Ecological site R042AB736TX
Arroyo, Hot Desert Shrub

Accessed: 04/19/2024

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.

Associated sites

R042AB733TX	**Loamy Bottomland, Hot Desert Shrub** This site is located at a lower position and receives runoff from the Arroyo site.
R042AB735TX	**Gravelly, Hot Desert Shrub** This site is located on older terraces above the flood plain.

Similar sites

R042AB735TX	**Gravelly, Hot Desert Shrub** The terrace of the Arroyo site is similar to the Gravelly site, but is more productive and has plant species that require extra water.

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	Not specified

Physiographic features

The site occurs on nearly level to moderately sloping drainageways, arroyos, stream terraces, and alluvial fans. Slopes range from 0 to 8 percent. The drainageways are incised from 1 to 15 feet into piedmont slopes. The degree of incision on this site depends on the intensity of summer rainfall events and the size of the watershed in the surrounding mountains that can cause flash floods that last for short periods.

Table 2. Representative physiographic features

Landforms	(1) Arroyo (2) Drainageway (3) Terrace
Flooding duration	Very brief (4 to 48 hours)
Flooding frequency	Occasional to frequent
Ponding frequency	None
Elevation	1,900–3,900 ft

Slope	0–8%
Aspect	Aspect is not a significant factor

Climatic features

The average annual precipitation ranges from 10 to 13 inches and highly variable from 2 to 21 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. Negligible amounts of precipitation falls in the form of sleet or snow.

Mean annual air temperature is 70° F. Daytime temperatures exceeding 100° F are common from May through September. Frost free period ranges from 254 to 295 days.

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 combination of low rainfall and relative humidity, warm temperatures, and high solar radiation creates a significant moisture deficit. The annual Class-A pan evaporation is approximately 94 inches.

Table 3. Representative climatic features

Frost-free period (average)	295 days
Freeze-free period (average)	334 days
Precipitation total (average)	13 in

Influencing water features

Soil features

The site consists of very deep, well-drained, calcareous, highly permeable soils. These soils formed in Young (Holocene) Quaternary aged loamy and gravelly alluvium from igneous and sedimentary rock. Permeability is moderately rapid to rapid. Available water capacity is low. Potential for wind and water erosion is slight. Typically, the surface layer is light brownish gray, very gravelly sandy loam about 15 inches thick. The underlying material to a depth of 60 inches is pale brown, stratified, very gravelly sandy loam. Gravels cover between 35-80 percent of the surface. Subsurface fragment volume was determined to a depth 15 inches. Representative soils include Pantera and Chillon.

Table 4. Representative soil features

Parent material	(1) Alluvium–rhyolite
Surface texture	(1) Very gravelly sandy loam (2) Extremely gravelly fine sandy loam (3) Very gravelly loamy sand
Drainage class	Well drained
Permeability class	Moderately rapid to rapid
Soil depth	72 in
Surface fragment cover <=3"	35–80%
Surface fragment cover >3"	10–40%
Available water capacity (0-40in)	0.04–0.08 in

Calcium carbonate equivalent (0-40in)	1–5%
Electrical conductivity (0-40in)	0–2 mmhos/cm
Sodium adsorption ratio (0-40in)	0–30
Soil reaction (1:1 water) (0-40in)	7.9–8.4
Subsurface fragment volume <=3" (Depth not specified)	20–50%
Subsurface fragment volume >3" (Depth not specified)	4–18%

Ecological dynamics

The reference plant community on the Arroyo, Hot Desert Shrub site consists of bunch and stoloniferous grasses along with a variety of perennial forbs and woody shrubs.

