

## Rapid Assessment Reference Condition Model

The Rapid Assessment is a component of the LANDFIRE project. Reference condition models for the Rapid Assessment were created through a series of expert workshops and a peer-review process in 2004 and 2005. For more information, please visit [www.landfire.gov](http://www.landfire.gov). Please direct questions to [helpdesk@landfire.gov](mailto:helpdesk@landfire.gov).

### Potential Natural Vegetation Group (PNVG)

R8OHPI Appalachian Oak Hickory Pine

#### General Information

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**Vegetation Type**

Forested

**General Model Sources**

- Literature
- Local Data
- Expert Estimate

**Rapid Assessment Model Zones**

- California
- Pacific Northwest
- Great Basin
- South Central
- Great Lakes
- Southeast
- Northeast
- S. Appalachians
- Northern Plains
- Southwest
- N-Cent. Rockies

**Dominant Species\***

QUPR	QUAL
QUCO	QUVE
PIEC2	
CAGL	

**LANDFIRE Mapping Zones**

57  
53  
48

#### Geographic Range

Central West Virginia south to the southern end of the Cumberland Plateau in central Alabama; western edge is at shale or limestone parent geology with Mississippian Plateau in KY and Highland Rim in TN; eastern boundary is foothills of the Blue Ridge Mountains adjacent to the Piedmont.

#### Biophysical Site Description

This group occurs primarily on intermediate site qualities for oak and hickory (oak site index 55-65). Parent geologies include Pennsylvanian sandstone on the Northern, Central, and Southern Cumberland Plateau sections; 'Red Mountain' sandstone in the Southern and Central Ridge and Valley ecological sections; quartzites, phyllite, conglomerates and shales in the Metasedimentary Mountains (western) subsection portion of the Blue Ridge Mountains also on the Tallulah Dome geologic feature in Georgia (at LTA scale), also chert and shales in the Southern Ridge and Valley section. It occurs in the intermountain valleys including the 'Copper Basin' of TN/GA, the Hiwassee River Basin on the NC/GA line, and the Little Tennessee basin also on the NC/GA line. Soils are typically somewhat droughty and relatively infertile. They may be coarse-textured and shallow (<40"). Elevational range of distribution is from approximately 1000 feet up to approximately 2000 feet. In the mountains aspects are typically 'hot'; that is south, southwest, and west but may occur on broad ridgetops of indeterminate aspect such as on the Cumberland Plateau, on adverse sites (I.e. edaphic climax) in otherwise sheltered locations, and on toe slopes with weak aspect. Annual precipitation ranges between approximately 45 in the north to 65 inches in the south. Frost-free days range between approximately 170 to 200 days.

#### Vegetation Description

Typical vegetation is mixed within the overall distribution. It may be dry-xeric site oaks, hickories and pine such as scarlet oak, chestnut oak, post oak, pignut hickory, sand hickory, shortleaf pine, pitch pine, Virginia pine, and longleaf pine or more mesic site species such as white oak, black oak, mockernut hickory, shortleaf and loblolly. Virginia pine aggressively colonizes if there is a fire refuge for mother trees. At the southern end, loblolly may replace or intermingle with shortleaf and can invade uplands from riparian

\*Dominant Species are from the NRCS PLANTS database. To check a species code, please visit <http://plants.usda.gov>.

areas. Frequent surface fire is the mechanism to exclude most Virginia pine, white pine, and loblolly. In the Southern Ridge and Valley and Southern Cumberland Plateau 'mountain longleaf' can be an important pine species. Associated midstory species are typically red maple, sourwood, dogwood and black gum occurring in low to no more than moderate density in stems/acre. Understory species include mountain laurel and various species of huckleberry, azaleas, panic grasses and bluestem, also 'clumpy' in occurrence. Of these, bluestem is the most abundant. Loblolly and Longleaf pine not a component for the Cumberland Plateau north of Alabama. (Zones 53 and 57). White pine is naturally found only in pockets west of the Smoky Mountains.

