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):

R#PIPOm **Dry Ponderosa Pine - Mesic**

General Information

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

Modelers		Reviewers	
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Vegetation Type

Forested

Dominant Species*

PIPO
FEID
CEVE

General Model Sources

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

LANDFIRE Mapping Zones

1 8
2 9
7

Rapid Assessment Model Zones

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

Geographic Range

Dry ponderosa pine forests extend from south-central and eastern Oregon to eastern Washington. They are an important forest type along the eastern flank of the Cascade Range extending eastward in the Blue and Wallowa Mountains of Oregon. In eastern Washington they occur in extensive tracks in the Okanagon highlands and near Spokane.

Biophysical Site Description

The Dry Ponderosa Pine mesic sub-type occurs between 600m (Washington) to 2000m (Oregon) elevation respectively. Precipitation varies between 40 to 60 cm/yr with the majority occurring as snowfall during the winter. Soil types include a range of parent materials having coarse and fine textures. In central Oregon, these forests commonly occur on sites characterized by shallow deposits of Mazama pumice and ash. Western juniper vegetation types are the only forest types occurring on sites drier than the Dry Ponderosa Pine forests.

Vegetation Description

The Dry Ponderosa Forest mesic sub-type consist of nearly pure, self-replacing stands. Older stands typically include multiple size and age cohorts shaped by frequent surface and mixed fire severities. Even-age stands were an important component but less common under pre-European settlement conditions. Other species in these stands including aspen, lodgepole, and western juniper were generally restricted to unique moisture, edaphic, or topo-edaphic conditions. Understory composition consisted of relatively few species and was dominated by Festuca idahoensis. Purshia tridentata may be locally present, especially in the western and northern extents of the range. Other grass species including Stipa comata, Agropyron spicatum (Pseudoroegneria spicata), and Poa spp., and shrub species including Ceanothus velutinus and Arctostaphylos patula were important understory species within the dry ponderosa forest subtype.

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

Disturbance Description

Fire is the most important disturbance agent shaping Dry Ponderosa Pine forests. Surface, mixed, and stand-replacing fire were common types of disturbance in these forests during Pre-EuroAmerican settlement conditions. Native Americans and lightning were important ignition source during the pre-settlement era. Surface fires occurred with a Mean Fire Return Interval (MFRI) frequency 2 to 10 years. Mixed-fire return intervals ranged from approximately 35-75 years with stand-replacing fires occurring at a MFRI of > 100 years. Other common disturbance agents include bark beetle (Dendroctonus spp.), dwarf mistletoe, and Pandora moth. Bark beetle are the most destructive insects infesting ponderosa pine in these forests where outbreaks can result in high tree mortality over 100s to 1000s of ha. Mistletoe can cause tree mortality among younger and smaller trees but rarely mature trees which do experience radial growth reductions. Pandora moth defoliation results in suppressed tree growth but rarely in tree mortality. In general each of these disturbance agents is more destructive under high tree densities resulting in resource competition among trees, and during drought conditions.

Adjacency or Identification Concerns

These forests are bounded by ponderosa pine dominated mixed-conifer forests at higher (more mesic) elevations and by western juniper woodlands or sagebrush steppe at lower (drier) elevations. In central Oregon, the pumice lodgepole pine forest type subdivides the dry ponderosa pine forests into a west and east branch east of Crater Lake.

This PNVG is distinct from Ponderosa Pine xeric (R#PIPOxe) in that it typically occurs in regions with >45cm/year precipitation.

Scale Description

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

Most of this PNVG consists of open stands maintained by surface and mixed fires. These stands occur at patches up to tens of thousands of acres. However, the disturbances themselves impact smaller areas in the thousands of acres.

Issues/Problems

Ponderosa pine forest types include the mesic subtype (described here) and the more xeric subtype located in areas with less than 45 cm of precipitation/yr. These subtypes are differentiated based on distinctive fire regimes (i.e., higher frequency for the mesic subtype). These subtypes also differ based on stand structure and understory associations.

The most important question is the spatial extent of the combined subtypes. Empirical data do seem to justify the subdivision of these subtypes based on the different fire regimes and mapping appears possible using the 17" (45 cm) isohyet. We believe they deserve inclusion, if not in this version then certainly in a later more specific iteration.

Model Evolution and Comments

Additional Reviewer: David Swanson (dkswanson@fs.fed.us)

Peer review had conflicting results.
One reviewer wrote: "These pine types are tricky. My experience is that the more mesic pine types, the ones >17" precipitation, have pinegrass understory and when burned severely often go to a persistent Ceanothus velutinus-dominated state that is only very slowly recolonized by trees. The intent of this model may be to mainly capture types that are drier than this. However, in my experience these drier types have bunchgrass and sagebrush or bitterbrush understory, they don't get invaded by Ceanothus, and I think they may have precipitation of less than 17". This may be more like the dry pine type (R#PIPOxe). I'm not sure how to resolve this." This reviewer suggested to create a model that Includes a persistent shrub-dominated

vegetation class.

A number of reviewers desired greater clarification between this Pipo model and the xeric Pipo model. Miles Hemstrom felt that replacement fire was over-represented resulting in too much mid-seral. Jim Merzenich brought up the discussion on the historic vs. present extent of Ponderosa grasslands. This discussion includes other pine models (R#PIPOxe, R#PICOpu). He suggests that one of these models should include large extent of Ponderosa grassland.

