**11480**

**Western Great Plains Sand Prairie**

BpS Model/Description Version: Aug. 2020

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| --- | --- | --- | --- |
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**Vegetation Type**

Herbaceous

**Map Zone**

32

**Geographic Range**

Northeastern Colorado, part of southwestern Nebraska, western Kansas, southeastern Wyoming, south to Oklahoma, New Mexico, and Texas. In map zone (MZ) 34, this system can be found throughout the MZ except possibly to a limited extent in 332Fb (where it may not occur at all). In MZ32, this type can be found in ECOMAP subsection 332Fb and 332Fd as well as in 315Fb and 315Fc.

**Biophysical Site Description**

Soils are going to be sandy to loamy sands in this Biophysical Setting (BpS). Soils are highly permeable and low in organic matter. This BpS is referenced as a Deep Sand or sandhills Ecological Site Description (USDA-NRCS ESD). Occurs on rolling topography and along river drainages (such as the Canadian River). Precipitation ranges from 40-60cm (15-24in).

**Vegetation Description**

Graminoid species, such as sand bluestem (*Andropogon hallii*), sand dropseed (*Sporobolus cryptandrus*), prairie sandweed (*Calamovilfa longifolia*), needle-and-thread (*Hesperostipa comata*), little bluestem (*Schizachyrium scoparium*), blue grama (*Bouteloua gracilis*) (dominant), and hairy grama (*B. hirsuta*), can be found within this system. It structurally resembles a tallgrass prairie system. Shrub species that may occur include sand sagebrush (*Artemesia filifolia*), Harvard oak (*Quercus havardii*), yucca (*Yucca elata*), sandcherry (*Prunus angustifolia*), and skunkbush sumac (*Rhus trilobata*). Also present -- switchgrass (*Panicum virgatum*), western wheatgrass (*Pascopyrum smithii*), and more rarely, Indiangrass (*Sorghastrum nutans*). Herbaceous cover is variable ranging from sparse cover (sometimes resulting in highly erodable areas) to >70%.

**BpS Dominant and Indicator Species**

|  |  |  |
| --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** |
| ANHA | *Andropogon hallii* | Sand bluestem |
| CALO | *Calamovilfa longifolia* | Prairie sandreed |
| PAVI2 | *Panicum virgatum* | Switchgrass |
| BOGR2 | *Bouteloua gracilis* | Blue grama |
| SONU | *Sophora nuttalliana* | Silky sophora |
| HECOC8 | *Hesperostipa comata ssp. comata* | Needle and thread |
| ARFI2 | *Artemisia filifolia* | Sand sagebrush |
| PRPUB | *Prunus pumila var. besseyi* | Western sandcherry |

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

**Disturbance Description**

Grazing, drought, and fire were the primary disturbances. Fire and drought disturbances were cyclic, with the earliest and latest seral stages fluctuating widely on a scale of centuries in accordance with changes in climate. Every year, there was probably some grazing -- intensity and number of animals probably varied greatly over time. The principal large grazer of the sandhills was most likely bison, which, when occurring in large numbers, would have locally disturbed large areas due both to grazing impact and physical disturbances such as trampling and wallowing. Elk and deer were other large grazers. Other ubiquitous grazers of the sandhills would have been numerous rodent species such as pocket gophers and kangaroo rats. Prairie dogs were a minor component of the sandhills prairie, with towns located only in areas of finer textured soils.

Grazing and drought would modify fire effects. Fires could occur in a mosaic pattern or may have burned extensively with high severity. The most extensive fires are likely to have occurred in years with wet springs followed by hot, dry summers when grazing pressure was low. Wet springs would have resulted in more productive and more continuous plant cover (i.e., fuel) that would have supported and expanded fires ignited under dry conditions occurring later in the season. In addition, litter accumulation over several fire-free years would also have supported widespread fire in any conditions. The litter component, a determining factor in fire size and frequency, is correlated with seral stage. Fire intervals could have ranged from a few years to >50yrs; however, the return interval was likely similar to that of adjacent grasslands, which probably burned at intervals of <10yrs. Post-fire recovery of the plant community can occur in 2-4yrs (Vermeire et al. 2004 and 2005). Post-fire shifts in species composition depend on the timing and condition of fire.

Extended periods of severe drought are likely to affect both species composition and the stability of the sandhill soil, particularly when compounded by effects of wind, grazing, and fire. These conditions may have led to the development of blowouts, making it difficult for vegetation to reestablish quickly. In early development immediately after disturbance, when herbaceous cover is low, wind erosion tends to maintain that class.

**Fire Frequency**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Severity** | **Avg FI** | **Percent of All Fires** | **Min FI** | **Max FI** |
| Replacement | 13 | 88 |  |  |
| Moderate (Mixed) | 201 | 6 |  |  |
| Low (Surface) | 205 | 6 |  |  |
| All Fires | 12 | 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**

Can occur as a large patch (1,000ac). More commonly occurs as a small patch. More recently, between 1984 and 2014, 184 wildfires burned within the Western Great Plains Sand Prairie MZ32 (MTBS 2016). Wildfires ranged from 264 to >85,000 acres in size, with a mean fire size of approximately 8,000 acres (MTBS 2016).

**Adjacency or Identification Concerns**

Classes of this BpS will resemble occurrences of Western Great Plains Sandhill Shrubland (BpS 1094). We have modeled the two systems separately because the species composition is different -- the shrubland will be dominated by shinnery oak whereas the shrubs in the prairie will be dominated by cherry and sagebrush. Shrub-dominated occurrences of the present BpS result from current grazing and altered fire regime.

