

10700

Rocky Mountain Alpine Dwarf-Shrubland

BpS Model/Description Version: Aug. 2020

Modelers		Reviewers	
Jim Ozenberger	jozenberger@fs.fed.us	Anonymous	None
Andy Norman	anorman@fs.fed.us		None
Sarah Canham	scanham@fs.fed.us	None	None

Vegetation Type

Shrubland

Map Zones

21

Geographic Range

This widespread ecological system occurs above upper timberline throughout the Rocky Mountain cordillera, including alpine areas of ranges in CO, NM, AZ, UT, NV, ID, MT, WY and north into Canada.

This BpS is common in MZ21 in subsections 342Dd, M331Ja, M331Df and M331Da (Wind River Range, Gros Ventre Range, Salt River Range, ranges in WY where elevations are over 10,000ft; Cleland et al. 2007).

Biophysical Site Description

Elevations are above 3,360m in the CO Rockies, but drop to less than 2,250m in southeastern British Columbia. This system occurs in areas of level or concave glacial topography, with late-lying snow, and sub-irrigation from surrounding slopes. Soils have become relatively stabilized in these sites, are moist, but well drained, strongly acid, and often with substantial peat layers.

At 46 degrees latitude, these conditions would occur at 10,000ft (3,000m). It is questionable as to how often peat layers are found at these elevations in MZ21.

Vegetation Description

This ecological system is characterized by a semi-continuous layer of ericaceous dwarf-shrubs, or dwarf willows which form a heath type ground cover less than 0.5m in height. Dense tufts of graminoids and scattered forbs occur. *Dryas octopetala* or *Dryas integrifolia* communities are included here, although they occur on more wind-swept and drier sites than the heath communities. Within these communities, *Cassiope mertensiana*, *Dryas integrifolia*, *Dryas octopetala*, *Salix arctica*, *Salix reticulata*, or *Phyllodoce empetriformis* can be dominant shrubs. *Vaccinium* spp., *Ledum glandulosum*, *Phyllodoce glanduliflora*, and *Kalmia microphylla* may also be shrub associates. The herbaceous layer is a mixture of forbs and graminoids, especially sedges, including, *Erigeron* spp., *Luetkea pectinata*, *Antennaria lanata*, *Oreostemma alpigenum* (= *Aster alpigenuus*), *Pedicularis* spp., *Castilleja* spp., *Deschampsia caespitosa*, *Caltha leptosepala*, *Erythronium* spp., *Juncus parryi*, *Luzula piperi*, *Carex spectabilis*, *Carex nigricans*, and *Polygonum bistortoides*. Fell-fields often intermingle with the alpine dwarf-shrubland. For MZ21, *Haplopappus suffruticosus* is also present.

Reviewers/modelers for MZ21 decided to add krummholz descriptive information here, as a krummholz BpS is absent from the BpS list, except for perhaps 1046, and krummholz would fit in closely with this BpS. For krummholz, species such as *Abies lasiocarpa*, *Picea engelmannii*, *Pinus ablicaulis*, *Ribes montigenus*, and *Carex* are present.

BpS Dominant and Indicator Species

Symbol	Scientific Name	Common Name
CAME7	<i>Cassiope mertensiana</i>	Western moss heather
DRIN4	<i>Dryas integrifolia</i>	Entireleaf mountain-avens
DROC	<i>Dryas octopetala</i>	Eightpetal mountain-avens
SAAR27	<i>Salix arctica</i>	Arctic willow
SARE2	<i>Salix reticulata</i>	Netleaf willow
PHEM	<i>Phyllodoce empetrifomis</i>	Pink mountainheath
VACCI	<i>Vaccinium</i>	Blueberry
ERIGE2	<i>Erigeron</i>	Fleabane

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

Disturbance Description

Vegetation in these areas is controlled by snow retention, wind desiccation, permafrost and a short growing season. Dry summers associated with major drought years (mean return interval of 100yrs) would favor grasses over forbs, whereas wet summers cause a more diverse mixture of forbs and graminoids.

Fire return interval is approximately 500yrs+. It has been suggested that it might be 2,000yrs as there is little evidence of spreading fire in this type.

