

## 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)

R8HEWP Hemlock - White Pine - Hardwood

### General Information

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

**Modelers**

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**Vegetation Type**

Forested

**General Model Sources**

- Literature  
 Local Data  
 Expert Estimate

**Rapid Assessment Model Zones**

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

**Dominant Species\***

TSCA QUVE  
PIST QUAL  
LITU MAGN  
FAGR RHMA

**LANDFIRE Mapping Zones**

53 47  
57  
48

### Geographic Range

Northeast Alabama, northern Georgia, eastern Kentucky, southeastern Ohio, western North Carolina, northwestern South Carolina, eastern Tennessee, southwestern West Virginia, western Virginia. In the Appalachian Mountains and on the Cumberland Plateau. May also be on the upper Piedmont. Canada hemlock (*Tsuga canadensis*) extends from Maine and Nova Scotia south to northern Alabama and Georgia.

### Biophysical Site Description

Generally found at lower elevations under 3,000 ft in riparian areas, usually along high gradient (1-2%) streams. This type is also found on lower slopes with west and south aspect, lower to mid slope on east and north aspects, and in narrow cliff bound valleys it may occur to the base of cliffs on all slopes.

Sites are acid, generally on moist, but moderately well drained to well drained loamy or silty soils, either colluvial or alluvial. Soils are often rocky and usually deep (>40") even if only in pockets between boulders. Sites remain moist in all but most severe drought conditions.

### Vegetation Description

Dominant vegetation is generally in two to three layers. The canopy in well developed late seral conditions is composed of eastern hemlock (*Tsuga canadensis*) (most common) and or white pine (*Pinus strobus*) mixed with various hardwoods including tulip poplar (*Liriodendron tulipifera*), American beech (*Fagus grandifolia*), black and white oaks (*Quercus velutina*, *Q. alba*), black birch (*Betula lenta*), bigleaf and umbrella magnolias (*Magnolia macrophylla*, *M. tripetala*). In the southern Appalachians, Fraser magnolia (*M. fraseri*) and silverbell (*Halesia carolina*) may also be found. There may be gaps with a younger cohort of the same set of species. A dense, low to high shrub layer of great laurel (*Rhododendron maxima*) and sometimes mountain laurel (*Kalmia latifolia*) is often present. Yellowroot (*Xanthorhiza simplissima*) may occur immediately adjacent to streams in sandy/silty alluvial deposits in gaps. Few if any herbs are found and bryophyte and hepatophyte cover is generally restricted to downed wood, tree/shrub boles, and rocks/boulders.

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

As written, the setting and range of the FRCC model NHDW2 (Conifer Northern Hardwood Forest) and NatureServe's 202.373 (Southern and Central Appalachian Cove Forest) includes the moist, acid, lower elevation landscape position variant described here. R8HEWP differs from NHDW2 and 202.373 in composition but shares a similar successional pathway, fire and disturbance regimes. R8HEWP is based in part on NHDW2 and R7SHEM. R8HEWP may grade into NHDW2, more or less equivalent to NatureServe's 202.593 (Appalachian Northern Hardwood Forest) and R7SHEM. See Adjacency/Identification Concerns for more discussion.

### Disturbance Description

Naturally this system had few fires of any type. Surface fires were rare and did not much affect vegetation except in the youngest (seedling/sapling) stages. Surface fires could result in some lower branch pruning creating small gaps on the forest floor. Stand replacement fires were extremely rare, following intense, prolonged drought and or insect/disease (extent and nature of this uncertain, but see Delcourt and Delcourt 1998?) or extensive wind/ice/snow damage. The system is in Fire Regime III and most protected sites are essentially fire free.

Weather related disturbance and catastrophic wind disturbances occur more frequently than fires, but still infrequently. Usually weather related disturbance affected smaller areas than fires. Ice and snow break tops and branches out of trees providing light to the forest floor. Wind on occasion will throw trees creating 1- few tree gaps. Rarely tornados or straight line winds especially on the Cumberland Plateau) would have resulted in extensive damage. Insect/disease events were rare, but extensive (see Delcourt and Delcourt 1998). Areas of this type which are most exposed to wind are likely to maintain a higher percentage of hardwood in the type.

### Adjacency or Identification Concerns

The R8HEWP grades into several PNVGs. Upslope, especially on eastern and northern aspect slopes there is often a transition into MMHF (48). At the upper elevation limits, this PNVG may grade into R7SHEM or NHDW2. On southern and western aspect slopes, the transition may be into ASLP (48, 49) or APOK (48, 49). Downstream, the transition may be into MMHF (48) or sycamore/ash/elm/river birch forest. In the most protected sites, R8HEWP tends toward R7SHEM in older age classes.

### Scale Description

Sources of Scale Data  Literature  Local Data  Expert Estimate

Landscape adequate in size to contain natural variation in vegetation and disturbance regime. This PNVG occurs as stringers along streams ranging from 2-3 acres to >200 acres in some areas.

### Issues/Problems

This PNVG is threatened by the spread of hemlock woolly adelgid and by global warming. Both factors will reduce the range and extent of the vegetation type. Roads are occasionally found in valleys along streams in this PNVG, at least at lower elevations.

