

13200

Central and Southern Appalachian Montane Oak Forest

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Vegetation Type

Forest and Woodland

Map Zones

48, 57, 61

Geographic Range

This system is known from the northern part of the Southern Appalachians and extreme southern part of the Central Appalachians in southwestern Virginia and adjacent parts of West Virginia, Tennessee, and North Carolina. Within the known range, it is a large-patch type that covers extensive areas on the Southern Blue Ridge. It is more localized in the Ridge and Valley and Cumberland Mountains, where it favors the higher ridges (Fleming 2010). NatureServe (2009) notes the system from Virginia and West Virginia to Georgia. In Kentucky, this system is restricted to the Cumberland Mountains in the extreme southeastern corner of that state.

Biophysical Site Description

This system consists of mixed oak forests on predominantly submesic slopes at elevations from 600-1200m (2000-4000ft) in the northern part of the Southern Appalachians. It occurs on various topographic positions from lower to upper slopes and crests, in deep, infertile soils. Parent material at known sites includes Ordovician siltstones and shale, Devonian shale and sandstone, quartzite, conglomerate sandstone and shale, interbedded quartzite and dolomite, charnockite, layered pyroxene granulite, biotite gneiss, and feldspathic metagraywacke. Slope profiles are usually convex in at least one direction (Fleming 2010). In the north zone of the Cherokee National Forest, this type occurs in Ecological Zones with a median elevation from 600-1000m (2000-3300ft) and a range of 365-1650m (1200-5400ft). At the lower end of this elevational range, it is confined to medium-width, cool-air drainages; at higher elevations it is confined to broader tertiary ridges and slopes, and at intermediate elevations it occurs on all landscape positions except the most exposed or the most protected, i.e. it occurs, on all submesic sites (Simon 2011).

For LANDFIRE, this Biophysical Setting (BpS) also includes the higher elevation, convex, rocky/talus slopes as a small subset.

Vegetation Description

Mature stands have a well-developed canopy of trees 30m+ tall. *Quercus rubra* is the leading overstory dominant, with only slightly higher density and basal area than *Quercus prinus*. Most stands are mixed, although either species can dominate small areas. One or both of the magnolias, *Magnolia acuminata* or *Magnolia fraseri*, are usually important in the overstory or understory. Minor canopy associates vary and can include *Quercus alba*, *Betula lenta*, *Acer rubrum*, *Carya* spp., *Fagus grandifolia*, *Tsuga canadensis*, and *Liriodendron tulipifera*. Most of the preceding species may be present in the understory, along with *Acer pensylvanicum*, *Oxydendrum arboreum*, *Pinus strobus*, *Amelanchier arborea* and *Amelanchier laevis*, and sprouts of *Castanea dentata*. *Acer pensylvanicum* is consistently the most important small tree / shrub, attaining densities >500 stems/ha in some stands (under the current fire-suppressed condition). Other shrubs that are less constant but sometimes important include *Hamamelis virginiana*, *Rhododendron maximum*, *Ilex montana*, *Viburnum acerifolium*, and *Vaccinium pallidum*. The herb layer is often patchy to sparse, with *Medeola virginiana*, *Galax urceolata*, *Convallaria majuscula*, *Thelypteris noveboracensis*, and *Dennstaedtia punctilobula* occasionally attaining 5% cover in a plot. In the higher part of the elevational range, however, the latter two ferns may greatly dominate the herb layer and cover more substantial areas. Other relatively constant but low-cover herbs include *Dioscorea quaternata*, *Eurybia divaricata*, *Solidago curtisii*, *Polygonatum biflorum*, *Polystichum acrostichoides*, *Conopholis americana*, *Clintonia umbellulata*, *Viola hastata*, *Uvularia puberula*, *Chamaelirium luteum*, *Zizia trifoliata*, and *Carex appalachica* (Fleming 2010).

This system concept also includes many successional communities that have been impacted by logging or agriculture, such as types dominated by *Liriodendron tulipifera*, *Pinus* spp., and *Robinia pseudoacacia*. Bedrock may be of any type. Soils are usually deep residual soils, but are often rocky. Some shallow soils, colluvium, and other soils may be present locally within the group, but shallow soils tend to produce environments that are more extreme and have a larger component of various pine species (LANDFIRE 2009).

