

10510

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

BpS Model/Description Version: Aug. 2020

Modelers		Reviewers	
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None	None	None	None
None	None	None	None

Vegetation Type

Forest and Woodland

Map Zone

6

Geographic Range

Occurs throughout the southern Rocky Mountains, north and west into Utah, western Wyoming, and Idaho. This type is rare to nonexistent in Nevada and may not be mappable in map zone (MZ) 12. It is restricted to northern locations in MZ17.

Biophysical Site Description

This type is generally located just above sagebrush ecosystems. These are mixed-conifer forests occurring on all aspects, at elevations ranging from 1,200-3,300m (4,000-11,000ft). Rainfall averages <75cm/yr (29in/yr), with summer “monsoons” during the growing season contributing substantial moisture in the eastern Great Basin. The composition and structure of the overstory is dependent upon the temperature and moisture relationships of the site and the successional status of the occurrence.

Vegetation Description

Abies concolor with *Pseudotsuga menziesii* are most frequent. *Pinus ponderosa* is incidental. *Pinus flexilis* is common in Nevada. *Pseudotsuga menziesii* forests occupy drier sites, mostly in the northeast corner of MZ17. *Abies concolor*-dominated forests occupy cooler sites, such as upper slopes at higher elevations, canyon side slopes, ridgetops, and north- and east-facing slopes, which burn somewhat infrequently. A number of cold-tolerant deciduous shrub and graminoid species are common, including *Arctostaphylos uva-ursi*, *Mahonia repens*, *Paxistima myrsinites*, *Symphoricarpos oreophilus*, *Jamesia americana*, *Quercus gambelii* (MZ17 only), and *Festuca arizonica*.

BpS Dominant and Indicator Species

Symbol	Scientific Name	Common Name
ABCO	<i>Abies concolor</i>	White fir
PIFL2	<i>Pinus flexilis</i>	Limber pine
CAGA3	<i>Carex garberi</i>	Elk sedge
CARU	<i>Calamagrostis rubescens</i>	Pinegrass
PSEUD7	<i>Pseudotsuga</i>	Douglas-fir
PICO	<i>Pinus contorta</i>	Lodgepole pine

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

Disturbance Description

The disturbance regime described here is for Douglas-fir in fire regime group (FRG) I. Some portions of these sites are transition zones to FRGs II and III. Frequent surface and mixed-severity fires were the common fire regime characteristics. Surface fire intervals ranged from 10-50yrs, and replacement severity fires occurred at intervals of 150-400+yrs (Crane 1986; Barrett 1988; Bradley 1992a, b; Brown 1994; Morgan et al. 1996). Mixed-severity fires were assumed to have an intermediate fire return interval (FRI) of 45-75yrs on average. Stand-replacement fires were generally restricted to the closed canopy forest and stand initiation conditions.

FRG I characteristics were facilitated by understory vegetation dominated by fine fuels (grasses, sedges, forbs), landscape position, and adjacency to other frequent fire Biophysical Settings (BpSs). Much of the forest structure was open-canopy overstory, which resulted in an understory dominated by healthy and vigorous plants (grasses, sedges, and forbs) and a generally continuous fine-fuels layer. These fine fuels facilitated fire spread and thinning of the conifer or aspen seedlings (thus promoting aspen suckering).

Other disturbances included insect outbreaks (return interval, 100yrs), disease, drought, and wind and ice damage (every 1,000yrs in closed stands, every 250yrs in open stands). Competition among trees was also a factor that increasingly slowed successional dynamics in more closed stands. Fire was, by far, the dominant disturbance agent.

Fire Frequency

Severity	Avg FI	Percent of All Fires	Min FI	Max FI
Replacement	91	12		
Moderate (Mixed)	76	14		
Low (Surface)	14	74	10	50
All Fires	11	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 BpS occurs in patches ranging from 1000s to 10'000s of acres in many western locations. However in MZ12 and MZ17, patch size may be much smaller (<100ac).

Adjacency or Identification Concerns

This BpS is very similar to BpS 1052 (Rocky Mountain Mesic Montane Mixed-Conifer Forest and Woodland) due to the dominance of white fir and limber pine in the Great Basin.

If aspen is present in large patches or if conifer does not establish after ~30yrs, the BpS is probably misclassified and one of the pure aspen types should be examined (BpS 1011 Rocky Mountain Aspen Forest and Woodland or BpS 1061 Inter-mountain Basins Aspen-Mixed-Conifer Forest and Woodland).

