THE HERBACEOUS STRATUM OF THE CHESTNUT OAK (QUERCUS PRINUS) COMMUNITY OF THE NOTHWESTERN HIGHLAND RIM, KENTUCKY AND TENNESSEE

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DEDICATION

This thesis is dedicated to my parents

Mr. and Mrs. William L. Harris

who have shared my dreams

and given me invaluable educational opportunities.

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ABSTRACT

Chestnut oak (*Quercus primus*) occurs over much of eastern North America and reaches its western limit in Kentucky and Tennessee along the Tennessee River where it dominates many xeric and nutrient poor ridge and upper slope communities. The purpose of this research was to document, quantify, and describe the herbaceous stratum of these communities. Ten representative sites were selected in Lyon (1) and Trigg (7) counties. Kentucky, and Stewart County (2), Tennessee. Within each site 3-6 permanently marked 0.04 ha macroplots (45 total) were established along a mid-slope or ridge transect. Each macroplot was divided into four 10 m^2 subplots (180 total). Sampling was conducted from 12 May 1997, through 19 September 1997, and included determination of species and a visual estimation of cover. Total flora was determined and presence, floristic similarity (Sorenson Index), and frequency calculated. Community structure was determined based on importance values (IV = relative frequency + relative cover). Bryophytes (57.29% cover), bare ground (including exposed rock and gravel; 19.99% cover), and leaf litter (18.79% cover) predominate the forest floor. Although coverage by individual or total species is low, the flora is rich (114 species sampled, 5 others observed). Based on IV, dominants are: *Danthonia spicata* (11.37%), *Carex albicans* (10.06%), *Toxicodendron radicans* (5.03%), *Lespedeza hirta* (3.64%), and *Cunila origanoides* (3.79%). Dominant genera (ranked by IV) are *Panicum*, *Lespedeza*, *Carex*, *Vitis*, *Danthonia*, and *Solidago*. Dominant families (ranked by IV) are the Fabaceae, Asteraceae, Poaceae, and Cyperaceae.

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CHAPTER I

INTRODUCTION

Old-growth forests are of considerable interest today, not only because they often represent settlement-era conditions, but also because of the vital roles they play in the study, appreciation, and protection of biological diversity (Smith and Hamel 1991). Although quantitative defining guidelines for old-growth conditions have not been formulated for many forest types, criteria are available for several regional types (Martin 1992, Parker 1989) and other definitions are being developed by the U.S. Forest Service and The Nature Conservancy (Nowacki and Trianosky 1993).

Generally, old-growth forests are characterized by (among numerous other factors) the presence of a wide range of tree sizes (numerical parameters vary with the forest type) and ages (including snags and downed logs), tree density, basal area and richness, and by community structure and diversity, including a diverse and often characteristic herbaceous layer (Martin 1992, Parker 1989). The herbaceous layer, usually defined as all vascular plants less than 2 m in height, is an important and dynamic forest stratum that is receiving increasing attention in the study of both old-growth and successional forest communities (Gilliam and Turrill 1993, Gilliam *et al.* 1995, Meier *et al.* 1995).

Few old-growth forests exist today within the Western Highland Rim Subsection of the Interior Low Plateaus Province (Chester *et al.* 1995b). Certainly this is true for Land Between The Lakes (LBL), one of the largest publicly owned tracts within the

Subsection. This 69,000 hectare interfluve between the lower Cumberland and Tennessee rivers has been owned and managed by the Tennessee Valley Authority (TVA) for environmental education, conservation, and recreation since the early 1960s. Before public ownership, farming, lumbering, and a formerly thriving iron industry resulted in significant disturbance if not complete removal of most forests. At present, selective timber harvest is on-going by TVA. Still, unique forest communities occur on some xeric, narrow ridges and upper slopes where soils are generally poor and gravelly. In these areas, chestnut oak (*Quercus prinus* L. = *Q. montana* Willd. in some literature) and to a lesser extent post oak (*Q. stellata* Wangenh.) dominate, often in nearly pure stands. Franklin and Fralish (1994), based on research by Fralish *et al.* (1991) in southern Illinois, suggest that such chestnut oak and post oak stands on extremely dry sites are the best representatives of pre-European settlement forest communities in the region. Although the stands were disturbed by the iron industry for charcoal production in the middle 1800s, they mostly have been ignored since because the soil is too poor and the slopees too steeep for agriculture. Also, the slow-growing chestnut and post oaks are not as commercially desirable as other species and hence these communities have not been as severely impacted by loggers either before or after LBL reverted to public ownership.

Chestnut oak, the dominant species of the community investigated here, is a member of the Beech Family (Fagaceae). Other vernaculars are rock chestnut oak, rock oak, and tanbark oak (McQuilkin 1990). Chestnut oak is part of the subgenus *Lepidobalanus* (the white oaks), an inclusive group including species such as *Q. alba, Q. michauxii*, and *Q. muhlenbergii*. The subgenus is characterized by (1) fruits that mature

by the end of the first growing season, (2) leaves or their lobes lacking bristle tips, and (3) stigmas that are sessile or nearly so (Gleason and Cronquist 1991).

Chestnut oaks are slow growing and medium-sized, reaching approximately 30 m (Gleason and Cronquist 1991). The lumber is similar to and marketed as white oak and the acorns are important food for wildlife (McQuilkin 1990). The range is from Alabama and Georgia to southwestern Maine and southern Ontario, extending mostly west and north of the southeastern Coastal Plain. Except for a few disjunctions, the western limit of the range in Kentucky and Tennessee is the Tennessee River (Della-Bianca 1980a). Dry, upland sites and mountain ridges are common habitats (McQuilkin 1990).

Chestnut oak is a major component of two Society of American Foresters (SAF) cover types and is an associated species in numerous others (Della-Bianca 1980b). SAF Type 44, Chestnut Oak, is characteristically a dry-site type with *Q. prinus* in pure stands or comprising a majority of the stocking. Common associates are northern red, southern red, black, post, scarlet, and white oaks; sourwood; shagbark and pignut hickory; yellow poplar; blackgum; sweetgum; red and sugar maple; eastern redcedar; black cherry; and black walnut (Della-Bianca 1980a).

SAF Type 51, White Pine-Chestnut Oak, occurs on both xeric and mesic sites. On xeric sites, *Q. prinus* is associated with scarlet, white, post, and black oaks; hickories; blackgum; sourwood; and red maple. On more mesic sites, associates are northern red and white oak, black locust, yellow poplar, sugar and red maple, and black cherry (Della-Bianca 1980b).

Cover types with chestnut oak as a major component include Eastern White Pine,

White Pine-Hemlock, Red Maple, White Oak-Black Oak-Northern Red Oak, White Oak, Black Oak, Pitch Pine, Virginia Pine, and Virginia Pine-Oak. Associated species vary by region, elevation, and topography (McQuilkin 1990).

Braun (1950) has presented the most widely accepted interpretation of eastern North American forests and noted the contribution of *Q. prinus* in several forest regions and community types. For example, the species-rich Mixed Mesophytic Forest Region includes *Q. prinus* as a dominant member in most mixed oak, oak-hickory, and oak-pine communities, and as a dominant of many subclimax communities. Chestnut oak was a principal associate of American chestnut in the Oak-Chestnut Forest Region before the demise of chestnut, but now is widespread throughout this Region on subxeric sites and on middle and upper slopes (Stephenson *et al.* 1993). Braun also notes that *Q. prinus* occurs on at least some mountainous slopes in the Oak-Pine Forest Region, sometimes in contact with longleaf pine forests. In the transitional Western Mesophytic Forest Region, *Q. prinus* is absent from large areas and mostly replaced by its ecological equivalent, *Q. muhlenbergii* (chinquapin oak).

The significance of *Q. prinus* in Kentucky and Tennessee forests is discussed in several papers included in compendia by Baskin *et al.* (1987) for Kentucky and Chester (1989) for Tennessee and in the forest region summaries for southeastern United States by Martin *et al.* (1993). Specifically, in the Appalachian Mountains east of the Ridge and Valley, Clebsch (1989), Thomas (1989), and White *et al.* (1993) report chestnut oak as important and widespread on dry sites of intermediate elevation. In the Ridge and Valley, Martin (1989) and Stephenson *et al.* (1993) report it as a dominant or important

constituent of forested upper slopes, dry ridges, and other dry sites. Extensive studies on the Cumberland Plateau and Eastern Highland Rim of both states found chestnut oak to be a dominant or to contribute significantly to the extensive dry-xeric forests (Bryant *et al.* 1993, Hinkle 1989, Hinkle *et al.* 1993, McKinney 1989, Martin 1987, Schmalzer 1989, Lebkuecher and Hunter 1991). In the Central Basin, Carpenter *et al.* (1976) and Bryant *et al.* (1993) reported chestnut oak on dry ridges, which are mostly outliers of the Highland Rim. However, on the Western Highland Rim, chestnut oak becomes more irregular in occurrence and reaches its best growth in that subsection near the edge of its range on uplands near the Tennessee River (Bryant *et al.* 1993; Chester and Ellis 1989; Chester *et al.* 1995a). The species also occurs in some dry slope-ridge forests of the Shawnee Hills (Western Coalfields) of Kentucky (Bryant *et al.* 1993).

