LANDFIRE Biophysical Setting Model

Biophysical Setting 2011480 Western Great Plains Sand Prairie

☐ *This BPS is lumped with:*
☐ *This BPS is split into multiple models:*

General Information

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Vegetation Type
Upland
Grassland/Herbaceous

General Model Sources
☑ Literature
☑ Local Data
☑ Expert Estimate

Dominant Species
CALO
SCSC
BOGR2
HECO26
SPCR

Map Zone
20

Model Zone
☐ Alaska
☐ California
☐
☐ Great Basin
☐ Great Lakes
☐ Hawaii
☐ Northeast
☐ Northern Plains
☐ N-Cent.Rockies
☑
☐ Pacific Northwest
☐ South Central
☐ Southeast
☐ S. Appalachians
☐ Southwest

Geographic Range
Predominantly the eastern portion of MZ20. Also found in scattered pockets elswhere throught the zone. It probably occurs on the Charles Russel National Wildlife Refuge. In 331Kf, this might occur.

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

Vegetation Description
Dominant vegetation includes Prairie Sandreed (Calamovilfa longifolia), Little Bluestem (Schizachyrium scoparium), Blue Grama (Bouteloua gracilis), Needle and Thread (Stipa comata) and Sand Dropseed (Sporobolus cryptandrus). Shrubs seen may include horizontal juniper (Juniperus horizontalis), silver sage (Artmeisia cana) and skunkbrush (Rhus trilobata). Further east (not in MZ20), BOHI2 and ANHA might occur.

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 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.

**Fire Regime Groups are: I: 0-35 year frequency, surface severity; II: 0-35 year frequency, replacement severity; III: 35-100+ year frequency, mixed severity; IV: 35-100+ year frequency, replacement severity; V: 200+ year frequency, replacement severity.

Prairie dogs might have been a 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 rather they usually occur on fixe textured soils.

Fire was a frequent and widespread occurence. 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 (ie, 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.

Extended periods of severe drought is 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.

Adjacency or Identification Concerns

Northwestern Plains Mixed Grass Prairie systems are often found nearby, especially in the western portion of the zone.

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

Native Uncharacteristic Conditions

Scale Description

This is generally a patch that occurs within the larger northwestern plains mixed grass. Size probably varies widely, but is generally going to be 10s of thousands of acres in MZ29 at the large side versus hundreds 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.

Issues/Problems

Very little data are available from presettlement times.

Comments

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 MT, instead of NE.

Vegetation Classes

**Fire Regime Groups are: I: 0-35 year frequency, surface severity; II: 0-35 year frequency, replacement severity; III: 35-100+ year frequency, mixed severity; IV: 35-100+ year frequency, replacement severity; V: 200+ year frequency, replacement severity.

Class A **20 %**

Early Development 1 Open

Upper Layer Lifeform

- [x] Herbaceous
- [ ] Shrub
- [ ] Tree

Fuel Model

Indicator Species and Canopy Position

SPCR
Upper
BOGR2
Lower
SCSC
Upper
CALO
Upper

Structure Data (for upper layer lifeform)

	Min	Max
Cover	0 %	40 %
Height	Herb 0m	Herb 0.5m
Tree Size Class	no data	

☐ Upper layer lifeform differs from dominant lifeform.

Description

Class A represents immediate to three year 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 (eg, available soil moisture). Litter is low initially but increases until, by year three, there is enough to support fire under average burning conditions. Fire was therefore modeled as occuring somewhat less frequently than in class B. 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.

It was originally suggested that there be a prairie-dog influenced stage at approximately two percent 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 and 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 prariie dogs would colonize very sandy sites; most prairie dog sites have fairly fine-textured soils.

Repeated grazing of these areas will prevent succession to Class B. Grazing occurs with a probability of 0.05. Prairie dog grazing was modeled as optional 1, with a very unlikely probability of 0.0007.

Replacement fires occur every 40yrs (due to less litter until the last years of this class, they were modeled as occurring less frequently than in class B. (20yr vs 40yr FRI does not change percentages in each class.)

Class B **80 %**

Late Development 1 Closed

Upper Layer Lifeform

- [x] Herbaceous
- [ ] Shrub
- [ ] Tree

Fuel Model

1

Indicator Species and Canopy Position

CALO
Upper
SCSC
Upper
BOGR2
Lower
ARCA13
Upper

Structure Data (for upper layer lifeform)

	Min	Max
Cover	41 %	60 %
Height	Herb 0m	Herb 1.0m
Tree Size Class	no data	

☐ Upper layer lifeform differs from dominant lifeform.

Description

This system was originally modeled as a four-box model with a mid and late stage; however, it was changed

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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 approximately 60%, even though in other mapzones, 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 approximately 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 thereby increasing the probability of larger fires. However, for the model, fires were attributed similarly between classes A and B.

Prairie dogs might impact this class with a very unlikely probability of 0.0007, bringing this class back to class A.

Other native grazing occurs with a probability of 0.01, bringing the class back to an early seral state, or with a probability of 0.15, maintaining this stage.

Replacement fires occur every 20yrs.

Class C **0 %**

[Not Used] [Not Used]

Upper Layer Lifeform

☐ Herbaceous
☐ Shrub
☐ Tree

Fuel Model

Indicator Species and Canopy Position

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	%	%
Height		
Tree Size Class		

☐ Upper layer lifeform differs from dominant lifeform.

Description

Class D **0 %**

[Not Used] [Not Used]

Upper Layer Lifeform

☐ Herbaceous
☐ Shrub
☐ Tree

Fuel Model

Indicator Species and Canopy Position

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	%	%
Height		
Tree Size Class		

☐ Upper layer lifeform differs from dominant lifeform.

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Description

Class E **0 %**

[Not Used] [Not Used]

Upper Layer Lifeform

☐ Herbaceous
☐ Shrub
☐ Tree

Fuel Model

Indicator Species and Canopy Position

Structure Data (for upper layer lifeform)

	Min	Max
Cover	%	%
Height		
Tree Size Class		

☐ Upper layer lifeform differs from dominant lifeform.

Description

Disturbances

Fire Regime Group:** **II**

Historical Fire Size (acres)

Avg
Min
Max

Sources of Fire Regime Data

☑ Literature
☐ Local Data
☑ Expert Estimate

Fire Intervals	*Avg FI*	*Min FI*	*Max FI*	*Probability*	*Percent of All Fires*
Replacement	20	2	100	0.05	100
Mixed					
Surface					
All Fires	20			0.05002	

Fire Intervals (FI):

Fire interval is expressed in years for each fire severity class and for all types of fire combined (All Fires). Average FI is central tendency modeled. Minimum and maximum show the relative range of fire intervals, if known. Probability is the inverse of fire interval in years and is used in reference condition modeling. Percent of all fires is the percent of all fires in that severity class.

Additional Disturbances Modeled

☐ Insects/Disease
☐ Wind/Weather/Stress
☑ Native Grazing
☐ Competition
☑ Other (optional 1) Prairie Dogs
☐ Other (optional 2)

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