

**10550**

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

BpS Model/Description Version: Aug. 2020

Update: 3/18

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

### **Vegetation Type**

Forest and Woodland

### **Map Zones**

16, 23, 24

### **Geographic Range**

Subalpine forests of the Cascades and Rocky Mountains from southern British Columbia east into Alberta, south into New Mexico and the Intermountain region.

### **Biophysical Site Description**

Dry-mesic spruce-fir forest are the matrix forests of the subalpine zone, with elevations ranging from 1,525-3,355m (5,000-11,000ft). Sites within this system are cold year-round, and precipitation is predominantly in the form of snow, which may persist until late summer. Snowpacks are deep and late-lying, and summers are cool. Frost is possible almost all summer and may be common in restricted topographic basins and benches.

### **Vegetation Description**

Engelmann spruce and subalpine fir forests comprise a substantial part of the subalpine forests. Despite their wide distribution, the tree canopy characteristics are remarkably similar, with *Picea engelmannii* and *Abies lasiocarpa* dominating either mixed or alone. *Pinus contorta* is common in many occurrences and patches of pure *Pinus contorta* are not uncommon, as well as mixed conifer/*Populus tremuloides* stands. In some areas, such as Wyoming, *Picea engelmannii*-dominated forests are on limestone or dolomite, while nearby co-dominated spruce-fir forests are on granitic or volcanic rocks. Xeric species may include *Juniperus communis*, *Linnaea borealis*, *Mahonia repens* or *Vaccinium scoparium*.

*Picea engelmannii* can be very long-lived, reaching 500yrs of age. *Abies lasiocarpa* decreases in importance relative to *Picea engelmannii* with increasing distance from the regions of Montana and Idaho where maritime air masses influence the climate. Fire is an important disturbance factor, but fire regimes have a long return interval and so are often stand-replacing. *Picea engelmannii* can rapidly recolonize and dominate burned sites, or can succeed other species such as *Pinus contorta* or *Populus tremuloides*. Due to great longevity, *Pseudotsuga menziesii* may persist in occurrences of this system for long periods without regeneration. Old-growth characteristics in *Picea engelmannii* forests will include treefall and windthrow gaps in the

canopy, with large downed logs, rotting woody material, tree seedling establishment on logs or on mineral soils unearthed in root balls, and snags.

### BpS Dominant and Indicator Species

| Symbol | Scientific Name             | Common Name      |
|--------|-----------------------------|------------------|
| PIEN   | <i>Picea engelmannii</i>    | Engelmann spruce |
| ABLA   | <i>Abies lasiocarpa</i>     | Subalpine fir    |
| ABCO   | <i>Abies concolor</i>       | White fir        |
| ACMI2  | <i>Achillea millefolium</i> | Common yarrow    |

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

### Disturbance Description

Primarily long-interval (200-500yrs) stand replacement fires, with mixed severity fire (1,000yrs) occurring in open conditions. Disturbances also include insect/disease (every 250yrs) and windthrow events than thin younger closed stands.

### Fire Frequency

| Severity         | Avg FI | Percent of All Fires | Min FI | Max FI |
|------------------|--------|----------------------|--------|--------|
| Replacement      | 216    | 97                   | 40     | 300    |
| Moderate (Mixed) | 7174   | 3                    |        |        |
| Low (Surface)    |        |                      |        | 30     |
| All Fires        | 210    | 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 vary but are mostly in the hundreds of acres, with rare very large patches (disturbances) in the 1,000s of acres. There may be frequent small disturbances in the 10s of acres or less.

### Adjacency or Identification Concerns

Generally lower elevation than Rocky Mountain Subalpine Mesic Spruce Fir Forest and Woodland (1056), but may also be interspersed with it in more mesic microsites. The Rocky Mountain Subalpine Dry-Mesic Spruce Fir Forest and Woodland is more common than Rocky Mountain Subalpine Mesic Spruce Fir Forest and Woodland.

If aspen is present in large patches or if conifers are not coming in after ~30yrs, the BpS is probably misclassified and one of the aspen types should be examined (Rocky Mountain Aspen Forest and Woodland (1011)).

### Issues or Problems

These systems are highly variable over space and time.

### Native Uncharacteristic Conditions

### Comments

In zones 16 and 23 BpS 10560 and 10550 have the same state-and-transition model, but the descriptions are different.

## 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       | C                | C     | C     | C     | B     | B     | B     | B     | B     | B      |
| 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      22      Early Development 1 - All Structures**

#### Indicator Species

| Symbol | Scientific Name   | Common Name      | Canopy Position |
|--------|-------------------|------------------|-----------------|
| BRMA4  | Bromus marginatus | Mountain brome   | Lower           |
| PIEN   | Picea engelmannii | Engelmann spruce | Upper           |
| ABLA   | Abies lasiocarpa  | Subalpine fir    | Upper           |

#### Description

Early succession after moderately long to long interval replacement fires.

