10940
Western Great Plains Sandhill Steppe

BpS Model/Description Version: Aug. 2020

Modelers		Reviewers	
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Vegetation Type
Shrubland

Map Zones
32, 35

Geographic Range
This system is found in south-central areas of the Western Great Plains Division ranging from New Mexico, east across the panhandle of Texas to western Oklahoma. In map zone (MZ) 32, this type is found in ECOMAP (Cleland et al. 2007) subsections 315Fb and 315Fc.

Biophysical Site Description
The climate is semi-arid to arid for much of the region in which this system occurs. This system is found on somewhat excessively to excessively well-drained, deep sandy soils that are often associated with dune systems and ancient floodplains, referred to as blowing sands, deep sands, or sandy or limy breaks in the Texas panhandle.

Vegetation Description
Havard oak or shinnery oak (*Q. havardii*) is a vigorous resprouter following a fire and thus persists for long periods of time, representing the permanent cover type. Growth of resprouts following disturbance (often related to fire) within these *Q. havardii* shrublands causes a structural change, moving from early short resprouts and developing into taller shrublands to ~2-3m in height. Sand sagebrush (*Artemisia filifolia*) can be a significant component of this system but rarely achieves dominance of the canopy. Composition can vary with geography, amount and season of precipitation, disturbance, and soil texture. Several graminoid species such as sand bluestem (*Andropogon hallii*), little bluestem (*Schizachyrium scoparium*), sand dropseed (*Sporobolus cryptandrus*), giant sandreed (*Calamovilfa gigantea*), needle-and-thread grass (*Hesperostipa comata*), and grama grass (*Bouteloua* spp., including *hirsuta*, *gracilis*, and *curtipendula*) can be connected with this system. Other shrub species may also be present, including yucca (*Yucca elata*), mesquite (*Prosopis glandulosa*), skunkbush sumac (*Rhus trilobata*), catclaw mimosa (*Mimosa biuncifera*), and chickasaw plum (*Prunus angustifolia*). Shinnery oak occurs as extensive clones. Shinnery oak areas tend to have more diverse shrub components than nearby sand-sagebrush-dominated areas.

BpS Dominant and Indicator Species

Symbol	Scientific Name	Common Name
ARFI2	*Artemisia filifolia*	Sand sagebrush

YUEL	*Yucca elata*	Soaptree yucca
BOUTE	*Bouteloua*	Grama
QUHA3	*Quercus havardii*	Havard oak
SCSC	*Schizachyrium scoparium*	Little bluestem
CAGI3	*Calamovilfa gigantea*	Giant sandreed
SPCR	*Sporobolus cryptandrus*	Sand dropseed

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

Disturbance Description

Edaphic and climatic factors (drought and extreme winds) are the most important processes of this type. Drought and extreme winds act in a synergistic way with fire in this Biophysical Setting (BpS). Once cover is removed, sand is easily eroded by the common and significant wind events. Fire does occur, especially during drought. Fires may be very patchy because of the patchy distribution of fine fuels; however, stand-replacement (>75% topkill of canopy vegetation) fires do occur.

Historical grazing may have been a factor, particularly during early resprouting of the shrubs. With continuous grazing, development of fine fuels attributable to graminoid cover is reduced, and fire frequency may be controlled by the development of litter from shinnery oak leaves, which may take a minimum of 5yrs. Bison probably grazed the BpS, especially following resprouting (Class A), and this process was probably mediated by the productivity of surrounding prairie types.

One MZ34 reviewer added about the disturbance regime: Some early explorations -- e.g., Marcy -- found diminutive oak overtopped by tall grasses. Present-day research has shown that this growth form can be temporarily brought about by fire. Given variable topography, fine fuel loading, etc., the historical shinnery landscape -- in the eastern portion of the range -- was composed of a shifting mosaic of plant community structural forms. That heterogeneity was associated with time since last fire. Whether or not you have a short or long fire interval will have a meaningful impact on what the shinnery landscape looks like.

A reviewer in MZ32 indicated that the mean fire return interval (MFRI) for this system, presently modeled with a MFRI of about 50yrs, was probably too long. The reviewer based this conclusion on the assumption that the MFRI of this BpS would be similar to that of the adjacent grasslands, which likely burned at intervals of <10yrs. The reviewer felt that this BpS should be classified into Fire Regime II and therefore should have an all fire return interval of <35yrs. The regional lead chose not to change the MFRI for this type based on this review because the reviewer indicated that the MFRI was debatable and because it was desirable to maintain consistency with MZ34 where reviewers were comfortable with the approximately 50yr MFRI.

