

10531

Northern Rocky Mountain Ponderosa Pine Woodland and Savanna - Mesic

BpS Model/Description Version: Aug. 2020

Modelers		Reviewers	
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Reviewer: James Dickinson, Andrew Merschel, Mike Simpson

Vegetation Type

Forest and Woodland

Map Zone

1, 7, 8, 9

Model Splits or Lumps

This Biophysical Setting (BpS) is split into a mesic and xeric type. This particular model is mesic and more commonly found in map zone (MZ)09. It is represented by a shorter mean fire return interval (MFRI) than the xeric ponderosa variant and is found in areas with >43cm/yr (17in) precipitation.

Geographic Range

Ponderosa pine forests extend from southcentral 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 Okanogan highlands and near Spokane.

Biophysical Site Description

The ponderosa pine mesic sub-type occurs between 600m (Washington) to 2,000m (Oregon) elevation respectively. Precipitation varies between 43-60 cm/yr (17-24in) 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 ponderosa pine forests.

Vegetation Description

The ponderosa forest mesic sub-type consists 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 and lodgepole, were generally restricted to unique moisture, edaphic, or topo-edaphic conditions. Understory composition consisted of relatively few species and was dominated by *Calamagrostis rubescens* and *Carex geyerii*. *Purshia tridentata* may be locally present, especially in the western and northern extents of the range. Other grass species, including *Stipa occidentalis*, *Agropyron spicatum*, and *Poa* spp., and shrub species, including *Symphoricarpos albus*, *Ceanothus*

velutinus, and *Arctostaphylos patula* were important understory species within the ponderosa forest.

BpS Dominant and Indicator Species

Symbol	Scientific Name	Common Name
PIPO	<i>Pinus ponderosa</i>	Ponderosa pine
FEID	<i>Festuca idahoensis</i>	Idaho fescue
ARPA	<i>Arctostaphylos patula</i>	Greenleaf manzanita
CEVE	<i>Ceanothus velutinus</i>	Snowbrush ceanothus
PUTR2	<i>Purshia tridentata</i>	Antelope bitterbrush
AMAL2	<i>Amelanchier alnifolia</i>	Serviceberry
SYAL	<i>Symphoricarpos albus</i>	Common snowberry
CAGE	<i>Carex geyerii</i>	Elk sedge
CARU	<i>Calamagrostis rubescens</i>	Pinegrass
STOC	<i>Stipa occidentalis</i>	Western needlegrass

Species names are from the NRCS PLANTS database. Check species codes at <http://plants.usda.gov>.

Disturbance Description

Fire is the most important disturbance agent shaping ponderosa pine forests. Surface, mixed, and stand-replacing fire were common types of disturbance in these forests during pre-European settlement conditions. Native Americans and lightning were important ignition sources during the pre-settlement era. Surface fires occurred with MFRI of about 2-30yrs. Mixed-fire return intervals ranged from approximately 50-80yrs. Other common disturbance agents include bark beetle (*Dendroctonus* spp.), dwarf mistletoe, and Pandora moth. Bark beetles are the most destructive insects infesting ponderosa pine in these forests where outbreaks can result in high tree mortality over 100s-1000s of hectares. 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.

Fire Frequency

Severity	Avg FI	Percent of All Fires	Min FI	Max FI
Replacement	277	5	100	400+
Moderate (Mixed)	79	18	50	80
Low (Surface)	19	77	2	30
All Fires	15	100	2	20

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. Percent of all fires is the percent of all fires modeled in that severity class. Minimum and Maximum FIs show the relative range of fire intervals as estimated by model contributors, if known.

Scale Description

Most of this BpS consists of open stands maintained by surface and mixed fires. These stands occur at patches up to 10,000s of acres. However, the disturbances themselves impact smaller areas in the 1,000s of acres.

Adjacency or Identification Concerns

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

Ponderosa pine forest types include the mesic subtype (described here) and the more xeric subtype located in areas with less than 43cm (17in) of annual precipitation. 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 43cm (17in) isohyet.