For those rocky/talus based portions of this BpS the species are similar but are more stunted due to the thin, nutrient poor, soils and exposed topographic position.

NatureServe (2009) also notes that the understory is usually dominated by ericaceous shrubs, but some communities are either dominated by graminoid species or ferns. Only rarely are the communities dominated by other herbs. *Ilex montana* and *Rhododendron prinophyllum* are characteristic shrubs. *Castanea dentata* sprouts are also common today, but the importance of chestnut in these forests has been dramatically altered by chestnut blight.

BpS Dominant and Indicator Species

Symbol	Scientific Name	Common Name
QURU	<i>Quercus rubra</i>	Northern red oak
QUPR2	<i>Quercus prinus</i>	Chestnut oak
BELE	<i>Betula lenta</i>	Sweet birch
CADE12	<i>Castanea dentata</i>	American chestnut
ACPE	<i>Acer pensylvanicum</i>	Striped maple
ACRU	<i>Acer rubrum</i>	Red maple
TIAM	<i>Tilia americana</i>	American basswood

Disturbance Description

The frequency of *Castanea dentata* sprouts in this community type suggests that it was formerly an important tree in the overstory mix. Extensive logging during the late 19th and early 20th centuries, along with removal of *Castanea* by chestnut blight, no doubt favored the oaks in regenerated stands. Many mature, contemporary stands of this vegetation type are now exhibiting classic symptoms of oak decline, with very poor recruitment of the dominant oaks, along with abundant invasion of stand understories by shade-tolerant mesophytic trees. The latter vary from site to site but include *Acer rubrum*, *Fagus grandifolia*, *Tsuga canadensis*, *Pinus strobus*, and rarely, *Acer saccharum* var. *saccharum*. Exclusion of low-intensity fires and logging disturbances have contributed to these changes, which will likely continue barring the re-introduction of fire. A recently burned stand on Clinch Mountain in southwest Virginia exhibited atypically high cover by herbaceous species, suggesting that fires also benefit herbs by burning off litter/humus and increasing illumination through the elimination of shrubs (Fleming 2010).

This system is impacted by disturbances at different scales and in different seral states (estimated historic frequencies for the various modeled disturbances are included in this description below). In the later, more persistent portions of the life cycle, small canopy gaps may be created across the landscape by the death of individual (or small numbers of) trees which topple. However, weather related events (ice, wind, etc.) could have created gaps in the mature canopy that range from individual tree size to larger areas depending on the specific incident. Fire also occurred, mostly at low and moderate intensities, and could create much larger openings or more open forest canopies when they occur in any seral stage.

These forests are naturally uneven-aged climax forests, with reproduction occurring in canopy gaps. The open slopes are exposed to a variety of natural disturbances such as fires, winds, and ice storms. Fires were probably of low to moderate intensity and confined to the surface. All these forests are in a state of transition following the loss of chestnut as a canopy dominant. In most stands it appears that chestnut has been replaced initially by existing canopy and understory species. Species that have responded favorably (to this disturbance), such as *Liriodendron tulipifera*, *Acer rubrum*, *Robinia pseudoacacia*, and *Pinus* spp. have increased (Schafale and Weakley 1990).

Fire Regime Group I. Fire occurred fairly frequently in pre-European settlement times. Pre-settlement forests studies suggest fire return intervals of 7-26yrs for drier oak sites (Schuler and McClain 2003) or similar sub-mesic oak sites in the northern portion of this BpS. These observations are consistent with previous research in the oak forests of Ohio, Maryland, and Missouri. Fires were usually low-intensity surface fires, with an occasional more intense fire that replaced patches of the overstory. The dominant species (oak and historically chestnut) are fairly fire-tolerant, making most fires non-catastrophic. If fires occurred during the spring “green up” under very dry to drought conditions, patches of overstory could be killed by basal injury depending on aspect and fire behavior (LANDFIRE 2009).