Studies of Western Highland Rim communities dominated by chestnut oak include those of Wheat and Dimmick (1987) from Houston and Lewis counties, Tennessee; Stack (1982) and Chester *et al.* (1995a) from Stewart County, Tennessee; and Fralish and Crooks (1988, 1989) from Land Between The Lakes, Kentucky and Tennessee. Fralish and Crooks (1988, 1989) found that LBL *Q. prinus* communities exist in two phases, based on a comparison of overstory and understory species composition: (1) compositionally stable communities occur where *Q. prinus* likely will remain the canopy dominant and (2) compositionally unstable (successional) communities that are dominated by *Q. prinus* but that probably will be dominated by *Q. alba* when the present overstory trees die or are cut.

Little quantitative information is available on the herbaceous stratum of specific

Tennessee-Kentucky forests (Baskin *et al.* 1987, Bryant *et al.* 1993, Chester 1989). In reference to chestnut oak forests, Braun (1950) noted the lack of herbaceous diversity in dry oak forests, and low numbers of herbs were reported from chestnut oak forests by Caplenor (1965) from the Cumberland Plateau and by Condley (1984) from the Ridge and Valley. Franklin and Fralish (1994) reported high species richness from the herb stratum of ridge forest communities but did not provide a list.

The goal of this research was to document and quantitatively characterize the herbaceous stratum of old-growth chestnut oak forests in Land Between The Lakes, Kentucky and Tennessee. Herbaceous plants are herein defined as non-woody species with the exception of woody vines such as *Parthenocissus quinquefolia* and semi-shrubs such as *Hypericum stragulum*.

CHAPTER 2

METHODS

Study Sites

Ten representative sites were selected in Land Between the Lakes. 1 site was in Lyon County, Kentucky, seven were in Trigg County, Kentucky, and two were in Stewart County, Tennessee. None of the sites showed evidence of recent anthropogenic disturbance. Sites were selected after conferences with LBL forestry personnel and investigators at The Center for Field Biology at Austin Peay State University, from studying topographic quadrangle maps, and after site reconnaissance. Only compositionally stable sites (*sensu* Fralish and Crooks 1988, 1989) were studied. Three sites (numbers 1, 2, and 3 in the following list) were on slopes directly above the Tennessee River at elevations of 122 ± 6 meters above sea level. The other sites were on narrow ridge crests and adjacent slopes at an elevation of 152 ± 6 meters above sea level, but not directly adjacent to the reservoirs.

The bedrock at all sites is mostly cherty limestones of the Mississippian System. Tuscaloosa white chert gravels of Cretaceous age occur over most of the uplands of the area and these are sometimes overlain by the Cretaceous McNairy Sand. Also, brown gravels (Tertiary-Quaternary) and silty loess (Pleistocene) veneer some sites (Harris 1988). The surface of many ridges and slopes where this study was conducted often lacked vegetation or litter and patches (often several square meters) of white gravel or

conglomerate were exposed.

Soils are within the Cumberland-Tennessee River and Highland Rim sections of Kentucky (Bailey and Winsor 1964) and Tennessee (Springer and Elder 1980). A variety of parent materials have contributed to present soils, including thin loess, gravel, and chert. Most soils of the sites are of the Baxter and Bodine series and are highly porous, infertile, and droughty (Harris 1988, Fralish *et al.* 1993). Additional descriptive data for each sampling site follows.

Site Number 1. Pilgrim's Rest, Lyon County, Kentucky. 36°58'27" N/88°12'54" W on the Birmingham Point, KY., 1967, USGS 7.5' Quadrangle. Four plots were taken, all on west aspect, 50-65% slope.

Site Number 2. Fenton North, Trigg County Kentucky. 36°46'27" N/88°06'36" W on the Fenton, KY., 1967, USGS 7.5' Quadrangle. Five plots were taken, all on west aspect, approximately 45% slope.

Site Number 3. Fenton South, Trigg County, Kentucky. 36°46'25" N/88°06'19" W on the Fenton, KY., 1967, USGS 7.5' Quadrangle. Three plots were taken, all on west to northwest aspects, 45-50% slope.

Site Number 4. Eagle Point, Trigg County, Kentucky. 36°44'08" N/88°05'03" W on the Rushing Creek KY.-TENN., 1950, photorevised 1971, photoinspected 1981, USGS 7.5' Quadrangle. Four plots were taken, all on south to southwest aspects, 10-42% slope.

Site Number 5. Colson, Trigg County, Kentucky. 36°43'57" N/88°04'46" W on the Rushing Creek KY.-TENN., 1950, photorevised 1971, photoinspected 1981, USGS

7.5' Quadrangle. Four plots were taken, all on west aspects, 2-45% slope.

Site Number 6. Bald Knob, Trigg County, Kentucky. 36°49'38" N/88°01'23" W on the Fenton, KY., 1967, USGS 7.5' Quadrangle. Six plots were taken, all on south to southwest aspects, 5-45% slope.

Site Number 7. Fire Tower, Trigg County, Kentucky. 36°49'29" N/88°01'45" W on the Fenton, KY., 1967 ,USGS 7.5' Quadrangle. Four plots were taken, all on west aspects, 0-45% slope.

Site Number 8. Bogard Cemetery, Trigg County, Kentucky. 36°47'37" N/88°01'36" W on the Fenton, KY., 1967, USGS 7.5' Quadrangle. Five plots were taken, all on south to southwest aspects, 5-45% slope.

Site Number 9. Byrd Bay, Stewart County, Tennessee. 36°33'55" N/88°01'28" W on the Hamlin, KY.-TENN., 1950, photorevised 1971, USGS 7.5' Quadrangle. Five plots were taken, all on south to west aspects, 4-20% slope.

Site Number 10. Wallace Cemetery, Stewart County, Tennessee. 36°34'01" N/88°01'05" W on the Hamlin, KY.-TENN., 1950, photorevised 1971, USGS 7.5' Quadrangle. Five plots were taken, all on south to west aspects, 7-22% slope.

Field Sampling

Within each site, 3-6 permanently marked macroplots were established along a mid-slope transect for slopes or along a ridge transect for ridge sites. Each macroplot was circular with a radius of 11.35 m, thus covering 0.04 ha, with the center marked by a plastic stake driven to ground level and identified by witness trees and distances. For

sampling, each macroplot was divided into four equal subplots, each encompassing 10 m^2, arranged, numbered, and identified by polar coordinates.

Spring flora was sampled 12, 13, 21, 22 May; 2, 3, 9, 10, 16, 17, 23 June; and 1 July, 1997. Summer and fall flora were sampled 14 and 22 July and 5, 6, and 19 September, 1997. During each sampling visit, each subplot and non-sampled areas of the forest stand were carefully surveyed for floristic composition and a species list taken. Specimens were collected only if laboratory identification was required or for permanent vouchers in some cases. Return visits often were required to observe flowering or fruiting necessary for identifications. The percentage of each subplot's area covered by each species, bare ground (including rock and gravel), litter, and bryophytes was visually estimated according to the percentage coverage scale of Daubenmire (1959, 1968) as modified by Bailey and Poulton (1968). The coverage classes, range of percentage cover for each, and class midpoints, which were used in calculations, were: Class 1 (0-1%, 0.5), Class 2 (2-5%, 3.0); Class 3 (6-25%, 15.0); Class 4 (26-50%, 37.5); Class 5 (51-75%, 62.5); Class 6 (76-95%, 85.0); and Class 7 (96-100%, 97.5).

Slope aspects were obtained from compass readings and percent slope was determined by a Haga altimeter. Latitude and longitude were determined with a Global Positioning System (Magellan GPS Nav 500 Pro).

