

11150

Inter-Mountain Basins Juniper Savanna

BpS Model/Description Version: Aug. 2020

Modelers		Reviewers	
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None	None	None	None

Vegetation Type

Forest and Woodland

Map Zones

10, 19

Geographic Range

In NV, western UT and southern ID.

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. Juniper savanna ecotype generally occurs in local, geologically confined, badland environments and is limited in its distribution. Occurs at the lower altitudinal limits for tree species, below the pinyon-juniper woodland type but at or above sagebrush semi-desert and salt desert shrubland in locations where soil moisture is limiting.

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 sparse cover of black sagebrush and perennial bunch grasses and forbs, with *Elymus elymoides*, *Achnatherum hymenoides* (= *Oryzopsis hymenoides*), *Hesperostipa comata*, and *Pleuraphis jamesii* (more southern locations) being most common. 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	<i>Juniperus osteosperma</i>	Utah juniper
ARNO4	<i>Artemisia nova</i>	Black sagebrush
HECO26	<i>Hesperostipa comata</i>	Needle and thread
ACHY	<i>Achnatherum hymenoides</i>	Indian ricegrass
ELEL5	<i>Elymus elymoides</i>	Squirreltail
PLJA	<i>Pleuraphis jamesii</i>	James' galleta

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. It is likely that fires were very infrequent in this ecotype with inherently low productivity. Fire occurrence was primarily

determined by fire occurrence in the surrounding matrix vegetation. Lightning-ignited fires typically did not affect more than a few individual trees. Replacement fires were rare (average FRI of >300-1,000yrs) and occurred primarily during extreme fire behavior conditions, particularly when preceded by wetter years associated with high herbaceous production. Fire regime primarily determined by adjacent communities, as fire rarely originated within the community. Mixed severity fire (average FRI of 200-500yrs) was characterized as a mosaic of replacement and surface fires distributed through the patch at a fine scale (<0.1ac). Surface fire could occur in stands where understory grass cover was high and provided adequate fuel. Surface fire was primarily responsible for producing fire scars on juniper trees in older stands (average FRI of 500yrs).

Fire Frequency

Severity	Avg FI	Percent of All Fires	Min FI	Max FI
Replacement	835	23	100	1000
Moderate (Mixed)	445	43	100	1000
Low (Surface)	569	34		
All Fires	192	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.

Adjacency or Identification Concerns

This system is generally found at lower elevations and more xeric sites than Great Basin Pinyon-Juniper Woodland (BpS 1019) or Colorado Plateau Pinyon-Juniper Woodland (BpS 1016).

In modern days, surrounding matrix vegetation has changed to young-mid aged woodlands that burn more intensely than the former sagebrush matrix that they encroached during the last century of fire exclusion or livestock grazing. Many lay-people confuse these younger juniper woodlands with true woodland sites dependent on naturally fire-protected features.

Also occurring under post-settlement management of woodlands (both fire exclusion and the reduction of grasses that would prevent woody establishment) is the uncharacteristic growth of younger trees amongst older trees. These canopy closures allow fires to crown and kill older trees (>200yrs) that would normally not experience these fires in unproductive soils.

Issues or Problems

Uncertainty exists about the fire frequencies of this ecological system because juniper does not generally survive fire and most fire studies for pinyon and/or juniper are from other regions with fire scars recorded on conifers that experience more frequent fire.

Native Uncharacteristic Conditions

Comments

D Major made changes to vegetation class structural values in response to MTD v3.1 updates (K Pohl 7/18/05 request). These changes have not been reviewed and accepted by model developers as of 7/24/05.

Jon Bates reviewed BpS 1125 for MZ18 with no changes recommended. Reviewer does not consider himself an expert of this system, therefore he was not retained as a modeler. Louis Provencher (lprovencher@tnc.org) made editorial changes and adjusted to 15% cover the cutoff between mid-open and late-open to achieve mutually exclusive cover classes.

Note for MFSL by L. Provencher: classes D (100-400yrs) and E (400yrs+) cannot be distinguished by cover or height. The main difference between these classes is DBH and the shape of tree crowns: rounder crowns for older trees.

This is essentially the same model as R2PIJU developed by Steve Bunting (sbunting@uidaho.edu), Krista Waid-Gollnick (krista_waid@blm.gov) and Henry Bastian (henry_bastian@ios.doi.gov) for juniper and/or pinyon savanna. Mean FRIs are somewhat longer due to the more arid Great Basin context. Reviewers of R2PIJU were George Gruell (ggruell@charter.net), Jolie Pollet (jpollet@blm.gov) and Peter Weisberg (pweisberg@cabnr.unr.edu).

