11170

Southern Rocky Mountain Ponderosa Pine Savanna

BpS Model/Description Version: Aug. 2020

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Vegetation Type

Steppe/Savanna

Map Zones

16, 23, 24

Geographic Range

Ponderosa pine is widely distributed throughout North America, occupying ~38 million acres across 14 states. Ponderosa pine savanna is much more restricted than the ponderosa pine woodlands; it is typically found throughout the inland west of North America in the foothills and montane zones. Elevation range from 335m in British Columbia to 2,700m in the Southwest. Ponderosa pine savanna is typically found in the southern and eastern Uinta Mountains in northern Utah and in the central and eastern side of Nevada along mountain ranges where mixed conifers are absent or uncommon. Ponderosa pine covers plateaus and mountains in the southern and central portion of Utah (Bradley et al. 1992).

Biophysical Site Description

This type occurs at elevations ranging from 5,500ft (waterways) to 9,000ft (Howard 2003), primarily on rolling plains, plateaus, and dry slopes in the foothills and montane zones, and is usually found on southerly aspects and drier sites.

Vegetation Description

This system is best described as a savanna that has widely spaced *Pinus ponderosa*. A healthy occurrence often consists of open and park-like stands dominated by *Pinus ponderosa*. Understory vegetation in the true savanna occurrences is predominantly fire-resistant grasses and forbs that resprout following surface fires; shrubs, understory trees, and downed logs are uncommon. Important species include *Festuca arizonica*, *Pseudoroegneria spicata*, *Andropogon gerardii*, *Schizachyrium scoparium*, *Festuca* spp., and *Bouteloua gracilis*. A century of anthropogenic disturbance and fire suppression has resulted in a higher density of *Pinus ponderosa* trees, altering the fire regime and species composition. Presently, many stands contain understories of more shade-tolerant species, such as *Pseudotsuga menziesii* and/or *Abies* spp., as well as younger cohorts of *Pinus ponderosa*.

BpS Dominant and Indicator Species

|  |  |  |
| --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** |
| PIPO | *Pinus ponderosa* | Ponderosa pine |
| FEID | *Festuca idahoensis* | Idaho fescue |
| PSSP6 | *Pseudoroegneria spicata* | Bluebunch wheatgrass |
| FEAR2 | *Festuca arizonica* | Arizona fescue |
| PSEUD7 | *Pseudotsuga* | Douglas-fir |
| ABCO | *Abies concolor* | White fir |

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

Disturbance Description

Under pre-settlement conditions, interior ponderosa pine forests were subject to frequent, low-severity fires (Fire Regime Group I) (Bradley et al. 1992). Mean fire return interval (MFRI) for this type ranged from 7-25yrs. MFRI is 8-10yrs for surface fire, with shorter intervals in more open stands. The MFRI for mixed-severity fires is 50yrs (closed stands) to 80yrs (open stands). Replacement fire is rare but more frequent in closed stands (fire return interval [FRI] of 250yrs), which is less common in the landscape, than in open stands (FRI of 800yrs).

Mountain pine beetle is the most significant insect in Utah, the Black Hills, and the central and southern Rocky Mountains. Mountain pine beetle outbreaks increase with stand density with return interval of 100yrs on average. Closed stands >40% cover are attacked by pine beetle, resulting in older trees (sometimes younger trees, too) being selectively killed.

Dwarf mistletoe is also an important disturbance in stands without fire or a secondary result of insect attacks.

Fire Frequency

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Severity** | **Avg FI** | **Percent of All Fires** | **Min FI** | **Max FI** |
| Replacement | 159 | 5 | 250 | 800 |
| Moderate (Mixed) | 81 | 10 |  |  |
| Low (Surface) | 10 | 85 | 8 | 10 |
| All Fires | 8 | 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

Ponderosa pine savannas are naturally limited in size on the Utah High Plateau and eastern Great Basin. Although large fires have been noted in ponderosa pine in the past, these are thought to occur in ponderosa pine woodlands, not the smaller savannas: In 1631, a fire burned an area of approximately 30-40 sq km at Cheesman Lake (Kaufmann et al. 2000); Goldblum and Veblen (1992) reported larger fires were of similar size; and at Zion National Park roughly 1,000ac burned every 3yrs (West and Madany 1981).

Adjacency or Identification Concerns

Found adjacent to Gambel or shrub live oak (*Quercus turbinella*), pinyon-juniper, mixed conifers, interior chaparral, and blackbrush.

This type may be easily confused with Southern Rocky Mountain Ponderosa Pine Woodland (1054), especially when fire-suppressed. The presence of large patches of Douglas-fir and/or white fir may indicate the need for closer examination to not misclassify the Biophysical Setting (BpS).

Issues or Problems

Ponderosa pine savanna should be better researched for the Great Basin. Many scattered PIPO patches in the Great Basin were completely logged during the mining era of 1850-1900 (e.g., several hundred acres in the Clover Mountains on the Great Basin-Mojave Desert boundary in eastern Nevada) and during the railroad construction era throughout the western United States. It is also thought that the dominance of shrubs in understories is greater today than during pre-settlement because livestock grazing greatly reduced grasses in the southern portion of the Great Basin. Therefore, shrubby woodlands today may have been grassy savannas in the past.

