JOURNAL

OF THE

Tennessee Academy of Science

VOLUME LXII NUMBER 1

JOURNAL OF THE TENNESSEE ACADEMY OF SCIENCE

VOLUME 62, NUMBER 1, JANUARY 1987

PLANT COMMUNITIES OF THE THIRD CHICKASAW LOESS BLUFF AND MISSISSIPPI RIVER ALLUVIAL PLAIN, SHELBY COUNTY, TENNESSEE

NEIL A. MILLER AND JOHN B. NEISWENDER

Biology Department

Memphis State University

Memphis, Tennessee 38152

ABSTRACT

Vegetation was sampled in 22 locations along the Third Chickasaw Loess Bluff and adjacent Mississippi River alluvial plain in Shelby County, Tennessee. Five distinct communities were identified based on the tree canopy taxa. They are differentiated by available soil moisture and flooding. The forests of the Third Chickasaw Bluff represent the mixed mesophytic and oak communities. The alluvial plain forests are distinct from those of the bluff because of high soil moisture and flooding.

INTRODUCTION

The Western Mesophytic Forest Region (Braun, 1950) is bounded to the east by the Cumberland and Allegheny plateaus, and to the west by the loess bluffs adjacent to the Mississippi River. This forest region does not develop its own communities with its own specific dominants throughout, but is a mosaic region between the Mixed Mesophytic Forest Region to the east and the Oak-Hickory Forest Region to the west. Its natural vegetation varies widely in composition with the changing soil, topography, and moisture regime of the region. Some areas are vegetated by the Mixed Mesophytic Forest but certain other Plateau vegetation is less diverse.

The loess bluffs, the western border of the Western Mixed Mesophytic Forest Region, is a belt of Pleistocene and Tertiary eolian deposits along the east bank of the Mississippi River (Braun, 1950). These bluffs are deeply eroded and often very steep, having fertile top soil and generally abundant moisture, thus providing an optimum habitat for a species-rich forest, a community richer than that of surrounding non-loessal areas. The forest of the loess bluffs is a mixed mesophytic association related to that of the Appalachian Plateau. Caplenor *et al.* (1968) compared thick loess bluffs near Vicksburg, Mississippi with thin loess areas to the east and found a total of 41 canopy species present in thick loess habitats and dominance shared by many species. The highest importance values were assigned to sweetgum *(Liquidambar styraciflua),* basswood *(Tilia),* water oak *(Quercus nigra),* tuliptree *(Liriodendron tulipifera),* cherrybark oak *(Quercus falcata pagodaefolia),* bitternut hickory *(Carya cordiformis),* hop hornbeam *(Ostrya virginiana),* shumard oak *(Quercus shumardii),* and box elder *(Acer negundo).* By contrast the thin loess area had 16 canopy species, and was dominated by few species. The most important were beech *(Fagus grandifolia),* black gum *(Nyssa sylvatica),* black oak *(Quercus velutina),* mockernut hickory *(Carya tomentosa),* hop hornbeam *(Ostrya virginiana),* and white oak *(Quercus alba).* In the shrub layer there were 51 species present in thick loess; and 34 in thin loess. In the herbaceous layer 77 species were present in thick loess, and 66 in thin loess. Braun (1950) described a mixed mesophytic forest on loess bluffs near Reelfoot Lake, Tennessee, and found similar species with beech, tuliptree, oaks, hickories, black gum, and cucumbertree *(Magnolia acuminata)* as the dominant species present. Generally, the mixed mesophytic forest of the loess bluffs is surrounded by oak-hickory forests, and the presence of this mixed mesophytic forest is the reason this area is included in the Western Mixed Mesophytic Forest Region and not in the Oak-Hickory Forest Region (Braun, 1950).

Between the loess bluffs and the Mississippi River in Tennessee is a floodplain that is part of the Mississippi alluvial plain section of the Southeastern Evergreen Forest Region (Braun, 1950). Species that can withstand periodic inundation, such as cottonwood *(Populus deltoides)* and sycamore *(Platanus occidentalis),* are common. Low lying swamps are dominated by bald cypress *(Taxodium distichum).*

METHODS

Study sites were selected at .5 mile intervals on the Third Chickasaw Loess Bluff and the Mississippi River alluvial plain of Meeman-Shelby Forest. Meeman-Shelby Forest, a state park of 12,525 acres, is in northwest Shelby County, in southwest Tennessee (Figure 1).

