11660

Middle Rocky Mountain Montane Douglas-fir Forest and Woodland

BpS Model/Description Version: Aug. 2020

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| --- | --- | --- | --- |
| **Modelers** |  | **Reviewers** |  |
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| None | None | None | None |
| None | None | None | None |

Vegetation Type

Forest and Woodland

Map Zone

22

Geographic Range

This Biophysical Setting (BpS) occurs in eastern Idaho, southwestern Montana, and northwestern Wyoming. Within map zone (MZ) 22, it occurs on those central isolated mountain ranges with outcrops of limestone and dolomite bedrock -- the Ferris Mountains and probably the Shirley Mountains.

Biophysical Site Description

The xeric Douglas-fir type primarily exists between the limber pine type and grasslands/ shrublands on lower foothills and the cool/dry subalpine vegetation types. This BpS often occurs on southern aspects at the higher elevation range and on northern aspects at the lower elevation range.

Vegetation Description

Generally dominated by *Pseudotsuga menziesii* including intermixed aspen with an understory of graminoids and/or shrubs such as sagebrush and currants. Shrub cover varies from sparse to dense and typically includes *Symphoricarpos* spp., *Physocarpus malvaceus*, and *Juniperus communis*. *Pinus flexilis* and *Juniperus scopulorum* may be present. *Pinus contorta* can co-dominate in cooler and moister settings. Stand structure is typically even- or two-aged. Three-aged stands are uncommon.

BpS Dominant and Indicator Species

|  |  |  |
| --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** |
| PSME | *Pseudotsuga menziesii* | Douglas-fir |
| POTR5 | *Populus tremuloides* | Quaking aspen |
| PHMA5 | *Physocarpus malvaceus* | Mallow ninebark |
| RIBES | *Ribes* | Currant |
| SYAL | *Symphoricarpos albus* | Common snowberry |
| ARTRV | *Artemisia tridentata ssp. vaseyana* | Mountain big sagebrush |

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

Disturbance Description

Fire regime is predominantly mixed-severity (Fire Regime III) with a mean fire return interval of ~20-50yrs (Arno and Gruell 1983; Fischer and Clayton 1983; Houston 2002; Korb et al. 2005; Littell 2002). Stand-replacing fire occurs to a lesser degree, mostly in dense stands and/or with severe fire weather and during drought conditions.

The most common insects causing mortality include Douglas-fir bark beetle in Douglas-fir and mountain pine beetle in lodgepole pine. Medium to large trees are most susceptible although poles may be infrequently infected. The most common disease affecting older Douglas-fir stands is Schweinitzii.

Wind/weather/stress may infrequently affect stands and were therefore given low probabilities.

Fire Frequency

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Severity** | **Avg FI** | **Percent of All Fires** | **Min FI** | **Max FI** |
| Replacement | 206 | 16 | 100 | 300 |
| Moderate (Mixed) | 53 | 60 | 20 | 80 |
| Low (Surface) | 137 | 24 | 15 | 400 |
| All Fires | 32 | 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

This type is dominated by mixed-severity fires. A disturbance such as fire tends to create numerous small patches (holes) within the stand due to the mortality often associated with mixed-severity fire. Fire sizes are generally variable but may be linked to time of season and available fuel.

Adjacency or Identification Concerns

This BpS corresponds with cool, dry Douglas-fir and limber pine habitat types (Pfister et al. 1977), including PSME/POTR5, PSME/SYAL, PSME/PHMA, and PSME/JUCO.

This type often forms an ecotone with mountain grasslands/sagebrush. Class A in this model is equivalent with a Class A in neighboring grassland/shrubland types. Higher elevations of this type border dry subalpine fir systems and persistent lodgepole pine in frost pockets and cooler areas of the MZ.

Douglas-fir increases in canopy density in the absence of fire. Much of this landscape today has canopy cover denser than the historic range of variability.

Douglas-fir will often encroach from this BpS into adjacent shrublands, aspen stands, or grasslands with fire exclusion.

There seems to be a general absence of fire in the last 100yrs (Arno and Gruell 1983; Houston 2002; Littell 2002), most likely due to successful fire suppression and livestock grazing.

Issues or Problems

Native Uncharacteristic Conditions

Comments

This BpS is mapped in MZs 9, 10, 19, 21, 22 and 29. In MZ19, LANDFIRE National modelers split out a fire-maintained subtype. During the 2016 BpS Review, Kori Blankenship asked reviewers if the fire-maintained subtype was found in other zones.

