10520
Southern Rocky Mountain Mesic Montane Mixed Conifer Forest and Woodland

BpS Model/Description Version: Aug. 2020

Modelers		Reviewers	
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None	None	None	None

Vegetation Type
Forest and Woodland

Map Zone
27

Geographic Range
Rocky Mountains of the conterminous United States west into the ranges of the Great Basin. Minor occurrence in map zone (MZ)25 in New Mexico and Arizona. In MZ27 in New Mexico, this type is thought to occur on montane slopes of the Manzano, Manzanita, and Sandia ranges, in section M313 in New Mexico.

Biophysical Site Description
Elevations range from 1,200-3,300m. Occurrences of this system are found on cooler and more moist sites than Rocky Mountain Montane Dry-Mesic Mixed Conifer Forest and Woodland (1051). Such sites include lower and middle slopes of ravines, stream terraces, moist, concave topographic positions, and north- and east-facing slopes, which burn somewhat infrequently.

Mixed conifer in the southwest had highly diverse stand composition and stand structure. This diversity was largely driven by topography, with the scale of stands dependent on the scale of topographic variation. Ridgetops and low-elevation sites were (and largely still are) characterized by open stands dominated by ponderosa pine and had frequent surface fires. South- and west-facing slopes likely were similar but were less open and had less ponderosa and more Douglas-fir, aspen, and white fir. These stands likely also were characterized by frequent surface fires. Perhaps the core of 1051 resembles these stands. North- and east-facing slopes were likely more dense and had still less ponderosa and more white fir, as well as Engelmann spruce and subalpine fir, especially at higher elevations. Perhaps the core of 1052 resembles these stands. Valley bottoms, if forested and not 1146, had dense stands similar to 1055 and 1056, dominated by blue spruce, Engelmann spruce, subalpine fir, and aspen. 1054, 1055, 1056, 1051, and 1052 made up the mixed conifer landscape in which stands were connected by various ecological processes (John Vankat, personal communication). See White and Vankat (1993), Fule et al. (2003), Vankat (2005), etc.

This system typically occurs above drier ponderosa or dry-mesic mixed conifer systems and below spruce-fir on an elevational gradient. Likewise, the type may occur below or be

intermingled with aspen-mixed conifer systems. Aspen is a common constituent of this system but does not occur as a cover type but rather in mixed stands with conifers when it does occur.

Vegetation Description

Pseudotsuga menziesii and *Abies concolor* are the most common canopy dominants, but *Picea engelmannii*, *Picea pungens*, or *Pinus ponderosa* may be present. In the southern extent of this setting, *Pinus strobiformis* and *P. flexilis* also occur. This system includes stands of mixed aspen and conifer. Aspen is a common constituent of this system but does not occur as a cover type but rather in mixed stands with conifers when it does occur.

A number of cold-deciduous shrub species can occur, including *Acer glabrum*, *Acer grandidentatum*, *Alnus incana*, *Cornus sericea*, *Jamesia Americana*, and *Robinia neomexicana*. Herbaceous species include *Bromus ciliatus*, *Carex siccata*, *Muhlenbergia virescens*, *Pseudoroegneria spicata*, *Erigeron eximius*, *Packera cardamine*, and *Thalictrum fendleri*.

North- and east-facing slopes in the southwest of mixed conifers were likely more dense and had still less ponderosa and more white fir, as well as Engelmann spruce and subalpine fir, especially at higher elevations. Perhaps the core of 1052 resembles these stands.

BpS Dominant and Indicator Species

Symbol	Scientific Name	Common Name
PSME	*Pseudotsuga menziesii*	Douglas-fir
ABCO	*Abies concolor*	White fir
PIEN	*Picea engelmannii*	Engelmann spruce
PIPU	*Picea pungens*	Blue spruce
PIPO	*Pinus ponderosa*	Ponderosa pine
POTR5	*Populus tremuloides*	Quaking aspen

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

Disturbance Description

Naturally occurring fire starts are of variable return intervals and mostly light, erratic, and infrequent due to the cool, moist conditions. These ecological systems are in a moderate frequency, low- and mixed-severity fire regime group, best characterized by recurring mixed-severity fire and the occasional stand-replacement fire (see below). This vegetation is a transition between the frequent surface and mixed-severity fires and the more stand-replacement regimes common in high-elevation fir and spruce ecosystems.

Surface fire and mixed-severity fire intervals were less frequent than 1051. Stand-replacement fires occurred at intervals of 120-400yrs+ (Crane 1986; Barrett 1988; Bradley 1992a,b; Brown et al. 1994; Morgan et al. 1996). Likelihood of stand-replacement fires increased with canopy closure and fuel ladders caused by white fir growth; however, ground fires acted as replacement fires during early stand development (Class A).

Other disturbances included insect, disease, drought, and wind and ice damage. Fire was by far the dominant disturbance agent.

In the southwest, western spruce budworm outbreaks were estimated to occur on the order of every three decades and affected small portions of the mixed conifer zone (Swetnam 1987; Lynch and Swetnam 1992; Swetnam and Lynch 1993).

Moderate fire frequencies, along with occasional insect or disease outbreaks, would have favored diverse canopy conditions and late successional forest conditions.

Fire Frequency

Severity	Avg FI	Percent of All Fires	Min FI	Max FI
Replacement	251	15	120	400
Moderate (Mixed)	97	37		
Low (Surface)	76	48		
All Fires	36	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 Biophysical Setting (BpS) occurs in patches ranging from 100s-1,000s of acres.