### **Disturbance Description**

This system is subject to frequent (1-10 year return) light disturbance, moderately frequent (10-30 year return) moderate disturbance, and infrequent (30 - 80 year return) severe disturbance.

Light disturbance types include surface fire, lightning, black turpentine beetle, twig girdling by hickory twig girdler and endemic level southern pine beetle and mortality from moderate intensity droughts about every 10 years. Moderate disturbances include epidemic level Southern Pine Beetle (SPB) on approximate 10 year cycles, thunderstorm downbursts or other high winds that remove trees within stands on an approximate 20 year interval, mixed fire intensities that 'blows holes' with localized group mortality with 'jackpot' fuels or fire-prone landscape positions and glaze damage on an approximate 30 year average return. Severe disturbances include ice storms, tornado blowdown of entire stands, stand replacement fire, mortality from severe droughts and oak decline or oak wilt on approximate 30 year intervals. Disturbance agents typically interact simultaneously or in close succession.

Fire is the agent that maintains light and seedbed conditions for pine seedling establishment and also retards competition by shade tolerant and fire intolerant species that would prevent pine development into the canopy. It must be frequent to fill this role and of these two, seedbed prep is the most critical. Natural ignition fire alone is not sufficient to maintain this system. Fire is also critical to prevent species shifts to Virginia pine, loblolly pine, and white pine since these species do not resprout if top killed, and both Virginia pine and white pine are fire intolerant. Note that in the ridge and valley this BpS/PNVG is a Fire Regime Group II with a few areas of I that have been maintained with fire, but this is less than 25% of the overall area (this could be more important in some LANDFIRE mapping zones).

### **Adjacency or Identification Concerns**

In more sheltered locations with better moisture regimes and on deeper, more fertile soils; this PNVG grades into dry-mesic oak-hickory. Conversely on more xeric sites it grades into predominant yellow pine or yellow pine-xeric oak groups. It occupies a relatively narrow ecological niche in that the intolerance of the pine component is a constraint to the entire system for frequent disturbance. The near-similarity between oak-pine and pine-oak PNVGs, the 'ecotonal' nature of these species mixes in existing vegetation, the need for human-caused fire, and the relatively minor shifts in disturbance response required to move between them is likely to make consensus difficult to reach.

This PNVG is similar to 'POHS' the "Piedmont Oak-Hickory-Shortleaf Pine" modeled and described by Cecil Frost. He should review this description. The POHS apparently crosswalks to CES202.339. R8OHPI is also very similar to OKPN2 'Oak-hickory-pine of LANDFIRE map zones 44 and 49 modeled by R.P.Guyette, L. Iverson, and J. Merzenich. They should also review this description. This PNVG is expected to be absent from areas with calcareous geology and non-acidic soils; for example, map zone 47 (Highland Rim and Nashville Basin in TN). This PNVG is similar to TNC plant associations CEGL005271 and CEGL005023, though they do not recognize the pine component as defining the association. Also similar to CEGL003560 'Shortleaf Pine Little Bluestem Appalachian Woodland' but differing in having oaks and hickories as predominant species instead of shortleaf. R8OHPI crosswalks to the CES202.591 Central Appalachian Dry Oak-Pine Forest ecological system. In Kuchler classification it crosswalks to K111 'oak-hickory-pine' and K112 'southern mixed forest though the geographic scale of this PNVG is mapped as

being in K103 'mixed mesophytic' on the Cumberland Plateau and as K104 'Appalachian oak' in the Blue Ridge. Some of this difference is conceptual (e.g. K103) and some (K104) is a difference in scale.

