10860

Rocky Mountain Lower Montane-Foothill Shrubland

BpS Model/Description Version: Aug. 2020

Vegetation Type

Shrubland

Map Zones

27, 31, 33

Geographic Range

This system occurs in the foothills, canyon slopes, and lower mountains of the Rocky Mountains. It ranges from southern New Mexico extending north into Wyoming and west into the Intermountain region.

This system is mostly found on the eastern Front Range -- both sides of the southern Rockies; there are also large patches on western side. It's patchy in canyons and adjacent to shortgrass prairie. The description here focuses more on true mountain-mahogany community type. Information in the FEIS online database indicates that the central distribution of true mountain-mahogany is located on the west side of the Rocky Mountains in the foothills and mountains of Utah, Colorado, and Wyoming. The range of true mountain-mahogany also extends north into Montana, east into South Dakota, and Nebraska, south from Oklahoma into Mexico, and west into Arizona and Nevada. True mountain-mahogany occasionally occurs in Idaho and southwestern Oregon.

Some experts felt that this system did not occur in New Mexico in map zone (MZ) 27 and rather occurred west of the New Mexico portion of MZ27.

This might be just on the outskirts of MZs 31 and 39, in the westernmost area on the fringes. In general, there is no mountain-mahogany in the eastern or central portions of MZs 31 or 39.

Biophysical Site Description

This ecological system is found in the foothills, canyon slopes, and lower mountains of the Rocky Mountains and on outcrops and canyon slopes in the western Great Plains. These shrublands are usually associated with exposed sites, rocky substrates, and dry conditions, which limit tree growth.

This Biophysical Setting (BpS) occurs in the transition zone between the plains and montane life zones. It ranges from roughly 1,500-2,900m (4,950-9,570ft). This BpS occurs on relatively dry sites with thin, shallow soils on moderately steep aspects. This BpS is not intended to cover communities dominated by ocean-spray (HODU) on extremely rocky sites (where vegetation is clearly subordinate to rock).

This system could be common in the foothills where *Quercus gambelii* is absent such as the northern Colorado Front Range and in drier foothills and prairie canyonlands and outcrops.

In New Mexico, this system is often a successional stage within pinyon woodlands maintained in a landscape by fire but eventually progressing to pinyon-juniper or as persistent shrubland on rocky breaks and ridges.

Vegetation Description

Species dominance varies depending on site conditions and by geographic location. Scattered trees or inclusions of grassland patches or steppe may be present, but the vegetation is typically dominated by a variety of shrubs including *Andropogon gerardii*, *Amelanchier utahensis*, *Cercocarpus montanus*, *Purshia tridentata*, *Rhus trilobata*, *Prunus americana*, *Ribes cereum*, *Symphoricarpus oreophilus,* and *Yucca glauca*.

Grasses may include species of *Bouteloua* (*B. curtipendula*), *Muhlenbergia*, *Hesperostipa*, *Sorghastrum nutans*, and *Pseudoroegneria spicata* or Griffith wheatgrass.

Shrub species dominant are true mountain-mahogany, several species of rabbitbrush, snowberry, hackberry, and chokecherry. *Quercus gambelii* does not occur. However, *Quercus undulata* (wavyleaf oak) is an important component in New Mexico.

Ponderosa pine, pinyon pine, and junipers may also be associated with this system. There is some evidence of early removal of these trees -- needs research.

BpS Dominant and Indicator Species

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

Disturbance Description

Historically, this type may have been in a Fire Regime Group IV or II -- primarily moderate-interval (e.g., 30-70yr) replacement fires in the shrub-dominated layer. Nearly all the dominant species in this BpS have the capability to resprout after disturbance.

For MZs 25 and previous, mixed-severity fire was modeled. However, due to a new understanding of fire severity definitions, only replacement fire was modeled for MZs 27 and 33. The mean fire return interval (MFRI) was originally 80yrs replacement and 50yrs mixed. Some feel that the overall MFRI might be ~80yrs; however, there is very little direct evidence of either 50 or 80yrs to ascertain.

