10180

East Cascades Mesic Montane Mixed-Conifer Forest and Woodland

BpS Model/Description Version: Aug. 2020

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

Vegetation Type

Forest and Woodland

Map Zones

1, 7

Geographic Range

This Biophysical Setting (BpS) occupies maritime-influenced sites in the eastern Washington and Oregon Cascades. Pass corridors are the primary occurrence areas for these sites in areas that get significant maritime air.

Biophysical Site Description

This BpS occurs on low- to mid-elevation slopes within the montane mesic forest, on various aspects where sites are strongly influenced by maritime climate. At the periphery of the distribution, these types are restricted to lower slope positions and terraces within drainages. These sites typically occur on the relatively cool, moist end of the environmental gradient. Typically, sites receive precipitation over 35in annually.

Vegetation Description

Vegetation composition will vary widely geographically but is today dominated by western hemlock, grand fir, and Douglas-fir. Western larch, western white pine, western red cedar, and Engelmann spruce may be present. In the drier, southern portion of this geographic area, Ponderosa pine may be locally important. Lodgepole pine may be present in some post-fire early seral stands.

This system represents some of the most productive forests in this region. Forests are typically even-aged with scattered residuals (i.e., one to three fire-regenerated age classes present in patches) with moderately dense to dense stands.

Understory associates may include BENE, ROGY, PAMY, ACCI, VAME, SMST, ACTR, CLUN, and LIBOL. The typical physiognomy includes a dense conifer overstory with understories dominated by moist-site forbs to tall shrubs. Shade-tolerant conifer species are well represented and dominate the tree understories of late-successional stands.

The moist plant associations included in this type are primarily the western hemlock, western red cedar, and moist grand fir types including: TSHE/ASCA3, TSHE/ACCI/ACTR, TSHE/ACCI/ASCA3 TSHE/ACTR, TSHE/ARNE, TSHE/BENE, TSHE/PAMY/CLUN, ABGR/ACCI, ABGR/ACCI-CHUM, ABGR/ACCI/CLUN, ABGR/BENE, and ABGR/ACTR in the north and central Washington Cascades. Southern Cascade types include western redcedar, western hemlock, and moist grand fir such as THPL/COCA, TSHE/ACTR, and ABGR/ACCI.

BpS Dominant and Indicator Species

|  |  |  |
| --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** |
| PSME | *Pseudotsuga menziesii* | Douglas-fir |
| ABGR | *Abies grandis* | Grand fir |
| TSHE | *Tsuga heterophylla* | Western hemlock |
| THPL | *Thuja plicata* | Western red cedar |
| PIMO3 | *Pinus monticola* | Western white pine |
| LAOC | *Larix occidentalis* | Western larch |
| PIEN | *Picea engelmannii* | Engelmann spruce |
| PICO | *Pinus contorta* | Lodgepole pine |

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

Disturbance Description

Fire Regime Group III or IV. Fires are mostly mixed-severity (50-200yr frequency) with the wetter sites experiencing longer fire return intervals (FRIs) and higher-severity fires (~200yr frequency). Mixed fire regimes, however, are very complex and occur "along a gradient that may not necessarily be stable in space or time" (Agee 2005). In the Idaho Panhandle National Forest, Zack and Morgan (1994) found replacement fire intervals at 200yrs and total fire interval at 65yrs for these systems; these probably approximate conditions found in this zone as suggested by age analyses of ecology plots (Lillybridge et al. 1995).

Less productive sites may be susceptible to insects or disease. Douglas-fir bark beetle will affect Douglas-fir or grand fir. Root rots, butt rots, and stem decay will affect grand fir, western redcedar, and western hemlock while Douglas-fir is less susceptible. Western white pine has been impacted by white pine blister rust and its abundance reduced in affected stands.

Fire Frequency

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Severity** | **Avg FI** | **Percent of All Fires** | **Min FI** | **Max FI** |
| Replacement | 250 | 26 | 150 | 500 |
| Moderate (Mixed) | 127 | 50 | 50 | 200 |
| Low (Surface) | 273 | 24 | 100 | 300 |
| All Fires | 64 | 100 | 27 | 97 |

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

Scales of fires tend to be highly variable -- from 100s-1,000s ac in area for Fire Regime Group III to IV. Rare stand-replacement fires may occur as tens of thousands of acre events, particularly in the wetter end of this type. Landscapes will typically be mosaics of single age-class patches resulting from stand-replacement fires.

