JOURNAL OF THE TENNESSEE ACADEMY OF SCIENCE
VOLUME 63, NUMBER 3, JULY 1988

VEGETATIONAL AND FLORISTIC CHARACTERIZATION OF A MIXED HARDWOODS-SHORTLEAF PINE STAND IN STEWART COUNTY, TENNESSEE

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ABSTRACT

The results of vegetational and floristic studies in a mixed hardwoods-shortleaf pine stand within the TVA-managed Land Between the Lakes, Stewart County, Tennessee, are provided. Such communities, with little disturbance in the past 25 years and with shortleaf pine as a major component, are rare in northwestern Middle Tennessee and mostly confined to a few dry, cherty ridges and upper slopes just east of the Tennessee River. Data, collected in plot studies during 1986-87, show that this stand is dominated by shortleaf pine (*Pinus echinata*) and chestnut oak (*Quercus prinus*).

Various other, mostly xerophytic oaks, including white (*Q. alba*), scarlet (*Q. coccinea*), blackjack (*Q. marilandica*) black (Q. *velutina*), as well as sourwood (*Oxydendrum arboreum*) and blackgum (*Nyssa sylvatica*) are also of importance. However, pines are increasingly less important in understory strata and in the absence of fire or other management techniques, may become an insignificant part of the community.

INTRODUCTION

Shortleaf or yellow pine (*Pinus echinata* Miller) is one of the most widespread of the southern United States pines and occurs from Pennsylvania to Florida, westward to Texas, and northward to Missouri (Gaby 1985). In Tennessee it has a general distribution east of the Cumberland Plateau and occurs locally in most of Middle and West Tennessee; however, it is absent from the Central Basin and the West Tennessee slope (Little 1971, Shanks 1952). Wofford and Evans (1979) found documented records from only two counties in the western half of the state and few undisturbed stands are known from west of the Cumberland Plateau (Quarterman and Powell 1978).

Several naturally-occurring stands of shortleaf pine, in combination with various oaks and a few other hardwood species, occur in Stewart County, northwestern Middle Tennessee. Best development is on dry, narrow, cherty ridges of the Tennessee Ridge and Devil's Backbone area just east of the Tennessee River. Mostly within the TVA-managed Land Between the Lakes, these sites are significant, not only because of the rarity of such stands in that part of Tennessee and the Interior Low Plateaus Province, but also because they are now within public domain and can be protected. Also, the mixed communities provide ideal conditions for long-term research on such factors as edaphic control, changes in composition with time, and the effects of prescribed burning or other management techniques.

The need for baseline data on community composition and structure is obvious, both as a means of increasing our often meager knowledge of area forest communities, and to provide a basis for future monitoring and research. It is the purpose of this report to characterize the Devil's Backbone site and to present the results of quantitative and qualitative studies of the vegetation.

THE STUDY AREA

Location. Devil's Backbone is centered at 36°29'00" north latitude and 87°29'20" west longitude on the Standing Rock 7.5' U.S. Geological Survey quadrangle, 14.5 km west of Dover, county seat of Stewart County. Accessibility is by hiking trails which junction with Ft. Henry Road and follow historic Civil War routes, or by an abandoned road from Highway 79, which is 2.4 km to the south.

Description. Physiographically, Stewart County is within the Interior Low Plateaus Physiographic Province, Highland Rim Section, Western Highland Rim Subsection of Fenneman (1938) and later authors. The subsection is a maturely dissected upland plateau between the Nashville (Central) Basin to the east, the Coastal Plain Province to the west, the Southern Highland Rim Subsection to the south, and the Pennyroyal Plain

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Subsection to the north.

Features of the study area include long, narrow ridges at elevations reaching 600 feet above sea level and narrow valley floors at about 350 feet. Drainage is by Panther and Piney creeks, which empty into the impounded Tennessee River (Kentucky Lake), 3.7 km to the west. Tributaries and ravines are generally oriented north-south; the resulting east or west-aspect slopes range to 50 percent and average about 21 percent.

The ridges and upper slopes are underlain by highly leached and weathered Warsaw and St. Louis limestones, both of Mississippian age. In some cases, weathering is so advanced that only residual chert remains. Fort Payne Chert, also of Mississippian age, generally occurs on lower slopes but may extend into the pine communities in a few spots. Discontinuous, thin patches of Tuscaloosa Gravel, of Cretaceous age, cap many of the high ridges (Larson and Barnes 1965, Marcher 1962).

