15030

Chihuahuan Loamy Plains Desert Grassland

BpS Model/Description Version: Aug. 2020

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Vegetation Type

Herbaceous

Map Zones

26

Geographic Range

This grassland system is found from northern to central Chihuahuan Desert and extends across the Trans-Pecos and into areas of the southwestern Great Plains. Stands are described from Jornada del Muerto Basin, Marfa grasslands and Marathon Basin, south to central Chihuahua and Coahuila. For map zone (MZ) 27, this only occurs on the southern edge, extending in from MZs 25 and 26. Historically this system would have occurred on loamy sites near Arizona/New Mexico border, east into Trans-Pecos and north into Jornada and extending into southern Great Plains.

In south MZ27, mostly up the Pecos River valley.

This system might occur in MZ27 intermixed with biophysical setting (BpS) 1504 in the desert grassland areas of ECOMAP (Cleland et al. 2007) subsection 315Ab and 315Ad.

Biophysical Site Description

This ecological system occurs in the northern Chihuahuan Desert and extends into limited areas of the southern Great Plains on alluvial flats, loamy plains and basins sometimes extending up into lower piedmont slopes. Sites are typically flat or gently sloping so precipitation does not run off and may be somewhat mesic if they receive runoff from adjacent areas, but are not wetlands. Soils are non-saline, finer textured loams or clay-loam.

Elevation is approximately 1,000-1,500m.

This system is comprised of the loamy plains sites - sandy to clay loam. It corresponds also to NRCS ESD for Loamy.

Vegetation Description

Vegetation is characterized by perennial grasses and is typically dominated by *Pleuraphis mutica* (*tobosa*) or with *Bouteloua eriopoda* (black grama) codominant or *Bouteloua gracilis*. *Pleuraphis jamesii* may become important in northern stands and *Bouteloua gracilis* in the Great Plains. If present, mesic graminoids such as *Pascopyrum smithii*, *Panicum obtusum*, *Sporobolus airoides*, and *Sporobolus wrightii* typically have low cover and are restricted to drainages and moist depressions (inclusions).

No shrubs including mesquite are indicators in the reference condition. Shrubs may have occurred in naturally disturbed areas but rare. Burrograss (SCBR), tarbush, creosote and mesquite indicate invasion/alteration. Scattered shrubs such as *Ephedra torreyana*, *Flourensia cernua*, *Gutierria sarothrae*, *Larrea tridentata*, *Opuntia imbricata*, *Prosopis glandulosa*, and *Yucca* spp. may be occasionally present, but do currently occur, especially on degraded sites. Therefore, all shrubs were removed from indicator species.

This system is defined and differentiated from 1503 by the variable presence of black grama and lack of mesic grass other than HIMU. This is the mixed tobosa/black grama loamy plains sites.

BpS Dominant and Indicator Species

|  |  |  |
| --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** |
| BOER4 | *Bouteloua eriopoda* | Black grama |
| PLMU3 | *Pleuraphis mutica* | Tobosagrass |
| MUPO2 | *Muhlenbergia porteri* | Bush muhly |
| PLJA | *Pleuraphis jamesii* | James' galleta |
| BOGR2 | *Bouteloua gracilis* | Blue grama |

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

Disturbance Description

One camp believes that fire has a major impact in these systems. Historical fire data in this system is lacking. It is uncertain what role fire plays in maintaining these systems, although it is likely that fire had a role in maintaining this system. This system might have a more variable fire response than 1504.

This system was originally modeled from BpS 1121 from MZ25 with a fire return interval (MFRI) of 80yrs. However, MFRI from MZ26 for 1121 was 12yrs. It is thought that fire should be somewhat frequent to keep out the desert scrub. Therefore, for MZ27, an MFRI of 10-15yrs was chosen, which is similar to what an MFRI for a desert grassland system would be.

This BpS 1503 is less resilient to disturbance than 1504. It might, however, be more resilient to drought which can affect the dynamics of this system.

Moisture following fire has significant impact on plant response/recovery. Fire cycle might be driven by pluvial periods. The norm in this part of the world is drought, a couple of high rainfall years could lead to the fuel development needed to allow fire.

