11660

Middle Rocky Mountain Montane Douglas-fir Forest and Woodland

BpS Model/Description Version: Aug. 2020

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| --- | --- | --- | --- |
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Reviewer: Kathleen S. Roche

Vegetation Type

Forest and Woodland

Map Zone

29

Geographic Range

East of the Continental Divide in Montana and Wyoming. NatureServe states that this is the predominant montane conifer system in these zones, particularly where it is Douglas-fir without true fir or spruce. This is in the Bighorns, Yellowstone region and isolated ranges of central Wyoming.

Biophysical Site Description

The xeric Douglas-fir type primarily exists on lower foothills immediately above grasslands/ shrublands in elevation. Slopes range from gentle to steep, but aspect is primarily north-facing.

Vegetation Description

Generally dominated by Douglas-fir with an understory of bunchgrasses and sparse shrubs. Stands are typically open and dominated by moderate- to large-diameter Douglas-fir.

BpS Dominant and Indicator Species

|  |  |  |
| --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** |
| PSMEG | *Pseudotsuga menziesii var. glauca* | Rocky Mountain Douglas-fir |
| ARTRV | *Artemisia tridentata ssp. vaseyana* | Mountain big sagebrush |
| FEID | *Festuca idahoensis* | Idaho fescue |

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

Disturbance Description

Fire regime is predominantly (70%) frequent, low-severity fires. Mixed-severity fires occur with a typical frequency of 30-50yrs primarily in dense stands (Classes B and E). (The model, however, varies the fire return interval in Class C to account for more surface vs. mixed fire.)

Native American burning was likely significant in many of these low-elevation forests.

Wind/weather stress and insect/disease are modeled as disturbances.

Fire Frequency

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Severity** | **Avg FI** | **Percent of All Fires** | **Min FI** | **Max FI** |
| Replacement | 210 | 9 | 100 | 300 |
| Moderate (Mixed) | 110 | 17 | 30 | 110 |
| Low (Surface) | 25 | 74 | 15 | 40 |
| All Fires | 18 | 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

Since this type is dominated by surface fires and because this type represents an ecotone, patches tended to be smaller in size. Consequently, fire sizes were also relatively small. Analysis areas of several thousand acres would probably be adequate.

Adjacency or Identification Concerns

This Biophysical Setting (BpS) corresponds with cool, dry Douglas-fir habitat types (Pfister et al. 1977). Ecotone with mountain grasslands/sagebrush. This BpS is a transitional phase between the sagebrush-graminoid prairie at lower elevations and the 291050 BpS above.

Much of this setting has seen epidemic bark beetle infestation recently.

There have been missed fire cycles recently. Much of the Douglas-fir is dead from MT down to Lander -- on the eastside. There is currently an epidemic of Douglas-fir beetle. Trees start failing; then they die. Also found on bottom fringes of Bighorns -- on western edge of map zone (MZ) 29.

During the reference period, there was a mosaic of Douglas-fir in terms of succession classes. Now insects are killing all stages. Under reference conditions, the beetle would only knock the system back to the late open stage. However, due to fire suppression, the beetle now causes the system to get thrown back to the early A stage.

For MZ29, 1166 was originally described as 1051; however, upon NatureServe recommendation, this description was imported and used for 1166 instead, as it matches it better. The Bighorn spruce, Douglas-fir, and limber pine concept of 1051 occurs in the Laramie Range and the Bighorns.

Issues or Problems

Native Uncharacteristic Conditions

Comments

Kathleen Roche reviewed this model during the 2016 BpS Review.

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.

An additional LANDFIRE National modeler for MZ29 was David Overcast.

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 7 Early Development 1 - All Structures

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| PSMEG | Pseudotsuga menziesii var. glauca | Rocky Mountain Douglas-fir | Upper |
| FEID | Festuca idahoensis | Idaho fescue | Lower |
| ARTRV | Artemisia tridentata ssp. vaseyana | Mountain big sagebrush | Lower |

Description

Dominated by bunchgrasses and seed/sapling-sized Douglas-fir. These are seedling/sapling trees, <1in DBH and 10ft tall.

