

11490

Western Great Plains Shortgrass Prairie

BpS Model/Description Version: Aug. 2020

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Vegetation Type

Herbaceous

Map Zones

34, 35

Geographic Range

Shortgrass prairie is found primarily in the western half of the Western Great Plains Division in the rain shadow of the Rocky Mountains and ranges from the northern Texas panhandle south into Texas and New Mexico (Laurenroth and Milchunas 1993).

In map zone (MZ) 34, shortgrass occurred historically in ECOMAP sections 315b (Texas High Plains), 331B (Southern High Plains), the western portion of 315f (Northern Texas High Plains), and transitioning into 315c (Mixed Grass Prairie) in the eastern section of MZ34. The eastern boundary of shortgrass is in MZ34.

Biophysical Site Description

In MZ34 (Texas panhandle), elevations are 1,200-1,830m (4,000-6,000ft) on the western edge and slopes to 915m (3,000ft) on the edge of the caprock. Precipitation ranges from 38-51cm (15-20in) and occurs mainly May, June, August, and September. Soils are primarily clay loams, silt loams, and sandy loams, underlain with caliche (Wright and Bailey 1982).

Vegetation Description

Historically, vegetation was dominated by short grass, and the subdominants were midgrasses and a small amount of shrubs on the fringes. Grass cover may be as great as 80% in this MZ, depending on precipitation and time since disturbance.

In the Texas panhandle, blue grama (*Bouteloua gracilis*) and buffalograss (*Buchloe dactyloides*) are co-dominants, with sideoats grama (*Bouteloua curtipendula*), sand dropseed (*Sporobolus cryptandrus*), hairy grama (*Bouteloua hirsuta*), threeawns (*Aristida* spp.), lovegrass (*Eragrostis* spp.), and tobosagrass (*Pleuraphis mutica*) present in varying amounts. Forbs will be more common during wet years and after disturbance but are seldom major components. They include annual broomweed (*Gutierrezia dracunculoides*), silverleaf nightshade (*Solanum elaeagnifolium*), western ragweed (*Ambrosia psilostachya*), and others. Woody plants include honey mesquite (*Prosopis glandulosa*), sand shinnery oak (*Quercus havardii*), fourwing saltbush (*Atriplex canescens*), broom snakeweed (*Gutierrezia sarothrae*), soaptree yucca (*Yucca elata*), prickly

pear (*Opuntia* spp.), cholla (*Opuntia* spp.), and tasajillo (*Opuntia leptocaulis*) (Wright and Bailey 1982). Woody plants have increased their presence with overgrazing and fire suppression.

Blue grama is the major diagnostic for this system.

BpS Dominant and Indicator Species

Symbol	Scientific Name	Common Name
BOGR2	<i>Bouteloua gracilis</i>	Blue grama
BUDA	<i>Buchloe dactyloides</i>	Buffalograss
BOCU	<i>Bouteloua curtipendula</i>	Sideoats grama
BOHI2	<i>Bouteloua hirsuta</i>	Hairy grama
ARFI2	<i>Artemisia filifolia</i>	Sand sagebrush
SPCR	<i>Sporobolus cryptandrus</i>	Sand dropseed

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

Disturbance Description

Return interval for fire could be extended (longer return interval) by ungulate grazing. Fire return intervals are now occurring more infrequently at ~40yrs. Probably burned more frequently with Native Americans at ~10-20yr intervals. Wright and Bailey (1982) indicate that historic mean fire return interval in the Southern Great Plains was probably between 5-10yrs.

Prairie dogs would have occurred extensively. There were some very large towns, but there were also areas without any towns.

Episodic disturbance caused by insect infestation (grasshoppers, range caterpillars, and Mormon crickets). The range caterpillar (*Hemileuca oliviae*) has approximately 50yr interval in some areas -- i.e., with a patchy distribution. Mormon crickets (*Anabrus simplex*) and grasshoppers are more evenly distributed. There were localized areas where grubs were an issue.

Large herds of bison went through this system -- as well as elk, deer, and pronghorn. Through growing season, they were there for relatively short periods. Bison probably followed behind fire in the subsequent growing season, causing periods of heavy disturbances (fire followed by bison) interrupting longer periods of little to no disturbance.

This is a drought-tolerant system. It is the norm in this system. Annual herbaceous production is affected by timing and amount of rainfall. There are short- and long-term droughts, and the climate varies year to year though there are more dry years than moist years.

Drought, fire, and grazing were probably the most important disturbances historically.

Fire Frequency Results

Severity	Min FI	Max FI
Replacement		
Moderate (Mixed)		
Low (Surface)		
All Fires		

Scale Description

This is a matrix community -- small to large patches. Disturbances can also occur within a matrix -- small to large, huge patches. Driving variables are climate (drought, low rainfall, etc.), grazing, and fire.

Adjacency or Identification Concerns

This system could be confused with mixedgrass prairie. Production is less in shortgrass versus mixedgrass prairie. A higher occurrence of blue grama would indicate shortgrass. If cover is 50% or more midgrasses, the system would probably be mixedgrass.

In MZ34, there is much less shortgrass prairie present now than historically, due to agricultural conversion. Much apparent grassland in MZ34 is actually Conservation Reserve Program (CRP), which may be very different in composition than native grassland.

In MZ34, this Biophysical Setting (BpS) is adjacent to mixed grass prairie.

Even the shortgrass prairie today that would have existed historically is departed. There is much more blue grama currently. Even though blue grama is diagnostic for this type -- historically and currently -- it's still more prevalent today in higher cover. There's less overall species diversity. There are some current increasers such as several species of threeawn.

Currently, in MZ34, weeping lovegrass (*Eragrostis curvula*) is an introduced species but not a big invasives problem.

