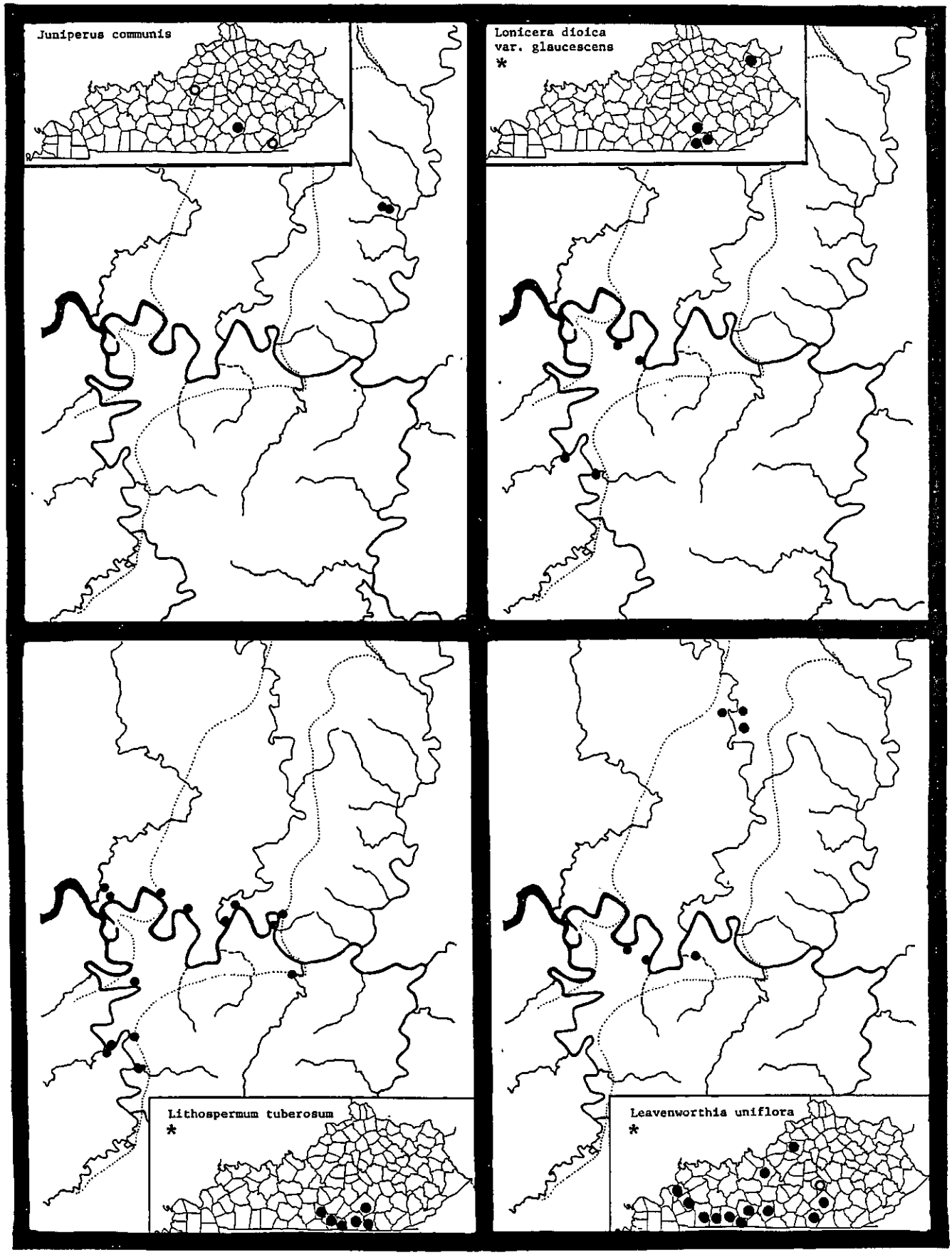

Carex scabrata
Carex striatula
*
Carex styloflexa
Carya pallida
*

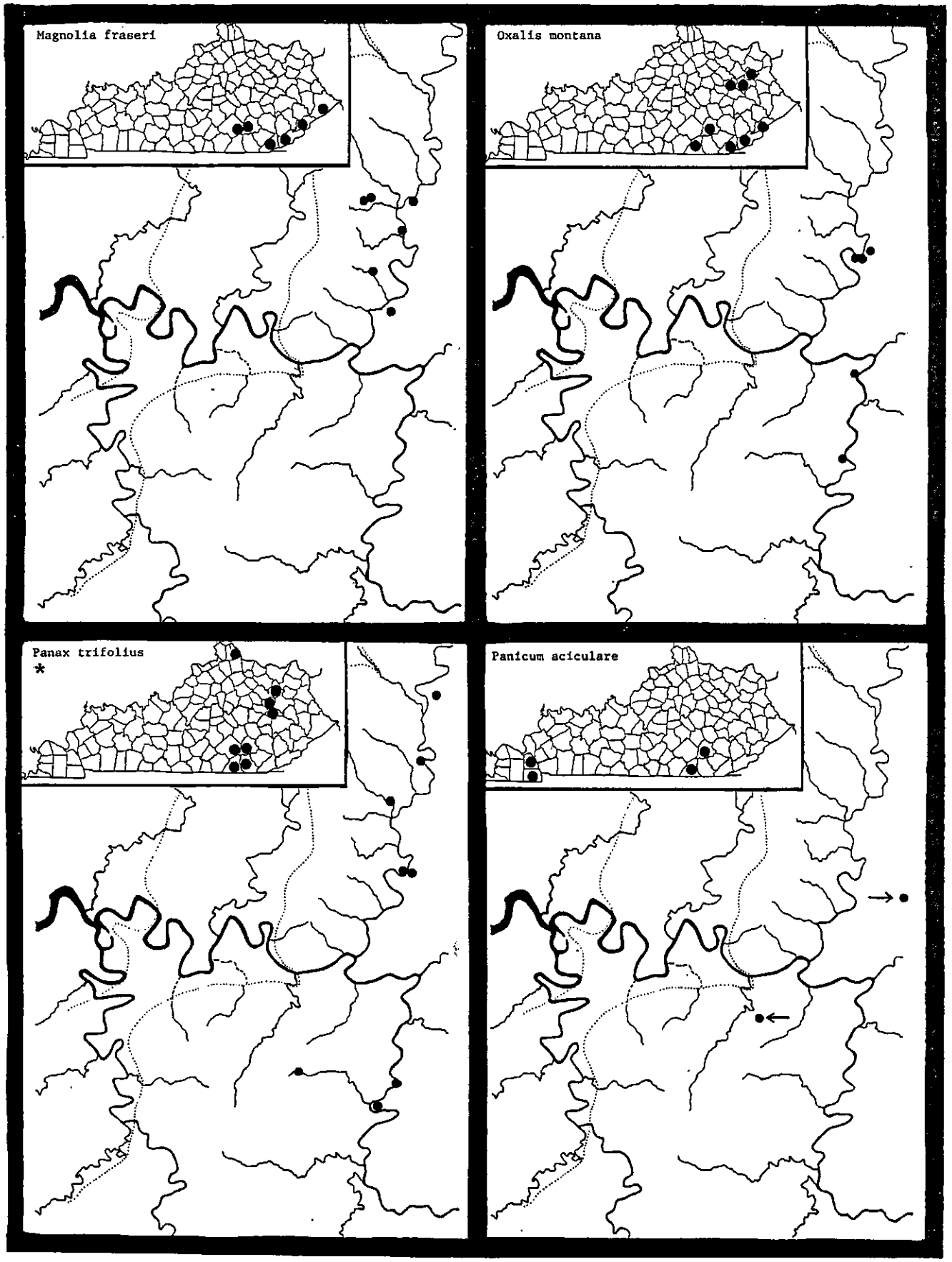

Catalpa bignonioides
(possibly native)
*
Cirsium carolinianum
Crotonopsis elliptica
Crataegus uniflora

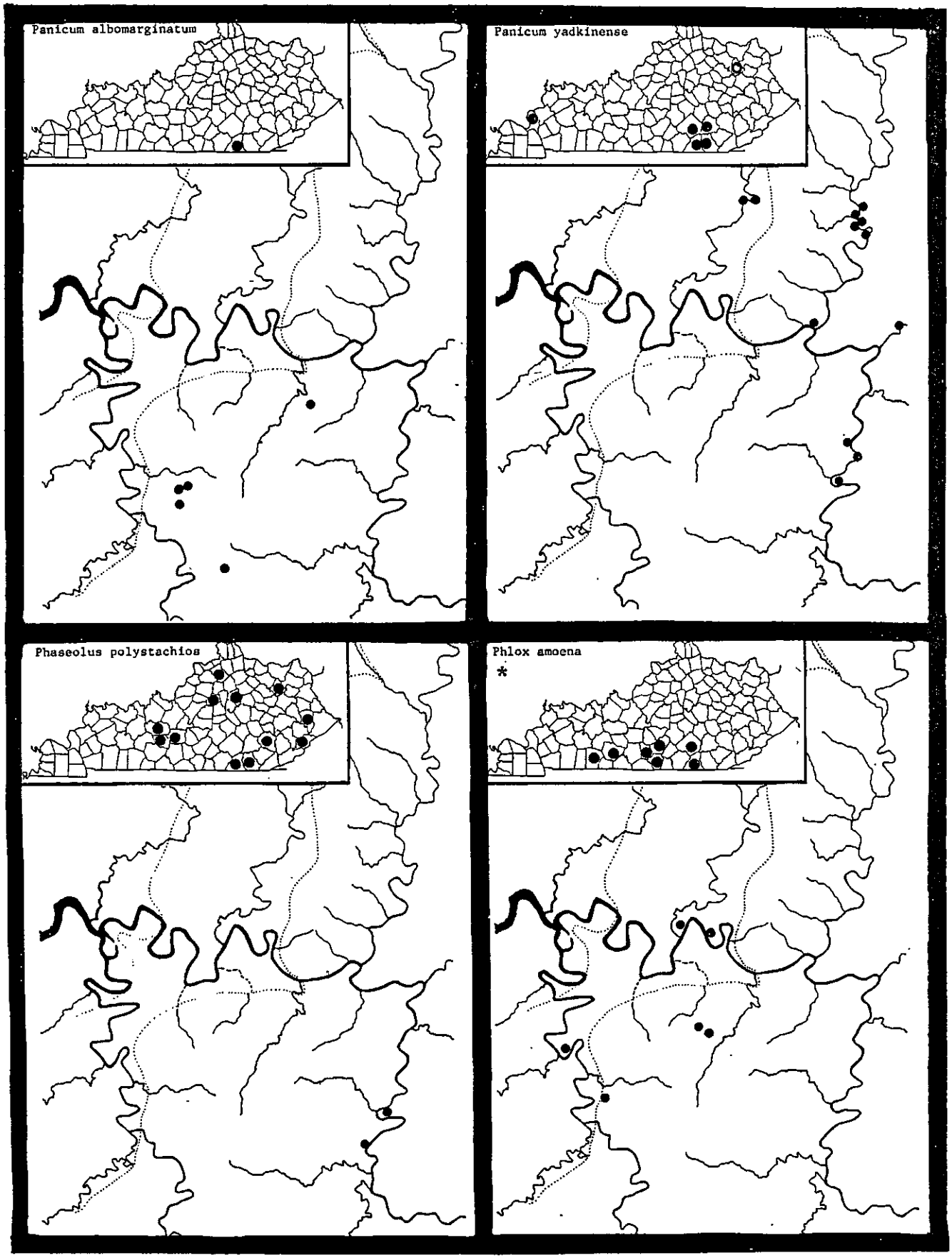

Cypripedium pubescens
*
Danthonia compressa
Epilobium ciliatum
Eupatorium hyssopifolium
var. hyssopifolium

