11460

Southern Rocky Mountain Montane-Subalpine Grassland

BpS Model/Description Version: Aug. 2020

|  |  |  |  |
| --- | --- | --- | --- |
| **Modelers** |  | **Reviewers** |  |
| John Vankat (MZ27 changes) | vankatjl@muohio.edu | John Vankat | vankatjl@muohio.edu |
| None | None | None | None |
| None | None | None | None |

Vegetation Type

Herbaceous

Map Zone

27

Geographic Range

This Biophysical Setting (BpS) occurs in northern Arizona, southern and northern New Mexico, southern Colorado, and Utah's Rocky Mountains, and some parts of Wyoming maybe. It is thought that this might occur in map zone (MZ) 27 in Sandia, maybe Sierra Grande.

Biophysical Site Description

This Rocky Mountain ecological system typically occurs between 2,200-3,000m on flat to rolling plains and parks or on lower sideslopes that are dry, but it may extend up to 3,350m on warm aspects. Soils resemble prairie soils in that the A-horizon is dark brown, relatively high in organic matter, slightly acidic, and usually well drained.

This montane-subalpine grassland occurs in "parks" where there are finer textured soils, different snow accumulation patterns, and "frost pockets" that all combine to limit trees.

It is thought (John Vankat, personal communication) that this BpS might be divided into two kinds of grasslands -- valley bottom and slope -- because they differ in the ecological processes that formed and maintain them (Vankat 2005). Valley bottom grasslands occur in some drainages with fine-textured, deep, well-developed, and well- to poorly drained soils, as well as deep, long-lasting snow pack, cold-air drainage, frost heaving, seasonal drought, animal activity, and fire. Slope grasslands occur on broad, relatively steep, primarily south-facing slopes, with deep, well-drained, dry soils, high fire frequency, winter desiccation of tree seedlings, and absence of seeds of drought-resistant trees. The margins of valley bottom grasslands may function as slope grasslands.

Vegetation Description

This BpS usually consists of a mosaic of two or three plant communities with one of the following dominant bunch grasses: *Danthonia intermedia*, *Danthonia parryi*, *Festuca idahoensis*, *Festuca arizonica*, *Festuca thurberi*, *Muhlenbergia filiculmis*, *Pseudoroegneria spicate*, or various sedges (*Carex* spp.) in moist (concave) sites. The subdominants include *Muhlenbergia montana*, *Boutela gracilis*, and *Poa secunda*. These large-patch grasslands are intermixed with matrix stands of spruce-fir, lodgepole pine, mixed conifer, aspen forest, and to a lesser degree in the Southwest, ponderosa pine forest.

The following are other grassland types that belong in here: *Anthonia parryi*, *Muhlenbergia montana*, *Festuca idahoensis*, *Agropyron spicatum*, and *Deschampsia cespitosa*.

BpS Dominant and Indicator Species

|  |  |  |
| --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** |
| FESTU | *Festuca* | Fescue |
| FETH | *Festuca thurberi* | Thurber's fescue |
| FEAR2 | *Festuca arizonica* | Arizona fescue |
| MUMO | *Muhlenbergia montana* | Mountain muhly |
| DAPA2 | *Danthonia parryi* | Parry's oatgrass |
| FEID | *Festuca idahoensis* | Idaho fescue |

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

Disturbance Description

MZs 23 and 24 modelers state that the predicted historic stand-replacement fire regime is approximately 20-60yrs, based upon historic photographic analysis, personal communication (Barry Johnston, USFS Region 2), and inference from mean/max and min fire regimes of adjacent forest types (PIPO 3-12yrs, ABCO/PSMEG 14-46yrs, PIEN/ABLAA 60-180+yrs). Anthropogenic (pre-European) fire use ignitions may have occurred every 5-15yrs. (The current regime is >60yrs in montane and 100yrs in subalpine systems.) For MZ27 and the southwest, these statements might conflict with Allen (2002).

MZ29 modelers state that fire return interval is strongly controlled by the surrounding forest and by aspect and fits the disturbance description for 291140, the Northern Subalpine Grass system. Therefore, the mean fire return interval (MFRI) was chosen at 75yrs overall replacement fire. (MZ23/24 had an overall MFRI of 10yrs, with 20yr replacement and 20yr surface/low severity. Reviewers for MZ29 disagreed with this.) It seems to take a long time for enough fuel (biomass) to build up after a replacement fire for there to be much chance of another one in <60-100yrs. Many of these areas are snow-covered during the Wyoming "early fire season" when the grasses cure out at the lower elevations, and many of these areas can have frost during any part of the year -- making the fine fuel moisture recovery reduce fire starts and fire spread.

