11150

Inter-Mountain Basins Juniper Savanna

BpS Model/Description Version: Aug. 2020

|  |  |  |  |
| --- | --- | --- | --- |
| **Modelers** |  | **Reviewers** |  |
| Bob Unnasch | bunnasch@tnc.org | Tim Christiansen | tchristiansen@tnc.org |
| None | None | None | None |
| None | None | None | None |

Vegetation Type

Steppe/Savanna

Map Zones

15, 16, 23, 24

Geographic Range

This widespread ecological system occupies dry foothills and sandsheets of western Colorado, northwestern New Mexico, northern Arizona, Utah, west into the Great Basin of Nevada, and southern Idaho.

Biophysical Site Description

This ecological system is typically found at lower elevations, ranging from 1,500-2,300m. Occurrences are found on lower mountain slopes, hills, plateaus, basins, and flats, often where juniper is expanding into semi-desert grasslands and steppe.

Vegetation Description

The vegetation is typically open savanna, although there may be inclusions of more dense juniper woodlands. This savanna is typically dominated by *Juniperus osteosperma* trees with high cover of perennial bunch grasses and forbs, with *Bouteloua gracilis*, *Hesperostipa comata*, and *Pleuraphis jamesii* being most common. In the southern Colorado Plateau, *Juniperus monosperma* or juniper hybrids may dominate the tree layer. Pinyon trees are typically not present because sites are outside the ecological or geographic range of *Pinus edulis* and *Pinus monophylla*.

BpS Dominant and Indicator Species

|  |  |  |
| --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** |
| JUOS | *Juniperus osteosperma* | Utah juniper |
| JUOC | *Juniperus occidentalis* | Western juniper |
| BOGR2 | *Bouteloua gracilis* | Blue grama |

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

Disturbance Description

Uncertainty exists about the fire frequencies of this ecological system, though it is predominantly Fire Regime Group III. Fire regime was primarily determined by fire occurrence in the surrounding matrix vegetation. Lightning-ignited fires were common but typically did not affect more than a few individual trees. Replacement fires were uncommon to rare (average fire return interval [FRI] of 100-500yrs) and occurred primarily during extreme fire behavior conditions. Mixed-severity fire (average FRI of 100-500yrs) was characterized as a mosaic of replacement and surface fires distributed through the patch at a fine scale (<0.1ac). Surface fires could occur in stands where understory grass (FEID) cover is high and provides adequate fuel. Surface fires were primarily responsible for producing fire scars on juniper or pinyon trees (average FRI of 100yrs).

Fire Frequency

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Severity** | **Avg FI** | **Percent of All Fires** | **Min FI** | **Max FI** |
| Replacement | 329 | 19 | 100 | 1000 |
| Moderate (Mixed) | 216 | 29 | 100 | 1000 |
| Low (Surface) | 124 | 52 |  |  |
| All Fires | 64 | 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

Juniper steppe was usually distributed across the landscape in patches that range from 10s to 100s of acres in size. In areas with very broken topography and/or mesa landforms, this type may have occurred in patches of several hundred acres. In Utah and Nevada, pinyon and juniper landscape patches tended to be 10-100s of acres in size.

Adjacency or Identification Concerns

This system is generally found at lower elevations and more xeric sites than Great Basin Pinyon-Juniper Woodland (1019) or Colorado Plateau Pinyon-Juniper Woodland (1016). It is also ecologically similar to (and the model is similar to) Colorado Plateau Pinyon-Juniper Shrubland (1102).

Fire regime primarily determined by adjacent vegetation and spread from the adjacent types into this community.

In modern days, surrounding matrix vegetation has changed to young to mid-aged woodlands that burn more intensely than the former sagebrush matrix. Many lay people confuse these younger pinyon and juniper woodlands with true woodlands dependent on naturally fire-protected features.

Issues or Problems

Native Uncharacteristic Conditions

Comments

Map zones (MZs) 15, 16, 23, and 24 were combined during 2015 BpS Review because the comments and LANDFIRE review indicated that the models were duplicate with only one minor differences in the s-class mapping rules -- MZ15 Class B minimum height was .6m, and in all other MZs it was 0m.

