10420
North Pacific Mesic Western Hemlock-Silver Fir Forest

BpS Model/Description Version: Aug. 2020

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Vegetation Type
Forest and Woodland

Map Zones
1, 7

Geographic Range
The Pacific silver fir type occurs on the western slopes of the Cascades and the Olympic mountains.

Biophysical Site Description
The Pacific silver fir forests described in this model occur at lower to mid slopes within the Pacific silver fir zone (200-1,000m in the Olympics, 600-1,000m in the northern Cascades and 1,000-1,500m in the south). These forests are cool and moist, and typically have high precipitation and moist topographic positions. This area has a moderate snowpack and usually a deep organic layer.

Vegetation Description
Pacific silver fir and western hemlock are co-dominant and climax tree species in the mature canopy, which it shares with western red-cedar or Alaska yellow cedar. The understory is predominantly composed of a well-developed layer of heath shrubs (*Vaccinium alaskaense* [aka *V. ovalifolium*] and other *Vaccinium*, *Menziesia ferruginea*, *Rubus spectabilis*, *Oplopanax horridum*) and lush herbs (*Clintonia uniflora*, *Rubus pedatus*, *Blechnum spicant*, *Maianthemum dilatatum*, *Cornus canadensis*, *Tiarella unifoliata*, *Streptopus roseus*, *Oxalis oregana*).

BpS Dominant and Indicator Species

Symbol	Scientific Name	Common Name
ABAM	*Abies amabilis*	Pacific silver fir
TSHE	*Tsuga heterophylla*	Western hemlock
THPL	*Thuja plicata*	Western red-cedar
CHNO	*Chamaecyparis nootkatensis*	Alaska yellow cedar

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

Disturbance Description
The fire regime for this biophysical setting (BpS) is characterized by infrequent fires occurring at approximately 800- to 1,000-yr intervals. These events were of high severity and large extent, resetting thousands of acres through stand-replacement fire. Avalanches and blowdown may occur. There is sizeable evidence of a fire 1,300yrs ago, when the climate was likely drier and possibly warmer too.

Fire Frequency

Severity	Avg FI	Percent of All Fires	Min FI	Max FI
Replacement	3639	33		
Moderate (Mixed)	1771	67		
Low (Surface)				
All Fires	1191	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 type is difficult to burn, so fires are wind driven when they are present, and even then historical fires have gone out at the edge of this type. Although infrequent avalanches and wind disturbances occur, these disturbances are more frequent at scales of tens and hundreds of acres.

Adjacency or Identification Concerns

This Pacific silver fir BpS occurs below the mountain hemlock forest type and above the hyper-maritime Tsuga heterophylla - Thuja plicata forest type. Dry-mesic silver fir type could be adjacent in drier topographic positions. This BpS is distinguished from the Pacific silver fir type (BpS 1174) by moisture regime.

Starting in the 1960s, harvesting occurred in this type and Douglas-fir plantations failed. Following disturbance, advanced and natural regeneration has been silver fir and western hemlock.

Issues or Problems

This type was hard to model because fires are known to be rare.

Native Uncharacteristic Conditions

Comments

Map zones 1 and 7 were combined during 2015 BpS Review. During the review it was found that the state-and-transition model did not match the original model description and that the Early1 All and Mid1 Open classes comprised less than 1% of the BpS. Kori Blankenship rebuilt the model based on the original description. Blankenship also changed the time-since-disturbance setting on the two alternative succession pathways from 35 to 150 to allow for at least 1% in each succession class overtime.

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	A	A	A	A	A	A	A	B	B	B
Tree	10-25	C	C	C	C	C	C	C	B	B	B
Tree	25-50	C	C	C	C	C	C	C	B	B	B
Tree	>50	D	D	D	D	D	D	D	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 2 Early Development 1 - All Structures

Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
ABAM	Abies amabilis	Pacific silver fir	Upper
TSHE	Tsuga heterophylla	Western hemlock	Upper

Description

The early-seral stand consists of shrubs, herbs, seedlings, and saplings. Shrubs can be the dominant lifeform for quite a few years, depending on stocking. Shrub canopy cover ranges from 0-80% and height is 1-2m. Silver fir and western hemlock are seral and climax. Canopy closure after 35yrs could be as high as 100%.