Stand-replacing rock slides occur periodically due to the high amount of surface rock and severe slopes for some portions of this BpS. At these high elevations, ice storms occur frequently and pose the greatest risk to old, craggy trees. Surface burning is restricted due to the excessive

surface rock and discontinuous fuels/litter. Due to prevailing open conditions, trees are relatively wind firm. NatureServe (2009) notes that the communities of this system inhabit some of the most inhospitable parts of the Appalachians. Their occurrence on exposed high ridges means they are subject to frequent ice and wind storms in the summer and high winds throughout the year. This probably explains the forest's stunted appearance. In addition, lightning-caused fires may create ground fires that change the understory composition and inhibit some ericaceous shrub species in some areas. Despite the high elevation, chestnut had been a fairly substantial component of this system and can still be seen as rotting stumps in the forest.

Fire Frequency

Severity	Avg FI	Percent of All Fires	Min FI	Max FI
Replacement	147	14		
Moderate (Mixed)	95	22		
Low (Surface)	33	64		
All Fires	21	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

The higher rocky portions of this BpS can range from small rock slides (one acre) to larger rock dominated surfaces along mountain slides (100s of acres). NatureServe (2007) notes this BpS is usually smaller than 10ac but can be larger if the slope is broadly convex on the upper exposed slopes.

The greater portion of this BpS is a matrix oak-dominated forest over large parts of its geographic range, covering millions of acres at mid to high elevations within the Southern and Central Appalachians, and may extend into the Northern Appalachians. It represents 30% of ecological zones in the Southern Appalachian Landscape, and nearly 25% of ecological zones in the north-zone of the Cherokee National Forest. This type represents sites that are the most productive for oaks except for northern red oak in rich coves (LANDFIRE 2009, Simon et. al. 2005, Simon 2011).

Because of its wide range in elevation and extent across the landscape, this matrix type can be adjacent to almost all Ecological Systems in the Appalachians. From a perspective of proximity to fire-prone types, its mean distance is less than ½ mile from Southern Appalachian Montane Pine Forest and Woodland, but greater than 3mi from more mesic to wet zones such as Central and Southern Appalachian Spruce-Fir Forest and Appalachian (Hemlock)-Northern Hardwood types. At the lower end of its range, it can occur in mesic to sub-mesic drainages adjacent to Southern Appalachian Low-Elevation Pine (Simon 2011).

Adjacency or Identification Concerns

The system according to NatureServe (2007) generally occurs as a transition between Southern Appalachian Oak Forest (CES202.886 -- BpS 1315) and the more mesic Southern Appalachian Northern Hardwood Forest (CES202.029 -- BpS 1309) that occurs on less-exposed ridgetops and protected upper slopes. Below 915-1220m (3000-4000ft), this BpS (Central and Southern Appalachian Montane Oak Forest) can grade into Southern Appalachian Oak Forest

(CES202.886). Above 1372m (4500ft) elevation and below spruce-fir communities, Central and Southern Appalachian Montane Oak Forest tends to be replaced by the Southern Appalachian Northern Hardwood Forest (CES202.029), since the habitat on most slopes at this elevation tends to favor those species adapted to a more mesic environment.

It is most similar to BpS 13150_57 – Southern Appalachian Oak Forest, also a matrix oak type, and can be considered its more mesic, higher elevation extension (or visa-versa). These oak-dominated systems are distinguished from xeric to dry oak types, that occur as patches within this matrix, by the lack of a dominant ericaceous species understory (evergreen or deciduous). Fire suppression and the time since the last fire can confuse the identification of these types in the field.

Issues or Problems

Despite the high elevation, chestnut had been a fairly substantial component of this system and can still be seen as rotting stumps in the forest. In some locations, contemporary fire exclusion has created abundant understories, the release of mesophytic trees (i.e., *Acer rubrum* or *Acer saccharum* var. *saccharum*), and poor oak regeneration (Fleming et al. 2005). In modern times, gypsy moth infestations have caused defoliation and widespread tree mortality in the northern Blue Ridge, posing a serious threat to these oak-dominated systems (Fleming et al. 2005).

