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

1, 8, 9

Geographic Range

This Biophysical Setting (BpS) occurs in the Blue Mountains of Washington and the Blue and Ochoco mountains in Oregon.

Biophysical Site Description

This forest type occurs at upper elevations (6,000-8,000ft), on cold sites with short summer and frosty growing seasons.

Vegetation Description

Some sites take a very long time to regenerate following reburn fires. Dense stands of lodgepole can develop and survive for 100yrs+. Old stands of Engelmann spruce and subalpine fir can develop but are prone to insect and fire replacement.

BpS Dominant and Indicator Species

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

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

Disturbance Description

Wildfires are less frequent than at lower elevations. Most fires are mixed-severity or stand-replacement severity. Spruce beetle can play a significant role at both endemic and epidemic/ outbreak levels. Balsam woolly adelgid (an introduced insect) is currently causing high mortality. Mountain pine beetle can cause high mortality of seral lodgepole pine forests. Windthrow is important in this environment.

Fire Frequency

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Severity** | **Avg FI** | **Percent of All Fires** | **Min FI** | **Max FI** |
| Replacement | 231 | 52 |  |  |
| Moderate (Mixed) | 247 | 48 |  |  |
| Low (Surface) |  |  |  |  |
| All Fires | 119 | 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

Stands often occur as large patches on upper slopes and break into stringers or islands as elevation nears tree line.

Adjacency or Identification Concerns

Sub-alpine woodland occurs above this type, and wet or dry mixed conifer (1045 or 1047) occurs below. Dense, dog-hair lodgepole stands were not modeled in this type but were left to be defined in the Rocky Mountain lodgepole model (1050).

Issues or Problems

Native Uncharacteristic Conditions

If tree canopy closure is <10%, the site might be subalpine woodland/parkland (1046). Canopies >25m might be mesic spruce fir (1056).

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 | B | B | B | B | B | B | B |
| Tree | 10-25 | D | D | D | D | E | E | E | E | E | E |
| Tree | 25-50 | D | D | D | D | E | E | E | E | E | E |
| 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 6 Early Development 1 - Open

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| VASC | Vaccinium scoparium | Grouse whortleberry | Upper |
| ARCO9 | Arnica cordifolia | Heartleaf arnica | Upper |
| ACOC3 | Achnatherum occidentale | Western needlegrass | Upper |

Description

Openings and meadows following stand-replacement fire. Poorly stocked with lodgepole pine, subalpine fir, and Engelmann spruce. Slow tree recruitment. Trees 0-5in DBH. Dominant understory species include grouse huckleberry, heartleaf arnica, and western needlegrass. Canopy closure >40% is possible but unlikely due to site limitations in favor of rock, snow, and ice.

*Maximum Tree Size Class*  
None

Class B 17 Mid Development 1 - Closed

Indicator Species

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

Description

Mid-sized mixed lodgepole pine, fir, and spruce stand. Trees mostly 6-15in DBH. Moderate lodgepole regeneration leads to more closed canopy than Class C. Lodgepole pines range in height up to 20m. Some large spruce and fir may persist from old stands that were thinned by insects or wind.

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

Class C 41 Mid Development 1 - Open

Indicator Species

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

Description

Mid-sized mixed lodgepole, fir, and spruce stand, closed canopy. Trees mostly 6-15in DBH. Lodgepole pines susceptible to outbreaks of mountain pine beetle. Lodgepole pines range in height up to 20m.

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

Class D 24 Late Development 1 - Open

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| ABLA | Abies lasiocarpa | Subalpine fir | None |
| PIEN | Picea engelmannii | Engelmann spruce | None |
| PICO | Pinus contorta | Lodgepole pine | None |
| VASC | Vaccinium scoparium | Grouse whortleberry | None |

Description

Mixed-age stands dominated by Engelmann spruce and subalpine fir, with minor lodgepole pine. Trees mostly 15in+ DBH. Dominant understory species include grouse huckleberry, heartleaf arnica, and western needlegrass. Spruce beetle attacks mature spruce and fir, moving the stand back to Class C. Mountain pine bark beetles attack mainly the remaining old lodgepole pines and maintain the stand.