Adjacency or Identification Concerns

This ecological system is often transitional between Fire Regime Group I and Fire Regime Groups II, IV, and V at higher elevations. Sites are dry/steep montane with a variety of aspects (often northerly) and soil conditions.

In the southwest, ridgetops and low-elevation sites were (and largely still are) characterized by open stands dominated by ponderosa pine and had frequent surface fires. This could therefore be confused with BpS 1054 or PIPO models. This type could also be confused for 1055 and 1056, the spruce-fir types as well as the aspen types. This could also easily be confused for 1051.

This system typically occurs above drier ponderosa or dry-mesic mixed conifer systems and below spruce-fir on an elevational gradient. Likewise, the type may occur below or be intermingled with aspen-mixed conifer systems.

Moderate fire frequencies, along with occasional insect or disease outbreaks, would have favored diverse canopy conditions and late successional forest conditions. Contemporary stands no doubt have a higher degree of canopy closure due mainly to fire suppression and are more vulnerable to high-severity fire.

Issues or Problems

Native Uncharacteristic Conditions

Moderate fire frequencies, along with occasional insect or disease outbreaks, would have favored diverse canopy conditions and late successional forest conditions. Contemporary stands no doubt have a higher degree of canopy closure due mainly to fire suppression and are more vulnerable to high-severity fire.

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	C	C	C	B	B	B	B	B	B	B
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 11 Early Development 1 - All Structures

Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
PSME	Pseudotsuga menziesii	Douglas-fir	Upper
ABCO	Abies concolor	White fir	Upper

Description

Tree seedling-shrub-grass-forb.

Maximum Tree Size Class

Seedling <4.5ft

Class B 25 Mid Development 1 - Closed

Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position

PSME	Pseudotsuga menziesii	Douglas-fir	Upper
ABCO	Abies concolor	White fir	Upper

Description
Closed trees, sapling, large poles, grass, and scattered shrub, 75-100% Douglas-fir/white fir and spruces at higher elevations. Insects/disease can cause minor mortality to this state.

Note that it is thought that there might have been a greater proportion of middle and late stages on the landscape historically than that modeled.

Maximum Tree Size Class
Medium 9-21" DBH

Class C 29 Mid Development 1 - Open

Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
PSME	Pseudotsuga menziesii	Douglas-fir	Upper
ABCO	Abies concolor	White fir	Upper

Description
Open pole-sapling/grass and scattered shrubs, maybe 90% Douglas-fir.
Maximum Tree Size Class
Medium 9-21" DBH

Class D 24 Late Development 1 - Open

Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
PSME	Pseudotsuga menziesii	Douglas-fir	Upper
ABCO	Abies concolor	White fir	Upper
ABLA	Abies lasiocarpa	Subalpine fir	Mid-Upper

Description
Open large tree/grass and scattered shrubs; potentially 90% Douglas-fir.

Note that it is thought that there might have been a greater proportion of mid and late stages on the landscape historically than that modeled.

Maximum Tree Size Class
Large 21-33" DBH

Class E 11 Late Development 1 - Closed

Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
PSME	Pseudotsuga menziesii	Douglas-fir	Upper
ABCO	Abies concolor	White fir	Upper
ABLA	Abies lasiocarpa	Subalpine fir	Upper

Description
Closed medium to large trees, scattered shrubs, 60-100% Douglas-fir.

Note that it is thought that there might have been a greater proportion of mid and late stages on the landscape historically than that modeled.

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	29
Mid1:OPN	30	Late1:OPN	99
Mid1:CLS	30	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
Wind or Weather or Stress	Early1:ALL	Early1:ALL	0.007	143	No	0
Replacement Fire	Early1:ALL	Early1:ALL	0.008	125	Yes	0
Mixed Fire	Early1:ALL	Early1:ALL	0.01	100	No	0
Alternative Succession	Mid1:OPN	Mid1:CLS	1	1	Yes	35
Wind or Weather or Stress	Mid1:OPN	Mid1:OPN	0.001	1000	No	0
Replacement Fire	Mid1:OPN	Early1:ALL	0.0025	400	Yes	0
Insects or Disease	Mid1:OPN	Mid1:OPN	0.01	100	No	0
Surface Fire	Mid1:OPN	Mid1:OPN	0.025	40	No	0
Wind or Weather or Stress	Mid1:CLS	Mid1:OPN	0.005	200	Yes	0
Replacement Fire	Mid1:CLS	Early1:ALL	0.005	200	Yes	0
Insects or Disease	Mid1:CLS	Mid1:CLS	0.02	50	No	0
Mixed Fire	Mid1:CLS	Mid1:OPN	0.025	40	Yes	0
Alternative Succession	Late1:OPN	Late1:CLS	1	1	Yes	40
Wind or Weather or Stress	Late1:OPN	Late1:OPN	0.001	1000	No	0
Replacement Fire	Late1:OPN	Early1:ALL	0.0025	400	Yes	0
Insects or Disease	Late1:OPN	Late1:OPN	0.01	100	No	0
Surface Fire	Late1:OPN	Late1:OPN	0.025	40	No	0
Wind or Weather or Stress	Late1:CLS	Late1:OPN	0.005	200	Yes	0
Replacement Fire	Late1:CLS	Early1:ALL	0.005	200	Yes	0
Insects or Disease	Late1:CLS	Mid1:OPN	0.008	125	Yes	0

Insects or Disease	Late1:CLS	Late1:OPN	0.012	83	Yes	0
Mixed Fire	Late1:CLS	Late1:OPN	0.025	40	Yes	0

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