The boundary of the site includes a dynamic arroyo channel and its first terrace, or active floodplain. The riverwash, or streambed, is a component of the arroyo and is not correlated with an ecological site because it lacks stable vegetation. However, vegetation does begin to establish once alluvial deposits begin to stabilize. Vegetation is then interspersed within and along the arroyo. Vegetation along arroyos is a dynamic complex of discontinuous plant communities responding to numerous environment controls such as watershed area, arroyo channel shape, width, and location, nature and relative position of depositional features such as terraces, gravel bars, frequency and amount of runoff, alluvial fragment size, depth of bedrock, and presence of perennial water sources. With the exception of perennial springs in some locations, arroyos within the Hot Desert Shrub Land Resource Unit are dry most of the year. Arroyos are subject to flash floods during the summer rainy season. It may be reasonable to assume that during pre-settlement times, plant communities along arroyos existed as a shifting mosaic. Common species within the arroyo channels include burrobrush, catclaw acacia, shrubby poreleaf, desert willow, sideoats grama, tanglehead, and annual forbs/grasses.

The terrace immediately adjacent to the channel has the potential to flood, but generally receives run-on water in a braided overland flow pattern from the surrounding landscape. Since water availability can be less within the terrace than in the arroyo channel, plant species able to withstand drier conditions become established. Plants that have intermediate water requirements become established on the terrace and banks of the channel. Existing plant species composition and production varies with the interaction of yearly weather conditions, location, aspect, elevation, watershed area, and the natural variability of the soils. A higher density of woody plant cover exists along the banks of the arroyo channel than on the adjacent terrace. Production is higher in an Arroyo Ecological Site than associated ecological sites (i.e. Gravelly) because the site is in a water receiving position on the landscape.

Present climatic and vegetation regimes of the region were established about 8000 years ago when a trend of increased aridity developed and may possibly be continuing today. Overutilization of rangelands during the past 150 years by early settlers may have accentuated a trend toward greater aridity already in existence. Early records suggest cattle, sheep, and horses were introduced into the southwest from Mexico in the mid-1500's. Livestock numbers peaked in the late 1880’s following the arrival of railroads. Historical accounts document ranches with stocking rates as high as one animal unit per four acres; this was far from sustainable in this environment.

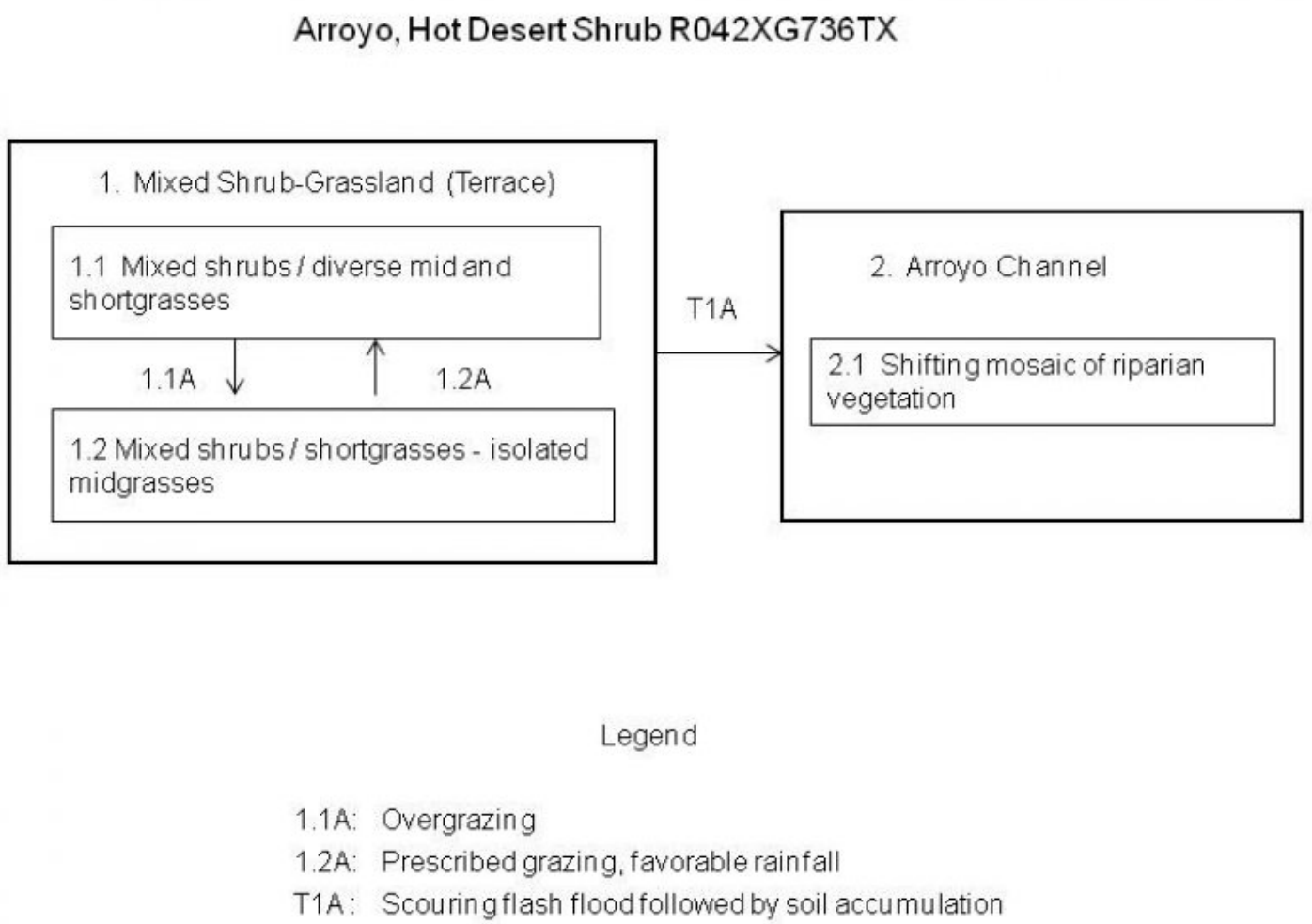
The impact of improper grazing within this site specifically will lead to the loss of mostly grasses, reduction of litter, increased stream bank instability, and soil erosion. Vegetation on the terrace will shift from a mixed shrub / grama grass community (1.1) to a mixed shrub/shortgrass community (1.2).