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 | B | B | B | B | B | B | B | B | B |
| Herb | 0.5-1.0 | A | B | B | B | B | B | B | B | B | B |
| Herb | >1.0 | A | B | B | B | B | B | B | B | B | B |
| Shrub | 0-0.5 | B | C | C | C | UN | UN | UN | UN | UN | UN |
| Shrub | 0.5-1.0 | B | C | C | C | UN | UN | UN | UN | UN | UN |
| Shrub | 1.0-3.0 | B | C | C | C | UN | UN | UN | UN | UN | UN |
| Shrub | >3.0 | B | C | C | C | UN | UN | UN | UN | UN | UN |
| Tree | 0-5 | C | C | D | E | UN | UN | UN | UN | UN | UN |
| Tree | 5-10 | C | C | D | E | UN | UN | UN | UN | UN | UN |
| Tree | 10-25 | C | C | D | E | UN | UN | UN | UN | UN | UN |
| Tree | 25-50 | C | C | D | E | UN | UN | UN | UN | UN | UN |
| Tree | >50 | C | C | D | E | 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 3 Early Development 1 - Open

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| BOGR2 | Bouteloua gracilis | Blue grama | Upper |
| HECO26 | Hesperostipa comata | Needle and thread | Upper |
| CRYPT | Cryptantha | Cryptantha | Lower |
| PLEUR12 | Pleuraphis | Galleta grass | Upper |

Description

Initial post-fire community dominated by annual forbs. Later stages of this class contain greater amounts of perennial grasses and forbs. Replacement fire occurs. Infrequent mixed-severity fire thins vegetation.

*Maximum Tree Size Class*  
None

Class B 5 Mid Development 1 - Open

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| BOGR2 | Bouteloua gracilis | Blue grama | Upper |
| HECO26 | Hesperostipa comata | Needle and thread | Upper |
| ARTRV | Artemisia tridentata ssp. vaseyana | Mountain big sagebrush | Upper |

Description

Dominated by perennial forbs and grasses. Total cover remains low due to shallow, unproductive soil. It is important to note that replacement fire at this stage does not eliminate perennial grasses. Mixed-severity fire thins the woody vegetation.

*Maximum Tree Size Class*  
None

Class C 13 Mid Development 2 - Open

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| ARTRV | Artemisia tridentata ssp. vaseyana | Mountain big sagebrush | Upper |
| BOGR2 | Bouteloua gracilis | Blue grama | Middle |
| JUOC | Juniperus occidentalis | Western juniper | Mid-Upper |
| JUOS | Juniperus osteosperma | Utah juniper | Mid-Upper |

Description

Shrub-dominated community with young juniper seedlings becoming established. It is important to note that replacement fire at this stage does not eliminate perennial grasses. Mixed-severity fire.

*Maximum Tree Size Class*  
Seedling <4.5ft

Class D 36 Late Development 1 - Open

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| JUOC | Juniperus occidentalis | Western juniper | Upper |
| BOGR2 | Bouteloua gracilis | Blue grama | Lower |
| ARTRV | Artemisia tridentata ssp. vaseyana | Mountain big sagebrush | Middle |
| JUOS | Juniperus osteosperma | Utah juniper | Upper |

Description

Community dominated by young juniper and pine of mixed age structure. Juniper and pinyon becoming competitive on site and beginning to affect understory composition. Mixed-severity fire is less frequent than in previous states, whereas surface fire becomes more important at this age in succession.

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

Class E 43 Late Development 2 - Open

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| JUOC | Juniperus occidentalis | Western juniper | Upper |
| BOGR2 | Bouteloua gracilis | Blue grama | Lower |
| JUOS | Juniperus osteosperma | Utah juniper | Upper |

Description

Site dominated by widely spaced old juniper. Grasses (e.g., *Bouteloua gracilis*, *Hesperostipa comata*) present on microsites sites with deeper soils (>20in) with restricting clay subsurface horizon. Potential maximum overstory coverage is greater in those stands with pinyon as compared to those with only juniper. Replacement fire and mixed-severity fires are rare. Surface fire will scar ancient trees.

