

10560

Rocky Mountain Subalpine Mesic-Wet Spruce-Fir Forest and Woodland

BpS Model/Description Version: Aug. 2020

Modelers		Reviewers	
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Reviewer: Cathy Stewart

Vegetation Type

Forest and Woodland

Map Zones

10, 19

Geographic Range

This type occurs in the Northern Rockies, including western Montana, Idaho north of the Salmon River, and Wyoming.

This specific model was refined to fit the mapped distribution of 10560 in the LANDFIRE Biophysical Setting (BpS) layer. See the Comments section for more information on how this type was mapped and modeled.

Biophysical Site Description

Upper subalpine zone and mesic sites. Occurrences are typically found in locations with cold-air drainage or ponding, or where snowpacks linger late into the summer, such as north-facing slopes and high-elevation ravines. They can extend downward in elevation below the subalpine zone in places where cold-air ponding occurs; northerly and easterly aspects predominate. These forests are found on gentle to very steep mountain slopes, high-elevation ridgetops and upper slopes, plateau-like surfaces, basins, alluvial terraces, well-drained benches, and inactive stream terraces.

Vegetation Description

Engelmann spruce and subalpine fir dominate on most aspects, with lodgepole pine comprising a greater component on dryer sites or during earlier successional stages. *Vaccinium scoparium* is a common understory associate.

In the northern Rocky Mountains of northern Idaho and Montana, *Picea galuca* may be present, and *Tsuga mertensiana* occurs as small to large patches within the matrix of this mesic spruce-fir system in the most maritime of environments (the coldest and wettest of the more continental subalpine fir forests).

Mesic understory shrubs include *Menziesia ferruginea*, *Vaccinium membranaceum*, *Rhododendron albiflorum*, *Amelanchier alnifolia*, *Rubus parviflorus*, *Ledum glandulosum*,

Phyllodoce empetrifomis, and *Salix* spp. Herbaceous species include *Actaea rubra*, *Maianthemum stellatum*, *Cornus canadensis*, *Erigeron eximius*, *Gymnocarpium dryopteris*, *Rubus pedatus*, *Saxifraga bronchialis*, *Tiarella* spp., *Lupinus arcticus* ssp. *subalpinus*, and *Valeriana sitchensis*. Specific graminoids include *Luzula glabrata* var. *hitchcockii* or *Calamagrostis canadensis*.

BpS Dominant and Indicator Species

Symbol	Scientific Name	Common Name
PIEN	<i>Picea engelmannii</i>	Engelmann spruce
ABLA	<i>Abies lasiocarpa</i>	Subalpine 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

Primarily long-interval stand-replacement fires. In some areas, spruce beetle can influence successional stage, species composition, and stand density. Spruce beetle may act to accelerate succession.

Fire Frequency

Severity	Avg FI	Percent of All Fires	Min FI	Max FI
Replacement	180	100	100	600
Moderate (Mixed)				
Low (Surface)				
All Fires	180	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

Fires could range from thousands to ten-thousands of acres. Variability of climate, topography, and other site factors can result in a wide range of representation of successional stages on the landscape. Equilibrium landscapes are not likely to develop in areas <500,000ac.

Adjacency or Identification Concerns

Adjacent to drier, lower subalpine forests (lodgepole-spruce-fir) and to krummholz and alpine vegetation. This system typically has more precipitation and longer winters than lower subalpine types.

Climate (severely dry conditions) is the primary driver of fire regimes in this system. Long-term changes in climate as well as interannual climate variability affect the frequency of fire in this system.

This BpS corresponds to the following habitat types (Pfister et al. 1977): ABLA/ALSI, ABLA/CAGE, ABLA/VASC, TSME/XETE, TSME/MEFE, TSME/CLUN, PICEA/GART, PICEA/LIBO, and PICEA/PHMA.

Issues or Problems

Native Uncharacteristic Conditions

Comments

Cathy Stewart reviewed this BpS during the 2015 BpS review. Stewart stated that windthrow is very prevalent in the Late Closed Class. The wind/weather/stress transition in that class originally had a probability of .0005, or a 2,000-yr return interval. Kori Blankenship reviewed the model for the same BpS in the PNW (map zone [MZ] 1, MZ07, MZ08, and MZ09) and found that it noted the susceptibility of Late Closed spruce-fir stands to windthrow and used a much higher probability for the late to mid wind/weather/stress transition. Blankenship used the PNW probability in this model for the Late Closed to Mid Open wind weather stress transition, which resulted in a small change in s-class percentages.

During LANDFIRE National, this model was corrupted and had to be recreated months after it was delivered for MZ10 and MZ19. Kathy Roche authored the model, but we were unable to get the model reviewed again prior to mapping. The comments from an earlier review that indicated the fire return interval (FRI) should be around 175yrs were incorporated into this version of the model.