-One reviewer, familiar with MZs 9, 10 and 19, felt that if this type existed it could be found at the forest-grass/shrub ecotone. The reviewer noted that she had only observed it in MZ10 and that it may not warrant a separate model.

-Another reviewer felt that the subtype did exist in MZs 8, 9, 10 and 22 and was more common on southern and southwestern aspects.

-Cameron Naficy responded that in his study areas (manuscript in development) in Zone 21, he “documented very few low density, multi-cohort Douglas-fir stands resulting from repeated low severity fire, i.e. these stands occupied a small portion of the landscape.  Many of these stands were ecotonal with grasslands and seemed to be in topographic safe sites such as rocky outcrops, concave depressions or on soil types with little organic material. Some of these factors might help you map the distribution of this forest type, but the relatively fine scale of the effects I’m describing and their inconsistency (i.e. not all rocky outcrops or concave depressions have fire-maintained forest) would make this challenging. In zones 21 and 19, most of our multi-cohort Douglas-fir stands showed clear evidence of initiating following high severity fire, but were subsequently affected by a variable number of non stand-replacing wildfires. Thus, they were multi-cohort, but resulting from a mix of severities over time rather than repeated low severity fires. Our dataset paints a picture primarily of non equilibrium dynamics over time at the patch scale, meaning that most patches in our study areas experienced a mix of fire severities over time and there were likely state switches between forest/non forest conditions over time in portions of the forest-grassland ecotone. Overall, I’m not sure it’s accurate to invoke an equilibrium dynamics model to describe these stands as is implied by the fire-maintained label. Doing so, I think, misinterprets the dynamics and processes that likely characterized many relatively open Douglas-fir forests historically. Rather than creating a unique fire-maintained sub group for each zone, unless there is good evidence for the existence of those dynamics in a specific region, I think it’s more accurate to stick with a mixed severity model for most of these forests and work to try to refine the parameters.”

Since the feedback was inconclusive, Blankenship made no changes. This issue should be reconsidered for future model refinement efforts.

FEIS website specific to Douglas-fir type in Wyoming was the reference for fire return intervals (FRIs) and were hypothetically adapted for each class using assumptions about fire behavior (Harrell, personal observation). For example, the early stage is mostly shrubs with seedling; the FRI for this type should be close to a mountain shrub FRI; therefore, replacement fire should be more frequent here than 1,000yrs (1,000yrs was the interval used for MZ21). When these shrubs and seedlings burn, there will be mortality of seedlings and may persist in this state for many years. How long this situation may last is probably unknown (Harrell, personal observation).

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 | UN |
| Tree | 5-10 | C | C | C | C | B | B | B | B | B | UN |
| Tree | 10-25 | D | D | D | D | E | E | E | E | E | UN |
| Tree | 25-50 | D | D | D | D | E | E | E | E | E | UN |
| Tree | >50 | D | D | D | D | E | E | E | E | E | 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 14 Early Development 1 - All Structures

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| PSME | Pseudotsuga menziesii | Douglas-fir | Upper |
| POTR5 | Populus tremuloides | Quaking aspen | Upper |
| PHMA5 | Physocarpus malvaceus | Mallow ninebark | Lower |
| RIBES | Ribes | Currant | Lower |

Description

Dominated by graminoids and seedling/sapling Douglas-fir and possibly aspen. Understory may be dominated by shrubs: *Symphoricarpos* spp., *Ribes* spp., *Artemisia tridentata vaseyana*, and *Physocarpus* may 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** |
| PSME | Pseudotsuga menziesii | Douglas-fir | Upper |
| POTR5 | Populus tremuloides | Quaking aspen | Upper |
| PHMA5 | Physocarpus malvaceus | Mallow ninebark | Lower |
| RIBES | Ribes | Currant | Lower |

Description

Relatively dense poles and seedlings of Douglas-fir and possibly aspen. The understory is open and understory may be dominated by *Symphoricarpos* spp., *Ribes* spp., *Artemisia tridentata vaseyana*, and *Physocarpus*.

