

Ecological site R042AE274TX Mountain Valley Foothill Slope, Mixed Prairie

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General information

Provisional. A provisional ecological site description has undergone quality control and quality assurance review. It contains a working state and transition model and enough information to identify the ecological site.

Figure 1. Mapped extent

Areas shown in blue indicate the maximum mapped extent of this ecological site. Other ecological sites likely occur within the highlighted areas. It is also possible for this ecological site to occur outside of highlighted areas if detailed soil survey has not been completed or recently updated.

Ecological site concept

- Site receives sheet-flow run-on water from higher elevation sites and sheds run-off water to lower elevation sites
- Site Landform: fan remnants and stream terraces of mountain valley
- Elevation Range: 4,500' to 6,700'
- Slope Range: 1-30%
- Soils:
 - Particle Size Class: loamy
 - Surface textures include gravelly loam, very gravelly loam, and cobbly loam
 - Soil Depth: shallow to very deep
 - Fragments on the Surface: 40-95%
 - Parent Material: alluvium derived from igneous rock
- Moisture Regime: dry ustic
- Temperature Regime: thermic
- Dominant Cover: rangeland (grassland)

Associated sites

R042AC244TX	Gravelly, Desert Grassland This site occurs downslope on lower piedmont slopes.
R042AE277TX	Igneous Hill and Mountain, Mixed Prairie This site occurs at higher position and is a source of alluvial material.

Similar sites

R042AF284TX	Foothill Slope, Mountain Savannah This site occurs in the same landscape position but at a higher elevation range.
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Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	Not specified

Physiographic features

The site occurs on alluvial fans and terraces in mountain valleys. Up to four geomorphic components can occur within the site. From highest to lowest, the components are erosional fan remnant summit, erosional fan remnant footslope, inset fan, and channel floor. Slopes range from 1- 30 percent. Runoff ranges from medium to high.

Table 2. Representative physiographic features

Landforms	(1) Mountain valleys or canyons > Fan remnant (2) Mountain valleys or canyons > Terrace
Flooding frequency	None
Ponding frequency	None
Elevation	1,372–2,042 m
Slope	1–30%
Aspect	Aspect is not a significant factor

Climatic features

The average annual precipitation ranges from 15 to 18 inches and the total annual precipitation is highly variable, ranging from 8 to 30 inches. Most of the precipitation occurs as widely scattered thunderstorms of high intensity and short duration during the summer. Occasional precipitation occurs as light rainfall during the cool season. Annual snowfall ranges from 1-3 inches.

Mean annual air temperature is 61° F. Frost-free period ranges from 201 to 206 days (April-October). However, the optimal growing season occurs July through September as this period coincides with greater rainfall.

The average relative humidity in mid-afternoon is about 25 percent. Relative humidity is higher at night, and the average at dawn is about 57 percent. The sun shines 81 percent of the time in summer and 75 percent in winter. The prevailing wind is from the southwest. Average wind speed is highest, around 11 miles per hour, in March and April. The annual Class-A pan evaporation is approximately 82 inches.

Table 3. Representative climatic features

Frost-free period (characteristic range)	202-205 days
Freeze-free period (characteristic range)	221-232 days
Precipitation total (characteristic range)	381-457 mm
Frost-free period (actual range)	201-206 days
Freeze-free period (actual range)	219-234 days
Precipitation total (actual range)	356-483 mm
Frost-free period (average)	204 days
Freeze-free period (average)	227 days
Precipitation total (average)	432 mm

Climate stations used

- (1) CHISOS BASIN [USC00411715], Big Bend National Park, TX
- (2) PANTHER JUNCTION [USC00416792], Big Bend National Park, TX

Influencing water features

- Site receives sheet-flow run-on water from higher elevation sites and sheds run-off water to lower elevation sites
- No wetlands or perennial streams influence this site

Soil features

The site consists of shallow to very deep, well drained, gravelly to cobbly soils with a loamy surface texture. The soils consist of three series formed in alluvium weathered from igneous bedrock:

The associated soil series for this ecological site in Big Bend National Park in Brewster County includes the Hurds (dry phase) series. The Hurds series formed in very gravelly, late Pleistocene-age pediments on footslopes (pediments) of erosion fan remnants. Diagnostic horizons contained within the soil include a mollic epipedon and a loamy-skeletal argillic horizon.