Probably the factor that most influenced the historic vegetative composition of the site was extended dry weather. High rainfall events did occur but were episodic. Fire is not considered to have had a significant influence in shaping current plant communities mostly due to the inherently low fine fuels needed to carry a widespread fire and the presence of fire intolerant species such as black grama and ocotillo. In addition, bison were not considered to have had an influence on vegetation mostly due to rough terrain, scarce water, and less grass cover than the Great

Plains. Native herbivory is currently limited to mule deer and small mammals.

The following diagram suggests general pathways that the vegetation on this site might follow. There may be other 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 1
Mixed Shrub-Grassland (Terrace)

A diversity of mixed shrubs with mid and short grasses characterized this state. Natural disturbances are rainfall events with and wildlife grazing and browsing. Overgrazing by cattle will lead to shifts in grass composition.

Community 1.1
Mixed Shrubs / Diverse Mid and Shortgrasses

Figure 4. 1.1 Shrubs / Midgrass Community

The Mixed shrubs / Midgrass plant community (1.1) is the reference plant community for Arroyo Ecological Site. The plant community exists on the first terrace or active floodplain of an associated arroyo channel. The size and or dimensions of the terrace can vary based on the watershed. Woody plants in the HCPC total approximately 50% of the species composition by air dry weight, while grasses and forbs account for 35% and 15% respectively. The plant community is in a water receiving and shedding position. As a result, there is a high diversity of bunch and stoloniferous grasses and shrubs within this plant community. Most shrubs listed in the plant composition list can occur on the terrace. However, woody plants requiring extra water such as desert willow, burrobrush, baccharis, cottonwood, western soapberry, and shrubby poreleaf are usually restricted to the arroyo channel. Ecological process (water cycle, nutrient cycle, and energy flow) are functioning with optimum efficiency due to the adequate amount of organic materials and surface fragments that cover the soil surface. The species diversity of this plant community provides excellent food and cover for wildlife. Extended dry weather causes an overall decline in grass cover and production and can cause some retrogression. However, the HCPC evolved with plants that have drought tolerance. Long term retrogression is triggered primarily by abusive grazing which causes an immediate decrease and eradication of the most palatable plants such as bush muhly, Arizona cottontop, black grama, menodora, and ratany. Chino grama will initially increase with grazing followed by a decline with further grazing pressure. Improper grazing management will transition the site to a Creosote-mixed shrub / shortgrass community (1.2). Conservation practices such as prescribed grazing can help maintain ecological resilience of this plant community by maintaining adequate plant cover, size, and appropriate density. Stocking rates need to be flexible and adjusted to carrying capacity because of sporadic rainfall.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	240	360	480
Shrub/Vine	210	315	420
Tree	90	135	180
Forb	60	90	120
Total	**600**	**900**	**1200**

