11190

Southern Rocky Mountain Juniper Woodland and Savanna

BpS Model/Description Version: Aug. 2020

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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 | *Pinus edulis* | Twoneedle pinyon |
| JUMO | *Juniperus monosperma* | Oneseed juniper |
| JUSC2 | *Juniperus scopulorum* | Rocky mountain juniper |
| BOGR2 | *Bouteloua gracilis* | Blue grama |
| PLJA | *Pleuraphis jamesii* | James' galleta |
| YUCCA | *Yucca* | 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 never extensive; conversion of savanna to pinyon-juniper woodland has affected only a minor portion of the landscapes in these regions (Romme working group 2006).

Grazing and fire exclusion probably have been important mechanisms driving the conversion of savanna to pinyon-juniper woodland in at least some areas, but not all. In the 20th century, climate has also played a role in some areas (Romme working group 2006).

Expansion of pinyon and/or juniper into previously non-wooded areas occurred prior to European settlement on some sites, although this expansion may have been more extensive in the 20th century versus the previous. However, loss of pinyon and/or juniper from marginal sites also occurred historically and recently in some areas (Romme working group 2006).

Especially in areas in which trees were historically rare or absent, there have been type conversions such that the historical condition is unidentifiable/replaced today.

An important result of expansion into formerly non-wooded areas in many regions is that formerly heterogeneous mosaics of small patches of woodland, shrubland, and grassland are becoming more homogeneous as trees become established in the shrubland and grassland patches (Romme working group 2006).

Juniper savanna is invasive in lower valleys, mesas and rolling plains if deep soils, but natural if medium (~shallow) depth soils, e.g., low rises between drainages. There are such areas east/west of US 54, south of I-40 with large, seemingly old junipers (Steven Yanoff, TNC, personal communication).

Some areas have extensive mortality since 2002 due to the drought-induced Ips beetle outbreak.

Issues or Problems

Native Uncharacteristic Conditions

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 | A | A | A | A | A | A | A |
| Herb | 0.5-1.0 | A | A | A | A | A | A | A | A | A | A |
| Herb | >1.0 | A | A | A | A | A | A | A | A | A | A |
| Shrub | 0-0.5 | A | A | A | A | A | A | A | A | A | A |
| Shrub | 0.5-1.0 | A | A | A | A | A | A | A | A | A | A |
| 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 | Pinus edulis | Twoneedle pinyon | All |
| JUMO | Juniperus monosperma | Oneseed juniper | All |
| JUSC2 | Juniperus scopulorum | Rocky mountain juniper | All |
| BOGR2 | Bouteloua gracilis | 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 | 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

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

community in understory. Review for MZ27 suggested that maximum canopy cover might be as low as 20%.

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

Class C 9 Mid Development 1 - Closed

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

Mid-development, dense pinyon-juniper woodland; understory being lost. Review for MZ27 suggested that maximum canopy cover might be as low as 30%.

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

Class D 8 Late Development 1 - Closed

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

Dense, old-growth stands with multiple layers. Late-development, closed pinyon-juniper forest. May have all-aged, multi-storied structure. Moderate mortality within stand. Occasional shrubs with few grasses and forbs and often much rock. Review for MZ27 suggested that canopy cover might be lower, e.g., 11-35%.

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

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