

11190

Southern Rocky Mountain Juniper Woodland and Savanna

BpS Model/Description Version: Aug. 2020

Modelers		Reviewers	
Paul Langowski	plangowski@fs.fed.us	Dave Borland	David_Borland@nm.blm.gov
Dick Edwards	rsedwards@fs.fed.us	Peter Brown	pmb@rmtrr.org
Mike Babler	mbabler@tnc.org	Keith Schulz	keith_schulz@natureserve.org

Vegetation Type

Steppe/Savanna

Map Zone

27

Geographic Range

Found throughout the region. This type is usually the lowest-elevation tree-dominated type in the area and is found on lower mountain slopes, mesas, and adjacent plains. Found along the eastern and southern slopes of central New Mexico mountains. It is thought that this system might just grade into map zone (MZ) 27 from MZ25 and MZ26. This type might be common in southeast Colorado and northeast New Mexico. It might be found throughout MZ27, but does not extend very far into MZ33.

Biophysical Site Description

This ecological system occupies the lower and warmest elevations. It is best represented just below the lower elevational range of ponderosa pine and often intermingles with grasslands and shrublands. This system is best described as a savanna that has widely spaced, mature (>150yrs old) juniper trees and occasionally *Pinus edulis*.

Pinyon-juniper savannas are usually found on gentle upland and transitional valley locations, where soil conditions favor grasses (or other grass-like plants) but can support at least some tree cover. Some savannas apparently have sparse tree cover because of edaphic or climatic limitations on woody plant growth (Romme working group 2006).

Pinyon-juniper savannas typically are found on moderately deep, coarse to fine-textured soils that readily support a variety of growth forms including trees, grasses, and other herbaceous plants and in regions that receive reliable summer rainfall that fosters growth of warm-season grasses. This type of pinyon-juniper vegetation appears to be especially prevalent in the basins and foothills of southern New Mexico, where a large portion of annual precipitation comes in the summer via monsoon rains. However, it is relatively rare in the Rocky Mountains, northern Colorado Plateau, and the Great Basin, where precipitation is more winter-dominated (Romme working group 2006).

Vegetation Description

Juniperus monosperma and *Juniperus scopulorum* (at higher elevations) are the dominant tall shrubs or short trees. *Pinus edulis* may be present but a subdominant for MZ27. Graminoid species are similar to those found in Western Great Plains Shortgrass Prairie (CES303.672), with

Bouteloua gracilis and *Pleuraphis jamesii* being most common. In addition, succulents such as species of *Yucca* and *Opuntia* are typically present.

One reviewer for previous MZs/Rapid Assessment (RA) suggests that in White River National Forest, southern Utah and Nevada, vegetation is dominated by juniper.

BpS Dominant and Indicator Species

Symbol	Scientific Name	Common Name
PIED	<i>Pinus edulis</i>	Twoneedle pinyon
JUMO	<i>Juniperus monosperma</i>	Oneseed juniper
JUSC2	<i>Juniperus scopulorum</i>	Rocky mountain juniper
BOGR2	<i>Bouteloua gracilis</i>	Blue grama
PLJA	<i>Pleuraphis jamesii</i>	James' galleta
YUCCA	<i>Yucca</i>	Yucca

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

Disturbance Description

There is some debate as to whether surface or low-severity fire intervals should be high or low. Model for MZ28 made a significant increase in surface fire interval from the Rapid Assessment (RA) model that resulted in a shorter All Fire Return Interval. Some, however, question the high frequency of low-severity fires in this type. For MZ27, it seemed that many agreed that there should be a good amount of low-severity surface fire in this type.

One reviewer for previous MZs/RA had concerns with all pinyon-juniper models and wanted to be certain there was a system with a long fire return interval (FRI) modeled.

Soil texture drives the fire regime. Sites with higher potential for graminoid understory will have higher fine fuel loading and create the spread component for more frequent and lower fire intensity. Sites with gravelly soils produce less grass and more shrub components, have less fire frequency, and are more lethal when wind-driven events (Dave Borland, BLM, personal communication).

Past fire regimes in southwestern pinyon-juniper woodlands were mixed, having both surface and crown fires, and are a reflection of variable intensity and frequency depending on site productivity. "Productive sites could sustain patchy fires at intervals of 10-50yrs, and could have attained densities sufficient to carry crown fires at intervals of 200-300yrs. In open stands, where grass cover was continuous, fire intervals might have been 10yrs or less, and probably maintained grasslands and savannas" (Gottfried 1999).

