11150
Inter-Mountain Basins Juniper Savanna

BpS Model/Description Version: Aug. 2020

Modelers		Reviewers	
Bob Unnasch	bunnasch@tnc.org	Vic Ecklund	vecklund@csu.org
		Chuck Kostecka	kostecka@webaccess.net

Vegetation Type
Steppe/Savanna

Map Zones
28

Geographic Range
This widespread ecological system occupies dry foothills and sandsheets of western CO, northwestern NM, northern AZ, UT, west into the Great Basin of NV 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 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. Fire occurrence 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 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 fire 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	340	33	100	1000
Moderate (Mixed)	437	26	100	1000
Low (Surface)	278	41		
All Fires	113	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-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 UT and NV 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 (CES304.773) or Colorado Plateau Pinyon-Juniper Woodland (CES304.767).

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-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

Canopy cover of trees >40% can be considered uncharacteristic in this savanna BpS.

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	B	B	B	B	B	B	B	B
Herb	0.5-1.0	A	A	B	B	B	B	B	B	B	B
Herb	>1.0	A	A	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	C	C	UN	UN	UN	UN	UN	UN
Tree	5-10	C	D	E	E	UN	UN	UN	UN	UN	UN
Tree	10-25	C	D	E	E	UN	UN	UN	UN	UN	UN
Tree	25-50	C	D	E	E	UN	UN	UN	UN	UN	UN
Tree	>50	C	D	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

Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
BOGR2	Bouteloua gracilis	Blue grama	Upper
HECO26	Hesperostipa comata	Needle and thread	Upper
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.

Maximum Tree Size Class

None

Class B 5 Early Development 1 - Closed

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.

Maximum Tree Size Class

None

Class C 13 Mid Development 1 - 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 emerging and becoming established.

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.

Maximum Tree Size Class

Medium 9-21"DBH

Class E 43 Late Development 1 - Closed

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.

Maximum Tree Size Class
Medium 9-21"DBH

Model Parameters

Deterministic Transitions

From Class	Begins at (yr)	Succeeds to	After (years)
Early1:OPN	0	Early1:CLS	9
Early1:CLS	10	Mid1:OPN	29
Mid1:OPN	30	Late1:OPN	99
Late1:OPN	100	Late1:CLS	399
Late1:CLS	400	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
Mixed Fire	Early1:OPN	Early1:OPN	0.003	333	No	0
Replacement Fire	Early1:OPN	Early1:OPN	0.01	100	Yes	0
Mixed Fire	Early1:CLS	Mid1:OPN	0.01	100	Yes	0
Replacement Fire	Early1:CLS	Early1:OPN	0.01	100	Yes	0
Replacement Fire	Mid1:OPN	Early1:OPN	0.005	200	Yes	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
Replacement Fire	Late1:CLS	Early1:OPN	0.002	500	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. 257 pp.

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.K. 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: 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. 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. USDA Forest Service, Intermountain Region, Ogden, UT. 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.

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.