

10550

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

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Vegetation Type

Forest and Woodland

Map Zones

29

Geographic Range

Common in the mountains of Wyoming and minor portion of the Pryor Mountains in the upper montane and lower subalpine zones. This would occur in ECOMAP sections M331B and M331I (Cleland et al. 2007). This type occurs in the Bighorn Mountains of Wyoming as well as the Laramie Peak Range.

Biophysical Site Description

This Biophysical Setting (BpS) occurs between approximately 7,000ft (above foothill forests dominated by ponderosa pine and Douglas-fir) to 9,500ft. This type is restricted to north slopes at lower elevations. Slopes may be gentle to moderately steep (e.g., 0-60% slope).

Vegetation Description

Lodgepole pine, Engelmann spruce and subalpine fir are the dominants of this BpS. Lodgepole pine is more common on drier sites and spruce and fir are more common on more mesic sites (such as north-facing slopes). Common associated species include aspen, grouse whortleberry, common juniper, heartleaf arnica, russet buffaloberry, elk sedge and various grasses.

Because of its relative intolerance for the forest understory environment, lodgepole pine traditionally has been considered a pioneer or seral species to forests dominated by Engelmann spruce and subalpine fir. However, some of the Bighorn National Forest map zone (MZ)29 is too dry to support spruce-fir forests and lodgepole pine perpetuates itself in some areas (Despain 1973 in Meyer et al. 2005).

BpS Dominant and Indicator Species

Symbol	Scientific Name	Common Name
PICO	<i>Pinus contorta</i>	Lodgepole pine
PIEN	<i>Picea engelmannii</i>	Engelmann spruce
ABLA	<i>Abies lasiocarpa</i>	Subalpine fir
VASC	<i>Vaccinium scoparium</i>	Grouse whortleberry

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

Disturbance Description

Primarily moderately long to long-interval stand replacement fires. Mixed-severity and surface fires may occur rarely in small patch sizes (i.e., <1,000s of acres) for this group, but are not modeled here.

Insects (mountain pine beetle) affect approximately 0.1% of the landscape every year and will either open the canopy, (maintaining or causing a transition to Classes C and D), or replace the vegetation, causing a transition to early-development conditions (Class A). Stand replacing insect outbreaks typically only occur in closed-canopy forests (Classes B and E).

Blister rust might have occurred during the historic range of variability (HRV) period - at relatively low levels during cool periods and at higher levels during warm, moist periods such as the early 1500s early 1700s (Meyer et al. 2005).

Blowdown events occur rarely (once every 500-1,000yrs), and are replacement events, causing a transition to early-development conditions (Class A).

For MZ29, changed replacement fire to higher and more frequent to get correct percentages in classes.

The HRV for succession and processes during the reference period for both individual stands and the landscape in the Bighorn Mountains would have been broad. Different sites on any specific burn can experience different successional trajectories, resulting in doghair stands of lodgepole in some areas, stands of average or below average tree density elsewhere, and a full variety of combinations of invading aspen, spruce, fir and lodgepole pine across the landscape (in Meyer et al. 2005).

Meyer et al. (2005) suggest that the mean fire return interval (FRI) of stand-replacing fires in the last 100yrs in high elevation types within the Bighorns is still within the range of means during the HRV period, despite fire suppression efforts. Recent fire records for the Bighorn National Forest suggest that fires still play an important role on the Bighorn National Forest, but fire suppression efforts have lengthened the mean FRI during the last 50yrs (Meyer et al. 2005).

Surface fires in lodgepole pine have been observed in the Bighorns, and because of the thin bark, some trees are killed. Surface fires may have burned through lodgepole pine forests in the Bighorn National Forest at intervals as short as 40-80yrs (Meyer et al. 2005). They were not modeled here.

Fire Frequency

Severity	Avg FI	Percent of All Fires	Min FI	Max FI
Replacement	116	100	30	300
Moderate (Mixed)				
Low (Surface)				
All Fires	116	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 sizes are generally 1,000s-10,000s of acres in variable mosaics, including forest land and meadows. Landscape are never in equilibrium, except possibly considering very large scales that exceed 300,000ac.