This model produced anomalous results in LANDSUM, and was revised on 7/28/06 by Brendan Ward, LANDFIRE, Missoula Fire Sciences Lab. During revisions, it was discovered this model was intended for extremely cold, long-return interval systems representing a more rare type of site within the distribution of spruce-fir and was not representative of this system in the areas mapped to it in the LANDFIRE BpS layer. This current model was built from the previous version of the model delivered in January 2005 and was updated to reflect some of the characteristics of the revised model from April 2006. The disturbance and succession rates were further refined through dialogue with the modeler and the reviewer of a previous version. Notable changes include a fire frequency of around 175yrs; increased rates of insect disturbance; decreased durations in Class A, Class B, and Class C; and a slight probability that some wind/weather/stress events may transition to Class B. This model was reviewed by the modeler (Kathy Roche), Steve Barrett, and Jeff Jones on 7/28/06.

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	B	B	B	B	B	B
Tree	10-25	C	C	C	C	D	D	D	D	D	D
Tree	25-50	C	C	C	C	D	D	D	D	D	D
Tree	>50	C	C	C	C	D	D	D	D	D	D

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 16 Early Development 1 - All Structures

Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
PIEN	<i>Picea engelmannii</i>	Engelmann spruce	Upper
ABLA	<i>Abies lasiocarpa</i>	Subalpine fir	Mid-Upper
PICO	<i>Pinus contorta</i>	Lodgepole pine	Upper

Description

Early succession stage. There can be extended periods (as long as 300yrs) of grass/seedling stage after fire-replacing events. This stage may occupy 3-50% or more of the landscape, depending upon climatic conditions and variability of FRIs.

Maximum Tree Size Class

Sapling >4.5ft; <5" DBH

Class B 26 Mid Development 1 - Closed

Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
PIEN	<i>Picea engelmannii</i>	Engelmann spruce	Upper
ABLA	<i>Abies lasiocarpa</i>	Subalpine fir	Mid-Upper
PICO	<i>Pinus contorta</i>	Lodgepole pine	Upper

Description

High-density saplings to poles. May occupy 5-50% of the landscape. Competition/maintenance was modeled to represent the stem-excluding phase of more pure lodgepole pine stands.

Maximum Tree Size Class

Pole 5-9" DBH

Class C 20 Mid Development 1 - Open

Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
PIEN	<i>Picea engelmannii</i>	Engelmann spruce	Upper
ABLA	<i>Abies lasiocarpa</i>	Subalpine fir	Mid-Upper

PICO	Pinus contorta	Lodgepole pine	Upper
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Description

Low-density saplings to poles. Primarily occurs after insects, disease, or weather stress thins denser stands. Occupies 3-50% of landscape.

Maximum Tree Size Class

Pole 5-9" DBH

Class D 38 Late Development 1 - Closed

Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
PIEN	Picea engelmannii	Engelmann spruce	Upper
ABLA	Abies lasiocarpa	Subalpine fir	Upper

Description

Pole-size to larger diameter trees. This stage occupies 15-50% of the landscape. These stands are susceptible to windthrow.

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:CLS	30	Late1:CLS	100
Mid1:OPN	50	Late1:CLS	100
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
Replacement Fire	Early1:ALL	Early1:ALL	0.005	200	Yes	0
Wind or Weather or Stress	Mid1:OPN	Mid1:OPN	0.0005	2000	No	0
Wind or Weather or Stress	Mid1:OPN	Early1:ALL	0.0005	2000	Yes	0
Insects or Disease	Mid1:OPN	Mid1:OPN	0.001	1000	No	0

Replacement Fire	Mid1:OPN	Early1:ALL	0.005	200	Yes	0
Wind or Weather or Stress	Mid1:CLS	Mid1:OPN	0.0005	2000	Yes	0
Wind or Weather or Stress	Mid1:CLS	Early1:ALL	0.0005	2000	Yes	0
Insects or Disease	Mid1:CLS	Mid1:OPN	0.002	500	Yes	0
Competition or Maintenance	Mid1:CLS	Mid1:OPN	0.002	500	Yes	0
Replacement Fire	Mid1:CLS	Early1:ALL	0.005	200	Yes	0
Wind or Weather or Stress	Late1:CLS	Early1:ALL	0.0005	2000	Yes	0
Insects or Disease	Late1:CLS	Mid1:OPN	0.002	500	Yes	0
Replacement Fire	Late1:CLS	Early1:ALL	0.0066	152	Yes	0
Wind or Weather or Stress	Late1:CLS	Mid1:OPN	0.007	143	Yes	0

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