Some feel that the mean fire return interval (MFRI) for this type in MZs 27 and 33 should be similar to a shortgrass prairie regime. Others, however, do not.

There is little fire importation from adjacent types.

Return interval for fire could be extended by ungulate grazing. Concentrations of ungulates could increase the percent of the landscape dominated by trees and some shrubs compared with reference conditions. FRIs are now in the range of 60yrs+.

Some areas have extensive mortality since 2002 due to the drought-induced Ips beetle outbreak. Episodic disturbance caused by insect infestation (grasshoppers, range caterpillars, Mormon crickets).

Also there is climate change, drought, and pluvials that affect the dynamics of this system.

Fire Frequency

Severity	Avg FI	Percent of All Fires	Min FI	Max FI
Replacement	499	5		
Moderate (Mixed)	229	12		
Low (Surface)	33	83		
All Fires	27	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

The most common disturbance in this type is very small scale, either single-tree or small groups. If the conditions are just right, then it will burn whole stands up to 1,000s of acres.

Adjacency or Identification Concerns

Higher-elevation sites of this type border the juniper steppe type. It is replaced upward by PIPO and/or Gambel oak/*Cercocarpus* shrubland and desert scrub on the lower end.

Concentrations of ungulates could increase the percent of the landscape dominated by trees and some shrubs compared with reference conditions.

This system might be difficult to distinguish from 1059 in areas where there has been infilling or a type conversion. We need to distinguish between (1059) persistent woodlands where trees were dominant versus areas where woody plants are either increasing in density relative to shrub- or grass-dominated systems (infilling) or expanding into previously unwooded areas (expansion). Former pinyon-juniper savannas (1190) or grasslands can become tree-invaded/encroached/converted and appear like 1059, so soils are needed to distinguish them.

Cheatgrass can be a problem in some areas in MZ27 and surrounding areas, although the scale of the problem does not generally rise to that of pinyon-juniper woodlands in, for example, the Great Basin.

Romme working group (2006) has identified issues with infilling (increased tree density in areas that were historically more open) and expansion (tree invasion into areas that were either shrublands or grass savannas) in areas that are today wooded.

In some regions, especially parts of New Mexico and Arizona, pinyon-juniper savannas probably were more extensive historically than they are today; many savannas in these regions have been converted to pinyon-juniper woodlands of moderate- to high-canopy coverage during the 20th century (Romme working group 2006), and many former grasslands have been converted to pinyon-juniper savanna or woodland. In other regions, such as parts of Colorado, savannas were

[illegible]

Shrub	1.0-3.0	A	A	A	A	A	A	A	A	A	A
Shrub	>3.0	A	A	A	A	A	A	A	A	A	A
Tree	0-5	A	A	A	A	A	A	A	UN	UN	UN
Tree	5-10	B	B	B	B	C	C	C	UN	UN	UN
Tree	10-25	E	E	E	E	D	D	D	UN	UN	UN
Tree	25-50	E	E	E	E	D	D	D	UN	UN	UN
Tree	>50	E	E	E	E	D	D	D	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 7 Early Development 1 - All Structures

Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
PIED	<i>Pinus edulis</i>	Twoneedle pinyon	All
JUMO	<i>Juniperus monosperma</i>	Oneseed juniper	All
JUSC2	<i>Juniperus scopulorum</i>	Rocky mountain juniper	All
BOGR2	<i>Bouteloua gracilis</i>	Blue grama	Lower

Description

Grass/forb/shrub/seedling -- usually post-fire.

This class succeeds to B, a mid-open stage after approximately 70yrs. (However, Floyd et al. [2000] in a Mesa Verde area suggest much longer recovery of woody vegetation if too large an area is killed. Recruitment is even more episodic in response to optimal climate conditions than in ponderosa.)

Maximum Tree Size Class

Sapling >4.5ft; <5" DBH

Class B 13 Mid Development 1 - Open

Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
PIED	<i>Pinus edulis</i>	Twoneedle pinyon	Upper
JUMO	<i>Juniperus monosperma</i>	Oneseed juniper	Upper
JUSC2	<i>Juniperus scopulorum</i>	Rocky mountain juniper	Upper
BOGR2	<i>Bouteloua gracilis</i>	Blue grama	Lower

Description

Mid-development, open pinyon-juniper stand with mixed shrub/herbaceous

Maximum Tree Size Class
Medium 9-21" DBH

Class E	63	Late Development 1 - Open
----------------	-----------	----------------------------------

Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
PIED	Pinus edulis	Twoneedle pinyon	Upper
JUMO	Juniperus monosperma	Oneseed juniper	Upper
JUSC2	Juniperus scopulorum	Rocky mountain juniper	Upper
BOGR2	Bouteloua gracilis	Blue grama	Lower

Description

Late-development, open pinyon-juniper stand with “savanna-like” appearance; mixed grass/shrub/herbaceous community.