Table 6. Canopy structure (% cover)

Height Above Ground (Ft)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.5	–	0-1%	1-3%	1-2%
>0.5 <= 1	–	1-3%	5-15%	2-5%
>1 <= 2	–	5-15%	10-25%	–
>2 <= 4.5	–	20-50%	0-2%	–
>4.5 <= 13	–	5-10%	–	–
>13 <= 40	0-2%	–	–	–
>40 <= 80	–	–	–	–
>80 <= 120	–	–	–	–
>120	–	–	–	–

Figure 6. Plant community growth curve (percent production by month). TX0018, Mixed Shrub Dominated Community (Mid & Shortgrasses/Shrubs). Drought tolerant mixed shrubs dominate with mid and shortgrasses..

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

Community 1.2
Mixed Shrubs / Shortgrasses – Isolated Midgrasses

Figure 7. 1.2 Creosotebush – mixed shrubs / shortgrasses

A combination of severe grazing and drought transitions the reference plant community to this plant community. Overgrazing will begin to reduce the most palatable midgrasses, halfshrubs, and forbs. Non-palatable plants such as creosotebush, prickleleaf dogweed, lechuguilla, and fluffgrass will increase. Isolated midgrasses are still present and can potentially increase with prescribed grazing and favorable rainfall. Soil erosion is accelerated compared to the reference community mainly because in the decrease of grass cover and litter. Surface rock fragments help lessen the impact of erosion to some degree. Prescribed grazing and a series of wet years will help maintain the current plant community and can potentially help return the community to an assemblage similar to the reference community.

Table 7. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Shrub/Vine	270	405	540
Grass/Grasslike	180	270	360
Tree	90	135	180
Forb	50	90	120
Total	**590**	**900**	**1200**

Figure 9. Plant community growth curve (percent production by month). TX0015, Shrub/Shortgrass Community. Shrubs dominant with few shortgrasses present..

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

Pathway 1.1A
Community 1.1 to 1.2

Mixed Shrubs / Diverse Mid and Shortgrasses

Mixed Shrubs / Shortgrasses – Isolated Midgrasses

Overgrazing will lead to Mixed Shrubs/Shortgrass Community.

Pathway 1.2A
Community 1.2 to 1.1

Mixed Shrubs / Shortgrasses – Isolated Midgrasses

Mixed Shrubs / Diverse Mid and Shortgrasses

Prescribed grazing and favorable rainfall can help restore the more palatable midgrasses.

Conservation practices

Prescribed Grazing

State 2
Arroyo Channel

This state consists of the arroyo channel (riverwash soil map unit component) that is usually without vegetation because of scouring flash floods. With time some areas of the channel can begin supporting riparian vegetation, however it can easily be washed away during the rainy season. It is not recommended to base stocking rate decisions based on this unstable plant community.

