

13150

Southern Appalachian Oak Forest

BpS Model/Description Version: Aug. 2020

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Vegetation Type

Forest and Woodland

Map Zones

48, 53, 57, 59 ,61

Geographic Range

This system is restricted to the southern Appalachians, from approximately Roanoke, Virginia, south to northern Georgia. It is closely related to similar systems in adjacent regions (Piedmont, central Appalachians, Cumberlands), but is distinctive for its occurrence only at lower elevations in a region with much diversity in topography and elevation.

Biophysical Site Description

This system consists of predominantly dry-mesic (to dry) forests occurring on open and exposed topography at lower to mid-elevations in the Southern Blue Ridge and Southern Ridge and Valley ecoregions. This is the upland forest that characterizes much of the lower elevations of these areas. Substrates of stands included in this system can range from acidic to circumneutral or basic, and the vegetation varies accordingly. Typically, the vegetation consists of forests dominated by oaks, especially *Quercus prinus*, *Quercus alba*, *Quercus rubra*, and *Quercus coccinea*, with varying amounts of *Carya* spp., *Acer rubrum*, and other species. 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.

Vegetation Description

Various species of oak (*Quercus* spp. are consistently present as major components of the tree stratum, along with hickories (*Cary* spp.) and other hardwoods. Historically American chestnut (*Castanea dentata*) was a dominant or co-dominant in many of these communities until its virtual elimination by the chestnut blight fungus (*Endothia [Cryphonectria] parasitica*) during the early 1900s.

Typically, the vegetation seen today consists of forests dominated by oaks, especially White oak (*Quercus alba*) and Northern red oak (*Quercus rubra*), and on drier sites Chestnut oak (*Quercus prinus*), Black oak (*Quercus velutina*), and Scarlet oak (*Quercus coccinea*). Along with oaks are varying amounts of Hickory (*Carya* spp.), Red maple (*Acer rubrum*), Black gum (*Nyssa sylvatica*) and other species such as white pine (*Pinus strobus*) and white ash (*Fraxinus americana*). Currently subcanopies and shrub layers are usually well-developed. Some areas (usually on drier sites) now have dense evergreen ericaceous shrub layers of Mountain laurel (*Kalmia latifolia*), with Rhododendron (*Rhododendron* spp.) on more mesic sites. Some other areas have deciduous ericad layers, sometimes consisting of Blueberries (*Vaccinium* spp.) or Huckleberries (*Gaylussacia* spp.). 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*.

Herbs, forbs, and ferns are sparse to moderate in density. Though often contiguous, patches of this system may be convoluted and interfingering with other systems, especially Mesophytic Cove Forests and Dry-Xeric Oak-Pine Forests. At the higher elevations it may grade into Northern Hardwood Forests. Small patches of other communities, such as rock outcrops and seepage wetlands, are sometimes embedded within this group.

Extreme wind or ice storms occasionally create larger canopy openings. Virtually all examples have been strongly affected by introduction of the chestnut blight, which killed all of the American chestnut trees, eliminating it as a canopy dominant. The introduction, and now widespread establishment, of gypsy moth (*Lymantria dispar*) that favors oaks as food has also affected these forests by causing widespread mortality of overstory trees depending on topographic position and precipitation amounts around defoliation events. Past logging, and now lack of fire, has affected most occurrences by changing canopies to an even-aged, or more even-aged, structure with an understory of shade tolerant but fire intolerant species such as white pine, red maple, and striped maple (*Acer pensylvanicum*). Hickories are thought to have benefited greatly from the removal of American chestnut from the overstory, and their persistence and continued recruitment in contemporary oak-hickory forests may reflect fire exclusion in recent decades. This southern Appalachian system is characterized by the presence, in most occurrences, of plant species of southern Appalachian affinity, such as *Magnolia fraseri*, *Gaylussacia ursina*, *Rhododendron calendulaceum*, etc.

BpS Dominant and Indicator Species

Symbol	Scientific Name	Common Name
QUPR2	<i>Quercus prinus</i>	Chestnut oak
QURU	<i>Quercus rubra</i>	Northern red oak
QUAL	<i>Quercus alba</i>	White oak
QUVE	<i>Quercus velutina</i>	Black oak
CADE12	<i>Castanea dentata</i>	American chestnut
PIST	<i>Pinus strobus</i>	Eastern white pine
QUCO2	<i>Quercus coccinea</i>	Scarlet oak
KALA	<i>Kalmia latifolia</i>	Mountain laurel

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

Disturbance Description

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.

Most oaks are long-lived with typical age of mortality ranging from 200-400yrs. Scarlet and black oaks are shorter lived with typical ages being ~ 50-100yrs while white oaks can live as long as 600yrs.

Fire Regime Group I. Fire occurred fairly frequently in pre-European settlement times. Pre-settlement forest studies suggest fire return intervals of 7-26yrs (Schuler et al. 2003, Ruffner and Abrams 2002, Shumway et al. 2001). 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 the overstory could be killed by basal injury depending on aspect and fire behavior. Fire is important for favoring oak dominance over more mesophytic tree species such as red maple, beech, and blackgum. Fire also can be expected to have a moderate to strong effect on vegetation structure, producing a more open canopy and less dense understory and shrub layer than currently seen. Fire frequency and/or intensity is important for determining the boundary between this group and both the more mesic and the drier systems, and works in conjunction with aspect and exposure. Ice storm, wind, drought, and insect (gypsy moth) events are disturbances that also occur in this system at widely varying frequencies.