This BpS is often transitional between non-forested areas or between *Pinus ponderosa* woodlands (at lower elevations), which are uncommon in MZ12 and MZ17, and spruce-fir at higher elevations.

Issues or Problems

Douglas-fir is rare to absent in Nevada and the west desert of Utah. The current model was clearly developed for dry Douglas-fir forests. It needs to be determined whether forests dominated by limber pine and white fir exhibit the same fire regimes.

Native Uncharacteristic Conditions

Comments

This model was adopted with minor edits on species composition from the MZ16 version created by Loewen (mloewen@fs.fed.us), Page (doug_page@blm.gov), and Chappell (lchappell@fs.fed.us). Further review is needed to make sure this type is appropriately described for MZ12 and MZ17, especially species occurrence.

BpS 1051 for MZ16 was based on modifications to R2PSMEdy (original modeler, Lynn Bennett, lmbennett@fs.fed.us; modified by Louis Provencher) on 24 February 2005 by Pohl for LANDFIRE BpS modeling. ABCO and PIPO were added as dominant species. Hugh Safford (hughsafford@fs.fed.us) and Steve Barrett (sbarrett@mtdig.net) were reviewers of R2PSMEdy.

As a result of final quality control for LANDFIRE National by Kori Blankenship, the user-defined min and max FRIs for replacement and mixed-severity fires were deleted because they were not consistent with the modeled FRIs for these fire severity types.

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	22	Early Development 1 - All Structures
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Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
CARU	Calamagrostis rubescens	Pinegrass	Low-Mid
CAGA3	Carex garberi	Elk sedge	Low-Mid
PICO	Pinus contorta	Lodgepole pine	Upper
PIPO	Pinus ponderosa	Ponderosa pine	Upper

Description

Grass/forb/shrub/tree seedlings. Replacement fire is frequent (mean fire return interval [MFRI] , 25yrs). Mixed-severity fire (MFRI, 100yrs) does not cause an ecological setback. Vegetation succeeds to the mid-development closed condition in 35yrs.

Canopy cover was originally input as 0-15%; however, due to new mapping rules/breakpoints, it was changed to 0-20%.

Maximum Tree Size Class

Sapling >4.5ft; <5" DBH

Class B	7	Mid Development 1 - Closed
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Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
PSEUD7	Pseudotsuga	Douglas-fir	Upper
ABCO	Abies concolor	White fir	Upper
PIFL2	Pinus flexilis	Limber pine	Upper
PICO	Pinus contorta	Lodgepole pine	Upper

Description

Forest canopy closure is >35%. Closed stand with trees, poles, saplings, grass, and scattered shrubs. White fir and limber pine make up 75-100%. If fire is absent for 70yrs, vegetation succeeds to closed late development. Replacement fire (average MFRI, 150yrs) and infrequent weather-related stress (return interval, 50yrs) returns vegetation to more open canopy. Mixed-severity fire (MFRI, 45yrs) and insect/diseases cause a transition to an open mid-development forest every 100yrs on average. Competition (probability/yr = 0.01) maintains the stand in its closed condition.

Canopy cover was originally input as 35-99%; however, due to new mapping breakpoints, it was changed to 31-100%.

Maximum Tree Size Class

Pole 5-9" DBH

Class C	12	Mid Development 1 - Open
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Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
PIPO	Pinus ponderosa	Ponderosa pine	Upper
PSEUD7	Pseudotsuga	Douglas-fir	Upper
PIFL2	Pinus flexilis	Limber pine	Upper
ABCO	Abies concolor	White fir	Upper

Description

Forest canopy closure is <35%. Open trees (poles, saplings) of Douglas-fir (if present in the area) and occasional ponderosa pine with grass and scattered shrubs. With surface fire (MFRI, 10yrs), mixed-severity fire (MFRI, 75yrs), weak adult tree competition, and insect/diseases (every 100yrs), primary succession is to the open late-development condition. Infrequent stand-replacing fire (MFRI, 400yrs) and infrequent weather-related stress (return interval, 1,000yrs) cause transitions. The stand succeeds on an alternative path to a closed late-development condition after 68yrs without fire.

Canopy cover was originally input as 0-35%; however, due to new mapping breakpoints, it was changed to 0-30%.

