

10500

Rocky Mountain Lodgepole Pine Forest

BpS Model/Description Version: Aug. 2020

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Vegetation Type

Forest and Woodland

Map Zones

22

Geographic Range

The Rocky Mountain Lodgepole Pine Forest BpS 1050 occurs throughout MZ22. It encompasses mid and upper elevations of west-central WY, ranging from the western and eastern flanks of the Wind River Range and eastern flanks of WY Range, southern, southeastern and extreme northern portions of the Bighorn Basin and on isolated mountain ranges within Sweetwater River Basin.

Stable lodgepole pine occurs in ecomap province M331 (Cleland et al. 2007). Persistent lodgepole occurs in the subalpine portions of M331A, M331B, M331H, M331I, M331G and M331F.

Biophysical Site Description

Subalpine cold climate, relatively moist but usually comes in the winter months as snow. Soils are usually excessively well-drained, residual or glacial till (coarse fraction 20-30% in soil, shallow soil effectively 1-2in to broken rock or bedrock) and alluvium on valley floors, droughty moderately deep to deep soils. Soils are acidic, and rarely formed from calcareous parent materials. Precipitation ranges from 15in to over 20in per year, soil pH usually slightly basic.

Lodgepole pine is generally found in the lower subalpine forest in Region 2, nested between upper montane and the upper subalpine.

Vegetation Description

These forests are dominated by *Pinus contorta* with shrub, grass or barren understories. Sometimes there are intermingled mixed conifer/*Populus tremuloides* stands with the latter occurring with inclusions of deeper, typically fine-textured soils. The shrub stratum may be conspicuous to absent; common species include *Arctostaphylos uva-ursi*, *Ceanothus velutinus*, *Mahonia repens*, *Spiraea betulifolia*, *Spiraea douglasii*, *Shepherdia canadensis*, *Vaccinium* spp., *Symphoricarpos oreophilus*, *Juniperis communis*, *Artemisia tridentata vaseyana*, *Ribes viscosissimum*, *Sambucus cerulea*, *Pachistima myrsinites*, *Salix scouleriana*, and *Prunus virginiana*. Grasses include *Elymus glaucus*, *Poa wheeleri*, *Carex rossii*, *Carex geyeri*, and *Carex hoodii*. Dominant forbs are *Arnica cordifolia* and *Hieracium alboblorum*.

Stable lodgepole pine is not being replaced by other tree species, although sometimes aspen may be seral to it. Lodgepole occurs in nearly pure stands throughout all successional stages. A sparse understory characterizes closed canopy stands often with scattered clumps of Geyer's sedge, Ross' sedge, grouse whortleberry patches and *Purshia tridentata*.

Minor embedded vegetation types are spruce-fir, spruce-fir aspen, alpine meadow, mixed conifer, aspen and several wetland types.

BpS Dominant and Indicator Species

Symbol	Scientific Name	Common Name
PICO	<i>Pinus contorta</i>	Lodgepole pine
VASC	<i>Vaccinium scoparium</i>	Grouse whortleberry
ABLA	<i>Abies lasiocarpa</i>	Subalpine fir
PIEN	<i>Picea engelmannii</i>	Engelmann spruce
ARCO9	<i>Arnica cordifolia</i>	Heartleaf arnica
MARE11	<i>Mahonia repens</i>	Creeping barberry
CAGE2	<i>Carex geyeri</i>	Geyer's sedge

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

Disturbance Description

These are subalpine forests where the dominance of *Pinus contorta* is related to fire history and topo-edaphic conditions. Following stand-replacing fires, *Pinus contorta* will rapidly colonize and develop into dense, even-aged stands depending on site characteristics and cone serotiny. In areas with low serotiny, the stands will be less dense and gradually seed in versus develop even-aged stands immediately. Some of the stands converge over time - more heterogeneity early on, then converges later.

The mean FRI is variable depending on elevation, precipitation and temperature (100-200yrs). Another reviewer had documentation supporting a FRG V and a 200yrs+ frequency replacement severity. However, because the overall FRI of the model was 175yrs, it was left as-is. Stand replacing fire is infrequent and often quite patchy due to lack of surface fuel. High winds are needed to carry crown fire which transitions to crowns above patches of lodgepole reproduction. Stand replacing fires are the most important in shaping stand structures; surface fires play minimum role. Some evidence that older stands with diverse structure burn more severely. Large fires tend to occur in extremely dry years and stand structure has little influence on burn severity under extreme burning conditions. In Region 2, lodgepole forests over 100yrs old are common, but forests over 300yrs old are rare. Large fires that burned for weeks or months burned with varying intensity with changes in topo, fuel and weather. Differences in burn intensity in combination with site factors influenced succession trajectories.

Large stand replacement fires create a coarse grained landscape pattern while mortality from bark beetles create a finer grained landscape pattern. Where aspen is present, lodgepole mortality from bark beetles favors aspen spread through suckering. Longer periods between fires favor spruce and fir regen.

