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 interfingered 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 | *Quercus prinus* | Chestnut oak |
| QURU | *Quercus rubra* | Northern red oak |
| QUAL | *Quercus alba* | White oak |
| QUVE | *Quercus velutina* | Black oak |
| CADE12 | *Castanea dentata* | American chestnut |
| PIST | *Pinus strobus* | Eastern white pine |
| QUCO2 | *Quercus coccinea* | Scarlet oak |
| KALA | *Kalmia latifolia* | 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

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| QUPR2 | Quercus prinus | Chestnut oak | Upper |
| QUAL | Quercus alba | White oak | Upper |
| QUVE | Quercus velutina | Black oak | Upper |
| CADE12 | Castanea dentata | American chestnut | Mid-Upper |

Description

Treefall gaps and small to medium patches with saplings and small trees up to 20cm (8in) DBH. Potential canopy species (oaks) are typically mixed with subcanopy and shrub species and herbs. Most oaks are coppice grown from previously established and fire killed individuals with some as seedlings from animal-buried acorns.

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

Class B 25 Mid Development 1 - Closed

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| QUPR2 | Quercus prinus | Chestnut oak | Upper |
| QURU | Quercus rubra | Northern red oak | Middle |
| CADE12 | Castanea dentata | American chestnut | Upper |

Description

Mid-seral closed. Old treefall gaps with closed canopy. Trees ranging from 20-60cm (8-24in) DBH. Shade tolerant species in the understory.

*Maximum Tree Size Class*  
Medium 9-21"DBH

Class C 36 Mid Development 1 - Open

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

Mid-seral open woodland with an open midstory and canopy.

*Maximum Tree Size Class*  
Medium 9-21"DBH

Class D 25 Late Development 1 - Open

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

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** |
| 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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