Data Analysis

Total flora was determined from samples and overall floristic observations. Each species was categorized by major plant group and family with arrangement and

nomenclature following Wofford and Kral (1993). Floristic analyses included: (1) determination of the most important families and genera based on number of taxa; (2) hardiness categories, *i.e.*, numbers and percentage of the flora that is totally herbaceous, semi-shrubs, and woody vines; (3) taxa listed as elements of concern in Tennessee and/or Kentucky, (4) life forms, *i.e.*, annuals versus perennials, and comparison of percentages with Raunkiaerian spectra on a world-wide basis and with published values for Kentucky and contiguous states.

Presence, or the percentage of the 10 stands in which a given species occurred (Barbour *et al.* 1987) was determined and a presence table constructed. Presence classes were determined as defined by Oosting (1956): Class 1 (rare, species found in 1-20% of stands), Class 2 (seldom present, species found in 21-40% of stands), Class 3 (often present, species found in 41-60% of stands), Class 4 (mostly present, species found in 61-80% of stands), and Class 5 (constantly present, species found in 81-100% of stands). Data were compared with the normal presence distribution (Oosting 1956).

Floristic similarity between stands, based on species presence, was calculated by the Sorenson Index of Similarity (IS_s) to determine if the stands were members of the same community, (Barbour *et al.* 1987). The equation is: $IS_s = (2C/ A+B) \times 100$, where A = number of species in stand 1; B = number of species in stand 2; and C = number of species in common.

A frequency table was prepared for the 180 plots using the frequency classes of Oosting (1956): Class A (species found in 1-20% of subplots = 1-36 plots), Class B (species found in 21-40% of subplots =37-42 plots), Class C (species found in 41-60% of

subplots =43-108 plots), Class D (species found in 61-80% of subplots =109-144 plots), and Class E (species found in 81-100% of subplots = 145-180 plots). Data were compared with the normal distribution (Oosting 1956).

Community structure was determined, based on importance values defined by Barbour *et al.* (1987). Frequency (percent of 180 quadrats in which a species occurred), relative frequency (the percent contributed by a species to total frequency), total coverage, average coverage (total coverage/180), and percent (relative) coverage (total coverage of a species/total coverage of all species X 100) were determined. Importance value (200) was obtained for each species by summing the relative values.

CHAPTER 3

RESULTS AND DISCUSSION

Total Flora

Based on plot sampling (114 species sampled) and floristic surveys (an additional 5 species observed) of 10 stands, the known herbaceous flora of the chestnut oak forest communities of the Northwestern Highland Rim, southwestern central Kentucky and northwestern middle Tennessee, consists of 119 species within 81 genera and 39 families, 3 taxa (2.5%) are not native. A statistical summary is given in Table 1 and an annotated list, with author citations, is included in Appendix A.

Table 1. Statistical summary of the herbaceous flora of ten chestnut oak stands, Northwestern Highland Rim, Kentucky and Tennessee.

			Species		
Major Groups	Families	Genera	Native	Non-native	Total
Pteridophytes	3	3	3	-	3
Angiosperms					
Monocots	7	16	26	-	26
Dicots	29	62	87	3	90
Totals	39	81	116	3	119

Four families, the Asteraceae (19 taxa), Fabaceae (17 taxa), Poaceae (14 taxa), and Rosaceae (6 taxa) include 49.12 percent of the flora. Other relatively prominent families are the Cyperaceae (6 taxa), Brassicaceae (4 taxa), and Lamiaceae (4 taxa). The largest genus is *Carex* (6 taxa), followed by *Solidago* and *Lespedeza* (5 taxa each), *Aster*, *Panicum* and *Desmodium* (4 taxa each), and *Hypericum* and *Viola* (3 taxa each). Genera with 2 taxa are *Andropogon*, *Arabis*, *Asclepias*, *Galium*, *Hedyotis*, *Helianthus*, *Krigia*, *Oxalis*, *Rubus*, *Smilax*, and *Vitis*. The flora includes 4 species of semi-shrubs (*Hypericum stragulum*, *Rosa carolina*, *Rubus argutus*, and *Rubus flagellaris*) and 9 species of woody vines (*Bignonia capreolata*, *Campsis radicans*, *Parthenocissus quinquefolia*, *Smilax bona-nox*, *S. glauca*, *Toxicodendron radicans*, *Vitis aestivalis*, *V. rotundifolia*, and *Wisteria frutescens*). No listed taxa for Kentucky or Tennessee were found (Kentucky State Nature Preserves Commission 1997, Tennessee Natural Heritage Program 1997).

When the 119 documented herbaceous taxa are added to the 33 species of trees and shrubs sampled and surveyed from these 10 sites by Chester *et al.* (1998), the total flora becomes 152 taxa. Seventeen (11.2 percent) of the 152 species are annuals. The normal Raunkiaerian spectrum (Phillips 1959) shows that 13 percent of species worldwide are annuals. Gibson (1961) found 11.8 percent annuals in the Kentucky flora, while Luken and Thieret (1988) found 12.5 percent annuals in the Ohio flora. The annual habit dominates some floras, especially deserts, where over 90 percent of the plants are annuals (Barbour *et al.* 1987). In temperate eastern America, the annual life cycle is favored by situations that reduce adult survival, such as disturbance and the existence of temporary habitats (Barbour *et al.* 1987). Such communities as agronomic and

successional fields and disturbed forests are especially high in percent annuals. The percentage of annuals in this study (11.2 percent) falls below the worldwide average of Raunkiaer (13.0 percent), as well as that of Kentucky as a whole (11.8 percent), and adjacent Ohio (12.5 percent), suggesting that these chestnut oak forests are relatively undisturbed.

Presence

Each of the 114 species sampled was categorized by presence class (Table 2, Figure 1) and compared to the normal distribution of Oosting (1956). Twenty species (17.5 percent) are in Class 5 (14 species occur in 10 stands and 6 species in 9 stands); the normal distribution is 9.3 percent. Thirteen species (11.4 percent) are in Class 4 (6 species occur in 8 stands and 7 species in 7 stands); the normal distribution is 9.3 percent. Eleven species (9.6 percent) are in Class 3 (6 species occur in 6 stands and 5 species in 5 stands); the normal distribution is 9.3 percent. Fifteen species (13.2 percent) are in Class 2 (8 species occur in 4 stands and 7 species in 3 stands); the normal distribution is 16.0 percent. Fifty-five species (48.2 percent) are in Class 1 (23 species occur in 2 stands and 32 species in 1 stand); the normal distribution is 56.0 percent.

Taxa occurring in classes 4 and 5 are considered mostly present and constantly present, respectively, by Oosting (1956). These results show that mostly present and constantly present species outnumber rarely-encountered or seldom present species, indicating a more uniform herbaceous flora in the chestnut oak stands than normally encountered.

Table 2. Stands in which each species occurred, total stands occurrence (= presence), and presence classes of 114 species sampled in ten chestnut oak stands, Northwestern Highland Rim, Kentucky, and Tennessee;

x = present and - = absent.

TAXA	Stands										Total Stands	Presence Class
	1	2	3	4	5	6	7	8	9	10		
Acalypha virginica	x	-	-	-	-	-	x	-	-	-	2	1
Agalinis tenuifolia	x	-	-	-	-	-	-	-	-	-	1	1
Agrimonia rostellata	-	-	-	-	-	-	x	-	-	-	1	1
Agrostis perennans	x	-	x	-	-	-	x	-	-	-	3	2
Ambrosia artemesiifolia	x	-	-	-	-	-	x	-	-	-	2	1
Andropogogon gyrans	-	-	-	-	-	x	-	-	-	x	2	1
Andropogon virginicus	-	x	-	-	-	x	x	-	x	x	5	3
Antennaria plantaginifolia	x	x	x	x	x	x	x	x	x	x	10	5
Apocynum cannabium	-	-	-	-	-	x	-	-	-	-	1	1
Arabis canadensis	-	-	-	x	-	-	-	-	-	-	1	1
Arabis laevigata	x	-	-	x	-	-	-	-	-	-	2	1
Aristolochia serpentaria	-	-	-	-	-	-	-	-	x	-	1	1
Asclepias amplexicaulis	-	-	-	-	-	-	x	-	-	-	1	1
Asplenium platyneuron	-	-	x	-	-	-	-	-	x	-	2	1
Aster lateriflorus	x	-	-	-	-	-	-	-	-	-	1	1
Aster linariifolius	x	x	-	x	x	x	x	x	x	x	9	5

Table 2 (continued)

