13160
Southern Piedmont Mesic Forest

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Vegetation Type
Forest and Woodland

Map Zones
60

Geographic Range
Ranges throughout the southern Piedmont, from Virginia to Alabama. In The Nature Conservancy (TNC) ecoregion 52 (NatureServe 2007).

Biophysical Site Description
This system encompasses mixed deciduous hardwood or occasionally hardwood-pine forests of mesic sites in the Piedmont (TNC ecoregion 52) of the southeastern United States. Most examples occur on lower or north-facing slopes where topography creates mesic moisture conditions. A mix of a small number of mesophytic trees is usually dominant, with *Fagus grandifolia* and *Liriodendron tulipifera* most prominent, *Quercus alba* and/or *Quercus rubra* may also be present or co-dominant. Both acidic and basic substrates are currently included in this concept, where shrub layers of mesophytic ericaceous shrubs may occur beneath an open tree canopy. Fire is naturally infrequent in this system, due to the slopes and moist conditions. If fire does penetrate, it is likely to be low in intensity but may have significant ecological effects (NatureServe 2007).

This forest type occurs on moist, topographically protected areas (e.g., coves, v-shaped valleys, north- and easy-facing toe slopes) within highly dissected hills. On slopes it forms a mosaic with pyrogenic oak-hickory forests, whereby mesic forests are restricted to the most protected coves and oak-hickory occurs on the ridges. Elevations range from 400-1,200ft in the central portions of Virginia and North Carolina. The dissected topography creates strong gradients in microclimate and soil moisture and fertility at the local (sub-watershed) scale (Hutchins et al. 1976, Iverson et al. 1997, Morris and Boerner 1998). In the absence of frequent or catastrophic disturbance, these environmental gradients determine forest composition (Hutchins et al. 1976, Muller 1982, Iverson et al. 1997, Dyer 2001).

Vegetation Description
A diverse closed-canopy forest with dominant species including a significant component of mesophytic species. Beech (*Fagus grandifolia*) is almost always abundant and is often strongly dominant. Red oak (*Quercus rubra*), yellow-poplar (*Liriodendron tulipifera*), and red maple (*Acer rubrum*) may be abundant (NatureServe 2007). In the western Piedmont *Tsuga canadensis*

may be present (Schafale and Weakley 1990). Other canopy species include American basswood (*Tilia americana* var. *heterophylla*), sugar maples (*Acer barbatum, Acer leucoderme*), painted buckeye (*Aesculus sylvatica*), and white oak (*Q. alba*). This forest type developed primarily on mesic, sheltered landscapes positions (e.g., lower slopes, coves, ravines) but also occurred on some dry-mesic slopes, where presumably fire was infrequent (Wade et al. 2000).

A well-developed understory is usually present and may include *Cornus florida, Ostrya virginiana, Acer rubrum*, and *Ilex opaca* (Schafale and Weakley 1990). Shrubs are generally sparse to moderate in density, except in heath bluffs and may include *Vaccinium stamineum*, *Viburnum rafinesquianum, Evonumus americana*, and sometimes *Kalmia latifolia* (Schafale and Weakley 1990; NatureServe 2007). Herbs range from fairly dense in basic examples to sparse in acidic examples, and may be nearly absent in a few. The composition of all lower strata varies substantially with soil acidity (NatureServe 2007). Herb species may include *Polystichum acrostichoides, Viola* spp., *Dichanthelium* (*Panicum*) spp., *Galium circaezans, Hexastylis arifolia, H. minor, Desmodium nudiflorum, Erythronium umbilicatum* ssp. *umbilicatum, Hepatica americana, Chamaelirium luteum, Epifagus virginiana, Tiarella cordifolia* var. *collina, Heuchera americana, Stellaria pubera, Podophyllum peltatum, Botrychium virginianum,* and *Prenanthes serpentaria* (Schafale and Weakley 1990).

