

10550

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

BpS Model/Description Version: Aug. 2020

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Vegetation Type

Forest and Woodland

Map Zones

20

Geographic Range

The Rocky Mountain Lodgepole Pine Forest Biophysical Setting (BpS) (1050) and 1055 occurs throughout map zone (MZ)21, including west-central Wyoming, ranging from the eastern flanks of the Wind River Range west to the Bridger-Teton National Forest, north to the Gallatin Range, and west towards Island Park, Idaho. It encompasses mid and upper elevations of the Bridger-Teton National Forest and portions of the Caribou Targhee in this map zone. It is also found in subsections highlands M331Dm, M331Dd, M331Aa and M331Ae (Cleland et al. 2007).

For MZ20, lower subalpine lodgepole pine is quite common (Pfister et al. 1977).

Biophysical Site Description

Subalpine cold climate, dry-mesic but usually comes in the winter months as snow, except at the eastern flanks of the Wind River Range where most of the precipitation occurs in the spring months. Soils are usually excessively well-drained, residual or glacial till and alluvium on valley floors, droughty moderately deep to deep soils over fractured granodiorite, quartzite and sandstone bedrock. Coarse fraction 30-50% in soil, soils moderately deep, to deep, to broken rock, or bedrock. Soils are acidic, and rarely formed from calcareous parent materials. BpS 1050 occurs regularly and conspicuously on the Flathead Sandstone Formation along the entire eastern Flank of the Wind River Range. Precipitation 400-900 mm/yr.

Vegetation Description

These forests are dominated by *Pinus contorta*, ABLA, PICEA, with shrub and grass. 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*, *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 alboflorum*.

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. The Mean Fire Return Interval (MFRI) is variable depending on such factors as terrain, elevation, precipitation, and temperature and often is influenced by neighboring fire regimes in more frequently burned adjacent forests and grasslands (i.e., "contagion" effect).

For MZ20, the range is thought to be between 40-300yrs, with an overall Mean Fire Interval (MFI) of 100yrs split between 70% stand replacing and 30% mixed severity fire regime.

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.

Fire size is largely dependent on climatic conditions. During periods when summers are rarely dry, average fire size is about 100ac but when dry summers and fast-moving cold fronts occur, fire sizes can range from 1,000-100,000ac.

Fire frequency <300yrs will keep lodgepole pine on the landscape.

According to Fisher and Clayton (1983), fire return intervals at elevations >7,500ft average 150yrs, but range from 300-400yrs in Yellowstone. In areas at <7,500ft, fire return intervals vary from 100-500yrs with some recurring cool fires that thin stands without serious damage for this type (Novak, personal correspondence). However, Barrett's (2004) summary of data from all fire history plots in the Northern Rockies as of 2000 suggests widely ranging Mean Fire Intervals (MFIs) for lodgepole pine forests east of the Continental Divide. That is, presettlement MFIs were as frequent as every 30yrs between mixed severity fires (relatively dry lower elevation environments), to infrequent stand replacement fires (up to 300yrs in relatively cold-moist upper elevation terrain).

Fire Frequency

Severity	Avg FI	Percent of All Fires	Min FI	Max FI
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Replacement	136	74	90	350
Moderate (Mixed)	383	26		
Low (Surface)				
All Fires	100	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

The Rocky Mountain Lodgepole Pine Forest occurs in large (100-1,000s of acres) tracts often following patterns of bedrock and/or surficial geology. The scale of disturbance is generally large, ranging from 100-1,000s of acres. Microclimate may have significant influence on the patch size and mosaic of the disturbance.

Adjacency or Identification Concerns

1050 is not a BpS in MZ21 but is a seral component of this BpS. This type was modified from 1810500 by adding Class D, the spruce/fir climax that would occur without fire.

This should be distinguished from 1056, as 1056 is more moist. Many of the tree species are similar, but shrub component is distinct. Reviewers for MZ20 were considering lumping this system with 1056, but decided not to, based on moisture gradient and different shrub component.

BpS 1055 is also slightly lower in elevation than 1056.

Lodgepole pine stands in the montane and lower subalpine zones, that are on less well-drained soils, are usually seral to mixed conifer or subalpine BpS, including species such as Douglas-fir, Engelmann spruce, whitebark pine and subalpine fir. Some *Pinus contorta* forests will persist on sites that are too extreme (hot and dry) for other conifers to establish (BpS 1167). Persistent PICO is also found in frost pockets (reviewers, MZ21).