Soils are mostly Bodine cherty silt loam, rolling (5-12 percent slopes), hilly (12-25 percent), and steep (25-50 percent) phases. These droughty, infertile, gravelly soils are derived from residuum weathered from cherty limestone or chert and in some places, from Coastal Plain gravels. Formed mostly under hardwood forests of oaks, hickories, and gum, both internal and external drainage is rapid. Soils on some upper slopes are Guin gravelly loam, steep phase (slopes exceeding 25 percent). This thin, gravelly soil, formed from unconsolidated gravel beds containing pockets and lenses of clay, is also very droughty and infertile (Austin et al. 1953, Springer and Elder 1980).

The climate is a warm-temperate one with long warm summers and short, often mild winters. Data from Dickerson (1960), and the Dover Weather Station (U.S. Dept. of Commerce 1931-1983) show that the average temperature is 14.5° C; January is the coldest month (avg. 2.6° C), July the warmest (avg. 25.4° C). The 191-day growing season extends from 12 April to 20 October. Soils freeze to a depth of several cm on numerous occasions each winter but rarely remain frozen for more than three days. Annual precipitation averages 126.8 cm and is well distributed throughout the year.

The area is within the Western Mesophytic Forest Region of Braun (1950), a transition zone in which no single climax type occurs; instead, the vegetation is a mosaic of types, determined by local climatic, topographic, and edaphic factors. Upland oak forests with hickories prevail but mesophytic species, such as American beech, sugar maple, and tulip poplar become important on moist slopes and in ravines (Carpenter and Chester 1987). Mixed mesophytic forests, probably always rare on the Western Rim, are almost non-existent today due to agricultural encroachment and lumbering. Shortleaf pine is occasional southward on the Rim but becomes rare in Stewart County where its northward limit in the lower Tennessee River Valley is reached.

History. The first settlers, about 1793, were mostly North Carolinians who had been issued land grants in exchange for Revolutionary War services. They found that virtually the entire area was densely forested with mixed hardwoods and a few pines; thus lumbering and related industries became their primary occupations. Farming was limited to the valleys of the Cumberland and Tennessee rivers and, with the exception of the iron industry, little commercial development occurred. From about 1820 to 1870, Stewart County became the midsouth center for blast furnaces and rolling mills. Great quantities of wood were required for charcoal production and most of the forests were harvested to some degree at that time (Goodspeed History Series 1886).

After the Civil War and to the present, the county has remained mostly agricultural and sparsely populated. Various governmental agencies and private holding companies have acquired extensive land tracts, including about 36000, mostly forested, acres by the Koppers Company. At least 15000 of these acres, including the study site, were between the rivers and thus became part of LB (Henry 1976).

Prior to TVA management the dry, mostly upland, forests were regularly disturbed by timbering and fires. Trees were commonly cut when large enough for one or two crossties, resulting in inferior quality forests (Austin et al. 1953). Pine forests were especially vulnerable to fire and practically no protection or control efforts were available until the 1940s when the Civilian Conservation Corps erected a lookout tower in the county. However, this effort was mainly toward protecting the Stewart State Forest and fires continued in the western part of the county almost yearly.

By the early 1950s, the county was still about 64 percent forested. Mixed pine-hardwoods, recognized as one of five forest cover types present then (Shivery 1953), occupied discontinuous patches within an area of about 2000 acres. With a thick undergrowth of huckleberry, prominent patches of mountain laurel, small, slow-growing forests, infertile soil, and steep, dissected terrain, these "piney woods" received little attention from area residents except for a few hunters.

Once TVA assumed management in 1964, the Devil's Backbone pine communities were recognized as unique and 32 acres were designated a TVA Forest Study Area (TVA 1973). Quarterman and Powell (1978) investigated this site, expanded it to include 180 acres, and proposed designation as a National Natural Landmark with a 2-C ecological rating (appears to be nationally significant and in no apparent jeopardy). The Tennessee Department of Conservation (1983) also evaluated the site and included it on their list of potential State Natural Areas.

At least two additional studies have looked at the area in relation to management. Braun (1984) developed a plan

for prescribed burning while Turner et al. (1985) suggested burning, chemical treatment, and girdling to control undesirable hardwoods and thus maintain the integrity of the pine component. At present, shortleaf pine, with densities ranging from almost pure stands to isolated trees, occurs over an area of at least 1000 acres (Braun 1984). However, pines appear to contribute significantly in only about 200 acres and occur mostly on ridge crests and upper slopes.

