

10510

Southern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland

BpS Model/Description Version: Aug. 2020

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Vegetation Type

Forest and Woodland

Map Zone

28

Geographic Range

This is a highly variable ecological system of the montane zone of the Rocky Mountains. Generally found in New Mexico, southwestern Colorado, and the Colorado Front Range. This is a transitional forest that occurs between the ponderosa pine zone and cool/moist mixed conifer forest types.

Biophysical Site Description

This Biophysical Setting (BpS) is found generally found between 2,100-2,880m (6,900-9,500ft). It can be found at higher elevations on south-facing slopes than north-facing slopes. Its distribution is variable on east and west aspects. Soils are usually well-drained sandstone or limestone based.

Vegetation Description

The composition and structure of overstory vary based on the temperature and moisture relationships of the site. Ponderosa pine, Douglas-fir, and aspen make up warm/dry mixed conifer forests, with white fir and white pine present as well in the southern portion of the map zone (MZ). In northern areas of the MZ, *Cercocarpus montanus* and *Ribes cereum* are common. Southwestern white pine, bristlecone pine, Rocky Mountain juniper, and limber pine (*Pinus flexilis*) can be present. Ponderosa pine regeneration typically occurs after fire. White fir regeneration happens continuously between fires. Douglas-fir regeneration can happen in between and after fires. It gains fire resistance more quickly than white fir and can be a canopy dominant with ponderosa pine.

BpS Dominant and Indicator Species

Symbol	Scientific Name	Common Name
PIPO	<i>Pinus ponderosa</i>	Ponderosa pine
ABCO	<i>Abies concolor</i>	White fir
PSME	<i>Pseudotsuga menziesii</i>	Douglas-fir
POTR5	<i>Populus tremuloides</i>	Quaking aspen

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

Disturbance Description

This BpS has a fire regime very similar to ponderosa pine. Frequent low-intensity surface fire is the dominant mode of disturbance. Fire intervals range from 2-71yrs with a mean of 15yrs. Lethal fires can occur on a limited scale, but this is not the norm unless aspen is involved. These will be characterized as mixed fires because they most likely occur as a part of a more widespread surface fire.

Insects and disease are an important non-fire disturbance in this BpS. Ponderosa pine is influenced by mountain pine beetle (*Dendroctonus ponderosae*) outbreaks in particular, while Douglas-fir is susceptible to western spruce budworm (*Choristoneura freemani*), Douglas-fir tussock moth (*Orgyia pseudotsugata*), and Douglas-fir beetle (*Dendroctonus pseudotsugae*). Lightning and windthrow are additional non-fire disturbances that are important in shaping the composition and structure of this BpS, though typically cause tree mortality at the scale of individual trees or small groups of trees.

Fire Frequency

Severity	Avg FI	Percent of All Fires	Min FI	Max FI
Replacement	322	6		
Moderate (Mixed)	53	35	80	200
Low (Surface)	31	59	2	70
All Fires	19	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

Matrix, 2,000-10,000ha.

Adjacency or Identification Concerns

This BpS is typically bounded by the Southern Rocky Mountain Ponderosa Pine Woodland BpS (10540) on the xeric end of the moisture gradient and by the Southern Rocky Mountain Mesic Montane Mixed Conifer Forest and Woodland BpS (10520) in more mesic settings. Often these systems grade into one another over relatively small spatial scales, based on variation in soil moisture availability and changes in topographic aspect.

Issues or Problems

Some uncertainty exists in the historical fire return intervals (FRIs) and the percent of fires that were replacement fires for this BpS (e.g., Williams and Baker 2012; Fule et al. 2014). Return intervals historically for insect and disease outbreaks are uncertain as well and are not incorporated in the disturbance pathways below.

Native Uncharacteristic Conditions

Comments

Rob Addington reviewed this BpS during the 2016 BpS Review and suggested several quantitative changes to the model based on the work of the Upper Monument Creek Collaborative (UMCC 2014). Kori Blankenship implemented the changes. Major changes included the addition of mixed fire transitions for early- to mid-open and for maintaining the open states. Replacement fire was added in the open states at a low probability. These changes

make the model consistent, though not identical, to the same model created by the UMCC (Low 2013 Appendix C shows quantitative state-and-transition model information).

DBH and height range estimates in the succession class descriptions below come from the Upper Monument Creek (UMC) project on the southern Front Range in Colorado near Colorado Springs and are believed to be representative for the entire zone. Monitoring data from Colorado suggest that >70% canopy cover is unlikely on these dry BpS sites (Rob Addington, personal communication).