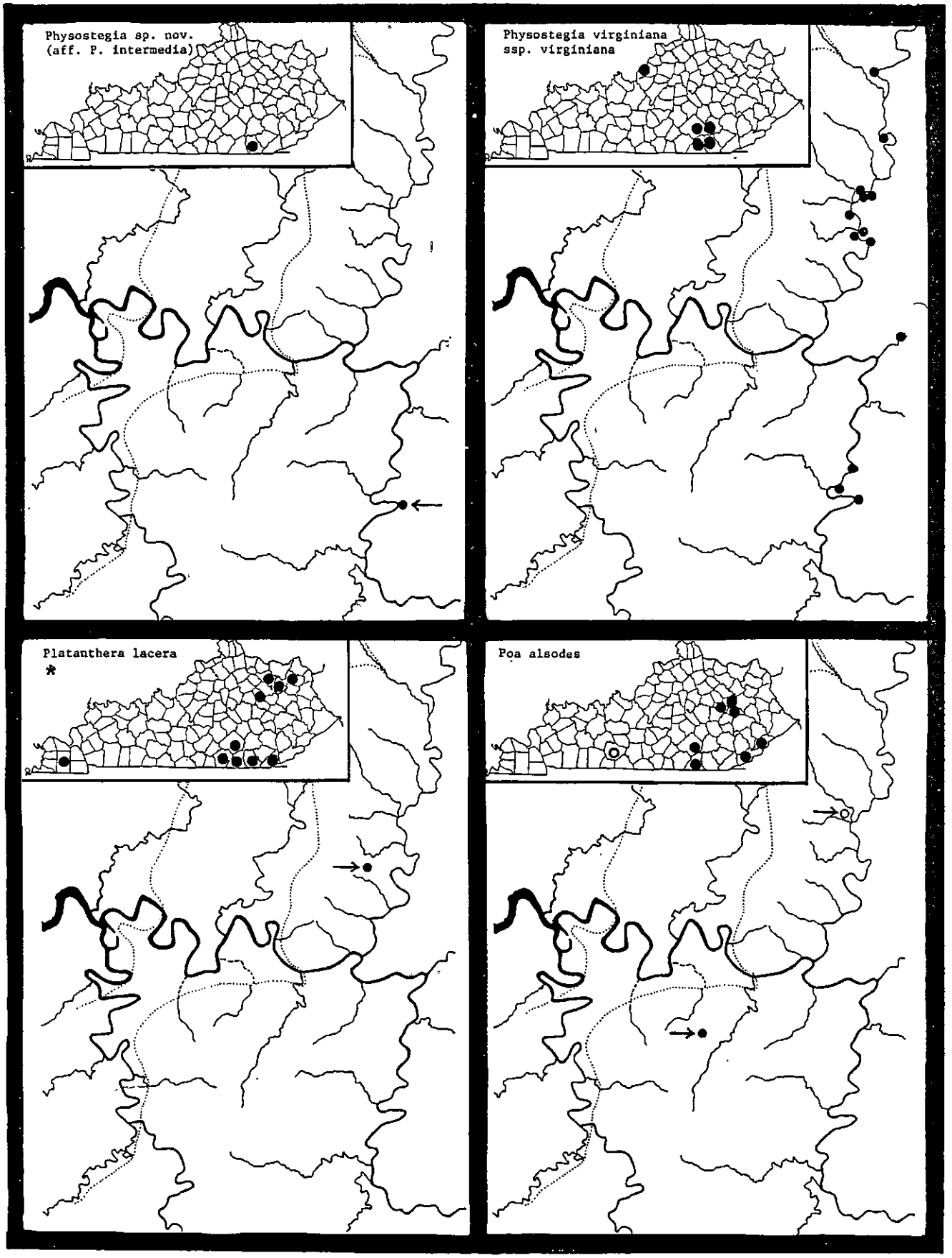

Eupatorium semiserratum
Geum virginianum
*
Glyceria septentrionalis
var. septentrionalis
Hydrastis canadensis
*

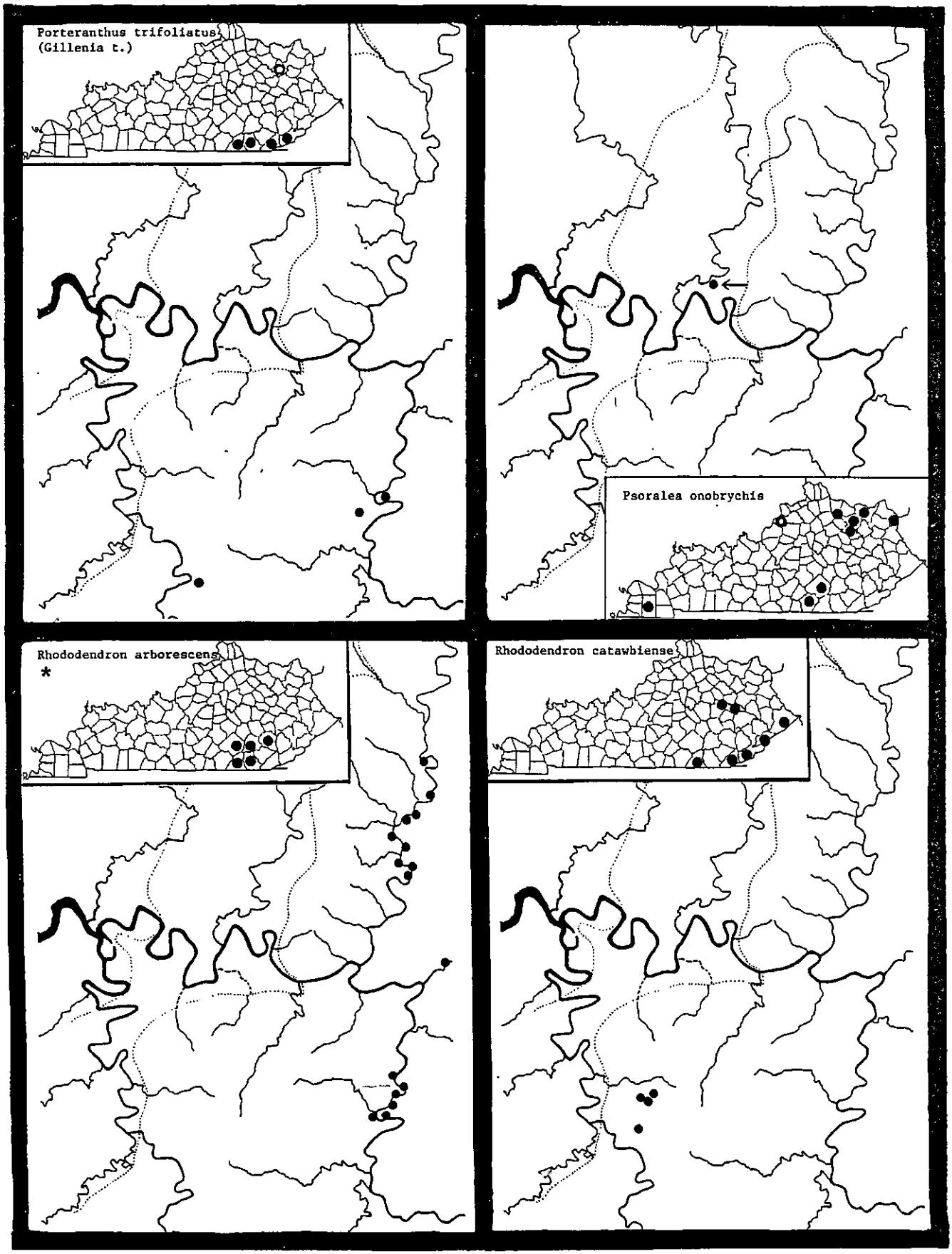

Hypericum hypericoides
(var. hypericoides)
Ilex montana var.
var. beadleyi
Juncus canadensis
Juncus coriaceus

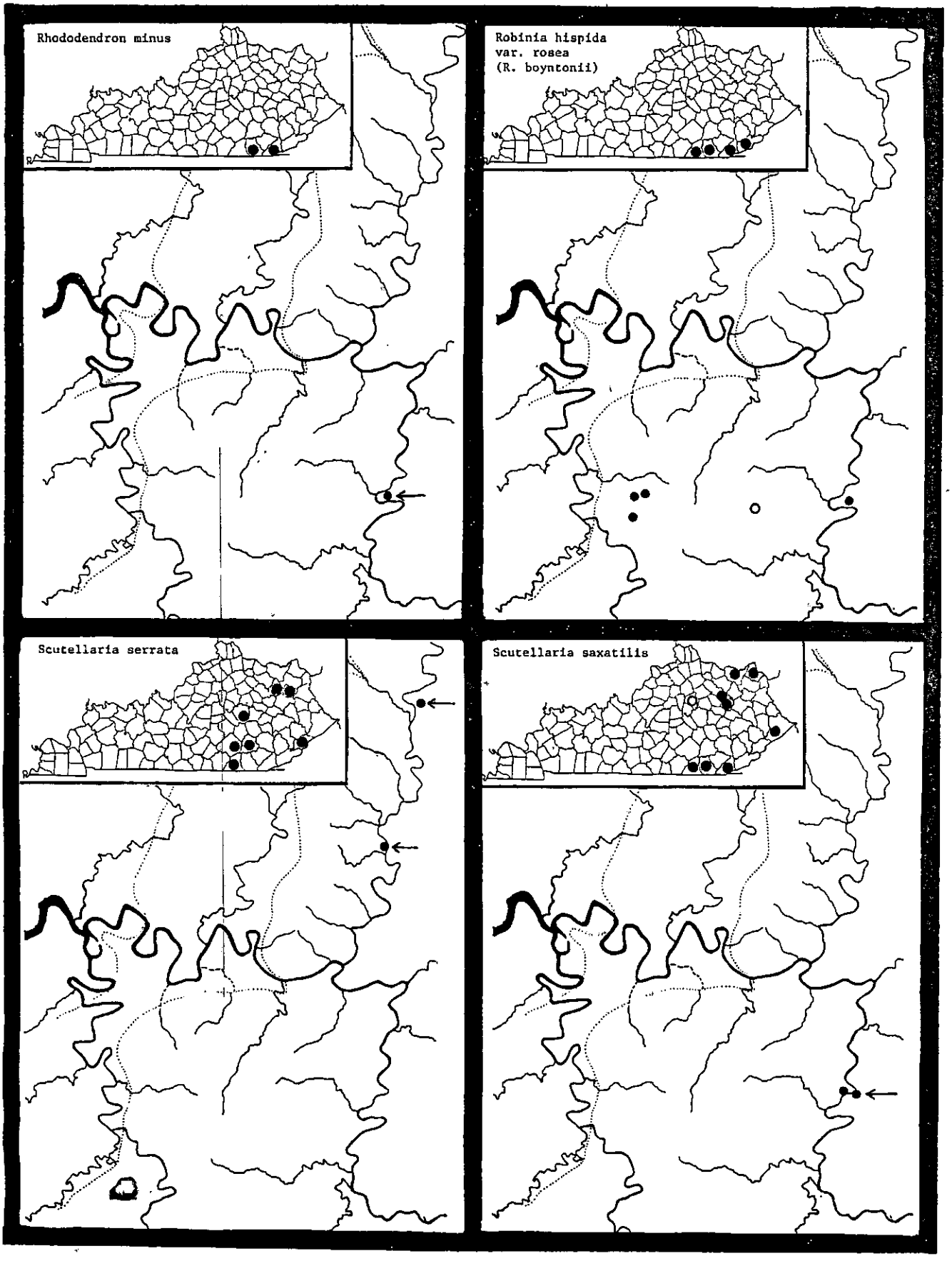

Juniperus communis
Lonicera dioica
var. glaucescens
*
Lithospermum tuberosum
*
Leavenworthia uniflora
*