Community 2.1
Shifting mosaic of riparian vegetation

Figure 10. Arroyo channel with riparian vegetation

Figure 11. Arroyo channel

The arroyo channel is a shifting mosaic of plant communities resulting from the naturally occurring seasonal flash floods. Soil is deposited usually behind debris, boulders, and other plants during flooding events. Typical vegetation growing within and along the channel include tanglehead, sideoats grama, shrubby poreleaf, burrobrush, baccharis, desert willow, catclaw acacia, skeletonleaf goldeneye, and western honey mesquite. Other species listed in the reference plant community composition table can also occur within the arroyo channel. Varied stages of plant succession can be seen throughout the entire range of the arroyos. Portions of the channel can be high in plant production compared to the surrounding landscape. The arroyo is invaluable for wildlife as habitat and as a traveling corridor. Improper grazing management can dramatically reduce the grass component thereby creating a less stable system. In most cases, these arroyos will be preferred grazing site by livestock because of the plant composition and the extra moisture. Resulting from mainly hay distribution and pasture seeding, introduced species such as Bermudagrass (*Cynodon dactylon*) and buffelgrass (*Pennisetum ciliare*) have been encroaching within the lower elevation range of the site. To maintain desirable composition, mitigating activities will include correct stocking rates, prescribed grazing, seasonal rest, and where feasible, development of off-site water. Reduced stocking rates alone may not remove the grazing impact on these preferred sites.

Transition T1A
State 1 to 2

A scouring flash flood can incise portions of the terrace and develop a dynamic arroyo channel.

Transition T1A
State 1 to 2

A scouring flash flood can incise portions of the terrace and develop a dynamic arroyo channel.

Additional community tables

Table 8. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	**Midgrasses - Bunchgrass**			60–120	
	tanglehead	HECO10	*Heteropogon contortus*	30–95	–
	sideoats grama	BOCU	*Bouteloua curtipendula*	30–85	–
2	**Shortgrasses - Stoloniferous**			48–96	
	black grama	BOER4	*Bouteloua eriopoda*	20–45	–
	false grama	CAER2	*Cathestecum erectum*	18–35	–
	bush muhly	MUPO2	*Muhlenbergia porteri*	10–20	–
3	**Midgrasses - Bunchgrass**			36–72	
	sand dropseed	SPCR	*Sporobolus cryptandrus*	15–45	–
	mesa dropseed	SPFL2	*Sporobolus flexuosus*	12–35	–
	spike dropseed	SPCO4	*Sporobolus contractus*	9–20	–
4	**Midgrass - Bunchgrass**			24–48	
	Chino grama	BORA4	*Bouteloua ramosa*	24–48	–
5	**Midgrasses - Bunchgrass**			30–60	
	cane bluestem	BOBA3	*Bothriochloa barbinodis*	15–60	–
	whiplash pappusgrass	PAVA2	*Pappophorum vaginatum*	5–15	–
	alkali sacaton	SPAI	*Sporobolus airoides*	5–15	–
	false Rhodes grass	TRCR9	*Trichloris crinita*	5–15	–
6	**Mid/Shortgrasses - Bunchgrass**			18–36	
	nineawn pappusgrass	ENDE	*Enneapogon desvauxii*	4–15	–
	streambed bristlegrass	SELE6	*Setaria leucopila*	4–10	–
	slim tridens	TRMU	*Tridens muticus*	5–10	–
	fall witchgrass	DICO6	*Digitaria cognata*	4–10	–
7	**Mid/Shortgrass - Bunchgrass**			12–24	
	threeawn	ARIST	*Aristida*	4–12	–
	low woollygrass	DAPU7	*Dasyochloa pulchella*	4–10	–
	red grama	BOTR2	*Bouteloua trifida*	4–8	–
8	**Annuals**			0–12	
	Grass, annual	2GA	*Grass, annual*	0–12	–
Shrub/Vine					
9	**Tall Shrubs**			54–108	
	catclaw acacia	ACGR	*Acacia greggii*	10–45	–
	desert willow	CHLI2	*Chilopsis linearis*	0–25	–
	stretchberry	FOPU2	*Forestiera pubescens*	5–20	–
	Texas lignum-vitae	GUAN	*Guaiacum angustifolium*	5–20	–
	Berlandier's wolfberry	LYBE	*Lycium berlandieri*	5–20	–
	catclaw mimosa	MIACB	*Mimosa aculeaticarpa var. biuncifera*	5–20	–
	littleleaf sumac	RHMI3	*Rhus microphylla*	5–15	–
	Torrey's yucca	YUTO	*Yucca torreyi*	5–15	–
	Texas persimmon	DITE3	*Diospyros texana*	0–15	–

