15040

Chihuahuan-Sonoran Desert Bottomland and Swale Grassland

BpS Model/Description Version: Aug. 2020

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Vegetation Type

Mixed Upland and Wetland

Map Zones

25, 27

Geographic Range

This system is found in the central and northern Chihuahuan Desert and adjacent Sky Islands and Sonoran Desert, as well as limited areas of the southern Great Plains.

Generally associated with flats, swales and bottomlands. Valley bottoms throughout much of Trans-Pecos and beyond, such as Marfa grasslands, Marathon Basin and around Valentine. South to central Chihuahua and Coahuila.

In south map zone (MZ) 27, mostly up the Pecos River valley and perhaps in the Estancia Valley south and east of the Manzano Mountains.

In MZ27, this could be the desert grassland tobosa/blue grama occurring in the south end of MZ27 around ECOMAP (Cleland et al. 2007) subsections 315Ad and 315Ab, corresponding to Rapid Assessment (RA) models: R3DGRA and Kuchler/FRCC PNVG DGRA.

The tobosa/blue grama version for MZ25 probably only occurs in some Otero Mesa swales.

Biophysical Site Description

This ecological system occurs in relatively small depressions and along drainages throughout the northern and central Chihuahuan Desert and adjacent Sky Islands and Sonoran Desert, as well as limited areas of the southern Great Plains on broad mesas, plains and valley bottoms that receive runoff from adjacent areas.. These depressions and drainages generally have deep, fine-textured soils that are neutral to slightly or moderately saline/alkaline. During summer rainfall events, ponding is common.

Desert grassland with extensive clayey bottomland plains and intermittently flooded swales where salts do not accumulate to appreciable levels. On Clay Flat (Desert Grassland) range site. Gilgai topography may be present. Topographic position and soil texture control this system.

This is the wet, mesic tobosa flat grasslands type. These are wetter and clayey sites as compared to 1503. This is the tobosa flats type. It is defined by water-dependent topography / hydrology (lowlands, run-in, slow drainage), and heavy soils (silt and clay loams to clay). Loamy Environmental Site Descriptions (ESDs) are excluded and are instead included in BpS 1503.

This also includes two components: the bottomland swale - alkali sacaton and tobosa (vine mesquite/PAOB) dominated swales and (wide) bottomlands with scattered shrubs on fine loamy saline soils; and wetter tobosa flats - tobosa (alkali sacaton, PAOB, black grama?) dominated swales and (wide) bottomlands with scattered shrubs on fine (clay loam, clayey) non-saline soils (Steven Yanoff, TNC, pers. comm.).

The tobosa-blue grama grassland association that this type might also represent at least for MZ27, is a minor swale type in the northern Jornada del Muerto basin and gentle dip slopes of the San Andres Mtns; 1400-2250m elevation (Muldavin et al. 2000).

Vegetation Description

Clear dominant is tobosa grass (*Pleuraphis mutica*), with culms rising to only about 3-5cm. Historically, other grama species are present, but soil movement (shrink/swell) gives a disadvantage under grazing and grama decreases.

This system is also defined by its lack of black grama and is dominated by mesic grass (e.g.: SPAI, PAOB and/or HIMU), dense grass.

Vegetation is typically dominated by *Sporobolus airoides*, *Sporobolus wrightii*, *Pleuraphis mutica* (tobosa swales), or other mesic graminoids such as *Pascopyrum smithii* or *Panicum obtusum*. With tobosa swales, sand-adapted species such as *Yucca elata* may grow at the swale's edge in the deep sandy alluvium that is deposited there from upland slopes. *Sporobolus airoides* and *Sporobolus wrightii* are more common in alkaline soils and along drainages. Other grass species may be present, but these mesic species are diagnostic.

Scattered shrubs such as *Atriplex canescens*, *Ericameria nauseosus*, *Fallugia paradoxa*, *Krascheninnikovia lanata*, or *Rhus microphylla* may be present. Also included are tree cholla (*Opuntia imbricata*), soaptree yucca (*Yucca elata*), and scattered honey mesquite (*Prosopis glandulosa*).

Other grasses may include buffalo grass (*Buchloe dactyloides*), vine mesquite (*Panicum obtusum*), Arizona cottontop (*Digitaria californica*), grama (*Bouteloua* spp.), dropseed (*Sporobolus* spp.), and tridens (*Tridens* spp.). Pleuraphis may form huge clones up to 0.5km2.

BpS Dominant and Indicator Species

|  |  |  |
| --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** |
| PLMU3 | *Pleuraphis mutica* | Tobosagrass |
| OPIM | *Opuntia imbricata* | Tree cholla |
| PAOB | *Panicum obtusum* | Vine mesquite |
| SPAI | *Sporobolus airoides* | Alkali sacaton |
| SPWR2 | *Sporobolus wrightii* | Big sacaton |
| PASM | *Pascopyrum smithii* | Western wheatgrass |
| BOGR2 | *Bouteloua gracilis* | Blue grama |

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

Disturbance Description

Periodic flooding. Continuous fuel means that once a fire starts, generally the entire occurrence will burn. Adjacent types to this system generally have lower fuel loads and are less likely to carry fire than this system. Post-fire response is good, with deep roots and rapid green-up.