TAXA	Stands 1	2	3	4	5	6	7	8	9	10	Total Stands	Presence Class
Aster patens	x	-	-	x	-	-	-	-	-	-	2	1
Aureolaria pectinata	-	-	-	-	-	-	-	x	x	-	2	1
Baptisia bracteata	-	-	-	-	-	x	-	x	-	-	2	1
Bignonia capreolata	x	-	-	-	-	-	-	-	-	-	1	1
Campsis radicans	x	-	-	-	-	-	-	-	-	-	1	1
Cardamine hirsuta	-	-	-	x	-	-	-	-	x	-	2	1
Carex albicans	x	x	x	x	x	x	x	x	x	x	10	5
Carex blanda	-	-	x	x	-	x	-	-	-	-	3	2
Carex cephalophora	x	-	x	x	x	x	x	x	x	x	9	5
Carex complanata	x	-	x	x	x	-	x	-	-	x	6	3
Carex muhlenbergii	x	-	-	-	-	x	-	x	x	-	4	2
Carex picta	-	-	-	-	-	-	-	-	x	-	1	1
Chamaecrista fasciculata	-	-	-	-	-	-	x	-	-	-	1	1
Coreopsis major	-	x	-	x	x	x	x	-	x	x	7	4
Clitoria mariana	-	-	-	x	x	x	x	x	x	x	7	4
Cunila origanoides	x	x	x	x	x	x	x	x	x	x	10	5
Danthonia spicata	x	x	x	x	x	x	x	x	x	x	10	5
Dasystoma macrophylla	x	-	x	-	x	x	-	x	x	-	6	3
Dentaria laciniata	x	-	-	-	-	-	-	-	-	-	1	1
Desmodium canescens	-	-	-	x	x	x	x	x	x	x	7	4
Desmodium nudiflorum	x	-	-	-	-	x	x	x	-	-	4	2
Desmodium paniculatum	-	-	-	-	-	-	x	-	-	-	1	1
Desmodium rotundifolium	-	-	-	-	-	x	-	-	-	-	1	1

Table 2 (continued)

TAXA	Stands 1	2	3	4	5	6	7	8	9	10	Total Stands	Presence Class
Dioscorea villosa	-	-	-	x	-	-	-	-	-	-	1	1
Elymus virginicus	x	-	-	-	x	-	x	-	-	-	3	2
Eragrostis hirsuta	-	-	-	-	-	-	x	-	-	-	1	1
Erigeron annuus	-	-	-	-	x	-	-	-	-	-	1	1
Eupatorium serotinum	-	-	x	-	-	-	-	-	-	-	1	1
Euphorbia corollata	x	x	x	x	x	x	x	x	x	x	10	5
Galium aparine	x	-	-	x	-	-	-	-	-	-	2	1
Galium circaezans	x	-	x	x	x	x	x	-	x	x	8	4
Hedeoma pulegioides	x	-	-	-	-	-	-	-	x	-	2	1
Hedyotis caerulea	x	x	x	-	x	x	x	x	-	x	8	4
Hedyotis purpurea	x	-	x	x	x	x	x	x	x	-	8	4
Helianthus divaricatus	-	-	-	x	-	-	x	-	-	-	2	1
Helianthus hirsutus	-	-	-	-	-	-	x	-	-	-	1	1
Heuchera villosa	x	-	x	-	x	-	x	-	x	-	5	3
Hieracium gronovii	x	x	x	x	x	x	x	x	x	x	10	5
Hypericum denticulatum	-	-	-	-	-	x	-	-	x	-	2	1
Hypericum gentianoides	-	-	-	-	-	-	-	-	x	-	1	1
Hypericum stragulum	x	x	x	x	x	x	x	x	x	x	10	5
Krigia biflora	x	x	x	-	-	x	x	x	-	-	6	3
Krigia dandelion	-	-	-	x	-	x	-	-	x	-	3	2
Lechea tenuifolia	-	-	-	-	-	-	-	-	x	x	2	1
Lespedeza hirta	x	x	x	x	x	x	x	x	x	x	10	5
Lespedeza intermedia	x	x	x	x	x	x	x	x	x	x	10	5
Lespedeza procumbens	x	-	-	x	x	x	x	x	x	x	8	4

Table 2 (continued)

TAXA	Stands 1	2	3	4	5	6	7	8	9	10	Total Stands	Presence Class
Lespedeza repens	-	-	-	x	x	x	x	x	x	x	7	4
Lespedeza virginica	-	-	-	-	x	-	x	-	-	-	2	1
Linum virginianum	-	-	-	-	-	-	-	x	-	-	1	1
Luzula echinata	x	x	x	-	-	x	x	-	x	-	6	3
Melilotus officinalis	-	-	x	-	-	-	-	-	-	-	1	1
Monarda fistulosa	-	-	-	-	-	-	x	-	x	-	2	1
Monotropa hypopithys	-	-	-	-	-	x	x	-	-	-	2	1
Myosotis verna	x	-	x	x	-	-	-	-	-	-	3	2
Opuntia humifusa	-	-	-	x	x	-	-	-	-	-	2	1
Oxalis stricta	x	-	x	-	-	x	x	-	x	-	5	3
Oxalis violacea	x	-	-	x	x	x	x	-	-	x	6	3
Panicum boscii	x	-	-	-	x	-	-	-	-	-	2	1
Panicum commutatum	x	-	x	-	-	x	x	x	x	x	7	4
Panicum depauperatum	x	x	x	x	x	x	x	x	x	x	10	5
Panicum dichotomum	x	-	x	x	x	x	x	x	x	x	10	5
Parthenocissus quinquefolia	x	x	x	x	x	x	x	x	x	x	10	5
Passiflora lutea	x	-	-	x	-	-	-	-	-	-	2	1
Polygonatum biflorum	-	x	x	-	x	x	x	x	x	-	7	4
Polygonum scandens	x	-	-	-	-	-	-	-	-	-	1	1
Polypodium polypodioides	-	-	-	-	x	-	-	-	-	-	1	1
Porteranthus stipulatus	-	-	x	-	x	-	-	-	x	x	4	2
Potentilla simplex	-	-	-	-	x	x	-	-	x	x	4	2
Pteridium aquilinum	x	x	x	-	x	-	-	x	x	x	7	4

Table 2 (continued)

TAXA	Stands 1	2	3	4	5	6	7	8	9	10	Total Stands	Presence Class
Rosa carolina	-	-	-	x	x	x	x	-	x	-	5	3
Rubus argutus	x	-	-	x	-	x	-	x	-	-	4	2
Rubus flagellaris	x	-	-	x	-	-	-	-	-	x	3	2
Sanicula canadensis	-	-	-	-	x	-	-	-	-	-	1	1
Schizachyrium scoparium	-	-	x	-	-	-	-	-	-	-	1	1
Scutellaria parvula	-	-	-	-	-	-	-	-	x	x	2	1
Silene antirrhina	-	-	-	x	-	-	-	-	-	-	1	1
Smilax bona-nox	x	x	x	-	-	-	-	-	x	-	4	2
Smilax glauca	x	x	x	x	x	x	x	x	-	x	9	5
Solidago caesia	x	x	x	-	-	-	x	-	-	-	4	2
Solidago erecta	-	x	x	x	x	x	x	-	x	x	8	4
Solidago hispida	x	-	-	-	-	-	-	-	-	-	1	1
Solidago nemoralis	x	-	-	x	-	-	x	x	x	-	5	3
Solidago ulmifolia	x	-	x	x	x	x	x	x	x	x	9	5
Sphenopholis obtusata	x	-	x	x	x	-	x	-	x	-	6	3
Spiranthes tuberosa	-	-	-	-	-	x	x	-	x	-	3	2
Stylosanthes biflora	-	-	-	-	-	x	-	-	-	x	2	1
Tephrosia virginiana	-	x	x	x	x	x	x	x	x	x	9	5
Toxicodendron radicans	x	x	x	x	x	x	x	x	x	x	10	5
Triodanis perfoliata	x	x	-	x	x	x	x	-	x	x	8	4
Viola palmata	-	-	x	-	-	-	-	-	-	-	1	1
Viola pedata	-	-	-	-	x	-	-	-	x	-	2	1
Viola sororia	-	-	-	-	-	-	-	-	x	-	1	1
Vitis aestivalis	x	x	x	x	x	x	x	x	-	x	9	5
Vitis rotundifolia	x	x	x	x	x	x	x	x	x	x	10	5

Table 2 (continued)

TAXA	Stands										Total Stands	Presence Class
	1	2	3	4	5	6	7	8	9	10		
Vulpia octoflora	-	x	-	x	x	-	-	x	-	-	4	2
Wisteria frutescens	x	-	-	-	-	-	-	-	-	-	1	1