In current conditions, this BpS has much less tallgrasses than historically -- switchgrass and bluestem. Some experts believe that there is also a greater amount of sandsage and shortgrass (blue grama) (denser, more basal area) today than there was historically. These experts contend that this system has largely been converted to a shortgrass sandsage plant community, primarily due to long-term continuous grazing and/or overstocking. The changes in grazing in current conditions have had a much greater effect on this system than changes in fire regimes (fire suppression). However, other experts indicate that it is difficult to explain how this system would be more extensive today than it was historically because sandsage is not limited by fire.

**Issues or Problems**

This habitat was important to lesser prairie chicken and greater prairie chicken and plains sharp-tailed grouse.

Very little research has been published on sand-sagebrush communities, but Sam Fuelendorf (Oklahoma State University) has ongoing studies looking at the fire/grazing interaction in this type.

In MZ32, a reviewer suggested that this system be represented by a two-box model, but other reviewers disagreed and preferred the existing three-box model that was created for MZ34. For consistency across zones and to represent the majority opinion received by modelers and reviewers, the regional lead chose to retain the three-box model from MZ34.

**Native Uncharacteristic Conditions**

Eastern redcedar (*Juniperus virginiana*) has invaded this type due to lack of fire. We did not add it here, due to lack of time available, but this clearly demonstrates the need for a *Juniperus* successional pathway, especially for any modern or non-historic revision of this model.

**Comments**

For MZ32, this model was adapted from the same BpS in MZ34. Minor descriptive changes were made to the description, but no changes were made to the VDDT model so MZ34 modeler-ship was retained.

Minor changes to the description were made during review of BpS 1148 in MZ34.

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 | B | B | B | B | B | B | B | B | B | B |
| Herb | >1.0 | B | B | B | B | B | B | B | B | B | B |
| Shrub | 0-0.5 | B | C | C | C | C | C | C | C | C | C |
| Shrub | 0.5-1.0 | B | C | C | C | C | C | C | C | C | C |
| Shrub | 1.0-3.0 | B | C | C | C | C | C | C | C | C | C |
| Shrub | >3.0 | B | C | C | C | C | C | C | C | C | C |
| Tree | 0-5 | C | C | C | C | C | C | C | C | C | C |
| 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 24 Early Development 1 - Open

*Indicator Species*

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| ANHA | Andropogon hallii | Sand bluestem | Upper |
| CALO | Calamovilfa longifolia | Prairie sandreed | Upper |
| PAVI2 | Panicum virgatum | Switchgrass | Upper |
| BOGR2 | Bouteloua gracilis | Blue grama | Lower |

*Description*

This class represents an array of early species, including annuals and resprouting perennials. Class A represents a mix of bare sand, including blowouts and sand draws and extensive areas of sparse vegetative cover up to 20%. The persistence of this class depends on continual disturbance that inhibits the establishment of vegetation, such as wind erosion drought and grazing. This class lasts for 3yrs. Buckwheat (*Eriogonum annuum*) and horseweed (*Conyza canadensis*) may dominate after disturbance.

Frequent wind/weather stress in this class is referring to high-wind events that occur normally. But the fire and drought are what create the conditions to have the wind affect the class and reset it. Native grazers maintain this stage.

See Arturburn et al. (2017) for more information. Current research suggests that blowouts are rare and not persistent.

*Maximum Tree Size Class*  
None

Class B 74 Mid Development 1 - Closed

*Indicator Species*

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| ANHA | Andropogon hallii | Sand bluestem | Upper |
| CALO | Calamovilfa longifolia | Prairie sandreed | Upper |
| PAVI2 | Panicum virgatum | Switchgrass | Upper |
| PRPUB | Prunus pumila var. besseyi | Western sandcherry | Mid-Upper |

*Description*

This class is sandhill grassland, the dominant historical condition. This class has a moderately dense herbaceous layer (20-80% cover) up to 1m tall. Shrubs may make up to 25% of the cover but are more commonly 0-10%. Native grazing maintains this class. Severe, multiple-year drought moves this class to C by reducing grass cover and fuel loads and giving a competitive advantage to the usually spare shrub cover.

*Maximum Tree Size Class*  
None

Class C 2 Late 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 |
| PRAN3 | Prunus angustifolia | Chickasaw plum | Upper |

*Description*

This class is shrub-dominated sandhill grassland and differs from the sandhill shrubland (BpS 1094), which is modeled separately based on edaphic differences. Dominant shrubs include sand sagebrush, shinnery oak, and sand cherry.

*Maximum Tree Size Class*  
None

Model Parameters

Deterministic Transitions

|  |  |  |  |
| --- | --- | --- | --- |
| **From Class** | **Begins at (yr)** | **Succeeds to** | **After (years)** |
| Early1:OPN | 0 | Mid1:CLS | 3 |
| Mid1:CLS | 4 | Mid1:CLS | 999 |
| Late1:ALL | 45 | Late1:ALL | 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** |
| Native Grazing | Early1:OPN | Early1:OPN | 0.2 | 5 | No | 0 |
| Wind or Weather or Stress | Mid1:CLS | Late1:ALL | 0.01 | 100 | Yes | 0 |
| Replacement Fire | Mid1:CLS | Early1:OPN | 0.1 | 10 | Yes | 0 |
| Native Grazing | Mid1:CLS | Mid1:CLS | 0.2 | 5 | No | 0 |
| Replacement Fire | Late1:ALL | Early1:OPN | 0.1 | 10 | Yes | 0 |
| Mixed Fire | Late1:ALL | Mid1:CLS | 0.2 | 5 | Yes | 0 |
| Surface Fire | Late1:ALL | Late1:ALL | 0.2 | 5 | No | 0 |

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