

**10500**

## **Rocky Mountain Lodgepole Pine Forest**

BpS Model/Description Version: Aug. 2020

| <b>Modelers</b> |                    | <b>Reviewers</b>       |      |
|-----------------|--------------------|------------------------|------|
| Doug Page       | doug_page@blm.gov  | One anonymous reviewer | None |
| Mark Loewen     | mloewen@fs.fed.us  | None                   | None |
| Linda Chappell  | lchapell@fs.fed.us | None                   | None |

### **Vegetation Type**

Forest and Woodland

### **Map Zones**

16, 23, 28

### **Geographic Range**

This system is widespread in upper montane to subalpine elevations of the Rocky Mountains, Intermountain region, and north into the Canadian Rockies. Southcentral Wyoming, south to the Colorado Front Range and interior ranges, west to the White River Plateau and northern Gunnison Basin. Also occurs in the Northern Rockies, north of the Red Desert and Utah High Plateau.

### **Biophysical Site Description**

Climate is subalpine and cold, relatively moist, but water is usually not available in liquid form. Soils are usually excessively well drained, residual or glacial till, or alluvium on valley floors where there is cold air accumulation. Soils may be shallow (effectively 1-2in), warm and droughty over fractured quartzite bedrock (coarse fraction 20-30%). Soils may have a significant component of volcanic ash. Soils are acidic and rarely formed from calcareous parent materials. Precipitation ranges from 400-900mm/yr. These are subalpine forests where the dominance of *Pinus contorta* is related to fire history and topo-edaphic conditions. Elevations vary.

### **Vegetation Description**

These forests are dominated by *Pinus contorta* (lodgepole pine) with shrub, grass, or barren understories. Sometimes there are intermingled mixed conifer/*Populus tremuloides* (aspen) stands, with the latter occurring with inclusions of deeper, typically fine-textured soils. Lodgepole pine is generally persistent and not replaced by other trees, although sometimes aspen may be seral to it. Tree cover averages 70-90% at later stages.

The shrub stratum may be conspicuous to absent; common species may include *Arctostaphylos uva-ursi*, *Ceanothus velutinus*, *Linnaea borealis*, *Mahonia repens*, *Purshia tridentata*, *Spiraea betulifolia*, *Spiraea douglasii*, *Shepherdia canadensis*, *Vaccinium caespitosum*, *Vaccinium scoparium*, *Vaccinium membranaceum*, *Symphoricarpos albus*, and *Ribes* spp.

### **BpS Dominant and Indicator Species**

| <b>Symbol</b> | <b>Scientific Name</b> | <b>Common Name</b> |
|---------------|------------------------|--------------------|
| PICO          | <i>Pinus contorta</i>  | Lodgepole pine     |

|       |                                                   |                     |
|-------|---------------------------------------------------|---------------------|
| VASC  | <i>Vaccinium scoparium</i>                        | Grouse whortleberry |
| VAMYO | <i>Vaccinium myrtillus</i> var. <i>oreophilum</i> | Whortleberry        |
| VASC  | <i>Vaccinium scoparium</i>                        | Grouse whortleberry |
| ABLA  | <i>Abies lasiocarpa</i>                           | Subalpine fir       |

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

### Disturbance Description

The dominance of *Pinus contorta* is related to fire history and topo-edaphic conditions. Following stand-replacing fires (mean fire return interval of 100-200yrs), *Pinus contorta* will rapidly colonize and develop into dense, even-aged stands. Most forests in this ecological system are early to mid-successional forests which developed following fires. Some *Pinus contorta* forests will persist on sites that are too extreme for other conifers to establish.

*Pinus contorta* will senesce after 150yrs. Insect outbreaks and stand-replacement fires will reset succession before senescence. Windthrow may occur rarely but over large geographic areas.

The zone 28 description for this BpS included the following statement: “Before fire suppression began in the early 20th century, most fires were low-intensity, creeping, surface fires; whereas most fires today are high-intensity crown fires that occur during severe fire weather (dry and windy) (Lotan and others 1985).”