The representative soils and their associated map units are:

Big Bend National Park Soil Survey:

Hurds very cobbly loam, 10 to 30 percent slopes

Table 4. Representative soil features

Surface texture	(1) Gravelly loam (2) Very gravelly loam (3) Cobbly loam
Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Moderate
Soil depth	36–203 cm
Surface fragment cover ≤3"	20–50%
Surface fragment cover >3"	20–45%
Available water capacity (0-101.6cm)	2.54 cm
Calcium carbonate equivalent (0-101.6cm)	0–1%
Electrical conductivity (0-101.6cm)	0 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0
Soil reaction (1:1 water) (0-101.6cm)	6.1–7.8
Subsurface fragment volume ≤3" (Depth not specified)	25–40%
Subsurface fragment volume >3" (Depth not specified)	8–30%

Ecological dynamics

The Historic Climax Plant Community (HCPC) for the site is composed primarily of a diversity of short and midgrasses, numerous perennial forbs, and scattered trees and shrubs. The distribution of vegetation within the site is highly dependent on local environment. Elevation gradients, landscape position, aspect, and variability of the soils, are the major factors driving species composition and distribution. Water can concentrate in small drains as it crosses this site and an axial drainageway in the valley bottom. Both of these result in denser vegetation.

Historically, the site has evolved with native herbivores such as mule deer and possibly desert bighorn sheep. Bison were not documented in the historical record as being present in any significant amount. A lack of sufficient water was probably a contributing factor. Small lightning induced fires were likely common mainly because of the adequate amount of fine fuels present.

Early records suggest cattle, sheep, and horses were introduced into the southwest from Mexico in the mid-1500's. However, extensive ranching began in the Trans-Pecos region in the 1880s. Records indicate cattle, sheep, and goats grazed this site extensively during the early to mid 1900s. Direct fire suppression and overutilization of plant resources in some areas most likely began during this time.

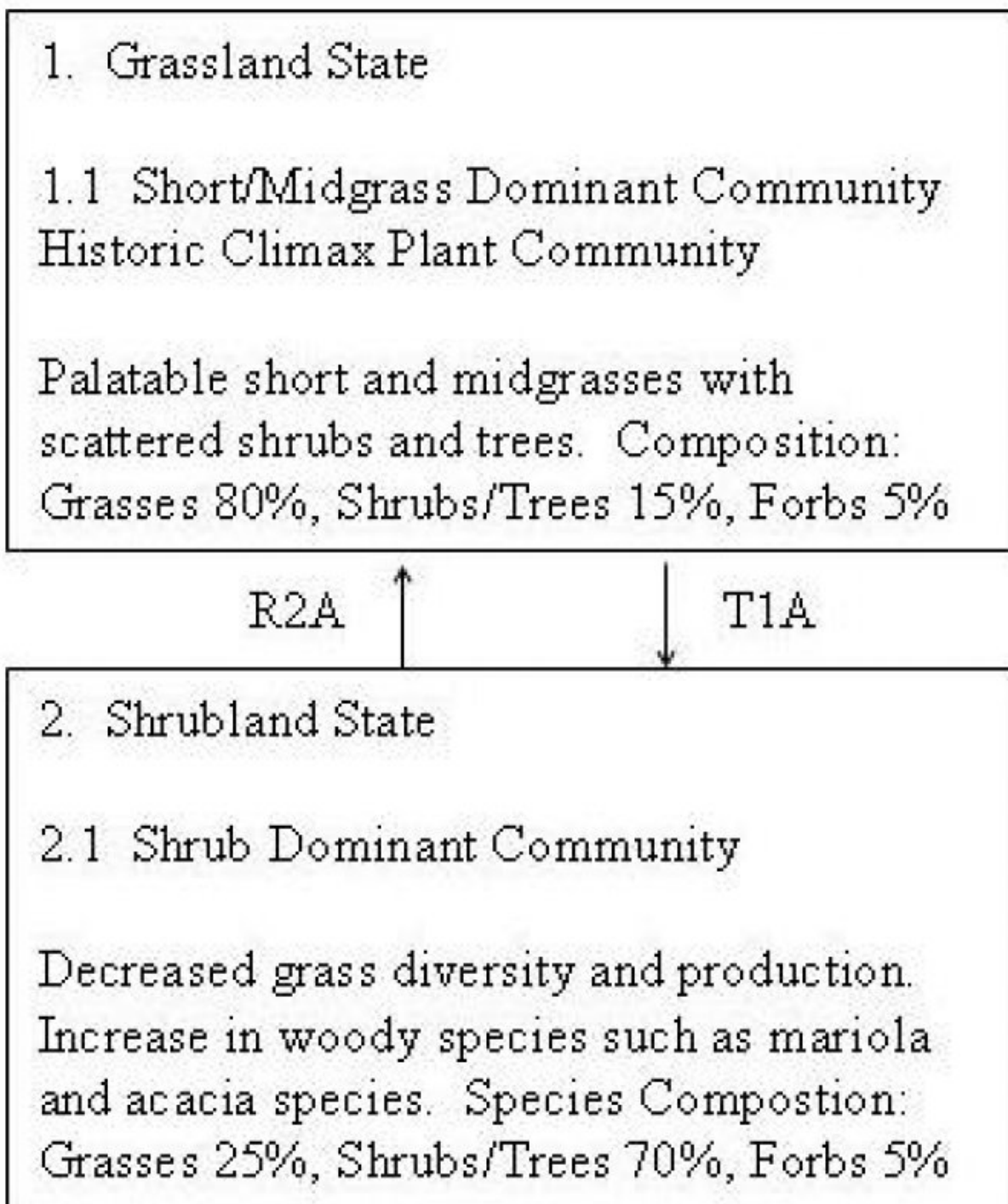
The impact of improper grazing within this site will lead to a reduction of palatable grasses and forbs and an increase of woody plants such as mariola and various acacias. In addition, direct fire suppression will also allow woody plants to increase.