	whitebrush	ALGR2	*Aloysia gratissima*	5–15	–
	spiny hackberry	CEEH	*Celtis ehrenbergiana*	5–15	–
	baccharis	BACCH	*Baccharis*	0–10	–
	willow	SALIX	*Salix*	0–10	–
	soaptree yucca	YUEL	*Yucca elata*	3–10	–
	Warnock's snakewood	COWA	*Condalia warnockii*	3–10	–
10	**Mid Shrubs**			42–84	
	creosote bush	LATR2	*Larrea tridentata*	10–30	–
	American tarwort	FLCE	*Flourensia cernua*	5–25	–
	resinbush	VIST	*Viguiera stenoloba*	8–20	–
	Texas barometer bush	LEFR3	*Leucophyllum frutescens*	5–15	–
	singlewhorl burrobrush	HYMO	*Hymenoclea monogyra*	0–15	–
	shortleaf jefea	JEBR	*Jefea brevifolia*	5–15	–
	viscid acacia	ACNE4	*Acacia neovernicosa*	3–10	–
	Wright's beebrush	ALWR	*Aloysia wrightii*	3–10	–
	fourwing saltbush	ATCA2	*Atriplex canescens*	0–10	–
	desert myrtlecroton	BEOB	*Bernardia obovata*	0–10	–
	splitleaf brickellbush	BRLA	*Brickellia laciniata*	0–10	–
	rough jointfir	EPAS	*Ephedra aspera*	3–10	–
	Apache plume	FAPA	*Fallugia paradoxa*	0–10	–
	yellow trumpetbush	TEST	*Tecoma stans*	3–10	–
	Mexican bladdersage	SAME	*Salazaria mexicana*	2–8	–
11	**Half Shrubs**			36–72	
	Trans-Pecos poreleaf	POSC6	*Porophyllum scoparium*	0–15	–
	American threefold	TRCA8	*Trixis californica*	3–10	–
	Trans-Pecos ayenia	AYFI	*Ayenia filiformis*	2–10	–
	Rio Grande stickpea	CACO	*Calliandra conferta*	3–10	–
	featherplume	DAFO	*Dalea formosa*	3–10	–
	black prairie clover	DAFR2	*Dalea frutescens*	3–10	–
	littleleaf ratany	KRER	*Krameria erecta*	4–10	–
	white ratany	KRGR	*Krameria grayi*	4–10	–
	Arizona blackfoot	MELO	*Melampodium longicorne*	4–10	–
	rough menodora	MESC	*Menodora scabra*	4–10	–
	mariola	PAIN2	*Parthenium incanum*	4–10	–
	glandleaf milkwort	POMA7	*Polygala macradenia*	3–10	–
12	**Short Shrubs**			24–48	
	ocotillo	FOSP2	*Fouquieria splendens*	5–25	–
	leatherstem	JADI	*Jatropha dioica*	5–20	–
	lechuguilla	AGLE	*Agave lechuguilla*	5–15	–
	green sotol	DALE2	*Dasylirion leiophyllum*	3–10	–
	candelilla	EUAN3	*Euphorbia antisyphilitica*	1–5	–
13	**Succulents**			24–48	
	pricklypear	OPUNT	*Opuntia*	5–20	–
	tree cholla	CYIMI	*Cylindropuntia imbricata var. imbricata*	5–15	–

