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. Please direct questions to helpdesk@landfire.gov.

Potential Natural Vegetation Group (PNVG)

R6WPHEff **Great Lakes Pine Forests: White Pine Hemlock Frequent Fire**

General Information

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

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Vegetation Type

Forested

Dominant Species*

PIST PIGL
TSCA
THOC
ABBA

General Model Sources

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

LANDFIRE Mapping Zones

50
51

Rapid AssessmentModel Zones

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

Geographic Range

This system occurs in the eastern Upper Peninsula of Michigan.

Biophysical Site Description

The hemlock-white pine PNVG in the Upper Peninsula of Michigan occurs primarily within extensive, flat to gently undulating glacial lakebeds (former Lake Algonquin) underlain by silty, well to somewhat poorly drained soils. Drainage catenas across interspersed poorly and very poorly drained lowlands facilitate co-occurrence of subregionally important wetland species such as cedar, balsam fir, and white spruce in upland positions with hemlock and white pine dominants.

Vegetation Description

In descending order of occurrence based on analysis of GLO line tree observations, the dominant species recorded along section lines by GLO surveyors were hemlock, white pine, cedar, fir, and spruce. Early successional aspen and white birch comprised 10% of the GLO line trees, and late successional inclusions of sugar maple and yellow birch comprised 9%.

Rogers (1978) reported only 8% of the hemlock stands sampled from Wisconsin to Nova Scotia were even-aged, indicating that very few of the hemlock stands were initiated after a catastrophic event such as a wildfire. In an old-growth white pine forest of Canada, white pine persisted as the dominant species over a seven-century period, indicating that white pine can be self-replacing (Quinby 1991). In a study of old growth white pine in Canada, Guyette et al. (1995) reported that canopy dominance and tree size suggested an even-aged structure, whereas actual ages of dominant trees ranged from 267 to 486 years. White pine older than 400 years made up 20% of the dominant trees, 52% were 300 to 400 years old, and 28% were 250 to 300 years old.

Diameter distributions approximated a reverse-J shape curve, suggesting an uneven-aged or multi-aged forest.

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

Disturbance Description

A relatively high incidence of blowdown due to shallow rooting, coupled with shorter-lived codominants susceptible to spruce budworm infestation, resulted in fuel formation and fire occurring twice as frequently within this landscape ecosystem as in those supporting white pine-hemlock communities in adjacent Lower Michigan and Wisconsin. Once white pine has matured and attained larger diameters and crown height, widely-spaced dominants were highly resistant to intense surface or maintenance fires (Beverly and Martell 2003). Other associates, including hemlock, white spruce, and balsam fir were injured or killed by intense surface fires, and all species suffer high rates of mortality following crown-fires. The successional dynamics of this ecosystem after mixed or severe crown fires may involve establishment of aspen-birch, cedar, or white pine following the disturbance, with subsequent succession to mixed white and red pine, spruce, and fir, followed by late successional gap-phase invasion of hemlock beneath white pine during long fire-free periods (Davis et al. 1992).

Adjacency or Identification Concerns

Much of the white pine and hemlock species components of this PNVG have been altered or eliminated. These systems must be identified based on historical range and site occupancy rather than modern species composition.

Scale Description

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

In the mid-1800s, there were 1.0 million acres of hemlock-white pine ecosystems within the 10.4 million acres of forestlands in the Upper Peninsula of Michigan (Cleland 2004a, ongoing R-9/SRS/MTU study).

Issues/Problems

There are three early successional classes; one can succeed to another (A-B, e.g.), but the ages don't line up.

Model Evolution and Comments

1/24/2005 - Changes from WPHE2: classes renamed, disturbances changed to be consistent with modeling rules. Outcomes not significantly affected. Outcomes reflect 1000-year simulation. Dave Cleland and others should be consulted to determine historical fire sizes.

*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

Stands are primarily comprised of early-seral aspen, birch, and other hardwood species

Dominant Species* and Canopy Position

POTR5 Upper
BEPA Upper

Upper Layer Lifeform

☐ Herbaceous
☐ Shrub
☑ Tree

Fuel Model 9

Structure Data (for upper layer lifeform)

	Min	Max
Cover	0 %	100 %
Height	Shrub Short 0.5-0.9m	Tree Medium 10-24m
Tree Size Class	Pole 5-9" DBH	

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

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Class B 20 %

Early2 Closed

Description

The 200-year mid-seral class consists of spruce-fir, tamarack, and white pine. White pine will develop in the understory of these stands and eventually overtop them, at which point it will succeed to late closed (D).

Dominant Species* and Canopy Position

PIRE	Upper
ABBA	Upper
LALA	Upper
PIST	Low-Mid

Upper Layer Lifeform

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

Fuel Model 8

Structure Data (for upper layer lifeform)

	Min	Max
Cover	50 %	100 %
Height	Shrub Short 0.5-0.9m	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 25 %

Early3 Closed

Description

Class consists of red pine and young white pine stands generally < 100 years of age, which succeeds to older white pine stands.

Dominant Species* and Canopy Position

PIRE	Upper
PIST	Upper

Upper Layer Lifeform

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

Fuel Model 9

Structure Data (for upper layer lifeform)

	Min	Max
Cover	50 %	100 %
Height	Shrub Short 0.5-0.9m	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 45 %

Late1 Closed

Description

Class consists of mature white pine stands. Over time, and in fire's absence, an understory of large hemlock may develop.

Dominant Species* and Canopy Position

PIST	Upper
TSCA	Upper

Upper Layer Lifeform

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

Fuel Model 9

Structure Data (for upper layer lifeform)

	Min	Max
Cover	50 %	100 %
Height	Tree Short 5-9m	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:

Class E 0 %

Late2 All Structu

Description

Dominant Species* and Canopy Position

Upper Layer Lifeform

- ☐ Herbaceous
- ☐ Shrub
- ☐ Tree

Fuel Model no data

Structure Data (for upper layer lifeform)

	Min	Max
Cover	%	%
Height	no data	no data
Tree Size Class	no data	

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

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Disturbances

Disturbances Modeled

- [x] Fire
- [ ] Insects/Disease
- [x] Wind/Weather/Stress
- [ ] Native Grazing
- [ ] Competition
- [ ] Other:
- [ ] Other

Historical Fire Size (acres)

Avg: no data
Min: no data
Max: no data

Sources of Fire Regime Data

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

Fire Regime Group: 4

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.

	Avg FI	*Min FI*	*Max FI*	*Probability*	*Percent of All Fires*
Replacement	260			0.00385	52
Mixed	1111			0.00090	12
Surface	385			0.0026	35
All Fires	136			0.00734	

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