Site stability controlled by edaphic, topographic position, and recurring fire.

SPAI and PLMU3 may be adapted and maintained by fire. A short mean fire return interval was modeled.

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.

Tobosa has been widely cited as being stimulated by fire (Uchytil 1988). In Arizona and New Mexico, tobosa grows on both upland and lowland sites, but only in the lowland swales are stands dense enough to carry a fire. Accumulation of tobosa litter with its compact and somewhat woody growth form usually insures a complete burn. Tobosa quickly revegetates the bare ground after fire, dominating the community by the middle of the first growing season (Britton and Steuter 1983, other references in Uchytil 1988).

Fire Frequency

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Severity** | **Avg FI** | **Percent of All Fires** | **Min FI** | **Max FI** |
| Replacement | 10 | 100 |  |  |
| Moderate (Mixed) |  |  |  |  |
| Low (Surface) |  |  |  |  |
| All Fires | 10 | 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

Hundreds of hectares. This type is concentrated in broad valley bottoms of southern New Mexico, southeast Arizona, and Trans-Pecos Texas, and often in linear drainage settings and flats.

Adjacency or Identification Concerns

Flats may intergrade downslope to alkali flats and upslope to Apacherian-Chihuahuan Semi-desert Grasslands. This system (swales, flats and bottomlands) does receive periodic flooding during the annual summer rains, but has no obligate riparian species present as a true wetland. The flats included in this also have overland flow and inundation, but soil does not stay saturated as long as lower bottomland sites.

This bottomland/depressional wetland system can be similar to the upland Chihuahuan Loamy Plains and Desert Grassland (CES302.061), biophysical setting (BpS) 1503 but is restricted to moist depressions and intermittently flooded drainage terraces and adjacent flats. Alkali sacaton (*Sporobolus airoides*) is often associated with more alkaline (to gypsic) poorly drained areas and giant sacaton (*Sporobolus wrightii*) with less alkaline better drained areas. *Distichlis spicata*, *Allenrolfea occidentalis*, and *Suaeda* spp. are characteristic of more saline and alkaline sites.

This system could be confused for BpS 1503. Please see BpS 1503 for indicators as to how to distinguish. This system is wetter, clayey and heavy soils. This system can be separated by more mesic indicator species and also by soils.

Hydrologic lowlands are less prone to shrub invasion. This may be due to clayey soils which may impede shrub invasion. Clayey sites are better adapted to hydrologic alteration/drying. Grazing compaction and roads cause grass loss and drying but not necessarily woody invasion. Therefore, this system is not as invaded as BpS 1503 would be. The soils more than hydrologic alteration or fire seem to limit shrub invasion.

The bottomland/swale portion of this system is degraded by sacaton (PAOB) loss; burrograss and four-wing saltbush and mesquite invasion via soil drying/loss, fire reduction, overgrazing, summer drought and increased winter precipitation. The tobosa flats portion of this system is degraded by tobosa loss; burrograss, tarbush, creosote and mesquite invasion via soil drying/loss, fire reduction, overgrazing, summer drought, increasing winter precipitation. Some think this type is edaphically (clayey soils) more resistant to shrub-invasion than others (Steven Yanoff, TNC, personal commommunication).

This BpS corresponds to several alkaline and non-alkaline ESDs - Draws, Bottomlands, Swales, Clayey and Salty ESDs.

This system may be the desert grassland system that corresponds to RA's R3DGRA and Kuchler's/ FRCC PNV Desert Grassland type.

Consider dynamics if distinguishing 1504 Bottomland/Swale Grasslands vs. Mesic Tobosa Flats Grasslands (not separated out for MZ27): (1) shrub invasion might be more important in altering the dynamics of Bottomland Swale versus Mesic Tobosa, (2) sacaton importance and soil alkalinity indicate Bottomland Swale more than Tobosa Flats and (3) fire regime might be altered more in Bottomland Swale, wherein shrub invasion/conversion can lead to a decline and exclusion in the amount of fire on the landscape; in Mesic Tobosa flats, the herbaceous fuel will still be present so fire might persist but decline due to lower fuel loads on average (Steven Yanoff, TNC, personal communication) .

Issues or Problems

Native Uncharacteristic Conditions

Comments

This model for MZ25 was adopted as-is from MZ27 created by Keith Schulz and Regional Lead for MZ27.

