10550

Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland

BpS Model/Description Version: Aug. 2020

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

Forest and Woodland

Map Zones

10, 19

Geographic Range

Northeastern Washington, northern and central Idaho, and northwestern Montana.

Biophysical Site Description

Subalpine zone, with lower extent at ~4,500ft (in northeastern Washington) or 6,500ft (in Montana and Idaho) and the upper extent at ~8,500ft.

Vegetation Description

Lodgepole pine, subalpine fir, and Engelmann spruce dominate. Lodgepole pine comprises a greater component on drier sites and earlier successional stages and can be a canopy dominant for >250yrs in some stands (Kipfmueller and Kupfer 2005). Pockets of pure lodgepole pine are not uncommon. At high elevations and southerly aspects, whitebark pine may occur. Western larch and Douglas-fir may be early seral components at lower portions of this Biophysical Setting (BpS). Aspen may be present, especially east of the Continental Divide and in the southern portions of map zones (MZs) 10 and 19. Mountain hemlock may be present in the north and west portions of MZs 10 and 19.

Understory associates may include: *Vaccinium scoparium*, beargrass (*Xerophyllum tenax*), *Rhododendron albiflorum*, *Linnaea borealis*, *Menziesia ferruginea*, and *Alnus sinuata*. Understory shrubs will be more prevalent on east- and north-facing aspects.

BpS Dominant and Indicator Species

|  |  |  |
| --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** |
| ABLA | *Abies lasiocarpa* | Subalpine fir |
| PIEN | *Picea engelmannii* | Engelmann spruce |
| PICO | *Pinus contorta* | Lodgepole pine |
| CAGE | *Carex geophila* | White mountain sedge |
| CARU | *Calamagrostis rubescens* | Pinegrass |

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

Disturbance Description

Fire regime characterized by primarily moderately long-interval mixed and stand-replacement fires. Lightning strikes are frequent but will often result in small, patchy spot fires. Some recent data show more frequent mean fire return intervals (8-71yrs) in systems that may include this BpS (Elaine Sutherland, USFS Rocky Mountain Research Station, personal communication, August 2005). In southern and western portions of MZs 10 and 19, this BpS may have more frequent fire regimes.

In some areas, spruce beetle and mountain pine beetle can influence successional stage, species composition, and stand density. Spruce beetle and mountain pine beetle may act to accelerate succession by removing the lodgepole pine and promoting the more shade-tolerant species. Large-scale insect infestations may create large patches of early seral conditions and/or create conditions that lead to large, stand-replacement fires.

Fire Frequency

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Severity** | **Avg FI** | **Percent of All Fires** | **Min FI** | **Max FI** |
| Replacement | 207 | 67 | 100 | 600 |
| Moderate (Mixed) | 417 | 33 |  |  |
| Low (Surface) |  |  |  |  |
| All Fires | 138 | 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

Fires could range widely in size from 1,000s to 100,000s of acres. Smith and Fischer (1997) suggest fires ranged from 500-1,000ac. Spot fires are common (Williams et al. 1995). Variability of climate, topography, and other site factors can result in a wide range of representation of successional stages on the landscape (Schoennagel et al. 2004). Equilibrium landscapes are not likely to develop in areas <500,000ac.

Adjacency or Identification Concerns

This BpS corresponds to the following habitat types (Pfister et al. 1977): ABLA/CAGE, ABLA/VASC, TSME/XETE, TSME/MEFE, TSME/CLUN, PICEA/GART, PICEA/LIBO, and PICEA/PHMA.

In northeastern Washington and northern Idaho, this type may transition to mountain hemlock, where it becomes more maritime.

Non-native insects and disease, including balsam wooly adelgid and whitebark pine blister rust, affect these forests today. Some local populations of whitebark pine have experienced >90% mortality from blister rust.

At lower elevations, this type is adjacent to upper montane, including western hemlock, western red cedar, grand fir, and Douglas-fir. At higher elevations, it is adjacent to Northern Rocky Mountain Subalpine Woodland and Parkland (1046).

Issues or Problems

Fire regimes in this system are strongly related to climatic cycles. Long-term changes in climate as well as interannual climate variability will affect the frequency of fire in this system and its distribution along an elevational gradient.

Moisture gradients control the fire regime of these systems relative to the lower-elevation montane mixed conifer types (eg, BpS 1045). Disturbance regimes may operate on a similar gradient. Where this system is in close proximity to montane mixed conifer systems, fire regimes may be more similar to the mixed conifer system (i.e., more frequent with more mixed-severity fire).

Native Uncharacteristic Conditions

Comments

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 | D | D | D | D | E | E | E | E | E | E |
| Tree | 10-25 | C | C | C | C | B | B | B | B | B | B |
| Tree | 25-50 | 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 | C | C | C | C | B | B | B | B | B | B |
| Tree | >50 | D | D | D | D | E | E | 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 16 Early Development 1 - All Structures

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| PICO | Pinus contorta | Lodgepole pine | Upper |
| ABLA | Abies lasiocarpa | Subalpine fir | Lower |
| PIEN | Picea engelmannii | Engelmann spruce | Lower |

Description

Early succession stage after long interval replacement fires. There can be extended periods (as long as 300yrs) of grass/seedling stage after fire replacement events. Whitebark pine may be present in central Idaho and southwestern Montana. Western larch and Douglas-fir may be present in northern Idaho, eastern Washington, and western Montana.