Black grama is reported to be fire sensitive (Allen 1996 in Simonin 2000). It usually recovers from fire slowly, through vegetative spread. However, black grama grows quickly in response to summer moisture, and its post fire recovery can be good if the stand was healthy before fire and there is adequate precipitation in the first two growing seasons after fire (Gosz and Gosz 1996 in Simonin 2000).

Desert grassland fire regime: Knowledge of fire frequency and fire's ecological role in desert grasslands is uncertain. Grassland fires leave no direct evidence of historical frequency, such as tree scars. Our general understanding comes from knowledge of plant community ecology, the physiology of individual plant species, and historical accounts. Scientific research has generated arguments to both support and contradict the idea that fire was a common disturbance in desert grasslands (Simonin 2000).

Several researchers suggest a fire frequency of 7-10yrs for desert grasslands (Brown and Smith 2000, Wolters et al. 1996 in Simonin 2000). Fires in desert grasslands of the Chihuahuan Desert were probably less frequent than those in the Sonoran Desert (Allen 1996 in Simonin 2000). Many researchers view fire as necessary to maintain desert grasslands, mainly due to the current level of invasion by woody species in the absence of fire. It is hypothesized that shrubs would not have achieved the current level of coverage in desert grasslands if stand-replacement fires had occurred at regular intervals (Wolters et al. 1996 in Simonin 2000). Although fires may kill some grass plants and weaken others, establishment of shrub seedlings requires several years more than establishment of grasses (Humphrey 1958 in Simonin 2000). Honey mesquite, a major invader of southwestern desert grasslands, shows low seedling establishment when subjected to frequent fire. Glendening and Paulsen (1955 in Simonin 2000) found that severe fires were required to kill established honey mesquite plants; honey mesquite seedlings were readily killed by low-severity fire.

Other research suggests that competition for space and moisture is more important than frequent fire in controlling woody shrub invasion of desert ecosystems (Buffington and Herbel 1965 in Simonin 2000). Glendening and Paulsen (1955 in Simonin 2000) observed that competition with annual grasses reduced germination and emergence of honey mesquite seedlings to the 1st true leaf. On healthy desert grassland sites, survival of mesquite seedlings through their first spring drought was rare (Buffington and Herbel 1965 in Simonin 2000).

When cured and dried, desert grassland vegetation provides adequate fuel for ignition. Annual dry lightning storms mark the beginning of the southwestern rains, which take place late June or early July (Wolters et al. 1996 in Simonin 2000). Once ignited, plant density is the limiting factor for fire spread. If fuel are sparse, light winds may carry desert grassland fires (Brown and Smith 2000 in Simonin 2000). Grazing may reduce fuel to the point where fire will no longer carry (Brown and Smith 2000 in Simonin 2000).

Black grama can carry fire if cover is dense and conditions are windy. However, black grama's high reliance upon layering and stolons for expansion, along with its poor seed production, support arguments that historical fires were infrequent in areas dominated by black grama (Buffington 1965, Dick-Peddie 1993, Wolters et al. 1996 in Simonin 2000).

On the other hand, the invasion of shrub and subshrub species (for example, honey mesquite and burroweed) has increased the severity of fire in desert grasslands. Invasive plants such as burroweed provide extra fuel and increase fire temperatures, resulting in "hot spots" (Allen 1998 in Simonin 2000).

Historic fire regimes for black grama dominated sites (Simonin 2000) range from less than 35yrs to less than 100yrs.

Review for MZ26 indicated that the modeled fire return interval for this system is probably at the short end and that others might argue for a longer return interval.