The Four Chickasaw Bluffs are areas of deeply dissected landscape that rise above the alluvial plain in a belt extending north from Fulton Point, Tennessee, 42.8 miles south to Memphis,

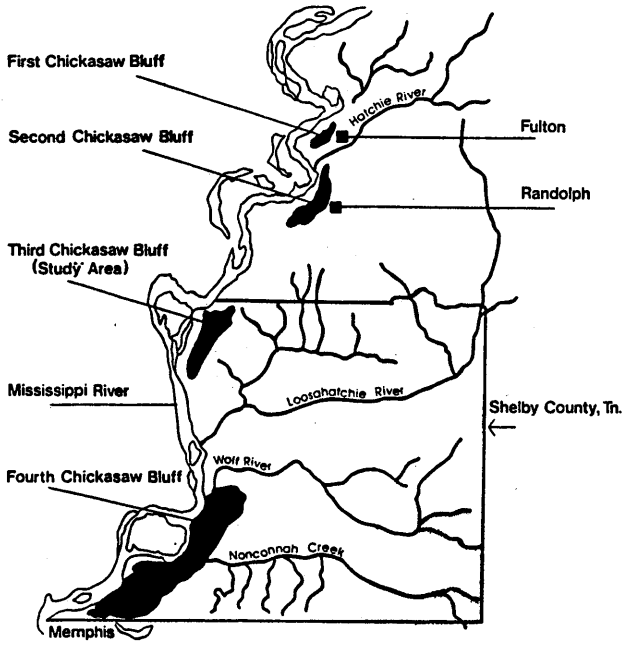

Figure 1. Location of the Four Chickasaw Bluffs and Study Area.

Tennessee. With the exception of the third bluff, the bluffs touch the Mississippi River.

Vegetation was sampled in 22 different locations on the Third Chickasaw Loess Bluff and Mississippi River Alluvial Plain within Meeman-Shelby State Forest. Samples were taken at regular half-mile intervals from the northern boundary of the park to a point just north of Poplar Tree Lake along the loess bluff and the alluvial plain.

Quantitative vegetational analysis was performed by the list-count quadrat procedure (Oosting, 1956). Plot sizes were 10 meters square for canopy trees, four meters square for the shrub layer, and one meter square for the herb layer. One shrub and herb plot each was nested in the tree quadrats. Diameters were measured and trees 4 inches or more diameter breast height (dbh) were sampled as canopy layer. Woody plants less than 4 inches dbh and over one foot tall were sampled in the shrub layer. All herbaceous species were included in the herb layer.

Quadrats were located at regularly .5 mile intervals along the bluff by following a transect along the crest of the bluff. Transects were located at the north end, near the center, and near the south end of the portion of the alluvial plain that lies within the park. Transects were 500 feet long and were oriented along north-south or east-west compass lines. Quadrats were spaced 100 feet apart. Fourteen sites along the bluff and 8 on the alluvial plain were sampled. Overstory plots totaled 132 with the shrub and herb plots nested within.

Absolute values of density and frequency of species sampled were determined and data values were then expressed in relative form. Absolute and relative dominance was calculated, and the three relative values were combined in a single Importance Value for each canopy series with the sum of the Importance Values totalling 300 for each community (Curtis and Cottam, 1962).

Results and Discussion

The Loess Bluff

Three distinct communities were identified along the loess bluff, ridges and south-west facing slopes, north-east facing slopes, and streambeds and ravines. Each habitat was characterized by a particular association of species (Tables 1-6) that distinguished it from the others.

Vegetation of Ridges and South-West Facing Slopes

Twenty-eight quadrats were used to sample the vegetation of ridgetops and south-west facing slopes. Tables 1 and 2 provide the ecological data for the most important species. Seventy-six species occurred. These sites were covered with a canopy layer, and a well developed shrub layer with many woody vines, and a relatively sparse herb layer that was probably inhibited by the canopy cover for most of the growing season. Thirty-four species occurred in the shrub layer.

Some of the early blooming herb species were *Arisaema dracontium, Phlox divaricata, Trillium recurvatum,* and *Podophyllum peltatum.* Dominant species developing or persisting through summer and fall were *Galium circaezans, Laportea canadensis, Cynoglossum virginianum, Polygonum virginiana,* and *Smilacina racemosa.* Thirty two species occurred (Table 2).