**Scale Description**

**Sources of Scale Data**    Literature    Local Data    Expert Estimate

This PNVG varies rather widely in different parts of its occurrence in scale. On the relatively undissected portions of the Cumberland Plateau, it can be very extensive ranging up to tens of thousands of contiguous acres. On the Plateau edges and in the Metasedimentary Mountains subsection of the Blue Ridge, it is more broken up by complex terrain ranging from less than 100 contiguous acres up to a few thousand. Within the 'crystalline' geology portion of the Blue Ridge Mountains it occurs as patches of tens to a few hundreds of acres.

**Issues/Problems**

This 'mixed' composition is ecotonal and perhaps more than other groups is mediated by frequent disturbance. It tends to 'straddle' between xeric and mesic; that is, the 'dry-mesic', and can be difficult to 'pin down' to reach consensus. Species composition; especially of the yellow pines, can be highly variable at the scale of the entire Southern Appalachians unit, making it tempting to create new but finer scale variants. For example, hickory is reported to be a largely missing component on the Central Cumberland Plateau and winged elm is a common associate in the Southern Ridge and Valley. Rhododendron and mountain laurel is reported as an associated understory species in the foothills of the Appalachians in western North Carolina.

**Model Evolution and Comments**

QA/QC changes: Changed destination for Mixed Fire pathway in Class A from Class C (because of rule violation of advancing age) to Class A. Added TSD of 8 to Class A AltSucc to Class B. All other changes were made to try and mimic original results after correcting the rule violations. Changed Succession in Class A from B to C. Changed Succession in Class D from A to D. Added AltSucc from Class C to B with TSD of 20 years. There were still some differences in classes percentages, particularly A and C, and Class E virtually disappears. Also, the Replacement FRI went from 220 originally to 180 after all the changes. Peer review changes: Added statements about fire regime in Ridge and Valley Province to Disturbance Description, and about Loblolly, Longleaf and White Pine provenances to the Vegetation Description.

**Succession Classes\*\***  
*Succession classes are the equivalent of "Vegetation Fuel Classes" as defined in the Interagency FRCC Guidebook (www.frcc.gov).*

**Class A    15 %**

Early1 All Struct

**Description**

Early seral-closed: This is the regeneration phase of the PNVG, that is, how it replaces itself. In Class A, composition is oak and hickory 'sprout seedlings' along with shortleaf pine sprouts and seedlings of other pine species. Pine seedlings can include Virginia pine and pitch pine in the northern and central portion of the PNVG distribution and loblolly pine or longleaf in the southern end. Light surface fires act to reduce stem density and maintain health in a well-functioning system. Class A

**Dominant Species\* and**

**Canopy Position**

- PIV12 Upper
- PIEC2 Upper
- QUPR2 Upper
- QUCO2 Upper

**Upper Layer Lifeform**

- Herbaceous
- Shrub
- Tree

**Fuel Model 9**

**Structure Data (for upper layer lifeform)**

	Min	Max
Cover	30 %	100 %
Height	Tree Regen <5m	Tree Short 5-9m
Tree Size Class	Seedling <4.5ft	

Upper layer lifeform differs from dominant lifeform. Height and cover of dominant lifeform are:

\*Dominant Species are from the NRCS PLANTS database. To check a species code, please visit <http://plants.usda.gov>.

occurs both as gaps and as extensive areas created by blowdown and/or wind or slope-driven fires.

**Class B 14 %**

Mid1 Closed

**Description**

Mid-seral closed: This structure is formed by closed early seral that has not been disturbed enough to significantly gap the closed canopy. It begins at about age 10 when crowns close. Canopy closure is greater than approximately 95%.

**Dominant Species\* and Canopy Position**

QUPR2 Upper  
 PIEC2 Upper  
 QUCO2 Upper  
 CAGL8 Upper

**Upper Layer Lifeform**

- Herbaceous
- Shrub
- Tree

**Fuel Model** 9

**Structure Data (for upper layer lifeform)**

	Min	Max
Cover	75 %	100 %
Height	Tree Short 5-9m	Tree Medium 10-24m
Tree Size Class	Pole 5-9" DBH	

- Upper layer lifeform differs from dominant lifeform. Height and cover of dominant lifeform are:

**Class C 55 %**

Mid1 Open

**Description**

Mid-seral open: This structure is formed by the development through time of an early seral open or by disturbance such as a 'mixed' fire in an early seral closed or a mid-seral closed. Canopy closure approximately 80 to 90%.