Issues or Problems

Native Uncharacteristic Conditions

Cover >80% is uncharacteristic and might indicate a more productive mixed-conifer BpS

Comments

James Dickinson, Andrew Merschel, and Mike Simpson refined this model during the 2016 review period. Changes include: revised s-class age ranges, revised s-class mapping rules, adjusted fire return intervals, corrected species codes, and minor additions to the description.

Amy Waltz (awaltz@tnc.org) and Kori Blankenship (kblankenship@tnc.org) also helped with the original LANDFIRE National model. Review resulted in the addition of a transition from Class B to Class C for mountain pine beetle outbreaks. The added transition did not affect the outcomes of landscape proportion or fire regime statistics.

Succession Classes

Mapping Rules

Upper Layer Lifeform	Height (m)	Canopy Cover (%)									
		0-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90	91-100
Herb	0-0.5	A	A	A	A	A	A	A	A	A	A
Herb	0.5-1.0	A	A	A	A	A	A	A	A	A	A
Herb	>1.0	A	A	A	A	A	A	A	A	A	A
Shrub	0-0.5	A	A	A	A	A	A	A	A	A	A
Shrub	0.5-1.0	A	A	A	A	A	A	A	A	A	A
Shrub	1.0-3.0	A	A	A	A	A	A	A	A	A	A
Shrub	>3.0	A	A	A	A	A	A	A	A	A	A
Tree	0-5	A	A	A	A	A	A	A	A	UN	UN
Tree	5-10	C	C	C	C	B	B	B	B	UN	UN
Tree	10-25	C	C	C	C	B	B	B	B	UN	UN
Tree	25-50	D	D	D	D	E	E	E	E	UN	UN

Tree	>50	D	D	D	D	E	E	E	E	UN	UN
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Succession class letters A-E are described in the Succession Class Description section. Some classes use a leafform distinction where a qualifier is added to the class letter: Brdl (broadleaf), Con (conifer), or Mix (mixed conifer and broadleaf). UN refers to uncharacteristic native or a combination of height and cover that would not be expected under the reference condition. NP refers to not possible or a combination of height and cover which is not physiologically possible for the species in the BpS.

Description

Class A	13	Early Development 1 - All Structures
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Indicator Species

Symbol	Scientific Name	Common Name
PIPO	<i>Pinus ponderosa</i>	Ponderosa pine
FEID	<i>Festuca idahoensis</i>	Idaho fescue
ARPA	<i>Arctostaphylos patula</i>	Greenleaf manzanita
CEVE	<i>Ceanothus velutinus</i>	Snowbrush ceanothus
PUTR2	<i>Purshia tridentate</i>	Antelope bitterbrush
SYAL	<i>Symphoricarpos albus</i>	Common snowberry
CAGE	<i>Carex geyerii</i>	Elk sedge
CARU	<i>Calamagrostis rubescens</i>	Pinegrass

Description

Post-disturbance regeneration consisting of seedling to sapling sized trees. Typical structure for this class could include: herbs 0-1m tall, 0-40% cover; shrubs 0-1m tall, 0-40% cover; trees 0-8m tall, 0-40% cover. Height-diameter regressions built from USFS Region 6 inventory data (CVS plots) indicate that trees transition into Class B or C at about 7-8m (22-26ft) tall.