No management plans, with the exception of fire prevention since the early 1960s, have been carried out.

Methods

Aerial photographs were examined to visualize the distribution patterns of pine communities and to extend information from ground reconnaissances within the 200-acre area. Systematic sampling was conducted on three major north-south ridges and adjacent upper slopes, using ridge crests as transects and alternating sample plots between crests, upper west-facing, and upper east-facing slopes.

Thirty, 0.04 ha (0.1 acre), circular plots were established; 10 plots were on crests and 10 on each of the slopes. Plots were permanently marked with metal stakes and separated by 90 m on the ridge transects. All trees with a dbh of 2.5 cm (1 in) or greater were recorded and standard parameters, absolute and relative, of density, dominance, frequency, and importance value (sum of the three relative values) determined. At the center of each plot, a smaller, circular plot of 0.004 ha (0.01 acre) was nested. Shrubs, woody vines, and tree seedlings were counted to obtain density and frequency data for those species.

The quantitative data were taken during the summer of 1986. The area was surveyed during the summer and fall of 1986 and the 1987 growing season to obtain a list of herbaceous and woody species not found in plots. Representative conditions were photographically documented and increment cores taken from several large pines for age determination during winter, 1987. Nomenclature follows Fernald (1950), who gives authority for each taxon.

Results and Discussion

Increment cores showed that the larger pines range in age from 70 to 138 years. Based on these ages, large tree diameters, the lack of stumps or other signs of recent disturbance, and historical data, this stand is considered old-growth. The importance of fire prior to the early 1960s is shown by old scars on many living hardwoods, and long-dead pines and snags with early burn damage. Also, oaks with double-based stems and ground-hollows are common.

A total of 2114 stems with diameters of 2.54 cm and above were measured. The 31 species represented are listed alphabetically, with their average diameters and size-class distributions, in Table 1. The majority of these 2114 stems (1235 or 58 percent) are in the 2.54-10.15 cm (1-4 in) dbh size class. Canopy species, or those stems 10.15 cm and above, make up 42 percent (879) of the stems and 55 percent (17) of the species. The average diameter of all stems sampled is 11.03 cm (4.34 in); for stems greater than 10.15 cm, the average is 18.84 cm (7.4 in). However, diameters are much higher among dominant species, e.g., 21.44 cm for *Pinus echinata* and 12 to 16 cm for the several species of *Quercus*.

Table 1. Average DBH (in cm) and Size Class Distribution for all Stems Sampled (2114) with a DBH of 2.54 cm and Above.

		Size Classes and Number Stems in Each				
Taxa	Avg. DBH	2.54-10.15	10.16-20.31	20.32-30.47	30.48-40.63	40.64& Higher
Acer rubrum	7.11	1	-	-	-	-
Carya glabra	5.47	190	6	2	-	-
Carya pallida	7.45	6	2	-	-	-
Carya tomentosa	7.18	3	1	-	-	-
Comus florida	5.58	80	4	-	-	-
Diospyros virginiana	5.47	17	-	-	-	-
Juniperus virginiana	4.57	15	1	-	-	-
Kalmia latifolia	3.30	1	-	-	-	-
Liquidambar styraciflua	15.75	-	1	-	-	-
Malus angustifolia	2.96	3	-	-	-	-
Nyssa sylvatica	5.29	334	20	1	-	-
Ostrya virginiana	7.20	3	-	-	-	-
Oxydendrum arboreum	7.34	173	40	-	-	-
Pinus echinata	21.44	53	95	75	66	17
Prunus americana	2.79	1	-	-	-	-
Prunus serotina	4.83	4	-	-	-	-
Quercus alba	12.24	56	76	12	-	1
Quercus coccinea	14.84	14	37	7	2	-
Quercus falcata	15.75	-	1	-	-	-
Quercus marilandica	11.81	29	21	4	1	1
Quercus prinus	13.51	113	210	42	2	3
Quercus rubra	12.87	-	3	-	-	-
Quercus stellata	13.68	55	53	15	6	4
Quercus velutina	13.07	33	33	11	1	2
Rhus copallina	3.35	5	-	-	-	-
Rhus glabra	2.54	1	-	-	-	-
Sassafras albidum	4.06	31	-	-	-	-
Styrax grandiflora	2.54	2	-	-	-	-
Ulmus alata	5.59	1	-	-	-	-
Vaccinium arboreum	2.94	7	-	-	-	-
Vitis aestivalis	3.24	4	-	-	-	-
TOTALS	11.03	1235	604	169	78	28

Table 2 provides a ranking by importance value (IV) of the canopy species. Not included are four sampled taxa (*Carya tomentosa, Juniperus virginiana, Liquidambar styraciflua, Quercus falcata*) represented by one stem each and hence with a negligible IV. Clearly, shortleaf pine and oaks dominate in all quantitative parameters.