BpS Dominant and Indicator Species

Symbol	Scientific Name	Common Name
FAGR	*Fagus grandifolia*	American beech
LITU	*Liriodendron tulipifera*	Tuliptree
ACRU	*Acer rubrum*	Red maple
TIAMH	*Tilia americana var. heterophylla*	American basswood
ACLE	*Acer leucoderme*	Chalk maple
ACBA3	*Acer barbatum*	Southern sugar maple
QUAL	*Quercus alba*	White oak
QURU	*Quercus rubra*	Northern red oak

Species names are from the NRCS PLANTS database. Check species codes at http://plants.usda.gov.

Disturbance Description

The mesophytic forest type fire regime is characterized by surface fires with return intervals 20-70yrs. Mixed severity fires may occur approximately every 100yrs depending on climatic conditions. This effect may also be achieved by recurrent, severe insect defoliations or droughts. Ice, straight-line winds or microbursts may cause blow-downs on a scale of 1-10ac. Stand replacement fires happen very infrequently. Low intensity surface fires, whether natural or Native American ignited, would have maintained the more fire resistant American chestnut and Oak species.

NatureServe (2007) notes fire is naturally infrequent in this system, due to the slopes and moist conditions. If fire does penetrate, it is likely to be low in intensity and may not have significant ecological effects. These forests generally exist naturally as old-growth forests, with canopy dynamics dominated by gap phase regeneration. Most of the prevailing species are shade tolerant. Most are not very fire-tolerant.

Fire Frequency

Severity	Avg FI	Percent of All Fires	Min FI	Max FI

Replacement	499	8		
Moderate (Mixed)	355	12		
Low (Surface)	52	80	20	70
All Fires	41	100		

Fire interval is expressed in years for each fire severity class and for all types of fire combined (All Fires). Average FI is the central tendency modeled. Percent of all fires is the percent of all fires modeled in that severity class. Minimum and Maximum FIs show the relative range of fire intervals as estimated by model contributors, if known.

Scale Description

This forest type occurs more continuously on north- and east-facing toe slopes, and interfinger with oak-hickory on side slopes.

NatureServe (2007) describes this system currently as a large-to small-patch system occurring as a regular part of the landscape mosaic in most of the Piedmont. It generally occurs as large to small patches, often in convoluted bodies following slopes in the dissected lands along streams and rivers. Contiguous convoluted patches or closely associated sets of patches may once have covered thousands of acres and perhaps could have been connected along miles of river bluffs. However, the effect of past fire on the extent of this system is uncertain, and it may have been confined to a more limited range of topography and to smaller, discontinuous patches than it now appears. Most remnants at present are several 10s-100s of acres.

Adjacency or Identification Concerns

Mapping mesophytic forests would likely focus on specific topographic positions, such as coves, valley bottoms typically v-shaped (excluding broad u-shaped floodplains), lower north and east facing slopes; sometimes west and south facing lower slopes where moisture permits; wet-mesic to mesic conditions on the landscape; rich fertile conditions/sites; shaded topographic positions. On side slopes, mesophytic forests form mosaic patterns with oak-hickory forests, with mesic forests occurring in v-notches and coves (drainages) and oak-hickory on ridges.

NatureServe (2007) notes this system is distinguished from Southern Piedmont Dry Oak-(Pine) Forest (CES202.339 – Biophysical Setting [BpS 1368]) by the significant component of mesophytic tree species, particularly *Fagus grandifolia*, as well as by occurrence on mesic topographic sites. Some oaks may also be present.

It is distinguished from Southern Piedmont Small Floodplain and Riparian Forest (CES202.323) and Southern Piedmont Large Floodplain Forest (CES202.324) by the absence of characteristic alluvial or bottomland species, along with upland position. This boundary can be somewhat difficult to place, as some alluvial species will occur upslope in basic soils, and some mesic forests will extend onto higher terraces in bottomlands (NatureServe 2007).

This system is closely related to Atlantic Coastal Plain Mesic Hardwood Forest (CES203.242 -- BpS 1343) and in the northern part of the range may be very similar except for the geologic substrate. Farther south, there is a greater floristic difference between the two. This system is related to the cove forest systems of the southern Appalachians but lacks a number of species characteristic of those regions. These species are present in increasing numbers as one goes west in the Piedmont (NatureServe 2007).