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	B	B	C	C	UN	UN	UN	UN	UN	UN
Shrub	0.5-1.0	B	B	C	C	UN	UN	UN	UN	UN	UN
Shrub	1.0-3.0	B	B	C	C	UN	UN	UN	UN	UN	UN
Shrub	>3.0	B	B	C	C	UN	UN	UN	UN	UN	UN
Tree	0-5	C	C	D	D	UN	UN	UN	UN	UN	UN
Tree	5-10	D	D	D	D	UN	UN	UN	UN	UN	UN
Tree	10-25	E	E	E	E	UN	UN	UN	UN	UN	UN
Tree	25-50	E	E	E	E	UN	UN	UN	UN	UN	UN
Tree	>50	E	E	E	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
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Indicator Species

Seedling <4.5ft

Late Development 1 - Open

Symbol	Scientific Name	Common Name	Canopy Position
JUOS	<i>Juniperus osteosperma</i>	Utah juniper	Upper
ARNO4	<i>Artemisia nova</i>	Black sagebrush	Middle
ELEL5	<i>Elymus elymoides</i>	Squirreltail	Low-Mid
ACHY	<i>Achnatherum hymenoides</i>	Indian ricegrass	Low-Mid

Community dominated by young to mature juniper of mixed age structure. Juniper becoming competitive on site and beginning to affect understory composition.

Large 21-33"DBH

Late Development 2 - Open

Symbol	Scientific Name	Common Name	Canopy Position
JUOS	Juniperus osteosperma	Utah juniper	Upper
ARNO4	Artemisia nova	Black sagebrush	Middle
ELEL5	Elymus elymoides	Squirreltail	Lower
ACHY	Achnatherum hymenoides	Indian ricegrass	Lower

Site dominated by widely spaced old juniper. Grasses (eg, *Hesperostipa comata*) present on microsites sites with deeper soils (>20in) with restricting clay subsurface horizon. Shrubs present. Mixed and surface fire will scar ancient trees.

Very Large >33"DBH

Model Parameters

Deterministic Transitions

From Class	Begins at (yr)	Succeeds to	After (years)
Early1:OPN	0	Mid1:OPN	19
Mid1:OPN	20	Mid2:OPN	39
Mid2:OPN	40	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
Replacement Fire	Early1:OPN	Early1:OPN	0.003	333	Yes	0
Mixed Fire	Early1:OPN	Early1:OPN	0.005	200	No	0
Replacement Fire	Mid1:OPN	Early1:OPN	0.003	333	Yes	0
Mixed Fire	Mid1:OPN	Mid1:OPN	0.005	200	No	0
Replacement Fire	Mid2:OPN	Early1:OPN	0.003	333	Yes	0
Mixed Fire	Mid2:OPN	Mid2:OPN	0.005	200	No	0
Replacement Fire	Late1:OPN	Early1:OPN	0.001	1000	Yes	0
Surface Fire	Late1:OPN	Late1:OPN	0.002	500	No	0
Mixed Fire	Late1:OPN	Late1:OPN	0.002	500	No	0
Replacement Fire	Late2:OPN	Early1:OPN	0.001	1000	Yes	0
Surface Fire	Late2:OPN	Late2:OPN	0.002	500	No	0
Mixed Fire	Late2:OPN	Late2:OPN	0.002	500	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. 257 pp.

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.

Blackburn, W.H. and P.T. Tueller. 1970. Pinyon and juniper invasion in black sagebrush communities in east-central Nevada. Ecology 51: 841-848.

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 p.

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: S.B. Monsen, R. Stevens, R.J. Tausch, R. Miller and S. Goodrich, compilers. Proceedings: ecology and management of pinyon-juniper communities within the Interior West. 15-18 Sept 1997, Provo, UT. Proceedings RMRS-P-9. Ogden, UT: USDA Forest Service, Rocky Mountain Research Station.

Gruell, G.E. 1999. Historical and modern roles of fire in pinyon-juniper. Pages 24-28 in: S.B. Monsen, R. Stevens, R.J. Tausch, R. Miller and S. Goodrich, compilers. Proceedings: ecology and management of pinyon-juniper communities within the Interior West. 15-18 Sept 1997, 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.

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.

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.

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: S.B. Monsen, R. Stevens, R.J. Tausch, R. Miller and S. Goodrich, compilers. Proceedings: ecology and management of pinyon-juniper communities within the Interior West. 15-18 Sept 1997, Provo, UT. Proceedings RMRS-P-9. Ogden, UT: USDA Forest Service, Rocky Mountain Research Station.

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.

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 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.