10540

Southern Rocky Mountain Ponderosa Pine Woodland

BpS Model/Description Version: Aug. 2020

Vegetation Type

Forest and Woodland

Map Zone

29

Geographic Range

This type would be in map zones (MZs) 29, 30, and 20. In MZ29, sections M331I, M331B, and 342A; subsection 342Fb (Cleland et al. 2007). It also occurs in Bighorns in Wyoming. This is the ponderosa pine woodland that is in the Rocky Mountain range. In Wyoming, it is basically found in the Laramie and Bighorn ranges and west.

Biophysical Site Description

North and northeast aspect slopes outside of Laramie Peak (section M331). Soils range from sandy loams to loams (Hansen and Hoffman 1988). The underlying substrate would be predominantly sedimentary. Elevation would be at ~3,000-4,000ft.

This Biophysical Setting (BpS) is found on all aspects of Laramie Peak above ponderosa pine savanna (BpS 1117) (generally 4,000-6,000ft), predominantly on the lower limestone plateau and material weathered from metamorphic rocks. This type is generally on sites with sandy loam to clayey loam soils.

Vegetation Description

Ponderosa pine, chokecherry, Saskatoon serviceberry, aspen, *Ribes* species, rose species, hawthorn, Oregon grape, raspberry, littleseed ricegrass, Canada wildrye, needlegrasses, sideoats grama, sedges, common juniper, and poison ivy are common.

Plant communities for Laramie Peak:

1) *Pinus ponderosa*/*Arctostaphylos uva-ursi* with *Mahonia repens*, *Rosa woodsii*, and *Symphoricarpos albus*; 2) *Pinus ponderosa*/*Carex rossii* with *Purshia tridentata*; and 3) *Pinus ponderosa*/*Carex geyeri* with *Arctostaphylos uva-ursi*, *Mahonia repens*, and *Juniperus communis*.

BpS Dominant and Indicator Species

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

Disturbance Description

Generally frequent fire return interval (FRI) with surface fire. The presence of abundant fire-scarred trees in multi-aged stands supports a prevailing historical model for ponderosa pine forests in which recurrent surface fires affected heterogeneous forest structure (Brown 2006). Mixed-severity fire occurs if FRIs are missed, and stand-replacement fire is infrequent. Some speculate that stand-replacing fire in the Black Hills is less frequent than outside. The Black Hills stand-replacement frequency is thought to be ~300yrs+. Some speculate that the stand-replacement frequency outside the Black Hills is ~150-200yrs (and is thought to be as such for the Laramie Peak area). With the Native American influence outside of the Black Hills, the replacement fire interval could be even more frequent than the 300yr interval. However, due to lack of evidence for a different interval outside of the Black Hills, the 300yr interval was chosen for this model and supported by review.

The Laramie Peak area is subject to several different weather patterns that may be tied to the El Niño/Southern Oscillation (ENSO). Sometimes it gets its weather from the southwest – e.g., like Arizona monsoons; other years, it gets its weather from the Northern Great Plains – colder, dryer; then some years, it gets its weather from the Southern Great Plains influenced by the Gulf of Mexico. Also, the Laramie Peak area has more elevation differences and topographic effects because of its steepness. Forest Service Region 2 considers ponderosa pine on the Laramie Peak area to be more similar to Colorado Front Range ponderosa pine, which doesn’t prune branches as readily nor get as big as fast as Black Hills ponderosa pine.

There is considerable debate over the role of mixed-severity and surface fires in the historical range of variability in this and other ponderosa pine forests in the northern and central Rockies (Baker and Ehle 2001, 2003; Barrett 2004; Veblen et al. 2000). Brown (2006) argues that surface fire was the dominant mode of disturbance. Snead (2005) reported a mean fire return interval of 4-42yrs on the northern side and 4-63 years on the southern side of the Ashland Ranger District.

Precipitation is concentrated in April through June but occurs throughout the growing season, resulting in good pine regeneration and dense patches of saplings. Elk and, to a lesser extent, bison, were important ungulates. Windthrow, storm damage, and mountain pine beetles were important disturbances in this type, especially when stands reached high densities, as evidenced in mountain pine beetle outbreaks occurring from 2000 through present and still increasing (USDA Forest Service 2006 map).

The Laramie Peak area had a mountain pine beetle outbreak in ponderosa pine in the early 1990s, followed by some large fires that were stand-replacing in areas -- now there is not much activity.

Insect/disease disturbance occurs but unsure of frequency. It was modeled at a very infrequent rate. Frequency could be related to density; therefore, modeled in the late closed and open stages. For additional information on insects in the Black Hills, see the Phase II Amendment (USDA Forest Service 2005).