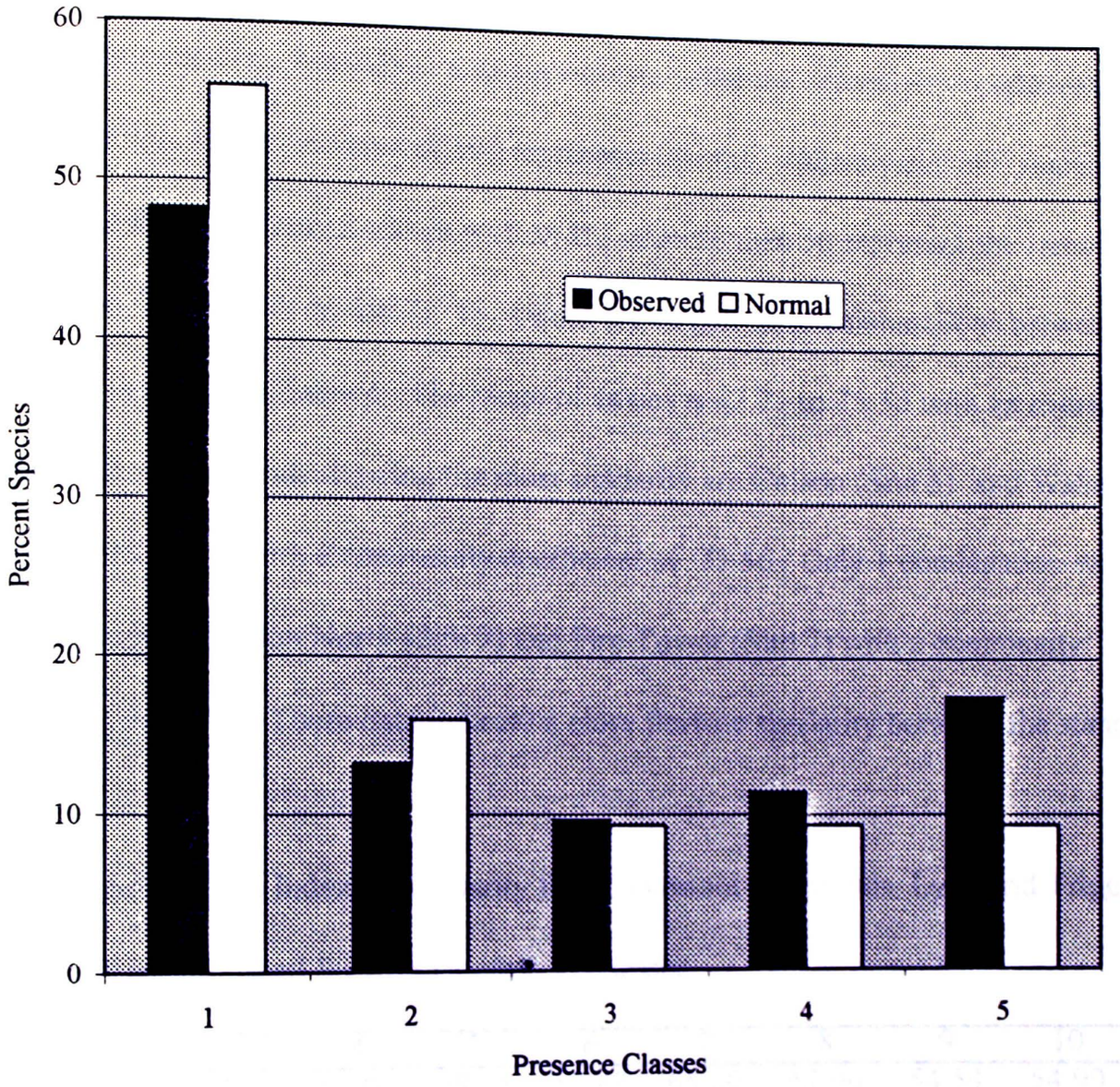

Figure 1. Histogram comparing the observed presence distribution to the normal distribution of Oosting (1956) for 114 sampled species found in 10 chestnut oak stands, Lyon and Trigg counties, Kentucky, and Stewart County, Tennessee.

Floristic Similarity

Floristic similarity (based on species presence) between each of the 10 stands was determined by Sorenson's Index of Similarity (IS_S). This index expresses the floristic similarity between any 2 stands in a single number called the community coefficient (Barbour *et al.* 1987). A value of 100 represents identity, while a value of 0 represents complete difference. Any 2 stands with an IS_S of more than 50 represent the same association (Barbour *et al.* 1987). IS_S values for all pair-wise combinations between the 10 stands is shown in Table 4. The range of values is 47.73 to 75.56 with an average value of 63.14. Stands showing the most similarity are Colson (Site 5) and Wallace Cemetery (Site 10) with a community coefficient of 75.56. Only 1 combination was less than 50 percent, Fenton North (Site 2) and Fire Tower (Site 7) with a community coefficient of 47.73. These data indicate a close floristic similarity between the stands.

Table 3. Sorenson's Index of Similarity for 10 chestnut oak stands, Lyon and Trigg counties, Kentucky, and Stewart County, Tennessee.

Site	2	3	4	5	6	7	8	9	10
1	51.11	64.76	63.06	58.18	57.89	65.00	62.00	54.54	54.90
2	-	65.75	53.16	61.54	58.54	47.73	64.71	53.49	62.86
3	-	-	55.32	64.52	61.86	64.08	62.65	61.39	61.18
4	-	-	-	70.71	66.02	55.05	62.92	59.81	68.13
5	-	-	-	-	68.63	70.37	63.27	67.92	75.56
6	-	-	-	-	-	73.21	73.91	70.91	72.34
7	-	-	-	-	-	-	63.27	63.79	66.00
8	-	-	-	-	-	-	-	62.50	67.50
9	-	-	-	-	-	-	-	-	69.39

Frequency

Each of the 114 sampled species was categorized by frequency class (Table 3, Figure 2) and compared to the normal distribution of Oosting (1956). One species (0.88 percent) is in Class E; the normal distribution is 16 percent. One species (8.8 percent) is in Class D; the normal distribution is 8.0 percent. Sixteen species (14.0 percent) are in Class C; the normal distribution is 9.0 percent. Two species are in Class B (1.75 percent); the normal distribution is 14 percent. Ninety-four species (82.5 percent) are in Class A; the normal distribution is 53 percent.

Species with high frequency values are: *Carex albicans* (99.44 percent), *Danthonia spicata* (77.78 percent), *Toxicodendron radicans* (57.78 percent), *Lespedeza hirta* (56.11 percent), *Panicum dichotomum* (55.56 percent), *Cunila origanoides* (51.67 percent), *Hieracium gronovii* (45.00 percent), *Parthenocissus quinquefolia* (42.78 percent), and *Aster linariifolius* (41.11 percent).