*Maximum Tree Size Class*  
Seedling <4.5ft

Class B 3 Mid Development 1 - Closed

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| PSMEG | Pseudotsuga menziesii var. glauca | Rocky Mountain Douglas-fir | Upper |

Description

Relatively dense pole-sized Douglas-fir. Sagebrush has largely dropped out of the stand.

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

Class C 25 Mid Development 1 - Open

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| PSMEG | Pseudotsuga menziesii var. glauca | Rocky Mountain Douglas-fir | Upper |
| FEID | Festuca idahoensis | Idaho fescue | Lower |
| ARTRV | Artemisia tridentata ssp. vaseyana | Mountain big sagebrush | Lower |

Description

Open poles with bunchgrass and sagebrush understory.

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

Class D 55 Late Development 1 - Open

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| PSMEG | Pseudotsuga menziesii var. glauca | Rocky Mountain Douglas-fir | Upper |
| FEID | Festuca idahoensis | Idaho fescue | Lower |
| ARTRV | Artemisia tridentata ssp. vaseyana | Mountain big sagebrush | Lower |

Description

Open canopy of medium- to large-diameter trees with bunchgrass and sagebrush understory.

*Maximum Tree Size Class*  
Very Large >33" DBH

Class E 10 Late Development 1 - Closed

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| PSMEG | Pseudotsuga menziesii var. glauca | Rocky Mountain Douglas-fir | Upper |

Description

Multi-storied Douglas-fir with sparse understory.

*Maximum Tree Size Class*  
Very Large >33" DBH

Model Parameters

Deterministic Transitions

|  |  |  |  |
| --- | --- | --- | --- |
| **From Class** | **Begins at (yr)** | **Succeeds to** | **After (years)** |
| Early1:ALL | 0 | Mid1:OPN | 29 |
| Mid1:OPN | 30 | Late1:OPN | 89 |
| Mid1:CLS | 30 | Late1:CLS | 89 |
| Late1:OPN | 90 | Late1:OPN | 999 |
| Late1:CLS | 90 | 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 | 25 |
| Wind or Weather or Stress | Early1:ALL | Early1:ALL | 0.033 | 30 | Yes | 0 |
| Replacement Fire | Early1:ALL | Early1:ALL | 0.05 | 20 | Yes | 0 |
| Mixed Fire | Early1:ALL | Early1:ALL | 0.05 | 20 | No | 0 |
| Alternative Succession | Mid1:OPN | Mid1:CLS | 1 | 1 | Yes | 45 |
| Mixed Fire | Mid1:OPN | Mid1:OPN | 0.001 | 1000 | No | 0 |
| Insects or Disease | Mid1:OPN | Mid1:OPN | 0.001 | 1000 | No | 0 |
| Wind or Weather or Stress | Mid1:OPN | Mid1:OPN | 0.033 | 30 | No | 0 |
| Surface Fire | Mid1:OPN | Mid1:OPN | 0.05 | 20 | No | 0 |
| Mixed Fire | Mid1:CLS | Mid1:OPN | 0.005 | 200 | Yes | 0 |
| Insects or Disease | Mid1:CLS | Mid1:OPN | 0.005 | 200 | Yes | 0 |
| Wind or Weather or Stress | Mid1:CLS | Mid1:OPN | 0.033 | 30 | Yes | 0 |
| Surface Fire | Mid1:CLS | Mid1:OPN | 0.04 | 25 | Yes | 0 |
| Alternative Succession | Late1:OPN | Late1:CLS | 1 | 1 | Yes | 45 |
| Insects or Disease | Late1:OPN | Late1:OPN | 0.001 | 1000 | No | 0 |
| Mixed Fire | Late1:OPN | Mid1:OPN | 0.005 | 200 | Yes | 0 |
| Wind or Weather or Stress | Late1:OPN | Late1:OPN | 0.03 | 33 | No | 0 |
| Surface Fire | Late1:OPN | Late1:OPN | 0.05 | 20 | No | 0 |
| Insects or Disease | Late1:CLS | Late1:OPN | 0.01 | 100 | Yes | 0 |
| Replacement Fire | Late1:CLS | Early1:ALL | 0.01 | 100 | Yes | 0 |
| Mixed Fire | Late1:CLS | Late1:OPN | 0.023 | 43 | Yes | 0 |
| Wind or Weather or Stress | Late1:CLS | Late1:OPN | 0.033 | 30 | Yes | 0 |

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