### Fire Frequency

| Severity         | Avg FI | Percent of All Fires | Min FI | Max FI |
|------------------|--------|----------------------|--------|--------|
| Replacement      | 152    | 81                   | 90     | 300    |
| Moderate (Mixed) |        |                      |        |        |
| Low (Surface)    | 636    | 19                   |        |        |
| All Fires        | 122    | 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

Isodiametric stands, mostly large (100s of acres), sometimes very large (1,000s of acres). Patches of this Biophysical Setting (BpS) usually correspond to patches of habitat (well-drained to excessively well-drained soils) in the subalpine zone. Although fire size could be large in other parts of the western United States, in the Utah High Plateau (map zone [MZ] 16), patches of this type were small enough to keep fire size within 200-300ac.

### Adjacency or Identification Concerns

Persistent 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, white fir, Engelmann spruce, and subalpine fir. In more mesic sites with less well-drained soils, the following BpSs may be more appropriate: Rocky Mountain Mesic Montane Mixed Conifer Forest and Woodland (1052), Rocky Mountain Subalpine Fry-Mesic Spruce-Fir Forest and Wetland (1055), or Rocky Mountain Subalpine Mesic Spruce-Fir Forest and Woodland (1056).

### Issues or Problems

### Native Uncharacteristic Conditions

## Comments

MZs 16 and 23 were combined during 2015 BpS Review. During the review it was noted that the model for zone 28 had several transitions that violated a LANDFIRE modeling rule by allowing a disturbance to advance a pixel's age. Kori Blankenship reviewed the zone 28 model and was unable to modify the model to follow LANDFIRE rules without additional expert input. Blankenship decided to lump the zone 28 with the model for the adjacent zones, 16 and 23, because the descriptions were similar. However, there were substantial differences in the state-and-transition models: the zone 28 model included mixed fire transitions but in zone 16/23 no mixed fire was modeled, and the zone 28 model was described with 5 seral states whereas the 16/23 model has 3. Contributors to the zone 28 model were: Paul Langowski, and Mike Babler; reviewers were: Mike Foley, Dick Edwards, and Laurie Huckaby.

Peer review suggested adding windthrow to this model. It was not added in the quantitative model but was included in the disturbance description.

## 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     | B     | B      |
| Tree                 | 5-10       | C                | C     | C     | C     | C     | C     | C     | 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      19      Early Development 1 - All Structures**

### Indicator Species

| Symbol | Scientific Name     | Common Name         | Canopy Position |
|--------|---------------------|---------------------|-----------------|
| VASC   | Vaccinium scoparium | Grouse whortleberry | Lower           |



## Model Parameters

### Deterministic Transitions

| From Class | Begins at (yr) | Succeeds to | After (years) |
|------------|----------------|-------------|---------------|
| Early1:ALL | 0              | Mid1:CLS    | 19            |
| Mid1:CLS   | 20             | Late1:CLS   | 79            |
| Late1:CLS  | 80             | Late1:CLS   | 499           |

### 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          | 0.005                   | 200                   | Yes                                                 | 0                            |
| Competition or Maintenance | Mid1:CLS              | Mid1:CLS            | 0.002                   | 500                   | No                                                  | 0                            |
| Replacement Fire           | Mid1:CLS              | Early1:ALL          | 0.005                   | 200                   | Yes                                                 | 0                            |
| Insects or Disease         | Mid1:CLS              | Mid1:CLS            | 0.013                   | 77                    | No                                                  | 0                            |
| Surface Fire               | Late1:CLS             | Late1:CLS           | 0.005                   | 200                   | No                                                  | 0                            |
| Replacement Fire           | Late1:CLS             | Early1:ALL          | 0.01                    | 100                   | Yes                                                 | 0                            |
| Insects or Disease         | Late1:CLS             | Early1:ALL          | 0.013                   | 77                    | Yes                                                 | 0                            |

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