	tree cholla	CYIMI	*Cylindropuntia imbricata var. imbricata*	0–10	
	Christmas cactus	CYLE8	*Cylindropuntia leptocaulis*	5–10	–
	pitaya	ECEN2	*Echinocereus enneacanthus*	3–10	–
Tree					
14	**Trees**			90–180	
	western honey mesquite	PRGLT	*Prosopis glandulosa var. torreyana*	25–135	–
	desert willow	CHLI2	*Chilopsis linearis*	0–45	–
	Fremont cottonwood	POFR2	*Populus fremontii*	0–15	–
	western soapberry	SASAD	*Sapindus saponaria var. drummondii*	0–10	–
Forb					
15	**Perennials**			60–120	
	croton	CROTO	*Croton*	15–35	–
	Forb, perennial	2FP	*Forb, perennial*	5–15	–
	prairie clover	DALEA	*Dalea*	5–10	–
	pricklyleaf dogweed	THAC	*Thymophylla acerosa*	5–10	–
	buckwheat	ERIOG	*Eriogonum*	3–8	–
	pygmy bluet	HOWR	*Houstonia wrightii*	3–8	–
	lacy tansyaster	MAPIP	*Machaeranthera pinnatifida ssp. pinnatifida*	3–8	–
	broom milkwort	POSC2	*Polygala scoparioides*	3–8	–
	Durango senna	SEDUD	*Senna durangensis var. durangensis*	3–8	–
	pelotazo	ABIN	*Abutilon incanum*	3–8	–
	hairyseed bahia	BAAB	*Bahia absinthifolia*	3–8	–
16	**Annuals**			0–10	
	Forb, annual	2FA	*Forb, annual*	0–5	–
	Havard's ipomopsis	IPHA	*Ipomopsis havardii*	0–3	–
	bladderpod	LESQU	*Lesquerella*	0–3	–

Animal community

The site is suitable for properly managed (appropriate stocking rates) livestock grazing. Abusive grazing causes a gradual decline in range health reducing livestock nutrition and habitat quality for wildlife. Livestock should be stocked at carrying capacity in proportion to the grazeable grass, forbs, and browse. Vegetative growth is episodic mirroring the rainfall. For this reason, stocker type livestock operations may be more suitable than year-round stocking.

The site is important for wildlife because it provides access to both seasonal and perennial water and it contains diverse habitat structure. Invertebrates, reptiles, birds, and mammals either use the site as their primary habitat or visit from adjacent sites. Common mammals include mule deer, black-tailed jackrabbit, cottontail rabbit, javelina, coyote, skunk, woodrats, many nocturnal mice, and occasionally mountain lions. Game birds include scaled quail, Gambel's quail, and dove. Numerous songbirds and raptors also occur in the area. Diversity in both plant species and plant communities over short distances is important for healthy wildlife populations.

Plant Preference by Animal Kind:
This rating system provides general guidance as to animal preference for plant species. Grazing preference varies between animal kinds and classes, and changes over time, especially between seasons. It also depends upon the grazing experience of the animals. Grazing preference does not necessarily reflect the ecological status of the plant within the plant community.

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 Arroyo ecological site is located low on the landscape and drains surrounding watersheds toward the Rio Grande. Scouring flash floods are a natural and common feature of the arroyos during the rainy season. The runoff water that is retained within the site becomes available for plant growth. Water flow patterns, rills, pedestals and/or terracettes, and areas of bare ground are common features throughout the site. The reference plant community (1.1) provides optimal hydrologic function for the site.

The shortgrass dominated community (1.2) will have increased soil erosion and decreased stability of the arroyo channel. This results from a decrease in grass cover, mostly from improper grazing management. Deeper rooted perennial midgrasses provide enhanced soil stability compared to shallower rooted shortgrasses and annuals.

Recreational uses

The site provides limited recreational use. The unpredictable nature of flash floods create dangerous conditions for hikers or campers.

Wood products

Mesquite trees are used for fence posts, firewood, and furniture.

Inventory data references

Information presented here has been developed from NRCS clipping, composition, plant cover, and soils data.

Other references

Reviewers:
Rusty Dowell, Resource Soil Scientist, NRCS, San Angelo, TX
Chad Evans, Soil Conservationist, NRCS, Pecos, TX
Preston Irwin, Rangeland Management Specialist, NRCS, Fort Stockton, TX
Cole Jacoby, Rangeland Management Specialist, NRCS, Alpine, TX
Laurie Meadows, Soil Conservation Technician, NRCS, Marfa, TX
Mark Moseley, Rangeland Management Specialist, NRCS, San Antonio, TX
Wayne Seipp, Resource Team Leader, NRCS, Alpine, TX
Craig Thomas, Rangeland Management Specialist, NRCS, Alpine, TX
Dr. Bonnie Warnock, Associate Professor, Sul Ross State University, Alpine, TX

Other References:

Briske, D.D., B.T. Bestelmeyer, T.K. Stringham, and P.L. Shaver. 2008. Recommendations for development of resilience-based state and transition models. Rangeland Ecology & Management 61:359-367.

