10250
Madrean Pinyon-Juniper Woodland

BpS Model/Description Version: Aug. 2020 ,

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Vegetation Type
Forest and Woodland

Map Zones
14, 15, 24, 25, 26

Geographic Range
Sierra Madre Occidentale and Sierra Madre Oriental in Mexico, Trans-Pecos Texas, southern New Mexico, southern Arizona (south of the Mogollan Rim and southwestern New Mexico).

Biophysical Site Description
This Biophysical Setting (BpS) typically is found at elevations between 1,400m-2,200m. Madrean Juniper savannas occur at the lower altitudinal limits for foothill tree species, below the pinyon-juniper woodlands but at or above semi-desert grassland where soil moisture limits cover of montane woody plants. At higher and therefore moister elevations, woodlands grade into Madrean encinal or, less frequently, montane pine-oak woodlands characterized by taller and denser vegetation than these woodlands. Savannas and woodlands are found on many and varied topographic positions, including low- to mid-elevation mountain slopes, hills, plateaus, basins, and flats.

Vegetation Description
The upper vegetation canopy is composed of open to moderately dense tree layer dominated by *Pinus cembroides*, *Pinus discolor*, *Pinus edulis*, *Juniperus depeanna*, and/or *Juniperus monosperma*. Madrean oaks such as *Quercus arizonica*, *Q. emoryi*, *Q. grisea*, *Q. oblongifolia*, or *Q. mohriana* may be co-dominant with pinyon pines (*Pinus edulis*, *P. discolor*) and/or juniper trees. In southwestern New Mexico, *Q. grisia* may be dominant. *Pinus engelmannii* occurs infrequently, and *P. ponderosa* and *P. arizonica* are absent or sparse. *Juniperus monosperma* is often present to dominant on the Gila National Forest. Understory layers are variable and may be dominated by shrubs such as manzanita (*Arctostaphylos pungens*, *A. pringlei*), cliffrose (*Cowania mexicana*), Apache plume (*Fallugia paradoxa*), or barberry (*Berberis* spp). Graminoids may form dense (savanna) to sparse canopy. Common species include sideoats grama (*Bouteloua curtipendula*), cane bluestem (*Bothriochloa barbinodis*), muhly grasses (*Muhlenbergia emerslyei*, *M. torreyi*, and *M. porteri*). Graminoids decrease in cover and biomass with increasing cover of woody plants.

BpS Dominant and Indicator Species

Symbol	Scientific Name	Common Name

JUDE	*Juncus debilis*	Weak rush
PIED	*Pinus edulis*	Twoneedle pinyon
PIDI3	*Pinus discolor*	Border pinyon
QUAR	*Quercus arizonica*	Arizona white oak
QUEM	*Quercus emoryi*	Emory oak
QUGR3	*Quercus grisea*	Gray oak
QUOB	*Quercus oblongifolia*	Mexican blue oak
PILE	*Pinus leiophylla*	Chihuahuan pine
QUMO	*Quercus mohriana*	Mohr oak

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

Disturbance Description

The fire regime of this ecological system is almost completely unknown. There are essentially no data about fire frequency, fire history, or fire behavior. The occasional paper that addresses fire includes considerably more speculation than data. It would seem that fire occurrence was determined primarily by fire occurrence in the surrounding matrix vegetation and was ignited by lightning during early summer. However, even this information is speculative and undocumented; based on contemporary ecological knowledge, models that assume specific fire regimes are little more than wild guesses. Such a model follows, in the sincere hope that it will be ignored or improved upon.

This system is likely predisposed to stand-replacement fires during the earliest stage of stand development. Replacement fires are assumed to have occurred every century or so and mixed severity fires slightly less frequently. Significant drought occurs about every 60yrs and, in combination with herbivory from invertebrates, causes disproportional mortality of large, old trees.

Fire Frequency

Severity	Avg FI	Percent of All Fires	Min FI	Max FI
Replacement	135	34	20	1000
Moderate (Mixed)	208	22	20	1000
Low (Surface)	104	44		
All Fires	46	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

Pinyon-juniper woodland usually was distributed across the landscape in patches between 100s-1000s of acres in size. In particularly dissected topography, this type may have occurred in smaller patches.

