10451

Northern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest - Ponderosa Pine-Douglas-fir

BpS Model/Description Version: Aug. 2020

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| --- | --- | --- | --- |
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Vegetation Type

Forest and Woodland

Map Zones

10, 19

Model Splits or Lumps

This Biophysical Setting (BpS) is split into multiple models. This BpS is split into three types based on dominance: one dominated by ponderosa pine with Douglas-fir; one dominated by western larch; and one dominated by grand fir.

Geographic Range

Northern Rocky Mountains in western Montana, eastern Washington, and northern Idaho, extending south to the Great Basin.

Biophysical Site Description

Generally found in the montane zone on well-drained, thin soils, generally on relatively warm, steep settings in the non-maritime influenced portion of the mapping zones. Elevation ranges from >4,000ft in the southern area and >2,500ft in the northern extent. Sites can range from nearly flat to steep on all aspects.

Common habitat types include: PSME/CARU -- all phases, PSME/PHMA7, PSME/SYALA, ABGR/LIBO3,ABGR/XETE, PSEME/PSSP (Pfister et al. 1977), PSME/FEID (NatureServe 2016), PSME/VAME (Pfister et al. 1977, NatureServe 2016), PSME/ARUV (Daubenmire and Daubenmire 1968).

Vegetation Description

Ponderosa pine is generally the dominant species on southerly aspects and drier sites, with Douglas-fir dominating on northerly aspects. Southerly aspects support relatively open stands. Northerly aspects support more closed stands. On mesic sites with longer fire return intervals (FRIs), Douglas-fir often co-dominates the upper canopy layers. In the absence of fire, Douglas-fir and grand fir dominate stand understories. Western larch and lodgepole pine may also be present and become more abundant throughout mid-elevations of the northern range of the BpS.

Understory can be dominated by shrubs such as ceanothus, mallow ninebark, white spirea, willow, and oceanspray or by graminoids including carex and pinegrass. Mallow ninebark can have high cover (>30%) in some stands.

BpS Dominant and Indicator Species

|  |  |  |
| --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** |
| PIPO | *Pinus ponderosa* | Ponderosa pine |
| PSME | *Pseudotsuga menziesii* | Douglas-fir |
| PICO | *Pinus contorta* | Lodgepole pine |
| CARU | *Calamagrostis rubescens* | Pinegrass |
| CAGE2 | *Carex geyeri* | Geyer’s sedge |
| PHMA5 | *Physocarpus malvaceus* | Mallow ninebark |
| ABGR | *Abies grandis* | Grand fir |
| LAOC | *Larix occidentalis* | Western larch |

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

Disturbance Description

The reported range of fire frequency in this BpS is 6-50yrs. Fryer (2016) and Heyerdahl et al. (2008) report a mean fire return interval (MFRI) of 6yrs (at Flannigan Creek, ID; Rexford and Libby Ranger Districts on the Kootenai National Forest, ID; and Missoula Ranger District on the Lolo National Forest). Arno et al. (1995) report a mean of 50yrs (Fales Flat on the Bitterroot National Forest). Heyerdahl et al. (2008a and 2008b) report that low-severity surface fires occurred with an interval of 4–45yrs depending on the site, with many sites averaging close to a 15-20yr FRI.

There are very few data on relative proportions of low-, moderate-, and high-severity fire in the Northern Rockies, but replacement and mixed fires were likely more common on north-facing aspects, moist slopes, and higher elevations. Arno (1980) reported that moderate-severity fires were historically common in ponderosa pine stands on relatively moist, steep slopes. Barrett (1998) reports the same for the Flathead National Forest, and Barrett (1983, 1984) documents extensive mixed-severity fires on the Salmon National Forest. Leiberg (1900) reported severe fires on what are now the Idaho Panhandle and Bitterroot National Forests. Since the 1910 fires happened only a decade later, these numbers may underestimate the importance -- and certainly the frequency -- of replacement fires and certainly underestimate the frequency of moderate-severity fires.

Insects and disease play an important role, especially in the absence of fire. Bark beetles such as mountain pine beetle, western pine beetle, and Douglas-fir beetle are active in the mid- and late structural stages, especially in closed canopies. Weather and climate, including drought, tend to affect the late-successional, closed structure more than other structural stages.

Root rot is a minor concern in the northern extent of this BpS. Dwarf mistletoe is present in the southern portion of this BpS and increases in occurrence with a lack of fire.

