

## Ecological site R041XC333AZ Limy Slopes 12-16" p.z. Gypsum

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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.

### MLRA notes

Major Land Resource Area (MLRA): 041X–Madrean Archipelago

AZ 41.3 – Chihuahuan – Sonoran Semidesert Grasslands

Elevations range from 3200 to 5000 feet and precipitation ranges from 12 to 16 inches per year. Vegetation includes mesquite, catclaw acacia, netleaf hackberry, palo verde, false mesquite, range ratany, fourwing saltbush, tarbush, littleleaf sumac, sideoats grama, black grama, plains lovegrass, cane beardgrass, tobosa, vine mesquite, threeawns, Arizona cottontop and bush muhly. The soil temperature regime is thermic and the soil moisture regime is ustic aridic. This unit occurs within the Basin and Range Physiographic Province and is characterized by numerous mountain ranges that rise abruptly from broad, plain-like valleys and basins. Igneous and metamorphic rock classes dominate the mountain ranges and sediments filling the basins represent combinations of fluvial, lacustrine, colluvial and alluvial deposits.

### Ecological site concept

Limy Slopes, Gypsum, 12-16" p.z. ecological site is found on an upland landscape position, generally on side-slopes of fan terraces, hillslopes and ridgetops. All moisture for the plant community is received from precipitation. Terrain is steeply sloping (6-40%). Soils are moderately deep to deep, calcareous with gypsum. Gypsum (calcium sulfate) is highly soluble making soil extremely vulnerable to accelerated erosion; It can be found either throughout the soil profile or within sub-surface horizons. Representative soil series representative are: Contention and Whitecliff.

### Associated sites

R041XC309AZ	<b>Limy Upland 12-16" p.z.</b>
R041XC313AZ	<b>Loamy Upland 12"-16" p.z.</b>
R041XC314AZ	<b>Loamy Slopes 12-16" p.z.</b>
R041XC319AZ	<b>Sandy Loam Upland 12-16" p.z.</b>

### Similar sites

R040XA110AZ	<b>Limy Slopes 10"-13" p.z.</b>
R041XB207AZ	<b>Limy Slopes 8-12" p.z.</b>
R041XA104AZ	<b>Limy Slopes 16-20" p.z.</b>

Table 1. Dominant plant species

Tree	Not specified
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Shrub	(1) <i>calliandra eriophylla</i> (2) <i>krameria erecta</i>
Herbaceous	(1) <i>bouteloua eriopoda</i> (2) <i>bouteloua curtipendula</i>

## Physiographic features

This site occurs in the middle elevations of the Madrean Basin and Range province in southeastern Arizona. It occurs on the side slopes of fan terraces and on hill slopes and ridge-tops. Slopes range from 6-40%. Direction of slope is not site differentiating except where east-west trending ridges of the site occur near MLRA boundaries.

**Table 2. Representative physiographic features**

Landforms	(1) Fan piedmont (2) Ballena (3) Hill
Flooding frequency	None
Ponding frequency	None
Elevation	975–1,524 m
Slope	6–40%
Aspect	N, E, S

## Climatic features

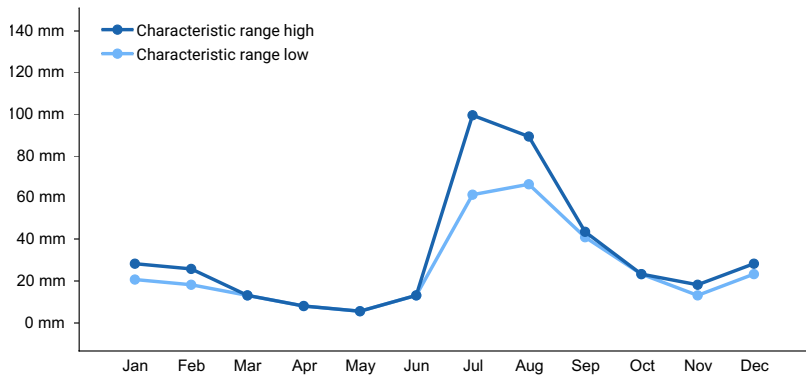
Precipitation in this common resource area ranges from 12-16 inches yearly in the eastern part with elevations from 3600-5000 feet, and 13-17 inches in the western part where elevations are 3300-4500 feet. Winter-Summer rainfall ratios are 40-60% in the west and 30-70% in the east. Summer rains fall July-September, originate in the Gulf of Mexico and are convective, usually brief, intense thunderstorms. Cool season moisture tends to be frontal, originates in the Pacific and Gulf of California, and falls in widespread storms with long duration and low intensity. Snow rarely lasts more than one day. May and June are the driest months of the year. Humidity is generally very low.

Temperatures are mild. Freezing temperatures are common at night from December-April; however temperatures during the day are frequently above 50 F. Occasionally in December-February, brief 0 F temperatures may be experienced some nights. During June, July and August, some days may exceed 100 F.

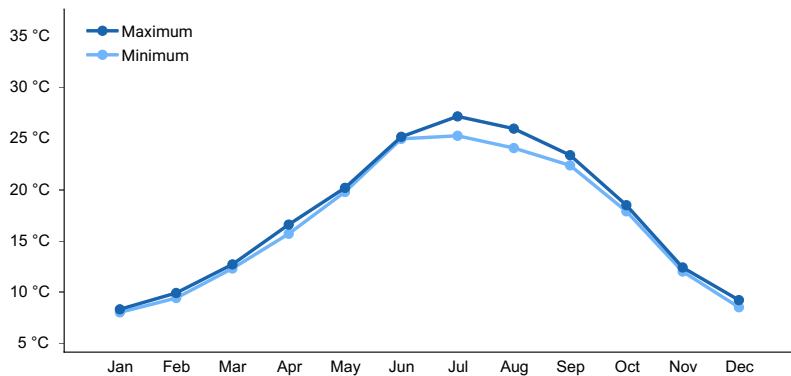
Cool season plants start growth in early spring and mature in early summer. Warm season plants take advantage of summer rains and are growing and nutritious July-September. Warm season grasses may remain green throughout the year.