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

This type is a subalpine forest, as opposed to the mixed conifer montane model of BpS 2010451.

Issues or Problems

BpS 1050 Rocky Mountain Lodgepole Pine Forest is a successional stage of BpS 1055 Rocky Mountain Dry Mesic Dry-Spruce-Fir Forest and Woodland. Fire frequency at <300yrs will keep lodgepole pine on the landscape.

The model for MZ20 was changed from the MZ21 model to reflect a different understanding of this system in this mapzone; therefore, FRIs and percentages in classes vary from MZ21 due to differing opinions about this system. The MZ21 model is focused on a Greater Yellowstone Ecosystem view, whereas this MZ20 model is not.

Native Uncharacteristic Conditions

Comments

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	5-10	D	D	D	D	D	D	D	D	D	D
Tree	10-25	C	C	C	C	C	C	C	C	C	C
Tree	10-25	D	D	D	D	D	D	D	D	D	D
Tree	25-50	D	D	D	D	D	D	D	D	D	D
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
Tree	>50	D	D	D	D	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 12 Early Development 1 - All Structures

Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
VASC	Vaccinium scoparium	Grouse whortleberry	Lower
RIVI	Ribes viburnifolium	Island gooseberry	Lower
CAGE2	Carex geyeri	Geyer's sedge	Lower
PICO	Pinus contorta	Lodgepole pine	Upper

Description

Grasses, forbs, low shrubs and lodgepole seedlings-saplings. Young lodgepole grows fast, and succession to mid-development happens within about two decades. 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.

Maximum Tree Size Class

Sapling >4.5ft; <5"DBH

Class B	39	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
ABLA	Abies lasiocarpa	Subalpine fir	Middle

Description

Moderate to dense pole-sized trees, sometimes very dense (dog-hair). Closed canopy is 51-100%. Mid-open stands are at 21-50% canopy cover and would have mature and immature aspen present. Mid-open stands would have subalpine fir in the understory. Therefore, this class is considered a mid-development, all-structures class.

Maximum Tree Size Class

Pole 5-9" DBH

Class C	20	Late Development 1 - Closed
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Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
PICO	Pinus contorta	Lodgepole pine	Upper
ABLA	Abies lasiocarpa	Subalpine fir	Mid-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. This class typically lasts more than 200yrs, and then succeeds to a spruce/fir class. There is also a possibility that this transition could occur sooner (modeled as alternative succession).

Maximum Tree Size Class

Medium 9-21"DBH

Class D	29	Late Development 2 - Closed
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Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
ABLA	Abies lasiocarpa	Subalpine fir	Upper
PIEN	Picea engelmannii	Engelmann spruce	Upper
VAME	Vaccinium membranaceum	Thinleaf huckleberry	Lower

VASC	Vaccinium scoparium	Grouse whortleberry	Lower
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Description

Mature spruce/fir forest with a variety of size classes from seedling to mature. Insect and disease usually affects only one species so survivor trees of other species remain in the stand.

This class is distinguished from C by species, not canopy closure or tree height.

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:ALL	19
Mid1:ALL	20	Late1:CLS	79
Late1:CLS	80	Late2:CLS	350
Late2:CLS	351	Late2: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	0.01	100	Yes	0
Competition or Maintenance	Mid1:ALL	Mid1:ALL	0.002	500	No	0
Mixed Fire	Mid1:ALL	Mid1:ALL	0.003	333	No	0
Replacement Fire	Mid1:ALL	Early1:ALL	0.007	143	Yes	0
Insects or Disease	Mid1:ALL	Mid1:ALL	0.013	77	No	0
Mixed Fire	Late1:CLS	Mid1:ALL	0.003	333	Yes	0
Insects or Disease	Late1:CLS	Mid1:ALL	0.006	167	Yes	0
Insects or Disease	Late1:CLS	Late1:CLS	0.006	167	No	0
Replacement Fire	Late1:CLS	Early1:ALL	0.007	143	Yes	0
Alternative Succession	Late1:CLS	Late2:CLS	0.01	100	Yes	0
Mixed Fire	Late2:CLS	Late2:CLS	0.003	333	No	0
Replacement Fire	Late2:CLS	Early1:ALL	0.007	143	Yes	0

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