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	C	C	B	B	B	B	B
Tree	10-25	C	C	C	C	C	B	B	B	B	B
Tree	25-50	D	D	D	D	D	E	E	E	E	E
Tree	>50	D	D	D	D	D	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 - All Structures
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Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
PIPO	<i>Pinus ponderosa</i>	Ponderosa pine	All
ABCO	<i>Abies concolor</i>	White fir	All
QUGA	<i>Quercus gambelii</i>	Gambel oak	All
POTR5	<i>Populus tremuloides</i>	Quaking aspen	All
PSME	<i>Pseudotsuga menziessi</i>	Douglas-fir	All

Description

Succession after a lethal fire will depend on what vegetation was on site before. In a general conifer-dominated scenario, some ponderosa are likely to survive. Fire will be an opportunity for new ponderosa establishment. On site, Gambel oak will resprout. White fir will also be regenerating. If aspen cover is 50-100% prior to disturbance, the stand would regenerate back to aspen.

Maximum Tree Size Class

Seedling <4.5ft

Class B 3 Mid Development 1 - Closed

Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
POTR5	Populus tremuloides	Quaking aspen	Upper
ABCO	Abies concolor	White fir	Mid-Upper
PIPO	Pinus ponderosa	Ponderosa pine	Mid-Upper
PSME	Pseudotsuga menziesii	Douglas-fir	Mid-Upper

Description

If aspen is dominant, the stand will achieve a mid-closed stage. Conifers such as white fir and Douglas-fir could be regenerating with it. Any surviving conifers such as ponderosa pine would be canopy dominants. If aspen, canopy cover is 50-100%. Trees are 5-16in DBH, 5-20m tall.

Maximum Tree Size Class

Medium 9-21" DBH

Class C 27 Mid Development 1 - Open

Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
PIPO	Pinus ponderosa	Ponderosa pine	Mid-Upper
ABCO	Abies concolor	White fir	Mid-Upper
PSME	Pseudotsuga menziesii	Douglas-fir	Mid-Upper
POTR5	Populus tremuloides	Quaking aspen	Upper

Description

Ponderosa is the canopy dominant with an understory dominated by white fir. Douglas-fir present, and some of its regeneration is entering the canopy. If aspen were present, the stand would have undergone some self-thinning that would have opened up the canopy. The conifers in the stand create a more flammable litter bed with their needles so that patchy surface fire could carry. Any fire would further open the stand by thinning aspen and fir. Eventually, the aspen stand would become very open, sharing the canopy with ponderosa pine and Douglas-fir. Trees are 5-16in DBH, 5-20m tall.

Maximum Tree Size Class

Medium 9-21" DBH

Class D	36	Late Development 1 - Open
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Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
PIPO	Pinus ponderosa	Ponderosa pine	Mid-Upper
PSME	Pseudotsuga menziesii	Douglas-fir	Mid-Upper
ABCO	Abies concolor	White fir	Mid-Upper
POTR	Populus tremuloides	Quaking aspen	Upper

Description

Ponderosa pine is the canopy dominant. Douglas-fir can also be a canopy dominant. Recurrent fire maintains white fir as an understory tree, but a rare white fir will join the other two species in the canopy. If aspen is present, its numbers are few. Low levels of suckering may keep it in the stand. Open aspen stands are not common in the warm/dry mixed conifer. Trees are 16-30in DBH, 20-30m tall.

Maximum Tree Size Class

Large 21-33" DBH

Class E	28	Late Development 1 - Closed
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Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
PIPO	Pinus ponderosa	Ponderosa pine	Upper
ABCO	Abies concolor	White fir	Upper
PSME	Pseudotsuga menziesii	Douglas-fir	Upper
POTR5	Populus tremuloides	Quaking aspen	Mid-Upper

Description

Aspen stand is mature to over-mature with a heavy understory of conifers. Mainly white fir and some Douglas-fir. Trees are 16-30in DBH, 20-30m tall.

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	34
Mid1:OPN	35	Late1:OPN	149
Mid1:CLS	35	Mid1:OPN	109
Late1:OPN	150	Late1:OPN	999

Late1:CLS	150	Late1:CLS	999
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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:OPN	0.01	100	Yes	0
Surface Fire	Early1:ALL	Early1:ALL	0.01	100	No	0
Mixed Fire	Early1:ALL	Mid1:OPN	0.022	45	Yes	0
Alternative Succession	Mid1:OPN	Late1:CLS	1	1	Yes	60
Replacement Fire	Mid1:OPN	Early1:ALL	0.0025	400	Yes	0
Mixed Fire	Mid1:OPN	Mid1:OPN	0.0166	60	No	0
Surface Fire	Mid1:OPN	Mid1:OPN	0.05	20	No	0
Replacement Fire	Mid1:CLS	Early1:ALL	0.005	200	Yes	0
Mixed Fire	Mid1:CLS	Mid1:OPN	0.022	45	Yes	0
Replacement Fire	Late1:OPN	Early1:ALL	0.0024	417	Yes	0
Mixed Fire	Late1:OPN	Late1:OPN	0.0166	60	No	0
Alternative Succession	Late1:OPN	Late1:CLS	0.02	50	Yes	0
Surface Fire	Late1:OPN	Late1:OPN	0.05	20	No	0
Replacement Fire	Late1:CLS	Early1:ALL	0.005	200	Yes	0
Mixed Fire	Late1:CLS	Late1:OPN	0.022	45	Yes	0

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