Native Uncharacteristic Conditions

Now present and increasingly abundant, red maple (*Acer rubrum*), white pine (*Pinus strobus*), and tulip poplar (*Liriodendron tulipifera*) could be typified as the “native invasive” in oak-dominated forests. Their abundance in these systems measured in both stem density and basal area has grown considerably due to fire suppression and the marked increase in fire return interval. In some stands, mountain laurel and great rhododendron have likely increased in cover, however, to a less extent than in more xeric or more mesic types (LANDFIRE 2009, Simon 2011).

Comments

During the BpS review and other modeling projects in the Cherokee National Forest, Nantahala-Pisgah National Forest and Great Smoky Mountains National Park the strong consensus was that the original model and description of this BpS was too limited to the rocky, high elevation, talus slopes of the Appalachians such that a critical, transitional BpS was entirely missing. Most of what was mapped as 13200 by LANDFIRE did not fit this description. In addition, NatureServe personnel provided feedback that was similar. Since we cannot modify the BpS spatial data at this point Jim Smith (The Nature Conservancy) merged a description from Steve Simon and Steve Croy into the existing description to make sure this important type was described. This type is locally called Chestnut Oak/Red Oak or sometimes High Elevation Red Oak. To match the description, Smith also adopted the model from the Great Smoky Mountains National Park's Landscape Conservation Forecasting project and merged descriptive information from that report as well.

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	A	A	A	A	A	A	A	A	A	A
Herb	0.5-1.0	A	A	A	A	A	A	A	A	A	A
Herb	>1.0	A	A	A	A	A	A	A	A	A	A
Shrub	0-0.5	A	A	A	A	A	A	A	A	A	A
Shrub	0.5-1.0	A	A	A	A	A	A	A	A	A	A
Shrub	1.0-3.0	A	A	A	A	A	A	A	A	A	A
Shrub	>3.0	A	A	A	A	A	A	A	A	A	A
Tree	0-5	A	A	A	A	A	A	A	A	A	A
Tree	5-10	C	C	C	C	C	C	C	B	B	B
Tree	10-25	D	D	D	D	D	D	D	E	E	E
Tree	25-50	D	D	D	D	D	D	D	E	E	E
Tree	>50	D	D	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 12 Early Development 1 - All Structures

Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
QURU	Quercus rubra	Northern red oak	All
QUPR2	Quercus prinus	Chestnut oak	All
BETUL	Betula	Birch	All
ACPE	Acer pensylvanicum	Striped maple	All

Description

Post-disturbance, regeneration state, primarily Oak seedlings.

Maximum Tree Size Class

Seedling <4.5ft

Class B 16 Mid Development 1 - Closed

Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
QURU	Quercus rubra	Northern red oak	Upper
QUPR2	Quercus prinus	Chestnut oak	Upper

BETUL	Betula	Birch	Upper
ACPE	Acer pensylvanicum	Striped maple	Middle

Description

Moderate sized deciduous trees with a closed canopy for the majority of this matrix type.

In the rockier portions of the BpS, limited growing spaces and infertility ensure that these stands maintain their open structure into maturity. Fire will also be limited by discontinuous fuels and occurs occasionally. Other disturbances include ice and wind storms, periodic drought, and, in some locations, severe gypsy moth defoliation and Quercus spp. mortality. In the rockier portions of this BpS the trees will be much smaller in diameter and much shorter.

Maximum Tree Size Class

Sapling >4.5ft; <5"DBH

Class C	11	Mid Development 1 - Open
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Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
QURU	Quercus rubra	Northern red oak	Upper
QUPR2	Quercus prinus	Chestnut oak	Upper
BETUL	Betula	Birch	Upper
ACPE	Acer pensylvanicum	Striped maple	Middle

Description

Moderate sized deciduous trees with a relatively open canopy for the majority of this matrix type.

For the rockier portions of this BpS, limited growing spaces and infertility ensure that these stands maintain their open structure into maturity. Fire will also be limited by discontinuous fuels and occurs occasionally. Other disturbances include ice and wind storms, periodic drought, and, in some locations, severe gypsy moth defoliation and Quercus spp. mortality. The trees will be much smaller in diameter and much shorter in the rockier portions of this BpS.

