LANDFIRE Biophysical Setting Model

Biophysical Setting: 5713530 Southern Appalachian Low-Elevation Pine Forest

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

General Information

Contributors (also see the Comments field) **Date** 7/26/2007

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		FRCC	

Vegetation Type
Forest and Woodland

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

Dominant Species*
PIVI2 QUCO
PIEC2 CAGL
QUFA VAPA
QUPR GABA

General Model Sources
☑ Literature
☐ Local Data
☑ Expert Estimate

Geographic Range
This system is found primarily in the Appalachian regions of Kentucky and the Southern Blue Ridge in northern Georgia, western North Carolina, southeastern Tennessee, the Cumberlands of Alabama, parts of the Interior Low Plateau (e.g., the Knobs Region of Kentucky), and southwestern Virginia (NatureServe 2007).

Biophysical Site Description
Occurs on a variety of topographic and landscape positions, including ridgetops, upper and midslopes, in mountain valleys and lower ranges. Bedrock may be a variety of types, but system is limited to acidic substrates (NatureServe 2007). This system consists of shortleaf pine- and Virginia pine-dominated forests in the lower elevation southern Appalachians and adjacent Piedmont and Cumberland Plateau, extending into the Interior Low Plateau of Kentucky and Tennessee. Fire is important in maintaining Shortleaf pine dominated types. The natural habitat of Virginia pine is xeric fire refuges such as exposed rock outcrops with patchy and light fuels. It is thus somewhat comparable to Table Mountain pine, but at lower elevations. Under natural conditions, it would occupy minor land area as a type but would have scattered individuals surviving in mixture with shortleaf pine.

This system is common to the Southern Appalachians but less so in the adjacent Piedmont, typically occupying xeric to dry sites at elevations generally below 700 m on ridge tops, western, south and southwestern aspects. Occasionally Virginia pine is also found dry-mesic sites as a pioneering vegetation.

Vegetation Description
Vegetation consists of closed to open forest dominated by shortleaf pine (Pinus echinata) or Virginia pine (Pinus virginiana). Pitch pine (Pinus rigida) may sometimes be present. Hardwoods may be abundant at times, especially dry-site oaks such as Quercus falcata, Quercus prinus, and Quercus coccinea. Other overstory components vary with moisture regimes but could include several other pine species, red and

white oaks, other hardwoods and/or eastern red cedar. Many stands are strongly even-aged and density-dependent based on age.

The hardwood component may be partly the result of fire suppression. The shrub layer may be well-developed, with Vaccinium pallidum, Gaylussacia baccata, or other acid-tolerant species most characteristic. Herbs are usually sparse but may include Pityopsis graminifolia and Tephrosia virginiana. Herbs probably were more abundant and shrubs less dense when fires occurred more frequently, and the communities of this system may have been grassy under more natural conditions, with Schizachyrium scoparium being a typical component, possibly with Danthonia sp (NatureServe 2007).

Virginia pine is an aggressive invader following disturbance and might be considered uncharacteristic vegetation on some sites. The frequency of its occurrence in the Southern Appalachian forested landscapes today is undoubtedly greater than in pre-settlement times. Its niche appears best fitted to xeric sites on thin soils (e.g. "necklace" stands adjacent to bluff lines in the Cumberlands and Appalachians). Virginia pine is increasingly at risk of mortality to disturbance agents as it matures. Older trees are particularly susceptible to pine beetle attacks due to slow radial growth and relatively high growing densities on often poor sites. Older trees are also more prone to windthrow. Few stands reach 100 years of age with most stands "breaking up" at 50 to 75 years of age.

Disturbance Description

Fire is an important influence and may be the only factor determining the occurrence of this system which would be a hardwood forest without fire. Fires were probably frequent and of low-intensity, or a mix of low- and high-intensity. Fire is important in determining the dominance of the two pines and the presence of the hardwood components and the overall vegetation structure.

Shortleaf pine (P. echinata) when mature is resistant to fire, while Virginia pine (P. virginiana) is less adapted to fire with thinner bark and higher mortality rates (particularly in young stands), and P. virginiana seedlings are easily killed by fire and will not resprout. It can however, survive repeated low intensity fires. The natural occurrence of P. virginiana on infertile, thin soils allows the community to persist in a specialized edaphic niche. It is a prolific seeder and is able to pioneer on these and other disturbed sites. P. virginiana often develops 'red heart' rot, caused by Fomes pini, at ages beyond about 60 years. Virginia pine is very shallow rooted and susceptible to windthrow. Heavy snow and ice can create significant stand openings. Initial openings give rise to further windthrow and even larger openings as trees fall into gaps.

Under present conditions, the Southern pine beetle is an important factor in this system. Beetle outbreaks can kill pines without creating conditions for pines to regenerate.

In the absence of fire to maintain the ecosystem, natural Virginia pine stands could succeed to varying vegetation cover: (a) xeric oaks such as scarlet oak, chestnut oak, blackjack oak, and post oak; (b) mountain laurel, sourwood, red maple, and huckleberry; and (c) eastern white pine overstory.

Effects of logging and past clearing as well as fire suppression make understanding of this system's natural character and dynamics difficult. Some pine-dominated areas appear to be successional stands established in former hardwood forests after logging or cultivation, and would not be expected to have the same dynamics or ecosystem characteristics as natural pine forests maintained by fire. In natural pine forests, logging may allow pines to regenerate or may change the composition to weedy hardwoods. It might alter canopy composition as well as structure (NatureServe 2007).