Maximum Tree Size Class

Pole 5-9" DBH

Class D	58	Late Development 1 - Open
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Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
PIPO	Pinus ponderosa	Ponderosa pine	Upper
PSEUD7	Pseudotsuga	Douglas-fir	Upper
PIFL2	Pinus flexilis	Limber pine	Upper
ABCO	Abies concolor	White fir	Upper

Description

Forest canopy closure is <35%. Open, large trees/grass and scattered shrubs. Douglas-fir with occasional ponderosa pine. Surface fire (MFRI, 10yrs) and mixed-severity fire (MFRI, 75yrs) maintain the stand in the open condition. This open condition, however, closes after 70yrs without fire. Adult tree competition (probability/yr = 0.001) and insect/diseases (mean return interval [MRI], 100yrs) also disturb this class, but do not affect the successional age. Replacement fire (every 500yrs) on average and weather-related stress (return interval, 1,000yrs) cause a transition.

Canopy cover was originally input as 0-35%; however, due to new mapping breakpoints, it was changed to 0-30%.

Maximum Tree Size Class

Large 21-33" DBH

Class E**1****Late Development 1 - Closed**Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
ABCO	Abies concolor	White fir	Upper
PIFL2	Pinus flexilis	Limber pine	Upper
PIPO	Pinus ponderosa	Ponderosa pine	Upper
PSEUD7	Pseudotsuga	Douglas-fir	Upper

Description

Forest canopy closure is >35%. Closed, large trees of Douglas-fir, white fir, limber pine, and occasional lodgepole pine, and scattered shrubs. Replacement fire (MFRI, 150yrs) and infrequent weather/wind-related stress (MRI, 250yrs) cause a transition. Mixed-severity fire (MFRI, 45yrs) opens the structure of the stand whereas surface fire (MFRI, 50yrs) and competition, although present, do not cause transitions to other classes. Insect and/or diseases occur every 40yrs on average.

Canopy cover was originally input as 35-99%; however, due to new mapping breakpoints, it was changed to 31-100%.

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	104
Mid1:CLS	35	Late1:CLS	104
Late1:OPN	105	Late1:OPN	999
Late1:CLS	105	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
Mixed Fire	Early1:ALL	Early1:ALL	0.01	100	No	0
Replacement Fire	Early1:ALL	Early1:ALL	0.04	25	Yes	0
Alternative Succession	Mid1:OPN	Late1:CLS	1	1	Yes	68

Wind or Weather or Stress	Mid1:OPN	Early1:ALL	0.001	1000	Yes	0
Replacement Fire	Mid1:OPN	Early1:ALL	0.0025	400	Yes	0
Competition or Maintenance	Mid1:OPN	Mid1:OPN	0.005	200	No	0
Insects or Disease	Mid1:OPN	Mid1:OPN	0.01	100	No	0
Mixed Fire	Mid1:OPN	Mid1:OPN	0.013	77	No	0
Surface Fire	Mid1:OPN	Mid1:OPN	0.1	10	No	0
Wind or Weather or Stress	Mid1:CLS	Early1:ALL	0.004	250	Yes	0
Replacement Fire	Mid1:CLS	Early1:ALL	0.007	143	Yes	0
Insects or Disease	Mid1:CLS	Mid1:OPN	0.01	100	Yes	0
Competition or Maintenance	Mid1:CLS	Mid1:CLS	0.01	100	No	0
Mixed Fire	Mid1:CLS	Mid1:OPN	0.0222	45	Yes	0
Alternative Succession	Late1:OPN	Late1:CLS	1	1	Yes	70
Competition or Maintenance	Late1:OPN	Late1:OPN	0.001	1000	No	0
Wind or Weather or Stress	Late1:OPN	Early1:ALL	0.001	1000	Yes	0
Replacement Fire	Late1:OPN	Early1:ALL	0.002	500	Yes	0
Insects or Disease	Late1:OPN	Late1:OPN	0.01	100	No	0
Mixed Fire	Late1:OPN	Late1:OPN	0.013	77	No	0
Surface Fire	Late1:OPN	Late1:OPN	0.1	10	No	0
Wind or Weather or Stress	Late1:CLS	Early1:ALL	0.004	250	Yes	0
Replacement Fire	Late1:CLS	Early1:ALL	0.007	143	Yes	0
Competition or Maintenance	Late1:CLS	Late1:CLS	0.01	100	No	0
Insects or Disease	Late1:CLS	Mid1:OPN	0.0125	80	Yes	0
Insects or Disease	Late1:CLS	Late1:OPN	0.0125	80	Yes	0
Surface Fire	Late1:CLS	Late1:CLS	0.02	50	No	0
Mixed Fire	Late1:CLS	Late1:OPN	0.0222	45	Yes	0

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