10160

Colorado Plateau Pinyon-Juniper Woodland

BpS Model/Description Version: Aug. 2020

|  |  |  |  |
| --- | --- | --- | --- |
| **Modelers** |  | **Reviewers** |  |
| Sandy Gregory | s50grego@nv.blm.gov | Louis Provencher | lprovencher@tnc.org |
| Chris Ross | Chris\_Ross@nv.blm.gov | None | None |
| Bryan Bracken | Bryan\_Bracken@blm.gov | None | None |

Vegetation Type

Forest and Woodland

Map Zone

17

Geographic Range

This ecological system occurs in dry mountains and foothills of the Colorado Plateau region including the western slope of Colorado to the Wasatch Range, south to the Mogollon Rim, and east into the northwestern corner of New Mexico.

Biophysical Site Description

These woodlands occur on warm, dry sites on mountain slopes, mesas, plateaus, and ridges. The system is typically found at lower elevations, ranging from 1,500-2,440m. Severe climatic events occurring during the growing season, such as frosts and drought, are thought to limit the distribution of pinyon-juniper woodlands to relatively narrow altitudinal belts on mountainsides. Soils supporting this system vary in texture ranging from stony, cobbly, gravelly sandy loams to clay loam or clay.

Vegetation Description

*Pinus edulis* and/or *Juniperus osteosperma* dominate the tree canopy. *Pinus monophylla* may be present. *Juniperus scopulorum* may co-dominate or replace *Juniperus osteosperma* at higher elevations.

Understory layers are variable and may be dominated by shrubs or graminoids or be absent. Associated species include *Arctostaphylos patula*, *Artemisia tridentata*, *Cercocarpus intricatus*, *Cercocarpus montanus*, *Coleogyne ramosissima*, *Purshia stansburiana*, *Purshia tridentata*, *Quercus gambelii*, *Bouteloua gracilis*, *Pleuraphis jamesii*, or *Poa fendleriana*.

BpS Dominant and Indicator Species

|  |  |  |
| --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** |
| PIED | *Pinus edulis* | Twoneedle pinyon |
| JUOS | *Juniperus osteosperma* | Utah juniper |
| PIMO | *Pinus monophylla* | Singleleaf pinyon |
| SYOR | *Symphoricarpos orbiculatus* | Coralberry |
| HECO26 | *Hesperostipa comata* | Needle and thread |
| BASA3 | *Balsamorhiza sagittata* | Arrowleaf balsamroot |
| ARTEM | *Artemisia* | Sagebrush |
| CEMO2 | *Cercocarpus montanus* | Alderleaf mountain mahogany |

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

Disturbance Description

The fire regime is characterized by somewhat frequent mixed-severity fire (mean fire return interval [MFRI] of 150-200yrs) with very infrequent replacement fires (MFRI of 200-500yrs) (Rondeau 2001). Surface fire occurs only in the earliest successional class. There is frequent fire importation from adjacent types.

Weather-related stress thins trees in more closed stands. Insects/disease have a similar effect, with a greater frequency in closed stands than open ones. Competition from grasses and older trees in late-open stands maintains open conditions.

Fire Frequency

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Severity** | **Avg FI** | **Percent of All Fires** | **Min FI** | **Max FI** |
| Replacement | 424 | 29 | 200 | 500 |
| Moderate (Mixed) | 193 | 65 | 150 | 200 |
| Low (Surface) | 2153 | 6 |  |  |
| All Fires | 125 | 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

This ecological system occupies small fire-proof sites (1ac+) to mid-elevation mountain slopes >1,000ac. 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 have replacement fires that burn stands up to 1,000s of acres. This type may also have mixed-severity fires of 10-100s of acres.

Adjacency or Identification Concerns

This system occurs at higher elevations than Great Basin Pinyon-Juniper Woodland (1019) and Colorado Plateau shrubland systems where sympatric.

Issues or Problems

Native Uncharacteristic Conditions

Comments

Alternative succession is used in the model to represent tree invasion.

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 | C | C | C | C | B | B | B | B | B | B |
| Tree | 5-10 | D | D | D | D | E | E | E | E | E | E |
| Tree | 10-25 | D | D | D | D | E | E | E | E | E | E |
| Tree | 25-50 | D | D | D | D | E | E | E | E | E | E |
| Tree | >50 | D | D | D | D | E | E | E | E | E | E |

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 9 Early Development 1 - All Structures

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| SYOR | Symphoricarpos orbiculatus | Coralberry | Lower |
| BASA3 | Balsamorhiza sagittata | Arrowleaf balsamroot | Lower |
| ARTEM | Artemisia | Sagebrush | Upper |
| HECO26 | Hesperostipa comata | Needle and thread | Lower |

Description

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

*Maximum Tree Size Class*  
None

Class B 21 Mid Development 1 - Closed

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| PIED | Pinus edulis | Twoneedle pinyon | Upper |
| JUOS | Juniperus osteosperma | Utah juniper | Upper |
| ARTEM | Artemisia | Sagebrush | Mid-Upper |
| SYOR | Symphoricarpos orbiculatus | Coralberry | Lower |

Description

Mid-development, dense pinyon-juniper woodland; understory is sparse.