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

Class B 44 Mid Development 1 - Closed

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| PICO | Pinus contorta | Lodgepole pine | Upper |
| ABLA | Abies lasiocarpa | Subalpine fir | Low-Mid |
| PIEN | Picea engelmannii | Engelmann spruce | Low-Mid |

Description

High-density lodgepole pine with spruce-fir in mid story. Tree heights of lodgepole pine will rarely exceed 25m.

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

Class C 15 Mid Development 1 - Open

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| PICO | Pinus contorta | Lodgepole pine | Upper |
| ABLA | Abies lasiocarpa | Subalpine fir | Low-Mid |
| PIEN | Picea engelmannii | Engelmann spruce | Low-Mid |

Description

Low-density pole to medium-diameter trees. Primarily occurs after mixed-severity fires, on droughty substrates, or after insects or disease thin denser stands. Reburn events may also result in lack of seed source. Douglas-fir and whitebark pine may be present in this class.

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

Class D 5 Late Development 1 - Open

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| PIEN | Picea engelmannii | Engelmann spruce | Upper |
| ABLA | Abies lasiocarpa | Subalpine fir | Upper |

Description

Low-density dominated by spruce-fir with declining lodgepole pine. Primarily occurs after mixed-severity fires, on droughty substrates, or after insects or disease thin denser stands. Reburn events may also result in lack of seed source. Douglas-fir and whitebark pine may be present in this class.

*Maximum Tree Size Class*  
Large 21-33" DBH

Class E 20 Late Development 1 - Closed

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| PIEN | Picea engelmannii | Engelmann spruce | Upper |
| ABLA | Abies lasiocarpa | Subalpine fir | Upper |

Description

High-density dominated by spruce-fir with declining lodgepole pine. This type will occur in the more mesic portions of the BpS's range, with longer fire return intervals. Fires will tend to be more stand-replacing in this type.

*Maximum Tree Size Class*  
Large 21-33" DBH

Model Parameters

Deterministic Transitions

|  |  |  |  |
| --- | --- | --- | --- |
| **From Class** | **Begins at (yr)** | **Succeeds to** | **After (years)** |
| Early1:ALL | 0 | Mid1:CLS | 29 |
| Mid1:OPN | 30 | Mid1:CLS | 69 |
| Mid1:CLS | 30 | Late1:CLS | 119 |
| Late1:OPN | 120 | Late1:CLS | 179 |
| Late1:CLS | 120 | 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 | 0.002 | 500 | Yes | 0 |
| Competition or Maintenance | Early1:ALL | Early1:ALL | 0.002 | 500 | No | 0 |
| Alternative Succession | Early1:ALL | Mid1:OPN | 0.003 | 333 | Yes | 0 |
| Mixed Fire | Mid1:OPN | Mid1:OPN | 0.002 | 500 | No | 0 |
| Insects or Disease | Mid1:OPN | Mid1:OPN | 0.002 | 500 | No | 0 |
| Alternative Succession | Mid1:OPN | Late1:OPN | 0.002 | 500 | Yes | 0 |
| Replacement Fire | Mid1:OPN | Early1:ALL | 0.002 | 500 | Yes | 0 |
| Competition or Maintenance | Mid1:CLS | Mid1:CLS | 0.001 | 1000 | No | 0 |
| Wind or Weather or Stress | Mid1:CLS | Mid1:OPN | 0.002 | 500 | Yes | 0 |
| Insects or Disease | Mid1:CLS | Mid1:OPN | 0.002 | 500 | Yes | 0 |
| Insects or Disease | Mid1:CLS | Early1:ALL | 0.002 | 500 | Yes | 0 |
| Mixed Fire | Mid1:CLS | Mid1:OPN | 0.003 | 333 | Yes | 0 |
| Replacement Fire | Mid1:CLS | Early1:ALL | 0.006 | 167 | Yes | 0 |
| Insects or Disease | Late1:OPN | Late1:OPN | 0.001 | 1000 | No | 0 |
| Wind or Weather or Stress | Late1:OPN | Mid1:OPN | 0.002 | 500 | Yes | 0 |
| Mixed Fire | Late1:OPN | Mid1:OPN | 0.002 | 500 | Yes | 0 |
| Insects or Disease | Late1:OPN | Mid1:OPN | 0.002 | 500 | Yes | 0 |
| Wind or Weather or Stress | Late1:OPN | Late1:OPN | 0.002 | 500 | No | 0 |
| Mixed Fire | Late1:OPN | Late1:OPN | 0.002 | 500 | No | 0 |
| Competition or Maintenance | Late1:OPN | Late1:OPN | 0.002 | 500 | No | 0 |
| Replacement Fire | Late1:OPN | Early1:ALL | 0.002 | 500 | Yes | 0 |
| Mixed Fire | Late1:CLS | Mid1:OPN | 0.001 | 1000 | Yes | 0 |
| Insects or Disease | Late1:CLS | Mid1:OPN | 0.001 | 1000 | Yes | 0 |
| Insects or Disease | Late1:CLS | Early1:ALL | 0.001 | 1000 | Yes | 0 |
| Wind or Weather or Stress | Late1:CLS | Late1:OPN | 0.002 | 500 | Yes | 0 |
| Mixed Fire | Late1:CLS | Late1:OPN | 0.002 | 500 | Yes | 0 |
| Replacement Fire | Late1:CLS | Early1:ALL | 0.008 | 125 | Yes | 0 |

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