This model for MZ27 was adapted from the draft model for 1155b (later changed to 2615041) from MZ26 created by Bonnie Warnock, John Karges, and Colin Shackelford. Descriptive and quantitative changes made during MZ27 review as the new system concept was developed for 1504. Therefore, modeler names 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 | A | A | A | A | A | A | A |
| Herb | 0.5-1.0 | A | A | A | A | A | A | A | A | A | A |
| Herb | >1.0 | A | A | A | A | A | A | A | A | A | A |
| Shrub | 0-0.5 | B | B | B | B | B | B | B | B | B | B |
| Shrub | 0.5-1.0 | B | B | B | B | B | B | B | B | B | B |
| Shrub | 1.0-3.0 | B | B | B | B | B | B | B | B | B | B |
| Shrub | >3.0 | B | B | B | B | B | B | B | B | B | B |
| Tree | 0-5 | B | B | B | B | B | UN | UN | UN | UN | UN |
| Tree | 5-10 | B | B | B | B | B | UN | UN | UN | UN | UN |
| Tree | 10-25 | B | B | B | B | B | UN | UN | UN | UN | UN |
| Tree | 25-50 | B | B | B | B | B | UN | UN | UN | UN | UN |
| Tree | >50 | B | B | B | B | B | 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 95 Early Development 1 - Open

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| PLMU3 | Pleuraphis mutica | Tobosagrass | Lower |
| SPAI | Sporobolus airoides | Alkali sacaton | Lower |
| PAOB | Panicum obtusum | Vine mesquite | Lower |

Description

Low to zero shrub cover. High density tobosagrass (*Pleuraphis mutica*) with some other grass species. With low shrub cover of tree cholla (*Opuntia imbricata*), Yucca and mesquite (*Prosopis* spp.) in stages lacking fire.

Site stability controlled by edaphic, topographic position and recurring fire. Replacement fires occur occasionally.

*Maximum Tree Size Class*  
None

Class B 5 Late Development 1 - Open

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| PLMU3 | Pleuraphis mutica | Tobosagrass | Lower |
| SPAI | Sporobolus airoides | Alkali sacaton | Low-Mid |
| PAOB | Panicum obtusum | Vine mesquite | Low-Mid |
| YUEL | Yucca elata | Soaptree yucca | Low-Mid |

Description

Herbaceous cover is still the dominant life form, but in the absence of fire, this class will occur with a higher shrub cover. Shrub cover should still be very low. Shrub invasion could also include four-wing saltbush and mesquite.

Replacement fires occur occasionally.

*Maximum Tree Size Class*  
None

Model Parameters

Deterministic Transitions

|  |  |  |  |
| --- | --- | --- | --- |
| **From Class** | **Begins at (yr)** | **Succeeds to** | **After (years)** |
| Early1:OPN | 0 | Late1:OPN | 30 |
| Late1:OPN | 31 | Late1:OPN | 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 | 0.1 | 10 | Yes | 0 |
| Replacement Fire | Late1:OPN | Early1:OPN | 0.08 | 13 | Yes | 0 |

References

Britton, C.M. and A.A. Steuter. 1983. Production and nutritional attributes of tobosagrass following burning. Southwestern Naturalist. 28(3): 347-352.

Brown, D.E. 1982. Semidesert grassland. In: D.E. Brown, ed. Biotic communities of the American Southwest--United States and Mexico. Desert Plants. 4(1-4): 123-131.

Cleland, D.T.; Freeouf, J.A.; Keys, J.E.; Nowacki, G.J.; Carpenter, C.A.; and McNab, W.H. 2007. Ecological Subregions: Sections and Subsections for the conterminous United States. Gen. Tech. Report WO-76D [Map on CD-ROM] (A.M. Sloan, cartographer). Washington, DC: U.S. Department of Agriculture, Forest Service, presentation scale 1:3,500,000; colored

Diamond, D. 1993. Natural Communities Description and Ranking.

Henrickson, J. and M.C. Johnston. 1986. Vegetation and community types of the Chihuahuan Desert. Pages 20-39 in: J.C. Barlow, A.M. Powell and B.N. Timmermann, eds. Second Symposium on Resources of the Chihuahuan Desert Region, United States and Mexico. Chihuahuan Desert Research Institute, Alpine, TX.

Muldavin, E., Y. Chauvin,and G. Harper. 2000. Vegetation of White Sands Missile Range, New Mexico: Volume I Handbook of vegetation communities. Final Report to White Sands Missile Range by New Mexico Natural Heritage Program, University of New Mexico, New Mexico. 192 pp.

NatureServe. 2006. International Ecological Classification Standard: Terrestrial Ecological

Classifications. NatureServe Central Databases. Arlington, VA, U.S.A. Data current as of

18 July 2006.

NatureServe. 2007. International Ecological Classification Standard: Terrestrial Ecological Classifications. NatureServe Central Databases. Arlington, VA. Data current as of 10 February 2007.

Uchytil, R. 1988. Pleuraphis mutica. In: Fire Effects Information System, [Online].

USDA Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: http://www.fs.fed.us/database/feis/ [2007, February 23].