Maximum Tree Size Class

None

Model Parameters

Deterministic Transitions

From Class	Begins at (yr)	Succeeds to	After (years)
Early1:ALL	0	Mid1:OPN	69
Mid1:CLS	50	Late1:CLS	149
Mid1:OPN	70	Late1:OPN	239
Late1:CLS	150	Late1:CLS	999
Late1:OPN	240	Late1:OPN	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	0.0025	400	Yes	0
Competition or Maintenance	Early1:ALL	Early1:ALL	0.01	100	No	0
Alternative Succession	Early1:ALL	Mid1:CLS	0.015	67	Yes	0
Alternative Succession	Mid1:OPN	Late1:CLS	0.002	500	Yes	0
Replacement Fire	Mid1:OPN	Early1:ALL	0.002	500	Yes	0
Mixed Fire	Mid1:OPN	Mid1:OPN	0.003	333	No	0
Competition or Maintenance	Mid1:OPN	Mid1:OPN	0.007	143	No	0
Surface Fire	Mid1:OPN	Mid1:OPN	0.04	25	No	0
Surface Fire	Mid1:CLS	Mid1:CLS	0.001	1000	No	0
Mixed Fire	Mid1:CLS	Mid1:CLS	0.001	1000	No	0
Replacement Fire	Mid1:CLS	Early1:ALL	0.002	500	Yes	0
Mixed Fire	Mid1:CLS	Mid1:OPN	0.005	200	Yes	0
Replacement Fire	Late1:OPN	Early1:ALL	0.002	500	Yes	0

Mixed Fire	Late1:OPN	Late1:OPN	0.005	200	No	0
Insects or Disease	Late1:OPN	Late1:OPN	0.005	200	No	0
Surface Fire	Late1:OPN	Late1:OPN	0.04	25	No	0
Surface Fire	Late1:CLS	Late1:CLS	0.0005	2000	No	0
Replacement Fire	Late1:CLS	Early1:ALL	0.0015	667	Yes	0
Mixed Fire	Late1:CLS	Late1:OPN	0.005	200	Yes	0
Insects or Disease	Late1:CLS	Late1:OPN	0.005	200	Yes	0

References

Baker, W.L. and D.J. Shinneman. 2004. Fire and restoration of piñon-juniper woodlands in the western United States: a review. *Forest Ecology and Management* 189: 1-21.

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.

Gottfried, G.J., Eskew, L.G., Curtin, C.G. and Edminster, C.B. compilers. 1999. Toward integrated research, land management, and ecosystem protection in the Malpai Borderlands: conference summary; 1999 January 6-8; Douglas, AZ. *Proceedings RMRS-P-10*. Fort Collins, CO: USDA Forest Service, Rocky Mountain Research Station: 95-99.

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 2, 2005).

NatureServe. 2004. International Ecological Classification Standard: Terrestrial Ecological Classifications, NatureServe Central Databases. Arlington, VA. U.S.A. Data current as of November 4, 2004.

Romme, W.H., L. Floyd-Hanna and D. Hanna. 2003. Ancient pinyon-juniper forests of Mesa Verde and the West: a cautionary note for forest restoration programs. Pages 335-350 in: P.N. Omi and L.A. Joyce. tech. eds. *Fire, fuel treatments, and ecological restoration: conference proceedings*. 16-18 April 2002. Fort Collins, CO. *Proceedings RMRS-P-29*. Fort Collins, CO: USDA Forest Service, Rocky Mountain Research Station. 475 pp.

Romme, W.H. and working group of 12 researchers (August 2006). Historical and modern disturbance regimes, stand structures, and landscape dynamics in pinon-juniper vegetation of the western U.S. Boulder, CO. Draft in progress.

Stein, S.J. 1988. Fire History of the Paunsaugunt Plateau in Southern Utah. Great Basin Naturalist 48(1): 58-63.

Sullivan, J. 1993. *Juniperus pinchotii*. In: Fire Effects Information System, [Online].
USDA Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer).
Available: <http://www.fs.fed.us/database/feis/> [2005, May 2].