At approximately 80-100yrs of age, insect, disease and/or blow down create small openings in forest canopy maintaining class B. Under favorable (extreme, 95% percentile) weather, early

successional stands will burn where live herbaceous fuel load is sufficient to carry fire. Wind/weather events were not modeled. Pine beetles preferentially occupy and kill larger trees leaving younger trees and patches of establishment sites for regeneration. Periodic bark beetle outbreaks modify stand structure thorough stand replacement, overstory mortality or by increasing diversity of structure.

Dwarf mistletoe is speculated to have been present, but little data is available.

Fire size is largely dependent on climatic conditions. Fire frequency less than 300yrs will keep lodgepole pine on the landscape.

Fire Frequency

Severity	Avg FI	Percent of All Fires	Min FI	Max FI
Replacement	170	100	90	350
Moderate (Mixed)				
Low (Surface)				
All Fires	170	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

Microclimate and fire return interval may have significant influence on the patch size and mosaic of the disturbance.

Adjacency or Identification Concerns

These areas may be confused with subalpine fir-spruce models in an early seral stage, however, the communities described here are persistent, and are maintained by fire. With fire exclusion, some spruce and fir may encroach in wetter lodgepole sites.

Another reviewer for MZ22 stated that some stands in the Shirley Mountains of central WY might succeed to spruce/fir dominance and hence might be better described by the model from MZ21 with the class D spruce/fir component. Those stands might have been better considered as part of this 1050 system versus 1055. However, for MZ22, we are keeping the 1050 persistent lodgepole type.

At the stand scale, the apparent deviations today from the HRV are the number of snags, amount of coarse woody debris, density and size of canopy gaps, age and size-class structure, forest floor depth and degree to which mineral soil is affected by disturbances. At the landscape scale, a reduction in the area of interior forest, less older forests, increased rate of patch formation, smaller disturbance patch sizes and a reduction in fire regime are deviations from the HRV.

Issues or Problems

It is thought that stable lodgepole pine BpSs are not large enough to support an equilibrial landscape (Romme and Despain 1989). The class percentages generated are scale-dependent and typically apply at a large scale, across the mapzone.

Native Uncharacteristic Conditions

Comments

Other modelers for MZ22 were Destin Harrell. It is thought that in MZ22, there is persistent lodgepole pine that would not transition as it does in areas in the Greater Yellowstone Ecosystem. This type for MZ22 was also lumped with 1167 in order to combine all lodgepole types together for this mapzone, as they are thought to function similarly.

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

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

Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
CAGE2	<i>Carex geyeri</i>	Geyer's sedge	Lower
RIVI	<i>Ribes viburnifolium</i>	Island gooseberry	Lower
PICO	<i>Pinus contorta</i>	Lodgepole pine	Upper
POTR5	<i>Populus tremuloides</i>	Quaking aspen	Upper

Description

Grasses, forbs, low shrubs and lodgepole seedlings-saplings. If aspen is present, it grows faster and dominates lodgepole during this stage only. Cover of trees (seedlings-saplings) varies widely. This could be considered a grass stage unless there is a lodgepole seed source nearby (MZ21 reviewers).

Maximum Tree Size Class

Sapling >4.5ft; <5"DBH

Class B	40	Mid Development 1 - All Structures
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Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
PICO	Pinus contorta	Lodgepole pine	Upper
VASC	Vaccinium scoparium	Grouse whortleberry	Lower
CAGE2	Carex geyeri	Geyer's sedge	Lower
POTR5	Populus tremuloides	Quaking aspen	Upper

Description

Moderate to dense pole-sized trees, sometimes very dense (dog-hair) including aspen and lodgepole pine may be present.

Maximum Tree Size Class

Pole 5-9" DBH

Class C	45	Late Development 1 - Closed
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Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
PICO	Pinus contorta	Lodgepole pine	Upper
POTR5	Populus tremuloides	Quaking aspen	Upper
VASC	Vaccinium scoparium	Grouse whortleberry	Lower
CAGE2	Carex geyeri	Geyer's sedge	Lower

Description

Many mature lodgepole pine, somewhat patchy, variety of lodgepole size classes, open canopies overall but patches of denser trees. Aspen may also be present with similar size and variation. Increase in dead woody fuel, but still resistant to fire, and some fires will die out in absence of wind in the earlier stage of this class. As this class becomes a mature closed canopy lodgepole class with some open patches, fire spreads easily due to continuous fuel and organic material.

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:ALL	19
Mid1:ALL	20	Late1:CLS	79
Late1:CLS	80	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	0.0067	149	Yes	0
Competition or Maintenance	Mid1:ALL	Mid1:ALL	0.002	500	No	0
Replacement Fire	Mid1:ALL	Early1:ALL	0.0067	149	Yes	0
Insects or Disease	Mid1:ALL	Mid1:ALL	0.013	77	No	0
Insects or Disease	Late1:CLS	Mid1:ALL	0.001	1000	Yes	0
Wind or Weather or Stress	Late1:CLS	Late1:CLS	0.001	1000	No	0
Insects or Disease	Late1:CLS	Early1:ALL	0.001	1000	Yes	0
Replacement Fire	Late1:CLS	Early1:ALL	0.005	200	Yes	0
Alternative Succession	Late1:CLS	Early1:ALL	0.005	200	Yes	0
Insects or Disease	Late1:CLS	Late1:CLS	0.006	167	No	0

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