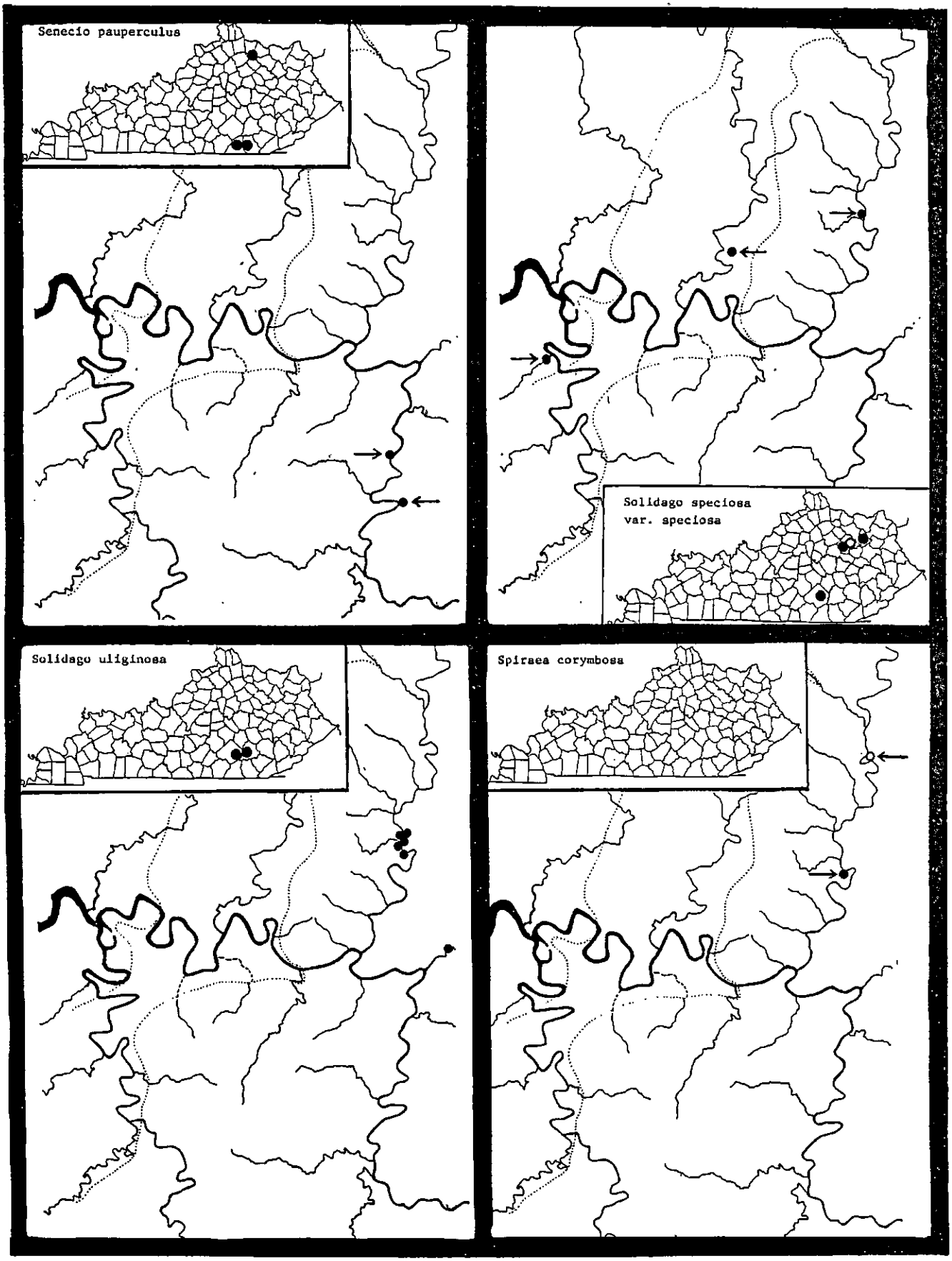

Magnolia fraseri
Oxalis montana
Panax trifolius
*
Panicum aciculare

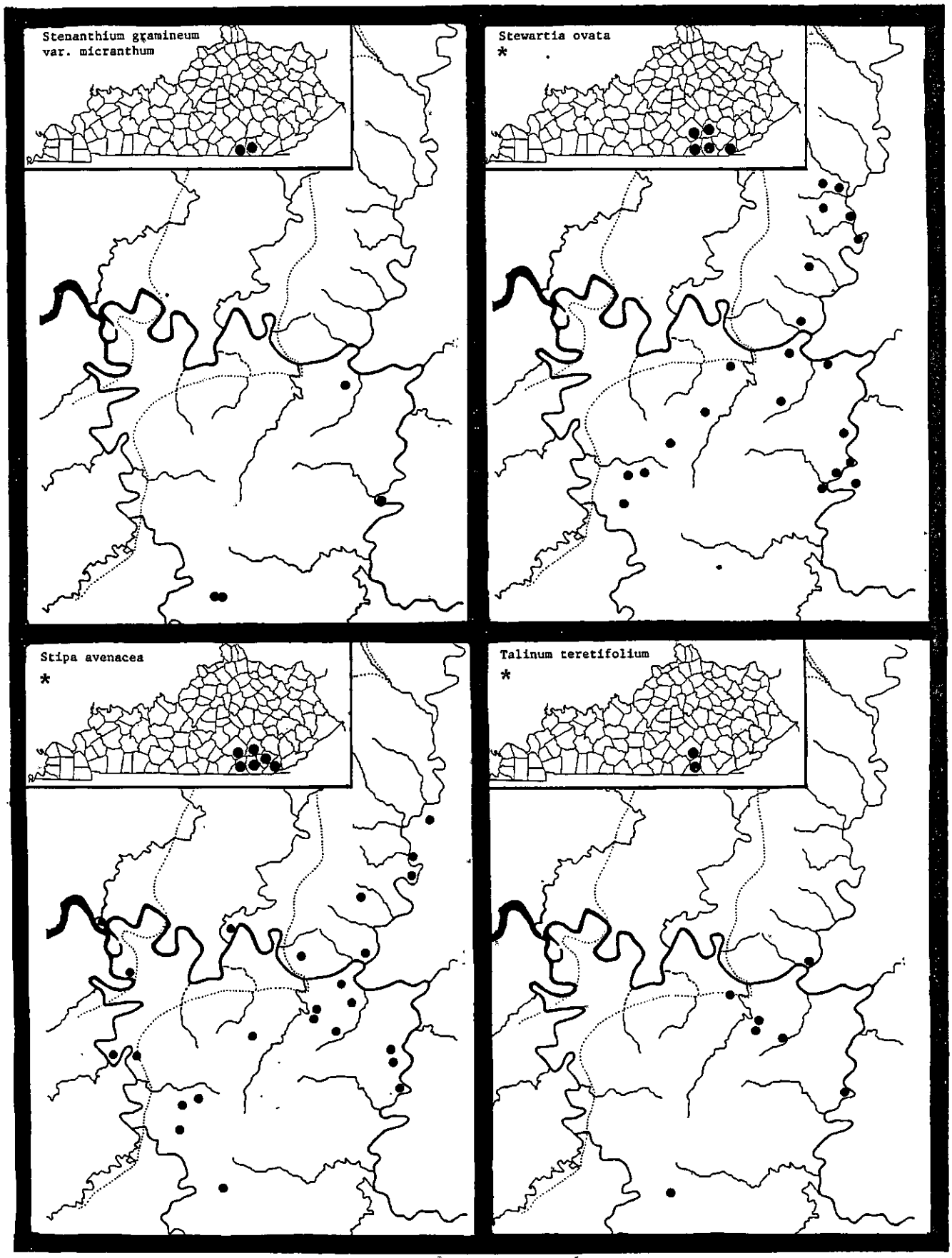

Panicum albomarginatum
Panicum yadkinense
Phaseolus polystachios
Phlox amoena
*

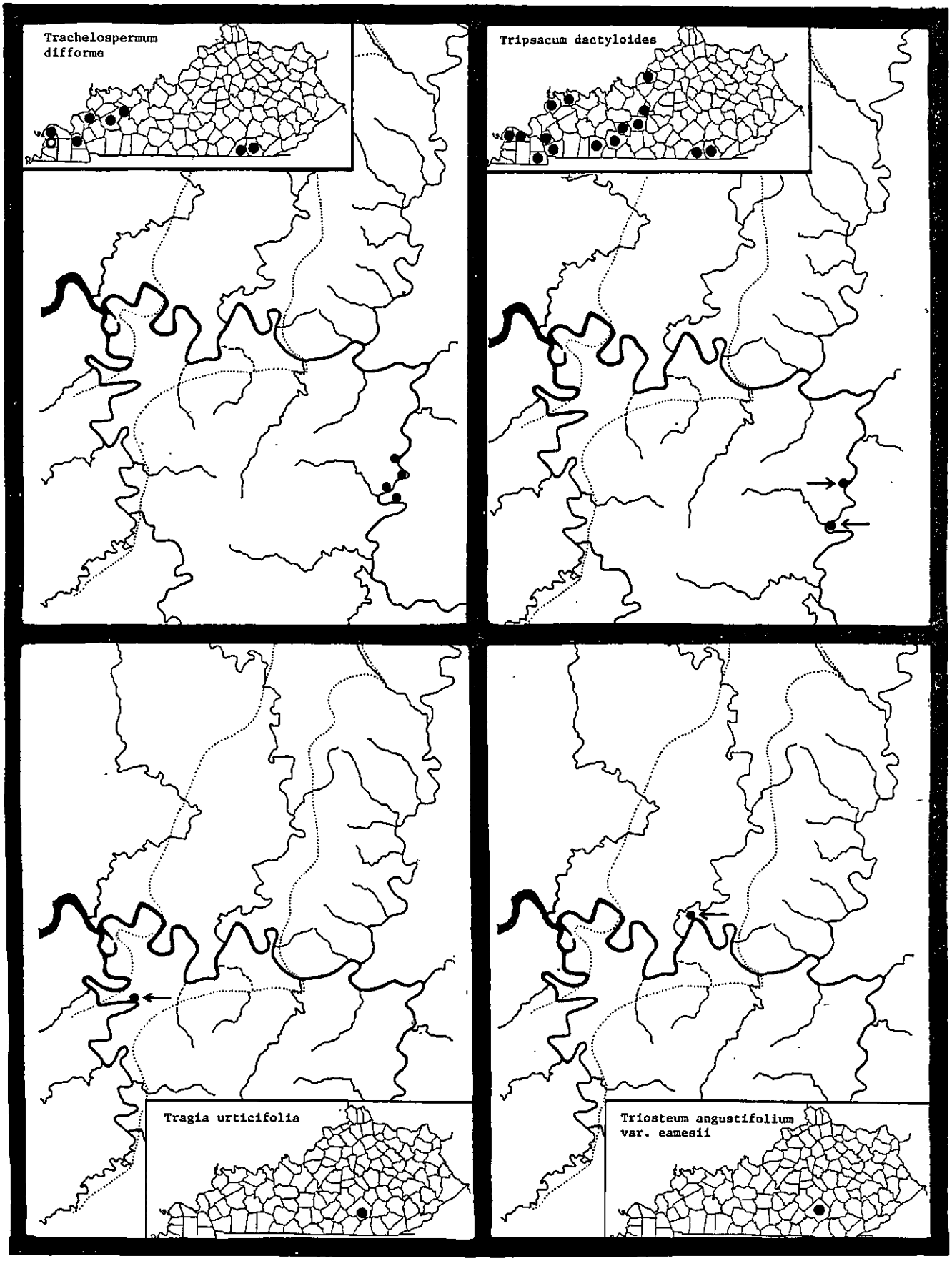

Physostegia sp. nov.
(aff. P. intermedia)
Physostegia virginiana
ssp. virginiana
Platanthera lacera
*
Poa alsodes