The following diagram suggests general pathways that the vegetation on this site might follow. There are other plant communities and states not shown on the diagram. This information is intended to show what might happen in a given set of circumstances; it does not mean that this would happen the same way in every instance. Local professional guidance should always be sought before pursuing a treatment scenario.

State and Transition Model

State and transition model

Foothill Slope (Mixed Prairie)
R042XE274TX



Legend

T1A Fire Suppression, Improper Grazing Management
R2A Prescribed Burning, Brush Management, Proper
Grazing Management

**State 1
Grassland State**

**Community 1.1
Short/Midgrass Dominant Community**



Figure 9. Short/Midgrass Dominant Community

The distribution of vegetation within the site is highly dependent on local environment. Elevation gradients, landscape position, aspect, and variability of the soils are the major factors driving species composition and distribution. The Historic Climax Plant Community (HCPC) for the site is composed primarily of a diversity of short and midgrasses, numerous perennial forbs, and scattered trees and shrubs and is the reference plant community. Plants more adaptable to drier conditions such as chino grama, lechuguilla, and pricklypear are most commonly found at low elevations, in convex positions, and/or in shallow soils. Plants more adapted to moist conditions such as evergreen and littleleaf sumac, hairy grama, juniper, and oak are most commonly found at higher elevations, in concave positions and/or in deeper soils. Since the site is located in a water receiving and shedding position and at a relatively high overall elevation, shrub encroachment following grass overutilization can occur quickly. Palatable grasses such as blue, black, and sideoats grama, Arizona cottontop, and, bristlegrass are replaced by shrubs such as mariola, several acacia species, lechuguilla, and grasses such as slim tridens, fluffgrass, and threeawns. Brush management tools such as prescribed fire, mechanical or chemical control, and prescribed grazing can help maintain the community within the reference state. Extensive overutilization of plant resources by livestock will transition the reference plant community to the Shrubland State (2). Droughts can expedite the change.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	717	986	1255
Shrub/Vine	108	148	188
Forb	45	62	78
Tree	27	37	47
Total	897	1233	1568

Figure 11. Plant community growth curve (percent production by month). TX4009, Mid/Shortgrasses Dominant with Shrubs Community. Mid and shortgrasses dominate the community with shrubs approaching 20% woody canopy..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2	2	2	2	3	8	8	18	23	15	15	2