Table 1. Canopy Layer of Ridges and South-West Facing Slopes*.

Name of Species	Relative Frequency	Relative Density	Relative Dominance	Importance Value
Liquidambar styraciflua	1.79	27.99	7.18	56.96
Quercus alba	7.89	11.79	23.01	42.69
Liriodendron tulipifera	7.89	10.00	17.52	35.41
Acer floridanum	7.89	10.00	1.33	19.22
Ostrya virginiana	6.45	7.86	0.87	15.18
Quercus velutina	2.63	3.93	7.93	14.49
Quercus falcata pagodaefolia	2.63	3.93	7.08	13.64
Quercus rubra	5.26	3.93	3.90	13.09
Carya cordiformis	2.63	3.93	4.88	11.44
Carya tomentosa	2.63	3.93	4.83	11.39
Cornus florida	4.07	6.07	0.29	10.43

*Includes species with importance values greater than 10.

Table 2. Understory Woody and Herbaceous Layers of Ridges and South-West Facing Slopes*.

Name of Species	Relative Density	Relative Frequency
Understory Woody Species:		
Ostrya virginiana	13.87	12.67
Aesculus pavia	7.39	7.82
Toxicondendron radicans	6.51	7.79
Fagus grandifolia	3.20	7.14
Acer floridanum	3.95	6.33
Lindera benzoin	3.64	6.33
Asimina triloba	4.18	5.66
Cornus florida	2.53	7.01
Smilax rotundifolia	4.86	4.31
Campsis radicans	3.26	5.12
Lonicera japonica	3.26	5.12
Smilax rotundifolia	2.48	3.90
Liquidambar styraciflua	1.42	4.31
Anisostichus capreolata	2.86	2.82
Carya illinoensis	2.09	2.82
Bignonia capreolata	3.26	1.22
Vitis rotundifolia	1.11	2.16
Herb Layer:		
Carex spp.	16.36	11.45
Polystichum acrostichoides	8.61	9.01
Galium circaezans	11.87	2.68
Laportea canadensis	6.51	3.90
Cynoglossum virginianum	3.64	5.12
Podophyllum peltatum	4.50	3.90
Polygonum virginianum	2.48	3.90
Arisaema dracontium	2.48	2.68
Fragaria virginiana	2.48	2.68

*Includes species of which 10 or more individuals were recorded.

Vegetation of North-East Facing Slopes

Thirty-four quadrats were used to sample the vegetation of north-east facing slopes (Tables 3, 4). Eighty-nine species occurred. The slopes had a canopy of well-spaced large trees, an often dense shrub layer similar to that of the dry slopes in composition, and a diverse herb layer that includes many ferns.

Fagus grandifolia was the most important canopy species and the stands usually had many very large individuals with diameters of 3 to 4 feet. Twenty-five species occurred in the canopy.

The shrub layer of these slopes contained many of the same species as that of south-west slopes, but often in greater density. The presence of *Arundinaria gigantea,* conspicuous near the base of slopes and near streambeds, plus the increased importance of *Carpinus caroliniana, Cercis canadensis,* and *Hydrangea arborescens,* were obvious differences from the shrub layer of south-west slopes. Thirty-seven species occurred.

Woody vines were common on these slopes. Species of vines encountered were *Bignonia capreolata, Parthenocissus quinquefolia, Campsis radicans, Smilax glauca, Toxicodendron radicans,* and *Vitis* spp.

A wide variety of herb species appeared early in the spring, notably *Podophyllum peltatum, Trillium recurvatum, Phlox divaricata, Arisaema triphyllum, Claytonia virginica,* and *Geranium maculatum.* Beech-drops *(Epifagus virginiana),* a parasite of the beech trees, was commonly encountered.

Beech-fern *(Thelypteris hexagonoptera)* became the most important herb species of this habitat beginning in the early summer; it occurred in extensive colonies on the hillsides above ravines. *Polygonum virginianum, Oxalis stricta, Collinsonia canadensis, Bohemeria cylindrica, Galium circaezans, Galium triflorum,* and less commonly, *Eupatorium rugosum* and *Phryma leptostachya* were among the species that assumed importance in the summer and early fall. Small individuals of *Bignonia capreolata* and *Toxicodendron radicans* were the vines most common in the herb layer. Forty-one species were present.