Adjacency or Identification Concerns

In Wyoming, this group is adjacent to lodgepole pine and upper subalpine groups, and will be found above Douglas-fir and ponderosa types in elevation. Vegetation classes may vary significantly.

Secondary succession initiated today could have quite different trajectories than 200-300yrs ago because of the warmer and wetter climatic conditions of the last century (in Meyer et al. 2005).

This type might be confused with the Subalpine Spruce Fir Forests 1056. This system, however, incorporates more of the lodgepole and is at somewhat lower elevations and might be drier. Note that some of the Engelmann spruce/subalpine fir should be keyed to 1056 as well as 1050/1055 in MZ29.

Blister rust increased in 1900s. At present time, dwarf mistletoe occurs at higher levels than in the HRV (Meyer et al. 2005).

In the Bighorns, a full range of size and age class structures probably existed during the HRV period, ranging from young to older even-aged stands of lodgepole, many having developed after fires in the 1600s and 1700s to uneven-aged stands that hadn't burned for centuries and were dominated primarily by Engelmann spruce and subalpine fir. The fires would have killed many of the big trees from time to time, and they probably burned over large areas. Consequently, tree size would have ranged from uniformly small trees after the stand was recently burned to very large trees with small trees when the stand hadn't been disturbed for long periods. Since the late 1800s, both human-caused fire and timber harvest have converted areas with large, old trees to stands of younger, smaller trees, with the exception that timber harvesting could extend into areas that hadn't burned for centuries, such as on leeward slopes or in ravines. When timber harvesting in those areas doesn't provide sufficient time to allow regrowth of old trees, age and size class structure is outside of the HRV. Across the rest of the landscape where disturbances were historically more common, the variety of age and size class structures with and without clearcutting is probably within the HRV; both clearcutting and intense fires would create the kind of size class structure characteristic of even-aged stands, and currently, the forest stands have not been cut more frequently than the rate at which fires have burned stands. However, because planned rotation times are shorter than natural FRIs, the average harvested stand won't be able to achieve old-growth characteristics and thus stand age and size structure may eventually exceed the HRV (Meyer et al. 2005).

In the Bighorns, due to thinning and selective harvesting, percent canopy cover is probably lower than that of the HRV (Meyer et al. 2005).

In the Bighorns, under existing conditions, tree densities might still fall within the moderately broad HRV, because even though trees have been partially or completely removed on about 20% of the landscape, fires may have removed half of that anyway if fire suppression had not been practiced. Canopy gap density and cover may be slightly below the HRV, but after 20yrs, these

variables return to more natural conditions (Meyer et al. 2005). Stand variables averaged at the landscape scale could go beyond the HRV because of the abundance of older forests, mineral soil disruption or compaction, snag density and abundance of coarse woody debris (Meyer et al. 2005).

Issues or Problems

This system will be highly heterogeneous and dynamic; this system has a very wide range of variability.

Native Uncharacteristic Conditions

There might be lower canopy cover and less old-growth today in parts of the Bighorns.

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	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN
Herb	0.5-1.0	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN
Herb	>1.0	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN
Shrub	0-0.5	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN
Shrub	0.5-1.0	A	A	A	A	UN	UN	UN	UN	UN	UN
Shrub	1.0-3.0	A	A	A	A	UN	UN	UN	UN	UN	UN
Shrub	>3.0	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN
Tree	0-5	C	C	C	B	B	B	B	UN	UN	UN
Tree	5-10	C	C	C	B	B	B	B	UN	UN	UN
Tree	10-25	D	D	D	D	E	E	E	UN	UN	UN
Tree	25-50	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN
Tree	>50	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN

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 **17** **Early Development 1 - All Structures**

Indicator Species

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

Description

These are seedling/sapling trees <1" DBH, and generally <6ft in height

Range of 3-50% of a landscape, depending on climatic conditions and size of landscape. Early succession after moderately long to long interval replacement fires. Buttery and Gillam's (1987) HSS 1, 2. Time in class is dependent on scale and intensity of disturbance, but generally moves out within 20yrs and goes to a mid-closed stage, B. Alternatively, succession, under the right conditions, can move to a closed stage.