Avalanches on stepper slopes where soil accumulated can cause infrequent soil-slips, which exposed bare ground.

Very small burns of a few square meters (replacement fire) caused by lightning strikes were included as a rare disturbance, although lightning storms are frequent in those elevations. The calculation of lightning strikes frequency was not based on fire return intervals, but on the number of strikes (in this case five) per 1,000 possible locations per year, thus 0.005.

Native herbivores (Rocky Mountain bighorn sheep, mule deer, elk and pica) were common in the alpine but probably did not greatly affect vegetation cover because animals move frequently as they reduce vegetation cover.

Fire Frequency

Severity	Avg FI	Percent of All Fires	Min FI	Max FI
Replacement	561	100		
Moderate (Mixed)				
Low (Surface)				
All Fires	561	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

This ecological system can occupy large areas of the alpine. Patch size varies from a few acres to 100ac in mountain basins. Stand-replacement fires may be caused by lightning strikes that do not spread due to the sparse cover of fine fuel and extensive barren areas acting as fire breaks.

Adjacency or Identification Concerns

Adjacent to and inter-mixed with Rocky Mountain Dry Tundra.

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Issues or Problems

Scarce information on this system.

Increased recreation use in the alpine zone (summer and winter) may have an effect on this BpS currently.

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	B	B	B	B	B	B	B	B	B	B
Shrub	0.5-1.0	B	B	B	B	B	B	B	B	B	B
Shrub	1.0-3.0	B	B	B	B	B	B	B	B	B	B
Shrub	>3.0	B	B	B	B	B	B	B	B	B	B
Tree	0-5	B	B	B	B	B	UN	UN	UN	UN	UN
Tree	5-10	B	B	B	B	B	UN	UN	UN	UN	UN
Tree	10-25	B	B	B	B	B	UN	UN	UN	UN	UN
Tree	25-50	B	B	B	B	B	UN	UN	UN	UN	UN
Tree	>50	B	B	B	B	B	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	10	Early Development 1 - All Structures
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Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
CAREX	Carex	Sedge	Upper
ERIGE2	Erigeron	Fleabane	Upper
DECA18	Deschampsia caespitosa	Tufted hairgrass	Upper
LUPE	Luetkea pectinata	Partridgefoot	Upper

Description

Very exposed (barren) state following a lightning strike. Exposed soil could also be due to other conditions such as wind and drought. Soil (not rock) may dominate the area. Grasses are more common than forbs or shrubs.

This model originally had canopy closure of 0-10% herbaceous; however, because that is unmappable, the canopy closure was changed to 20%.

Outside reviewer commented that class should have higher than 20% cover. This is probably a discrepancy between modeler and mapping perspective (scale). On the landscape, might be 0-20% cover, but of the pixel covered by grass, would be higher cover. It is suggested that this BpS even be modeled as a one-box model.

Maximum Tree Size Class

None

Class B	90	Late Development 1 - Closed
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Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
CAME7	Cassiope mertensiana	Western moss heather	Upper
DRIN4	Dryas integrifolia	Entireleaf mountain-avens	Upper
DROC	Dryas octopetala	Eightpetal mountain-avens	Upper
SAAR27	Salix arctica	Arctic willow	Upper

Description

Alpine community is dominated by semi-continuous layer of ericaceous shrubs. Plant cover may vary from 10% on exposed sites to as much as 50% on mesic and more protected sites.

Infrequent replacement fire in the form of lightning strikes, severe summer droughts and rare avalanches on steeper slopes with soil cause a transition to class A.

Maximum Tree Size Class

None

Model Parameters

Deterministic Transitions

From Class	Begins at (yr)	Succeeds to	After (years)
Early1:ALL	0	Late1:CLS	9
Late1:CLS	10	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
Optional 1	Late1:CLS	Early1:ALL	0.001	1000	Yes	0
Replacement Fire	Late1:CLS	Early1:ALL	0.002	500	Yes	0
Wind or Weather or Stress	Late1:CLS	Early1:ALL	0.01	100	Yes	0

Optional Disturbances

Optional 1: avalanches

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