Fires play an important role in this system as the dominant shrubs usually have a severe die-back following fire, although some plants will stump sprout.

In New Mexico, this type is maintained within the pinyon-juniper matrix by repeated stand-replacement fires.

Grazing or browsing primarily by deer, elk, and some pronghorn occurred, as well as bison.

Browsing/barking by rabbits occurs during heavy snowfall. Voles may also impact during heavy snow years.

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

Erhard's observations suggest that the scale of the most common disturbance extent is relatively small. The disturbance regime is expected to be relatively frequent under historic conditions. Scale estimate is in the 100s of acres realm -- not 1,000s of acres. However, in the last several years, there have been fires in the 1,000s of acres. Native grazing and browsing affect areas on a scale of probably 100s of acres. In New Mexico, there can be large brush fields of this type inside the pinyon-juniper matrix that are maintained by repeated stand-replacing fires.

The system occurs in large patches -- and can occur from 100-50,000ac. But more commonly, it would occur in the 1,000s of acres.

Adjacency or Identification Concerns

Shrub species vary by geographic location in this region. Shrub species dominance is tied to a variety of environmental conditions including geology, soils, topographic position, etc., making a description of this generalized type problematic.

This system is generally drier than Rocky Mountain Gambel Oak-Mixed Montane Shrubland (CES306.818) but may include mesic montane shrublands where *Quercus gambelii* does not occur. (However, *Q. undulata* does occur in New Mexico.)

Fire suppression may have allowed an invasion of trees into some of these shrublands, but in many cases west-facing slope and drier sites are too dry for tree growth. This can occur in some sites. (Some feel that fire suppression has allowed ponderosa pine to return more quickly and that they are native to these soils and sites -- Harvey Sprock, NRCS, personal communication.) Most of the steep west-facing hogbacks consist of deeper developed soils that do not have trees or many shrubs. On north-facing or east-facing slopes, ponderosa pine, pinyon pine, and junipers may also be associated with this system in more mesic patches -- scattered patches. There is some evidence of removal of these trees in the 1800s to early 1900s -- needs research. It is also thought that sometimes this is not invasion but rather succession to woodlands.

Today, in portions, the understory is dominated by exotics -- toadflax, knapweeds, cheatgrass, musk thistle, Kentucky bluegrass, Canada bluegrass, and mullein. These exotics may have a very different fire regime than the historic condition. Overstory is probably okay.

Recreation today such as foot, bike, and horse traffic is disturbing this system. Roads and housing are causing fragmentation.

Past, continuous (livestock) grazing has also altered the understory especially.

There are still some large fully functioning patches. But when near urban areas, much is degraded.

In New Mexico, this system is often a successional stage within pinyon woodlands maintained in a landscape by fire but eventually progressing to pinyon-juniper. Therefore, this type might also be considered a state in the pinyon-juniper models.

Without fire, the shrubs will grow taller and bigger and, from a wildlife forage point of view, less palatable. Hence, there is a management inclination to burn these shrublands at a higher-than-normal MFRI today (Este Muldavin, personal communication).

Issues or Problems

This is a poorly understood system and needs better monitoring data.

This is a model of succession from shrubland to grassland. It is uncertain if that works for New Mexico -- either this stuff is persistent shrublands or it moves to woodlands rather than grasslands. Reviewers cannot think of a place where there has been such a grassland dynamic. This type can be much more prevalent adjacent to grasslands going north into Colorado and Wyoming -- hence the model transition to grassland. But in New Mexico, that might be relatively rare.

Native Uncharacteristic Conditions

Comments

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 17 Early Development 1 - All Structures

Upper-layer lifeform is not the dominant lifeform. Herbaceous cover may dominate: BOGR2, up to 0.09m in height, canopy cover 20-60%. Shrub cover less than 10% 0-1m.

Indicator Species

Description

Early succession, usually after moderately frequent stand-replacement fires; grasses and forbs dominant. <10% shrub cover, with grasses/forbs dominant in extensive openings. (Some question whether or not mountain muhly was abundant.)