**Dominant Species\* and Canopy Position**

QUPR2 Upper  
 QUCO2 Upper  
 CAGL8 Mid-Upper  
 PIEC2 Upper

**Upper Layer Lifeform**

- Herbaceous
- Shrub
- Tree

**Fuel Model** 9

**Structure Data (for upper layer lifeform)**

	Min	Max
Cover	30 %	75 %
Height	Tree Short 5-9m	Tree Medium 10-24m
Tree Size Class	Pole 5-9" DBH	

- Upper layer lifeform differs from dominant lifeform. Height and cover of dominant lifeform are:

**Class D 15 %**

Late1 Open

**Description**

Late seral - open: This structure occurs when light to moderate intensity disturbance has maintained the mid-seral open or severe disturbance has opened up a late seral closed. Scarlet oak declines beyond about 80 years as an overstory dominant in the late seral. Canopy closure is approximately 65 to 80%.

**Dominant Species\* and Canopy Position**

QUPR2 Upper  
 QUAL Upper  
 PIEC2 Upper  
 CAGL8 Mid-Upper

**Upper Layer Lifeform**

- Herbaceous
- Shrub
- Tree

**Fuel Model** 9

**Structure Data (for upper layer lifeform)**

	Min	Max
Cover	15 %	55 %
Height	Tree Medium 10-24m	Tree Tall 25-49m
Tree Size Class	Medium 9-21"DBH	

- Upper layer lifeform differs from dominant lifeform. Height and cover of dominant lifeform are:

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**Class E 1 %**

Late I Closed

**Description**

Late seral - closed: This structure occurs when disturbance intensity has been too light to create canopy gaps. Scarlet oak declines as an overstory dominant beyond about 80 years. Canopy closure is 95 to 100%.

**Dominant Species\* and Canopy Position**

QUPR2 Upper  
QUAL Upper  
PIEC2 Upper  
CAGL8 Mid-Upper

**Upper Layer Lifeform**

- Herbaceous
- Shrub
- Tree

**Fuel Model 9**

**Structure Data (for upper layer lifeform)**

	Min	Max
Cover	55 %	95 %
Height	Tree Medium 10-24m	Tree Tall 25-49m
Tree Size Class	Medium 9-21"DBH	

Upper layer lifeform differs from dominant lifeform. Height and cover of dominant lifeform are:

**Disturbances**

**Disturbances Modeled**

- Fire
- Insects/Disease
- Wind/Weather/Stress
- Native Grazing
- Competition
- Other:
- Other

**Historical Fire Size (acres)**

Avg: 1000  
Min: 30  
Max: 5000

**Fire Regime Group: 1**

- I: 0-35 year frequency, low and mixed severity
- II: 0-35 year frequency, replacement severity
- III: 35-200 year frequency, low and mixed severity
- IV: 35-200 year frequency, replacement severity
- V: 200+ year frequency, replacement severity

**Fire Intervals (FI)**

Fire interval is expressed in years for each fire severity class and for all types of fire combined (All Fires). Average FI is central tendency modeled. Minimum and maximum show the relative range of fire intervals, if known. Probability is the inverse of fire interval in years and is used in reference condition modeling. Percent of all fires is the percent of all fires in that severity class. All values are estimates and not precise.

**Sources of Fire Regime Data**

- Literature
- Local Data
- Expert Estimate

	Avg FI	Min FI	Max FI	Probability	Percent of All Fires
Replacement	180	30	500	0.00556	3
Mixed	65	15	150	0.01538	8
Surface	6	3	10	0.16667	89
All Fires	5			0.18761	

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