10450

Northern Rocky Mountain Dry-Mesic Montane Mixed-Conifer Forest

BpS Model/Description Version: Aug. 2020 21/14

|  |  |  |  |
| --- | --- | --- | --- |
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Reviewer: James Dickinson, James Johnston, Andrew Merschel, Mike Simpson

Vegetation Type

Forest and Woodland

Map Zones

1, 7, 8, 9

Geographic Range

Modal population is in North Central Rockies (map zone [MZ] 10); it also occurs in Blue Mountains in Oregon and Washington, Ochoco Mountains in Oregon, and Wallowa-Snake Province in Oregon/Washington. There may be trickles of this type in the foothills of Yakima and Klickitat counties, especially on stream slopes, also in the southeast of MZ08 on stream and river canyons in the foothills of the Blue Mountains.

Biophysical Site Description

Elevation range on the eastside of Washington is about 2,000-6,000ft and 3,000-6,000ft in eastern Oregon, but most stands occur between 3,000-4,500ft. This forest type occurs just above ponderosa types based on a moisture gradient. Grand fir will typically occur in areas with >20in annual precipitation, and Douglas-fir can occur in areas with about 18-20in annual precipitation. Mean annual temperature varies from about 43-45°F for the white fir/grand fir plant associations to about 45-48°F for the Douglas-fir associations.

Vegetation Description

Ponderosa pine overstory is typical in fire-maintained stands. Older stands tend to be of large, widely spaced ponderosa pine or Douglas-fir. Early seral forests are often open stands of mostly ponderosa pine. Lack of wildfire causes infill of understory conifers, mainly ponderosa pine, Douglas-fir, and grand fir. Western larch is locally important.

BpS Dominant and Indicator Species

|  |  |  |
| --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** |
| PIPO | *Pinus ponderosa* | Ponderosa pine |
| ABGR | *Abies grandis* | Grand fir |
| PSME | *Pseudotsuga menziesii* | Douglas-fir |
| CAGE2 | *Carex geyeri* | Geyer's sedge |
| CARU | *Calamagrostis rubescens* | Pinegrass |
| SYAL | *Symphoricarpos albus* | Common snowberry |
| SPBE2 | *Spiraea betulifolia* | White spirea |

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

Disturbance Description

Typical disturbance regimes under natural conditions include frequent, low-intensity under-burns that maintain open stands of fire resistant trees. Much more infrequent mixed-severity and stand-replacement wildfire occurred and tended to generate mosaics of older, larger trees and younger regeneration. Fire return intervals throughout the southern Blue Mountains (Malheur National Forest) range from 8-25yrs (Johnston et al. 2016). Endemic bark beetles produced patch mortality. Rarer epidemic bark beetle outbreaks caused larger-scale overstory mortality and released understory trees. Defoliator outbreaks also caused fir mortality in some areas. Defoliation by spruce budworm is now more widespread than the historic occurrence. Root diseases may play a significant role in later seral forests in this environment.

Fire Frequency

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Severity** | **Avg FI** | **Percent of All Fires** | **Min FI** | **Max FI** |
| Replacement | 184 | 12 | 70 | 400 |
| Moderate (Mixed) | 107 | 21 | 70 | 175 |
| Low (Surface) | 32 | 67 | 2 | 35 |
| All Fires | 22 | 100 | 8 | 27 |

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

Dry mixed-conifer forests often occur in large areas (100s-1,000s of acres) that, due to fire and insect disturbances, often contained mosaics of older, larger trees and smaller trees.

Adjacency or Identification Concerns

This Biophysical Setting (BpS) occurs below the more mesic mixed-conifer forest types and often occurs above ponderosa pine forests. For mapping, the dry-mesic mixed-conifer could be associated with areas that receive about 20-35in of annual precipitation, and the mesic mixed-conifer could be associated with areas that receive >35in.

This BpS includes the following plant associations: PSME/elk sedge, PSME/pinegrass, PSME/snowberry, PSME/ninebark and similar types, and grand fir (or grand fir-white fir hybrids) with similar associated species. It does not include moister PSME and ABGR types (e.g. PSME/HODI, PSME/ACGL, ABGR/CLUN, ABGR/VAME, ABGR/LIBO, and similar moist types). White fir occurs in this type in south-central Oregon.