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 Open

Description

Post-disturbance regeneration consisting of seedling to sapling sized trees (<1 to 4 cm dbh; < 1.4 m ht.) 0 to 20 years old. [Succession to class C after 20 years. Replacement fire resets to time zero (MFRI 25 years). After 8 years without fire fuels are thick enough to carry a mixed fire which maintains in class A (MFRI 7-8 years). After 20 years, any patch that has not burned (at mixed severity) will succeed to class B.]

Indicator Species* and Canopy Position

PIPO
FEID
PUTR2

Upper Layer Lifeform

☐ Herbaceous
☐ Shrub
☐ Tree

Fuel Model no data

Structure Data (for upper layer lifeform)

	Min	Max
Cover	0 %	30 %
Height	no data	no data
Tree Size Class	no data	

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

Class B 10 %

Mid1 Closed

Description

Young (20-100 years) closed canopy stands consisting of trees between 4 to 10 cm dbh. Understory density lower than that found in Class A as a result of canopy closure and lower light conditions. [Succession to class E after 80 years in this class. Replacement fire MFRI 100 years resets to class A. Surface fire (MFRI 30 years) maintains in class B. Mixed fire (MFRI 60-70 years) opens the stand up to class C.]

Indicator Species* and Canopy Position

PIPO
PUTR2

FEID

Upper Layer Lifeform

☐ Herbaceous
☐ Shrub
☐ Tree

Fuel Model no data

Structure Data (for upper layer lifeform)

	Min	Max
Cover	30 %	80 %
Height	no data	no data
Tree Size Class	no data	

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

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

Class C 35 %

Mid1 Open

Description

Open canopy stands consisting of multiple cohorts of young to intermediate-aged trees (20-150 years). Younger trees range in diameter from 10 to 20 cm dbh; older, canopy dominant trees are 20 to 40 cm dbh. Size class: 4 to 10 cm. [Succession to class D after 130 years. Replacement fire (MFRI 300-350 years). Surface (MFRI 6-7 years) and mixed fires (MFRI 50 years) maintain the stand in class C. If a patch goes 20 years with no fire, then it will fill in to class B.]

Indicator Species* and Canopy Position

PIPO
PUTR2
FEID
CEVE

Upper Layer Lifeform

☐ Herbaceous
☐ Shrub
☐ Tree

Fuel Model no data

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	10 %	30 %
Height	no data	no data
Tree Size Class	no data	

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

Class D 40 %

Late1 Open

Description

Mature open canopy stands supporting multiple size and age cohorts. Tree sizes occur in a range of sizes > 30 cm dbh. Tree ages range from 150 to > 300 years. [Maintains in class D. Replacement fire (MFRI 400 years) resets to class A. Surface (MFRI 6-7 years) and mixed fires (MFRI 60-70 years) maintain the stand in class D. If a patch goes 20 years with no fire, then it will fill in to class E.]

Indicator Species* and Canopy Position

PIPO
PUTR2
FEID
CEVE

Upper Layer Lifeform

☐ Herbaceous
☐ Shrub
☐ Tree

Fuel Model no data

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	10 %	30 %
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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*Dominant and Indicator Species are from the NRCS PLANTS database. To check a species code, please visit http://plants.usda.gov.

Class E **5 %**

Late1 Closed

Description

Late successional closed canopy stands consisting of young to mature trees (100+ years) greater than 30 cm dbh. These stands are rare and may include some canopy gaps caused by individual tree mortality. [Maintains in class E. Replacement fire (MFRI 33 years) resets to class A. Surface (MFRI 30 years) and mixed fires (MFRI 40 years) open the stand to class D.]

Indicator Species* and Canopy Position

PIPO
PUTR2
FEID

Upper Layer Lifeform

☐ Herbaceous
☐ Shrub
☐ Tree

Fuel Model no data

Structure Data (for upper layer lifeform)

	Min	Max
Cover	30 %	80 %
Height	no data	no data
Tree Size Class	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:
☐ Other:

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

Historical Fire Size (acres)

Avg:
Min:
Max:

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	125			0.008	5
Mixed	50			0.02	13
Surface	8			0.125	82
All Fires	7			0.153	

Sources of Fire Regime Data

☑ Literature
☑ Local Data
☑ Expert Estimate

References

Agee, J.K. 1993. Fire Ecology of Pacific Northwest Forests. Island Press, Covelo, CA. 493 p.

Arabas, K.B., Hadley, K.S., and Larson, E.R. (in prep.) Fire history of a naturally fragmented landscape in central Oregon.

Bork, B.J. 1979. Historic Fires in the Central Western Cascades, Oregon. Ph.D. Dissertation. Oregon State University, Covallis, OR.

Franklin, J.F. and Dyrness, C.T. 1988. Natural Vegetation of Oregon and Washington. Second Edition. Oregon State University Press, Corvallis, Oregon.

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Heyerdahl et al. 2001. Spatial controls of historic fire regimes: a multiscale example from the interior West, USA. Ecology 82: 660-678.

McCauley, P. 1993. Deschutes National Forest Fire History 1908-1992. Unpublished Report. USFS, Deschutes National Forest Supervisor's Office, Bend, OR

Morrow, R.J. 1985. Age Structure and Spatial Pattern of Old-Growth Ponderosa Pine in Pringle Falls Experimental Forest, Central Oregon. M.S. Thesis, Oregon State University, Corvallis, OR