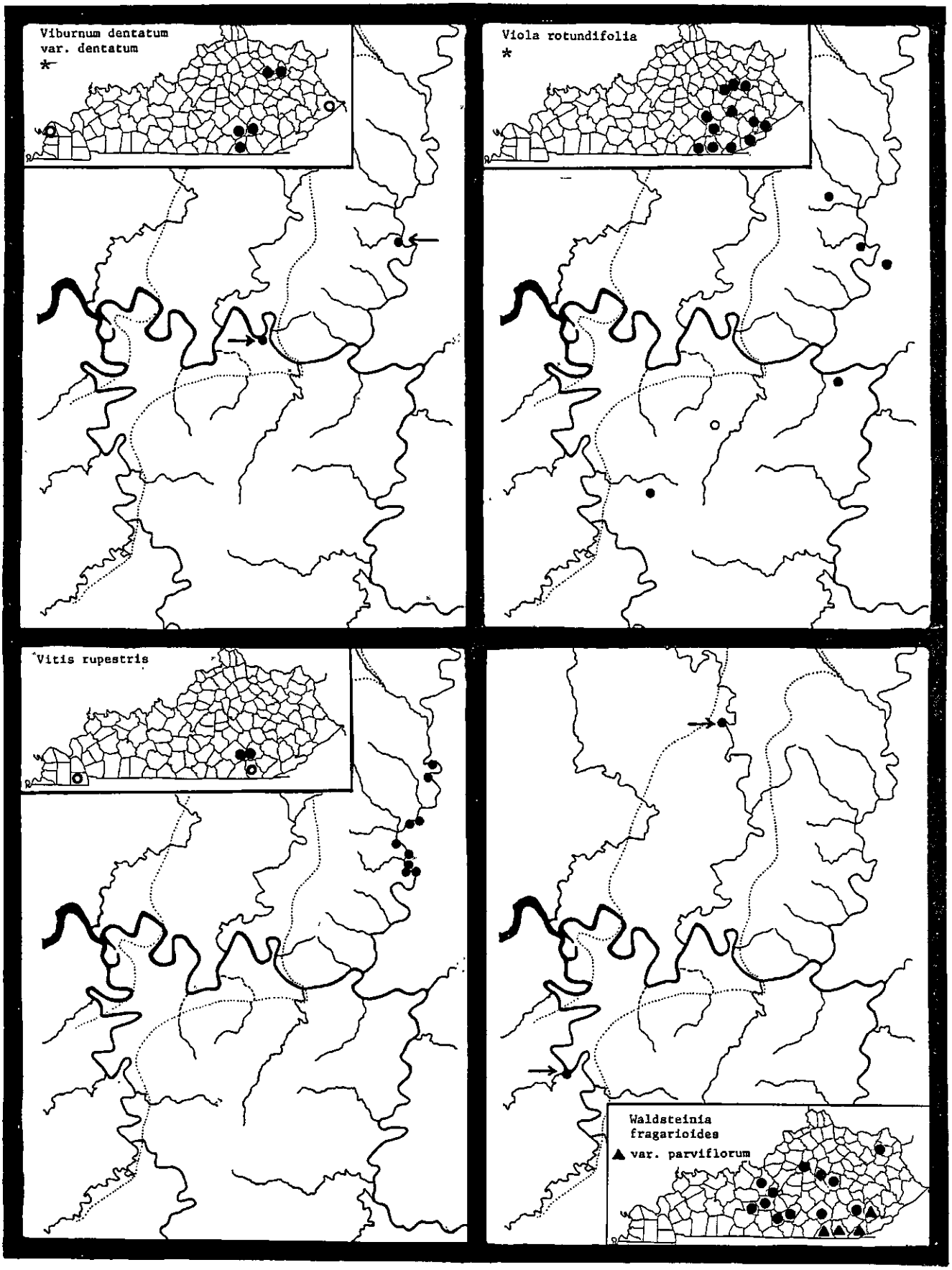

Porteranthus trifoliatus
(Gillenia t.)
Psoralea onobrychis
Rhododendron arborescens
*
Rhododendron catawbiense

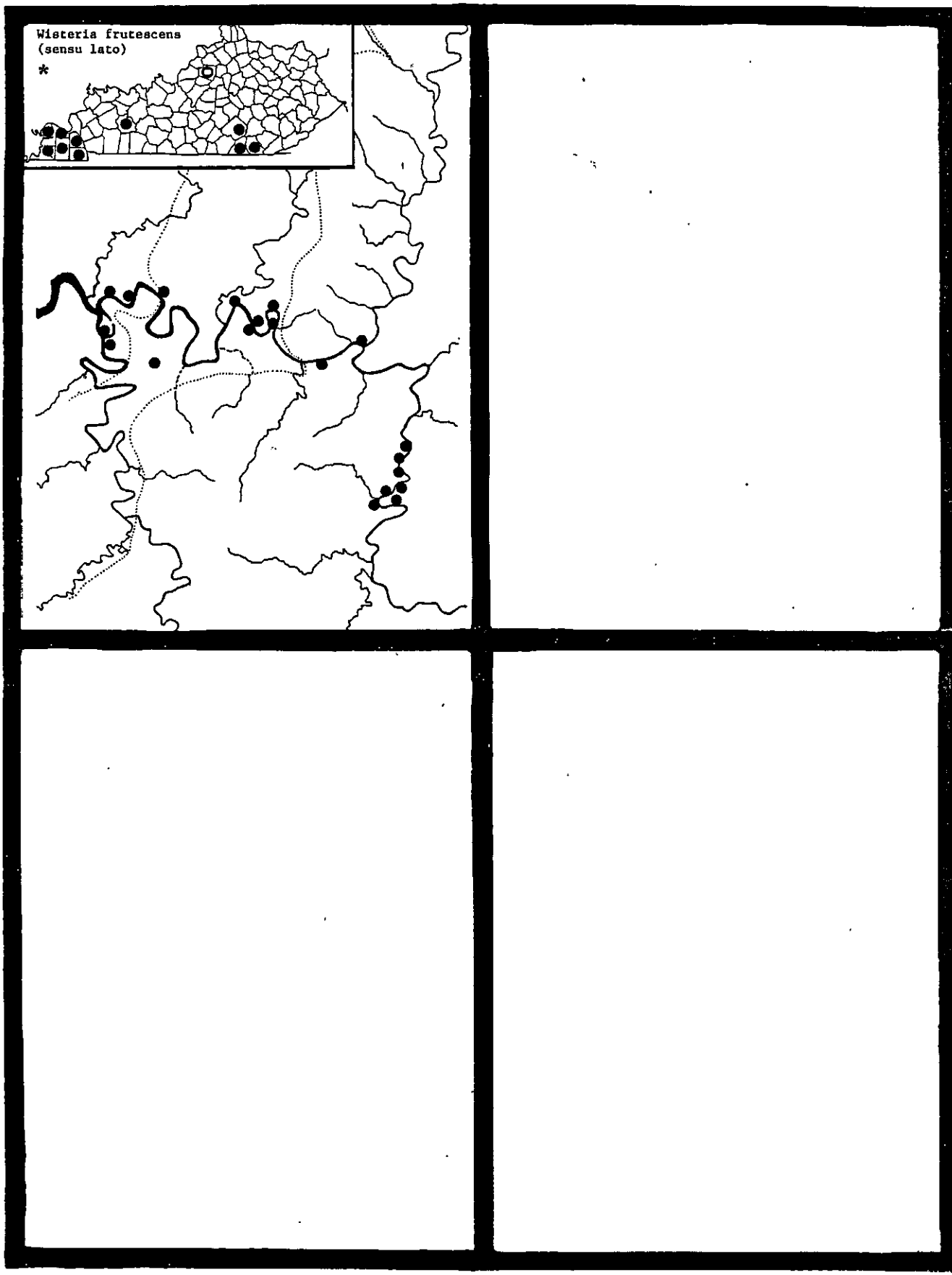

Rhododendron minus
Robinia hispida
var. rosea
(R. boyntonii)
Scutellaria serrata
Scutellaria saxatilis