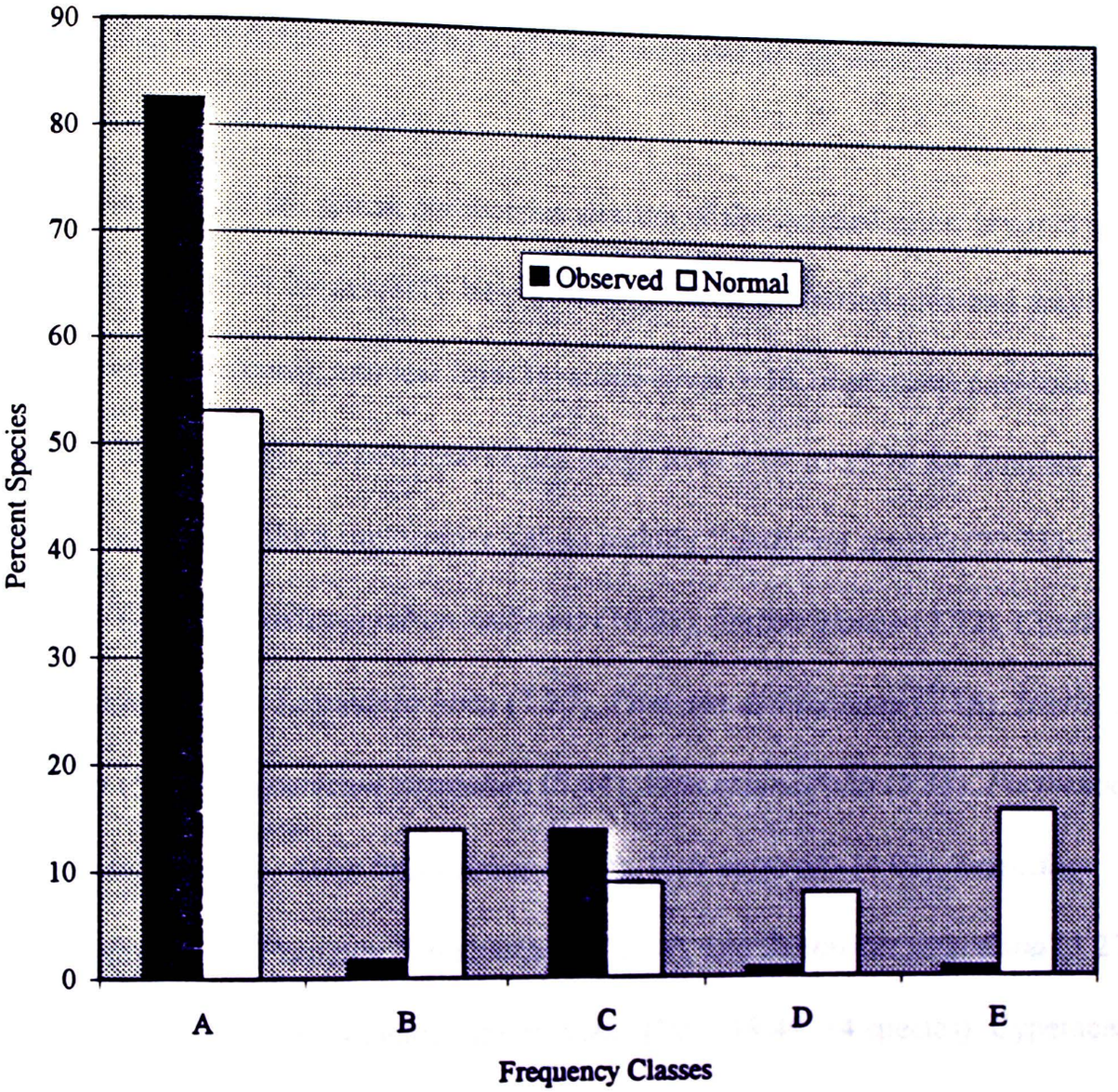

Figure 2. Histogram comparing the observed frequency distribution to the normal distribution of Oosting (1956) for 114 sampled species in ten chestnut oak stands, Lyon and Trigg counties, Kentucky, and Stewart County, Tennessee.

Community Structure

Community structure was determined based on importance values. Importance refers to the relative contribution of each species to the entire community (Barbour *et al.* 1987) and here is defined as the sum of relative cover and relative frequency with a maximum value of 200 (Table 4).

Because of the sparse herbaceous stratum of the sampled plots, bryophytes (average cover = 57.29 percent), bare ground (including exposed rock and gravel; average cover = 19.99 percent), and leaf litter (average cover = 18.19 percent) compose the majority of the cover. Importance values range from 0.07 to 22.73 for sampled taxa. Species with the highest importance values include *Danthonia spicata* (22.73), *Carex albicans* (20.12), *Toxicodendron radicans* (10.05), *Smilax glauca* (7.72), *Cunila origanoides* (7.57), *Lespedeza hirta* (7.27), *Panicum dichotomum* (7.18), *Hieracium gronovii* (5.66), *Hypericum stragulum* (5.44), *Vitis rotundifolia* (5.33), *Parthenocissus quinquefolia* (5.14), *Aster linariifolius* (4.97), *Vitis aestivalis* (4.93), *Lespedeza intermedia* (4.60), *Panicum depauperatum* (3.34), and *Tephrosia virginiana* (3.27).

Dominant families include the Poaceae (IV = 38.49, 14 species), Cyperaceae (IV = 27.56, 6 species), Asteraceae (IV = 26.11, 18 species), and Fabaceae (IV = 25.58, 16 species). Dominant genera include *Carex* (IV = 27.56, 6 species), *Danthonia* (IV = 22.73, 1 species), *Lespedeza* (IV = 16.23, 5 species), *Panicum* (IV = 11.86, 4 species), *Vitis* (IV = 10.26, 2 species), and *Solidago* (IV = 6.66, 5 species).

Table 4. Number of plots occurrence, frequency, total cover, and average cover for bare ground, bryophytes, and litter; number of plots occurrence, frequency, relative frequency, total cover, average cover, relative cover, and importance value (200) for each of 114 sampled species in 180 10 m^2 plots in 10 chestnut oak stands, Northwestern Highland Rim, Kentucky and Tennessee.

Category	No. Plots	Freq. (%)	Rel. Freq	Total Cover	Avg. Cover	Rel. Cover	IV-200
Bare Ground	177	98.33		3597.5	19.99		
Bryophytes	180	100.00		10313	57.29		
Litter	179	99.44		3274.5	18.19		
Species							
Acalypha virginica	3	1.67	0.13	1.50	0.01	0.08	0.21
Agalinis tenuifolia	3	1.67	0.13	1.50	0.01	0.08	0.21
Agrimonia rostellata	1	0.56	0.04	0.50	0.00	0.03	0.07
Agrostis perennans	5	2.78	0.21	1.50	0.01	0.08	0.29
Ambrosia artemesiifolia	2	1.11	0.08	0.50	0.00	0.03	0.11
Andropogogon gyrans	2	1.11	0.08	1.00	0.01	0.05	0.13
Andropogon virginicus	9	5.00	0.37	4.50	0.03	0.23	0.60
Antennaria plantaginifolia	34	18.89	1.41	17.50	0.10	0.88	2.29
Apocynum cannabium	1	0.56	0.04	0.50	0.00	0.03	0.07
Arabis canadensis	6	3.33	0.25	2.50	0.01	0.13	0.38

Table 4 (continued)

Species	No. Plots	Freq. (%)	Rel. Freq	Total Cover	Avg. Cover	Rel. Cover	IV-200
Arabis laevigata	5	2.78	0.21	3.00	0.02	0.15	0.36
Asclepias amplexicaulis	1	0.56	0.04	0.50	0.00	0.03	0.07
Asplenium platyneuron	5	2.78	0.21	2.50	0.01	0.13	0.34
Aster lateriflorus	1	0.56	0.04	0.50	0.00	0.03	0.07
Aster linariifolius	74	41.11	3.08	37.50	0.21	1.89	4.97
Aster patens	4	2.22	0.17	2.00	0.01	0.10	0.27
Aureolaria pectinata	3	1.67	0.13	1.00	0.01	0.05	0.18
Baptisia bracteata	6	3.33	0.25	3.00	0.02	0.15	0.40
Bignonia capreolata	8	4.44	0.33	4.00	0.02	0.20	0.53
Campsis radicans	2	1.11	0.08	1.00	0.01	0.05	0.13
Cardamine hirsuta	8	4.44	0.33	4.00	0.02	0.20	0.53
Carex albicans	179	99.44	7.44	251.50	1.40	12.68	20.12
Carex blanda	6	3.33	0.25	4.00	0.02	0.20	0.45
Carex cephalophora	35	19.44	1.46	16.50	0.09	0.83	2.29
Carex complanata	10	5.56	0.42	5.00	0.03	0.25	0.67
Carex muhlenbergii	6	3.33	0.25	3.00	0.02	0.15	0.40
Carex picta	8	4.44	0.33	65.50	0.36	3.30	3.63
Chamaecrista fasciculata	1	0.56	0.04	0.50	0.00	0.03	0.07
Coreopsis major	49	27.22	2.04	24.50	0.14	1.23	3.27
Clitoria mariana	35	19.44	1.46	22.50	0.13	1.13	2.59
Cunila origanoides	93	51.67	3.87	73.50	0.41	3.70	7.57
Danthonia spicata	140	77.78	5.82	335.50	1.86	16.91	22.73

Table 4 (continued)

