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):

R7APOK   **Appalachian Dry-Mesic Oak 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*

QUPR2	CADE12
QURU	PIST
QUAL	QUCO2
QUVE	KALA

General Model Sources

☑ Literature
☐ Local Data
☑ Expert Estimate

LANDFIRE Mapping Zones

61	57	58
60	64	53
59	65	62

Rapid Assessment Model Zones

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

Geographic Range

Ranges from southern New England, throughout the central and southern Appalachians, from approximately eastern New York south to northern Georgia and northeast Alabama.

Biophysical Site Description

This system consists of predominately dry-mesic to dry forests occurring on open and exposed topography at lower to mid elevations in the Blue Ridge, Ridge and Valley, Central Appalachians, the Piedmont, and Lower New England. This is the upland forest that characterizes much of the Appalachian highlands of the eastern United States. It occupies a region of considerable size and environmental diversity with respect to landform, climate, soils, and geology. Contiguous forests of tens to hundreds of thousands of acres once occurred. Elevations of these forests range from near sea level to over 4000 feet. In New England, it is generally found at <1800 feet elevation, and its higher-elevation occurrences are found in the southern portion of the range. Occurs primarily on convex and more exposed slopes, ridgetops, lower elevation peaks, and higher parts of broad valley bottoms. Bedrock maybe 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. Soils can range from acidic to circumneutral or basic, and the vegetation varies accordingly.

Vegetation Description

Various species of oak (Quercus spp.) are consistently present as major components of the tree stratum. 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 1900's.

Typically, the vegetation seen today consists of forests dominated by oaks, especially white oak (Quercus alba) and red oak (Quercus rubra), and on drier sites chestnut oak (Quercus prinus), black oak (Quercus velutina), and scarlet oak (Quercus occinea). Along with oaks are varying amounts of hickory (Carya spp.), red maple (Acer rubrum), and other species such as white pine (Pinus strobus) and white ash (Fraxinus americana). American chestnut (Castanea dentata) was once dominant or codominant in many of these forests. 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), fetterbush (Pieris floribunda) in the southern extent, or on more mesic sites rhododendron (Rhododendron spp.). Others areas have deciduous ericad
layers, sometimes consisting of blueberries (Vaccinium spp.) or huckleberries (Gaylussacia spp.).

Herbs, forbs, and ferns are sparse to moderate in density. Though often contiguous, patches are may be convoluted and interfingered with other systems, especially Mesophytic Cove Forests and Dry-Xeric Oak-Pine Forests. At the highest elevations and northern limits it may grade into Northern Hardwood Forests. Small patches of other communities,such as rock outcrops and wetlands, are sometimes embedded within this group. Huckleberry and mountain laurel are major components of classes D and E in the Shawangunks region of NY.

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 400 years. Scarlet and black oaks are shorter lived with typical ages being approximately 50 to 100 years while white oaks can live as long as 600 years.

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 pennsylvanicum). 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.

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 to 26 years (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 noncatastrophic. 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 depending on aspect and fire behavior. Fire is important for favoring oak dominance over more mesophytic tree species such as red maple, beech, and black birch . 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

Eastern woodland mosaic (R7EPWM) is closely related, but in concept is more savanna-like, with a shorter fire return interval typical. In the northern part of the range, and in more protected sites in the southern part of the range, R7APOK may be dominated by red oak and white pine, where historic fire return intervals were apparently longer. This system grades into Xeric rock oak and rocky outcrop pine.

Scale Description

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

Matrix forest type over large parts of the geographic range, covering thousands of acres. In the central and southern Appalachian mountains, this type may be interfingered with cove forests and more xeric oak-pine woodlands.

Issues/Problems

Discussed whether to pull out red oak - white pine slightly more mesic type as its own, but decided to retain is as the less xeric extreme of APOK. The more xeric settings fit better with Eastern Dry-Xeric Oak-Pine type (R7OAPIdx), which originally was characterized as only in the southern Appalachians but which now extends north into the central Appalachians.

Model Evolution and Comments

Additional author was Steve Croy (scroy@fs.fed.us).

Only peripheral in Great Lakes model zone. Suggested reviewers: Pat Brose (pbrose@fs.fed.us - USFS Research NE Station, PA); Mark Abrahms (agl@psu.edu, Penn State Univ); Tom Schuler (tschuler@fs.fed.us (?), Fernow Experimental Forest, WVA, USFS); Cecil Frost.

Peer reviewed by Daniel Yaussy 3/30/05. The VDDT model was adjusted as per Daniel's comments. The edits to the model included in class E the removal of the mixed fire disturbance that took the class from E to A. The surface fire disturbance in class E that took the class from E to D was changed to a mixed fire disturbance. The percentages of landscape represented by each class were not substantially affected.

Peer reviewed by Michael S. Batcher, Ecologist, 04/22/05 and Daniel Yaussy, Supervisory Research Forester USDA Forest Service, 3/30/05.

Succession Classes

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

Class A   5%

Early1 Open

Description

Treefall gaps and small to medium patches 0-19 years 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 some as seedlings from animal-buried acorns.

Indicator Species* and Canopy Position

QUPR2	Upper
QUAL	Upper
QUVE	Upper
CADE12	

Upper Layer Lifeform

☐ Herbaceous
☐ Shrub
☑ Tree

Fuel Model 6

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

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

Indicator Species* and Canopy Position

QUPR2	Upper
QURU	Middle
CADE12	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	Medium 9-21"DBH	

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

Class C   40%

Mid1 Open

Description

Mid-seral open woodland with an open midstory and canopy closure <60%.Age of 20-69 years. Shrub/herbaceous cover patchy.

Indicator Species* and Canopy Position

QUPR2	Upper
QUAL	Upper
CADE12	Upper
KALA	Lower

Upper Layer Lifeform

☐ Herbaceous
☐ Shrub
☑ Tree

Fuel Model   8

Structure Data (for upper layer lifeform)

	Min	Max
Cover	40%	80%
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:

Class D   25%

Late1 Open

Description

Late- seral open. Forest with an open midstory and canopy closure 50-80%. Is 70+ years. Shrub/herbaceous cover patchy.

Indicator Species* and Canopy Position

QUPR2	Upper
QUAL	Upper
CADE12	Upper
KALA	Lower

Upper Layer Lifeform

☐ Herbaceous
☐ Shrub
☑ Tree

Fuel Model   8

Structure Data (for upper layer lifeform)

	Min	Max
Cover	50%	80%
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:

Class E   10 %

Late1 Closed
Description
Late- seral closed. Closed canopy forest with cover >80%. Trees 65+ years in. Midstory and understory closed with dense cover and stocking of shrubs and saplings.

Indicator Species* and Canopy Position

QUPR2	Upper
CADE12	Upper
PIST	Middle
QURU	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:

Disturbances

Non-Fire Disturbances Modeled

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

Historical Fire Size (acres)

Avg: 1000
Min:
Max:

Sources of Fire Regime Data

☑ Literature
☐ Local Data
☑ Expert Estimate

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 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.

	Avg FI	Min FI	Max FI	Probability	Percent of All Fires
Replacement	625	500	1000	0.0016	2
Mixed	250	200	500	0.004	6
Surface	15	7	26	0.06667	92
All Fires	14			0.07227	

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