The westernmost Piedmont has some examples of well-developed Southern and Central Appalachian Cove Forest (CES202.373 -- BpS 1318) in the more mountainous portions. Distinct subsets of this system, which could be recognized as different systems, are the basic/circumneutral and acidic examples and the shrubby heath bluffs (NatureServe 2007).

Issues or Problems

Delineating the mesic forest type today is influenced by the absence of fire, large herbivore species, and non-native invasive species (plants, animals, insects and disease). The absence of fire is causing an expansion of this vegetation out of coves and potentially replacing oak-dominated vegetation on some sites.

Native Uncharacteristic Conditions

Comments

Succession Classes

Mapping Rules

Upper Layer Lifeform	Height (m)	Canopy Cover (%)									
		0-10	11-20	21-30	31-40	41 - 50	51-60	61-70	71-80	81-90	91-100
Herb	0-0.5	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN
Herb	0.5-1.0	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN
Herb	>1.0	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN
Shrub	0-0.5	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN
Shrub	0.5-1.0	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN
Shrub	1.0-3.0	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN
Shrub	>3.0	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN
Tree	0-5	A	A	A	A	A	A	A	A	A	A
Tree	5-10	UN	UN	C	C	C	C	C	B	B	B
Tree	10-25	UN	UN	C	C	C	C	C	B	B	B
Tree	25-50	UN	UN	D	D	D	D	D	E	E	E
Tree	>50	UN	UN	D	D	D	D	D	E	E	E

Succession class letters A-E are described in the Succession Class Description section. Some classes use a leafform distinction where a qualifier is added to the class letter: Brdl (broadleaf), Con (conifer), or Mix (mixed conifer and broadleaf). UN refers to uncharacteristic native or a combination of height and cover that would not be expected under the reference condition. NP refers to not possible or a combination of height and cover which is not physiologically possible for the species in the BpS.

Description

Class A 6 Early Development 1 - All Structures

Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
FAGR	Fagus grandifolia	American beech	Upper
LITU	Liriodendron tulipifera	Tuliptree	Upper

ACLE	Acer leucoderme	Chalk maple	Mid-Upper
ACBA3	Acer barbatum	Southern sugar maple	Mid-Upper

Description
Regenerating stands established after catastrophic disturbance, primarily wind and ice storms and less frequently by fire. Tree regeneration unfolds from a combination of stump and root sprouts and the seedbank. This short-lived stage exists until canopy closure occurs and resource competition for growing space begins transitioning to Class B.

Northern red oak and white oak may also be present as class indicator species.

Maximum Tree Size Class
Sapling >4.5ft; <5"DBH

Class B 11 Mid Development 1 - Closed

Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
LITU	Liriodendron tulipifera	Tuliptree	Upper
ACRU	Acer rubrum	Red maple	Upper
ACLE	Acer leucoderme	Chalk maple	Mid-Upper
ACBA3	Acer barbatum	Southern sugar maple	Mid-Upper

Description
Mid-seral closed overstory, stem exclusion stage. Intense competition begins after canopy closure (ca. 16-75yrs.) and lasts until shade tolerant tree species (*Fagus grandifolia*) begin to replace fast growing shade intolerant species (*Acer species*).

Maximum Tree Size Class
Medium 9-21"DBH

Class C 22 Mid Development 1 - Open

Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
QURU	Quercus rubra	Northern red oak	Upper
QUAL	Quercus alba	White oak	Mid-Upper
LITU	Liriodendron tulipifera	Tuliptree	Mid-Upper

Description
Mid-seral open overstory. Historically maintained by low intensity surface fires, that suppressed less fire resistance trees. The seral stage continues until fire exclusion causes the forest to close or the forest matures, class D.

Maximum Tree Size Class
Medium 9-21"DBH

Class D 22 Late Development 1 - Open

Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
QUAL	Quercus alba	White oak	Upper
QURU	Quercus rubra	Northern red oak	Upper
LITU	Liriodendron tulipifera	Tuliptree	Upper

Description
Open-canopy mesophytic forests that develop on mesic landscape positions. Note that although C and D overlap in structural data, tree size class varies between the two classes.