Fire Frequency

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Severity** | **Avg FI** | **Percent of All Fires** | **Min FI** | **Max FI** |
| Replacement | 15 | 100 |  |  |
| Moderate (Mixed) |  |  |  |  |
| Low (Surface) |  |  |  |  |
| All Fires | 15 | 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

1,000-100,000 of ha

Adjacency or Identification Concerns

Natural Resource Conservation Service (NRCS) Ecological Site Descriptions (ESDs) are SD-2 Draw, Loamy and Gravelly Loam (see NRCS reference). Excludes SD-2 Limy which may be more similar in vegetation and disturbance dynamics to SD-2 Gravelly and to the MZ15 Grama Creosote BpS. The SD-2 Bottomland and Draw is also excluded from this BpS. ESDs for or Clayey, Bottomland, Salt Meadow, Salty Bottomland (see NRCS reference) represent other BpSs.

This system contains drier and lighter soils than BpS 1504: Chihuahuan-Sonoran Desert Bottomland and Swale Grassland, which correspond to NRCS ESDs for Clayey, Bottomland, Salt Meadow, Salty Bottomland (see NRCS reference). Soils may be the key to distinguishing this system from 1504. This system also has higher aridity than 1504. It is also a less topographically / hydrologically lowland than 1504. It is also less dense than 1504. This is the tobosa-black grama dominated loamy plains with decreasing moisture and coarser soil texture across BpS as it shifts from tobosa to black grama.

In degraded stands, *Scleropogon brevifolius* or *Aristida* spp. may co-dominate.

NRCS ESD MLRA 42 SD-2 Loamy Ecological Site descriptions describe this system on the Jornada Experimental Range with State-and-Transition Model showing shifts in species composition with land use. Degraded stands often have scattered desert scrubs such as *Larrea tridentata*, *Fourensia cernua*, and *Prosopis glandulosa* present.

This upland grassland is similar to the bottomland/depressional wetland system Chihuahuan-Sonoran Desert Bottomland and Swale Grassland (CES302.746) and grades into Apacherian-Chihuahuan Semi-Desert Grassland and Steppe (CES302.735) in the foothills and piedmont desert grasslands. In similar loamy plains land positions in the Great Plains, *Bouteloua gracilis*, *Buchloe dactyloides*, or *Pleuraphis jamesii* are dominant grasses in the Western Great Plains Shortgrass Prairie (CES303.672) system.

Much of this has been converted currently to desert scrub. There is much less than historically. Historically this system would have occurred on loamy plains and alluvial flats near Arizona/New Mexico border, east into the Trans-Pecos and north into Jornada Basin and extending north into southern Great Plains on the edge of MZ27. Currently, it is much more restricted. Good remnant examples of Black grama and tobosa grasslands are in Nutt, Lordsburg, Deming; of black grama and blue grama in Sevilleta NWR, north of Sierra Ladrones.

In current conditions, loamy sites dominated by tobosa may lack black grama as it is more sensitive to heavy grazing. This system is degraded by black grama loss; burrograss tarbush, creosote and mesquite invasion via soil drying/loss, fire reduction (though note complexity since BOER4), overgrazing, summer drought and increased winter precipitation.

Fine loamy ESDs are also more prone to shrub invasion than fine, clayey ESDs (1504). Along with that characteristic, along with variable black grama (dropseeds) and variable fire response.

In MZ26, these sites are currently in agriculture or dominated by mesquite scrub. However, they might also have more closely fit or resembled shortgrass historically.

Black grama-tobosa grassland loamy plains type is probably the most widespread - currently and historically - grassland in parts of NM (Steven Yanoff, TNC, personal communication).

Where there is blue grama-tobosa, it is invaded by creosote and tarbush.

This might correspond in part to the Rapid Assessment (RA) model R3DGRA and Kuchler/PNV Desert Grassland. However, the more likely similar system would be 1504 Bottomland Swale/Mesic Tobosa flats for the desert grassland type.

No shrubs including mesquite are indicators in the reference condition. Shrubs may have occurred in naturally disturbed areas but rare. Burrograss (SCBR) tarbush, creosote and mesquite indicate invasion/alteration. Scattered shrubs such as *Ephedra torreyana*, *Flourensia cernua*, *Gutierria sarothrae*, *Larrea tridentata*, *Opuntia imbricata*, *Prosopis glandulosa*, and *Yucca* spp. may be occasionally present, but do currently occur, especially on degraded sites.