Within 40yrs, conifers will replace herbaceous vegetation and shrubs. Occasionally, a lack of seed source of conifer may maintain this condition (modeled as competition/maintenance).

#### Maximum Tree Size Class

Sapling >4.5ft; <5"DBH

**Class B      28      Mid Development 1 - Closed**

#### Indicator Species

| Symbol | Scientific Name | Common Name | Canopy Position |
|--------|-----------------|-------------|-----------------|
|--------|-----------------|-------------|-----------------|

|      |                          |                  |       |
|------|--------------------------|------------------|-------|
| PIEN | <i>Picea engelmannii</i> | Engelmann spruce | Upper |
| ABLA | <i>Abies lasiocarpa</i>  | Subalpine fir    | Upper |

Description

Shade tolerant- and mixed conifer saplings to poles (>5% canopy cover). Spruce and fir dominate and canopy is dense.

### Maximum Tree Size Class

Medium 9-21"DBH

|                |           |                                 |
|----------------|-----------|---------------------------------|
| <b>Class C</b> | <b>14</b> | <b>Mid Development 1 - Open</b> |
|----------------|-----------|---------------------------------|

Indicator Species

| Symbol | Scientific Name          | Common Name      | Canopy Position |
|--------|--------------------------|------------------|-----------------|
| PIEN   | <i>Picea engelmannii</i> | Engelmann spruce | Upper           |
| ABLA   | <i>Abies lasiocarpa</i>  | Subalpine fir    | Upper           |

### Description

Primarily moderately tolerant saplings to poles (1-6.9in DBH) and <50% canopy cover of spruce and fir.

*Maximum Tree Size Class*

Medium 9-21"DBH

|                |           |                                    |
|----------------|-----------|------------------------------------|
| <b>Class D</b> | <b>36</b> | <b>Late Development 1 - Closed</b> |
|----------------|-----------|------------------------------------|

### Indicator Species

| Symbol | Scientific Name          | Common Name      | Canopy Position |
|--------|--------------------------|------------------|-----------------|
| PIEN   | <i>Picea engelmannii</i> | Engelmann spruce | Upper           |
| ABLA   | <i>Abies lasiocarpa</i>  | Subalpine fir    | Upper           |

Description

Pole and larger diameter moderately tolerant to shade tolerant conifer species, in moderate to large size patches, all aspects. Spruce and fir dominate.

## Maximum Tree Size Class

Large 21-33"DBH

### Model Parameters

| From Class | Begins at (yr) | Succeeds to | After (years) |
|------------|----------------|-------------|---------------|
| Early1:ALL | 0              | Mid1:CLS    | 39            |
| Mid1:OPN   | 40             | Late1:CLS   | 129           |
| Mid1:CLS   | 40             | Late1:CLS   | 129           |

|           |     |           |     |
|-----------|-----|-----------|-----|
| Late1:CLS | 130 | 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 |
|----------------------------|-----------------------|---------------------|-------------------------|-----------------------|-----------------------------------------------------|------------------------------|
| Competition or Maintenance | Early1:ALL            | Early1:ALL          | 0.002                   | 500                   | No                                                  | 0                            |
| Replacement Fire           | Early1:ALL            | Early1:ALL          | 0.005                   | 200                   | Yes                                                 | 0                            |
| Mixed Fire                 | Mid1:OPN              | Mid1:OPN            | 0.001                   | 1000                  | No                                                  | 0                            |
| Replacement Fire           | Mid1:OPN              | Early1:ALL          | 0.005                   | 200                   | Yes                                                 | 0                            |
| Competition or Maintenance | Mid1:CLS              | Mid1:CLS            | 0.001                   | 1000                  | No                                                  | 0                            |
| Replacement Fire           | Mid1:CLS              | Early1:ALL          | 0.005                   | 200                   | Yes                                                 | 0                            |
| Insects or Disease         | Mid1:CLS              | Mid1:OPN            | 0.007                   | 143                   | Yes                                                 | 0                            |
| Wind or Weather or Stress  | Late1:CLS             | Late1:CLS           | 0.001                   | 1000                  | No                                                  | 0                            |
| Replacement Fire           | Late1:CLS             | Early1:ALL          | 0.004                   | 250                   | Yes                                                 | 0                            |
| Insects or Disease         | Late1:CLS             | Early1:ALL          | 0.004                   | 250                   | Yes                                                 | 0                            |

### References

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