Table 3. Canopy Layer of North-East Facing Slopes*.

Name of Species	Relative Frequency	Relative Density	Relative Dominance	Importance Value
Fagus grandifolia	14.98	11.31	4.68	50.97
Liquidambar styraciflua	12.64	17.29	5.56	45.49
Liriodendron tulipifera	10.77	11.31	1.56	43.64
Acer floridanum	10.77	14.14	2.22	27.13
Quercus rubra	4.21	8.49	13.86	6.56
Cornus florida	10.77	10.06	1.85	22.68
Diospyros virginiana	4.21	4.40	8.27	16.88
Mangolia acuminata	4.21	2.83	7.85	14.89

*Includes species with importance values greater than 10.

Table 4. Understory Woody and Herbaceous Layers of North-East Facing Slopes*.

Name of Species	Relative Density	Relative Frequency
Understory Woody Species:		
Ostrya virginiana	13.27	9.32
Fagus grandifolia	10.91	10.64
Acer floridanum	8.82	8.60
Asimina triloba	7.83	6.56
Lindera benzoin	8.94	5.25
Cornus florida	5.31	8.01
Smilax rotundifolia	8.51	3.35
Arundinaria gigantea	9.22	2.62
Aesculus pavia	5.04	5.97
Carpinus caroliniana	3.35	4.66
Parthenocissus quinquefolia	4.11	2.80
Cercis canadensis	2.92	3.93
Bignonia capreolata	2.05	3.74
Hydrangea arborescens	2.24	3.35
Sassafras albidum	1.81	2.62
Lonicera japonica	3.08	0.93
Fraxinus pennsylvanica	1.26	2.62
Liquidambar styraciflua	1.54	2.04
Toxicodendron radicans	1.71	1.87
Herb Layer:		
Thelypteris hexagonoptera	14.73	6.54
Polystichum acrostichoides	8.22	8.41
Carex spp.	6.85	8.41
Podophyllum peltatum	7.88	4.67
Polygonum virginianum	6.16	4.67
Trillium recurvatum	6.16	4.67
Arisaema triphyllum	4.11	4.67
Epifagus virginiana	2.40	3.74
Claytonia virginica	3.77	1.87
Geranium maculatum	3.42	0.93
Oxalis stricta	3.42	0.93
Collinsonia canadensis	2.74	0.93
Galium aparine	2.05	0.93

*Includes species of which 10 or more individuals were recorded.

Table 5. Canopy Layer of Streambeds and Ravines*.

Name of Species	Relative Frequency	Relative Density	Relative Dominance	Importance Value
Platanus occidentalis	7.67	7.33	32.06	47.06
Fagus grandifolia	7.67	11.11	18.30	37.08
Liquidambar styraciflua	11.63	14.89	6.59	33.11
Liriodendron tulipifera	11.63	11.11	7.29	30.03
Quercus rubra	3.72	7.33	16.11	27.16
Acer floridanum	3.72	14.89	3.83	22.44
Quercus phellos	7.67	7.33	4.03	19.03
Quercus alba	3.72	3.56	7.34	14.62
Ulmus rubra	3.72	7.33	1.27	12.32
cornus florida	6.05	7.33	0.77	11.82

*Includes species with importance values greater than 10.

Vegetation of Streambeds and Ravines

Ten quadrats were used to sample vegetation adjacent to streambeds and in ravine bottoms (Tables 5 and 6). These habitats are characterized by severe erosion. Forty-seven species occurred.

The canopy layer in the streambeds and ravines was dominated by sycamore *(Platanus occidentalis).* The canopy is distinguishable by the inclusion of typical flood plain species such as *Platanus occidentalis, Quercus phellos,* and Ulmus rubra. Twelve species occurred in this layer.

The shrub layer (Table 6) was dominated by thick stands of cane *(Arundinaria gigantea),* which define the streambed community. Twenty shrub species occurred.

A variety of early spring species appeared, most notable were *Claytonia virginica, Arisaema triphyllum, Phlox divaricata, Trillium recurvatum,* and *Podophyllum peltatum.* Also present were horsetail *(Equisetum hyemale)* growing in dense clumps along the streambeds. Thirty-four species occurred.