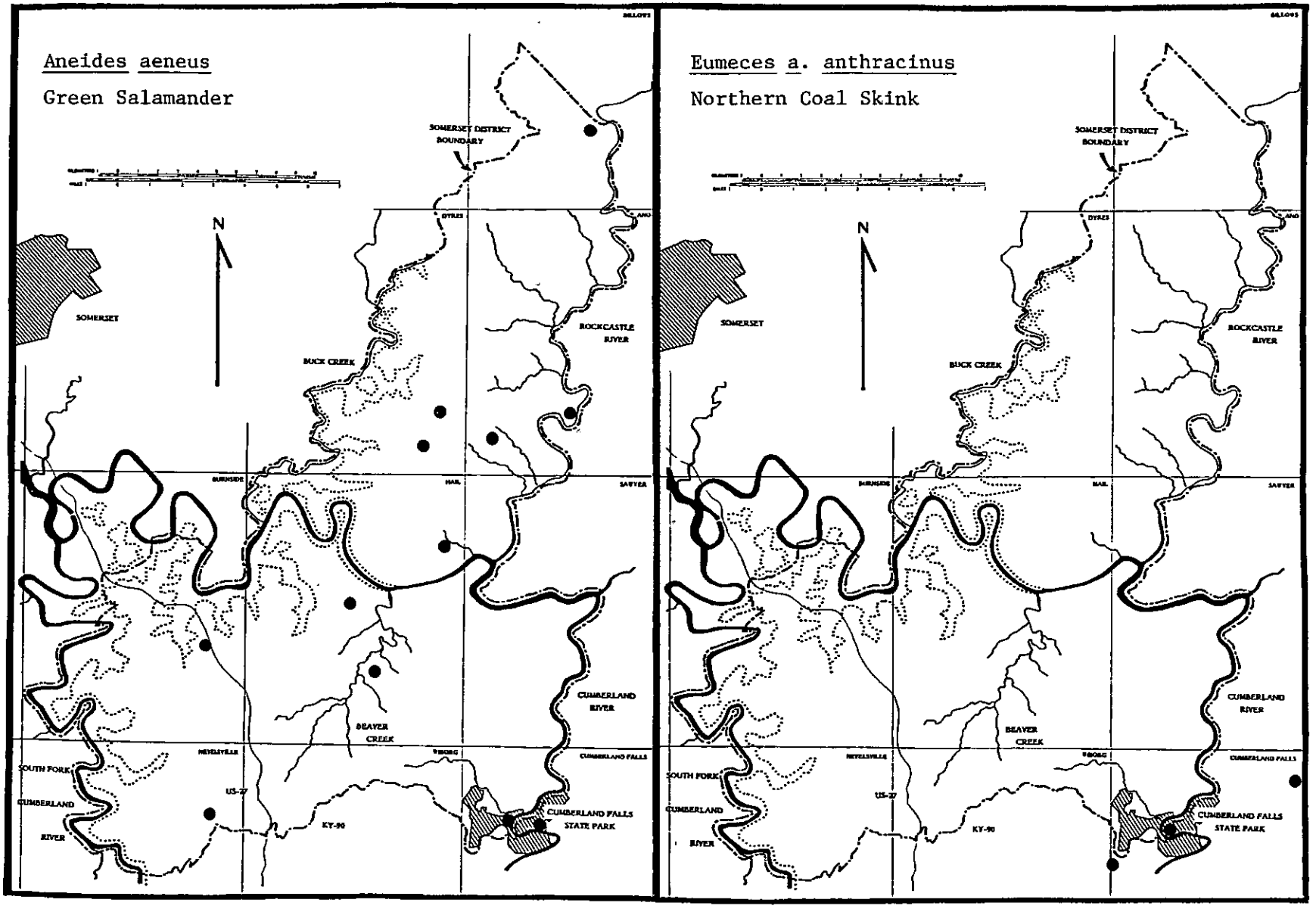

Senecio pauperculus
Solidago speciosa
var. speciosa
Solidago uliginosa
Spiraea corymbosa

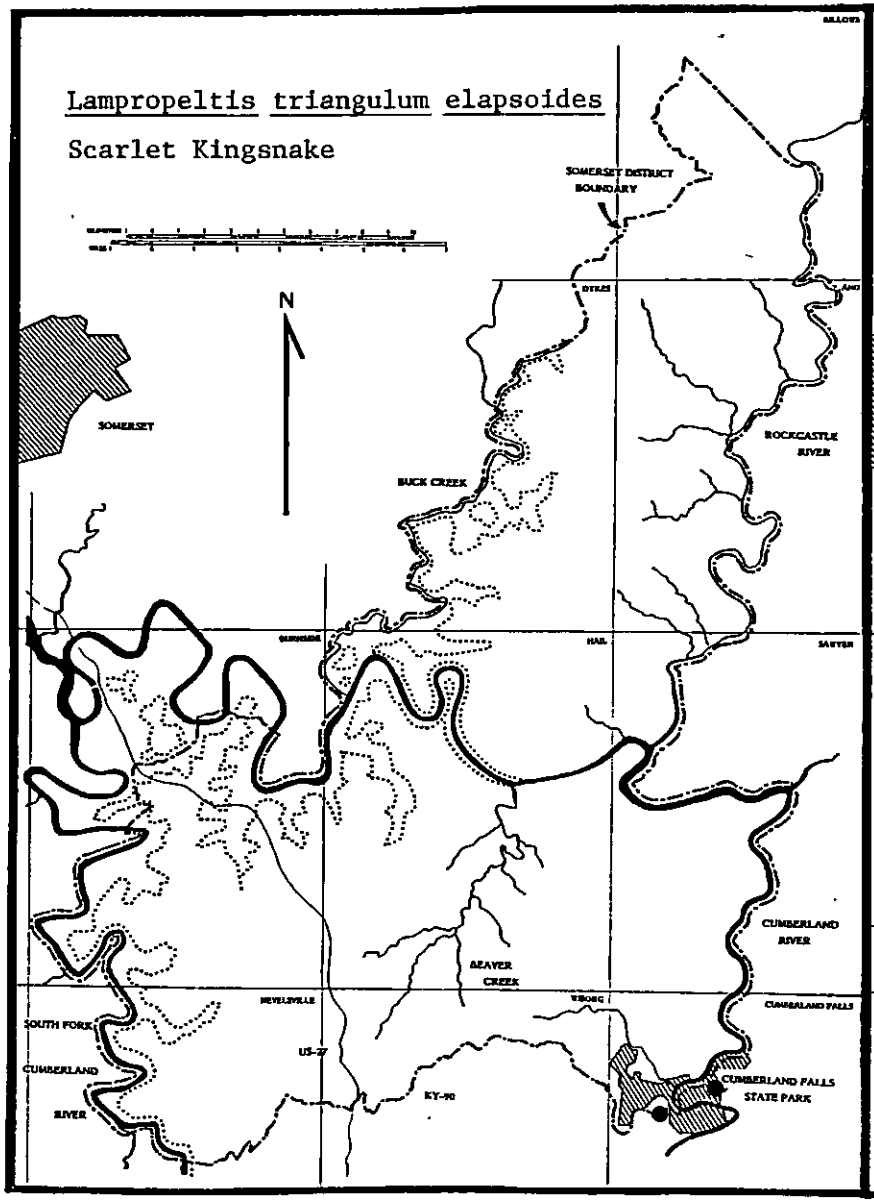

Stenanthium gramineum
var. micranthum
Stewartia ovata
*
Stipa avenacea
*
Talinum teretifolium
*

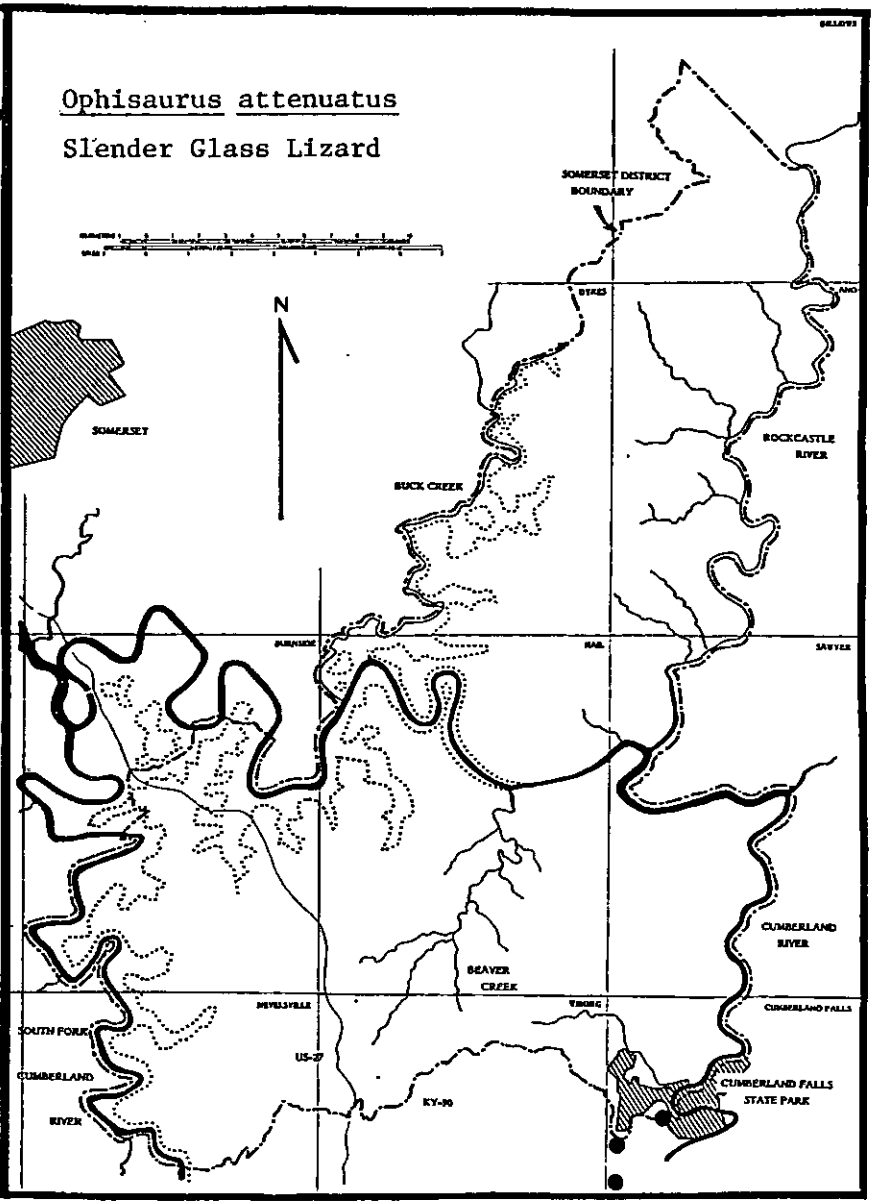

Trachelospermum difforme
Tripsacum dactyloides
Tragia urticifolia
Triosteum angustifolium var. eamesii

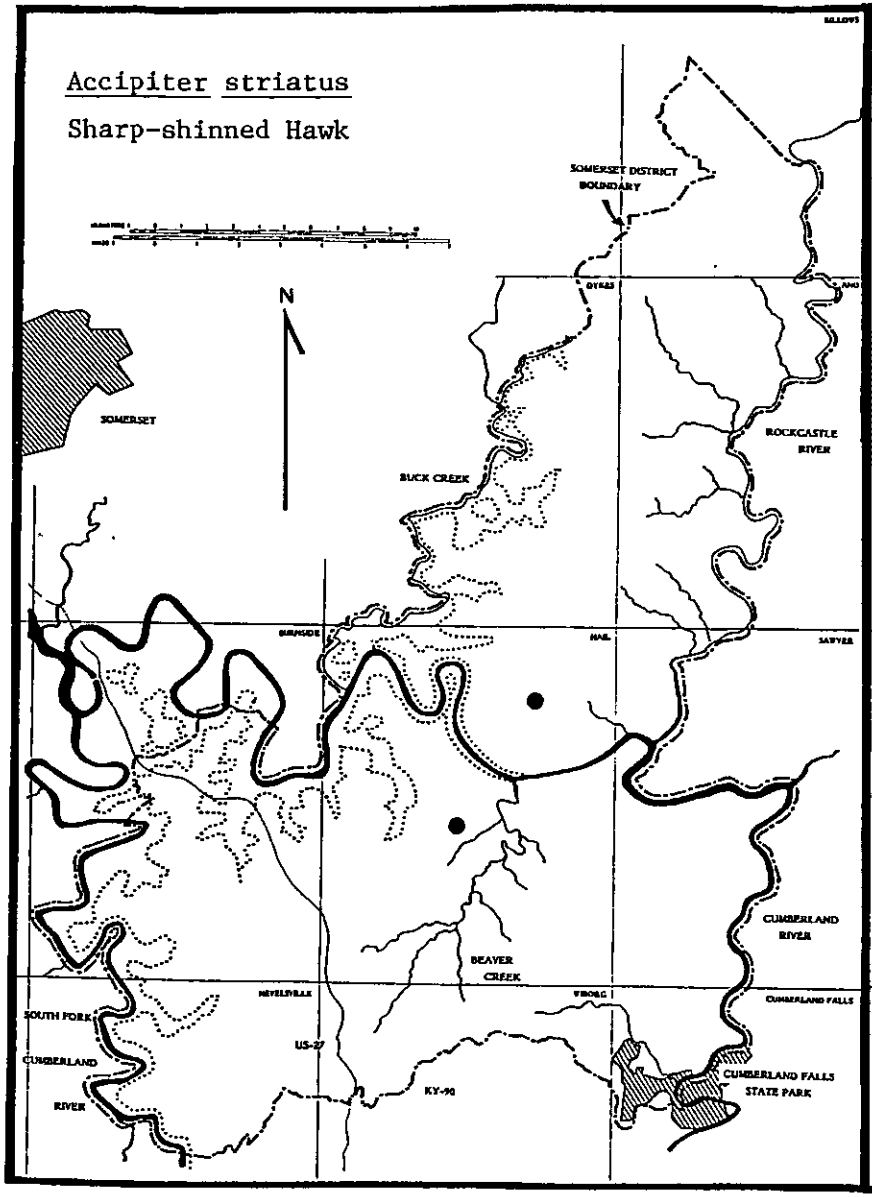

Viburnum dentatum
var. dentatum
*
Viola rotundifolia
*
Vitis rupestris
Waldsteinia
fragarioides
▲ var. parviflorum

