LANDFIRE Biophysical Setting Model

Biophysical Setting 5713150 Southern Appalachian Oak Forest

☐ *This BPS is lumped with:*
☐ *This BPS is split into multiple models:*

General Information

Contributors (also see the Comments field) **Date** 9/24/2007

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Vegetation Type
Forest and Woodland

Map Zone
57

Model Zone

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

Dominant Species*

QUPR2	CADE12
QURU	PIST
QUAL	QUCO2
QUVE	KALA

General Model Sources
☑ Literature
☐ Local Data
☑ Expert Estimate

Geographic Range

This system is restricted to the southern Appalachians, from approximately Roanoke, VA, south to northern GA. 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)

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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 1900's.

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.

This system is naturally dominated by stable, uneven-aged forests, with canopy dynamics dominated by gap-phase regeneration. Most oaks are long-lived with typical age of mortality ranging from 200 to 400yrs. Scarlet and black oaks are shorter lived with typical ages being approximately 50 to 100yrs while white oaks can live as long as 600yrs.

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.

Disturbance Description

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 and McClain 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 then patches of the overstory could be killed by basal injury

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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.

Adjacency or Identification Concerns

Stands of this 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.

Native Uncharacteristic Conditions

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.

Issues/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).

Comments

This BpS model description and VDDT model were based upon the RA model R7APOK. The previous creaters/reviewers (of the RA starter model R7APOK Appalachian Dry-mesic Oak Forest) are Doug Wallner, Sue Gawler, Cecil Frost. Additional author was Steve Croy (scroy@fs.fed.us).

Original model Peer reviewed by Daniel Yaussy 3/30/05. The VDDT model was adjusted as per Daniel's comments. Peer reviewed by Michael S. Batcher, Ecologist, 04/22/05 and Daniel Yaussy, Supervisory Research Forester USDA Forest Service, 3/30/05.

Vegetation Classes

Class A 5 %

Early Development 1 All Structure

Upper Layer Lifeform

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

Fuel Model 6

Indicator Species* and Canopy Position

QUPR2	Upper
QUAL	Upper
QUVE	Upper
CADE12	Mid-Upper

Structure Data (for upper layer lifeform)

	Min	Max
Cover	0 %	70 %
Height	Tree 0m	Tree 10m
Tree Size Class	Sapling >4.5ft; <5"DBH	

☐ Upper layer lifeform differs from dominant lifeform.

Description

(Class age 0-19yrs): Treefall gaps and small to medium patches 0-19yrs in age with saplings and small trees up to 20 cm (8 in) 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

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some as seedlings from animal-buried acorns. Review Comments 11/07: Changed TSD for AltSuccession to 18 to follow LANDFIRE modeling rules [No significant impact on model outputs].

Class B **25 %**

Mid Development 1 Closed

Upper Layer Lifeform

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

Fuel Model 8

Indicator Species* and Canopy Position

QUPR2	Upper
QURU	Middle
CADE12	Upper

Structure Data (for upper layer lifeform)

	Min	Max
Cover	61 %	100 %
Height	Tree 10.1m	Tree 25m
Tree Size Class	Medium 9-21"DBH	

☐ Upper layer lifeform differs from dominant lifeform.

Description

(Class age 20-69yrs): Mid-seral closed. Old treefall gaps with closed canopy 20-69yrs in age. Trees ranging from 20-60cm (8-24in) DBH. Shade tolerant species in the understory.

Class C **35 %**

Mid Development 1 Open

Upper Layer Lifeform

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

Fuel Model 8

Indicator Species* and Canopy Position

QUPR2	Upper
QUAL	Upper
CADE12	Upper
KALA	Lower

Structure Data (for upper layer lifeform)

	Min	Max
Cover	41 %	60 %
Height	Tree 10.1m	Tree 25m
Tree Size Class	Medium 9-21"DBH	

☐ Upper layer lifeform differs from dominant lifeform.

Description

(Class age 20-69yrs): Mid-seral open woodland with an open midstory and canopy closure <60%. Age of 20-69yrs. Shrub/herbaceous cover patchy.

Class D **26 %**

Late Development 1 Open

Upper Layer Lifeform

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

Fuel Model 8

Indicator Species* and Canopy Position

QUPR2	Upper
QUAL	Upper
CADE12	Upper
KALA	Lower

Structure Data (for upper layer lifeform)

	Min	Max
Cover	51 %	80 %
Height	Tree 25.1m	Tree 50m
Tree Size Class	Large 21-33"DBH	

☐ Upper layer lifeform differs from dominant lifeform.

Description

(Class age 70yrs+): Late- seral open. Forest with an open midstory and canopy closure 50-80%. Is 70yrs+. Shrub/herbaceous cover patchy.

Class E **9 %**

Late Development 1 Closed

Upper Layer Lifeform

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

Fuel Model 8

Indicator Species* and Canopy Position

QUPR2	Upper
CADE12	Upper
PIST	Middle
QURU	Upper

Structure Data (for upper layer lifeform)

	Min	Max
Cover	81 %	100 %
Height	Tree 25.1m	Tree 50m
Tree Size Class	Large 21-33"DBH	

☐ Upper layer lifeform differs from dominant lifeform.

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Description

(Class age 70yrs+): Late- seral closed. Closed canopy forest with cover >80%. Trees 65yrs+ in. Midstory and understory closed with dense cover and stocking of shrubs and saplings.

Disturbances

Fire Regime Group:** I

Historical Fire Size (acres)

Avg 1000
Min
Max

Sources of Fire Regime Data

☑ Literature
☐ Local Data
☑ Expert Estimate

Fire Intervals	Avg FI	Min FI	Max FI	Probability	Percent of All Fires
Replacement	602.2	500	1000	0.00166	2
Mixed	139.3	200	500	0.00718	10
Surface	15.87	7	26	0.06302	88
All Fires	14			0.07186	

Fire Intervals (FI):
Fire interval is expressed in years for each fire severity class and for all types of fir combined (All Fires). Average FI is central tendency modeled. Minimum and maximum show the relative range of fire intervals, if known. Probability is the inver 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.

Additional Disturbances Modeled

☑ Insects/Disease ☐ Native Grazing ☐ Other (optional 1)
☑ Wind/Weather/Stress ☐ Competition ☐ Other (optional 2)

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