Issues or Problems

Native Uncharacteristic Conditions

If these late successional classes exceed 55m height, the stand may be the mesic mixed-conifer type.

Comments

James Dickinson, James Johnston, 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, and minor additions to the description.

Dave Swanson (dswanson@fs.fed.us) contributed to the development of the original LANDFIRE model.

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 | A | A |
| Tree | 5-10 | C | C | C | C | B | B | B | B | B | B |
| Tree | 10-25 | C | C | C | C | B | B | B | B | B | B |
| Tree | 25-50 | D | D | D | D | E | E | E | E | E | E |
| Tree | >50 | UN | UN | UN | UN | UN | UN | UN | UN | 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 10 Early Development 1 - All Structures

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| PIPO | Pinus ponderosa | Ponderosa pine | Upper |
| PSME | Pseudotsuga menziesii | Douglas-fir | Upper |
| LAOC | Larix occidentalis | Western larch | Upper |
| CAGE2 | Carex geyeri | Geyer's sedge | Lower |

Description

Open stand of ponderosa pine and other tree seedlings mixed with grasses and shrubs. Early seral dominant species include *ceanothus*, scouler willow, Bromus, some sedges and grasses. We used Comp/Maintenance to hold a portion of this class back in an extended shrub-dominated stage. Typical structure for this class could include: herbs 0-1m tall, 0-50% cover; shrubs 0-1m tall, 0-50% 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 8m (22-26ft) tall.

*Maximum Tree Size Class*  
Sapling >4.5ft; <5" DBH

Class B 11 Mid Development 1 - Closed

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| PIPO | Pinus ponderosa | Ponderosa pine | Upper |
| PSME | Pseudotsuga menziesii | Douglas-fir | Mid-Upper |
| LAOC | Larix occidentalis | Western larch | Mid-Upper |
| ABGR | Abies grandis | Grand fir | Mid-Upper |

Description

Closed stands of 5-20in DBH early seral tree species. Forests in this type rarely exceed 80% canopy closure even in closed, dense conditions. Typical structure for this class could include: trees 8-26m tall (local estimate based on height-diameter regressions).

*Maximum Tree Size Class*  
Medium 9-21" DBH

Class C 39 Mid Development 1 - Open

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| PIPO | Pinus ponderosa | Ponderosa pine | Upper |
| PSME | Pseudotsuga menziesii | Douglas-fir | Mid-Upper |
| LAOC | Larix occidentalis | Western larch | Mid-Upper |
| ABGR | Abies grandis | Grand fir | Mid-Upper |

Description

Open stands of 5-20in DBH early seral tree species. Dominant understory plants include elk sedge, pinegrass, common snowberry, rose, mountain mahogany (wetter), heartleaf arnica, and lupines. This class has low probability of replacement fire due to discontinuous fuel in these open stands. Typical structure for this class could include: trees 8-26m tall (local estimate based on height-diameter regressions).

*Maximum Tree Size Class*  
Medium 9-21" DBH

Class D 32 Late Development 1 - Open

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| PIPO | Pinus ponderosa | Ponderosa pine | Upper |
| PSME | Pseudotsuga menziesii | Douglas-fir | Mid-Upper |
| LAOC | Larix occidentalis | Western larch | Mid-Upper |
| ABGR | Abies grandis | Grand fir | Mid-Upper |

Description

Open stands of 20+" DBH early seral tree species. Dominant understory plants include elk sedge, pinegrass, common snowberry, rose, mountain mahogany (wetter), heartleaf arnica, and lupines. Typical structure for this class could include: trees 26-55m tall (local estimate based on height-diameter regressions). Tree height greater than 55m likely indicates the mesic mixed-conifer forest.