Maximum Tree Size Class

Sapling >4.5ft; <5" DBH

Class B	9	Mid Development 1 - Closed
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Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
PIPO	<i>Pinus ponderosa</i>	Ponderosa pine	Upper
PUTR2	<i>Purshia tridentata</i>	Antelope bitterbrush	Middle
CAGE	<i>Carex geyerii</i>	Elk Sedge	Lower
CARU	<i>Calamagrostis rubescens</i>	Pinegrass	Lower
FEID	<i>Festuca idahoensis</i>	Idaho fescue	Lower

Description

Young closed canopy stands. Understory density lower than that found in Class A as a result of canopy closure and lower light conditions. Shrub cover rapidly declines when tree canopy cover

Large and Very Large >20" DBH

Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
PIPO	<i>Pinus ponderosa</i>	Ponderosa pine	Upper
PUTR2	<i>Purshia tridentata</i>	Antelope bitterbrush	Middle
FEID	<i>Festuca idahoensis</i>	Idaho fescue	Lower
ARPA	<i>Arctostaphylos patula</i>	Greenleaf manzanita	Middle
CEVE	<i>Ceanothus velutinus</i>	Snowbrush ceanothus	Middle
SYAL	<i>Symphoricarpos albus</i>	Common snowberry	Middle
CAGE	<i>Carex geyerii</i>	Elk sedge	Lower
CARU	<i>Calamagrotis rubescens</i>	Pinegrass	Lower

Description

Late successional closed canopy stands consisting of young to mature trees >50cm DBH. These stands are rare and may include some canopy gaps caused by individual tree mortality.

Understory density lower than that found in Class D as a result of canopy closure and lower light conditions. Shrub cover rapidly declines when tree canopy cover is >50-60%. Insect/disease open the stand, occasionally favoring the older trees. Typical tree height is 25-45m for this class. Taller trees or canopy cover >80% may indicate a different BpS, likely the dry-mesic mixed-conifer.

Maximum Tree Size Class

Large and Very Large >20" DBH

Model Parameters**Deterministic Transitions**

From Class	Begins at (yr)	Succeeds to	After (years)
Early1:ALL	0	Mid1:OPN	39
Mid1:OPN	40	Late1:OPN	134
Mid1:CLS	40	Late1:CLS	199
Late1:OPN	135	Late1:OPN	999
Late1:CLS	200	Late1:CLS	999

Probabilistic Transitions

Disturbance Type	Disturbance occurs In	Moves vegetation to	Disturbance Probability	Return Interval (yrs)	Reset Age to New Class Start Age After Disturbance?	Years Since Last Disturbance
Alternative Succession	Early1:ALL	Mid1:CLS	1	1	Yes	39
Replacement Fire	Early1:ALL	Early1:ALL	0.0067	149	Yes	0
Mixed Fire	Early1:ALL	Early1:ALL	0.02	50	No	0
Alternative Succession	Mid1:OPN	Mid1:CLS	1	1	Yes	40
Replacement Fire	Mid1:OPN	Early1:ALL	0.0033	303	Yes	0

Mixed Fire	Mid1:OPN	Mid1:OPN	0.0133	75	No	0
Surface Fire	Mid1:OPN	Mid1:OPN	0.0667	15	No	0
Insects or Disease	Mid1:CLS	Mid1:OPN	0.005	200	Yes	0
Replacement Fire	Mid1:CLS	Early1:ALL	0.0067	149	Yes	0
Mixed Fire	Mid1:CLS	Mid1:OPN	0.0167	60	Yes	0
Surface Fire	Mid1:CLS	Mid1:CLS	0.033	30	No	0
Alternative Succession	Late1:OPN	Late1:CLS	1	1	Yes	40
Replacement Fire	Late1:OPN	Early1:ALL	0.0025	400	Yes	0
Insects or Disease	Late1:OPN	Late1:OPN	0.005	200	No	0
Mixed Fire	Late1:OPN	Late1:OPN	0.01	100	No	0
Surface Fire	Late1:OPN	Late1:OPN	0.0667	15	No	0
Replacement Fire	Late1:CLS	Early1:ALL	0.0033	303	Yes	0
Insects or Disease	Late1:CLS	Late1:OPN	0.005	200	Yes	0
Insects or Disease	Late1:CLS	Mid1:OPN	0.01	100	Yes	0
Mixed Fire	Late1:CLS	Late1:OPN	0.0133	75	Yes	0
Surface Fire	Late1:CLS	Late1:CLS	0.033	30	Yes	0

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