11480

Western Great Plains Sand Prairie

BpS Model/Description Version: Aug. 2020

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

Herbaceous

Map Zones

20, 29, 30

Geographic Range

Predominantly the eastern portion of map zone (MZ) 20. Also found in scattered pockets elsewhere throughout the zone. It probably occurs on the Charles Russell National Wildlife Refuge. In 331Kf, this might occur.

In MZs 29 and 30, more of this type than in MZ20 because more sandstone and sandy soils. Mostly only in MZ30. About 30,000ac (estimate) may be found in the southern portion of MZ29. Occurs around Broadus and Ekalaka. Medicine Rocks State Park almost all sand prairie. 331Kf, in 331Gf and d. Occurs in Little Missouri Grasslands in Dakotas.

There are good classification data and local descriptions of this type for Theodore Roosevelt National Park near Medora, ND, as part of the USGS-NPS Vegetation Mapping Program (Jim Von Loh, personal communication).

Biophysical Site Description

This Biophysical Setting (BpS) would be found in NRCS's sand type or the Sandy Ecological site description. Occurs around sandstone outcrops.

Lower productivity on these sandy sites versus the mixedgrass prairie sites.

Vegetation Description

Dominant vegetation includes prairie sandreed (*Calamovilfa longifolia*), little bluestem (*Schizachyrium scoparium*), blue grama (*Bouteloua gracilis*), needle-and-thread grass (*Stipa comata*), and sand dropseed (*Sporobolus cryptandrus*). Shrubs seen may include horizontal juniper (*Juniperus horizontalis*), silver sagebrush (*Artemisia cana*), and skunkbrush (*Rhus trilobata*). Further east (not in MZ20), BOHI2 and ANHA might occur.

It's uncommon to find Wyoming big sagebrush, and when you do, it's usually Wyoming big sagebrush with bluebunch wheatgrass or needle-and-thread grass that you would find on a sandy soil. The sagebrush in this type is usually silver sagebrush. It would be unusual to have >10-15% shrub cover except in the case of *Juniperus horizontalis*, where cover can go up to 80% or more.

BpS Dominant and Indicator Species

|  |  |  |
| --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** |
| CALO | *Calamovilfa longifolia* | Prairie sandreed |
| SCSC | *Schizachyrium scoparium* | Little bluestem |
| BOGR2 | *Bouteloua gracilis* | Blue grama |
| HECO26 | *Hesperostipa comata* | Needle and thread |
| SPCR | *Sporobolus cryptandrus* | Sand dropseed |

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

Disturbance Description

Fire, grazing, and drought were the primary disturbances. Disturbances were cyclic with the earliest and latest seral stages fluctuating widely in accordance with changes in climate.

The principal large grazer of the system was most likely bison (Bison 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. Grazing impacts are more pronounced near water and removed from steep, rough terrain. Overall the whole system would have been frequently impacted by large ungulate grazers.

Prairie dogs might have been a very minor component of the system. Where they occurred, prairie dogs grazed vegetation close to the ground, which provided a local firebreak. It is questionable, however, as to whether prairie dogs prefer sandy soil and actually occurred here. It is thought that prairie dogs would not occur on these sandy sites and that rather they usually occur on fine-textured soils.

Fire was a frequent and widespread occurrence. 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. Three to five fire-free years produce enough litter to carry another fire. Post-fire shifts in species composition depend on the timing and condition of fire. It is also speculated that native burning might have been an influence in this BpS.

Fire regime similar to adjacent grassland.

Extended periods of severe drought are likely to have affected both species composition and the stability of the sandy soil, particularly when compounded by wind and heavy grazing. Droughts could affect the entire region.

Fire Frequency

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Severity** | **Avg FI** | **Percent of All Fires** | **Min FI** | **Max FI** |
| Replacement | 22 | 100 | 2 | 100 |
| Moderate (Mixed) |  |  |  |  |
| Low (Surface) |  |  |  |  |
| All Fires | 22 | 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 is generally a patch that occurs within the larger northwestern Great Plains mixedgrass. Size probably varies widely but is generally going to be 10s of 1,000s of acres in MZ29 at the large side versus 100s of acres or less in MZ20.

In terms of disturbance impact, in MZ20, entire patches are going to be impacted, whereas it will vary to an unknown level in MZ29.

Adjacency or Identification Concerns

Northwestern Plains Mixedgrass Prairie systems are often found nearby, especially in the western portion of the zone. The sand prairie, however, occurs on the sandy sites. You should identify this system by sandy/soil types.

Pine savanna is sometimes at top of these sandy sites. Trees on northerly or easterly slopes, might be looking at sandy outcrop. Portion of upper slope might be associated with sand prairie. Top will be mapped to pine savanna or woodland.

The disturbance regime has been drastically changed since European settlement. Agriculture replaced bison, and fires have been effectively suppressed.

*Bromus* much less prevalent on sandy soils than on mixedgrass prairie but does occur. There aren't any invasives for this system that are particularly an issue.

It is uncommon to find Wyoming big sagebrush, and when you do, it's usually Wyoming big sagebrush with bluebunch wheatgrass or needle-and-thread that you would find on a sandy soil. The sagebrush in this type is usually silver sagebrush. It would be unusual to have >10-15% shrub cover except in the case of *Juniperus horizontalis*, where cover can go up to 80% or more.

This system is much less departed than 1141. This system is probably not very far departed from the HRV, if at all.

Issues or Problems

Very little data are available from pre-settlement times.