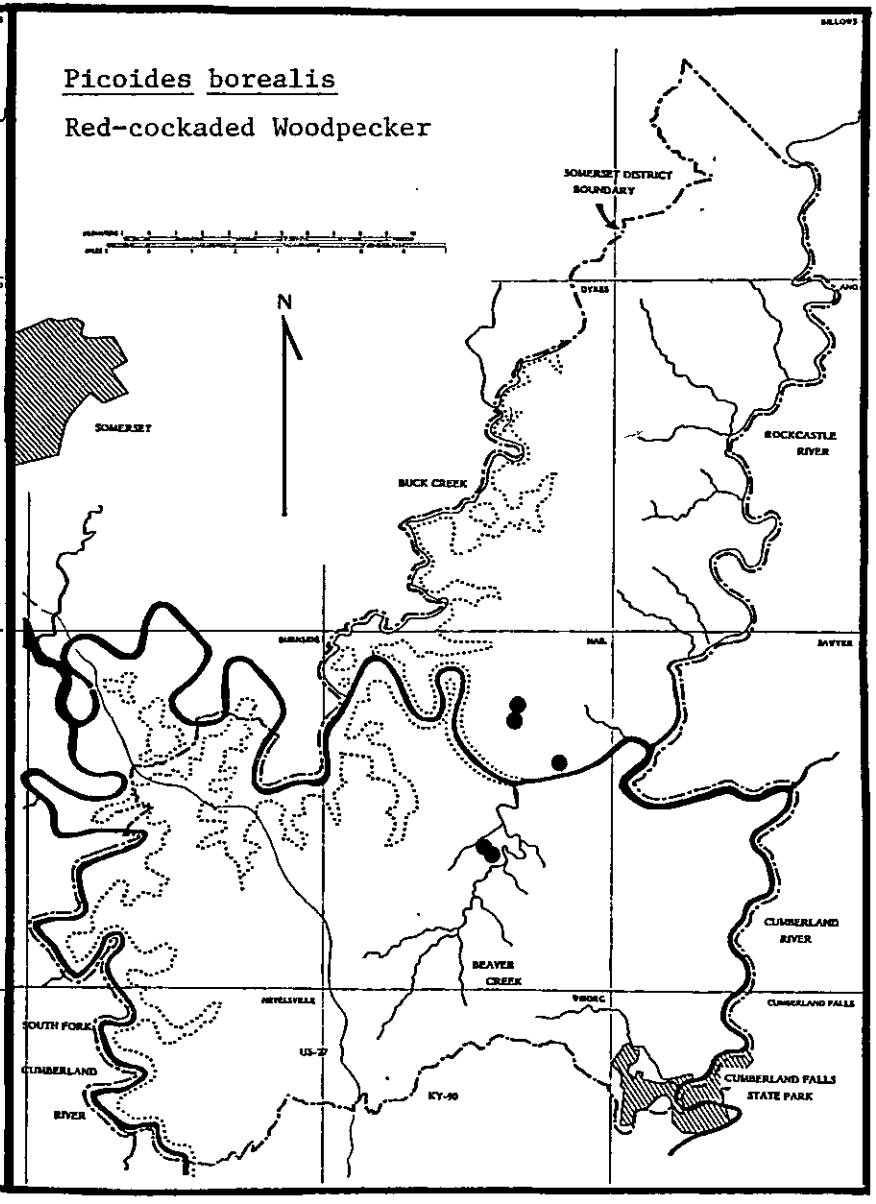

Wisteria frutescens
(sensu lato)
*

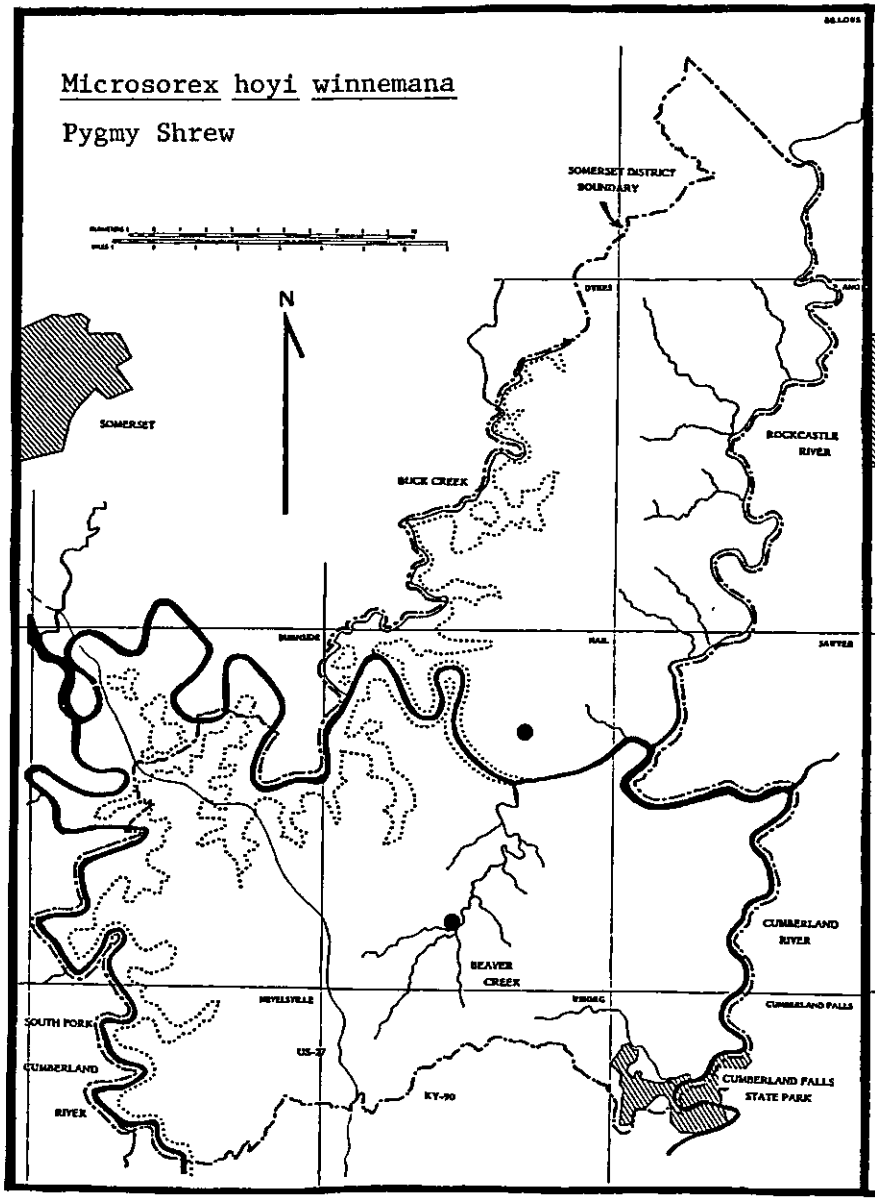

Aneides aeneus
Green Salamander
SOMERSET DISTRICT BOUNDARY
N
SOMERSET
BUCK CREEK
ROCKCASTLE RIVER
BURNSIDE
SAWYER
BEAVER CREEK
CUMBERLAND RIVER
NEVELSVILLE
WINOKA
CUMBERLAND FALLS
SOUTH FORK CUMBERLAND RIVER
US-27
KY-90
CUMBERLAND FALLS STATE PARK
Eumeces a. anthracinus
Northern Coal Skink
SOMERSET DISTRICT BOUNDARY
N
SOMERSET
BUCK CREEK
ROCKCASTLE RIVER
BURNSIDE
SAWYER
BEAVER CREEK
CUMBERLAND RIVER
NEVELSVILLE
WINOKA
CUMBERLAND FALLS
SOUTH FORK CUMBERLAND RIVER
US-27
KY-90
CUMBERLAND FALLS STATE PARK