Species	No. Plots	Freq (%)	Rel. Freq	Total Cover	Avg. Cover	Rel. Cover	IV-200
Dasystoma macrophylla	9	5.00	0.37	4.50	0.03	0.23	0.60
Dentaria laciniata	1	0.56	0.04	0.50	0.00	0.03	0.07
Desmodium canescens	12	6.67 2	0.50	6.00	0.03	0.30	0.80
Desmodium nudiflorum	23	12.78	0.96	11.50	0.06	0.58	1.54
Desmodium paniculatum	2	1.11	0.08	1.00	0.01	0.05	0.13
Desmodium rotundifolium	1	0.56	0.04	0.50	0.00	0.03	0.07
Dioscorea villosa	1	0.56	0.04	0.50	0.00	0.03	0.07
Elymus virginicus	6	3.33	0.25	3.00	0.02	0.15	0.40
Eragrostis hirsuta	1	0.56	0.04	0.50	0.00	0.03	0.07
Erigeron annuus	1	0.56	0.04	0.50	0.00	0.03	0.07
Eupatorium serotinum	2	1.11	0.08	1.00	0.01	0.05	0.13
Euphorbia corollata	39	21.67	1.62	18.00	0.10	0.91	2.53
Galium aparine	3	1.67	0.13	1.50	0.01	0.08	0.21
Galium circaezans	23	12.78	0.96	11.50	0.06	0.58	1.54
Hedeoma pulegioides	3	1.67	0.13	1.50	0.01	0.08	0.21
Hedyotis caerulea	46	25.56	1.91	25.00	0.14	1.26	3.17
Hedyotis purpurea	29	16.11	1.21	14.50	0.08	0.73	1.94
Helianthus hirsutus	1	0.56	0.04	0.50	0.00	0.03	0.07
Helianthus divaricatus	3	1.67	0.13	1.50	0.01	0.08	0.21

Table 4 (continued)

Species	No. Plots	Freq. (%)	Rel. Freq	Total Cover	Avg. Cover	Rel. Cover	IV-200
Heuchera villosa	9	5.00	0.37	4.50	0.03	0.23	0.60
Hieracium gronovii	81	45.00	3.37	45.50	0.25	2.29	5.66
Hypericum denticulatum	2	1.11	0.08	1.00	0.01	0.05	0.13
Hypericum gentianoides	1	0.56	0.04	2.00	0.01	0.10	0.14
Hypericum stragulum	83	46.11	3.45	39.50	0.22	1.99	5.44
Krigia biflora	25	13.89	1.04	12.50	0.07	0.63	1.67
Krigia dandelion	8	4.44	0.33	6.50	0.04	0.33	0.66
Lechea tenuifolia	5	2.78	0.21	2.50	0.01	0.13	0.34
Lespedeza hirta	101	56.11	4.20	61.00	0.34	3.07	7.27
Lespedeza intermedia	67	37.22	2.79	36.00	0.20	1.81	4.60
Lespedeza procumbens	36	20.00	1.50	18.00	0.10	0.91	2.41
Lespedeza repens	26	14.44	1.08	13.00	0.07	0.66	1.74
Lespedeza virginica	3	1.67	0.13	1.50	0.01	0.08	0.21
Linum virginianum	1	0.56	0.04	0.50	0.00	0.03	0.07
Luzula echinata	27	15.00	1.12	15.50	0.09	0.78	1.90
Melilotus officinalis	1	0.56	0.04	0.50	0.00	0.03	0.07
Monarda fistulosa	2	1.11	0.08	1.00	0.01	0.05	0.13
Monotropa hypopithys	3	1.67	0.13	1.50	0.01	0.08	0.21
Muhlenbergia sobolifera	3	1.67	0.13	1.50	0.01	0.08	0.21
Myosotis verna	9	5.00	0.37	4.50	0.03	0.23	0.60

Table 4 (continued)

Species	No Plots	Freq (%)	Rel. Freq	Total Cover	Avg. Cover	Rel. Cover	IV-200
Opuntia humifusa	7	3.89	0.29	3.50	0.02	0.18	0.41
Oxalis stricta	12	6.67	0.50	6.00	0.03	0.30	0.80
Oxalis violacea	19	10.56	0.79	9.50	0.05	0.48	1.27
Panicum boscii	1	0.56	0.04	0.50	0.00	0.03	0.07
Panicum commutatum	19	10.56	0.79	9.50	0.05	0.48	1.27
Panicum depauperatum	50	27.78	2.08	25.00	0.14	1.26	3.34
Panicum dichotomum	100	55.56	4.16	60.00	0.33	3.02	7.18
Parthenocissus quinquefolia	77	42.78	3.20	38.50	0.21	1.94	5.14
Passiflora lutea	3	1.67	0.13	1.50	0.01	0.08	0.21
Polygonatum biflorum	25	13.89	1.04	12.50	0.07	0.63	1.67
Polygonum scandens	1	0.56	0.04	0.50	0.00	0.03	0.07
Polypodium polypodioides	1	0.56	0.04	0.50	0.00	0.03	0.07
Porteranthus stipulatus	13	7.22	0.54	6.50	0.04	0.33	0.87
Potentilla simplex	11	6.11	0.46	5.50	0.03	0.28	0.74
Pteridium aquilinum	29	16.11	1.21	19.50	0.11	0.98	2.19
Rosa carolina	21	11.67	0.87	10.50	0.06	0.53	1.40
Rubus argutus	8	4.44	0.33	6.50	0.04	0.33	0.66
Rubus flagellaris	4	2.22	0.17	2.00	0.01	0.10	0.27
Sanicula canadensis	1	0.56	0.04	0.50	0.00	0.03	0.07

Table 4 (continued)

Species	No. Plots	Freq. (%)	Rel. Freq	Total Cover	Avg. Cover	Rel. Cover	IV-200
Schizachyrium scoparium	3	1.67	0.13	1.50	0.01	0.08	0.21
Scutellaria parvula	5	2.78	0.21	2.50	0.01	0.13	0.34
Silene antirrhina	1	0.56	0.04	0.50	0.00	0.03	0.07
Smilax bona-nox	11	6.11	0.46	5.50	0.03	0.28	0.74
Smilax glauca	68	37.78	2.83	97.00	0.54	4.89	7.72
Solidago caesia	5	2.78	0.21	2.50	0.01	0.13	0.34
Solidago erecta	41	22.78	1.71	35.00	0.19	1.76	3.47
Solidago hispida	2	1.11	0.08	1.00	0.01	0.05	0.13
Solidago nemoralis	10	5.56	0.42	5.00	0.03	0.25	0.67
Solidago ulmifolia	25	13.89	1.04	20.00	0.11	1.01	2.05
Sphenopholis obtusata	19	10.56	0.79	12.00	0.07	0.60	1.39
Spiranthes tuberosa	12	6.67	0.50	6.00	0.03	0.30	0.80
Stylosanthes biflora	5	2.78	0.21	2.50	0.01	0.13	0.34
Tephrosia virginiana	49	27.22	2.04	24.50	0.14	1.23	3.27
Toxicodendron radicans	104	57.78	4.33	113.50	0.63	5.72	10.05
Triodanis perfoliata	36	20.00	1.50	78.50	0.44	3.96	5.46
Viola palmata	1	0.56	0.04	0.50	0.00	0.03	0.07
Viola pedata	2	1.11	0.08	1.00	0.01	0.05	0.13
Viola sororia	3	1.67	0.13	2.50	0.01	0.13	0.26
Vitis aestivalis	72	40.00	2.99	38.50	0.21	1.94	4.93
Vitis rotundifolia	73	40.56	3.04	45.50	0.25	2.29	5.33

Table 4 (continued)

Species	No. Plots	Freq. (%)	Rel. Freq	Total Cover	Avg. Cover	Rel. Cover	IV-200
Vulpia octoflora	9	5.00	0.37	4.50	0.03	0.23	0.60
Wisteria frutescens	1	0.56	0.04	0.50	0.00	0.03	0.07
Total		1335.70	100.0	1984.00		100.15	200.00

Summary

The significance of *Quercus prinus* in Kentucky and Tennessee forests is discussed in several papers, including compendia by Baskin *et al.* (1987) for Kentucky and Chester (1989) for Tennessee as well as in the forest region summaries for southeastern United States by Martin *et al.* (1983). Little quantitative information is available on the herbaceous stratum of Tennessee-Kentucky chestnut oak forests (Baskin *et al.* 1987, Bryant *et al.* 1993, Chester 1989).