**State 2
Shrubland State**

Community 2.1 Shrub Dominant Community



Figure 12. Shrub Dominant Community



Figure 13. Shrub Dominant Community



Figure 14. Shrub Dominant Community

This plant community is the result of extensive overutilization of plant resources by livestock and direct fire suppression. Improper grazing management reduces the amount of palatable midgrasses and fine fuels needed for natural fires to occur. This provides a competitive advantage to woody plants. The most prevalent woody plants that increase under these conditions are mariola, lechuguilla, broomweed, and several acacia species. Palatable grasses such as black grama, sideoats grama, and Arizona cottontop decrease. Fluffgrass and slim tridens increase following disturbance. Proper grazing management (adequate rest to allow recovery of some grasses) followed by prescribed fire and/or brush management will help transition the community back to a composition similar to the reference plant community. Brush management strategies may include grubbing and/or chemical herbicide application or most likely a combination of methods over time. Poor accessibility may limit brush management methods in some areas.

Table 6. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Shrub/Vine	583	801	1020
Grass/Grasslike	224	308	392
Forb	39	62	78
Tree	45	62	78
Total	891	1233	1568

Figure 16. Plant community growth curve (percent production by month). TX4004, Shrub Dominant Community. The major woody increaser species, such as lechuguilla, ocotillo, sotol, acacia, and creosotebush, have multiplied. Very little shortgrasses remaining..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	1	2	2	2	8	8	20	25	15	15	1

Transition T1A State 1 to 2

With fire suppression and improper grazing management, the Grassland State converts to Shrubland State.

Restoration pathway R2A State 2 to 1

With Prescribed Burning, Brush Management, and Proper Grazing Management, the Shrubland State can be restored to Grassland State.

Conservation practices

Brush Management
Prescribed Burning
Prescribed Grazing

Additional community tables

Table 7. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	Warm-season midgrasses			269–471	
	sideoats grama	BOCU	<i>Bouteloua curtipendula</i>	157–392	–
	cane bluestem	BOBA3	<i>Bothriochloa barbinodis</i>	112–280	–
2	Warm-season short/midgrasses			224–392	
	black grama	BOER4	<i>Bouteloua eriopoda</i>	84–224	–
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	84–224	–
	bush muhly	MUPO2	<i>Muhlenbergia porteri</i>	56–112	–
3	Warm-season midgrasses			135–235	
	Arizona cottontop	DICA8	<i>Digitaria californica</i>	50–140	–
	tanglehead	HECO10	<i>Heteropogon contortus</i>	50–140	–
	green sprangletop	LEDU	<i>Leptochloa dubia</i>	34–112	–