Native Uncharacteristic Conditions

Over 60% cover herbaceous would be uncharacteristic. Probably wouldn't be a sandy site anymore. Herb height also wouldn't be >1m.

Comments

This model for MZs 29 and 30 was adapted from the same BpS from MZ20 created by Peter Lesica, Vinita Shea, and Ben Pratt and reviewed by Steve Barrett and Brian Martin. This model for MZ20 was adapted from the Rapid Assessment model R4NESP Nebraska Sandhills Prairie created by Tom Bragg (tbragg@mail.unomaha.edu), Mary Lata (mlata@fs.fed.us), and Dave Shadis (dshadis@fs.fed.us) and reviewed by John Ortmann (jortmann@tnc.org). Major descriptive and quantitative changes were made so that the model more appropriately represented Montana, instead of Nebraska.

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 | B | B | B | UN | UN | UN |
| Herb | 0.5-1.0 | A | A | A | A | B | B | B | UN | UN | UN |
| Herb | >1.0 | UN | UN | UN | UN | UN | UN | UN | UN | UN | UN |
| 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 | 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 18 Early Development 1 - Open

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| SPCR | Sporobolus cryptandrus | Sand dropseed | Upper |
| HECO26 | Hesperostipa comata | Needle and thread | Lower |
| SCSC | Schizachyrium scoparium | Little bluestem | Upper |
| CALO | Calamovilfa longifolia | Prairie sandreed | Upper |

Description

Class A represents immediate to a few years post-disturbance conditions. Vegetation consists of resprouting and seedling grass and forbs. Total bare soil is greater than before the disturbance, particularly on less productive sites. The vigor of new growth and the specific species affected depend on the season of the disturbance and on pre- and post-disturbance environmental conditions (e.g., available soil moisture). Litter is low initially but increases until, by year three, there is enough to support fire under average burning conditions. In uplands, where soil-type is dominated by coarse-grained sands with low water-holding capacity, post-disturbance primary production initially decreases; thus, fire may only carry under ideal conditions. Under these conditions, grazing is likely to be light. In lowlands, with finer-textured soils, primary production is determined largely by moisture availability.

HECO26 was used as an indicator species for MZs 29 and 30 instead of BOGR2. ARCA13 can resprout immediately after fire, so it could be present in this stage as well. It could, however, be killed following intensive fires. But since not much litter in these sites, possibility of intense fire reduced.

It was originally suggested that there would be a prairie-dog-influenced stage at ~2% of the landscape. However, there was some disagreement as to whether this class should exist or not for this system, as it is thought that these sandy sites might have been unlikely to have prairie dog towns. It was only distinguished from A by different species (*Buchloe dactyloides* [only in the extreme southeast portion of the stage], *Bouteloua gracilis*, and *Agropyron dasystachyum*). Canopy cover was 0-20%. This (very unlikely) prairie-dog-influenced class was therefore merged into the early successional stage, Class A. It is doubtful that prairie dogs would colonize very sandy sites; most prairie dog sites have fairly fine-textured soils.

*Maximum Tree Size Class*  
None

Class B 82 Late Development 1 - Closed

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| CALO | Calamovilfa longifolia | Prairie sandreed | Upper |
| SCSC | Schizachyrium scoparium | Little bluestem | Upper |
| BOGR2 | Bouteloua gracilis | Blue grama | Lower |
| ARCA13 | Artemisia cana | Silver sagebrush | Upper |

Description

This system was originally modeled as a four-box model with a mid and late stage; however, it was changed to a three-box model, combining the mid and late stages, since species and structural info was very similar, as were disturbances. It was then combined into a two-box model because of the lack of a prairie dog stage.

This mid- to late-seral stage would persist three years after a fire. The maximum cover height for grasses would be ~60%, even though in other MZs, cover might be much higher.

Other species indicators could be JUHO2 and SPCR -- in the later part of this stage. Various sprouting shrubs may be established. The shrubs are as tall or taller than the grasses, but they would not be dominant; shrubs might occupy ~10% of the area. Some of the shrubs include *Juniper horizontalis* and skunkbush sumac (*Rhus trilobata*). Other woody species such as chokecherry (*Prunus virginiana*) and snowberry (*Symphoricarpos occidentalis*) may also be established.

This stage includes moderate grazing by native ungulates and insects.

Litter accumulates, providing continuous fuel for fires and thereby increasing the probability of larger fires.

*Maximum Tree Size Class*  
None

Model Parameters

Deterministic Transitions

|  |  |  |  |
| --- | --- | --- | --- |
| **From Class** | **Begins at (yr)** | **Succeeds to** | **After (years)** |
| Early1:OPN | 0 | Late1:CLS | 3 |
| Late1:CLS | 4 | 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** |
| Optional 1 | Early1:OPN | Early1:OPN | 0.0007 | 1429 | Yes | 0 |
| Replacement Fire | Early1:OPN | Early1:OPN | 0.025 | 40 | Yes | 0 |
| Native Grazing | Early1:OPN | Early1:OPN | 0.05 | 20 | Yes | 0 |
| Optional 1 | Late1:CLS | Early1:OPN | 0.0007 | 1429 | Yes | 0 |
| Native Grazing | Late1:CLS | Early1:OPN | 0.01 | 100 | Yes | 0 |
| Replacement Fire | Late1:CLS | Early1:OPN | 0.05 | 20 | Yes | 0 |
| Native Grazing | Late1:CLS | Late1:CLS | 0.15 | 7 | No | 0 |

Optional Disturbances

Optional 1: Prairie Dogs

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