LANDFIRE Biophysical Setting Model

Biophysical Setting 0910531 Northern Rocky Mountain Ponderosa Pine Woodland and Savanna - Mesic

☐ *This BPS is lumped with:*

☑ *This BPS is split into multiple models:* *Suggest splitting into a mesic and xeric. This model is mesic and more commonly found in MZ09. Represented by shorter MFRI than xeric in areas with >17in precipitation.*

General Information

Contributors (also see the Comments field) **Date** 10/4/2005

Modeler 1	Mike Simpson	msimpson@fs.fed.us	**Reviewer**	Bruce Hostetler	bhostetler@fs.fed.us
Modeler 2	James Dickinson	jddickinson@fs.fed.us	**Reviewer**		
Modeler 3	Dave Owens	deowens@fs.fed.us	**Reviewer**		

Vegetation Type

Forest and Woodland

General Model Sources

☑ Literature
☑ Local Data
☑ Expert Estimate

Dominant Species

PIPO
FEID
CEVE
PUTR2
POSA
AMAL
SYAL
CAGE

Map Zone

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Model Zone

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

Geographic Range

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

Biophysical Site Description

The dry ponderosa pine mesic sub-type occurs between 600m (WA) to 2000m (OR) elevation respectively. Precipitation varies between 40-60cm/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 OR, 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 pine 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

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spicatum and Poa spp. Shrub species, including Ceanothus velutinus and Arctostaphylos patula, were important understory species within the dry ponderosa forest subtype.

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 sources during the presettlement era. Surface fires occurred with a mean fire return interval (MFRI) frequency of 2-10yrs. Mixed-fire return intervals ranged from approximately 25-75yrs, with stand-replacing fires occurring at a MFRI of >100yrs. 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. Western pine beetle is the most important and preferentially attacks large trees (late successional closed and open stands). 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 OR, the pumice lodgepole pine forest type subdivides the dry ponderosa pine forests into a west and east branch east of Crater Lake.

This BpS is distinct from ponderosa pine xeric (RA - R#PIPOxe; LANDFIRE: 091053xeric) in that it typically occurs in regions with >45cm/year precipitation.

Native Uncharacteristic Conditions

Cover >80% is uncharacteristic and might be mixed conifer

Scale Description

Most of this BpS 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 <45cm of precipitation/yr. These subtypes are differentiated based on distinctive fire regimes (ie, 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 17in (45cm) isohyet. We believe they deserve inclusion, if not in this version then certainly in a later more specific iteration.

Comments

As a result of national QC, the TSD of eight years associated with mixed severity fire in A was removed. This was intended to only allow mixed fire after sufficient fuel build-up, but does not conform to

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LANDFIRE (LF) rules. This slightly changed the porportion of the landscape in class B from 5% to 10% and in class C from 35% to 30% and increased the MFRI for mixed fires from 33yrs to 35yrs.

Oct. 4 Update: Amy Waltz (awaltz@tnc.org) and Kori Buford (kbuford@tnc.org) also helped with the model. The RA model (R#PIPOme) was adapted for LF. Modifications were made to the time within seral stage B with the thought it takes longer for trees in dense stands to reach larger structural stage classes. Insects and disease disturbances were added to seral stages B and E.

Review resulted in the addition of a transition from class B to class C for mountain pine beetle outbreaks. The added transition (at 0.005 probability) did not effect the outcomes of landscape proportion or fire regime statistics.

Vegetation Classes

Class A 10 %

Early Development 1 All Structure

Upper Layer Lifeform

- ☐ Herbaceous
- ☑ Shrub
- ☐ Tree

Fuel Model

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Indicator Species and Canopy Position

PIPO
Upper
FEID
Upper
PUTR2
Upper

Structure Data (for upper layer lifeform)

	Min	Max
Cover	0 %	30 %
Height	Shrub 0m	Shrub 1.0m
Tree Size Class	Sapling >4.5ft; <5"DBH	

☐ Upper layer lifeform differs from dominant lifeform.

Description

Post-disturbance regeneration consisting of seedling to sapling sized trees (<1 to 4cm DBH; <1.4m ht.) 0-20yrs old. Succession to class C after 20yrs. Replacement fire resets to time zero (MFRI 25yrs). After 8-10yrs without fire, fuel is thick enough to carry a mixed fire which maintains in class A (MFRI 7-8yrs). After 18yrs, any patch that has not burned (at mixed severity) will succeed to class B.