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

Class E 12 Late Development 1 - Closed

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| ABLA | Abies lasiocarpa | Subalpine fir | None |
| PIEN | Picea engelmannii | Engelmann spruce | None |
| PICO | Pinus contorta | Lodgepole pine | None |
| VASC | Vaccinium scoparium | Grouse whortleberry | None |

Description

Mixed-age stands dominated by Engelmann spruce and subalpine fir, with minor lodgepole pine. Trees mostly 1in+ DBH. Understory vegetation is sparse.

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

Model Parameters

Deterministic Transitions

|  |  |  |  |
| --- | --- | --- | --- |
| **From Class** | **Begins at (yr)** | **Succeeds to** | **After (years)** |
| Early1:OPN | 0 | Mid1:OPN | 39 |
| Mid1:OPN | 40 | Late1:OPN | 119 |
| Mid1:CLS | 40 | 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** |
| Mixed Fire | Early1:OPN | Early1:OPN | 0.002 | 500 | No | 0 |
| Alternative Succession | Early1:OPN | Mid1:CLS | 0.06 | 17 | Yes | 0 |
| Replacement Fire | Mid1:OPN | Early1:OPN | 0.003 | 333 | Yes | 0 |
| Insects or Disease | Mid1:OPN | Mid1:OPN | 0.005 | 200 | No | 0 |
| Mixed Fire | Mid1:OPN | Mid1:OPN | 0.006 | 167 | No | 0 |
| Mixed Fire | Mid1:CLS | Mid1:OPN | 0.003 | 333 | Yes | 0 |
| Insects or Disease | Mid1:CLS | Mid1:OPN | 0.007 | 143 | Yes | 0 |
| Replacement Fire | Mid1:CLS | Early1:OPN | 0.007 | 143 | Yes | 0 |
| Insects or Disease | Late1:OPN | Mid1:OPN | 0.002 | 500 | Yes | 0 |
| Mixed Fire | Late1:OPN | Late1:OPN | 0.002 | 500 | No | 0 |
| Replacement Fire | Late1:OPN | Early1:OPN | 0.005 | 200 | Yes | 0 |
| Wind or Weather or Stress | Late1:OPN | Mid1:OPN | 0.007 | 143 | Yes | 0 |
| Insects or Disease | Late1:OPN | Late1:OPN | 0.007 | 143 | No | 0 |
| Mixed Fire | Late1:CLS | Late1:OPN | 0.004 | 250 | Yes | 0 |
| Insects or Disease | Late1:CLS | Mid1:OPN | 0.006 | 167 | Yes | 0 |
| Replacement Fire | Late1:CLS | Early1:OPN | 0.006 | 167 | Yes | 0 |
| Wind or Weather or Stress | Late1:CLS | Mid1:OPN | 0.007 | 143 | Yes | 0 |
| Insects or Disease | Late1:CLS | Late1:OPN | 0.007 | 143 | Yes | 0 |

References

Agee, J.K. 1993. Fire ecology of Pacific Northwest forests. Washington, DC: Island Press. 493 pp.

Heyerdahl, E.K. and J.K. Agee. 1996. Historical fire regimes of four sites in the Blue Mountains, Oregon and Washington. Final Report, University of Washington, Seattle, WA. 173 pp.

Johnson, C.G. Jr. 2004. Alpine and subalpine vegetation of the Wallowa, Seven Devils and Blue Mountains. R6-NR-ECOL-TP-03-04. Portland, OR, USDA Forest Service, Pacific Northwest Region, 612 pp.

Johnson, C.G. and R.R. Clausnitzer. 1992. Plant associations of the Blue and Ochoco Mountains. P6-ERW-TP-036-92. Portland, OR: USDA Forest Service, Pacific Northwest Region. 164 pp. + appendices.

Johnson, C.G. and S.A. Simon. 1986. Plant associations of the Wallowa-Snake province. R6-ECOL-TP-255b-86. Portland, OR: USDA Forest Service, Pacific Northwest Region. 272 pp. + appendices.

NatureServe. 2007. International Ecological Classification Standard: Terrestrial Ecological Classifications. NatureServe Central Databases. Arlington, VA. Data current as of 10 February 2007.