

10240

Madrean Lower Montane Pine-Oak Forest and Woodland

BpS Model/Description Version: Aug. 2020

Modelers		Reviewers	
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None	None	Keith Schulz	Keith_Schulz@naturereserve.org
None	None	None	None

Vegetation Type

Forest and Woodland

Map Zones

25, 27

Geographic Range

Sierra Madre Occidental and Sierra Madre Oriental in Mexico, Trans-Pecos Texas, southern New Mexico, and along the Sky Islands of southeastern Arizona, generally south of the Mogollon Rim.

Biophysical Site Description

This type is intermingled with patchy shrublands on moist mid-elevation slopes (1,500-2,300m elevation). May occur on granite, rhyolite, or limestone substrates.

Vegetation Description

These forests and woodlands are dominated by Madrean pines in the overstory (*Pinus arizonica*, *P. engelmannii*, *P. leiophylla*, or *P. strobiformis*) and evergreen oaks in the understory (*Quercus arizonica*, *Q. emoryi*, and *Q. grisea*), intermingled with patchy shrublands on most mid-elevation slopes (1,500-2,300m elevation). Other tree species include *Cupressus arizonica*, *Juniperus deppeana*, *Pinus arizonica*, *P. discolor*, *P. engelmannii*, and *P. ponderosa*. Subcanopy and shrub layers may include typical encinal and chaparral species such as *Agave* spp., *Arbutus arizonica*, *Arctostaphylos pringlei*, *Arctostaphylos pungens*, *Garrya wrightii*, *Nolina* spp., *Quercus hypoleucoides*, *Q. rugosa*, and *Q. turbinella*. Some stands have moderate cover of perennial warm-season grasses such as *Bouteloua curtipendula*, *B. gracilis*, *Muhlenbergia emersleyi*, *M. longiligula*, *M. virescens*, and *Schizachyrium cirratum*. Graminoids decrease in cover and biomass with increasing cover of woody plants.

BpS Dominant and Indicator Species

Symbol	Scientific Name	Common Name
QUAR	<i>Quercus arizonica</i>	Arizona white oak
PIAR5	<i>Pinus arizonica</i>	Arizona pine
PIEN2	<i>Pinus engelmannii</i>	Apache pine
QUEM	<i>Quercus emoryi</i>	Emory oak
PIST3	<i>Pinus strobiformis</i>	Southwestern white pine
PILE	<i>Pinus leiophylla</i>	Chihuahuan pine

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

Disturbance Description

Fire is the primary disturbance in this Biophysical Setting (BpS). Fire histories derived from sampling the *Pinus* species show a frequent (6-10yrs) low-intensity fire regime with infrequent replacement fires (Swetnam and Basin 1996). Historically, fires were caused by lightning; it is unknown if aboriginal burning was present or significant. Larger fires that occurred in the early summer months immediately prior to the onset of monsoonal moisture started after monsoonal precipitation were often smaller and less intense due to higher moisture presence.

Anonymous reviewer suggested different ranges of mean fire return interval (MFRI) than used in the model: replacement 50yrs (30-200yrs), mixed 20yrs (20-100yrs), surface 10yrs (4-25yrs), and all fires seven years; still in Fire Regime Group I.

Based on reviewer comments and discussions with the original modeler, Tyson Swetnam, and after this type had been mapped adjacent to types with longer MFRIs, Kori Blankenship (kblankenship@tnc.org) modified the model to increase the MFRI from 4yrs to 7yrs.

Fire Frequency

Severity	Avg FI	Percent of All Fires	Min FI	Max FI
Replacement	59	12	10	200
Moderate (Mixed)	30	23		
Low (Surface)	11	65	15	100
All Fires	7	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 type usually was distributed across the landscape in patches of 100s to 1,000s of acres. 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 Madrean encinal. The presence of *Pinus* species delineates this BpS from others. It may be bordered by, and confused with, pinyon-juniper woodland or interior chaparral (e.g., Great Basin pinyon-juniper woodland [Brown 1982], the juniper-pinyon or juniper steppe types of coarse-scale PNVG [Schmidt et al. 2002], and PNV [Kuchler 1964]).

Indicator species of this type include alligator juniper, evergreen oaks, Mexican pines, mountain muhly, blue grama, and sideoats grama.

