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 2004-2005. For more information, please visit www.landfire.gov. Please direct questions to helpdesk@landfire.gov.

Potential Natural Vegetation Group (PNVG):

R8SAHE **Southern Appalachian High-Elevation Forest**

General Information

Contributors *(additional contributors may be listed under "Model Evolution and Comments")*

Modelers		Reviewers	
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Vegetation Type

Forested

Dominant Species*

BEAL2	TSCA
PIRU	AEFL
ABFR	ACSA3
FAGR	QURU

General Model Sources

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

LANDFIRE Mapping Zones

57
53

Rapid Assessment Model Zones

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

Geographic Range

This system ranges from northwestern Georgia, western North Carolina and eastern Tennessee to Virginia and West Virginia. The Northern Hardwood component also occurs in small part on Black Mt. in eastern Kentucky.

Biophysical Site Description

High elevation sites in the Southern Appalachians. Generally occurring on all topographic positions above 1372m (4500ft) in the southern extent of the range, elevations may be considerably lower in the northern part of the range. At elevations greater than 1676m (5500ft) (975m in W. Virginia?), spruce-fir forests become the predominant type, though the range of this sub-type is extremely limited within this zone. Soils are highly variable, ranging from deep mineral soils to well-developed boulderfields. Soils are most often rocky and acidic, with low base saturation. A thick organic soil layer is frequently present. Overall hydrology is mesic, ranging from wet in bogs, seeps, and the most protected sites to dry-mesic on some exposed upper slopes and ridges. Mesic conditions are maintained by high annual rainfall, frequent fog deposition, low temperatures, and heavy shading.

Vegetation Description

This setting supports various combinations of dense evergreen, broadleaf, and mixed forests. The highest elevations support nearly pure expanses of Fraser fir (Abies fraseri) and/or red spruce (Picea rubens) Balsam fir (Abies balsamea) replaces Fraser fir in West Virginia. Associated species in these upper elevations include yellow birch (Betula alleghaniensis), mountain ash (Sorbus americana), pin cherry (Prunus pensylvanica), and mountain maple (Acer spicatum). American beech (Fagus grandifolia) may occur in pure stands at a small scale. With decreasing elevations, typical northern hardwood species (B. alleghaniensis, F. grandifolia, and Aesculus flava) mix with P. rubens. As P. rubens drops out, various combinations of B. alleghaniensis, F. grandifolia, A. flava, Acer saccharum, and Quercus rubra

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

predominate. Eastern hemlock (Tsuga canadensis) may be locally important. A well-developed deciduous shrub layer is common, and a dense evergreen shrub layer (or shrub dominated community-"heath balds") can develop on more exposed sites. The herb layer is often dense, and diversity may be high with many Southern Appalachian endemics. CES 202.028, CES 202.029, CES 202.593 (high elevation)

Disturbance Description

This setting is characterized by stable, uneven aged forests. Canopy dynamics are primarily driven by single or multiple tree disturbances, encouraging gap-phase regeneration. Primary disturbance factors are wind events and ice storms. Extreme weather-driven events can also be important in larger scale disturbances. These are all more important than fire, although they predispose forests to fire during drought conditions. Fire Regime Group V. Destructive fires occurred rarely within this biophysical setting, usually occurring after catastrophic wind events, following periods of extreme drought. As much as 25% of this biophysical setting may be considered in a non-fire regime. When they occur, fires are severe and affect large patch sizes. Surface fire is extremely rare, at greater than 1,000 year intervals, while replacement fire is more frequent at 300 to 1,000-year intervals. In spruce-fir dominated parts of this setting, replacement fires are severe and kill most trees and understory, removing most to all of the canopy and allowing pioneer species to emerge. Recent research indicates that on the most exposed sites, stand replacement fires in spruce-fir can result in a stable shrub-dominated community ("heath balds"). Mixed fires pass through the understory of the northern hardwood component, killing most smaller trees, leaving behind some large, well-established trees while creating canopy openings. Occurrence of fire is most frequent on sites where northern red oak dominates.

Adjacency or Identification Concerns

The northern hardwood component of this biophysical setting can have a nearly indistinguishable transition to the adjacent cove-hardwood community (mixed mesophytic). Montane oak forests can be found above 4500' on very exposed slopes.

Scale Description

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

Large scale. All landforms above 4500 feet elevation are included.