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

Class C 24 Mid Development 1 - Open

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| PIED | Pinus edulis | Twoneedle pinyon | Upper |
| JUOS | Juniperus osteosperma | Utah juniper | Upper |
| SYOR | Symphoricarpos orbiculatus | Coralberry | Lower |
| HECO26 | Hesperostipa comata | Needle and thread | Lower |

Description

Mid development-open pinyon-juniper stand with mixed shrub/herbaceous community in understory.

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

Class D 38 Late Development 1 - Open

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| PIED | Pinus edulis | Twoneedle pinyon | Upper |
| JUOS | Juniperus osteosperma | Utah juniper | Upper |
| SYOR | Symphoricarpos orbiculatus | Coralberry | Upper |
| CELE3 | Cercocarpus ledifolius | Curl-leaf mountain mahogany | Upper |

Description

Late development-open juniper-pinyon stand with “savanna-like” appearance; mixed

grass/shrub/herbaceous community.

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

Class E 8 Late Development 1 - Closed

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| PIED | Pinus edulis | Twoneedle pinyon | Upper |
| JUOS | Juniperus osteosperma | Utah juniper | Upper |
| SYOR | Symphoricarpos orbiculatus | Coralberry | Upper |
| CELE3 | Cercocarpus ledifolius | Curl-leaf mountain mahogany | Upper |

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 rock or bare soil.

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

Model Parameters

Deterministic Transitions

|  |  |  |  |
| --- | --- | --- | --- |
| **From Class** | **Begins at (yr)** | **Succeeds to** | **After (years)** |
| Early1:ALL | 0 | Mid1:OPN | 59 |
| Mid1:OPN | 60 | Late1:OPN | 159 |
| Mid1:CLS | 60 | Late1:CLS | 179 |
| Late1:OPN | 160 | Late1:OPN | 999 |
| Late1:CLS | 180 | Late1:CLS | 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** |
| Surface Fire | Early1:ALL | Early1:ALL | 0.005 | 200 | No | 0 |
| Replacement Fire | Early1:ALL | Early1:ALL | 0.005 | 200 | Yes | 0 |
| Alternative Succession | Early1:ALL | Mid1:CLS | 0.01 | 100 | Yes | 0 |
| Insects or Disease | Mid1:OPN | Mid1:OPN | 0.001 | 1000 | No | 0 |
| Replacement Fire | Mid1:OPN | Early1:ALL | 0.002 | 500 | Yes | 0 |
| Mixed Fire | Mid1:OPN | Mid1:OPN | 0.005 | 200 | No | 0 |
| Alternative Succession | Mid1:OPN | Mid1:CLS | 0.02 | 50 | Yes | 0 |
| Replacement Fire | Mid1:CLS | Early1:ALL | 0.0023 | 435 | Yes | 0 |
| Wind or Weather or Stress | Mid1:CLS | Mid1:OPN | 0.007 | 143 | Yes | 0 |
| Mixed Fire | Mid1:CLS | Mid1:OPN | 0.007 | 143 | Yes | 0 |
| Insects or Disease | Mid1:CLS | Mid1:OPN | 0.01 | 100 | Yes | 0 |
| Insects or Disease | Late1:OPN | Late1:OPN | 0.001 | 1000 | No | 0 |
| Replacement Fire | Late1:OPN | Early1:ALL | 0.002 | 500 | Yes | 0 |
| Mixed Fire | Late1:OPN | Late1:OPN | 0.005 | 200 | No | 0 |
| Alternative Succession | Late1:OPN | Late1:CLS | 0.005 | 200 | Yes | 0 |
| Competition or Maintenance | Late1:OPN | Late1:OPN | 0.01 | 100 | No | 0 |
| Replacement Fire | Late1:CLS | Early1:ALL | 0.002 | 500 | Yes | 0 |
| Wind or Weather or Stress | Late1:CLS | Late1:OPN | 0.007 | 143 | Yes | 0 |
| Mixed Fire | Late1:CLS | Late1:OPN | 0.007 | 143 | Yes | 0 |
| Insects or Disease | Late1:CLS | Late1:OPN | 0.01 | 100 | Yes | 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.

Barney, M.A. and N.C. Frischknecht. 1974. Vegetation changes following fire in the Pinyon-Juniper type of West-Central Utah. Jour. Range Manage. 27: 91-96

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.

Despain, D.W. and J.C. Mosely. 1990. Fire history and stand structure of a pinyon-juniper woodland at Walnut Canyon National Monument, Arizona. USDI National Park Service Technical Report No. 34. Tucson AZ: Cooperative National Park Resources Studies Unit, University of Arizona, 27 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. Provo, UT: Brigham Young University. 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. 1999. Historical and modern roles of fire in pinyon-juniper. Pages 24-28 in: S.B. Monsen, and R. Stevens, compilers. Proceedings: ecology and management of pinyon-juniper communities within the Interior West: Sustaining and restoring a diverse ecosystem; 1997 September 15-18; Provo, UT. Proceedings RMRS-P-9. Ogden, UT: USDA 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. Pages 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.

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

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

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; April 2002; Fort Collins, CO. 19 pp.

Rondeau, R. 2001. Ecological System Viability Specifications for Southern Rocky Mountain Ecoregion. Colorado Natural Heritage Program. 181 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., N.E. West and A.A. Nabi. 1981. Tree Age and Dominance Patterns in Great Basin Pinyon-Juniper Woodlands. Jour. Range. Manage. 34: 259-264.

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 Successional 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.