Fire Frequency

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Severity** | **Avg FI** | **Percent of All Fires** | **Min FI** | **Max FI** |
| Replacement | 149 | 13 |  |  |
| Moderate (Mixed) | 52 | 38 | 40 | 75 |
| Low (Surface) | 39 | 49 | 25 | 85 |
| All Fires | 19 | 100 |  |  |

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

Patch sizes were variable, from 10s to 1,000s of acres. Severe fire patches were variable in size, too. Barrett (1983, 1984) reported 11 fires from 1707 to 1919 that were >1,000ac in size. Heyerdahl et al. (2008b) reported extensive fires in dry years prior to 1900.

Adjacency or Identification Concerns

The mixed conifer zone in the Northern Rockies is broad, with a moisture gradient that affects fire regimes and species dominance. The Northern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland system was thus split into three BpSs to represent differences in species dominance and fire regimes. BpS 10451 represents the drier sites and is dominated by ponderosa pine and Douglas-fir with a very frequent, low-severity fire regime. BpS 10452 is dominated by western larch and represents slightly more mesic sites. The fire regime is dominated by moderately frequent, mixed-severity fires. BpS 10453 is dominated by grand fir and represents more mesic, cool sites with longer mixed-severity fire regimes.

At lower elevations or southerly aspects, this type generally borders dry ponderosa pine or shrub systems. At higher elevations or northerly aspects, it borders larch, moist grand fir, or Douglas-fir, spruce, and subalpine fir. At ecotones, it may be very difficult to distinguish between this BpS and BpS 1053 (Northern Rocky Mountain Ponderosa Pine Woodland) in mid- and late-closed seral states. Because of fire suppression, xeric ponderosa pine types may be disproportionally invaded by Douglas-fir today. It may be especially difficult in fire-excluded areas to distinguish between ponderosa pine and ponderosa pine-Douglas-fir BpSs.

This BpS corresponds to Pfister et al. (1977) and Steele et al. (1981) warm dry Douglas-fir (PSME/AGSP, PSME/ARUV PSME/FESC, PSME/SPBE, PSME/SYAL) and grand fir (ABGR/PHMA, ABGR/SPBE) habitat types. In the western portion of map zone (MZ) 10, this type may occupy portions of habitat type PSME/SYOR.

Issues or Problems

In the northern range of this BpS, the younger age/size classes (Class A, Class B, and Class C) may be more extensive owing to larger and more frequent mixed or stand-replacement fires (relative to surface fires).

This type is extensive on the Colville National Forest but has not been captured adequately in previous national mapping projects.

Native Uncharacteristic Conditions

Canopy closure >80% is considered to be uncharacteristic for this BpS.

Comments

Janet Fryer and Kerry Kemp suggested descriptive changes to this BpS during the 2016 BpS Review. Fryer suggested that replacement fire and mixed fire should be more frequent based on fire history literature (see discussion in the Disturbance Description). Kori Blankenship implemented these changes in consultation with Fryer and also decreased the surface fire frequency to maintain the overall fire frequency at ~20yrs.

Additional LANDFIRE National reviewers included Cathy Stewart (cstewart@fs.fed.us), Pat Green (pgreen@fs.fed.us), Steve Rawlings (srawlings@fs.fed.us), Catherine Phillips (cgphillips@fs.fed.us), Lyn Morelan (lmorlan@fs.fed.us), Susan Miller (smiller03@fs.fed.us), and Steve Barrett (sbarrett@mtdig.net).

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 | UN | UN |
| Tree | 25-50 | C | C | D | D | D | D | E | E | UN | UN |
| Tree | >50 | C | C | D | D | D | D | 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 16 Early Development 1 - All Structures

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| PIPO | Pinus ponderosa | Ponderosa pine | Upper |
| LAOC | Larix occidentalis | Western larch | Upper |
| PSME | Pseudotsuga menziesii | Douglas-fir | Upper |
| PICO | Pinus contorta | Lodgepole pine | Upper |

Description

Openings of grass and forbs that are created by infrequent, stand-replacement fire. Some sites exhibit resprouting shrubs (*Physocarpus malvaceus*) as the dominant lifeform. Other sites may be dominated by graminoids such as pinegrass (*Calamagrostis rubescens*). Seedlings and saplings of ponderosa pine, western larch, Douglas-fir, and lodgepole pine may be present; grand fir would be rare in the early succession stage. On the moist end of the BpS's range, western larch will be dominant; on the drier end, ponderosa pine will be dominant. Following very severe replacement fires, this class may be dominated by lodgepole pine on the moist end of the BpS's range.