Briske, D.D., S. D. Fuhlendorf, F. E. Smeins. 2005. State-and-transition models, thresholds, and rangeland health: A synthesis of ecological concepts and perspectives. Rangeland Ecology & Management 58: 1-10.

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. Willms. 2008. Rotational grazing on rangelands: Reconciliation of perception and experimental evidence.

Rangeland Ecology and Management 61: 3-17.

Gould, F.W. 1978. Common Texas grasses. Texas A&M University Press, College Station.

Hatch, S. L., J. Pluhar. 1993. Texas Range Plants. Texas A&M University Press, College Station.

Henklein, D.C. 2003. Vegetation alliances and associations of the Bofecillos Mountains and plateau. Thesis, Sul Ross State University, Alpine, TX.

Krausman P.R. 1978. Forage relationships between two deer species in Big Bend National Park, Texas. Journal of Wildlife Management 42: 101-107.

Taylor, R., J. Rutledge, and J.G. Herrera. 1997. A field guide to common south Texas shrubs. Texas Parks and Wildlife Press, Austin, TX.

Texas Parks and Wildlife Department, s.v. “West Texas Wildlife Management,” http://www.tpwd.state.tx.us/landwater/land/habitats/trans_pecos/ (accessed January 2008).

Taylor, R., J. Rutledge, and J.G. Herrera. 1997. A field guide to common south Texas shrubs. Texas Parks and Wildlife Press, Austin, TX.

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.

Smeins, F.E. 1984. Origin of the brush problem – a geological and ecological perspective of contemporary distributions. In Brush Management Symposium, edited by Kirk McDaniel, pages 5-16. Texas Tech Press, Lubbock, Texas.

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 July 2008).

Warnock, B. H. 1970. Wildflowers of the Big Bend Country. Sul Ross State University, Alpine, TX.

Contributors

Michael Margo, RMS, NRCS, Marfa, Texas

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)	Michael Margo, RMS, NRCS, Marfa, TX
Contact for lead author	Zone RMS, San Angelo, TX 325-944-0147
Date	04/16/2012
Approved by	Kent Ferguson
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** Active rill formation is slight at infrequent intervals, mostly in exposed areas within the stream terrace. The site is located within a drainage area subject to flash floods. Scoured areas within the stream channel is natural.

---

2. **Presence of water flow patterns:** Flow patterns are stable and short.

---

3. **Number and height of erosional pedestals or terracettes:** None

---

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** 5-10 percent bare ground

---

5. **Number of gullies and erosion associated with gullies:** None

---

6. **Extent of wind scoured, blowouts and/or depositional areas:** None

---

7. **Amount of litter movement (describe size and distance expected to travel):** In drainages, there can be significant amounts of litter moved long distances. On the stream terrace, minimal and short distance (<5ft) of litter movement associated with high intense rainfall.

---

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** Stability values range from 3-4 in the interspaces and 4-5 under plant canopies.

---

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** 0-3 inches thick, brown surface horizon with a weak medium subangular structure. Data from Pantera soil series description

---

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** A high canopy cover of bunch, rhizomatous, and stoliniferous grasses will help minimize runoff and maximize infiltration. Grasses should comprise approximately 35% of total plant compostion by weight. Shrubs will comprise about 50% by weight.

---

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

---

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: Shrubs = dominant stoloniferous = dominant bunchgrasses > subdominant grasses > half shrubs = forbs > succulents > annual forbs = annual grasses

Additional:

---

13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** All grasses will show some mortality and decadence in addition to annual forbs. Mid/tall perennial shrubs will show some mortality or decadence only after prolonged and severe droughts. Subshrubs will be less resistant to severe droughts than mid/tall perennial shrubs.

---

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):** 600-1200 lbs/ac depending on annual rainfall.

---

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:** Buffelgrass and bermudagrass in some locations.

---

17. **Perennial plant reproductive capability:** All species should be capable of reproducing.