Issues/Problems

In modern times other disturbances, especially logging, logging slash fires, balsam woolly adelgid (an exotic species), chestnut blight (exotic fungus), acid deposition, and climate change are playing an important role. In particular, the balsam wooly adelgid has decimated the endemic Fraser fir populations throughout its range. Though regeneration of this species is plentiful, the continued presence of the adelgid ensures a lack of recruitment to mature size. Additionally, there has been a large increase in downed woody debris resulting from extensive tree mortality.

Model Evolution and Comments

QA/QC changes: Added four references and additional info from modeler; changed Upper Layer Lifeform min Height from Shrub Med to Tree Regen with concurrence of original modeler. Peer reviewer suggested that more literature might be available, perhaps from Tall Timbers (note for LANDFIRE workshops).

Succession Classes

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

Class A 10 %

Early1 All Structures

Description

Typical gap replacement. Mostly single to multiple tree-sized gaps, but extreme weather-driven events can create larger scale openings. Stand replacement fires in northern hardwoods or spruce-fir also result in this class. Stand replacement in spruce-fir leads to a northern hardwood pathway. Rubus alleghaniensis, Rubus canadensis, Prunus pennsylvanica, Betula alleghaniensis, Quercus rubra, Fagus grandifolia. 0-24 years.

Indicator Species* and Canopy Position

RUAL	Mid-Upper
RUCA16	Mid-Upper
PRPE2	Upper
BEAL2	Upper

Upper Layer Lifeform

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

Fuel Model 8

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	0 %	70 %
Height	Tree Regen <5m	Tree Short 5-9m
Tree Size Class	Sapling >4.5ft; <5"DBH	

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

Class B 20 %

Mid1 Closed

Description

Typical stand development following most single tree to stand replacement events. Betula alleghaniensis, Abies fraseri (or A. balsamea), Picea rubens, Prunus pennsylvanica, and Fagus grandifolia. Quercus rubra may be locally important on more exposed sites. 25-75 years.

Indicator Species* and Canopy Position

ABFR	Upper
PIRU	Upper
FAGR	Upper
BEAL2	Upper

Upper Layer Lifeform

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

Fuel Model 8

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	60 %	100 %
Height	Tree Short 5-9m	Tree Medium 10-24m
Tree Size Class	Medium 9-21"DBH	

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

Class C 55 %

Late1 Closed

Description

Dense, closed forest. Betula alleghaniensis, Abies fraseri (or A. balsamea), Picea rubens, Fagus grandifolia, Acer saccharum. Tsuga canadensis or Quercus rubra may be locally important. Well-developed deciduous shrub layer and dense herbaceous layer are frequent. 76 years and on.

Indicator Species* and Canopy Position

BEAL2	Upper
ABFR	Upper
PIRU	Upper
FAGR	Upper

Upper Layer Lifeform

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

Fuel Model 8

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	80 %	100 %
Height	Tree Medium 10-24m	Tree Tall 25-49m
Tree Size Class	Large 21-33"DBH	

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

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Class D 15 %

Late2 Open

Description

More open stands of northern hardwoods (especially red oak) resulting from rare mixed fires. Quercus rubra, Betula alleghaniensis, Fagus grandifolia, Rubus alleghaniensis, Prunus pennsylvanica. 76 years and on. Note that this description does not include balds, although they may be subsumed in this type.

Indicator Species* and Canopy Position

QURU	Upper
BEAL2	Upper
RUAL	Low-Mid
PRPE2	Upper

Upper Layer Lifeform

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

Fuel Model 8

Structure Data (for upper layer lifeform)

	Min	Max
Cover	15 %	80 %
Height	Tree Regen <5m	Tree Tall 25-49m
Tree Size Class	Large 21-33"DBH	

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

Class E 0 %

Late2 Open

Description

Indicator Species* and Canopy Position

Structure Data (for upper layer lifeform)

	Min	Max
Cover	%	%
Height		
Tree Size Class		

Upper Layer Lifeform

- ☐ Herbaceous
- ☐ Shrub
- ☐ Tree

Fuel Model no data

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

Disturbances

Non-Fire Disturbances Modeled

- ☐ Insects/Disease
- ☑ Wind/Weather/Stress
- ☐ Native Grazing
- ☐ Competition
- ☑ Other: extreme weather
- ☐ Other:

Fire Regime Group: 5

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

Historical Fire Size (acres)

Avg: 250
Min: 1
Max: 500

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 the 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	525			0.00190	59
Mixed	770			0.0013	40
Surface					
All Fires	312			0.00321	

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References

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