4	Warm-season mid/shortgrasses			45-78	
	threeawn	ARIST	<i>Aristida</i>	13-56	-
	slim tridens	TRMU	<i>Tridens muticus</i>	13-56	-
	streambed bristlegrass	SELE6	<i>Setaria leucopila</i>	11-45	-
	plains lovegrass	ERIN	<i>Eragrostis intermedia</i>	6-28	-
5	Warm-season mid/shortgrasses			27-47	
	common wolfstail	LYPH	<i>Lycurus phleoides</i>	11-22	-
	hairy grama	BOHI2	<i>Bouteloua hirsuta</i>	11-22	-
	Chino grama	BORA4	<i>Bouteloua ramosa</i>	0-22	-
	low woollygrass	DAPU7	<i>Dasyochloa pulchella</i>	4-13	-
6	Warm-season mid/tallgrasses			18-31	
	Texas bluestem	SCCI2	<i>Schizachyrium cirratum</i>	6-17	-
	little bluestem	SCSCS	<i>Schizachyrium scoparium</i> var. <i>scoparium</i>	6-17	-
Shrub/Vine					
7	Shrubs			45-78	
	resinbush	VIST	<i>Viguiera stenoloba</i>	11-45	-
	littleleaf ratany	KRER	<i>Krameria erecta</i>	9-22	-
	littleleaf sumac	RHMI3	<i>Rhus microphylla</i>	6-17	-
	stretchberry	FOPU2	<i>Forestiera pubescens</i>	6-17	-
	woolly butterflybush	BUMA	<i>Buddleja marrubiifolia</i>	6-17	-
	featherplume	DAFO	<i>Dalea formosa</i>	6-17	-
	jointfir	EPHED	<i>Ephedra</i>	3-11	-
	evergreen sumac	RHVI3	<i>Rhus virens</i>	3-11	-
8	Shrubs			36-63	
	whitethorn acacia	ACCO2	<i>Acacia constricta</i>	3-11	-
	catclaw acacia	ACGR	<i>Acacia greggii</i>	3-11	-
	whitebrush	ALGR2	<i>Aloysia gratissima</i>	3-9	-
	catclaw mimosa	MIACB	<i>Mimosa aculeaticarpa</i> var. <i>biuncifera</i>	2-9	-
	mariola	PAIN2	<i>Parthenium incanum</i>	3-9	-
	western honey mesquite	PRGLT	<i>Prosopis glandulosa</i> var. <i>torreyana</i>	2-7	-
	spiny hackberry	CEEH	<i>Celtis ehrenbergiana</i>	0-6	-
	creosote bush	LATR2	<i>Larrea tridentata</i>	1-6	-
	rough menodora	MESC	<i>Menodora scabra</i>	1-3	-
9	Fibrous/Succelents			27-47	
	sotol	DASYL	<i>Dasyilirion</i>	6-17	-
	pricklypear	OPUNT	<i>Opuntia</i>	6-17	-
	yucca	YUCCA	<i>Yucca</i>	3-9	-
	Texas sacahuista	NOTE	<i>Nolina texana</i>	3-9	-
	tree cholla	CYIMI	<i>Cylindropuntia imbricata</i> var. <i>imbricata</i>	3-9	-
	Christmas cactus	CYLE8	<i>Cylindropuntia leptocaulis</i>	3-9	-
	lechuguilla	AGLE	<i>Agave lechuguilla</i>	0-6	-

Tree					
10	Trees			27-47	
	juniper	JUNIP	<i>Juniperus</i>	13-28	-
	oak	QUERC	<i>Quercus</i>	13-28	-
Forb					
11	Forbs			45-78	
	Forb, dicot, perennial	2FDP	<i>Forb, dicot, perennial</i>	17-34	-
	Forb, annual	2FA	<i>Forb, annual</i>	0-11	-
	awnless bushsunflower	SICA7	<i>Simsia calva</i>	6-9	-
	white sagebrush	ARLUM2	<i>Artemisia ludoviciana ssp. mexicana</i>	6-9	-
	croton	CROTO	<i>Croton</i>	6-9	-
	low silverbush	ARHU5	<i>Argythamnia humilis</i>	2-4	-
	globemallow	SPHAE	<i>Sphaeralcea</i>	2-4	-
	lacy tansyaster	MAPI	<i>Machaeranthera pinnatifida</i>	1-3	-
	polygala	POLYG	<i>Polygala</i>	1-3	-
	golden prairie clover	DAAU	<i>Dalea aurea</i>	1-3	-
	pepperweed	LEPID	<i>Lepidium</i>	0-2	-

Animal community

The site is suitable for properly managed (appropriate stocking rates) livestock grazing. Improper grazing management causes a gradual decline in range health reducing livestock nutrition and habitat quality for wildlife. Livestock should be stocked at or below carrying capacity in proportion to the grazeable grass, forbs, and browse. When the slopes on this site approach >15 percent, cattle use becomes limited. Grazing distribution will be an issue in these cases.

The site supports a high diversity of wildlife species. Mammals that use this site for at least a portion of their overall habitat needs include mule deer, javelinas, bobcats, coyotes, black-tailed jackrabbits, cottontails, raccoons, ringtails, gray foxes, and ground squirrels. Birds that use this site as year-round habitat, a stopover area during migration, nesting grounds, and/or wintering grounds include scaled quail, dove, raptors, and numerous song birds.

Plant Preference by Animal Kind:

These preferences are somewhat general in nature as the preferences for plants is dependent upon grazing experience, time of year, availability of choices, and total forage supply.