### Model Evolution and Comments

This model replaces the model R7SHEM from the Northeast model zone; the majority of this PNVG will occur in the Southern Appalachians model zone.

Quality control resulted in a changed Relative Age in Class A from -49 to -50 because the class had 50 time steps. This caused no visible changes to model results. No significant review comments--checked the accuracy of the RHMA4 code (looked correct).

Suggested reviewers include: Dr. Bill Martin-Eastern Kentucky University, Richmond, KY 40475, Professor Emeritus; Dr. Julian Campbell, KY Chapter TNC, Lexington; Dan Pittillo, Western Carolina Univ. - Cullowhee, NC; Cecil Frost; Also made use of C. Frost's draft R7SHEM model/description.

## 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 Struct

**Description**

Young stand characterized by eastern hemlock and or white pine which can replace the hemlock or share dominance with it. Hemlock is the usual conifer present. Tulip polar, American beech and usually umbrella magnolia and or bigleaf magnolia (at least on Cumberland Plateau) also present. Fraser magnolia and silverbell may be present in Southern Appalachians. A few oaks (black, white) may be present. Great laurel and mountain laurel usually present in dense patches at least in older forests; Less than 50 yrs old.

**Dominant Species\* and Canopy Position**

TSCA Upper  
LITU Upper  
FAGR Upper  
RHMA Lower

**Upper Layer Lifeform**

- Herbaceous
- Shrub
- Tree

**Fuel Model 5**

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

	Min	Max
Cover	0 %	100 %
Height	Tree Regen <5m	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 B 10 %**

Mid1 Closed

**Description**

Intermediate stand dominated by eastern hemlock and or white pine which can replace the hemlock or share dominance with it. Hemlock is usually the conifer present. Tulip poplar, American beech, umbrella magnolia and or bigleaf magnolia (at least on Cumberland Plateau) also present. Fraser magnolia and silverbell may be present in Southern Appalachians. A few oaks (black, white) may be present. Great laurel is present in dense patches. Mountain laurel may be present in dense patches. 50 - 200 yrs old

**Dominant Species\* and Canopy Position**

TSCA Upper  
LITU Upper  
FAGR Upper  
RHMA Lower

**Upper Layer Lifeform**

- Herbaceous
- Shrub
- Tree

**Fuel Model 8**

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

	Min	Max
Cover	70 %	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:

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

**Class C 25%**

Mid1 Open  
**Description**

Intermediate stand dominated by eastern hemlock and or white pine which can replace the hemlock or share dominance with it. Hemlock is usually the conifer present. Tulip poplar, American beech, umbrella magnolia and or bigleaf magnolia (at least on Cumberland Plateau) also present. Fraser magnolia and silverbell may be present in Southern Appalachians. A few oaks (black, white) may be present. Great laurel is present in dense patches. Mountain laurel may be present in dense patches. 50 - 200 yrs old

**Dominant Species\* and Canopy Position**

TSCA Upper  
LITU Upper  
FAGR Upper  
RHMA Lower

**Upper Layer Lifeform**

- Herbaceous
- Shrub
- Tree

**Fuel Model** 8

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

	Min	Max
Cover	60 %	70 %
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 D 30%**

Late1 Open  
**Description**

Mature stand may have eastern hemlock or white pine dominant or be a mixture of both (hemlock usually present and dominant). Tulip poplar and American beech, and possibly black birch, and umbrella and bigleaf magnolia (at least on Cumberland Plateau). Fraser magnolia and silverbell may be present in Southern Appalachians. Great laurel is present in dense patches. Mountain laurel may be present in dense patches. Oldest trees are 200 – 350 yrs old, rarely as much as 400 yrs old.

**Dominant Species\* and Canopy Position**

TSCA Upper  
LITU Upper  
FAGR Upper  
RHMA Lower

**Upper Layer Lifeform**

- Herbaceous
- Shrub
- Tree

**Fuel Model** 8

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

	Min	Max
Cover	60 %	70 %
Height	Tree Medium 10-24m	Tree Tall 25-49m
Tree Size Class	Very Large >33"DBH	

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

Canopy closure in this class is generally close to the upper limit in the class: 70 percent. Differentiating this class from class E may be difficult, but Class D tends to have more hardwood in it.

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**Class E 25%**

Late I Closed

**Description**

Mature stand characterized by more hemlock and or white pine and fewer hardwoods, usually tulip poplar and or American beech, but can include any listed in class C and D; great laurel may be present in loose to dense patches. Oldest trees are 200 --350 (-400) yrs old. With time, this class tends to grade into R7SHEM in the most protected areas.

**Dominant Species\* and Canopy Position**

TSCA Upper  
LITU Upper  
FAGR Upper  
RHMA Lower

**Upper Layer Lifeform**

- Herbaceous
- Shrub
- Tree

**Fuel Model** 8

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

	Min	Max
Cover	70 %	100 %
Height	Tree Medium 10-24m	Tree Tall 25-49m
Tree Size Class	Very Large >33"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: Catastrophic wind events
- Other

**Historical Fire Size (acres)**

Avg: 30  
Min: 5  
Max: 200

**Fire Regime Group: 3**

- 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	1000	500	1E+04	0.001	17
Mixed					
Surface	210	100	5000	0.00476	83
All Fires	174			0.00577	

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