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 | B | B | B | B | B | B | B |
| Tree | 10-25 | D | D | D | E | E | E | E | E | E | E |
| Tree | 25-50 | D | D | D | E | E | E | E | E | E | E |
| Tree | >50 | D | D | D | E | 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 4 Early Development 1 - All Structures

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| PIPO | Pinus ponderosa | Ponderosa pine | Upper |
| FEID | Festuca idahoensis | Idaho fescue | Lower |
| PSSP6 | Pseudoroegneria spicata | Bluebunch wheatgrass | Lower |
| FEAR2 | Festuca arizonica | Arizona fescue | Lower |

Description

Graminoid-dominated community following stand-replacement fire. Grass are short to medium in height and range in canopy cover from 0-100%. Sprouting shrubs on more moist site can occur. Conifer seedlings are scattered throughout but are typically found in dog-hair-type thickets.

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

Class B 8 Mid Development 1 - Closed

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| PIPO | Pinus ponderosa | Ponderosa pine | Upper |
| FEID | Festuca idahoensis | Idaho fescue | Lower |
| PSSP6 | Pseudoroegneria spicata | Bluebunch wheatgrass | Lower |
| FEAR2 | Festuca arizonica | Arizona fescue | Lower |

Description

>30% canopy cover from sapling to pole-size pine. Understory species decreasing to depressed. DBH range of 2-14in. Surface fire is not assumed possible in this closed condition as any fire would at least cause mixed-severity fire effects.

*Maximum Tree Size Class*  
Pole 5-9" DBH

Class C 11 Mid Development 1 - Open

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| PIPO | Pinus ponderosa | Ponderosa pine | Upper |
| FEID | Festuca idahoensis | Idaho fescue | Lower |
| PSSP6 | Pseudoroegneria spicata | Bluebunch wheatgrass | Lower |
| FEAR2 | Festuca arizonica | Arizona fescue | Lower |

Description

<30% canopy cover of pole- to saw-timber-size trees with diverse understory of grasses and forb species. Open structure maintained by low-intensity and mixed-severity fire. DBH range of 2-14in.

*Maximum Tree Size Class*  
Pole 5-9" DBH

Class D 76 Late Development 1 - Open

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| PIPO | Pinus ponderosa | Ponderosa pine | Upper |
| FEID | Festuca idahoensis | Idaho fescue | Lower |
| PSSP6 | Pseudoroegneria spicata | Bluebunch wheatgrass | Lower |
| FEAR2 | Festuca arizonica | Arizona fescue | Lower |

Description

<30% canopy cover with scattered saw-timber-size trees throughout, creating a savanna-like appearance with diverse grass and forb species dominating the understory. DBH range of 14in+.

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

Class E 1 Late Development 1 - Closed

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| PIPO | Pinus ponderosa | Ponderosa pine | Upper |
| FEAR2 | Festuca arizonica | Arizona fescue | Lower |
| ABCO | Abies concolor | White fir | Mid-Upper |
| PSEUD7 | Pseudotsuga | Douglas-fir | Upper |

Description

>30% canopy cover of decadent trees. Severely suppressed to poorly developed understory. White fir and Douglas-fir may be present. Age class: 100yrs+.

*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 | 14 |
| Mid1:OPN | 15 | Late1:OPN | 99 |
| Mid1:CLS | 15 | Late1:CLS | 99 |
| Late1:OPN | 100 | 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 | 0.1 | 10 | Yes | 0 |
| Alternative Succession | Mid1:OPN | Mid1:CLS | 1 | 1 | Yes | 25 |
| Replacement Fire | Mid1:OPN | Early1:ALL | 0.00125 | 800 | Yes | 0 |
| Mixed Fire | Mid1:OPN | Mid1:OPN | 0.0125 | 80 | No | 0 |
| Surface Fire | Mid1:OPN | Mid1:OPN | 0.1 | 10 | No | 0 |
| Replacement Fire | Mid1:CLS | Early1:ALL | 0.004 | 250 | Yes | 0 |
| Insects or Disease | Mid1:CLS | Mid1:OPN | 0.01 | 100 | Yes | 0 |
| Mixed Fire | Mid1:CLS | Mid1:OPN | 0.02 | 50 | Yes | 0 |
| Alternative Succession | Late1:OPN | Late1:CLS | 1 | 1 | Yes | 50 |
| Replacement Fire | Late1:OPN | Early1:ALL | 0.00125 | 800 | Yes | 0 |
| Mixed Fire | Late1:OPN | Late1:OPN | 0.0125 | 80 | No | 0 |
| Surface Fire | Late1:OPN | Late1:OPN | 0.125 | 8 | No | 0 |
| Insects or Disease | Late1:CLS | Late1:OPN | 0.0025 | 400 | Yes | 0 |
| Replacement Fire | Late1:CLS | Early1:ALL | 0.004 | 250 | Yes | 0 |
| Insects or Disease | Late1:CLS | Mid1:OPN | 0.0075 | 133 | Yes | 0 |
| Mixed Fire | Late1:CLS | Late1:OPN | 0.02 | 50 | Yes | 0 |

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