Climate -- drought, above-average precipitation, late-spring frosts, etc., are major factors in the time it takes for this class to succeed.

This is a model of succession from shrubland to grassland. It is uncertain if that works for New Mexico -- either this system remains as persistent shrublands or it moves to woodlands rather than grasslands. Reviewers cannot think of a place where there has been such a grassland dynamic. This type can be much more prevalent adjacent to grasslands going north into Colorado and Wyoming, but in New Mexico, that might be relatively rare.

*Maximum Tree Size Class*  
None

Class B 21 Mid Development 1 - Closed

Upper-layer lifeform is not the dominant lifeform. Herbaceous cover may dominate at times/ locations: BOGR2, up to 0.09m in height, canopy cover 0-20%.

Indicator Species

Description

This class contains >10% shrub cover (i.e., line intercept method) by weakly sprouting and seed-producing shrubs; grasses/forbs dominant in scattered openings.

*Maximum Tree Size Class*  
None

Class C 62 Late Development 1 - Closed

Indicator Species

Description

There is >30% shrub cover depending on location/timing, with over-mature shrubs as patchy dominant overstory (e.g., in rock outcrops); grasses/forbs dominant in extensive openings. All age classes are present but dominated by over-mature shrubs (e.g., in rocky draws).

Other indicator species might include *Shizachyrium scoparium*, *Bouteloua curtipendula*, and *Pseudoroegeneria spicata*. Some feel that some of the tree species might occur in this class historically -- such as *Pinus ponderosa*, *Juniperus scopulorum*, and *Pinus edulis* -- and that they might indicate succession instead of encroachment (Sprock, personal communication).

There might be very scattered trees in this class.

*Maximum Tree Size Class*  
None

Model Parameters

Deterministic Transitions

Probabilistic Transitions

References

Arno, Stephen F. and Gruell, George E. 1983. Fire history at the forest-grassland ecotone in southwestern Montana. Journal of Range Management 36: 332-336.

Arno, Stephen F. and Gruell, George E. 1986. Douglas-fir encroachment into mountain grasslands in southwestern Montana. Journal of Range Management 39: 272-275.

Arno, Stephen F. and Wilson, Andrew E. 1986. Dating past fires in curlleaf mountain mahogany communities. Journal of Range Management 39(3): 241-243.

Bunting, Stephen C., Neuenschwander, Leon F. and Gruell, George E. 1985. Fire ecology of antelope bitterbrush in the Northern Rocky Mountains. In: Lotan, James E. and Brown, James K., compilers. Fire’s Effects on Wildlife Habitat—Symposium Proceedings. March 21, 1984, Missoula, Montana. Gen. Tech. Rep. INT-186. Ogden, UT: USDA Forest Service, Intermountain Research Station: 48-57.

Erdman, J.A. 1970. Pinon-juniper succession after natural fires on residual soils of Mesa Verde, Colorado. Brigham Young University Biological Series Vol. XI (2). 58pp.

Floyd, M.L, W.H. Romme and D.D. Hanna. 2000. Fire History and vegetation pattern in Mesa Verde National Park, Colorado, USA. Ecological Applications 10: 1666-1680.

Gruell, George E., Bunting, Stephen C. and Neuenschwander, Leon F. 1985. Influence of fire on curlleaf mountain mahogany in the Intermountain West. In: Lotan, James E. and Brown, James K., compilers. Fire’s Effects on Wildlife Habitat— Symposium Proceedings. March 21, 1984, Missoula, Montana. Gen. Tech. Rep. INT-186. Ogden, UT: USDA Forest Service, Intermountain Research Station: 58-71.

Johnston, Barry C., Laurie Huckaby, Terry J. Hughes and Joseph Pecor. 2001. Ecological types of the Upper Gunnison Basin: Vegetation-soil-landform-geology-climate-water land classes for natural resource management. Technical Report R2-RR-2001-01, 858 pp. Lakewood, CO: USDA Forest Service, Rocky Mountain Region. May, 2001. Keeley, J.E. and S.C. Keely. 1988. Chaparral. Chapter 6 (pages 165-207) in: Barbour, M.G. and W.D. Billings (editors). North American terrestrial vegetation. Cambridge Univ. Press, Cambridge, England.

