10540

Southern Rocky Mountain Ponderosa Pine Woodland

BpS Model/Description Version: Aug. 2020

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

Forest and Woodland

Map Zones

15, 25

Geographic Range

Arizona, Colorado, New Mexico, Great Basin. Within map zone (MZ) 25, it occurs along I-25 in foothills to larger ranges. M313Bg; M313Am; modelers most familiar with New Mexico, some familiarity to southeastern Arizona; area southwest of Los Alamos M331Gm; portions of the sky islands in southeastern Arizona

Biophysical Site Description

These woodlands occur at the lower treeline between grassland or shrubland and more mesic coniferous forests. Elevations range to 2,800m in the New Mexico mountains. Occurrences are found on all slopes and aspects. This ecological system generally occurs on soils derived from igneous, metamorphic, and sedimentary material, with characteristic features of good aeration and drainage, medium to fine texture, neutral to slightly acid pH, an abundance of mineral material, rockiness, and periods of drought during the growing season. This model represents this Biophysical Setting (BpS) above the Mogollon Rim, southern New Mexico, and southeastern Arizona. Sky islands in this BpS can be more diverse and difficult to characterize due to diversity of topography, vegetation, and influences of Sonoran, Chihuahuan, Southern Rocky Mountains, and Madrean.

Vegetation Description

*Pinus ponderosa* is the dominant conifer while *Pseudotsuga menziesii*, *Pinus edulis*, *Quercus gambelii*, and *Juniperus* spp. may be present in the tree canopy. The understory is usually grassy, with *Festuca*, *Muhlenbergia*, and *Bouteloua* as some of the common grasses. Woody shrubs and trees, such as *Purshia stansburiana*, *Artemisia tridentata*, and *Robinia neomexicana*, can also be common but not dominant.

BpS Dominant and Indicator Species

|  |  |  |
| --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** |
| PIPOS | *Pinus ponderosa var. scopulorum* | Ponderosa pine |
| QUGA | *Quercus gambelii* | Gambel oak |
| MUMO | *Muhlenbergia montana* | Mountain muhly |
| BOGR | *Boerhavia gracillima* | Slimstalk spiderling |
| FEAR2 | *Festuca arizonica* | Arizona fescue |

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

Disturbance Description

These sites are in a Fire Regime Group I or III. Some portions of these sites are transition zones to Fire Regime Groups II and III. Frequent surface fires were the common fire regime characteristics. Surface fire intervals ranged from 2-10yrs, and replacement severity occurred at intervals of 150-400yrs+ (Brown 2000; Crane 1986; Bradley 1992a; Bradley 1992b; Barrett 1988; Morgan et al. 1996; Brown 1994).

Bark beetle outbreaks are highly related to drought and stand density. Denser stands in relation to site capacity will favor outbreaks, which will decrease as trees are thinned. Non-native herbaceous species may move in following severe-intensity fire.

Fire Frequency

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Severity** | **Avg FI** | **Percent of All Fires** | **Min FI** | **Max FI** |
| Replacement | 397 | 2 | 150 | 500 |
| Moderate (Mixed) | 108 | 9 | 10 | 150 |
| Low (Surface) | 10 | 89 | 5 | 50 |
| All Fires | 9 | 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

BpS is very large: largest contiguous areas of ponderosa pine found in United States occur throughout the MZ.

Adjacency or Identification Concerns

This system intergrades with pinyon-juniper at lower elevation and mixed conifer at upper elevation.

Issues or Problems

Ponderosa pine woodlands and savannas should be better researched. Many scattered PIPO patches in the MZ were 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.

Under dry site conditions, oak and chaparral vegetation will prevent stand closure from Class C to B or from D to E. Possible future work to investigate separate Pine/Oak System. Some uncertainty exists in the historical fire return intervals and the percent of fires that were replacement fires for this BpS (e.g., Williams and Baker 2012; Fule et al. 2014).

Native Uncharacteristic Conditions

Tree cover >60% can be considered uncharacteristic in this woodland type.

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 | C | C | C | B | B | B | UN | UN | UN | UN |
| Tree | 5-10 | C | C | C | B | B | B | UN | UN | UN | UN |
| Tree | 10-25 | D | D | D | E | E | E | UN | UN | UN | UN |
| Tree | 25-50 | D | D | D | E | E | E | UN | UN | UN | UN |
| Tree | >50 | D | D | D | E | E | E | UN | UN | 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 10 Early Development 1 - All Structures

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| PIPOS | Pinus ponderosa var. scopulorum | Ponderosa pine | Upper |
| QUGA | Quercus gambelii | Gambel oak | Upper |
| MUMO | Muhlenbergia montana | Mountain muhly | Upper |
| FEAR2 | Festuca arizonica | Arizona fescue | Upper |

Description

Openings with grass, shrub, and forbs created after replacement fire. Post-replacement vegetation is patchy and episodic. Ponderosa pine seedlings can be very limited and variable. Gambel oak and *Ceanothus fendleri* are vigorous rapid resprouters.