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

Model Parameters

Deterministic Transitions

|  |  |  |  |
| --- | --- | --- | --- |
| **From Class** | **Begins at (yr)** | **Succeeds to** | **After (years)** |
| Early1:OPN | 0 | Mid1:OPN | 9 |
| Mid1:OPN | 10 | Mid2:OPN | 29 |
| Mid2:OPN | 30 | Late1:OPN | 99 |
| Late1:OPN | 100 | Late2:OPN | 399 |
| Late2:OPN | 400 | Late2: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** |
| Mixed Fire | Early1:OPN | Early1:OPN | 0.003 | 333 | No | 0 |
| Replacement Fire | Early1:OPN | Early1:OPN | 0.01 | 100 | Yes | 0 |
| Mixed Fire | Mid1:OPN | Mid1:OPN | 0.01 | 100 | No | 0 |
| Replacement Fire | Mid1:OPN | Early1:OPN | 0.01 | 100 | Yes | 0 |
| Replacement Fire | Mid2:OPN | Early1:OPN | 0.005 | 200 | Yes | 0 |
| Mixed Fire | Mid2:OPN | Mid2:OPN | 0.01 | 100 | No | 0 |
| Replacement Fire | Late1:OPN | Early1:OPN | 0.002 | 500 | Yes | 0 |
| Mixed Fire | Late1:OPN | Late1:OPN | 0.005 | 200 | No | 0 |
| Surface Fire | Late1:OPN | Late1:OPN | 0.01 | 100 | No | 0 |
| Mixed Fire | Late2:OPN | Late2:OPN | 0.002 | 500 | No | 0 |
| Replacement Fire | Late2:OPN | Early1:OPN | 0.002 | 500 | Yes | 0 |
| Surface Fire | Late2:OPN | Late2:OPN | 0.01 | 100 | No | 0 |

References

Alexander, R.R. and F. Ronco, Jr. 1987. Classification of the forest vegetation on the National Forests of Arizona and New Mexico. Res. Note RM-469. Fort Collins, CO: USDA Forest Service, Rocky Mountain Forest and Range Experiment Station. 10 pp.

Anderson, H.E. 1982. Aids to Determining Fuel Models for Estimating Fire Behavior. Gen. Tech. Rep. INT-122. Ogden, UT: USDA Forest Service, Intermountain Forest and Range Experiment Station. 22 pp.

Arno, S.F. 2000. Fire in western forest ecosystems. Pages 97-120 in: J.K. Brown and J. Kapler-Smith, 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.

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

Bradley, A.F., N.V. Noste and W.C. Fischer. 1992. Fire Ecology of Forests and Woodlands in Utah. Gen. Tech. Rep. GTR- INT-287. Ogden, UT: USDA Forest Service, Intermountain Research Station. 127 pp.

Brown, J.K. and J.Kapler-Smith, eds. 2000. 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. 257 pp.

Erdman, J.A. 1970. Pinyon-juniper succession after natural fires on residual soils of Mesa Verde, Colorado. Science Bulletin, Biological Series - -Volume XI, No. 2. Brigham Young University, Provo, UT. 26 pp.

Everett, R.L. and K. Ward. 1984. Early Plant Succession on Pinyon-Juniper Controlled Burns. Northwest Science 58: 57-68.

Eyre, F.H., ed. 1980. Forest cover types of the United States and Canada. Washington, DC: Society of American Foresters. 148 pp.

Goodrich, S. and B. Barber. 1999. Return Interval for Pinyon-Juniper Following Fire in the Green River Corridor, Near Dutch John, Utah. In: USDA Forest Service Proceedings RMRS-P-9.

Gruell, G.E. Historical and Modern Roles of Fire in Pinyon-Juniper. Pages 24-28 In: Monsen, Stephen B.; Stevens, Richard, comps. 1999. Proceedings: ecology and management of pinyon-juniper communities within the Interior West; 1997 September 15-18; Provo, UT. Proc. RMRS-P-9. Ogden, UT: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station.

