

11670

Rocky Mountain Poor-Site Lodgepole Pine Forest

BpS Model/Description Version: Aug. 2020

Modelers		Reviewers	
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Vegetation Type

Forest and Woodland

Map Zones

21

Geographic Range

Northern Rockies, northwestern WY, Wind River Range, Teton Range and eastern ID subsections M331Aa and M331Ae (Cleland et al. 2007).

Biophysical Site Description

This type occurs on coarse, nutrient poor soils derived largely from silicic rocks, (rhyolite, granite and some sterile sandstone). This type may be considered an edaphic climax. These are subalpine forests where the dominance of *Pinus contorta* is related to topo-edaphic conditions and nutrient-poor soils. These include excessively well-drained pumice deposits, glacial till and shallow moisture-deficient soils with a significant component of volcanic ash. Soils on these sites are typically well-drained, gravelly, coarse-textured, acidic and rarely formed from calcareous parent materials. Annual precipitation averages 600-900mm with fairly even distribution across the months.

Vegetation Description

Following stand-replacing fires, *Pinus contorta* rapidly colonizes and develops into dense, even-aged stands. Regeneration is accelerated where serotiny is characteristic. Following stem exclusion, understory trees increase and may include subalpine fir and Engelmann spruce, in wetter areas, or commonly whitebark pine at higher elevations and drier sites. Lodgepole pine occurs in nearly pure stands throughout all successional stages (i.e., lodgepole pine plays early-seral and quasi-climax roles in this system). These stands can be dense (80-100 sq. ft basal area) and can have densities greater than 150 sq. ft basal area. Understory herbaceous and advanced regeneration layers will typically be sparse except in canopy gaps. Species typically include: Geyer's sedge, Ross' sedge, grouse whortleberry, and pine grass. Early succession stands can be dense with lodgepole pine seedlings and saplings that thin over time to widely spaced trees with a multi-aged structure. However, reviewers state that very dense lodgepole pine stands can remain at high densities throughout their succession.

BpS Dominant and Indicator Species

Symbol	Scientific Name	Common Name
PICO	<i>Pinus contorta</i>	Lodgepole pine
CAGE2	<i>Carex geyeri</i>	Geyer's sedge

VASC	<i>Vaccinium scoparium</i>	Grouse whortleberry
CARU	<i>Calamagrostis rubescens</i>	Pinegrass
CARO5	<i>Carex rossii</i>	Ross' sedge

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

Disturbance Description

Most fires remain small (less than one hectare) and naturally extinguish. The stand-replacing fire regime is driven more by weather events than fuel accumulation (Bessie and Johnson 1995, Schoennagel, et al. 2004). Older stands are more disposed to stand-replacing fire (Renkin and Despain 1992). Spotting and crowning are more important than surface spread during large fire events. Young stands generally lack litter or live herbaceous/shrubby fuel to sustain surface spread. Where young stands have been observed to burn, fire spread is carried by thick elk sedge culms. Surface spread in mature stands is slow, erratic and patchy in compacted needle litter and dispersed heavy fuel jackpots. The live herbaceous and live shrubby fuel component contribute little to fire spread. Romme (1982) found a fire return interval of 300-400yrs for stand-replacing events in the Little Firehole drainage in Yellowstone. Although surface and mixed severity fires are much more frequent, they remain small <50 ha and most less than one hectare. Thus any given point on the landscape is much more likely to burn in a stand-replacing fire than a surface or mixed severity fire. Another reviewer, however, commented that a 350yr replacement fire MFI might be too long for densely spaced stressed trees.

Mountain pine beetles kill trees in endemic and epidemic disturbance events. Large diameter trees (>20cm DBH) are preferred by mountain pine beetles but in epidemics, 13cm DBH class trees have been known to be killed. Generally younger trees are not host trees. Patches of mortality provide gaps for regeneration. Mistletoe may cause mortality in older trees and greater susceptibility to mountain pine beetle. The profusion of induced branches and partial crown mortality may predispose them to torching. Shallow root systems are prone to wind-throw.

This is generally a non-equilibrium system which is highly variable, with fire mainly controlled by the weather and climatic changes.

Reviewers suggested not modeling surface fire since the effects are minimal. They also recommended leaving out much of the insect effect and alternative succession, since little data is available.

Fire Frequency

Severity	Avg FI	Percent of All Fires	Min FI	Max FI
Replacement	331	63	100	400
Moderate (Mixed)	563	37	200	4000
Low (Surface)				
All Fires	208	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

Patch size ranges from a few hectares to a few hundred on sandstone outcrops to areas of thousands to tens of thousands on rhyolite and granitic substrates. The Yellowstone Fires of 1988 included 50,000ha+ of this forest type, however 1,000ha would be a large fire.

Adjacency or Identification Concerns

May be confused with dense stands of lodgepole pine dominated seral stages of more moist or andesitic subalpine forested environments (e.g., BpS 1050; Despain 1990). This type corresponds to cool habitat types dominated by lodgepole pine (Pfister et al. 1977).

This is a non-equilibrium ecosystem which is highly variable and not out of its historical range of variability (Romme, pers. comm.).

Currently, there is probably less class A than would have been historically. This system might be in condition class 1 today.

Issues or Problems

Native Uncharacteristic Conditions

None.