Fire Frequency

Severity	Avg FI	Percent of All Fires	Min FI	Max FI
Replacement	603	2	500	1000
Moderate (Mixed)	138	10	200	500
Low (Surface)	16	88	7	26
All Fires	14	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 is a matrix forest type over large parts of the geographic range, covering thousands of acres. This type is more-or-less endemic to the southern Appalachian mountains, where it may be inter-fingered with cove forests and more xeric oak-pine woodlands.

Adjacency or Identification Concerns

Stands of this Biophysical Setting (BpS) may be difficult to distinguish floristically (in relation to their canopies) from similar forests of adjacent regions; it is separated from those based primarily on (an admittedly arbitrary) biogeography.

Issues or Problems

Some drier/xeric settings (e.g. narrow fire-prone ridges) may develop a substantial pine component of shortleaf, pitch, and/or table mountain pine. Depending on location and elevation, these would be examples of Southern Appalachian Montane Pine Forest and Woodland (CES202.331; BpS 1352) or Southern Appalachian Low Elevation Pine Forest (CES202.332; BpS 1353).

Native Uncharacteristic Conditions

Comments

Reviewer opted to utilize the Dry-Mesic Oak Forest model from the Great Smoky Mountains National Park (GSMNP) Landscape Conservation Forecasting (LCF) project. The LCF project connected this LANDFIRE model to their Dry, Dry-Mesic and Mesic Oak Forest model, but the reviewer determined that the Dry-Mesic GSMNP LCF model would be the most suitable for LANDFIRE. The LANDFIRE description only required very minor modification to match the GSMNP model and description.

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	5	Early Development 1 - All Structures
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Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
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Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
QUPR2	Quercus prinus	Chestnut oak	Upper
QUAL	Quercus alba	White oak	Upper
CADE12	Castanea dentata	American chestnut	Upper
KALA	Kalmia latifolia	Mountain laurel	Lower

Description

(Class a Late- seral open. Forest with an open midstory and canopy. Patchy shrub/herbaceous cover.

Maximum Tree Size Class

Large 21-33"DBH

Class E	9	Late Development 1 - Closed
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Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
QUPR2	Quercus prinus	Chestnut oak	Upper
CADE12	Castanea dentata	American chestnut	Upper
PIST	Pinus strobus	Eastern white pine	Middle
QURU	Quercus rubra	Northern red oak	Upper

Description

Late-seral closed. Closed canopy forest. Midstory and understory closed with dense cover and stocking of shrubs and saplings.

Maximum Tree Size Class

Large 21-33"DBH

Model Parameters

Deterministic Transitions

From Class	Begins at (yr)	Succeeds to	After (years)
Early1:ALL	0	Mid1:OPN	19
Mid1:OPN	20	Late1:OPN	69
Mid1:CLS	20	Late1:CLS	69
Late1:OPN	70	Late1:OPN	999
Late1:CLS	70	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
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Alternative Succession	Early1:ALL	Mid1:CLS	1	1	Yes	18
Replacement Fire	Early1:ALL	Early1:ALL	0.002	500	Yes	0
Surface Fire	Early1:ALL	Early1:ALL	0.07	14	No	0
Alternative Succession	Mid1:OPN	Mid1:CLS	1	1	Yes	25
Replacement Fire	Mid1:OPN	Early1:ALL	0.002	500	Yes	0
Surface Fire	Mid1:OPN	Mid1:OPN	0.07	14	No	0
Replacement Fire	Mid1:CLS	Early1:ALL	0.001	1000	Yes	0
Mixed Fire	Mid1:CLS	Early1:ALL	0.002	500	Yes	0
Mixed Fire	Mid1:CLS	Mid1:OPN	0.01	100	Yes	0
Surface Fire	Mid1:CLS	Mid1:CLS	0.05	20	No	0
Alternative Succession	Late1:OPN	Late1:CLS	1	1	Yes	40
Replacement Fire	Late1:OPN	Early1:ALL	0.002	500	Yes	0
Wind or Weather or Stress	Late1:OPN	Early1:ALL	0.003	333	Yes	0
Mixed Fire	Late1:OPN	Mid1:OPN	0.005	200	Yes	0
Wind or Weather or Stress	Late1:OPN	Mid1:OPN	0.02	50	Yes	0
Surface Fire	Late1:OPN	Late1:OPN	0.07	14	No	0
Replacement Fire	Late1:CLS	Early1:ALL	0.001	1000	Yes	0
Insects or Disease	Late1:CLS	Early1:ALL	0.002	500	Yes	0
Wind or Weather or Stress	Late1:CLS	Late1:OPN	0.003	333	Yes	0
Insects or Disease	Late1:CLS	Late1:OPN	0.013	77	Yes	0
Mixed Fire	Late1:CLS	Late1:OPN	0.033	30	Yes	0
Surface Fire	Late1:CLS	Late1:CLS	0.05	20	No	0

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