10531

Northern Rocky Mountain Ponderosa Pine Woodland and Savanna - Mesic

BpS Model/Description Version: Aug. 2020

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| --- | --- | --- | --- |
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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 | *Pinus ponderosa* | Ponderosa pine |
| FEID | *Festuca idahoensis* | Idaho fescue |
| ARPA | *Arctostaphylos patula* | Greenleaf manzanita |
| CEVE | *Ceanothus velutinus* | Snowbrush ceanothus |
| PUTR2 | *Purshia tridentata* | Antelope bitterbrush |
| AMAL2 | *Amelanchier alnifolia* | Serviceberry |
| SYAL | *Symphoricarpos albus* | Common snowberry |
| CAGE | *Carex geyerii* | Elk sedge |
| CARU | *Calamagrostis rubescens* | Pinegrass |
| STOC | *Stipa occidentalis* | 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 |

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

Indicator Species

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

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| PIPO | Pinus ponderosa | Ponderosa pine | Upper |
| PUTR2 | Purshia tridentata | Antelope bitterbrush | Middle |
| CAGE | Carex geyerii | Elk Sedge | Lower |
| CARU | Calamagrostis rubescens | Pinegrass | Lower |
| FEID | Festuca idahoensis | 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 is >50%. Typical tree height is 8-25m for this class. Cover >80% may indicate a different BpS, likely the dry-mesic mixed-conifer.

*Maximum Tree Size Class*  
Pole-Medium 5-20" DBH

Class C 25 Mid Development 1 - Open

Indicator Species

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

Description

Open canopy stands consisting of multiple cohorts of young to intermediate-aged trees. Younger trees range in diameter from 12-25cm DBH; older, canopy-dominant trees are 25-50cm DBH.

Typical tree height is 8-25m for this class.

*Maximum Tree Size Class*  
Pole-Medium 5-20" DBH

Class D 47 Late Development 1 - Open

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| PIPO | Pinus ponderosa | Ponderosa pine | Upper |
| PUTR2 | Purshia tridentata | Antelope bitterbrush | Middle |
| FEID | Festuca idahoensis | Idaho fescue | Lower |
| CEVE | Ceanothus velutinus | Snowbrush ceanothus | Middle |

Description

Mature open canopy stands supporting multiple size and age cohorts. Dominant tree sizes occur in a range of sizes >50cm DBH. Typical tree height is 25-45m for this class. Taller trees may indicate a different BpS, likely the dry-mesic mixed-conifer.

*Maximum Tree Size Class*  
Large and Very Large >20" DBH

Class E 6 Late Development 1 - Closed

Indicator Species

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