Disturbance from mountain pine beetles was frequent locally and rare area-wide. Current research indicates that the highest probability of infestation occurs in areas with trees denser than 120 sq ft per acre (possibly 100) and averaging 7in DBH or greater.

The occurrence of area-wide mountain pine beetle epidemics is dependent on favorable weather and abundant food supplies in the form of adjacent susceptible areas.

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

Disturbance patch size probably ranged from 10s-10,000s of acres.

Outside of the Black Hills and Missouri Breaks, this BpS would have been 10s-1,000ac.

Adjacency or Identification Concerns

This type occurs at elevations above ponderosa pine savanna. This type differs from Northwestern Great Plains Highland Spruce Woodland and Ponderosa Pine- Black Hills (BpS 2910480) because it has been documented to have more frequent surface fires, less frequent replacement fires, and less closed canopy forest. (Brown 2003)

This system could be difficult to distinguish from 1117, Ponderosa Pine Savanna. They will be adjacent to each other. It could also be adjacent to grassland and shrubland systems associated with prairie systems. It might also be adjacent to and intermingled with green ash/woody draw systems. And at the lowest margins, grassland invasion has occurred. Distinguishing features can be found by aspect (see Biophysical Site Description).

This system will be difficult to distinguish from Northwestern Great Plains-Black Hills Ponderosa Pine Woodland and Savanna -- Low Elevation Woodland (1179); it is only distinguished by geography.

Currently, there have probably been at least 5 fire cycles that have been missed due to suppression, grazing, etc. (In the Laramie Peak area, however, there have been numerous wildfires since the 1990s, so this claim cannot be made for that area.) Therefore, the system today would look much more like the late closed stage with ~70-90% canopy closure. Increased ladder fuel as a result of missed fire cycles increases the probability of a stand-replacement fire.

Expansion into grasslands both at prairie margins and into interior meadows; timber harvest and removal of larger size classes from all areas; stand infilling and thickening due to fire exclusion.

The absence of dwarf mistletoe also distinguishes this ponderosa pine system from most others in the country.

This model for 1054 for MZ29 seems to differ slightly from 1054 in MZ20 (adjacent MZ), due to distinctness of Black Hills ponderosa pine (which was originally modeled for 291054). However, in general, overall FRI similar with mostly low-severity fires. And general amounts in the successional classes are similar, with similar cover/height distinctions. Some of the other disturbance probabilities differ, due to more information provided in the literature for MZ29.

In this system, as in many others, non-native grass species may be providing different surface fire effects. For example, litter produced by Kentucky bluegrass, Japanese brome, and downy brome is much finer and has different characteristics for burning, insulation, and moisture retention. This would change the effects of fires, even if they occurred at historic frequencies. The most likely change is in composition of surface vegetation, although longer-term effects to the soil may also occur.

Issues or Problems

Native Uncharacteristic Conditions

The Laramie Peak area has numerous areas where canopy closure will never get above 40% and other areas where canopy closure will never get above 60%. There is so much rock that ponderosa pine grows in “flower pots” between the rocks.

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 5 Early Development 1 - All Structures

Indicator Species

Description

Herbaceous/shrubby post-replacement class. Outside of the Black Hills, associated with grass/ forb, chokecherry, serviceberry, leadplant, raspberry, rose, Oregon grape, snowberry, and currant. Shrubs are typically >1m, but chokecherry can reach heights of >3m.

*Maximum Tree Size Class*  
Seedling <4.5ft

Class B 19 Mid Development 1 - Closed

Indicator Species

Description

Pole ponderosa pine (dog hair). (Because the Laramie Peak area is so rocky, it rarely gets dog hair ponderosa pine.) Very few understory species present due to canopy closure. This class may succeed to a late closed stage if not affected by fire or insect outbreaks.

*Maximum Tree Size Class*  
Pole 5-9" DBH

Class C 13 Mid Development 1 - Open

Indicator Species

Description

Pole ponderosa pine. Surrounding this class are other trees/stands that are >100yrs old. Understory species would be similar to those in Class A. Snowberry will also become more prevalent.

*Maximum Tree Size Class*  
Pole 5-9" DBH

Class D 54 Late Development 1 - Open

Indicator Species

Description

Open canopy stand. Patches of dense doghair and 200yrs+ trees persist. Common juniper and rough leaf ricegrass common in Black Hills. Other understory species same as in classes C and A.