For MZ27, there is little or no evidence for much of the above applying in the Southwest. Allen (1984) reported an MFRI of 15yrs for slope grasslands in the Jemez Mountains of New Mexico (John Vankat, personal communication). Because MZ27 is more similar to MZ23/24 and Rapid Assessment model R3MGRA, the MFRI was changed to be more similar to those mapzones, with an average of approximately 20-25yrs.

Review of this type for MZs 23 and 24 noted that there is insufficient information to distinguish fire regimes for all the variants of this type in the Southwest and Southern Rockies.

Fire Frequency

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Severity** | **Avg FI** | **Percent of All Fires** | **Min FI** | **Max FI** |
| Replacement | 23 | 100 | 10 | 100 |
| Moderate (Mixed) |  |  |  |  |
| Low (Surface) |  |  |  |  |
| All Fires | 23 | 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

Type occurs in large patches of 100-1,000ac.

Adjacency or Identification Concerns

This is almost the same as BpS 1140, the Northern version.

Montane grasslands are very similar and intergrade with their subalpine counterparts but are separated to represent those species that do not occur at higher altitudes.

This subalpine grassland might be difficult to distinguish from the montane grassland. There is a montane grassland that occurs below the mountain shrubs in elevation and below the forest zone; then there is this subalpine grassland that occurs intermingled with the higher-elevation forests but not above the timber line (it is separate from alpine grass/tundra). The subalpine grassland occurs in "parks" where there are both finer-textured soils, different snow accumulation patterns, and "frost pockets" that all combine to limit trees. The grasses are generally shorter and, where tall, less continuous than in the lower-elevation grassland.

This would be difficult to distinguish from pure alpine sites/systems. This system might also be confused with mountain big sage type, because if the mountain big sage type burns, it will look like this type and will have the species in this type. So the seral condition of 1126, mountain big sagebrush, will be difficult to distinguish. This could also be confused with the Wyoming-basin low sagebrush shrubland when the low sagebrush burns, as it will appear to be this system, at least while the low sagebrush is in early stage.

There has been an increase in *Poa secunda* currently versus historically. Clumps of Idaho fescue become smaller and smaller until die out, then converts to the *Danthonia* and *Poa secunda*. But still in same system.

Sheep and cattle in this system currently. Heavy grazing now. System not adapted to that – so, loss of fescue. Bluebunch wheatgrass is a decreaser species in this system also, in addition to FEID.

Kentucky bluegrass is a big increaser in these sites in areas with a little excess moisture. Smooth brome is also an increaser in the montane areas. Timothy (*Phleum pratensi*) is also an increaser and an exotic in this system -- especially where there are horses.

This system will probably not appear departed, however, when looking from a satellite and looking at cover/height.

Issues or Problems

There is little or no scientific basis for estimating fire intervals for this type.

Native Uncharacteristic Conditions

Decreased cover today

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 | B | B | B | B | B | B | B |
| Herb | 0.5-1.0 | A | A | A | B | B | B | B | B | B | B |
| Herb | >1.0 | A | A | A | B | B | B | B | B | B | B |
| Shrub | 0-0.5 | B | UN | UN | UN | UN | UN | UN | UN | UN | UN |
| Shrub | 0.5-1.0 | B | UN | UN | UN | UN | UN | UN | UN | UN | UN |
| Shrub | 1.0-3.0 | B | UN | UN | UN | UN | UN | UN | UN | UN | UN |
| Shrub | >3.0 | B | UN | UN | UN | UN | UN | UN | UN | UN | UN |
| Tree | 0-5 | B | UN | UN | UN | UN | UN | UN | UN | UN | UN |
| Tree | 5-10 | B | UN | UN | UN | UN | UN | UN | UN | UN | UN |
| Tree | 10-25 | B | UN | UN | UN | UN | UN | UN | UN | UN | UN |
| Tree | 25-50 | B | UN | UN | UN | UN | UN | UN | UN | UN | UN |
| Tree | >50 | B | UN | UN | UN | UN | 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 16 Early Development 1 - All Structures

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| FETH | Festuca thurberi | Thurber's fescue | Upper |
| FEAR2 | Festuca arizonica | Arizona fescue | Upper |
| ANPA | Anemone parviflora | Smallflowered anemone | Upper |
| ERFO | Eragrostis fosbergii | Fosberg's lovegrass | Upper |

Description

Low cover and frequency of Thurber fescue (FETH), Arizona fescue (FEAR2), sheep fescue (FEOV), mountain muhly (MUMO), timber/Parry's oatgrass (DAIN/DAPA), Kentucky bluegrass (POPR), and nodding brome (BRAN); tufted hairgrass (DECE) and various sedges (*Carex* spp.) in moist (concave) sites. BLTR is common.

