10160
Colorado Plateau Pinyon-Juniper Woodland

BpS Model/Description Version: Aug. 2020

Modelers		Reviewers	
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None	None	None	None
None	None	None	None

Vegetation Type
Forest and Woodland

Map Zones
13, 14

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. In map zone (MZ) 13, it is located in the extreme eastern part.

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 nova*, *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
ARNO4	*Artemisia nova*	Black 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

Uncertainty exists about the fire frequencies of this ecological system, especially since this ecological system groups different types of pinyon-juniper communities for different slopes, exposures, and elevations. Replacement fires of a scale beyond a few trees were uncommon to rare (average fire return interval [FRI] of 100-1,000yrs) and occurred primarily during extreme fire behavior conditions and during long droughts. Fire occurrence may be caused by importation from adjacent shrub- and grassland-dominated vegetation of lower and higher altitudinal zones. 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). For sites situated far east of MZ13 with greater monsoonal rains, Rondeau (2001) described mixed and replacement FRI, respectively, at 150-200yrs and 200-500yrs. For MZ13, longer FRIs were chosen. There is limited evidence for surface fires (Gruell 1994; Bauer and Weisberg, unpublished data), which likely occurred only in the more productive sites during years where understory grass cover was high, providing adequate fuel. Although fire scars are only rarely found in pinyon-juniper of the Colorado Plateau and elsewhere (Baker and Shinneman 2004; Eisenhart 2004), ongoing studies in the central Great Basin are observing fire-scarred trees, suggesting that surface fires historically occurred at low frequency. Limited evidence to date suggests that while lightning ignitions in this biophysical setting may have been common, the resulting fires only rarely spread to affect more than a few trees.

Ethnobiological studies of Great Basin and Mojave Desert tribes (Fowler et al. 2003) describe the common use of fire for stimulating tobacco growth in the gaps between old pinyons and junipers, in addition to the common practice of roasting pine cones in pits. Burning for tobacco could be the source of mixed-severity and surface fires in these systems and of fire scars.

Prolonged weather-related stress (drought mostly) and insects and tree pathogens are coupled disturbances that thin trees to varying degrees and kill small patches every 250-500yrs on average, with greater frequency in more closed stands.

Fire Frequency

Severity	Avg FI	Percent of All Fires	Min FI	Max FI
Replacement	484	33	100	1000
Moderate (Mixed)	341	46	100	1000
Low (Surface)	771	21	5	1000
All Fires	159	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 (1102) systems where sympatric.

Due to livestock removal of grasses, thus competition for tree seedlings, and fire exclusion for more than a century, pinyon-juniper stands have experienced densification. Older trees (>300yrs) are surrounded by younger conical trees <100yrs old. The shrubland matrix around these woodlands has also experienced invasion of pinyon and juniper and a greater occurrence of crown fires that spread to true woodlands.

Issues or Problems

Native Uncharacteristic Conditions
Tree cover >70% is considered uncharacteristic; however, higher cover values are more due to greater cover on cooler aspects or higher elevations in the pre-settlement condition.

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	B	B	B	B	B	B	B	B	B	B
Shrub	0.5-1.0	B	B	B	B	B	B	B	B	B	B
Shrub	1.0-3.0	B	B	B	B	B	B	B	B	B	B
Shrub	>3.0	B	B	B	B	B	B	B	B	B	B
Tree	0-5	C	C	C	C	C	C	C	C	C	C
Tree	5-10	D	D	D	D	D	D	D	D	D	D
Tree	10-25	D	D	D	D	D	D	D	D	D	D
Tree	25-50	D	D	D	D	D	D	D	D	D	D
Tree	>50	D	D	D	D	D	D	D	D	D	D

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 **2** **Early Development 1 - Open**

Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
SYOR	Symphoricarpos orbiculatus	Coralberry	Upper
BASA3	Balsamorhiza sagittata	Arrowleaf balsamroot	Lower
BOGR2	Bouteloua gracilis	Blue grama	Lower
HECO26	Hesperostipa comata	Needle and thread	Lower

Description

Initial post-fire community dominated by annual grasses and forbs. Later stages of this class contain greater amounts of perennial grasses, forbs, and shrubs. Shrubs are between 0-10% cover and from 0-0.5m in height. Evidence of past fires (burnt stumps and charcoal) should be observed.

Maximum Tree Size Class

None

Class B 7 Mid Development 1 - Open

Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
ARNO4	Artemisia nova	Black sagebrush	Upper
SYOR	Symphoricarpos orbiculatus	Coralberry	Upper
PIED	Pinus edulis	Twoneedle pinyon	Lower
JUOS	Juniperus osteosperma	Utah juniper	Lower

Description

Dominated by shrubs, perennial forbs and grasses. Tree seedlings starting to establish on favorable microsites. 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 27 Mid Development 2 - 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	Middle
HECO26	Hesperostipa comata	Needle and thread	Lower

Description

Shrub- and tree-dominated community with young juniper and pinyon seedlings becoming established. It is important to note that replacement fire at this stage does not eliminate perennial grasses. Mortality from insects, pathogens, and drought affects older trees.

Maximum Tree Size Class
Pole 5-9" DBH

Class D 64 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
Community dominated by young (<300yrs) to old (>300yrs) junipers and pines of mixed age structure. Juniper and pinyon becoming competitive on site and affecting understory composition between 100-300yrs. After 300yrs, old, non-conical trees dominate the stand. Tree pathogens and insects such as pinyon Ips become more important for woodland dynamics, including both patch mortality and thinning of isolated individual trees.

Maximum Tree Size Class
Large 21-33" 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	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:OPN	Early1:OPN	0.003	333	Yes	0
Mixed Fire	Mid1:OPN	Mid1:OPN	0.005	200	No	0
Replacement Fire	Mid1:OPN	Early1:OPN	0.005	200	Yes	0
Insects or Disease	Mid2:OPN	Mid1:OPN	0.001	1000	Yes	0
Replacement Fire	Mid2:OPN	Early1:OPN	0.004	250	Yes	0

Mixed Fire	Mid2:OPN	Mid2:OPN	0.005	200	No	0
Replacement Fire	Late1:OPN	Early1:OPN	0.001	1000	Yes	0
Insects or Disease	Late1:OPN	Mid2:OPN	0.002	500	Yes	0
Insects or Disease	Late1:OPN	Mid1:OPN	0.002	500	Yes	0
Surface Fire	Late1:OPN	Late1:OPN	0.002	500	No	0
Mixed Fire	Late1:OPN	Late1:OPN	0.002	500	No	0

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