*Maximum Tree Size Class*  
Large 21-33" DBH

Class E 9 Late Development 1 - Closed

Indicator Species

Description

Closed canopy, multi-layer stand. At >70% canopy closure, mountain pine beetle outbreaks occur, opening up the canopy. Understory species the same but fewer numbers. Common or Rocky Mountain juniper might be present with lack of disturbance. Outside of Black Hills, sun sedge and littleseed ricegrass may be present.

Closed canopy conditions were probably transient due to regional synchronous recruitment forced by climate (i.e., the distinction between fire history and fire regime; see figure 5 in Brown 2006).

*Maximum Tree Size Class*  
Medium 9-21" DBH

Model Parameters

Deterministic Transitions

Probabilistic Transitions

References

Alexander, R.R., G.R. Hoffman and J.M Wirsing. 1986. Forest vegetation of the Medicine Bow National Forest in southeastern Wyoming: a habitat type classification. Research Paper RM-271. Fort Collins, CO: USDA Forest Service, Rocky Mountain Forest and Range Experiment Station. On file at MBR-TB SO, Laramie, WY.

Baker, W.L. and D.S. Ehle. 2001. Uncertainty in surface-fire history: The case of ponderosa pine forests in the western United States. Canadian Journal of Forest Research 31: 1205-1226.

Baker, W.L. and D.S. Ehle. 2003. Uncertainty in fire history and restoration of ponderosa pine forests in the western United States. Pages 319-333 in: P.N. Omi and L.A. Joyce, tech. eds. Fire, fuel treatments, and ecological restoration: conference proceedings; 2002 April 16-18; Fort Collins, CO. Proceedings RMRS-P-29. Fort Collins, CO: USDA Forest Service, Rocky Mountain Research Station.

Barrett, S.W. 2004. Altered fire intervals and fire cycles in the Northern Rockies. Fire Management Today 64(3): 25-29.

Barrett, S.W. 2004. Fire Regimes in the Northern Rockies. Fire Management Today 64(2): 32-38.

Bock, J.H and C.E. Bock. 1984. Effect of Fires on Woody Vegetation in the Pine-grassland Ecotone of the Southern Black Hills. The American Midland Naturalist 112(1): 35-42.

Bragg, T.B. 1985. A preliminary fire history of the oak/pine forest of northcentral Nebraska, Page 8 in: Proc. 95th Annu Meeting Nebr Acad Sci., Lincoln, NE. 78 pp.

Brown, P.M. 2006. Climate effects on fire regimes and tree recruitment in Black Hills ponderosa pine forests. Ecology 87(10): 2500-10.

Brown, P.M. and B. Cook. 2006. Early settlement forest structure in Black Hills ponderosa pine forests. Forest Ecology and Management 223: 284-290.

Brown, P.M., 2003. Fire, climate, and forest structure in ponderosa pine forests of the Black Hills. Dissertation.

Brown, P.M. 2006. Climate effects on fire regimes and tree recruitment in Black Hills ponderosa pine forests. In Press, Ecology.

Brown, P.M. and C.H. Sieg. 1999. Historical variability in fire at the ponderosa pine - Northern Great Plains prairie ecotone, southeastern Black Hills, South Dakota. Ecoscience 6(4): 539-547.

Brown and Sieg. 1996. Fire history in interior ponderosa pine communities of the Black Hills, South Dakota, USA. International Journal of Wildland Fire 6: 97-105.

Brown, P.M., M.G. Ryan and T.G. Andrews. 2000. Historical surface fire frequency in ponderosa pine stands in Research Natural Areas, Central Rocky Mountains and Black Hills, USA. Natural Areas Journal 20: 133-139.

Brown, P.M, M.R. Kaufmann and W.D. Shepperd. 1999. Long-term, landscape patterns of past fire events in a montane ponderosa pine forest of central Colorado. Landscape Ecology 14: 513–532.

Camp, A., C. Oliver, P. Hessburg and R. Everett. 1997. Predicting late-successional fire refugia pre-dating European settlement in the Wenatchee Mountains. Forest Ecology and Management 95: 63-77.

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 [11/12/05].

Cleland, D.T.; Freeouf, J.A.; Keys, J.E.; Nowacki, G.J.; Carpenter, C.A.; and McNab, W.H. 2007. Ecological Subregions: Sections and Subsections for the conterminous United States. Gen. Tech. Report WO-76D [Map on CD-ROM] (A.M. Sloan, cartographer). Washington, DC: U.S. Department of Agriculture, Forest Service, presentation scale 1:3,500,000; colored.