*Maximum Tree Size Class*  
None

Class B 84 Late Development 1 - Closed

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| FETH | Festuca thurberi | Thurber's fescue | Upper |
| DAPA2 | Danthonia parryi | Parry's oatgrass | Upper |
| MUMO | Muhlenbergia montana | Mountain muhly | Upper |
| FEAR2 | Festuca arizonica | Arizona fescue | Upper |

Description

Thurber fescue (FETH), Arizona fescue (FEAR2), sheep fescue (FEOV), mountain muhly (MUMO), timber/Parry's oatgrass (DAIN/DAPA), Kentucky bluegrass (POPR), and nodding brome (BRAN); tufted hairgrass (DECE) and various sedges (*Carex* spp.) in moist (concave) sites.

*Maximum Tree Size Class*  
None

Model Parameters

Deterministic Transitions

|  |  |  |  |
| --- | --- | --- | --- |
| **From Class** | **Begins at (yr)** | **Succeeds to** | **After (years)** |
| Early1:ALL | 0 | Late1:CLS | 4 |
| Late1:CLS | 5 | 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** |
| Replacement Fire | Early1:ALL | Early1:ALL | 0.0435 | 23 | Yes | 0 |
| Replacement Fire | Late1:CLS | Early1:ALL | 0.0435 | 23 | Yes | 0 |

References

Allen, C.D. 1984. Montane grassland in the landscape of the Jemez Mountains, New Mexico, Master's Thesis, Univ. Wisconsin, Madison, WI.

Allen, C.D. 1989. Changes in the landscape of the Jemez Mountains, New Mexico. University of California, Berkeley, California.

Allen, C.D. 2002. Lots of lightning and plenty of people: an ecological history of fire in the upland Southwest. Pages 143-193 in: T.R. Vale, editor. Fire, native peoples, and the natural landscape, Island Press, Covelo, CA.

Brewer D.G., R.K. Jorgensen, L.P. Munk, W.A. Robbie and J.L. Travis. 1991. Terrestrial Ecosystem Survey of the Kaibab National Forest. USDA Forest Service, Southwestern Region. 319 pp.

Chumley, T.W., B.E. Nelson and R.L. Hartman. 1998. Atlas of the Vascular

Plants of Wyoming. University of Wyoming, Laramie, WY. Available at:

http://www.sbs.utexas.edu/tchumley/wyomap/atlas.htm.

Danker, R.C., W. Robbie and C. Landers. 1979. Terrestrial Ecosystem Report for Smokey Bear Ranger District. USDA Forest Service, Southwestern Region. 245pp. w/maps.

Dick-Peddie, W.A. 1993. New Mexico Vegetation; Past, Present and Future. University of New Mexico Press. Albuquerque, NM.

Dillon, G.K., D. Knight and C. Meyer. 2003. Historic Variability for Upland Vegetation in the Medicine Bow National Forest. Department of Botany, Univ. of Wyoming: prepared under agreement with the USDA Forest Service MBNF 1102-0003-98-043. Available at: http://www.treesearch.fs.fed.us/pubs/20739 [11/27/06].

Edwards, M., G. Miller, J. Redders, R. Stein and K. Dunstan. 1987. Terrestrial Ecosystem Survey of the Carson National Forest. USDA Forest Service Southwestern Region. 552 pp.

Hartman, R and B.E. Nelson. 2002. Final Report Medicine Bow National Forest General Floristic/Sensitive Plant Species Survey of the Medicine Bow National Forest, Wyoming. Report submitted to the Medicine Bow-Routt National Forests. On file at Medicine Bow-Routt NFs and Thunder Basin NG Supervisor’s Office, Laramie, WY.

Jones, G.P. 1989 a. Report on the Ashenfelder Basin Special Interest Area. Unpublished report prepared for Medicine Bow National Forest by WYNDD.