Martin, Robert E. and Driver, Charles H. 1983. Factors affecting antelope bitterbrush reestablishment following fire. In: Tiedemann, Arthur R. and Johnson, Kendall L., compilers. Research and management of bitterbrush and cliffrose in western North America. Gen. Tech. Rep. INT-152. Ogden, UT: USDA Forest Service, Intermountain Forest and Range Experiment Station: 266-279.

Mueggler, Walter F. and Stewart, William L. 1980. Grassland and shrubland habitat types of western Montana. Gen. Tech. Rep. INT-66. Ogden, UT: USDA Forest Service, Intermountain Forest and Range Experiment Station, 154 pp.

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

NatureServe. 2005. NatureServe Explorer: An online encyclopedia of life [web application]. Version 4.4. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: May 3, 2005 ).

Omi, P. and L. Emrisk. 1980. Fire and resource management in Mesa Verde National Park. Contract CS-1200-9-B015. Unfinished report, on file at Mesa Verde National Park.

Paysen, Timothy E.; Ansley, James R.; Brown, James K.; Gottfried, Gerald J.; Haase, Sally M.; Harrington, Michael G.; Narog, Marcia G.; Sackett, Stephen S. and Wilson, Ruth C. Chapter 6: Fire in Western Shrubland, Woodland, and Grassland Ecosystems. In: Brown, James K.; Smith, Jane Kapler, eds. Wildland fire in ecosystems: Effects of fire on flora. Gen. Tech. Rep. RMRS-GTR-42-vol. 2. Ogden, UT: USDA Forest Service, Rocky Mountain Research Station: 121-160.

Rice, C.L. 1983. A literature review of the fire relationships of antelope bitterbrush. In: Tiedemann, Arthur R.; Johnson, Kendall L., compilers. Research and management of bitterbrush and cliffrose in western North America. Gen. Tech. Rep. INT-152. Ogden, UT: USDA Forest Service, Intermountain Forest and Range Experiment Station: 256-265.

Romme, W.H., P. Barry, D. Hanna and S. White. A wildlife hazard map for La Plata County, Colorado. Final report to the San Juan National Forest, Durango, CO.

Schmidt, Kirsten M, Menakis, James P., Hardy, Colin C., Hann, Wendel J., Bunnell, David L. 2002. Development of coarse-scale spatial data for wildland fire and fuel management. Gen. Tech. Rep. RMRS-GTR-87. Fort Collins, CO: USDA Forest Service, Rocky Mountain Research Station. 41 pp. + CD.

Shiflet, Thomas N., ed. 1994. Rangeland cover types of the United States. Denver, CO: Society for Range Management. 152 pp.

Spencer, J.R., W.H. Romme, L. Floyd-Hanna and P.G. Rowlands. 1995. A preliminary vegetation classification for the Colorado Plateau. Pages 193-213 in: C. van Riper III (editor), Proceedings for the second biennial conference on research in Colorado Plateau national parks. National Park Service Transactions and Proceedings Series NPS/NRNAU/NRTP-95/11.

Spencer, A.W. and W.H. Romme. 1996. Ecological patterns, Pages 129-142 in: Blair, R. (managing editor), The western San Juan Mountains: their geology, ecology, and human history. University Press of Colorado, Niwot, CO.

USDA Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (2002, December). Fire Effects Information System: http://www.fs.fed.us/database/feis/.

USDA-NRCS Ecological Site/Range Site Descriptions, Section II, Field Office Technical Guides. http://www.nrcs.usda.gov/Technical/efotg/.

Wright, Henry A. 1971. Shrub response to fire. In: Wildland shrubs—their biology and utilization. Gen. Tech. Rep. INT-1. Ogden, UT: USDA Forest Service, Intermountain Forest and Range Experiment Station: 204-217.