Fire Frequency

Severity	Avg FI	Percent of All Fires	Min FI	Max FI
Replacement	52	100		
Moderate (Mixed)				
Low (Surface)				
All Fires	52	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 BpS can occur as small patches of 10-100s of hectares but sometimes occupying areas as large 1,000ha+.

Adjacency or Identification Concerns

This BpS occurs adjacent to the matrix shortgrass, mixedgrass, or tallgrass prairie, depending on soil type of the surrounding landscape and climatic conditions affecting moisture availability. It also occurs as a mosaic with grasslands occurring on similar deep sand situations (modeled separately, BpS 1148). However, the shrublands modeled for the present BpS are stable shrublands that do not transition with the grassland BpS.

Issues or Problems

In MZ26, this BpS was lumped with Chihuahuan Sandy Plains Semi-desert Grassland (BpS 1133), treating the grassland type as a class within the model. In MZ34, we are treating the Western Great Plains Sand Prairie (BpS 1148) as a separate BpS, modeling it separately. There will be a class within BpS 1148 that resembles this BpS (BpS 1094) in species composition but generally expressing an increased cover of *Artemisia filifolia* relative to the BpS modeled here and to a lesser (but still significant) extent of shrub cover.

Chemical treatment of areas (sometimes large areas) of the BpS results in at least a temporary shift toward the Western Great Plains Sand Prairie and may take decades to recover. Such treatment has occurred at numerous locations throughout the range of the BpS. Complete removal of shinnery oak (killing of entire clones) may result in a longer term shift toward shrublands dominated by other species, such as *Rhus trilobata*, *Prunus angustifolia*, and *Artemisia filifolia*.

Native Uncharacteristic Conditions

This BpS will appear on the landscape as an uncharacteristic native condition for Western Great Plains Sand Prairie (BpS 1148).

Comments

For MZ32 this type was imported from the MZ34 model for the same BpS by Lee Elliott, Sandra Rideout-Hanzak, and Douglas Zollner and reviewed by Wade Harrell (wharrell@tnc.org) and Chris Hise (cmhise@tnc.org). For MZ32, additional geographic information was added and comments added to the disturbance description by reviewer Sam Fuhlendorf. Because only minor descriptive changes were made for MZ32, the modelers were not changed.

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	A	A	A	A	A	A	A	A	A	A
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	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN
Tree	5-10	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN
Tree	10-25	UN	UN	UN	UN	UN	UN	UN	UN	UN	UN
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 23 Early Development 1 - All Structures

Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
ARFI2	Artemisia filifolia	Sand sagebrush	Upper
QUHA3	Quercus havardii	Havard oak	Upper
YUEL	Yucca elata	Soaptree yucca	Upper
BOUTE	Bouteloua	Grama	Upper

Description

This early development stage is characterized by early sprouting shrubs (*Quercus havardii*). In *Quercus havardii*-dominated areas, the early developmental stages will be almost completely dominated by *Q. havardii* resprouts, with some development of scattered graminoid cover. Wind events, especially directly following a fire, will cause significant erosion and may slow the rate of succession.

Maximum Tree Size Class

None

Class B 77 Late Development 1 - Closed

Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
QUHA3	Quercus havardii	Havard oak	Upper
ARFI2	Artemisia filifolia	Sand sagebrush	Upper
PRAN3	Prunus angustifolia	Chickasaw plum	Upper
YUEL	Yucca elata	Soaptree yucca	Upper

Description
Fire disturbance is stand-replacing and is commonly wind-driven. This class is the dominant class. *Q. havardii* resprouts vigorously following a fire and thus persists for long periods of time. Succession within these *Q. havardii* shrublands manifests as a structural change, moving from early short resprouts and developing into taller shrublands to ~2-3m in height.

Maximum Tree Size Class
None

Model Parameters

Deterministic Transitions

From Class	Begins at (yr)	Succeeds to	After (years)
Early1:ALL	0	Late1:CLS	12
Late1:CLS	13	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
Replacement Fire	Late1:CLS	Early1:ALL	0.025	40	Yes	0

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