Comments

There was one additional anonymous reviewer for MZ21.

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	A	A	A
Tree	10-25	C	C	C	C	B	B	B	B	B	B
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	15	Early Development 1 - All Structures
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Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
PICO	<i>Pinus contorta</i>	Lodgepole pine	Upper
CAGE2	<i>Carex geyeri</i>	Geyer's sedge	Lower
CARO5	<i>Carex rossii</i>	Ross' sedge	Lower

Description

Sparse to dense lodgepole pine seedlings to young pole-sized trees. Herbaceous ground cover mostly of *Carex geyeri*, *C. rossii*, and early successional annuals and colonizers. Lodgepole pine are slow growing.

Maximum Tree Size Class

Pole 5-9" DBH

Class B	19	Mid Development 1 - Closed
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Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
PICO	<i>Pinus contorta</i>	Lodgepole pine	Upper
CAGE2	<i>Carex geyeri</i>	Geyer's sedge	Lower
CARO5	<i>Carex rossii</i>	Ross' sedge	Lower
VASC	<i>Vaccinium scoparium</i>	Grouse whortleberry	Lower

Description

Mid- to large sized lodgepole pine with a sparse herbaceous layer and high canopy closure and stem exclusion. Most ground cover is litter. Grouse whortleberry, if present, steadily increasing.

Modelers and reviewers felt that tree height doesn't seem to change much once the lodgepole stands reach maturity and the canopy cover for both falls within the specified range of 41-100%. The differences have more to do with influx of advance regeneration, decreasing tree density with time, increasing canopy bulk density, decreasing canopy base height and increasing surface fuel loading. The sites (better sites taller trees), will determine the height of the trees.

Maximum Tree Size Class

Medium 9-21"DBH

Class C	46	Mid Development 1 - Open
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Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
PICO	<i>Pinus contorta</i>	Lodgepole pine	Upper
CAGE2	<i>Carex geyeri</i>	Geyer's sedge	Lower
CARO5	<i>Carex rossii</i>	Ross' sedge	Lower
VASC	<i>Vaccinium scoparium</i>	Grouse whortleberry	Lower

Description

Mid- to large-sized lodgepole pine with a higher herbaceous and shrub component. Grouse whortleberry, if present, increasing in cover.

Maximum Tree Size Class

Medium 9-21"DBH

Class D	20	Late Development 1 - Closed
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Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
PICO	Pinus contorta	Lodgepole pine	Upper
CAGE2	Carex geyeri	Geyer's sedge	Lower
CARO5	Carex rossii	Ross' sedge	Lower
VASC	Vaccinium scoparium	Grouse whortleberry	Lower

Description

Nearly homogenous even aged or uneven aged lodgepole pine stands with limited recruitment in gaps. Includes the non-pyrogenous climax lodgepole pine (Despain 1983). Understory herbaceous cover is sparse and limited to where there is sunlight.

This class was originally modeled with canopy and height identical to class B, 41-100% and 10-25m height. Modelers and reviewers felt that tree height doesn't seem to change much once the lodgepole stands reach maturity and the canopy cover for both falls within the specified range of 41-100%. The differences have more to do with influx of advance regeneration, decreasing tree density with time, increasing canopy bulk density, decreasing canopy base height and increasing surface fuel loading. The sites (better sites taller trees), will determine the height of the trees. In order to accommodate the modeling/mapping rules, the tree height was raised in this class to 25m and higher; however, modelers and reviewers felt that this class could contain shorter trees.

Maximum Tree Size Class

Medium 9-21"DBH

Model Parameters

Deterministic Transitions

From Class	Begins at (yr)	Succeeds to	After (years)
Early1:ALL	0	Mid1:CLS	39
Mid1:OPN	40	Late1:CLS	150
Mid1:CLS	40	Late1:CLS	150
Late1:CLS	151	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	0.001	1000	No	0

Replacement Fire	Early1:ALL	Early1:ALL	0.003	333	Yes	0
Mixed Fire	Mid1:OPN	Mid1:OPN	0.001	1000	No	0
Competition or Maintenance	Mid1:OPN	Mid1:OPN	0.001	1000	No	0
Replacement Fire	Mid1:OPN	Early1:ALL	0.003	333	Yes	0
Wind or Weather or Stress	Mid1:CLS	Mid1:OPN	0.001	1000	Yes	0
Mixed Fire	Mid1:CLS	Mid1:OPN	0.001	1000	Yes	0
Insects or Disease	Mid1:CLS	Mid1:OPN	0.001	1000	Yes	0
Competition or Maintenance	Mid1:CLS	Mid1:CLS	0.001	1000	No	0
Replacement Fire	Mid1:CLS	Early1:ALL	0.003	333	Yes	0
Competition or Maintenance	Mid1:CLS	Mid1:OPN	0.01	100	Yes	0
Wind or Weather or Stress	Late1:CLS	Mid1:OPN	0.002	500	Yes	0
Replacement Fire	Late1:CLS	Early1:ALL	0.0033	303	Yes	0
Mixed Fire	Late1:CLS	Mid1:OPN	0.005	200	Yes	0
Insects or Disease	Late1:CLS	Mid1:OPN	0.005	200	Yes	0
Insects or Disease	Late1:CLS	Early1:ALL	0.005	200	Yes	0

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