Girard, M.M., H. Goetz and A.J. Bjugstad. 1989. Native woodland habitat types of southwestern North Dakota. Research Paper RM-281. Fort Collins, CO: USDA Forest Service, Rocky Mountain Forest and Range Experiment Station. 36 pp.

Graves, H.S. 1899. The Black Hills Forest Reserve. Pages 67-164 in: the 19th Annual Report of the Survey, 1897-1898. Part V. Forest Reserves. Washington, DC: USGS.

Hansen, P.L. and G.R. Hoffman. 1988. The vegetation of the Grand River/Cedar River, Sioux, and Ashland Districts of the Custer National Forest: a habitat type classification. General Technical Report RM-157. Fort Collins, CO: USDA Forest Service, Rocky Mountain Forest and Range Experiment Station.

Hawksworth, F.G. and D. Wiens. 1996. Dwarf mistletoes: biology pathology and systematics. USDA Forest Service Agriculture Handbook 709. 410 pp.

Huckaby, L.S. 2006. Fire Regimes for the Major Life Zones of the Colorado. Unpublished manuscript.

Marriott, H.J. and D. Faber-Langendoen 2000. Black Hills Community Inventory. Volume 2: Plant Community Descriptions. The Nature Conservancy and Association for Biodiversity Information, Minneapolis, MN.

McCambridge, W.F., F.G. Hawksworth, C.B. Edminster and J.G. Laut. 1982. Ponderosa pine mortality resulting from a mountain pine beetle outbreak. USDA Forest Service, Rocky Mountain Forest and Range Experiment Station. Fort Collins, CO.

Morgan, P., C.C. Hardy, T.W. Swetnam, M.G. Rollins and D.G. Long. 2001. Mapping fire regimes across time and space: Understanding coarse and fine-scale fire patterns. International Journal of Wildland Fire 10: 329–342.

NatureServe. 2006. International Ecological Classification Standard: Terrestrial Ecological

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

18 July 2006.

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

Parrish, J.B., D.J. Herman, D.J. Reyher. 1996. A century of change in Black Hills forest and riparian ecosystems. USDA Forest Service and South Dakota Agricultural Experiment Station B722, South Dakota State University, Brookings, SD.

Perryman, B.L. and W.A. Laycock. 2000. Fire history of the Rochelle Hills Thunder Basin National Grasslands. J. Range Manage 53: 660–665.

Progulske, D.R. 1974. Yellow ore, yellow hair, yellow pine: A photographic study of a century of forest ecology. Agricultural Experiment Station Bulletin 616, South Dakota State University, Brookings, SD.

Schmid, J.M. and S.A. Mata. 1996. Natural variability of specific forest insect populations and their associated effects in Colorado. General Technical Report RM-GTR-275. Fort, Collins, CO: USDA Forest Service Rocky Mountain Forest and Range Experiment Station.

Schmid, J.M. and G.D. Amman. 1992. Dendroctonus beetles and old-growth forests in the Rockies. In: Old-growth forests in the Southwest and Rocky Mountain regions. Proceedings of a workshop, Portal, AZ.

Sheppard, W.D. and M.A. Bettaglia. 2002. Ecology, silviculture and management of Black Hills ponderosa pine. RMRS-GTR-97. Fort Collins, CO: Rocky Mountain Research Station.

Shinneman, D.J. and W.L. Baker. 1997. Nonequilibrium dynamics between catastrophic disturbances and old-growth forests in ponderosa pine landscapes of the Black Hills. Conservation Biology 11: 1276-1288.

Snead, P. 2005. Fire history study: Ashland District, Custer National Forest, Eastern Montana. Dec 31, 2005.

Stevens, R.E., W.F. McCambridge and C.B. Edminster. 1980. Risk rating guide for mountain pine beetle in Black Hills ponderosa pine. Research Note RM-385. Fort Collins, CO: USDA Forest Service, Rocky Mountain Research Station.

Uresk, D.W. and K.E. Severson. 1989. Understory-overstory relationships in ponderosa pine forests, Black Hills, SD. Journal of Range Management 42: 203-208.

USDA Forest Service, 2005, Black Hills National Forest Phase II Amendment.

Veblen, T.T., T.T. Kitzberger and J. Donnegan. 2000. Climatic and human influences on fire regimes in ponderosa pine forests in the Colorado Front Range. Ecological Applications. 10(4): 1178-1195.

Wienk, C.L., C.H. Sieg and G.R. McPherson. 2004. Evaluating the role of cutting treatments, fire and soil seed banks in an experimental framework in ponderosa pine forest of the Black Hills, South Dakota. Forest Ecology and Management 192: 375-393.