Maximum Tree Size Class

Pole 5-9" DBH

Class B 11 Mid Development 1 - Closed

Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
ABAM	Abies amabilis	Pacific silver fir	Upper
TSME	Tsuga mertensiana	Mountain hemlock	Upper
THPL	Thuja plicata	Western red-cedar	Mid-Upper
CHNO	Chamaecyparis nootkatensis	Alaska cedar	Mid-Upper

Description

Canopy closure occurs in the middle-age stand. Silver fir and western hemlock continue to co-dominate the stand, and continue to fill the mid story, along with other shade-tolerant conifers (western red-cedar or Alaskan yellow cedar). Trees in this class may average 15-30in in DBH.

Maximum Tree Size Class
Large 21-33" DBH

Class C 1 Mid Development 1 - Open

Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
ABAM	Abies amabilis	Pacific silver fir	Upper
TSHE	Tsuga heterophylla	Western hemlock	Upper
THPL	Thuja plicata	Western red-cedar	Mid-Upper
CHNO	Chamaecyparis nootkatensis	Alaska cedar	Mid-Upper

Description
The canopy is opened up through mixed-severity fire. Trees in this middle stage may average 15-30in in DBH.

Maximum Tree Size Class
Large 21-33" DBH

Class D 4 Late Development 1 - Open

Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
ABAM	Abies amabilis	Pacific silver fir	Upper
TSHE	Tsuga heterophylla	Western hemlock	Upper
THPL	Thuja plicata	Western red-cedar	Mid-Upper
CHNO	Chamaecyparis nootkatensis	Alaska cedar	Mid-Upper

Description
The overall density of trees is reduced through mixed-severity fire, wind events, and avalanches; however, silver fir and western hemlock continue to be dominant. Trees in this stand average 30in in DBH and 30m in height.

Maximum Tree Size Class
Large 21-33" DBH

Class E 82 Late Development 1 - Closed

Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
ABAM	Abies amabilis	Pacific silver fir	Upper
TSHE	Tsuga heterophylla	Western hemlock	Upper
THPL	Thuja plicata	Western red-cedar	Mid-Upper
CHNO	Chamaecyparis nootkatensis	Alaska cedar	Mid-Upper

Description
The late-development stand is dominated by Pacific silver fir and western hemlock, and other co-dominants (western red-cedar and Alaskan yellow cedar). The trees have a wide range of diameters; rare giants can exceed 100in in DBH.

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	35
Mid1:OPN	36	Late1:CLS	200
Mid1:CLS	36	Late1:CLS	200
Late1:OPN	201	Late1:OPN	999
Late1:CLS	201	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	0.0002	5000	Yes	0
Alternative Succession	Mid1:OPN	Mid1:CLS	1	1	Yes	150
Mixed Fire	Mid1:OPN	Mid1:OPN	0.0005	2000	No	0
Replacement Fire	Mid1:OPN	Early1:ALL	0.001	1000	Yes	0
Replacement Fire	Mid1:CLS	Early1:ALL	0.0002	5000	Yes	0
Mixed Fire	Mid1:CLS	Mid1:OPN	0.0005	2000	Yes	0
Alternative Succession	Late1:OPN	Late1:CLS	1	1	Yes	150
Mixed Fire	Late1:OPN	Late1:OPN	0.0005	2000	No	0
Replacement Fire	Late1:OPN	Early1:ALL	0.002	500	Yes	0
Replacement Fire	Late1:CLS	Early1:ALL	0.0002	5000	Yes	0
Mixed Fire	Late1:CLS	Late1:OPN	0.0003	3333	Yes	0
Mixed Fire	Late1:CLS	Late1:CLS	0.0003	3333	No	0
Insects or Disease	Late1:CLS	Late1:OPN	0.0005	2000	Yes	0
Insects or Disease	Late1:CLS	Early1:ALL	0.0005	2000	Yes	0
Wind or Weather or Stress	Late1:CLS	Late1:OPN	0.001	1000	Yes	0

References

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