Table 6. Understory Woody and Herbaceous Layers of Streambeds and Ravines*.

Name of Species	Relative Density	Relative Frequency
Understory Woody Species:		
Arundinaria gigantea	27.21	15.38
Ostrya virginiana	14.97	11.54
Asimina triloba	9.86	13.46
Acer floridanum	12.93	9.62
Liriodendron tulipifera	6.80	9.62
Lindera benzoin	8.16	5.77
Fagus grandifolia	3.74	7.69
Toxicondendron radicans	4.65	6.56
Cornus florida	4.76	5.77
Carpinus caroliniana	5.44	3.85
Aesculus pavia	3.06	1.92
Herb Layer:		
Thelypteris hexagonoptera	20.47	9.84
Polystichum acrostichoides	6.98	8.20
Equisetum hyemale	9.30	3.28
Polygonum lapathifolium	6.98	3.28
Arisaema triphyllum	4.65	3.28
Cystopteris protrusa	4.19	3.28
Botrychium dissectum	2.33	4.92
Ophioglossum engelmanii	3.26	3.28
Brachyeletum erectum	2.79	3.28
Oxalis stricta	4.19	1.64
Adiantum pedatum	2.33	3.28
Carex spp.	2.33	3.28
Polygonum virginianum	2.33	3.28
Solidago curtisii	2.33	3.28

*Includes species of which 10 or more individuals were recorded.

The Alluvial Plain

Flooding has a major impact on the species that can exist on the floodplain since trees must be able to withstand periodic inundation of up to 4 or 5 feet in depth. The flora of the floodplain is strikingly different from that of the loess bluff adjacent to it (Tables 7 and 8). The alluvial plain was divided into two separate community types: the bottomland hardwoods forest occurring in places that are elevated enough to be dry except during winter floods, and the cypress swamps which occur in low places where the soils are saturated most of the year. These two communities are as distinct from each other as they are from the loess bluff.

Table 7. Canopy Layer of Dry Bottomland Forest*.

Name of Species	Relative Frequency	Relative Density	Relative Dominance	Importance Value
Populus deltoides	12.05	11.42	8.52	61.99
Platanus occidentalis	5.80	5.88	20.47	2.15
Celtis laevigata	12.05	10.38	6.45	28.88
Fraxinus pennsylvanica	7.59	10.38	6.85	24.82
Acer negundo	7.59	9.34	4.49	21.42
Celtis occidentalis	5.80	7.96	6.88	20.64
Acer floridanum	5.80	9.34	2.13	17.27
Quercus rubra	3.13	3.46	7.46	14.05
Acer rubrum	5.80	4.50	2.37	12.67
Ulmus rubra	4.46	5.88	1.49	11.83

*Includes species with importance values greater than 10.

Table 8. Understory Woody and Herbaceous Layers of Bottomland Forest*.

Name of Species	Relative Density	Relative Frequency
Understory Woody Species:		
Toxicodendron radicans	31.06	16.48
Campsis radicans	16.28	12.09
Fraxinus pennsylvanica	7.24	8.72
Celtis laevigata	7.67	7.50
Parthenocissus quinquefolia	6.81	8.08
Acer rubrum	8.87	5.76
Acer negundo	6.46	7.50
Quercus lyrata	5.25	6.98
Lonicera japonica	5.99	3.78
Celtis occidentalis	3.62	4.71
Smilax rotundifolia	4.83	3.49
Carya aquatica	1.99	3.49
Ostrya virginiana	1.99	3.49
Herb Layer:		
Bohemeria cylindrica	16.95	11.11
Laportea canadensis	10.96	6.67
Polygonum virginiana	6.41	8.89
Bidens discoidea	5.99	2.89
Asclepias perennis	5.21	2.22
Aster simplex	5.21	2.22
Solidago curtisii	3.59	2.89
Leersia lenticularis	4.79	1.56
Carex spp.	1.98	1.56
Eupatorium rugosum	1.98	1.56

*Includes species of which 10 or more individuals were recorded.

Bottomland Forests

Thirty quadrats were used to sample the bottomland forest. There were 62 species recorded, 24 of which did not occur on the loess bluff.