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

Class C 19 Mid Development 1 - Open

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| PSME | Pseudotsuga menziesii | Douglas-fir | Upper |
| POTR5 | Populus tremuloides | Quaking aspen | Upper |
| PHMA5 | Physocarpus malvaceus | Mallow ninebark | Lower |
| RIBES | Ribes | Currant | Lower |

Description

Open pole and medium Douglas-fir that may have aspen with patchy graminoid cover and dispersed shrubs such as *Symphoricarpos* spp., *Ribes* spp., and *Physocarpus*. Conifer heights range between 5-20m but adjusted to eliminate class overlap.

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

Class D 39 Late Development 1 - Open

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| PSME | Pseudotsuga menziesii | Douglas-fir | Upper |
| POTR5 | Populus tremuloides | Quaking aspen | Upper |
| PHMA5 | Physocarpus malvaceus | Mallow ninebark | Lower |
| RIBES | Ribes | Currant | Lower |

Description

Open canopy of medium to large Douglas-fir with a graminoid and shrub understory with highly variable understory cover. Aspen may be present. Understory may be dominated by *Symphoricarpos* spp., *Ribes* spp., and *Physocarpus*. Heights can exceed 25m up to ~30m.

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

Class E 14 Late Development 1 - Closed

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| PSME | Pseudotsuga menziesii | Douglas-fir | Upper |
| POTR5 | Populus tremuloides | Quaking aspen | Upper |
| PHMA5 | Physocarpus malvaceus | Mallow ninebark | Lower |
| RIBES | Ribes | Currant | Lower |

Description

Multi-storied Douglas-fir, sometimes with aspen clones declining. Understory with variable cover often dominated by *Symphoricarpos* spp., *Ribes* spp., and *Physocarpus*. Heights can exceed 25m up to ~30m.

*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 | 39 |
| Mid1:CLS | 31 | Late1:CLS | 99 |
| Mid1:OPN | 40 | Late1:OPN | 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** |
| Alternative Succession | Early1:ALL | Mid1:CLS | 1 | 1 | Yes | 30 |
| Wind or Weather or Stress | Early1:ALL | Early1:ALL | 0.001 | 1000 | Yes | 0 |
| Replacement Fire | Early1:ALL | Early1:ALL | 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 | 0.004 | 250 | Yes | 0 |
| Wind or Weather or Stress | Mid1:OPN | Mid1:OPN | 0.005 | 200 | No | 0 |
| Insects or Disease | Mid1:OPN | Mid1:OPN | 0.005 | 200 | No | 0 |
| Surface Fire | Mid1:OPN | Mid1:OPN | 0.01 | 100 | No | 0 |
| Mixed Fire | Mid1:OPN | Mid1:OPN | 0.02 | 50 | No | 0 |
| Wind or Weather or Stress | Mid1:CLS | Mid1:OPN | 0.001 | 1000 | Yes | 0 |
| Replacement Fire | Mid1:CLS | Early1:ALL | 0.004 | 250 | Yes | 0 |
| Insects or Disease | Mid1:CLS | Mid1:OPN | 0.005 | 200 | Yes | 0 |
| Surface Fire | Mid1:CLS | Mid1:OPN | 0.01 | 100 | Yes | 0 |
| Mixed Fire | Mid1:CLS | Mid1:OPN | 0.0133 | 75 | Yes | 0 |
| Alternative Succession | Late1:OPN | Late1:CLS | 1 | 1 | Yes | 45 |
| Replacement Fire | Late1:OPN | Early1:ALL | 0.002 | 500 | Yes | 0 |
| Wind or Weather or Stress | Late1:OPN | Late1:OPN | 0.008 | 125 | No | 0 |
| Surface Fire | Late1:OPN | Late1:OPN | 0.01 | 100 | No | 0 |
| Mixed Fire | Late1:OPN | Late1:OPN | 0.02 | 50 | No | 0 |
| Insects or Disease | Late1:OPN | Late1:OPN | 0.1 | 10 | No | 0 |
| Surface Fire | Late1:CLS | Late1:CLS | 0.001 | 1000 | No | 0 |
| Wind or Weather or Stress | Late1:CLS | Late1:OPN | 0.005 | 200 | Yes | 0 |
| Replacement Fire | Late1:CLS | Early1:ALL | 0.01 | 100 | Yes | 0 |
| Mixed Fire | Late1:CLS | Late1:OPN | 0.02 | 50 | Yes | 0 |
| Insects or Disease | Late1:CLS | Late1:OPN | 0.12 | 8 | Yes | 0 |

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