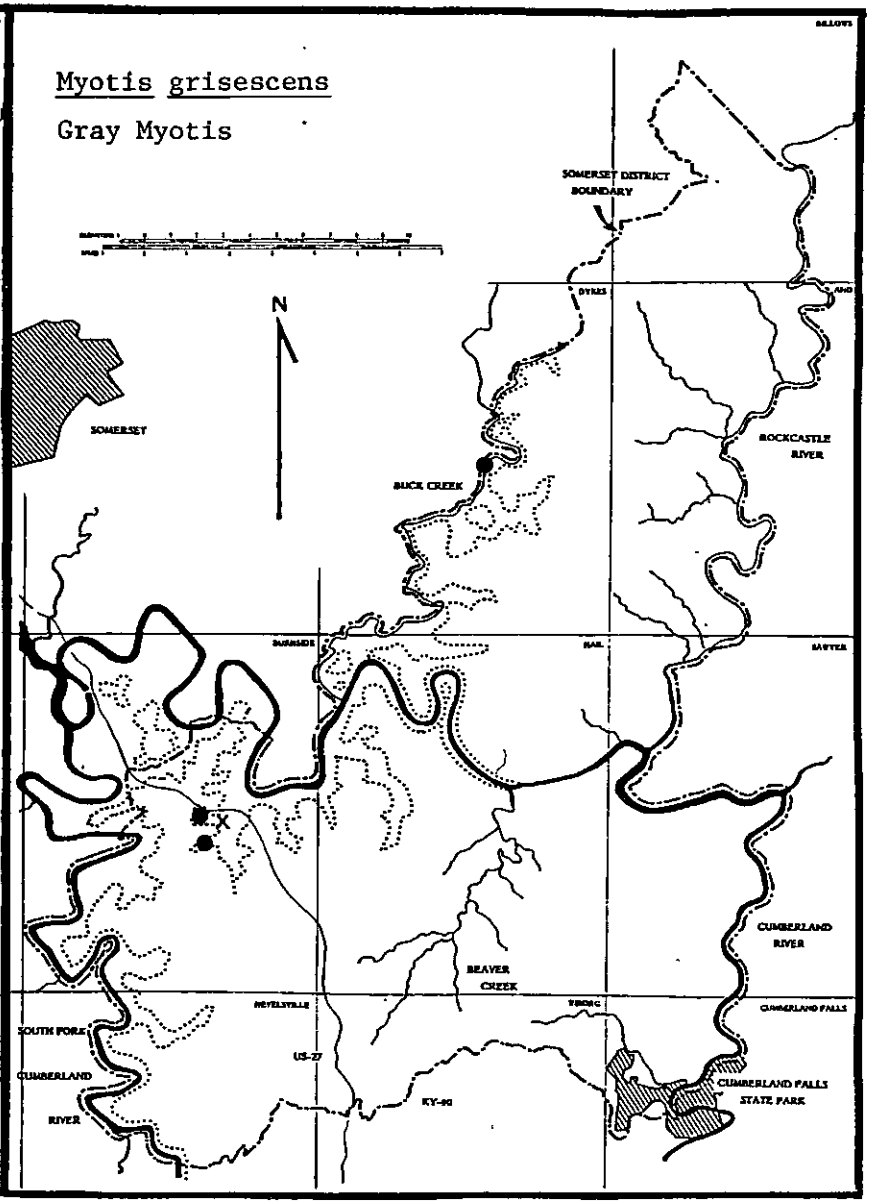

Lampropeltis triangulum elapsoides
Scarlet Kingsnake
N
SOMERSET DISTRICT BOUNDARY
SOMERSET
BUCK CREEK
ROCKCASTLE RIVER
BEAVER CREEK
CUMBERLAND RIVER
SOUTH FORK CUMBERLAND RIVER
US-27
KY-90
CUMBERLAND FALLS STATE PARK

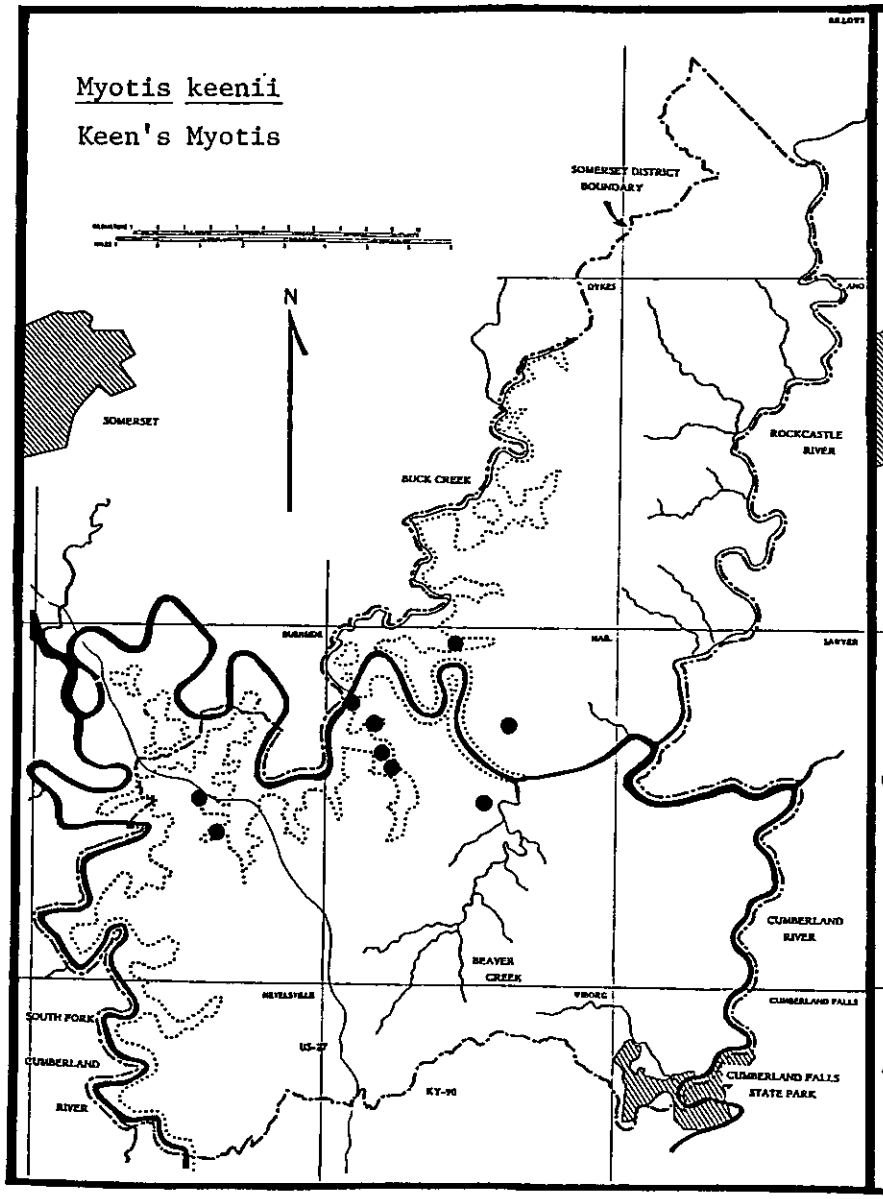

Ophisaurus attenuatus
Slender Glass Lizard
N
SOMERSET DISTRICT BOUNDARY
SOMERSET
BUCK CREEK
ROCKCASTLE RIVER
BEAVER CREEK
CUMBERLAND RIVER
SOUTH FORK CUMBERLAND RIVER
US-27
KY-90
CUMBERLAND FALLS STATE PARK

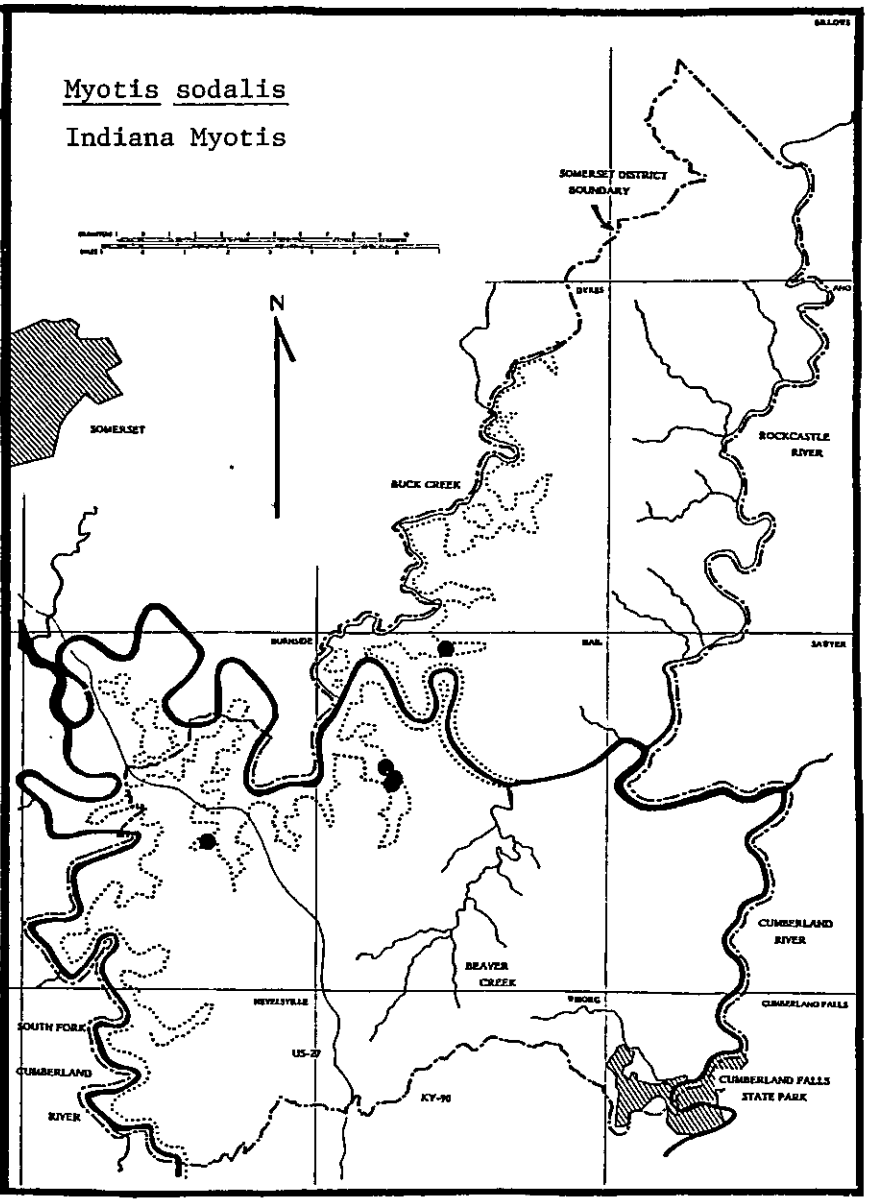

Accipiter striatus
Sharp-shinned Hawk
SOMERSET DISTRICT BOUNDARY
N
SOMERSET
BUCK CREEK
ROCKCASTLE RIVER
BEAVER CREEK
CUMBERLAND RIVER
SOUTH FORK CUMBERLAND RIVER
US-27
KY-90
CUMBERLAND FALLS STATE PARK