Class B 10 %

Mid Development 1 Closed

Upper Layer Lifeform

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

Fuel Model

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Indicator Species and Canopy Position

PIPO
Upper
PUTR2
Middle
FEID
Lower

Structure Data (for upper layer lifeform)

	Min	Max
Cover	41 %	80 %
Height	Tree 5.1m	Tree 25m
Tree Size Class	Medium 9-21"DBH	

☐ Upper layer lifeform differs from dominant lifeform.

Description

Young (20-169yrs) closed canopy stands consisting of trees between 4-10cm 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 150yrs in this class. Replacement fire MFRI 100yrs resets to class A. Surface fire (MFRI 30yrs) maintains in class B. Mixed fire (MFRI 60-70yrs) opens the stand up to class C.

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Class C 30 %

Mid Development 1 Open

Upper Layer Lifeform

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

Fuel Model

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Indicator Species and Canopy Position

PIPO
Upper
PUTR2
Middle
FEID
Lower
CEVE
Middle

Structure Data (for upper layer lifeform)

	Min	Max
Cover	10 %	40 %
Height	Tree 5.1m	Tree 25m
Tree Size Class	Medium 9-21"DBH	

☐ Upper layer lifeform differs from dominant lifeform.

Description

Open canopy stands consisting of multiple cohorts of young to intermediate-aged trees (20-124yrs). Younger trees range in diameter from 10-20cm DBH; older, canopy dominant trees are 20-40cm DBH. Succession to class D after about 100yrs. Replacement fire (MFRI 300-350yrs). Surface (MFRI 6-7yrs) and mixed fires (MFRI 50yrs) maintain the stand in class C. If a patch goes 20yrs with no fire, then it will fill in to class B.

Class D 45 %

Late Development 1 Open

Upper Layer Lifeform

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

Fuel Model

Indicator Species and Canopy Position

PIPO
Upper
PUTR2
Middle
FEID
Lower
CEVE
Middle

Structure Data (for upper layer lifeform)

	Min	Max
Cover	10 %	40 %
Height	Tree 25.1m	Tree 50m
Tree Size Class	Very Large >33"DBH	

☐ Upper layer lifeform differs from dominant lifeform.

Description

Mature open canopy stands supporting multiple size and age cohorts. Tree sizes occur in a range of sizes >30cm DBH. Tree ages range from 125- 300yrs+. Also represents the mature fire maintained open stands of Douglas-fir (PSME) in the dry-site mixed conifer associations. Maintains in class D. Replacement fire (MFRI 400yrs) resets to class A. Surface (MFRI 6-7yrs) and mixed fires (MFRI 60-70yrs) and insect/disease (MFR=200yrs) maintain the stand in class D. If a patch goes 20yrs with no fire, then it will fill in to class E.

Class E 5 %

Late Development 1 Closed

Upper Layer Lifeform

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

Fuel Model

Indicator Species and Canopy Position

PIPO
Upper
PUTR2
Middle
FEID
Lower

Structure Data (for upper layer lifeform)

	Min	Max
Cover	41 %	80 %
Height	Tree 25.1m	Tree 50m
Tree Size Class	Very Large >33"DBH	

☐ Upper layer lifeform differs from dominant lifeform.

Description

Late successional closed canopy stands consisting of young to mature trees (170yrs+) >30cm DBH. These stands are rare and may include some canopy gaps caused by individual tree mortality. Maintains in class E. Replacement fire (MFRI 33yrs) resets to class A. Surface (MFRI 30yrs) and mixed fires (MFRI 40yrs) open

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the stand to class D. Insect/disease (MFR=100yrs) has equal chance to open the stand to class D as to class C - occasionally favoring the older trees.

Disturbances

Fire Regime Group:** I

Historical Fire Size (acres)

Avg
Min
Max

Sources of Fire Regime Data

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

Fire Intervals	Avg FI	Min FI	Max FI	Probability	Percent of All Fires
Replacement	125	100		0.008	5
Mixed	35	28	75	0.02857	18
Surface	8	2	10	0.125	77
All Fires	6			0.16157	

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.

Additional Disturbances Modeled

- [x] Insects/Disease
- [ ] Wind/Weather/Stress
- [ ] Native Grazing
- [ ] Competition
- [ ] Other (optional 1)
- [ ] Other (optional 2)

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