11430

Rocky Mountain Alpine Fell-Field

BpS Model/Description Version: Aug. 2020

Vegetation Type

Herbaceous

Map Zones

9, 19, 21, 28

Geographic Range

This ecological system is found discontinuously at alpine elevations throughout the Rocky Mountains.

Biophysical Site Description

These are wind-scoured fell-fields that are free of snow in the winter, such as ridgetops and exposed saddles, exposing the plants to severe environmental stress. Soils on these windy, unproductive sites are shallow, stony, low in organic matter, and poorly developed. Wind deflation often results in a gravelly pavement. “Fell” is Gaelic for “stone”; a fell-field is a stone field. Sites are stable for hundreds to thousands of years as soils develop. They are, essentially, scree slopes.

Vegetation Description

Most fell-field plants are cushioned or matted, frequently succulent, flat to the ground in rosettes, and often densely haired and thickly cutinized. Plant cover is 15-50% whereas exposed rock makes up the rest. Fell-fields are usually within or adjacent to alpine tundra dry meadows.

BpS Dominant and Indicator Species

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 has 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 lighting storms are frequent at those elevations. The calculation of lightning strike frequency was not based on fire return intervals (FRIs), but on the number of strikes (in this case, five) per 1,000 possible locations per year; thus, 0.005. FRI is modeled at approximately 525yrs. A contributor for map zone (MZ) 21 felt that fire frequency is insignificant enough in the alpine BpSs in that zone that all alpine BpSs could be combined based on fire frequency; however, the alpine BpSs do have different species composition and biophysical gradients; therefore, the alpine types were not combined.

Alpine rodents (pikas, marmots, etc.) cause common but generally small-scale disturbances in these systems. 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

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

During the next decades, several experts claim that the alpine is one of the more threatened community types by global climate change. Essentially, the tree line is moving up. There is also an acid rain concern, especially in the Wind River Range for MZ21.

Issues or Problems

No data on fire or effects of lightning strikes. No data on recovery time after stand-replacing events. Species were derived from literature review. Modelers were uncertain about the amount of time it takes to succeed from Class A to Class B in the model. Moss campion, which flowers at 10yrs, was used to estimate growth rate.

Native Uncharacteristic Conditions

Cover of vegetation >50% indicates a system other than Rocky Mountain Alpine Fell-Field because rock cover is 50% or more in this community.

Comments

MZs 9, 19, 21, and 28 were combined during the 2015 BpS Review.

For LANDFIRE National, this model for MZs 10 and 19 had no peer review. Additional reviewers for MZ21 included Sarah Canham (scanham@fs.fed.us) and Brenda Fiddick (bfiddick@fs.fed.us).

Succession Classes

**Mapping Rules**

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 5 Early Development 1 - All Structures

Indicator Species

Description

Very exposed (barren) state following disturbance. Rock may dominate the area. Forbs (cushion plants) are more common than grasses.

*Maximum Tree Size Class*  
None

Class B 95 Late Development 1 - Closed

Indicator Species

Description

Alpine community is dominated by low-growing perennials and some graminoids. Plant cover may vary from 5% to as much as 50%. Infrequent replacement fire in the form of lightning strikes, severe summer drought, and animal disturbance (1/500) cause a transition to Class A.

*Maximum Tree Size Class*  
None

Model Parameters

Deterministic Transitions

Probabilistic Transitions

Optional Disturbances

Optional 1: Rodent Disturbances

References

Baker, W.L. 1980. Alpine vegetation of the Sangre De Cristo Mountains, New Mexico: Gradient analysis and classification. Unpublished thesis, University of North Carolina, Chapel Hill. 55 pp.

Bamberg, S.A. 1961. Plant ecology of alpine tundra area in Montana and adjacent Wyoming. Unpublished dissertation, University of Colorado, Boulder. 163 pp.

Bamberg, S.A. and J. Major. 1968. Ecology of the vegetation and soils associated with calcareous parent materials in three alpine regions of Montana. Ecological Monographs 38(2): 127-167.

Cooper, S.V., P. Lesica and D. Page-Dumroese. 1997. Plant community classification for alpine vegetation on Beaverhead National Forest, Montana. USDA Forest Service, Intermountain Research Station, Report INT-GTR-362. Ogden, UT. 61 pp.

Duft, J.F. and R.K. Mosely. 1989. Alpine Wildflowers of the Rocky Mountains. Mountain Press Publishing Co. Missoula MT. 200 pp.

Komarkova, V. 1976. Alpine vegetation of the Indian Peaks Area, Front Range, Colorado Rocky Mountains. Unpublished dissertation, University of Colorado, Boulder. 655 pp.

Komarkova, V. 1980. Classification and ordination in the Indian Peaks area, Colorado Rocky Mountains. Vegetation 42: 149-163.

NatureServe. 2007. International Ecological Classification Standard: Terrestrial Ecological Classifications. NatureServe Central Databases. Arlington, VA. Data current as of 10 February 2007.

Nelson, R.A. 1976. Plants of Rocky Mountain National Park. Rocky Mountain Nature Association. 168 pp.

Schwan, H.E. and D.F. Costello. 1951. The Rocky Mountain alpine type: Range conditions, trends and land use (a preliminary report). Unpublished report prepared for USDA Forest Service, Rocky Mountain Region (R2), Denver, CO. 18 pp.

Thilenius, J.F. 1975. Alpine range management in the western United States--principles, practices, and problems: The status of our knowledge. USDA Forest Service Research Paper RM-157. Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO. 32 pp.

Weber, W.A. 1976. Rocky Mountain Flora. Colorado Associated University Press. Boulder, CO. 484 pp.

Willard, B.E. 1963. Phytosociology of the alpine tundra of Trail Ridge, Rocky Mountain National Park, Colorado. Unpublished dissertation, University of Colorado, Boulder.

Zwinger, A.H. and B.E. Willard.1972. Land above the trees; A guide to American Alpine Tundra. Harper and Row. New York. 487 pp.