Dominant species include *Quercus alba*, and *Quercus rubra* also *Fagus grandifolia, Acer barbatum, Liriodendron tulipifera, Tilia americana* var. *heterophylla, Aesculus sylvatica, Tsuga canadensis* may be present in the western part of the range.

Maximum Tree Size Class
Very Large >33"DBH

Class E 39 Late Development 1 - Closed

Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
LITU	Liriodendron tulipifera	Tuliptree	Upper
ACRU	Acer rubrum	Red maple	Upper
ACLE	Acer leucoderme	Chalk maple	Mid-Upper
ACBA3	Acer barbatum	Southern sugar maple	Mid-Upper

Description
Late seral closed overstory. Note that although B and E overlap in structural data, tree size class varies between the two classes. Shade tolerant species (*Fagus grandifolia*) begin to dominate and replace fast growing shade intolerant species (*Acer species*).

American beech, northern red oak, white oak, basswood, and eastern hemlock may also be present as class indicator species.

Maximum Tree Size Class
Very Large >33"DBH

Model Parameters

Deterministic Transitions

From Class	Begins at (yr)	Succeeds to	After (years)
Early1:ALL	0	Mid1:CLS	15
Mid1:OPN	16	Late1:OPN	75
Mid1:CLS	16	Late1:CLS	75
Late1:OPN	76	Late1:OPN	999
Late1:CLS	76	Late1:CLS	999

Probabilistic Transitions

Disturbance Type	Disturbance occurs In	Moves vegetation to	Disturbance Probability	Return Interval (yrs)	Reset Age to New Class Start Age After Disturbance?	Years Since Last Disturbance
Replacement Fire	Early1:ALL	Early1:ALL	0.002	500	Yes	0
Alternative Succession	Mid1:OPN	Mid1:CLS	1	1	Yes	40
Replacement Fire	Mid1:OPN	Early1:ALL	0.002	500	Yes	0
Optional 1	Mid1:OPN	Early1:ALL	0.002	500	Yes	0
Mixed Fire	Mid1:OPN	Mid1:OPN	0.003	333	No	0
Insects or Disease	Mid1:OPN	Mid1:OPN	0.003	333	No	0
Wind or Weather or Stress	Mid1:OPN	Mid1:OPN	0.01	100	No	0
Surface Fire	Mid1:OPN	Mid1:OPN	0.035	29	No	0
Replacement Fire	Mid1:CLS	Early1:ALL	0.002	500	Yes	0
Optional 1	Mid1:CLS	Early1:ALL	0.002	500	Yes	0
Mixed Fire	Mid1:CLS	Mid1:OPN	0.0033	303	Yes	0
Insects or Disease	Mid1:CLS	Mid1:OPN	0.0033	303	Yes	0
Wind or Weather or Stress	Mid1:CLS	Mid1:OPN	0.01	100	Yes	0
Surface Fire	Mid1:CLS	Mid1:OPN	0.035	29	Yes	0
Alternative Succession	Late1:OPN	Late1:CLS	1	1	Yes	40
Replacement Fire	Late1:OPN	Early1:ALL	0.002	500	Yes	0
Optional 1	Late1:OPN	Early1:ALL	0.002	500	Yes	0
Mixed Fire	Late1:OPN	Late1:OPN	0.003	333	No	0
Insects or Disease	Late1:OPN	Late1:OPN	0.003	333	No	0
Wind or Weather or Stress	Late1:OPN	Late1:OPN	0.01	100	No	0
Surface Fire	Late1:OPN	Late1:OPN	0.035	29	No	0
Replacement Fire	Late1:CLS	Early1:ALL	0.002	500	Yes	0
Optional 1	Late1:CLS	Early1:ALL	0.002	500	Yes	0
Mixed Fire	Late1:CLS	Late1:OPN	0.003	333	Yes	0

Insects or Disease	Late1:CLS	Late1:OPN	0.003	333	Yes	0
Wind or Weather or Stress	Late1:CLS	Late1:OPN	0.01	100	Yes	0

Optional Disturbances
Optional 1: Tornadic/Hurricane Winds

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