Out of a total of 25 canopy species there were 10 with importance values greater than 10 (Table 7). The dominant species were cottonwood *(Populus deltoides),* and sycamore *(Platanus occidentalis).* These accounted for nearly all the large individuals. *Acer floridanum* and *Quercus rubra* were the only dominants shared with the loess bluff, and these occurred near the base of the bluff.

The shrub layer (Table 8) was dominated by woody vines and species of the canopy. *Acer rubrum, Acer negundo, Quercus lyrata,* water elm *(Planera aquatica)* and *Carya aquatica,* while common here, were all rare or absent on the bluff. Near the base of the bluff species such as *Ostrya virginiana* and *Lindera benzoin* occurred, but were absent near the river. Thirty-three species occurred in the shrub layer.

Thirty-four species of herbaceous plants occurred. The three most common species of summer and fall were *Bohemeria cylindrica, Laportea canadensis,* and *Polygonum virginianum.* Herbaceous growth was abundant only in canopy tree-fall openings. The surface of some quadrats was bare mud; water movement was sufficient to remove leaf litter and inhibit and/or bury herbs.

Cypress Swamps

The cypress swamps occur in low areas of the alluvial plain and its soils are saturated much of the year. Swamps were sampled using 30 plots. These swamps have the lowest species diversity among the habitats studied (Tables 9, 10). The canopy layer included 7 species and was overwhelmingly dominated by *Taxodium distichum,* which accounted for nearly two-thirds of the total importance value and which had a frequency of 100%. The shrub layer included 12 species. Dense stands of black willow *(Salix nigra)* were common and it had the highest density and frequency values.

In the herb layer lizard's tail *(Saururus cernuus), Tradescantia subaspera,* and *Sagittaria montevidensis* had the highest relative density and frequency.

Table 10. Understory Woody and Herbaceous Layers of Cypress Swamp.

Name of Species	Relative Density	Relative Frequency
Understory Woody Species:		
Taxodium distichum	36.09	25.64
Salix nigra	34.92	21.74
Campsis radicans	17.04	16.39
Toxicodendron radicans	14.29	8.70
Parthenocissus quinquefolia	6.90	13.83
Acer rubrum	4.76	13.04
Acer negundo	7.94	8.70
Celtis laevigata	7.94	8.70
Fraxinus pennsylvanica	4.76	8.70
Planera aquatica	1.59	4.35
Smilax rotundifolia	1.59	4.35
Ulmus rubra	1.59	4.35
Campsis radicans	0.28	2.56
Herbaceous Species:		
Saururus cernuus	42.42	25.64
Tradescantia subaspera	7.44	17.95
Sagittaria montevidensis	9.64	12.82
Aster pilosus	0.83	2.56

Table 9. Canopy Layer of Cypress Swamp.

Name of Species	Relative Frequency	Relative Density	Relative Dominance	Importance Value
Taxodium distichum	50.00	51.43	80.04	181.47
Celtis laevigata	15.00	17.14	3.98	36.12
Acer negundo	10.00	11.43	2.49	23.92
Fraxinus pennsylvanica	10.00	5.71	4.47	20.18
Carya aquatica	5.00	8.57	3.42	16.99
Platanus occidentalis	5.00	2.86	5.44	13.30
Ulmus rubra	5.00	2.86	0.16	8.02

CONCLUSIONS

The taxa of the loess bluffs in the lower Mississippi Valley are a composite of Mixed Mesophytic Forest Region species chiefly of the north and east with southern species present. In view of the Pleistocene origin of the loess deposits and the fact that the Pleistocene forests of the lower valley were composed of a mixture of taxa of northern and southern origin (Brown, 1938), the area would have been subject to invasion by taxa of diverse ecological capacities at a time when the land was slowly being elevated by loess accumulation (Caplenor *et al.*, 1968 and Delcourt, *et al.*, 1980, 1983). Such a mixture of species would have resulted from migration during several climatic fluctuations in Tertiary and Quaternary times (Caplenor *et al.*, 1968). Many of the taxa now present apparently were able to persist because of their ability to withstand the arid intervals that followed the cool periods of the Pleistocene (Caplenor *et al.*, 1968). The taxa that have persisted in sites with adequate water conditions have also persisted to the north, where the ratio of precipitation to evapotranspiration is relatively high. The deeply dissected loess bluffs have greater species richness than the drier or perennially flooded sites.