Maximum Tree Size Class

Seedling <4.5ft

Class B	34	Mid Development 1 - Closed
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Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
PICO	Pinus contorta	Lodgepole pine	Upper
PIEN	Picea engelmannii	Engelmann spruce	Lower

Description

This is dog hair lodgepole <5" DBH and 25ft tall.

Range of 5-50% of a landscape, depending on climatic conditions and size of landscape. Saplings to poles in size. Buttery and Gillam's (1987) HSS 3B, 3C. Includes classic "dog hair" stands.

There is probably more of this class in current vs. historical conditions, at least in the Bighorns (Meyer et al. 2005).

Maximum Tree Size Class

Sapling >4.5ft; <5"DBH

Class C	8	Mid Development 1 - Open
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Indicator Species

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

Description

This is open grown pole sized lodgepole <9" DBH and 35ft in height.

Range of 3-50% of a landscape, depending on climatic conditions and size of landscape. Saplings to poles. Buttery and Gillam's (1987) HSS 3A. Succession primarily to the late open

stage. Alternately, under the right conditions, succession can also occur toward a late closed stage.

There is probably more of this class in current vs historical conditions, at least in the Bighorns (Meyer et al. 2005).

Maximum Tree Size Class

Pole 5-9" DBH

Class D	10	Late Development 1 - Open
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Indicator Species

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

Description

Range of 2-15% of a landscape, depending on climatic conditions and size of landscape. Edaphic conditions control the density of this class. Moderate to large-diameter mixed conifer, generally on south aspects and shallow, intermittent rocky soils.

There is probably less old growth in current vs. historical conditions (Meyer et al. 2005).

Maximum Tree Size Class

Medium 9-21"DBH

Class E	31	Late Development 1 - Closed
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Indicator Species

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

Description

Range of 15-50% of a landscape, depending on climatic conditions and size of landscape. Moderate to large-diameter trees largely on mesic sites (e.g., north slopes). This is closed lodgepole stands of <9" DBH and <50ft tall.

There is probably less old growth in current vs historical conditions (Meyer et al. 2005).

Maximum Tree Size Class

Pole 5-9" DBH

Model Parameters

Deterministic Transitions

From Class	Begins at (yr)	Succeeds to	After (years)
Early1:ALL	0	Mid1:CLS	20
Mid1:OPN	21	Late1:OPN	80
Mid1:CLS	21	Late1:CLS	80
Late1:OPN	81	Late1:CLS	300
Late1:CLS	81	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	0.002	500	Yes	0
Replacement Fire	Early1:ALL	Early1:ALL	0.003	333	Yes	0
Insects or Disease	Mid1:OPN	Mid1:OPN	0.001	1000	No	0
Alternative Succession	Mid1:OPN	Late1:CLS	0.001	1000	Yes	0
Wind or Weather or Stress	Mid1:OPN	Mid1:OPN	0.0015	667	No	0
Replacement Fire	Mid1:OPN	Early1:ALL	0.01	100	Yes	0
Insects or Disease	Mid1:CLS	Early1:ALL	0.0001	10000	Yes	0
Wind or Weather or Stress	Mid1:CLS	Mid1:OPN	0.001	1000	Yes	0
Insects or Disease	Mid1:CLS	Mid1:OPN	0.0015	667	Yes	0
Replacement Fire	Mid1:CLS	Early1:ALL	0.01	100	Yes	0
Wind or Weather or Stress	Late1:OPN	Mid1:OPN	0.001	1000	Yes	0
Insects or Disease	Late1:OPN	Mid1:OPN	0.001	1000	Yes	0
Wind or Weather or Stress	Late1:OPN	Late1:OPN	0.001	1000	No	0
Insects or Disease	Late1:OPN	Late1:OPN	0.001	1000	No	0
Competition or Maintenance	Late1:OPN	Late1:OPN	0.001	1000	No	0
Replacement Fire	Late1:OPN	Early1:ALL	0.01	100	Yes	0
Insects or Disease	Late1:CLS	Early1:ALL	0.0001	10000	Yes	0

Wind or Weather or Stress	Late1:CLS	Late1:OPN	0.001	1000	Yes	0
Insects or Disease	Late1:CLS	Mid1:OPN	0.0015	667	Yes	0
Replacement Fire	Late1:CLS	Early1:ALL	0.01	100	Yes	0

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