Gruell, G.E., L.E. Eddleman and R. Jaindl. 1994. Fire History of the Pinyon-Juniper Woodlands of Great Basin National Park. Technical Report NPS/PNROSU/NRTR-94/01. U.S. Department of Interior, National Park Service, Pacific Northwest Region. 27 pp.

Hardy, C.C., K.M. Schmidt, J.P. Menakis and R.N. Samson. 2001. Spatial data for national fire planning and fuel management. Int. J. Wildland Fire. 10(3&4): 353-372.

Hessburg, P.F., B.G. Smith, R.B. Salter, R.D. Ottmar and E. Alvarado. 2000. Recent changes (1930s-1990s) in spatial patterns of interior northwest forests, USA. Forest Ecology and Management 136: 53-83.

Kilgore, B.M. 1981. Fire in ecosystem distribution and structure: western forests and scrublands. P. 58-89. In: H.A. Mooney et al., technical coordinators. Proceedings: Conference on Fire Regimes and Ecosystem Properties, Honolulu, 1978. Gen. Tech. Rep. WO-GTR-26.

Kuchler, A.W. 1964. Potential Natural Vegetation of the Conterminous United States. American Geographic Society Special Publication No. 36. 116 pp.

NatureServe. 2004. International Ecological Classification Standard: Terrestrial Ecological Classifications. Terrestrial ecological systems of the Great Basin US: DRAFT legend for LANDFIRE project. NatureServe Central Databases. Arlington, VA. Data current as of 4 November 2004.

Ogle, K. and V. DuMond. 1997. Historical Vegetation on National Forest Lands in the Intermountain Region. USDA Forest Service, Intermountain Region, Ogden, UT. 129 pp.

Ott, J.E., E.D. McArthur and S.C. Sanderson. 2001. Plant Community Dynamics of Burned and Unburned Sagebrush and Pinyon-Juniper Vegetation in West-Central Utah. Pages 177-190 in: Proceedings, USDA Forest Service RMRS-P-9.

Romme, W.H., L. Floyd-Hanna and D. Hanna. 2002. Ancient Pinyon-Juniper forests of Mesa Verde and the West: A cautionary note for forest restoration programs. In: Conference Proceedings – Fire, Fuel Treatments, and Ecological Restoration: Proper Place, Appropriate Time, Fort Collins, CO, April 2002. 19 pp.

Schmidt, K.M., J.P. Menakis, C.C. Hardy, W.J. Hann and D.L. Bunnell. 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.

Soule’, P.T. and P.A. Knapp. 1999. Western juniper expansion on adjacent disturbed and near-relict sites. Journal of Range Management 52: 525-533.

Soule’, P.T. and P.A. Knapp. 2000. Juniperus occidentalis (western juniper) establishment history on two minimally disturbed research natural areas in central Oregon. Western North American Naturalist (60)1: 26-33.

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

Tausch, R.J. and N.E. West. 1987. Differential Establishment of Pinyon and Juniper Following Fire. The American Midland Naturalist 119(1): 174-184.

USDA Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (2002, December). Fire Effects Information System, [Online]. Available: http://www.fs.fed.us/database/feis/ [Accessed: 11/15/04].

Ward, K.V. 1977. Two-Year Vegetation Response and Succession Trends for Spring Burns in the Pinyon-Juniper Woodland. M.S. Thesis, University of Nevada, Reno. 54 pp.

Wright, H.A., L.F. Neuenschwander and C.M. Britton. 1979. The role and use of fire in Sagebrush-Grass and Pinyon-Juniper Plant Communities. Gen. Tech. Rep. INT-GTR-58. Ogden, UT: USDA Forest Service, Intermountain Research Station. 48 pp.

Young, J.A. and R.A. Evans. 1978. Population Dynamics after Wildfires in Sagebrush Grasslands. Journal of Range Management 31: 283-289.

Young, J.A. and R.A. Evans. 1981. Demography and Fire History of a Western Juniper Stand. Journal of Range Management 34: 501-505.