Jones, G.P. and S.M. Ogle. 2000. Characterization abstracts for vegetation types on the Bighorn, Medicine Bow, and Shoshone National Forests. Laramie. Prepared for USDA Forest Service, Region 2, by George Jones and Steve Ogle, WYNDD, UW, Laramie WY.

Knight, D.H. 1994. Mountains and Plains, The Ecology of Wyoming Landscapes. Yale University Press, New Haven, CT.

Knight, D.H. and W.A. Reiners. 2000. Natural patterns in southern Rocky Mountain landscapes and their relevance to forest management. In Forest Fragmentation in the Southern Rocky Mountains. R. Knight, F.W. Smith, W.H. Romme and W.L. Baker eds. University Press of Colorado, Boulder, Colorado:15-30.

Knight, D.H., A.D. Anderson, G.T. Baxter, K.L. Diem, M. Parker, P.A. Rechard, P.C. Singleton, J.F. Thilenius, A.L. Ward and R.W. Weeks. 1975. Final Report the Medicine Bow Ecology Project, The potential Sensitivity of Various Ecosystem Components to Winter Precipitation Management in The Medicine Bow Mountains, Wyoming. Prepared for the Division of Atmospheric Water Resources Management, Bureau of Reclamation, USDI, Denver, CO by the Rocky Mountain Forest and Range Experiment Station, USDA Forest Service and the Wyoming Water Resource Research Institute.

Miller, G., N. Ambos, P. Boness, D. Ryher, G. Robertson, K. Scalzone, R. Steinke and T. Subirge. 1995. Terrestrial Ecosystem Survey of the Coconino National Forest. USDA Forest Service, Southwestern Region. 405 pp.

Miller, Gregory, Jeff Redders, Ron Stein, Malcolm Edwards, John Phillips, Valerie Andrews, Steve Sebring and Corrine Vaandrager. 1993. Terrestrial Ecosystem Survey of the Santa Fe National Forest. USDA Forest Service Southwestern Region. 563 pp. Maps.

Moir, William H., 1967. The subalpine tall grass, Festuca thurberi, community of Sierra Blanca, New Mexico. The Southwest Naturalist. 12: 321-328.

Moore, Margaret M. and David W. Huffman. 2004. Tree encroachment on meadows of the North Rim, Grand Canyon National Park, Arizona, U.S.A. Arctic, Antarctic, and Alpine Research 36: 474-483.

Muldavin, Esteban and Phil Tonne. 2003. A Vegetation Survey and Preliminary Ecological Assessment of the Valles Caldera National Preserve, New Mexico. Final Report. New Mexico Natural Heritage Program. Albuquerque, NM.

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

NatureServe. 2006. International Ecological Classification Standard: Terrestrial Ecological

Classifications. NatureServe Central Databases. Arlington, VA, U.S.A. Data current as of

18 July 2006.

Peet, R.K. 2000. Forests and meadows of the Rocky Mountains. Pages 75-121 in: M.G. Barbour and W.D. Billings, editors. North American terrestrial vegetation. 2nd edition. Cambridge University Press, New York, NY.

Swetnam, Thomas W. 1990. Fire History and Climate in the Southwestern United States. USDA Forest Service. Rocky Mountain. Forest and Range Exp. Sta. GTR-RM-191.

Touchan, R., C.D. Allen and T.W. Swetnam. 1996. Fire history and climatic patterns in the ponderosa pine and mixed-conifer forests of the Jemez Mountains, northern New Mexico. Pages 33-46 in: C.D. Allen, tech. ed. Proceedings of the second La Mesa fire symposium, fire effects in southwestern forests. RM-GTR-2. Fort Collins, CO: USDA Forest Service, Rocky Mountain Forest and Range Experiment Station. 216 pp.

Turner, G.T. and H.A. Paulsen, Jr. 1976. Management of mountain grasslands in the central Rockies: the status of our knowledge. USDA Forest Service Research Paper RM-161, Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO.

Vankat, J.L. 2005. Montane and subalpine terrestrial ecosystems of the southern Colorado Plateau – literature review and conceptual models. Pages 1-100 (of Supplement II) in L. Thomas, M. Hendrie (ed.), C. Lauver, S. Monroe, N. Tancreto, S. Garman, and M. Miller. Vital signs monitoring plan for the Southern Colorado Plateau Network: phase III report, National Park Service, Southern Colorado Plateau Network, Flagstaff, Arizona (http://www1.nature.nps.gov/im/units/scpn/Documents/Supplements/SupplementII\_Montane\_Model.pdf). [note: a version of this has been submitted for publication and is in review].