Adjacency or Identification Concerns

Examples with significant hardwood component may be classified as Southern Piedmont Dry Oak-(Pine) Forest (CES202.339 -- BpS1368). NatureServe (2007) also notes that this system probably usually bordered and intermixed with Southern Appalachian Oak Forest (CES202.886-- BpS1315) and Southern and Central Appalachian Cove Forest (CES202.373 -- BpS1318) may be present in more mesic areas. It

may also intergrade into Southern Appalachian Montane Pine Forest and Woodland (CES202.331 -- BpS1352) at high elevations.

The relationship between this system and Southern Appalachian Montane Pine Forest and Woodland (CES202.331 -- BpS1352) may need further clarification. Southern Appalachian Low-Elevation Pine Forest (CES202.332) is distinguished by its occurrence as large patches on lower terrain (generally below 700 m [2300 feet]) and less extreme topography. The vegetation of the two systems may overlap but pitch pine and Table Mountain pine are more typical of the former, while shortleaf pine and Virginia pine are more typical of the latter (NatureServe 2007).

This system (CES202.332) at its western extent in central Tennessee would be distinguished from equivalent Ozarkian systems (e.g.,Ozark-Ouachita Shortleaf Pine-Oak Forest and Woodland (CES202.313 -- BpS1367)) by the presence of Pinus virginiana and Quercus prinus, which do not cross the Mississippi River (NatureServe 2007).

Uncharacteristic Native Conditions

Absence of fire without pine reproduction may lead to succession to hardwood forest types.

Scale Description

Sources of Scale Data ☑ Literature ☐ Local Data ☑ Expert Estimate

Spatial scale and pattern are generally characterized as large patch. Most remnants in relatively natural condition are probably small patches. In its most natural setting, topography generally limits the patch size of the ecological community.

Issues/Problems

Comments

This BpS is really a combination of Rapid Assessment model descriptions for R8PIVlap - Appalachian Virginia Pine and R8PIECap - Appalachian Shortleaf Pine. The RA modeler for each was Roger D. Fryar and each were reviewed by Ron Stephens rstephens@fs.fed.us.

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Vegetation Classes

Class A 32 %

Early Development 1 All Structures

Indicator Species* and Canopy Position

PIVI2	Upper
PIEC2	Upper
VACCI	Upper

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	1 %	90 %
Height	Tree 0m	Tree 5m
Tree Size Class	Sapling >4.5ft; <5"DBH	

Upper Layer Lifeform

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

☐ Upper layer lifeform does not differ from dominant lifeform.

Description

Fuel Model 7

Class age 0-10 yrs. Dense seedling and sapling stands with variable herbaceous or woody understory vegetation. Stands originating from Virginia pine forests may have dense pine seedlings with very little understory. Shortleaf-originating stands may include hickory, yellow poplar, dogwood, blueberry, blackberry, huckleberry, grasses and forbs.

Class B 2 %

Mid Development 1 Closed

Indicator Species* and Canopy Position

PIVI2	Upper
VACCI	Upper

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	51 %	100 %
Height	Tree 5.1m	Tree 10m
Tree Size Class	Pole 5-9" DBH	

Upper Layer Lifeform

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

☐ Upper layer lifeform does not differ from dominant lifeform.

Description

Fuel Model 8

Class age 11-30 yrs. Poletimber and small sawtimber stands dominated by Virginia pines with minor components of shortleaf pine and other woody and herbaceous vegetation. Stands are often dense.

Class C 32 %

Mid Development 1 Open

Indicator Species* and Canopy Position

PIEC2	Upper
PIVI2	Upper
QUERC	Low-Mid
CARY	Low-Mid

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	31 %	50 %
Height	Tree 5.1m	Tree 25m
Tree Size Class	Pole 5-9" DBH	

Upper Layer Lifeform

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

☐ Upper layer lifeform does not differ from dominant lifeform.

Description

Fuel Model 8

Class age 11-30 yrs. Canopy trees are dominated by shortleaf pine, relatively open with grassy understory. Oak and hickory may also be present in canopy or midstory. Virginia pine may be present in pockets protected from fire.

Class D 34 %

Late Development 1 Open

Indicator Species* and Canopy Position

PIEC2	Upper
QUERC	Mid-Upper
CARY	Mid-Upper
COFL2	Middle

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	31 %	70 %
Height	Tree 25.1m	Tree 50m
Tree Size Class	Medium 9-21"DBH	

Upper Layer Lifeform

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

☐ Upper layer lifeform does not differ from dominant lifeform.

Description

Fuel Model 8

Class age 31+ yrs. Canopy is dominated by shortleaf pine. Some open parklike stands with grassy understories; overstory contains varying amounts of pine, oak and hickory. Variable midstory development possible with dogwood, oak and hickories.

Disturbances

Fire Regime Group:** 1

Historical Fire Size (acres)

Avg 100
Min 10
Max 1000

Sources of Fire Regime Data

- [x] Literature
- [ ] Local Data
- [x] Expert Estimate

Fire Intervals

	Avg FI	Min FI	Max FI	Probability	Percent of All Fires
Replacement	25.282	25	125	0.03955	14
Mixed	144.91	10	30	0.00690	2
Surface	4.2025	5	15	0.23795	84
All Fires	4			0.28441	

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.

Additional Disturbances Modeled

- [x] Insects/Disease
- [x] Wind/Weather/Stress
- [ ] Native Grazing
- [ ] Competition
- [ ] Other (optional 1)
- [ ] Other (optional 2)

References

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*Dominant Species are from the NRCS PLANTS database. To check a species code, please visit http://plants.usda.gov.
**Fire Regime Groups are: I: 0-35 year frequency, surface severity; II: 0-35 year frequency, replacement severity; III: 35-100+ year frequency, mixed severity; IV: 35-100+ year frequency, replacement severity; V: 200+ year frequency, replacement severity.