Adjacency or Identification Concerns

This system generally is found at higher elevations and more mesic sites than semi-desert grassland. Typically it is bordered at higher elevations by Madrean Pine-Oak Woodlands. Cover and density of juniper and pinyon trees at lower elevations in this type doubtless have increased as a result of fire suppression (possibly as mitigated by livestock grazing). This

phenomenon is characteristic of BpS 11160 (juniper savanna), with which BpS 1025 (pinyon-juniper woodland) has been lumped for map zone (MZ) 15. Bordered at low elevation by Madrean Encinal and Desert Grasslands on Gila NF.

Issues or Problems

Virtually no components of the fire regimes are known with any certainty. Fire scars are rare, and trees in this system cannot be aged with conventional dendrochronological techniques. Information about fire regimes is extrapolated from adjacent systems, and extreme caution is warranted when interpreting these models. Fire season can be inferred more reliably than fire frequency; the former likely is equally or more important than the latter.

This ecological system was originally described assuming evergreen oak species are present to co-dominant in the understory or canopy in MZ15 (Schulz, personal communication). This system also includes pinyon-juniper woodlands and savannas with understories dominated by other shrubs or a grass layer and lacks evergreen oaks, which may have a different fire behavior. Christiansen suggests that further data may justify merging with another pinyon-juniper BpS.

Native Uncharacteristic Conditions

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	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN
Shrub	0.5-1.0	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN
Shrub	1.0-3.0	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN
Shrub	>3.0	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN
Tree	0-5	B	B	B	B	B	B	B	B	B	B
Tree	5-10	B	B	B	B	B	B	B	B	B	B
Tree	10-25	C	C	C	C	C	C	C	C	C	C
Tree	25-50	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN
Tree	>50	UN	UN	UN	UN	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 **5** **Early Development 1 - All Structures**

Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
BOCU	Bouteloua curtipendula	Sideoats grama	Upper
BOBA3	Bothriochloa barbinodis	Cane bluestem	Upper
MUCA2	Muhlenbergia capillaris	hairawn muhly	Upper
QUGR3	Quercus grisea emoryi	Gray oak	Mid-Upper
QUAR	Quercus arizonica	Arizona white oak	
QUEM	Quercus emoryi	Emory oak	

Description

Initial post-fire community dominated by perennial caespitose grasses. Evidence of past fires may be observed, including charcoal and resprouting woody plants.

Maximum Tree Size Class

No Data

Class B 57 Mid Development 1 - Closed

Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
JUDE	Juncus debilis	Weak rush	Upper
PIED	Pinus edulis	Twoneedle pinyon	Upper
QUAR	Quercus arizonica	Arizona white oak	Upper
QUEM	Quercus emoryi	Emory oak	Upper

Description

Community dominated by young to mature alligator juniper and evergreen oak trees of various ages.

Maximum Tree Size Class

Pole 5-9" DBH

Class C 38 Late Development 1 - Closed

Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
JUDE	Juncus debilis	Weak rush	Upper
PIED	Pinus edulis	Twoneedle pinyon	Upper
QUAR	Quercus arizonica	Arizona white oak	Upper
QUEM	Quercus emoryi	Emory oak	Upper

Description

Site dominated by relatively dense old alligator juniper and evergreen oak trees.

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:CLS	9
Mid1:CLS	10	Late1:CLS	84
Late1:CLS	85	Late1:CLS	984

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:ALL	Early1:ALL	0.1	10	Yes	0
Replacement Fire	Mid1:CLS	Early1:ALL	0.003	333	Yes	0
Mixed Fire	Mid1:CLS	Mid1:CLS	0.005	200	No	0
Replacement Fire	Late1:CLS	Early1:ALL	0.003	333	Yes	0
Mixed Fire	Late1:CLS	Late1:CLS	0.005	200	No	0
Wind or Weather or Stress	Late1:CLS	Mid1:CLS	0.015	67	Yes	0
Surface Fire	Late1:CLS	Late1:CLS	0.025	40	No	0

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