The goal of this research was to document and quantitatively characterize the herbaceous stratum of old-growth chestnut oak forests in southwest central Kentucky, and northwest central Tennessee. Total flora, presence, floristic similarity, frequency, and community structure were examined and analyzed. Although herbs were sparse throughout the ten sampled stands, several are ubiquitous (presence greater than or equal to 80 percent), including *Antennaria plantaginifolia, Aster linariifolius, Carex albicans, Carex cephalophora, Cunila origanoides, Danthonia spicata, Euphorbia corollata, Galium circaezans, Hedyotis caerulea, Hedyotis purpurea, Hieracium gronovii, Hypericum stragulum, Lespedeza hirta, Lespedeza intermedia, Lespedeza procumbens,*

Panicum depauperatum, *Panicum dichotomum*, *Parthenocissus quinquefolia*, *Smilax glauca*, *Solidago erecta*, *Solidago ulmifolia*, *Tephrosia virginiana*, *Toxicodendron radicans*, *Triodanis perfoliata*, *Vitis aestivalis*, and *Vitis rotundifolia*. The surface of these chestnut oak forests is predominately bryophytes (average cover= 57.29 percent), bare ground (average cover = 19.99 percent), and litter (average cover = 18.19 percent). Dominant species based on importance value are: *Danthonia spicata* (11.37 percent of IV), *Carex albicans* (10.06 percent of IV), *Toxicodendron radicans* (5.03 percent of IV), *Cunila origanoides* (3.79 percent of IV), *and Lespedeza hirta* (3.64 percent of IV).

Long-term monitoring of the permanent plots established in this study will provide information on the stability, or changes in diversity, of the herbaceous strata of these chestnut oak forests over time.

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APPENDIX

APPENDIX A

Categorized list of herbaceous taxa (including semi-shrubs and woody vines) sampled and observed in ten chestnut oak forest stands, Northwestern Highland Rim, Kentucky and Tennessee.

Annotations
* = non-native species
A = annual
P = perennial
P-SS = semi-shrub
P-WV = woody vine
observed but not sampled are so noted

Pteridophyta

Aspleniaceae
Asplenium platyneuron (L.) Britton, Sterns & Poggenb. [P]
Dennstaedtiaceae
Pteridium aquilinum (L.) Kuhn [P]
Polypodiaceae
Polypodium polypioides (L.) Watt [P]

Angiosperms - Monocots

Cyperaceae
Carex albicans Willd. [P]
Carex blanda Dewey [P]
Carex cephalophora Willd. [P]
Carex complanata Torr. & Hook. [P]
Carex muhlenbergii Schkuhr [P]
Carex picta Steud. [P]
Dioscoreaceae
Dioscorea villosa L. [P]
Juncaceae
Luzula echinata (Small) F.J. Herm [P]
Liliaceae
Polygonatum biflorum (Walter) Elliott [P]

Orchidaceae
Spiranthes tuberosa Raf. [P]
Poaceae
Agrostis perennans (Walter) Tuck. [P]
Andropogon gyrans Ashe [P]
Andropogon virginicus L. [P]
Danthonia spicata (L.) P. Beauv. ex Roem. & Schult. [P]
Elymus virginicus L. [P]
Eragrostis hirsuta (Michx.) Nees [A]
Muhlenbergia sobolifera (Muhl.) Trin. [P]
Panicum boscii Poir. [P]
Panicum commutatum Schult. [P]
Panicum depauperatum Muhl. [P]
Panicum dichotomum L. [P]
Schizachyrium scoparium (Michx.) Nash [P]
Sphenopholis obtusata (Michx.) Scribn. [P]
Vulpia octoflora (Walter) Rydb. [A]
Smilacaceae
Smilax bona-nox L. [P-WV]
Smilax glauca Walter [P-WV]

Angiosperms - Dicots

Acanthaceae
Ruellia caroliniensis (J.F. Gmel.) Steud. [P]; observed but not sampled
Anacardiaceae
Toxicodendron radicans (L.) Kuntze [P-WV]
Apiaceae
Sanicula canadensis L. [P]
Apocynaceae
Apocynum cannabium L. [P]
Aristolochiaceae
Aristolochia serpentaria L. [P]
Asclepiadaceae
Asclepias amplexicaulis Sm. [P]
Asclepias verticillata L. [P]; observed but not sampled
Asteraceae
Ambrosia artemisiifolia L. [A]
Antennaria plantaginifolia (L.) Richardson [P]
Aster lateriflorus L. [P]
Aster linariifolius L. [P]
Aster patens Aiton [P]
Aster shortii Lindl. [P]; observed but not sampled

Coreopsis major Walter [P]
Erigeron annuus (L.) Pers. [A]
Eupatorium serotinum Michx. [P]
Helianthus divaricatus L. [P]
Helianthus hirsutus Raf. [P]
Hieracium gronovii L. [P]
Krigia biflora (Walter) S.F. Blake [P]
Krigia dandelion (L.) Nutt. [P]
Solidago caesia L. [P]
Solidago erecta Pursh [P]
Solidago hispida Muhl. [P]
Solidago nemoralis Aiton [P]
Solidago ulmifolia Muhl. [P]

Bignoniaceae

Bignonia capreolata L. [P-WV]
Campsis radicans (L.) Seem. ex Bureau [P-WV]

Boraginaceae

Myosotis verna Nutt. [A]

Brassicaceae

Arabis canadensis L. [P]
Arabis laevigata (Muhl.) Poir. [P]
**Cardamine hirsuta* L. [A]
Dentaria laciniata Muhl. ex Willd. [P]

Cactaceae

Opuntia humifusa (Raf.) Raf. [P]

Campanulaceae

Lobelia inflata L. [A]; observed but not sampled
Triodanis perfoliata (L.) Nieuwl. [A]

Caryophyllaceae

Silene antirrhina L. [A]

Cistaceae

Lechea tenuifolia Michx. [P]

Clusiaceae

Hypericum denticulatum Walter [P]
Hypericum gentianoides (L.) Britton, Sterns & Poggenb. [A]
Hypericum stragulum W.P. Adams & N. Robson [P-SS]

Ericaceae

Monotropa hypopithys L. [P]

Euphorbiaceae

Acalypha virginica L. [A]
Euphorbia corollata L. [P]

Fabaceae

Baptisia bracteata Muhl. ex Elliott [P]

Chamaecrista fasciculata (Michx.) Greene [A]
Clitoria mariana L. [P]
Desmodium canescens (L.) DC. [P]
Desmodium nudiflorum (L.) DC. [P]
Desmodium paniculatum (L.) DC. [P]
Desmodium rotundifolium DC. [P]
**Lespedeza cuneata* (Dum.Cours.) G.Don [P]; observed but not sampled
Lespedeza hirta (L.) Hornem. [P]
Lespedeza intermedia (S. Watson) Britton [P]
Lespedeza procumbens Michx. [P]
Lespedeza repens (L.) Barton [P]
Lespedeza virginica (L.) Britton [P]
**Melilotus officinalis* (L.) Pall. [A]
Stylosanthes biflora (L.) Britton, Sterns & Poggenb. [P]
Tephrosia virginiana (L.) Pers. [P]
Wisteria frutescens (L.) Poir. [P-WV]

Lamiaceae
Cunila origanoides (L.) Britton [P]
Hedeoma pulegioides (L.) Pers. [A]
Monarda fistulosa L. [P]
Scutellaria parvula Michx. [P]

Linaceae
Linum virginianum L. [P]

Oxalidaceae
Oxalis stricta L. [A]
Oxalis violacea L. [P]

Passifloraceae
Passiflora lutea L. [P]

Polygonaceae
Polygonum scandens L. [P]

Rosaceae
Agrimonia rostellata Wallr. [P]
Porteranthus stipulatus (Muhl. ex Willd.) Britton [P]
Potentilla simplex Michx. [P]
Rosa carolina L. [P-SS]
Rubus argutus Link [P-SS]
Rubus flagellaris Willd [P-SS].

Rubiaceae
Galium aparine L. [A]
Galium circaezans Michx. [P]
Hedyotis caerulea L. [P]
Hedyotis purpurea (L.) Torr. & A. Gray [P]

Saxifragaceae
Heuchera villosa Michx. [P]
Scrophulariaceae
Agalinus tenuifolia (Vahl) Raf. [A]
Aureolaria pectinata (Nutt.) Pennell [P]
Dasytoma macrophylla (Nutt.) Raf. [P]
Violaceae
Viola palmata L. [P]
Viola pedata L. [P]
Viola sororia Willd. [P]
Vitaceae
Parthenocissus quinquefolia (L.) Planch. [P-WV]
Vitis aestivalis Michx. [P-WV]
Vitis rotundifolia Michx. [P-WV]

VITA

Christine Elizabeth Harris was born in Nashville, Tennessee on January 26, 1973. She attended elementary schools in the Metro Nashville and Robertson County school systems and graduated from East Robertson High School in May 1991. The following August she entered Union University. In August, 1993 she transferred to the The University of Tennessee at Martin where she received the degree of Bachelor of Arts in Biology. She entered Austin Peay State University in August, 1996 and in May, 1998 received a Master of Science degree in Biology.