The habitats of the loess bluff are believed to be differentiated mostly on the availability of soil moisture. The habitats ranked on the basis of assumed increasing moisture availability are upper or south-west facing slopes and ridgetops, north-east facing slopes, and ravines and streambeds. It is presumed that increased moisture availability is reflected in the composition of each community. Dry slopes have a characteristic dominance of oaks and hickories, typical of drier soils in the region, moist slopes support a beech dominated forest, common to favorable sites to the east and north, but absent from most of the surrounding region. Ravines and streambeds are characterized by the abundant growth of ferns and of *Arundinaria gigantea,* which are plants that thrive in very moist locations.

The alluvial plain communities are distinguishable by abundant soil moisture; the chief edaphic feature of the cypress swamp is the nearly permanent saturation. The alluvial plain is further separated from the loess bluffs by the flat topography and their clayey soils. Alluvial plains represent habitats where moisture is usually higher than the surrounding uplands due to drainage into the floodplain area and the proximity of streams. Thus, floodplains in the region support a greater species richness of vegetation than the drier flatlands of the region but less varied than the loess slopes. The vegetation of the Third Chickasaw Bluff is characterized by a high number of mesophytic hardwood dominants in the canopy layer and by the usual absence of gymnosperms. Some alluvial plain species occur in streambeds of the bluff.

Important trees occurring on the loess bluff include sweetgum *(Liquidambar styraciflua),* tulip poplar *(Liriodendron tulipifera),* sugar maple *(Acer floridanum),* white oak *(Quercus alba),* bitternut hickory *(Carya cordiformis),* and red oak *(Quercus rubra).* Beech *(Fagus grandifolia)* is very important on north facing slopes.

The woody understory has a relatively high density and frequency of hop hornbeam *(Ostrya virginiana),* flowering dogwood *(Cornus florida),* pawpaw *(Asimina triloba),* dwarf red buckeye *(Aesculus pavia),* and spicebush *(Lindera benzoin).* Other shrubs and woody vines occur commonly. Poison ivy *(Toxicodendron radicans),* catbriar *(Smilax* spp.), and virginia creeper *(Parthenocissus quinquefolia)* have relatively high frequency, as does trumpet vine *(Campsis radicans),* crossvine *(Anisostichus capreolata),* and virgin's bower *(Clematis virginiana).*

The herbaceous layer consists of a variety of mesophytic species and is notable for the high density of ferns, particularly along streams and in moist low places. Christmas fern *(Polystichum acrostichoides),* broad beech fern *(Thelypteris hexagonoptera),* and maidenhair fern *(Adiantum pedatum)* have a high relative frequency.

The vegetation of the flood plain is of lower species richness than that of the loess bluff and its important species can withstand periodic inundation. In the sloughs bald cypress *(Taxodium distichum)* is very important. Cottonwood *(Populus deltoides),* sycamore *(Platanus occidentalis),* and hackberry *(Celtis* spp.) have the highest frequency in drier areas.

LITERATURE CITED

Braun, E.L., 1950. Deciduous forests of Eastern North America. The Blakiston Company, Philadelphia.

Brown, C.A., 1938. The flora of Pleistocene deposits in the Western Florida Parishes, West Felicana Parish, and East Baton Rouge Parish, Louisiana. Lousiana Dept. Conser. Bull. 12.

Caplenor, D.C., R.E. Bell, J. Brook, D. Caldwell, C. Hughes, A. Regan, A. Scott, S. Ware, and M. Wells, 1968. Forests of west central Mississippi as affected by loess. Mississippi Geol. Surv. Bull. 111: 205-256.

Curtis, J.T., and G. Cottam, 1962. Plant ecology workbook. Burgess Publishing Co., Minneapolis.

Delcourt, P.A., H.R. Delcourt, R.C. Brister, and L.E. Lackey, 1980. Quaternary vegetation history of the Mississippi Embayment. Quaternary Research 13: 111-132.

Delcourt, H.R., P.A. Delcourt, and E.C. Spiker, 1983. A 12,000-year record of forest history from Cahaba Pond, St. Clair County, Alabama. Ecology 64(4): 874-887.

Oosting, H.J., 1956. The study of plant communities. 2nd. Ed. W.H. Freeman & Co., San Francisco.