Issues or Problems

This model needs further review by regional experts of the Sky Island chain. Recent research indicates that replacement fire plays an important role in this BpS along steep slopes, such as in the Animas and Rincon mountains. Other possible locations of similar replacement fire settings may be found in the Huachuca and Galiuro mountains. Although this is a small BpS located in a transitional belt along elevational gradients, it plays an important role in moving fire between other BpS types.

Native Uncharacteristic Conditions

Tree cover >70% is uncharacteristic.

Comments

Succession Classes	
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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	A	A	A	A	A	A	A	UN	UN	UN
Tree	5-10	C	C	C	C	B	B	B	UN	UN	UN
Tree	10-25	D	D	D	D	D	B	B	UN	UN	UN
Tree	25-50	D	D	D	D	D	B	B	UN	UN	UN
Tree	>50	D	D	D	D	D	B	B	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	8	Early Development 1 - All Structures
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Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
MUHLE	Muhlenbergia	Muhly	Lower
BOUTE	Bouteloua	Grama	Lower
QUAR	Quercus arizonica	Arizona white oak	Upper
QUEM	Quercus emoryi	Emory oak	Upper

Description

Openings with grass, shrub, and forbs created after replacement fire. Post-replacement vegetation is patchy and episodic. Grass species are primary cover type with 10-30% cover. Oaks are vigorous rapid resprouters. Pine seedlings begin to establish.

Maximum Tree Size Class

Seedling <4.5ft

Class B	6	Mid Development 1 - Closed
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Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
QUEM	Quercus emoryi	Emory oak	Low-Mid
QUAR	Quercus arizonica	Arizona white oak	Low-Mid
PIEN	Picea engelmannii	Engelmann spruce	Upper
PIAR5	Pinus arizonica	Arizona pine	Upper

Description

Woodlands are made up of developing oaks and pine with limited grass and herbaceous understory.

Maximum Tree Size Class

Pole 5-9" DBH

Class C	34	Mid Development 1 - Open
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Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
QUEM	Quercus emoryi	Emory oak	Middle
QUAR	Quercus arizonica	Arizona white oak	Middle
MUHLE	Muhlenbergia	Muhly	Lower
PIAR5	Pinus arizonica	Arizona pine	Upper

Description

Woodlands are made up of developing oaks and pine with grass understory. Open canopy with herbaceous species growing in openings.

Maximum Tree Size Class

Medium 9-21" DBH

Class D	52	Late Development 1 - Open
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Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
PIAR5	Pinus arizonica	Arizona pine	Upper
PIEN	Picea engelmannii	Engelmann spruce	Upper
PIST3	Pinus strobiformis	Southwestern white pine	Upper
QUEM	Quercus emoryi	Emory oak	Lower

Description

Open woodland derived from succession on slopes and ridgetops and from thinning on relatively productive soils. Frequent fire removes senescent grasses and dead woody material maintaining stand conditions. Woodland canopy closure averages 25%; *Pinus arizonica*, *P. engelmannii*, and *P. strobiformis* form the dominant canopy layer.

Maximum Tree Size Class

Large 21-33" DBH

Model Parameters

Deterministic Transitions

From Class	Begins at (yr)	Succeeds to	After (years)
Early1:ALL	0	Mid1:OPN	20
Mid1:OPN	21	Late1:OPN	70
Mid1:CLS	21	Late1:OPN	70
Late1:OPN	71	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
Mixed Fire	Early1:ALL	Early1:ALL	0.033	30	No	0
Replacement Fire	Early1:ALL	Early1:ALL	0.1	10	Yes	0
Alternative Succession	Early1:ALL	Mid1:CLS	0.125	8	Yes	0
Replacement Fire	Mid1:OPN	Early1:ALL	0.01	100	Yes	0
Mixed Fire	Mid1:OPN	Mid1:OPN	0.033	30	No	0
Surface Fire	Mid1:OPN	Mid1:OPN	0.1	10	No	0
Replacement Fire	Mid1:CLS	Early1:ALL	0.01	100	Yes	0
Mixed Fire	Mid1:CLS	Mid1:OPN	0.033	30	Yes	0
Surface Fire	Mid1:CLS	Mid1:OPN	0.1	10	Yes	0
Replacement Fire	Late1:OPN	Early1:ALL	0.01	100	Yes	0
Mixed Fire	Late1:OPN	Late1:OPN	0.033	30	No	0
Surface Fire	Late1:OPN	Late1:OPN	0.1	10	No	0

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