Some mesquite hummocks occur currently more than historically. Currently, there is mesquite widespread and low-statured, although historically it was present but not as prominent. If mesquite is >3ft high, it's a different BpS. More mesquite, cholla, prickly pear currently -- uncharacteristic.

There is also some encroachment of juniper into these grasslands. If there is >10% juniper canopy cover in the grasslands, this would be uncharacteristic.

Currently, grazing mismanagement is increasing fire intervals (less fire) throughout. Grazing mismanagement currently fosters a grazing-adaptive blue grama species of sod.

Issues or Problems

Introduced exotic tamarisk (*Tamarix* spp.) is present in small, mostly isolated populations through most of MZ34 in wet (or formerly wet) areas only.

Changes in weather patterns, such as an increase of heat degree days, will change insect population growth and timing to occur earlier in the season. This may increase insect outbreaks on to fresh, growing grasses, which in turn may cause different fire behavior and an increase of woody shrubs and loss of grass/other herbaceous species densities.

Native Uncharacteristic Conditions

If grass is >0.5m, it would be uncharacteristic because it would be in a different BpS (Mixedgrass Prairie, BpS 1132). There is also more mesquite, juniper, cholla, and prickly pear currently. If mesquite or juniper are over three feet high, different BpS. If grass cover >80%, uncharacteristic. (It's patchy in this system.)

Comments

For MZ35, this model was adopted without changes from the same BpS for MZ34.

For MZ34, this model was adapted from MZ27 draft model by Rex Peiper, John Tunberg, and Clarence Chavez. Due to significant changes in the description and model, the authorship was 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	B	B	B	B	B	UN	UN
Herb	0.5-1.0	A	A	A	B	B	B	B	B	UN	UN
Herb	>1.0	A	A	A	B	B	B	B	B	UN	UN
Shrub	0-0.5	B	UN	UN	UN	UN	UN	UN	UN	UN	UN
Shrub	0.5-1.0	B	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	B	B	UN	UN	UN	UN	UN	UN	UN	UN
Tree	5-10	B	B	UN	UN	UN	UN	UN	UN	UN	UN
Tree	10-25	B	B	UN	UN	UN	UN	UN	UN	UN	UN
Tree	25-50	B	B	UN	UN	UN	UN	UN	UN	UN	UN
Tree	>50	B	B	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 29 Early Development 1 - Open

Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
BOGR2	<i>Bouteloua gracilis</i>	Blue grama	Upper
BUDA	<i>Buchloe dactyloides</i>	Buffalograss	Upper
PASM	<i>Pascopyrum smithii</i>	Western wheatgrass	Upper
CHVE2	<i>Chloris verticillata</i>	Tumble windmill grass	Upper

Description

Class A is early succession stage. Grasses that exert more dominance in the early stages include western wheatgrass (*Pascopyrum smithii*) and tumble windmill grass (*Chloris verticillata*).

Indicator grasses, such as blue grama and buffalograss, will still be present but in lesser amounts

than the climax community. Annual forbs such as broomweed, ragweed, and false mesquite (*Calliandra eriophylla*) will typically be present early. Weeping lovegrass (an exotic) may be increased by fire. On sandy soils, sand bluestem (*Andropogon hallii*), little bluestem (*Schizachyrium scoparium*), switchgrass (*Panicum virgatum*), and sand shinnery oak may increase after disturbance. There was also a lot of bare ground in this stage.

In this early stage, grasses will be more nutritious and palatable, grazing by bison, antelope, deer, rodents, and lagomorphs would be high but not cause a transition. This would also be a typical prairie dog town and with buffalo wallows. Prairie dog impact occurs (modeled as Option).

Surface soil horizon is heavily eroded by wind after disturbance, particularly in sandy soils.

Replacement fire might occur but not often due to low fuel loads and would reset age to 0.

Maximum Tree Size Class

None

Class B 71 Late Development 1 - Closed

Upper-layer lifeform is not the dominant lifeform. Scattered woody plants may be present, particularly in ravines and other refugia from fire (up to 10% cover, maybe up to 1m tall) -- fourwing saltbush, mesquite, juniper, prickly pear, and cholla.

Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
BOGR2	<i>Bouteloua gracilis</i>	Blue grama	Upper
BUDA	<i>Buchloe dactyloides</i>	Buffalograss	Upper
BOCU	<i>Bouteloua curtipendula</i>	Sideoats grama	Upper
SPCR	<i>Sporobolus cryptandrus</i>	Sand dropseed	Lower

Description

This is the historic climax plant community with blue grama, buffalograss, sideoats grama, sand dropseed, hairy grama, and sand sage (*Artemisia filifolia*). Historically, would have more midgrasses.

There would also be scatterings of black grama (*B. eriopoda*) and vine mesquite (*Panicum obtusum*) on heavier soils. Replacement fires occur more often in this class and cause a transition to Class A. Insects would also occur but not modeled, no widespread effect -- just localized.

Native grazing occurs in this class and maintains this class. Prairie dog impact could occur in this class. Replacement drought may also occur.

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
Replacement Fire	Early1:OPN	Early1:OPN	0.01	100	Yes	0
Optional 1	Early1:OPN	Early1:OPN	0.1	10	No	0
Native Grazing	Early1:OPN	Early1:OPN	0.5	2	No	0
Optional 1	Late1:CLS	Early1:OPN	0.01	100	Yes	0
Wind or Weather or Stress	Late1:CLS	Early1:OPN	0.025	40	Yes	0
Replacement Fire	Late1:CLS	Early1:OPN	0.1	10	Yes	0
Native Grazing	Late1:CLS	Late1:CLS	0.2	5	No	0

Optional Disturbances

Optional 1: prairie dogs

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