

10560

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

BpS Model/Description Version: Aug. 2020

Modelers		Reviewers	
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Vegetation Type

Forest and Woodland

Map Zones

21, 22

Geographic Range

Northern Rockies, including Montana, Idaho, and Wyoming

Biophysical Site Description

Upper subalpine zone and mesic sites. Occurrences are typically found in locations with cold-air drainage or “ponding,” or where snow packs linger late into the summer, such as north-facing slopes and high-elevation ravines. They can extend down 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 in earlier successional stages. Early successional vegetation includes *Eurybia conspicua* and *Carex geyeri*. *Vaccinium scoparium* is a common understory associate in later successional stages.

Mesic understory shrubs include *Menziesia ferruginea*, *Vaccinium membranaceum*, *Rubus parviflorus*, and *Ledum glandulosum*. Herbaceous species include *Actaea rubra*, *Maianthemum stellatum*, *Cornus canadensis*, *Erigeron engelmannii*, *Saxifraga bronchialis*, *Lupinus argenteus* ssp. *subalpinus*, and *Valeriana sitchensis*, and graminoids such as *Carex generii* and *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

In some areas, spruce beetle can influence successional stage, species composition, and stand density. Spruce beetle may act to accelerate succession.

It has been suggested that this system is not outside of its historical range of variability (HRV) for fire frequency and severity. Fire interval could be >400yrs at times (Romme, pers. comm.; Veblen et al. 1991, 1994), or between 335yrs and 400yrs (Bradley et al. 1992), and there is no equilibrium achieved in this system; it fluctuates widely normally in each class.

Based on input for map zones (MZs) 10 and 19, a reduction in the overall mean fire return interval (FRI; from 300yrs to 175yrs) was made. For MZ21, however, all modelers and reviewers agreed this FRI should be >300yrs. Most of the fire is modeled as replacement fire. There might be some mixed-severity fire in this system, and it is modeled in the Late Closed state, as per modelers and reviewers.

Fire Frequency

Severity	Avg FI	Percent of All Fires	Min FI	Max FI
Replacement	428	67		
Moderate (Mixed)	886	33		
Low (Surface)				
All Fires	288	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 tens of 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, or perhaps not in areas greater than that either (Romme, pers. comm.). Reviewers state that typical fires in this system are small clumps of stand-replacing fires with spots to adjacent clumps.

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 inter-annual climate variability affect the frequency of fire in this system.

This biophysical setting (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.

It has been suggested that this system is not outside of its HRV for proportions of seral stages (Romme, pers. comm.; Veblen et al. 1991, 1994), and there is no equilibrium achieved in this system; it fluctuates widely normally in each class.

Currently, there is probably not much Class A on the landscape. Overall, this system probably isn't departed. It might lack some open stands, but overall, it's probably in good shape.

Issues or Problems

Currently, balsam bark beetle is killing subalpine fir trees throughout the Rocky Mountain subalpine mesic spruce fir region.

Reviewers state that, since 1990, subalpine fir mortality complex has increased.

Native Uncharacteristic Conditions

Comments

MZs 21 and 22 were combined during 2015 BpS Review.

Model was also reviewed by an anonymous reviewer. Quantitative changes were implemented during the review process in 6 March 2015 by Liz Davy, Tim Belton, Heidi Whitlatch, David Barron, Spencer Johnston, Candi Eighme, and Lisa Heiser.

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	D	D	D	D	D	E	E	E	E	E
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	8	Early Development 1 - All Structures
Upper Layer Lifeform: Tree		

Indicator Species

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

Description

This is an early succession stage after long-interval replacement fire. There can be extended periods of grass/seedling stage after fire-replacement events. This stage may occupy 3-50% of the landscape, depending upon climatic conditions and variability of FRIs.

Class B 19

Mid Development 1 - Closed

Upper Layer Lifeform: Tree

Indicator Species

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

Description

Shade-tolerant and mixed conifer saplings to poles. High-density saplings to poles. May occupy 5-50% of the landscape.

Class C 7

Mid Development 1 - Open

Upper Layer Lifeform: Tree

Indicator Species

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

Description

Low-density saplings to poles. Primarily occurs after weather stress thins denser stands. It might be possible that this could occur from insects and disease.

Class D	43
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Late Development 1 - Open

Upper Layer Lifeform: Tree

Indicator Species

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

Description

Poles and larger diameter, moderately shade-tolerant conifer species in small to moderate patches. Patches would include subalpine fir seedlings. This stage occupies 15-50% of the landscape.

Class E 23 Late Development 1 - Closed

Upper Layer Lifeform: Tree

Indicator Species

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

Description

Pole and larger diameter moderately to shade-tolerant conifer species, in moderate to large patches, all aspects.

Model Parameters

Deterministic Transitions

From Class	Begins at (yr)	Succeeds to	After (years)
Early1:ALL	0	Mid1:CLS	39
Mid1:OPN	40	Late1:OPN	149
Mid1:CLS	40	Late1:CLS	149
Late1:OPN	150	Late1:OPN	999
Late1:CLS	150	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:OPN	0.001	1000	Yes	0
Replacement Fire	Early1:ALL	Early1:ALL	0.002	500	Yes	0
Replacement Fire	Mid1:OPN	Early1:ALL	0.002	500	Yes	0

Wind or Weather or Stress	Mid1:CLS	Mid1:OPN	0.001	1000	Yes	0
Replacement Fire	Mid1:CLS	Early1:ALL	0.002	500	Yes	0
Insects or Disease	Late1:OPN	Mid1:OPN	0.001	1000	Yes	0
Alternative Succession	Late1:OPN	Late1:CLS	0.001	1000	Yes	0
Replacement Fire	Late1:OPN	Early1:ALL	0.0025	400	Yes	0
Insects or Disease	Late1:CLS	Late1:OPN	0.001	1000	Yes	0
Replacement Fire	Late1:CLS	Early1:ALL	0.0025	400	Yes	0
Mixed Fire	Late1:CLS	Late1:OPN	0.005	200	Yes	0

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