Issues or Problems

Historical fire data in this system is lacking.

Native Uncharacteristic Conditions

Comments

For MZ26 this model was adopted from MZ27 with very minor descriptive changes and no quantitative changes to the VDDT model. Modelership was not changed because significant model changes did not occur. Lee Elliot (lelliot@tnc.org) reviewed this system for MZ26.

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 | A | A | B | B | B | B | B | B | B | B |
| Herb | >1.0 | A | A | B | B | B | B | B | B | B | B |
| Shrub | 0-0.5 | B | C | UN | UN | UN | UN | UN | UN | UN | UN |
| Shrub | 0.5-1.0 | B | C | UN | UN | UN | UN | UN | UN | UN | UN |
| Shrub | 1.0-3.0 | B | C | UN | UN | UN | UN | UN | UN | UN | UN |
| Shrub | >3.0 | B | C | UN | UN | UN | UN | UN | UN | UN | UN |
| Tree | 0-5 | C | C | UN | UN | UN | UN | UN | UN | UN | UN |
| Tree | 5-10 | C | C | UN | UN | UN | UN | UN | UN | UN | UN |
| Tree | 10-25 | C | C | UN | UN | UN | UN | UN | UN | UN | UN |
| Tree | 25-50 | C | C | UN | UN | UN | UN | UN | UN | UN | UN |
| Tree | >50 | C | C | 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 56 Early Development 1 - All Structures

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| BOER4 | Bouteloua eriopoda | Black grama | Upper |
| PLMU3 | Pleuraphis mutica | Tobosagrass | Upper |
| BOGR2 | Bouteloua gracilis | Blue grama | Upper |

Description

Grass and herbs. Early succession post fire grass and herb community. Perennial bunch grasses, annual grass and herb community. Upper layer of shrubs, canopy cover low.

Replacement fire occurs.

*Maximum Tree Size Class*  
None

Class B 42 Mid Development 1 - All Structures

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| BOER4 | Bouteloua eriopoda | Black grama | Middle |
| PLMU3 | Pleuraphis mutica | Tobosagrass | Middle |

Description

Grass with some low shrubs. Perennial bunch grasses regenerated and young shrubs begin growing. Species are perennial bunch grasses and shrubs. Perennial grass species dominate.

Replacement fire occurs. Wind/weather stress maintains this class.

*Maximum Tree Size Class*  
None

Class C 2 Late Development 1 - All Structures

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| BOER4 | Bouteloua eriopoda | Black grama | Middle |
| PLMU3 | Pleuraphis mutica | Tobosagrass | Middle |
| PRGL2 | Prosopis glandulosa | Honey mesquite | Middle |
| LATR2 | Larrea tridentata | Creosote bush | Upper |

Description

Shrubs continue to increase in size and/or number of individuals. Perennial grass species dominate. Species are perennial bunch grasses and shrubs. (Shrub cover will be similar to species composition found in the Ecological System, Apacherian-Chihuahuan Mesquite Upland Scrub.)

This class persists in the absence of disturbance. Replacement fire occur. Wind/weather stress maintains this class.

*Maximum Tree Size Class*  
None

Model Parameters

Deterministic Transitions

|  |  |  |  |
| --- | --- | --- | --- |
| **From Class** | **Begins at (yr)** | **Succeeds to** | **After (years)** |
| Early1:ALL | 0 | Mid1:ALL | 15 |
| Mid1:ALL | 16 | Late1:ALL | 50 |
| Late1:ALL | 51 | 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** |
| Replacement Fire | Early1:ALL | Early1:ALL | 0.05 | 20 | No | 0 |
| Wind or Weather or Stress | Mid1:ALL | Mid1:ALL | 0.02 | 50 | No | 0 |
| Replacement Fire | Mid1:ALL | Early1:ALL | 0.0833 | 12 | Yes | 0 |
| Wind or Weather or Stress | Late1:ALL | Late1:ALL | 0.02 | 50 | No | 0 |
| Replacement Fire | Late1:ALL | Early1:ALL | 0.0833 | 12 | Yes | 0 |

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