Table 2. Trees 10.15 cm DBH and Above, Ranked by Importance Value.

Taxa	Number of Stems	Density (No./ha)	Dominance (Sq. dm/ha)	No. Plots Occurrence	IV
Pinus echinata	252	207.58	1168.05	25	90.36
Quercus prinus	257	211.70	510.32	26	64.36
Quercus alba	89	73.31	163.07	26	30.91
Quercus stellata	78	64.25	213.55	22	29.57
Quercus coccinea	46	37.89	98.25	18	19.02
Quercus velutina	47	38.71	114.65	16	18.73
Oxydendrum arboreum	40	32.95	43.77	14	13.93
Quercus marilandica	27	22.24	58.30	10	10.89
Nyssa sylvatica	21	17.30	26.04	11	9.41
Carya glabra	8	6.59	14.72	7	5.30
Cornus florida	4	3.29	3.55	3	2.23
Carya pallida	2	1.65	3.14	2	1.46
Quercus rubra	3	2.47	3.27	1	1.01

Quercus prinus is the major oak (IV 64.36), but *Q. alba* (30.91), *Q. stellata* (29.57), *Q. coccinea* (19.02), and *Q. velutina* (18.73) are of considerable importance. Other species are those expected in the canopy of area upland forests with two exceptions; the one stem of *Liquidambar* and several of American ash (*Fraxinus americana*) grow in ruts within the long-abandoned ridge roads.

The sapling and small tree layer, based on 1235 sampled stems between 2.54 and 10.15 cm dbh, is dominated by *Nyssa sylvatica, Oxydendrum arboreum, Carya glabra,* and *Quercus prinus* (Table 3).

Sixteen of the 28 sampled species also occur in the canopy and of the remaining 12, only *Acer rubrum, Diospyros virginiana, Prunus serotina, Sassafras albidum,* and *Ulmus alata* have canopy potential.

Table 3. Saplings and Small Trees, 2.54-10.15 cm DBH, Ranked by Importance Value.

Taxa	Number of Stems	Density (No./ha)	Dominance (Sq. dm/ha)	No. Plots Occurrence	IV
Nyssa sylvatica	334	275.12	56.80	23	56.52
Oxydendrum arboreum	173	142.50	46.45	20	38.62
Carya glabra	190	156.51	36.17	24	38.03
Quercus prinus	113	93.08	39.30	22	32.07
Cornus florida	80	65.90	15.82	19	19.89
Quercus alba	56	46.13	15.58	22	19.11
Quercus stellata	55	45.30	17.10	15	16.67
Pinus echinata	54	44.48	16.93	9	14.05
Quercus velutina	33	27.18	8.71	15	11.94
Quercus marilandica	29	23.89	11.29	9	10.05
Quercus coccinea	14	11.53	4.85	10	6.97
Sassafras albidum	31	25.54	3.77	7	6.73
Diospyros virginiana	17	14.00	3.65	9	6.39
Juniperus virginiana	15	12.36	2.05	9	5.65
Carya pallida	6	4.94	1.08	5	2.94
Vaccinium arboreum	7	5.77	0.40	5	2.78
Prunus serotina	4	3.29	0.67	3	1.80
Vitis aestivalis	4	3.29	0.28	3	1.66
Carya tomentosa	3	2.47	0.52	3	1.66
Rhus copallina	5	4.12	0.39	2	1.37
Ostrya virginiana	3	2.47	1.05	1	1.02

Of significance is the decline in IV for *Pinus* from 90.36 in the canopy to 14.05 in this subcanopy stratum, indicating a competitive advantage for hardwoods in that size class.

Not included in Table 3 are those taxa with an importance value less than one; in alphabetical order, with number of stems each, these include: *Acer rubrum* (1), *Kalmia latifolia* (1), *Malus angustifolia* (3), *Prunus americana* (1), *Rhus glabra* (1), *Styrax grandifolia* (2), and *Ulmus alata* (1). Also, a few stems of *Amelanchier arborea, Castanea dentata, Fagus grandifolia,* and *Viburnum rufidulum* were observed but none appeared in plots.

