

11440

Rocky Mountain Alpine Turf

BpS Model/Description Version: Aug. 2020

Modelers		Reviewers	
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None	None	None	None
None	None	None	None

Vegetation Type

Herbaceous

Map Zones

12, 16, 19, 28

Geographic Range

This widespread ecological system occurs above upper timberline throughout the Rocky Mountain cordillera, including alpine areas of ranges in Utah and Nevada, and north into Canada.

Biophysical Site Description

The alpine belt is above timberline (approximately >3,000m) and below the permanent snow level (<4,500m). Found on gentle to moderate slopes, flat ridges, valleys, and basins, where the soil has become relatively stabilized and the water supply is more or less constant.

Vegetation Description

This system is characterized by a dense cover of low-growing, perennial graminoids and forbs. Rhizomatous, sod-forming sedges are the dominant graminoids, and prostrate and mat-forming plants with thick rootstocks or taproots characterize the forbs. Dominant species include *Artemisia arctica*, *Carex elymoides*, *Carex siccata*, *Carex scirpoidea*, *Carex nardina*, *Carex rupestris*, *Deschampsia caespitosa*, *Festuca brachyphylla*, *Festuca idahoensis*, *Geum rosii*, *Kobresia myosuroides*, *Phlox pulvinata*, and *Trifolium dasyphyllum*. Although alpine tundra dry meadow is the matrix of the alpine zone, it typically intermingles with alpine bedrock and scree, ice field, fell-field, alpine dwarf-shrubland, and alpine/subalpine wet-meadow systems.

BpS Dominant and Indicator Species

Symbol	Scientific Name	Common Name
ARAR9	<i>Artemisia arctica</i>	Boreal sagebrush
CAEL3	<i>Carex elynoides</i>	Blackroot sedge
CAFO3	<i>Carex foenea</i>	Dryspike sedge
CASC10	<i>Carex scirpoidea</i>	Northern singlespike sedge
CANA2	<i>Carex nardina</i>	Spike sedge
CARU3	<i>Carex rupestris</i>	Curly sedge
DECA18	<i>Deschampsia caespitosa</i>	Tufted hairgrass
FEBR	<i>Festuca brachyphylla</i>	Alpine fescue

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, 100yrs) favor grasses over forbs, whereas wet summers cause a more diverse mixture of forbs and graminoids.

Avalanches on steeper slopes, where soil accumulated, can cause infrequent soil slips and expose bare ground.

Very small burns (replacement fire) of a few square meters caused by lightning strikes are possible in this biophysical setting (BpS), although lightning storms are frequent at high elevations.

Native herbivores (Rocky Mountain bighorn sheep, mule deer, and elk) 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	203	100		
Moderate (Mixed)				
Low (Surface)				
All Fires	203	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 1,000ac on mountain ridges and tops. 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 that act as fire breaks.

Adjacency or Identification Concerns

Many experts assert that the alpine is one of the community types more threatened by global climate change in coming decades. With climate change, the tree line is moving up in elevation.

Issues or Problems

There are no data on fire, effects of lightning strikes, or recovery time after stand-replacing events.

Native Uncharacteristic Conditions

Comments

Map zones (MZs) 12, 16, 19, and 28 were combined during the 2015 BpS Review.

In this model, fire probability was based on a calculation of lightning strike frequency rather than fire return intervals. The number of strikes was assumed to be five per 1,000 possible locations per year; thus, a probability of 0.005.

BpS 1144 for MZs 12, 17, and 28 was adopted as-is from BpS 1114 for MZ16, which was developed by Louis Provencher (lprovencher@tnc.org). Input to the model was based on discussion with Kimball Harper (retired USFS scientist, Utah), an alpine specialist in the Utah High Plateau.

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	B	B	B	B	B	B	B	B
Herb	0.5-1.0	A	A	B	B	B	B	B	B	B	B
Herb	>1.0	A	A	B	B	B	B	B	B	B	B
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	3	Early Development 1 - All Structures
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Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
CAREX	Carex	Sedge	Upper
DECA18	Deschampsia caespitosa	Tufted hairgrass	Upper
FEBR	Festuca brachyphylla	Alpine fescue	Upper

Description

Very exposed (barren) state following a lightning strike. Soil (not rock) may dominate the area. Grasses are more common than forbs.

Maximum Tree Size Class

None

Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
CAREX	Carex	Sedge	Upper
DECA18	Deschampsia caespitosa	Tufted hairgrass	Upper
ARAR9	Artemisia arctica	Boreal sagebrush	Upper

Description

Alpine community is dominated by graminoids, herbaceous perennials, and few low-growing shrubs. Plant cover may vary from 2% on exposed sites to as much as 25% 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	2
Late1:CLS	3	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	0.005	200	Yes	0
Wind or Weather or Stress	Late1:CLS	Early1:ALL	0.01	100	Yes	0

Optional Disturbances

Optional 1: Avalanches

References

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