Legend: P=Preferred D=Desirable U=Undesirable N=Not Consumed T=Toxic X=Used, but not degree of utilization unknown

Preferred – Percentage of plant in animal diet is greater than it occurs on the land

Desirable – Percentage of plant in animal diet is similar to the percentage composition on the land

Undesirable – Percentage of plant in animal diet is less than it occurs on the land

Not Consumed – Plant would not be eaten under normal conditions. Only consumed when other forages not available.

Toxic – Rare occurrence in diet and, if consumed in any tangible amounts results in death or severe illness in animal

Hydrological functions

The existing plant community with representative plant species, current soil conditions (soil health), land management, and climate affect the dynamics of the water cycle. Plant and litter cover are important factors which protect the site from erosion. However, it is total production and the types of plant species present that have greatest impact on hydrologic dynamics (infiltration capacity, runoff, and soil losses).

Livestock overgrazing can reduce the amount of perennial, deep-rooted mid and tall grasses. This can then lead to soil erosion by increasing overland flow and decreasing infiltration rates.

Recreational uses

The site is suitable for hiking and camping.

Wood products

None.

Other products

None.

Other information

None.

Inventory data references

Information presented here has been developed from NRCS clipping, composition, plant cover, and soils data. Where empirical data is limiting, technical interpretations were made based of field experience.

Other references

Briske, D.D., J.D. Derner, J.R. Brown, S.D. Fuhlendorf, W.R. Teague, K.M. Havstad, R.L. Gillen, A.J. Ash, and W.D. Williams. 2008. Rotational grazing on rangelands: Reconciliation of perception and experimental evidence. *Rangeland Ecology and Management* 61: 3-17.

Peterson, F.F. 1981. Landforms of the basin and range province: Defined for soil survey. Technical Bulletin 28. Nevada Agricultural Experiment Station, University of Nevada, Reno.

Powell, M.A. 2000. Grasses of the Trans-Pecos and Adjacent Areas. Iron Mountain Press, Marathon, TX.

Powell, M.A. 1998. Trees and shrubs of the Trans-Pecos and adjacent areas. University of Texas Press, Austin.

USDA, National Water and Climate Center, "Climate Reports," <http://www.wcc.nrcs.usda.gov/climate/> (accessed January 2007).

USDA, Natural Resources Conservation Service, "Plants Database," <http://plants.usda.gov/> (accessed October 2008).

Warnock, B.H. 1977. Wildflowers of the Davis Mountains and Marathon Basin Texas. Sul Ross State University, Alpine, TX.

Reviewers:

Jim Clausen, Soil Scientist, NRCS, Marfa, TX

Lynn Loomis, Soil Scientist, NRCS, Marfa, TX

Laurie Meadows, Soil Conservation Technician, NRCS, Marfa, TX

Mark Moseley, Rangeland Management Specialist, NRCS, San Antonio, TX

Contributors

Michael Margo, RMS, NRCS, Marfa, Texas

Unknown

Approval

Scott Woodall, 8/10/2020

Rangeland health reference sheet

Interpreting Indicators of Rangeland Health is a qualitative assessment protocol used to determine ecosystem condition based on benchmark characteristics described in the Reference Sheet. A suite of 17 (or more) indicators are typically considered in an assessment. The ecological site(s) representative of an assessment location must be known prior to applying the protocol and must be verified based on soils and climate. Current plant community cannot be used to identify the ecological site.

Author(s)/participant(s)	
Contact for lead author	
Date	05/13/2025
Approved by	Scott Woodall
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:**

2. **Presence of water flow patterns:**

3. **Number and height of erosional pedestals or terracettes:**

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):**

5. **Number of gullies and erosion associated with gullies:**

6. **Extent of wind scoured, blowouts and/or depositional areas:**

7. **Amount of litter movement (describe size and distance expected to travel):**

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):**

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):**

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:**

11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):**

12. **Functional/Structural Groups (list in order of descending dominance by above-ground annual-production or live foliar cover using symbols: >>, >, = to indicate much greater than, greater than, and equal to):**

Dominant:

Sub-dominant:

Other:

Additional:

13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):**

14. **Average percent litter cover (%) and depth (in):**

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):**

16. **Potential invasive (including noxious) species (native and non-native). List species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicators, we are describing what is NOT expected in the reference state for the ecological site:**

17. **Perennial plant reproductive capability:**