Table 4 shows that the low shrub and woody seedling layer (less than 2.54 cm dbh), as sampled in the nested plots, is often dense and dominated by species of *Vaccin-*

Table 4. Plot Data for Woody Taxa with DBH less than 2.5 cm

Taxa	No. Plots Occurrence	Rel. Freq.	Density (No./Ha)	Rel. Density	Importance Value
Vaccinium spp.*	27	9.0	20483.0	59.89	68.89
Nyssa sylvatica	22	7.4	2650.1	7.75	15.15
Quercus prinus	18	6.0	2775.9	8.11	14.11
Smilax spp.	22	7.4	1533.3	4.48	11.88
Carya glabra	25	8.4	508.3	1.49	9.89
Rubus spp.	15	5.0	716.7	2.11	7.10
Cornus florida	14	4.7	641.7	1.88	6.58
Vitis rotundifolia	14	4.7	558.3	1.63	6.33
Rhus radicans	10	3.3	716.7	2.07	5.37
Sassafras albidum	11	3.7	575.1	1.67	5.37
Quercus coccinea	13	4.3	216.7	0.63	4.93
Prunus serotina	11	3.7	358.3	1.05	4.75
Diospyros virginiana	11	3.7	308.3	0.90	4.60
Quercus stellata	11	3.7	233.3	0.68	4.38
Quercus velutina	11	3.7	200.0	0.58	4.28
Quercus alba	10	3.3	225.6	0.66	3.96
Pinus echinata	08	2.7	275.0	0.80	3.51
Vitis aestivalis	08	2.7	116.7	0.34	3.04
Parthenocissus quinquefolia	05	1.7	150.0	0.44	2.14
Rhus copallina	05	1.7	58.3	0.17	1.87
Quercus marilandica	04	1.3	66.7	0.20	1.50
Acer rubrum	04	1.3	41.7	0.12	1.42
Juniperus virginiana	03	1.0	41.7	0.12	1.12
Oxydendrum arboreum	03	1.0	33.3	0.10	1.10
Rosa spp.	02	0.7	133.3	0.40	1.10
Kalmia latifolia	01	0.3	250.0	0.73	1.03
Styrax grandifolia	01	0.3	208.3	0.61	0.91
Hypericum stragalum	02	0.7	33.3	0.10	0.80
Amelanchier arborea	02	0.7	16.7	0.05	0.75
Aralia spinosa	01	0.3	16.7	0.05	0.35
Fraxinus americana	01	0.3	16.7	0.05	0.35
Ulmus alata	01	0.3	16.7	0.05	0.35
Carya pallida	01	0.3	8.3	0.02	0.32
Ostrya virginiana	01	0.3	8.3	0.02	0.32
Prunus americana	01	0.3	8.3	0.02	0.32

*includes *V. arboreum, V. stamineum, V. vacillans,* and *Gaylussacia baccata.*

ium (*V. arboreum, stamineum*, and *vacillans*, with *Gaylussacia baccata*). Shrubby species of *Rosa, Rubus*, and *Smilax*, and such woody vines as *Parthenocissus quinquefolia, Rhus radicans*, and *Vitis rotundifolia* are frequent and often thicket-forming. Twenty-five of the 36 taxa are seedlings of canopy or subcanopy trees. Tree seedlings of most importance are *Nyssa sylvatica, Quercus prinus, Carya glabra*, and various other taxa of *Quercus*. As in the sapling layer, but even more noticeable, is the lack of pine. Absolute and relative density indicate a considerable number of seedlings, but frequency is low. Pine seedlings were found in only eight of 30 plots and were most abundant in areas opened by treefall.

Few unexpected species occur in this stratum. *Acer rubrum* and *Fagus grandifolia*, like previously mentioned American ash and sweetgum, are anomalies growing mostly in ancient roadway ruts or in depressions left by uprooted trees. *Kalmia latifolia* is dense on one steep, west-facing slope and *Styrax grandifolia*, a rare shrub in the region, occurs abundantly in one section.

Importance values were computed separately for the ridges and slopes to ascertain differences in species distribution and diversity. Calculations for the major canopy species (dbh above 10.15 cm and IV's exceeding 5.0) are compared in Table 5 and show that *Pinus* is most important on ridges, of high importance on west-facing slopes, and of reduced importance on east-facing slopes. A similar distribution pattern is shown by *Quercus marilandica*. The decline in *Pinus* on the west is compensated for by increases in *Oxydendrum arboreum* and *Quercus velutina*. On the east, pines are replaced by *Nyssa sylvatica, Oxydendrum arboreum, Quercus alba, Q. coccinea, Q. prinus*, and *Q. velutina*. However, larger pine trees occur on the east (average dbh 26.1 cm), than on the west (23.3) or the ridges (19.7). Comparisons using IV's computed only with stems less than 10.15 cm dbh follow the same general distribution patterns.