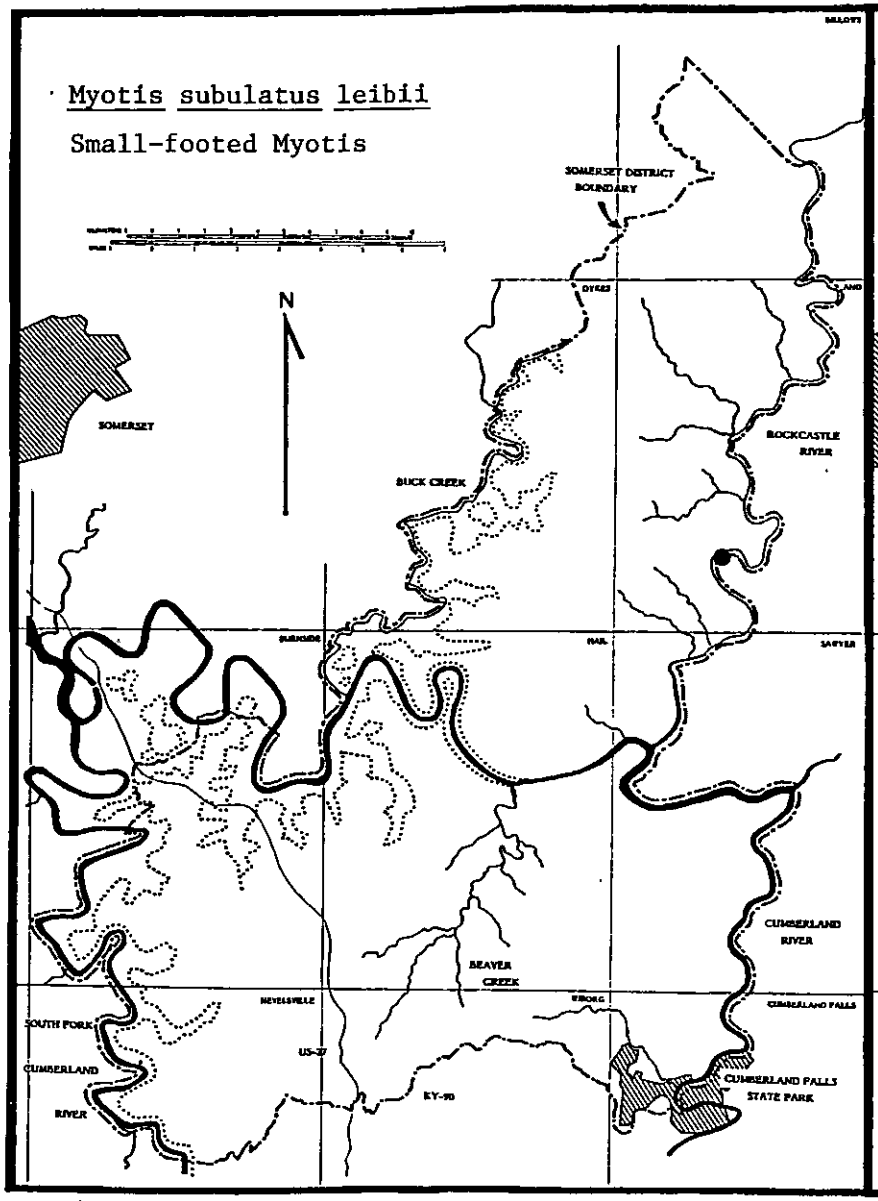

Picoides borealis
Red-cockaded Woodpecker
SOMERSET DISTRICT BOUNDARY
N
SOMERSET
BUCK CREEK
ROCKCASTLE RIVER
BEAVER CREEK
CUMBERLAND RIVER
SOUTH FORK CUMBERLAND RIVER
US-27
KY-90
CUMBERLAND FALLS STATE PARK

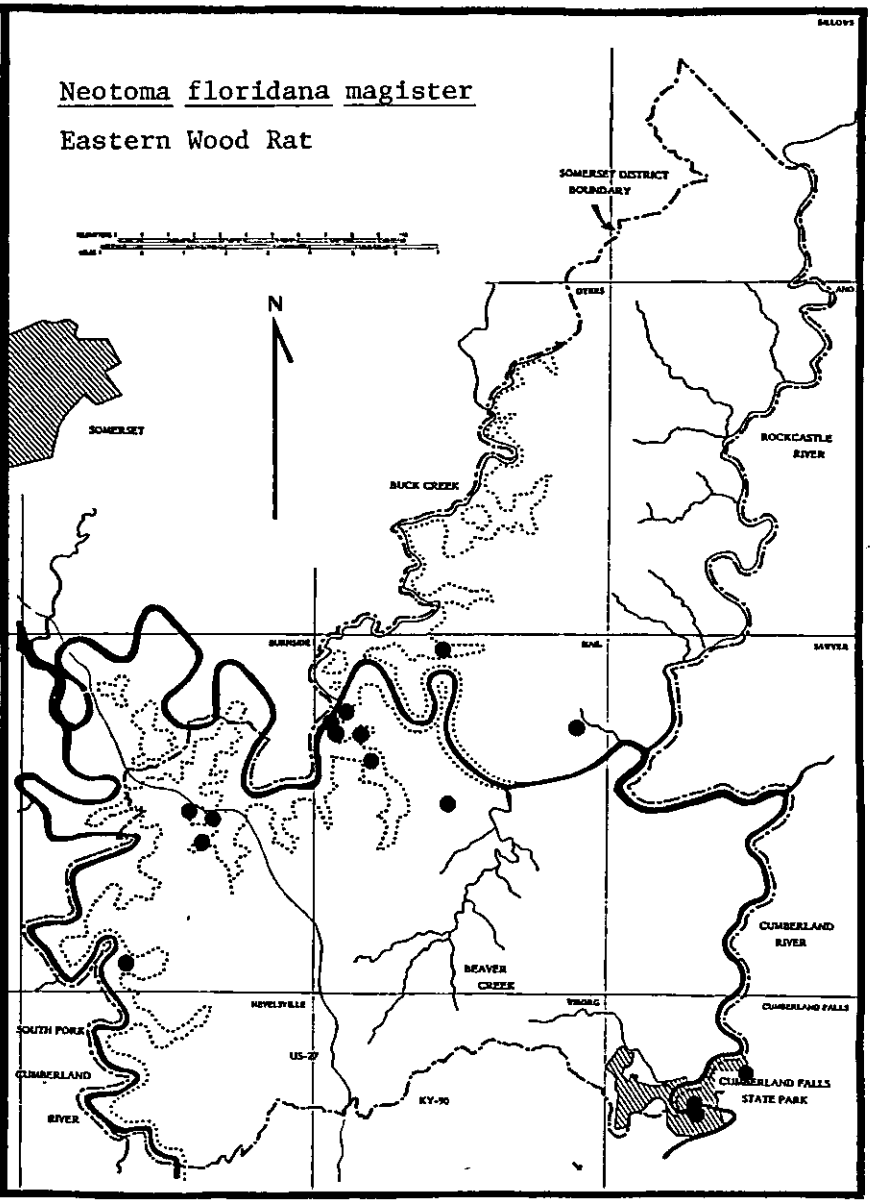

Microsorex hoyi winnemana
Pygmy Shrew
SOMERSET DISTRICT BOUNDARY
N
SOMERSET
BUCK CREEK
ROCKCASTLE RIVER
BEAVER CREEK
CUMBERLAND RIVER
SOUTH FORK CUMBERLAND RIVER
US-27
KY-90
CUMBERLAND FALLS STATE PARK


Myotis grisescens
Gray Myotis
SOMERSET DISTRICT BOUNDARY
N
SOMERSET
BUCK CREEK
ROCKCASTLE RIVER
BEAVER CREEK
CUMBERLAND RIVER
SOUTH FORK CUMBERLAND RIVER
US-27
KY-90
CUMBERLAND FALLS STATE PARK


Myotis keenii
Keen's Myotis
SOMERSET DISTRICT BOUNDARY
N
SOMERSET
BUCK CREEK
ROCKCASTLE RIVER
CUMBERLAND RIVER
BEAVER CREEK
SOUTH FORK CUMBERLAND RIVER
US-27
KY-90
CUMBERLAND FALLS STATE PARK


Myotis sodalis
Indiana Myotis
SOMERSET DISTRICT BOUNDARY
N
SOMERSET
BUCK CREEK
ROCKCASTLE RIVER
CUMBERLAND RIVER
BEAVER CREEK
SOUTH FORK CUMBERLAND RIVER
US-27
KY-90
CUMBERLAND FALLS STATE PARK


Myotis subulatus leibii
Small-footed Myotis
SOMERSET DISTRICT BOUNDARY
N
SOMERSET
BUCK CREEK
ROCKCASTLE RIVER
BEAVER CREEK
CUMBERLAND RIVER
SOUTH FORK CUMBERLAND RIVER
US-27
KY-90
CUMBERLAND FALLS STATE PARK


Neotoma floridana magister
Eastern Wood Rat
SOMERSET DISTRICT BOUNDARY
N
SOMERSET
BUCK CREEK
ROCKCASTLE RIVER
BEAVER CREEK
CUMBERLAND RIVER
SOUTH FORK CUMBERLAND RIVER
US-27
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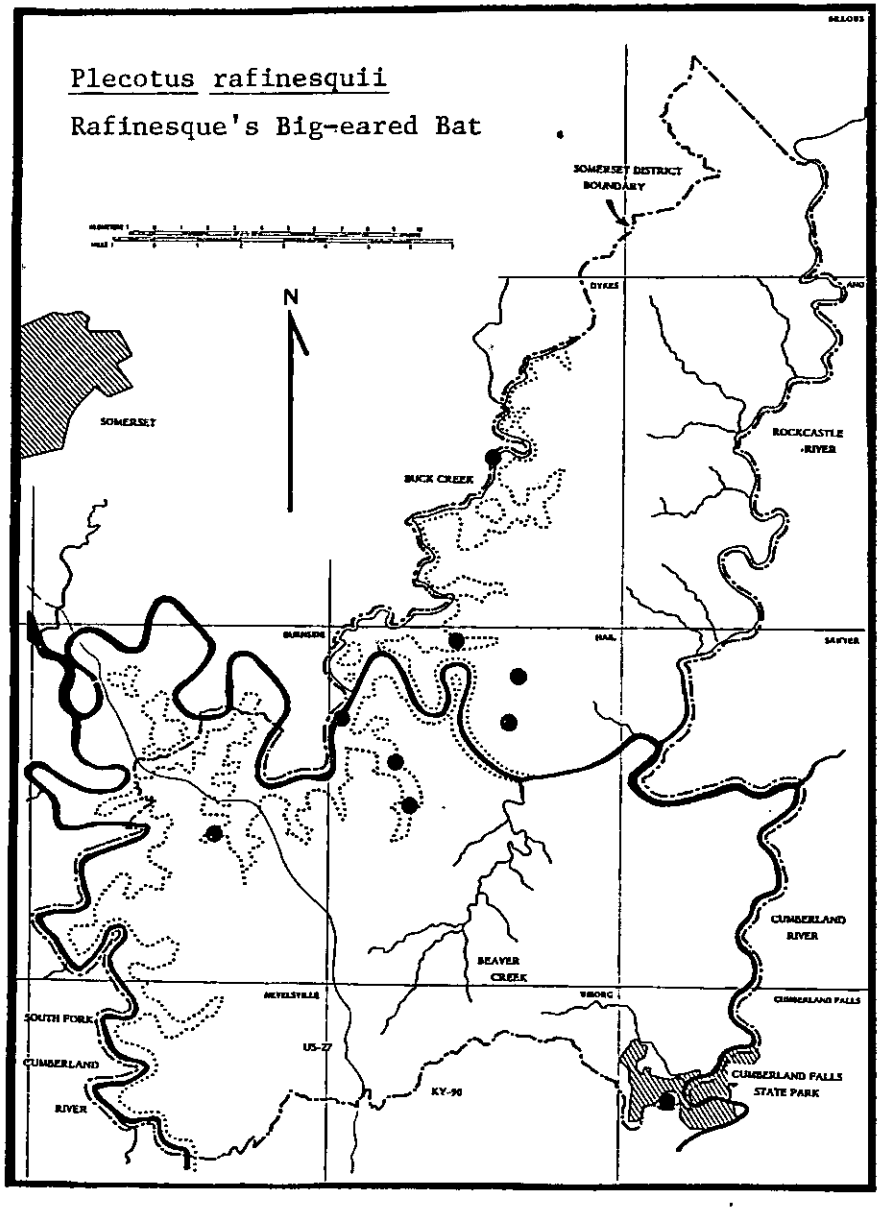
CUMBERLAND FALLS STATE PARK


Plecotus rafinesquii
Rafinesque's Big-eared Bat
SOMERSET DISTRICT BOUNDARY
N
SOMERSET
BUCK CREEK
ROCKCASTLE RIVER
BURNSIDE
SAINYER
CUMBERLAND RIVER
BEAVER CREEK
MEYELSVILLE
VIBORG
CUMBERLAND FALLS
SOUTH FORK
CUMBERLAND
RIVER
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