15030

Chihuahuan Loamy Plains Desert Grassland

BpS Model/Description Version: Aug. 2020

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Vegetation Type

Herbaceous

Map Zones

25, 27

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 MZ25 and MZ26. 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 subsections 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, basins sometimes extending up into lower piedmont slopes. Sites are typically flat or gently sloping, so precipitation does not run off, and sites 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. This system contains drier and lighter soils than 1504 (which correspond to NRCS ESDs for Clayey, Bottomland, Salt Meadow, Salty Bottomland). 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 the BpS as it shifts from tobosa to black grama.

Vegetation Description

Vegetation is characterized by perennial grasses and is typically dominated by *Pleuraphis mutica* (tobosa) or with *Bouteloua eriopoda* (black grama) co-dominant 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. Such scattered shrubs are *Ephedra torreyana*, *Flourensia cernua*, *Gutierria sarothrae*, *Larrea tridentata*, *Opuntia imbricata*, *Prosopis glandulosa*, and *Yucca* spp. may be occassionally present (but do occur currently, 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 are lacking. 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.

BpS 1503 is less resilient to disturbance than 1504. It might, however, be more resilient to drought.

Drought is another factor in 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 first 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 fuels are sparse, light winds may carry desert grassland fires (Brown and Smith 2000 in Simonin 2000). Grazing may reduce fuels 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 <35yrs to <100yrs.

Fire Frequency Results

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

Scale Description

1,000-100,000 of ha

Adjacency or Identification Concerns

NRCS Ecological Site Descriptions are Loamy and Gravelly Loam. 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.

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

NRCS Ecological Site Description 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 and black grama and blue grama are in Sevilleta NWR, north of Sierra Ladrones.

This system contains drier and lighter soils than 1504. Soils may be the key to distinguishing this system from 1504.

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; increased winter precipitation.

Fine loamy ESDs are also more prone to shrub invasion than fine, clayey ESDs (1504). Along with that characteristic, variable black grama (dropseeds), and variable fire response, this system can be distinguished from the clayey ESDs (1504).

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

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

This might correspond in part to Rapid Assessment models: 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.

Consider three dynamics when distinguishing 1503 Bottomland/Swale (BS) Grasslands versus 1504 Mesic Tobosa Flats (TF) Grassland:

1) Importance of shrub invasion in altering dynamics -- 1503 B/S y?, 1504 TF n?

2) Sacaton importance and soil alkalinity -- 1503 B/S y, 1504 TF n.

3) Role of fire regime in altering dynamics -- 1503 B/S fire decline then exclusion with shrub invasion/ conversion, 1504 TF can be altered but still grassy so fire might persist but decline due to lower fuels on average.

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. Such scattered shrubs are *Ephedra torreyana*, *Flourensia cernua*, *Gutierria sarothrae*, *Larrea tridentata*, *Opuntia imbricata*, *Prosopis glandulosa*, and *Yucca* spp. may be occasionally present (but do occur currently, especially on degraded sites).

Issues or Problems

Historical fire data in this system are lacking.

Climate change will have little impact, except low depressed moist areas may become more infrequent due to further drought conditions.

Native Uncharacteristic Conditions

Shrub cover >20% would indicate invasion and degraded sites

Comments

This model for MZ27 was adapted from BpS 1121 from MZ25 developed by Steve Bumgarner and Phil Smith. Fire intervals and descriptive changes were made as this system concept emerged more completely during review for MZ27.

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 bunchgrasses, annual grass, and herb community. Upper layer of shrubs with low canopy cover.

*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

Perennial grass species dominate.

Grass with some low shrubs. Perennial bunchgrasses regenerated, and young shrubs begin growing. Species are perennial bunchgrasses and shrubs. Canopy cover of shrubs is low.

Replacement fires occur.

Wind/weather stress modeled as well.

*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

Perennial grass species dominate.

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

The amount in this class historically should be low, since higher shrub cover indicates invasion and more degraded sites.

Wind/weather stress modeled.

*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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