Slope aspect plays only a minor role in woody species diversity. All canopy dominants occur throughout with one exception (Table 5); *Quercus marilandica* was not observed on east-facing slopes. Of the 28 species in the sapling layer, 19 occur on east-facing slopes, 20 on west, and 24 on ridges. However, those species absent from one or more exposure types generated importance values less than 2.95 and thus contributed minimally to the total community structure (see Table 3 and associated text).

The herbaceous flora is generally scant and dominated by taxa of composites, grasses, and legumes (Table 6). Of most interest is *Goodyera pubescens*, a rare orchid of the area found under a dense *Pinus* canopy.

Table 5. Importance Value Comparisons between Slopes and Ridges for Dominant Species.

		Importance Values		
Taxa	Total	East-Facing	Ridges	West-Facing
Pinus echinata	90.36	50.71	122.79	96.27
Quercus prinus	64.36	96.42	49.72	47.51
Quercus alba	30.91	41.93	23.22	28.20
Quercus stellata	29.57	29.06	32.26	27.84
Quercus coccinea	19.02	21.81	19.22	16.14
Quercus velutina	18.73	19.35	9.35	27.31
Oxydendrum arboreum	13.93	12.68	4.60	24.02
Quercus marilandica	10.89	0.00	19.92	11.94
Nyssa sylvatica	9.41	16.94	5.71	6.55
Carya glabra	5.30	2.62	6.88	6.03
Cornus florida	2.23	2.28	2.08	2.30
Six other taxa	5.29	5.47	4.23	5.88

Table 6. Herbaceous Taxa Observed.

Agave virginica	*Hypoxis hirsuta*
Agrimonia rostellata	*Krigia biflora*
Agrostis perennans	*Krigia dandelion*
Antennaria plantaginifolia	*Lechea tenuifolia*
Aristida dichotoma	*Lespedeza repens*
Aristida longespica	*Linum virginianum*
Asplenium platyneuron	*Lobelia puberula*
Aster azureus	*Luzula echinata*
Aster hemisphericus	*Muhlenbergia sobolifera*
Aster sagittifolius	*Muhlenbergia tenuiflora*
Aster solidagineus	*Oxalis violacea*
Aureolaria flava	*Panicum boscii*
Carex artitecta	*Plantago virginica*
Carex cephalophora	*Podophyllum peltatum*
Carex digitalis	*Polystichum acrostichoides*
Chimaphila maculata	*Potentilla simplex*
Coreopsis major	*Prunella vulgaris*
Cunila origanoides	*Pteridium aquilinum*
Cynoglossum virginianum	*Ranunculus hispidus*
Danthonia spicata	*Ranunculus micranthus*
Dasistoma macrophylla	*Rudbeckia hirta*
Desmodium ciliare	*Sanicula canadensis*
Desmodium rotundifolium	*Scutellaria parvula*
Dioscorea villosa	*Solidago erecta*
Elymus virginicus	*Solidago hispida*
Erigeron annuus	*Solidago nemoralis*
Festuca octoflora	*Solidago ulmifolia*
Galium circaezans	*Sorghastrum nutans*

Summary

Shortleaf pine, contributing 29 percent of a total density of 723 stems/ha (2.54 cm dbh and above), and eight species of oaks, contributing 62 percent of this density, dominate the dry ridges and upper slopes of Devil's Backbone, an 81 ha (200 acre) site in Stewart County, Tennessee. The stand has not been disturbed in at least 25 years and probably longer; increment cores from eight representative pines showed ages ranging from

70 to 138 years. Average dbh for stems 2.54 cm dbh and above is 11.03 cm and 18.84 cm for stems 10.15 cm and above. However, pines average 21.44 cm dbh and clearly dominate the canopy in all quantitative parameters evaluated (density, dominance, frequency). The data show a sharp drop in pine importance from the canopy to the sapling and seedling strata and suggest that continued development in the absence of fire or other management techniques may lead to a reduction of pines in the canopy and increased importance of such hardwoods as *Carya glabra, Nyssa sylvatica,* and xerophytic oaks, especially *Quercus prinus.*

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