

10700

Rocky Mountain Alpine Dwarf-Shrubland

BpS Model/Description Version: Aug. 2020

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Vegetation Type

Shrubland

Map Zones

10, 19, 28

Geographic Range

This BpS occurs above upper timberline throughout the Rocky Mountain cordillera, including alpine areas of ranges in CO (Komarkova 1976, 1980, Rottman and Hartman 1985, Willard 1973, Fowler et al. 2014), NM (Baker 1980, 1983, Fowler et al. 2014), AZ (Billings 1978, Smith 2006, Fowler et al. 2014), UT (Billings 1978), NV (Willard 2010, Billings 1978) ID (Billings 1978, Richardson and Henderson 1999), MT (Cooper et al. 1997, Aho and Bala 2012, Bamberg 1980, Bamberg and Major 1968), WY (Spence and Shaw 1983, Cain 1943, Knight 1996), and north into Canada (Schultz 2014, Smith 2006, Billings 1978, Malanson et al. 2015, Thileneus 1975, Schwan and Costello 1951). It is more widespread in the north and as the alpine zone becomes increasingly rare in the southern part of the Rockies, this BpS also becomes increasingly rare within those areas and patch sizes are smaller (Billings 1978).

Biophysical Site Description

Elevations are above 3,360m in the Colorado Rockies, (around 3,040-3,050m NV, 3,000m WY, 2,900m UT), 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, and are moist, but well drained, strongly acid, and often (more so in the north and less so to the south) with substantial peat layers (Billings 1978).

Vegetation Description

This BpS 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 (NatureServe 2016). Dense tufts of graminoids and scattered forbs occur throughout all the map zone. In the north, *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* may be present (more so in the north), *Salix arctica* (in the north), *Salix nivalis* (MT field guide 2016, USDA NRCS 2016)) or *Phyllodoce empetriformis* (MT, ID, AZ, WY) can be dominant shrubs (more so in the north). *Vaccinium* spp, *Ledum glandulosum*, *Phyllodoce glanduliflora* (MT, ID, WY) 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* (MT, ID), *Antennaria lanata* (MT, ID), *Oreostemma alpigenum* (= *Aster alpigenus*) (MT, ID, WY), *Pedicularis* spp, *Castilleja* spp, *Deschampsia caespitosa*, *Caltha leptosepala*, *Erythronium* spp., *Juncus parryi*, *Luzula piperi*, *Carex spectabilis*, *Carex nigricans*, *Minuartia obtusiloba*, and *Polygonum bistortoides*. Fell-fields often intermingle with the alpine dwarf-shrubland.

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
SANI8	<i>Salix nivalis</i>	Snow 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 (Heginbottom et al. 1997). In most areas, in most years, precipitation exceeds potential evaporation in all months (Aho 2006). Dry summers associated with major drought years would favor grasses over forbs, whereas wet summers cause a more diverse mixture of forbs and graminoids.

Avalanches on steeper slopes where soil accumulates can cause infrequent soil-slips, which expose bare ground. Also, debris flows caused by saturated ground from snow melt can expose bare ground and/or cover and bury existing vegetation.

Fires would likely burn into this BpS from adjacent forest BpSs in the most extreme drought years. 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 (Anderson et al. 2008, Schussman et al. 2006, Douglas and Ballard.1971).

Marmots, pikas, voles, and gophers are the primary herbivores (Smith 2006, Sherrod et al. 2005). Other native herbivores (Rocky Mountain bighorn sheep, mule deer and elk) were common in the alpine in the past but probably did not greatly affect vegetation cover because animals move frequently as they reduce vegetation cover. In some areas mountain goats occur naturally but are introduced in other alpine areas (Innes 2011).

Fire Frequency

Severity	Avg FI	Percent of All Fires	Min FI	Max FI
Replacement	227	100		
Moderate (Mixed)				
Low (Surface)				

All Fires	227	100		
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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 BpS can occupy large areas of the alpine (more so in the north and less so in the southern map zones and states). Patch size varies from a few acres to 100ac in mountain basins. Lager patches occur in MT with smaller patches occurring in NM, AZ and NV). 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. Also, can be adjacent to fell fields, herbaceous cushion plant communities and subalpine forests which can burn during drought years and fires can spread into this BpS (Anderson et al. 2008).

Issues or Problems

Scarce information on fire in this system.

Native Uncharacteristic Conditions

Marmot burrows and adjoining areas are typically devoid of vegetation due to foraging and burrowing activities.

Bare ground from avalanches or debris flows.

Comments

Kathleen Roche reviewed this BpS during 2016 BpS Review and made descriptive edits.

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 13 Early Development 1 - All Structures

Indicator Species

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

Description

Very exposed (barren) state following a lightning strike. Soil (not rock) may dominate the area. Plant recovery can be fairly rapid following fire (Douglas 1971). Some of the shrubs will rapidly resprout from the roots. If fire coincides with extreme and continuing drought recovery can be slower. Grasses are more common than forbs or shrubs.

Maximum Tree Size Class

None

Class B 87 Late Development 1 - Closed

Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
CAME7	<i>Cassiope mertensiana</i>	Western moss heather	Upper
DRIN4	<i>Dryas integrifolia</i>	Entireleaf mountain-avens	Upper
DROC	<i>Dryas octopetala</i>	Eightpetal mountain-avens	Upper
SAAR27	<i>Salix arctica</i>	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 90% on mesic and more protected sites.

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
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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	0.005	200	Yes	0
Wind or Weather or Stress	Late1:CLS	Early1:ALL	0.01	100	Yes	0

Optional Disturbances

Optional 1: avalanches and debris flows

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