Maximum Tree Size Class

Sapling >4.5ft; <5"DBH

Class D	18	Late Development 1 - Open
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Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
QURU	Quercus rubra	Northern red oak	Upper
QUPR2	Quercus prinus	Chestnut oak	Upper
BETUL	Betula	Birch	Upper

ACPE	Acer pensylvanicum	Striped maple	Middle
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Description

Mature, open canopy deciduous forest. In the rockier portions of this BpS, the trees will be much smaller in diameter and much shorter.

Maximum Tree Size Class

Sapling >4.5ft; <5"DBH

Class E 43 Late Development 1 - Closed

Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
QURU	Quercus rubra	Northern red oak	Upper
QUPR2	Quercus prinus	Chestnut oak	Upper
BETUL	Betula	Birch	Upper
ACPE	Acer pensylvanicum	Striped maple	Middle

Description

Mature, closed canopy deciduous forest. The trees will be much smaller in diameter and much shorter in the rockier portions of this BpS.

Maximum Tree Size Class

Medium 9-21"DBH

Model Parameters

Deterministic Transitions

From Class	Begins at (yr)	Succeeds to	After (years)
Early1:ALL	0	Mid1:OPN	20
Mid1:OPN	21	Late1:OPN	70
Mid1:CLS	21	Late1:CLS	70
Late1:OPN	71	Late1:OPN	999
Late1:CLS	71	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
Alternative Succession	Early1:ALL	Mid1:CLS	1	1	Yes	19
Replacement Fire	Early1:ALL	Early1:ALL	0.015	67	Yes	0
Mixed Fire	Early1:ALL	Early1:ALL	0.02	50	No	0
Surface Fire	Early1:ALL	Early1:ALL	0.04	25	No	0
Alternative Succession	Mid1:OPN	Mid1:CLS	1	1	No	20

Wind or Weather or Stress	Mid1:OPN	Mid1:OPN	0.0025	400	No	0
Replacement Fire	Mid1:OPN	Early1:ALL	0.005	200	Yes	0
Mixed Fire	Mid1:OPN	Mid1:OPN	0.008	125	No	0
Surface Fire	Mid1:OPN	Mid1:OPN	0.04	25	No	0
Wind or Weather or Stress	Mid1:CLS	Mid1:OPN	0.0025	400	No	0
Replacement Fire	Mid1:CLS	Early1:ALL	0.01	100	Yes	0
Mixed Fire	Mid1:CLS	Mid1:OPN	0.011	91	No	0
Surface Fire	Mid1:CLS	Mid1:OPN	0.027	37	No	0
Surface Fire	Mid1:CLS	Mid1:CLS	0.027	37	No	0
Alternative Succession	Late1:OPN	Late1:CLS	1	1	No	20
Wind or Weather or Stress	Late1:OPN	Late1:OPN	0.0025	400	No	0
Wind or Weather or Stress	Late1:OPN	Early1:ALL	0.0025	400	Yes	0
Insects or Disease	Late1:OPN	Late1:OPN	0.0033	303	No	0
Replacement Fire	Late1:OPN	Early1:ALL	0.004	250	Yes	0
Mixed Fire	Late1:OPN	Late1:OPN	0.007	143	No	0
Surface Fire	Late1:OPN	Late1:OPN	0.036	28	No	0
Wind or Weather or Stress	Late1:CLS	Late1:OPN	0.0025	400	No	0
Wind or Weather or Stress	Late1:CLS	Early1:ALL	0.0025	400	Yes	0
Insects or Disease	Late1:CLS	Late1:OPN	0.0033	303	No	0
Replacement Fire	Late1:CLS	Early1:ALL	0.005	200	Yes	0
Mixed Fire	Late1:CLS	Late1:OPN	0.01	100	No	0
Surface Fire	Late1:CLS	Late1:OPN	0.025	40	No	0
Surface Fire	Late1:CLS	Late1:CLS	0.025	40	No	0

Optional Disturbances

Optional 1: Rock Slide

References

Fleming, G.P. 2010. *Southern Appalachian Montane Northern Red Oak - Chestnut Oak Forest* Classif. Resp.: Southeast. This provisional association is a synonym for a community type in the Natural Communities of Virginia and the description is provided for users of that classification.

Data source: NatureServe. 2010. International Ecological Classification Standard: Terrestrial Ecological Classifications. NatureServe Central Databases. Arlington, VA.

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