Adjacency or Identification Concerns

This BpS is found above the Northern Rocky Mountain Dry-Mesic Montane Mixed-Conifer Forest (1045) and below the North Pacific Dry-Mesic Silver fir-Western Hemlock-Douglas-fir Forest (1174). Northern Rocky Mountain Conifer Swamp (1161) late successional forests will be present in bottomlands. 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 greater than 35in.

Issues or Problems

Native Uncharacteristic Conditions

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 FRIs, corrected species codes, and minor additions to the description.

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 | A | A | A | A | A | A | A | A | A | A |
| Tree | 10-25 | C | C | C | C | C | C | B | B | B | B |
| Tree | 25-50 | D | D | D | D | D | D | E | E | E | E |
| Tree | >50 | D | D | D | D | D | D | E | E | E | E |

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 4 Early Development 1 - All Structures

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| ACCI | Acer circinatum | Vine maple | Upper |
| CEVE | Ceanothus velutinus | Shiny-leaf ceanothus | Mid |
| CESA | Ceanothus sanguineus | Red-stem ceanothus | Mid |
| RUPA | Rubus parviflorus | Thimbleberry | Mid-Upper |
| RIBES | Ribes | Currant | Mid-Upper |
| VAME | Vaccinium membranaceum | Thinleaf huckleberry | Mid-Upper |

Description

Post-fire vegetation is shrub-dominated with some seedling and sapling trees present. Establishment of western or paper birch, quaking aspen, or black cottonwood is favored by fires that remove the duff layer (Williams et al. 1995).

Typical structure for this class could include: herbs 0-1m tall, 0-60% cover; shrubs 0.5-3m tall, 0-80% cover; trees 0-5m tall, 0-60% cover; and trees 5-10m tall, 0-80% cover.

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

Class B 36 Mid Development 1 - Closed

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| PSME | Pseudotsuga menziesii | Douglas-fir | Upper |
| LAOC | Larix occidentalis | Western larch | Upper |
| PIMO3 | Pinus monticola | Western white pine | Upper |
| ABGR | Abies grandis | Grand fir | Mid-Upper |

Description

Pole and medium-sized trees of mixed-conifer species have overtopped the shrubs and dominate the site. Canopy cover is dense (often up to 100% cover). Western red cedar and western hemlock may be present in the understory. Douglas-fir, western larch, grand fir, and western white pine will be present in the overstory -- although western white pine is not as abundant in map zone (MZ) 01 as it was, historically, east of this zone. Engelmann spruce may be important seral species on cooler sites (Williams et al. 1995).

Typical structure for this class could include: trees 10-30m tall.

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

Class C 11 Mid Development 1 - Open

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| LAOC | Larix occidentalis | Western larch | Upper |
| PIMO3 | Pinus monticola | Western white pine | Upper |
| PIPO | Pinus ponderosa | Ponderosa pine | Upper |
| PSME | Pseudotsuga menziesii | Douglas-fir | Mid-Upper |
| ABGR | Abies grandis | Grand fir | Mid-Upper |

Description

Open canopy conditions may be a result of topo-edaphic conditions or disturbances. Mixed-severity fires result in open, patchy stand conditions and favor ponderosa pine, western larch, and white pine. Seedling/sapling western red cedar and western hemlock will be present in the understory.

Typical structure for this class could include: trees 10-30m tall.

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

Class D 11 Late Development 1 - Open

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| PIMO3 | Pinus monticola | Western white pine | Upper |
| LAOC | Larix occidentalis | Western larch | Upper |
| THPL | Thuja plicata | Western red cedar | Upper |
| ABGR | Abies grandis | Grand fir | Upper |

Description

Open canopy conditions are rare and may be a result of topo-edaphic conditions or disturbances. Mixed-severity fires result in open, patchy stand conditions. Western red cedar and western hemlock will be co-dominant with western white pine, western larch, and grand fir. Seedling/ sapling western red cedar and grand fir will be present in the understory. Historically, these stands would have had high proportions of white pine and western larch.