*Maximum Tree Size Class*  
No Data

Class B 1 Mid Development 1 - Closed

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| PIPOS | Pinus ponderosa var. scopulorum | Ponderosa pine | Upper |
| QUGA | Quercus gambelii | Gambel oak | Mid-Upper |
| FEAR2 | Festuca arizonica | Arizona fescue | Mid-Upper |
| MUHLE | Muhlenbergia | Muhly | Mid-Upper |

Description

Forest canopy closure is 30% or greater. Closed pole-sapling/grass and shrubs.

Ideally, the maximum heights would be higher. Due to current LANDFIRE mapping rules, that is not possible.

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

Class C 13 Mid Development 1 - Open

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| PIPOS | Pinus ponderosa var. scopulorum | Ponderosa pine | Upper |
| QUGA | Quercus gambelii | Gambel oak | Mid-Upper |
| FEAR2 | Festuca arizonica | Arizona fescue | Low-Mid |
| MUHLE | Muhlenbergia | Muhly | Low-Mid |

Description

Forest canopy closure is <30%. Open pole-sapling/grass and shrubs.

Ideally, the maximum heights would be higher. Due to current LANDFIRE mapping rules, that is not possible.

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

Class D 74 Late Development 1 - Open

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| PIPOS | Pinus ponderosa var. scopulorum | Ponderosa pine | Upper |
| QUGA | Quercus gambelii | Gambel oak | Upper |
| FEAR2 | Festuca arizonica | Arizona fescue | Low-Mid |
| MUHLE | Muhlenbergia | Muhly | Low-Mid |

Description

Forest canopy closure is <30%. Open large trees/grass and shrubs.

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

Class E 2 Late Development 1 - Closed

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| PIPOS | Pinus ponderosa var. scopulorum | Ponderosa pine | Upper |
| QUGA | Quercus gambelii | Gambel oak | Upper |
| FEAR2 | Festuca arizonica | Arizona fescue | Upper |
| MUHLE | Muhlenbergia | Muhly | None |

Description

Forest canopy closure is 30% or greater. Closed, large trees, poles, saplings, and shrubs. Replacement and surface fires occur every 250yrs on average.

*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:OPN | 49 |
| Mid1:OPN | 50 | Late1:OPN | 119 |
| Mid1:CLS | 50 | Late1:CLS | 119 |
| Late1:OPN | 120 | Late1:OPN | 969 |
| Late1:CLS | 120 | Late1:CLS | 969 |

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** |
| Alternative Succession | Early1:ALL | Mid1:CLS | 0.01 | 100 | Yes | 0 |
| Surface Fire | Early1:ALL | Early1:ALL | 0.1 | 10 | No | 0 |
| Replacement Fire | Mid1:OPN | Early1:ALL | 0.0033 | 303 | Yes | 0 |
| Mixed Fire | Mid1:OPN | Mid1:OPN | 0.01 | 100 | No | 0 |
| Surface Fire | Mid1:OPN | Mid1:OPN | 0.1 | 10 | No | 0 |
| Surface Fire | Mid1:CLS | Mid1:CLS | 0.0063 | 159 | No | 0 |
| Replacement Fire | Mid1:CLS | Early1:ALL | 0.0125 | 80 | Yes | 0 |
| Alternative Succession | Mid1:CLS | Late1:OPN | 0.03 | 33 | Yes | 0 |
| Mixed Fire | Mid1:CLS | Mid1:OPN | 0.04 | 25 | Yes | 0 |
| Alternative Succession | Late1:OPN | Late1:CLS | 0.001 | 1000 | Yes | 0 |
| Replacement Fire | Late1:OPN | Early1:ALL | 0.0025 | 400 | Yes | 0 |
| Mixed Fire | Late1:OPN | Late1:OPN | 0.01 | 100 | No | 0 |
| Surface Fire | Late1:OPN | Late1:OPN | 0.1 | 10 | No | 0 |
| Surface Fire | Late1:CLS | Late1:CLS | 0.004 | 250 | No | 0 |
| Replacement Fire | Late1:CLS | Early1:ALL | 0.004 | 250 | Yes | 0 |
| Mixed Fire | Late1:CLS | Late1:OPN | 0.008 | 125 | Yes | 0 |
| Insects or Disease | Late1:CLS | Late1:OPN | 0.02 | 50 | Yes | 0 |

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