LANDFIRE Biophysical Setting Model

Biophysical Setting 3411480 Western Great Plains Sand Prairie

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

General Information

Contributors (also see the Comments field) **Date** 1/10/2007

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Vegetation Type
Upland Grassland/Herbaceous

Dominant Species
ANHA
CALO
PAVI2
BOGR2
SONU
HECOC8
ARFI2
PRPUB

Map Zone
34

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

General Model Sources
☐ Literature
☐ Local Data
☑ Expert Estimate

Geographic Range
Northeast CO, part of southwest NE, western KS, southeast WY, south to OK, NM and TX. In MZ34, this system can found throughout the mapzone except possibly to a limited extent in ECOMAP subsection 332Fb (where it may not occur at all).

Biophysical Site Description
Soils are going to be sandy to loamy sands in this 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%.

Disturbance Description
Grazing, drought and fire were the primary disturbances. Fire and drought disturbances were cyclic with

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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 would occur in a mosaic pattern. 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 over 50yrs. 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 re-establish quickly. In early development immediately after disturbance, when herbaceous cover is low, wind erosion tends to maintain that class.

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 domintaed 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. There is also a greater amount of sandsage and shortgrass (blue grama) (denser, more basal area) today than there was historically. 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).

Properly stocked grazing systems that allow for adequate recovery periods following each grazing event can restore the historic climax plant community. See NRCS ESDs for sands and choppy sands.

Native Uncharacteristic Conditions

With increased shrub dominance of the grassland, this system could look like BpS 1094. Shrub cover (Box C) is
overrepresented in current conditions compared to the historic condition.

Scale Description

Can occur as a large patch (1000ac). More commonly occurs as a small patch.

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Issues/Problems

Much of this type in CO, KS and NE has also been converted to center-pivot irrigation, plowed and planted. Spraying of sandsage in the recent past has also had an impact on this system, since the spraying kills most forbs and shrubs.

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

Comments

For MZ34 this model was adapted from MZs 27 and 33 BpS1094 Western Great Plains Sandhill Shrubland by Harvey Sprock (harvey.sprock@co.usda.gov), Steve Kettler (steve_kettler@fws.gov) and Keith Schulz (keith_schulz@natureserve.org). For MZ34, significant changes to the MZs 27 and 33 model resulted in a change in modelership.

The model for MZs 27 and 33 was adapted from the RA model R4NESP created by Tom Bragg, Mary Lata, Dave Shadis and reviewed by John Ortmann. Other modelers for MZs 27 and 33 were Rich Sterry, Lorenz Sollmann, Dan Nosal and Randy Reichert.

Vegetation Classes

Class A **25 %**

Early Development 1 Open

Upper Layer Lifeform

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

Fuel Model

Indicator Species and Canopy Position

ANHA Upper
CALO Upper
PAVI2 Upper
BOGR2 Lower

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	0 %	20 %
Height	Herb 0m	Herb 0.5m
Tree Size Class		

- [ ] Upper layer lifeform differs from dominant lifeform.

Description

(Early post-replacement 0-3yrs) 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 three years. Buckwheat (Eriogonum annuum) and horseweed (Conyza canadensis) may dominate after disturbance.

Frequent wind/weather stress (every 3 years) in this class is referring to high wind events which occur normally. But the fire and drought are what create the conditions to have the wind affect the class and reset it. Native grazers (probability = 0.5) maintain this stage.

A year-end of 15yrs was chosen as a median. So this year-end covers part of the wind disturbance and environmental factors. Major droughts occur every 20-30yrs.

Wind/weather stress in this class is referring to high wind events which occur normally. We're describing it in terms of area - i.e.: 10% of area affected. But the fire and drought is what creates the conditions to have the wind affect the class and reset it.

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Native grazers can accelerate or maintain this stage or slow this process, depending on when the grazing occurs and intensity. Because all of these effects occur naturally and frequently, it was not modeled.

If there are good climatic conditions, this stage can cycle more quickly, so this was modeled as alternate succession, with a probability of .01.

Currently, there would be less than 20% in class A. There would probably only be about 5% in this class.

Class B **65 %**

Late Development 1 Open

Upper Layer Lifeform

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

Fuel Model

1

Indicator Species and Canopy Position

ANHA
Upper
CALO
Upper
PAVI2
Upper
PRPUB
Mid-Upper

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	21 %	80 %
Height	Herb 0.6m	Herb >1.1m
Tree Size Class		

☐ Upper layer lifeform differs from dominant lifeform.

Description

(Late development open, four years plus.) Class B is sandhill grassland, the dominant historical condition. This class has a moderatly dense herbaceous layer (20-80% cover) up to one meter tall. Replacement fire (every 10yrs) would return this class to A, while lack of fire (after 40yrs) would move it toward C. If fire occurs adjacent to blowouts, it could enlarge the blowouts and move class B to A. Shrubs may make up to 25% of the cover but is more commonly 0-10%. Native grazing (probability = 0.2) maintains this class. Severe, multiple year drought (every 100yrs) moves this class to C by reducing grass cover and fuel loads and giving a competitive advantage to the usually spare shrub cover.

Class C **10 %**

Late Development 1 Closed

Upper Layer Lifeform

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

Fuel Model

1

Indicator Species and Canopy Position

ARFI2
Upper
QUHA3
Upper
PRAN3
Upper

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	21 %	100 %
Height	Shrub 0.6m	Shrub 3.0m
Tree Size Class		

☐ Upper layer lifeform differs from dominant lifeform.

Description

(Late development closed 45yrs+) Class C is the shrub dominated sandhill grassland and differs from the sandhill shrubland (BpS 1094) which is modeled separately based on edaphic differences. Replacement fire (every 10yrs) returns this class to A. Dominate shrubs include Artemisia filliformis, Quercus havardii and Prunus angustifolia.

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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.

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	13			0.07692	100
Mixed					
Surface					
All Fires	13			0.07694	

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)
☐ Other (optional 2)

References

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