Typical structure for this class could include: trees 30-75m tall. Local estimates based on height-diameter regressions built from USFS Region 6 inventory data (CVS plots) suggest that the maximum height for this BpS is over 75m. Heights >60m likely indicate a Cedar-Hemlock Mixed-Conifer, the wettest end of this BpS.

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

Class E 38 Late Development 1 - Closed

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| THPL | Thuja plicata | Western red cedar | Upper |
| TSHE | Tsuga heterophylla | Western hemlock | Upper |
| PSME | Pseudotsuga menziesii | Douglas-fir | Upper |
| ABGR | Abies grandis | Grand fir | Upper |

Description

Late-development closed conditions are multi-storied, dense canopies. Understories will tend to be depauperate due to dense overstory. Large woody debris is abundant, caused by in-stand competition. Fuel loadings range from 18-40tons/ac (Kapler-Smith and Fischer 1995). Root rot will affect Douglas-fir and grand fir in patches.

Typical structure for this class could include: trees 30-75m tall. Local estimates based on height-diameter regressions built from USFS Region 6 inventory data (CVS plots) suggest that the maximum height for this BpS is ~5m. Heights >60m likely indicate a Cedar-Hemlock Mixed-Conifer, the wettest end of this BpS.

*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:CLS | 19 |
| Mid1:OPN | 20 | Late1:OPN | 74 |
| Mid1:CLS | 20 | Late1:CLS | 99 |
| Late1:OPN | 75 | Late1:OPN | 999 |
| Late1:CLS | 100 | 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** |
| Replacement Fire | Early1:ALL | Early1:ALL | 0.005 | 200 | Yes | 0 |
| Mixed Fire | Early1:ALL | Early1:ALL | 0.01 | 100 | No | 0 |
| Alternative Succession | Early1:ALL | Mid1:OPN | 0.1 | 10 | Yes | 0 |
| Alternative Succession | Mid1:OPN | Mid1:CLS | 1 | 1 | Yes | 20 |
| Insects or Disease | Mid1:OPN | Early1:ALL | 0.0003 | 3333 | Yes | 0 |
| Insects or Disease | Mid1:OPN | Mid1:OPN | 0.0027 | 370 | No | 0 |
| Replacement Fire | Mid1:OPN | Early1:ALL | 0.005 | 200 | Yes | 0 |
| Surface Fire | Mid1:OPN | Mid1:OPN | 0.0067 | 149 | No | 0 |
| Mixed Fire | Mid1:OPN | Mid1:OPN | 0.0077 | 130 | No | 0 |
| Insects or Disease | Mid1:CLS | Mid1:OPN | 0.001 | 1000 | Yes | 0 |
| Insects or Disease | Mid1:CLS | Early1:ALL | 0.001 | 1000 | Yes | 0 |
| Surface Fire | Mid1:CLS | Mid1:CLS | 0.003 | 333 | No | 0 |
| Replacement Fire | Mid1:CLS | Early1:ALL | 0.004 | 250 | Yes | 0 |
| Mixed Fire | Mid1:CLS | Mid1:OPN | 0.0077 | 130 | Yes | 0 |
| Alternative Succession | Late1:OPN | Late1:CLS | 1 | 1 | Yes | 30 |
| Replacement Fire | Late1:OPN | Early1:ALL | 0.002 | 500 | Yes | 0 |
| Surface Fire | Late1:OPN | Late1:OPN | 0.0067 | 149 | No | 0 |
| Mixed Fire | Late1:OPN | Late1:OPN | 0.0077 | 130 | Yes | 0 |
| Wind or Weather or Stress | Late1:CLS | Early1:ALL | 0.002 | 500 | Yes | 0 |
| Insects or Disease | Late1:CLS | Late1:OPN | 0.0025 | 400 | Yes | 0 |
| Surface Fire | Late1:CLS | Late1:CLS | 0.003 | 333 | No | 0 |
| Replacement Fire | Late1:CLS | Early1:ALL | 0.004 | 250 | Yes | 0 |
| Mixed Fire | Late1:CLS | Late1:OPN | 0.0077 | 130 | Yes | 0 |

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