*Maximum Tree Size Class*  
Very Large >33" DBH

Class E 8 Late Development 1 - Closed

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| PIPO | Pinus ponderosa | Ponderosa pine | Upper |
| PSME | Pseudotsuga menziesii | Douglas-fir | Upper |
| ABGR | Abies grandis | Grand fir | Mid-Upper |
| LAOC | Larix occidentalis | Western larch | Upper |

Description

Closed stands of 20+" DBH early seral tree species. Forests in this BpS rarely exceed 80% canopy closure even in closed, dense conditions. This class has relatively high probability of replacement fires, due to the dense understory. Typical structure for this class could include: trees 26-55m tall (local estimate based on height-diameter regressions). Tree height >55m likely indicates the mesic mixed-conifer forest.

*Maximum Tree Size Class*  
Very Large >33" DBH

Model Parameters

Deterministic Transitions

|  |  |  |  |
| --- | --- | --- | --- |
| **From Class** | **Begins at (yr)** | **Succeeds to** | **After (years)** |
| Early1:ALL | 0 | Mid1:OPN | 29 |
| Mid1:OPN | 30 | Late1:OPN | 99 |
| Mid1:CLS | 30 | Late1:CLS | 174 |
| Late1:OPN | 100 | Late1:OPN | 999 |
| Late1:CLS | 175 | 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** |
| Competition or Maintenance | Early1:ALL | Early1:ALL | 0.01 | 100 | Yes | 0 |
| Alternative Succession | Early1:ALL | Mid1:CLS | 0.02 | 50 | Yes | 0 |
| Replacement Fire | Early1:ALL | Early1:ALL | 0.025 | 40 | Yes | 0 |
| Mixed Fire | Mid1:OPN | Mid1:OPN | 0.001 | 1000 | No | 0 |
| Replacement Fire | Mid1:OPN | Early1:ALL | 0.0033 | 303 | Yes | 0 |
| Alternative Succession | Mid1:OPN | Mid1:CLS | 1 | 1 | Yes | 40 |
| Competition or Maintenance | Mid1:OPN | Mid1:OPN | 0.01 | 100 | No | 0 |
| Surface Fire | Mid1:OPN | Mid1:OPN | 0.045 | 22 | No | 0 |
| Surface Fire | Mid1:CLS | Mid1:OPN | 0.005 | 200 | Yes | 0 |
| Replacement Fire | Mid1:CLS | Early1:ALL | 0.0067 | 149 | Yes | 0 |
| Insects or Disease | Mid1:CLS | Mid1:OPN | 0.015 | 67 | Yes | 0 |
| Competition or Maintenance | Mid1:CLS | Mid1:CLS | 0.02 | 50 | No | 0 |
| Mixed Fire | Mid1:CLS | Mid1:OPN | 0.03 | 33 | Yes | 0 |
| Alternative Succession | Late1:OPN | Late1:CLS | 1 | 1 | Yes | 40 |
| Insects or Disease | Late1:OPN | Mid1:OPN | 0.0025 | 400 | Yes | 0 |
| Replacement Fire | Late1:OPN | Early1:ALL | 0.0025 | 400 | Yes | 0 |
| Mixed Fire | Late1:OPN | Mid1:OPN | 0.005 | 200 | Yes | 0 |
| Mixed Fire | Late1:OPN | Late1:OPN | 0.005 | 200 | No | 0 |
| Insects or Disease | Late1:OPN | Late1:OPN | 0.0075 | 133 | No | 0 |
| Surface Fire | Late1:OPN | Late1:OPN | 0.04 | 25 | No | 0 |
| Wind or Weather or Stress | Late1:CLS | Late1:OPN | 0.001 | 1000 | Yes | 0 |
| Surface Fire | Late1:CLS | Late1:OPN | 0.001 | 1000 | Yes | 0 |
| Replacement Fire | Late1:CLS | Early1:ALL | 0.0033 | 303 | Yes | 0 |
| Competition or Maintenance | Late1:CLS | Late1:CLS | 0.01 | 100 | No | 0 |
| Mixed Fire | Late1:CLS | Late1:OPN | 0.03 | 33 | Yes | 0 |
| Insects or Disease | Late1:CLS | Late1:OPN | 0.03 | 33 | Yes | 0 |

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