Additional dominant species (low in the canopy) may include ninebark (PHMA5; *Physocarpus malvaceus*), ceanothus (CESA; *Ceanothus sanguineus*), and spiraea. Elk sedge and pinegrass may also be present.

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

Class B 14 Mid Development 1 - Closed

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| PIPO | Pinus ponderosa | Ponderosa pine | Upper |
| PSME | Pseudotsuga menziesii | Douglas-fir | Upper |
| PICO | Pinus contorta | Lodgepole pine | Middle |
| LAOC | Larix occidentalis | Western larch | Upper |

Description

Pole- and medium-sized Douglas-fir and ponderosa pine. Larch regeneration will decrease due to shade intolerance. Grand fir as a minor component will remain or increase due to shade tolerance.

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

Class C 38 Mid Development 1 - Open

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 |
| PICO | Pinus contorta | Lodgepole pine | Middle |

Description

Pole- and medium-sized ponderosa pine or Douglas-fir are the dominant trees. Western larch may also be present on the moist end of the BpS's range.

Additional dominant species (low in the canopy) may include ninebark (PHMA5; *Physocarpus malvaceus*), ceanothus (CESA; Ceanothus sanguineus), and spiraea. Elk sedge and pinegrass may also be present.

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

Class D 27 Late Development 1 - Open

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 |

Description

Large- and very large-sized ponderosa pine and Douglas-fir are the dominant trees. Western larch (on the moist end of the BpS's range) and grand fir may also be present in small proportions. Structure may be patchy depending on fire severities in previous class. Ceanothus will be decreasing, and willow, white spirea, mallow ninebark, elk sedge, and pinegrass will still be present.

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

Class E 5 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 | Middle |
| LAOC | Larix occidentalis | Western larch | Upper |

Description

Large- and very large-diameter ponderosa pine, Douglas-fir, grand fir, and western larch (on the moist end of the BpS's range). Mallow ninebark and white spirea will be present, but ceanothus will be absent. Some pinegrass and elk sedge will be present.

*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 | 114 |
| Mid1:CLS | 35 | Late1:CLS | 149 |
| Late1:OPN | 115 | Late1:OPN | 999 |
| Late1:CLS | 150 | 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 | 0.004 | 250 | Yes | 0 |
| Alternative Succession | Early1:ALL | Mid1:CLS | 0.01 | 100 | 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 | 0.006 | 167 | Yes | 0 |
| Insects or Disease | Mid1:OPN | Mid1:OPN | 0.0125 | 80 | No | 0 |
| Mixed Fire | Mid1:OPN | Mid1:OPN | 0.02 | 50 | No | 0 |
| Surface Fire | Mid1:OPN | Mid1:OPN | 0.03 | 33 | No | 0 |
| Surface Fire | Mid1:CLS | Mid1:CLS | 0.004 | 250 | No | 0 |
| Replacement Fire | Mid1:CLS | Early1:ALL | 0.012 | 83 | Yes | 0 |
| Mixed Fire | Mid1:CLS | Mid1:OPN | 0.02 | 50 | Yes | 0 |
| Insects or Disease | Mid1:CLS | Mid1:OPN | 0.02 | 50 | Yes | 0 |
| Alternative Succession | Late1:OPN | Late1:CLS | 1 | 1 | Yes | 40 |
| Replacement Fire | Late1:OPN | Early1:ALL | 0.006 | 167 | Yes | 0 |
| Insects or Disease | Late1:OPN | Late1:OPN | 0.01 | 100 | No | 0 |
| Mixed Fire | Late1:OPN | Late1:OPN | 0.02 | 50 | No | 0 |
| Surface Fire | Late1:OPN | Late1:OPN | 0.05 | 20 | No | 0 |
| Surface Fire | Late1:CLS | Late1:CLS | 0.007 | 143 | No | 0 |
| Replacement Fire | Late1:CLS | Early1:ALL | 0.012 | 83 | Yes | 0 |
| Mixed Fire | Late1:CLS | Late1:OPN | 0.0125 | 80 | Yes | 0 |
| Wind or Weather or Stress | Late1:CLS | Late1:OPN | 0.015 | 67 | Yes | 0 |
| Insects or Disease | Late1:CLS | Late1:OPN | 0.02 | 50 | Yes | 0 |

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