**Table 3. Representative climatic features**

Frost-free period (average)	220 days
Freeze-free period (average)	
Precipitation total (average)	406 mm



**Figure 1. Monthly precipitation range**



**Figure 2. Monthly average minimum and maximum temperature**

## Influencing water features

There are no water features associated with this site.

## Soil features

These soils have developed on very calcareous, gravelly, loamy alluvium. They are moderately deep to deep and calcareous throughout. The surface 6-10 inches are dark colored. The soils have calcic horizons at shallow depths. Soil surfaces are well covered with gravels and rocks. Plant-soil moisture relationships are fair.

Soils mapped on this site include: SSA-661 Eastern Pinal & Southern Gila counties MU's 77 Powerline & 91 Tombstone; SSA-663 Gila-Duncan area MU 11 Alsco; SSA-666 Cochise county Northwest part MU's 36 Andrada, 61 Mule, 64 tombstone & 79 Stronghold; SSA-667 Santa Cruz area MU's BhD & WtF Hathaway, CvE2 & RIE2 Rillino eroded, HhE2 Hathaway eroded; SSA-669 Pima county Eastern part MU's 6, 51 & 79 Tombstone, 23 Andrada & 65 Powerline; SSA-671 Cochise county Douglas-Tombstone part MU's 56, 58 108 & 134 Stronghold and 133 Stronghold GrFSL.

**Table 4. Representative soil features**

Surface texture	(1) Gravelly sandy loam (2) Very gravelly sandy loam (3) Very gravelly loam
Family particle size	(1) Sandy
Drainage class	Well drained
Permeability class	Moderately rapid to moderate
Soil depth	76–152 cm
Surface fragment cover <=3"	25–50%
Surface fragment cover >3"	0–8%

Available water capacity (0-101.6cm)	7.11–15.24 cm
Calcium carbonate equivalent (0-101.6cm)	10–30%
Electrical conductivity (0-101.6cm)	0–8 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0–2
Soil reaction (1:1 water) (0-101.6cm)	7.9–8.6
Subsurface fragment volume <=3" (Depth not specified)	15–45%
Subsurface fragment volume >3" (Depth not specified)	0–5%

## Ecological dynamics

The potential plant community of Limy Slopes, Gypsum, is dominated by warm season perennial grasses. Perennial forbs are well represented on the site, as well as a few species of half shrubs. Most of the major perennial grasses on the site are well dispersed throughout the plant community. Black grama occurs in patches of various sizes and these patches appear to be well dispersed over larger areas of the site. The aspect is open grassland. With continuous heavy grazing, the potential dominant grasses are replaced by increases in species like red threeawn, blue threeawn, slim tridens and fluffgrass. Low shrubs that can increase on the site include paperflower, snakeweed, ratear coldenia, and desert zinnia. Large shrubs such as creosotebush, whitethorn, paloverde, little leaf sumac and tarbush can invade this site from adjacent areas of Limy Upland or Limestone Hills. Natural fire may have been a factor in the development of the potential plant community. Gravel size cover may be inadequate on steep slopes in preventing water erosion. Loss of dark colored surface soil (A horizon) can reduce site productivity. Lehmann lovegrass can invade and become dominant on areas of this site where perennial grass cover has been lost due the interactions of drought, fire and continuous grazing.

When the native perennial grass cover is depleted due the combination of continuous grazing and drought and / or fire, Lehmann lovegrass can invade areas of this site as long as a seed source is present. Over time Lehmann can dominate the grass and forb component of the plant community. The dominant half shrubs, false mesquite and range ratany, seem to be able to persist under these circumstances.

In the absence of fire for long periods and with the interaction of drought, fire and continuous grazing, shrubs like creosotebush and whitethorn acacia can invade and increase to dominate the site. In some areas other shrubs like mesquite, mimosa, sandpaper bush, ocotillo, paloverde and succulents like prickly pear, soaptree yucca and banana yucca can also increase. As woody plants increase the herbaceous component diminishes until there is no longer enough fine fuel produced to carry fire.

Eroded State: The gypsum in the soil is highly soluble making this ecological site vulnerable to any mechanical disturbance that removes soil surface protection. Thus, soil disturbance can trigger unstoppable erosion. Mechanical soil disturbances can include brush management, mechanical land treatments (ie, ripping), cultivation, road cuts, construction, heavy use zone by cattle (ie, trailing, supplement or water trough site), trenching, recreational vehicle use. The interaction of continuous heavy grazing with drought and / or fire and livestock trails removing surface gravel cover, can lead to accelerated sheet and rill erosion and loss of the entire A horizon. This state has heavy shrub covers, deep continuous rills and the calcic horizon is exposed at the soil surface. It's potential to grow perennial grasses is largely eliminated making shrub control with herbicides pointless. Shrubs like creosote, sandpaper bush and whitethorn dominate the plant community.

## State and transition model

## MLRA 41-3 (12-16"), Limy Slopes, Gypsum

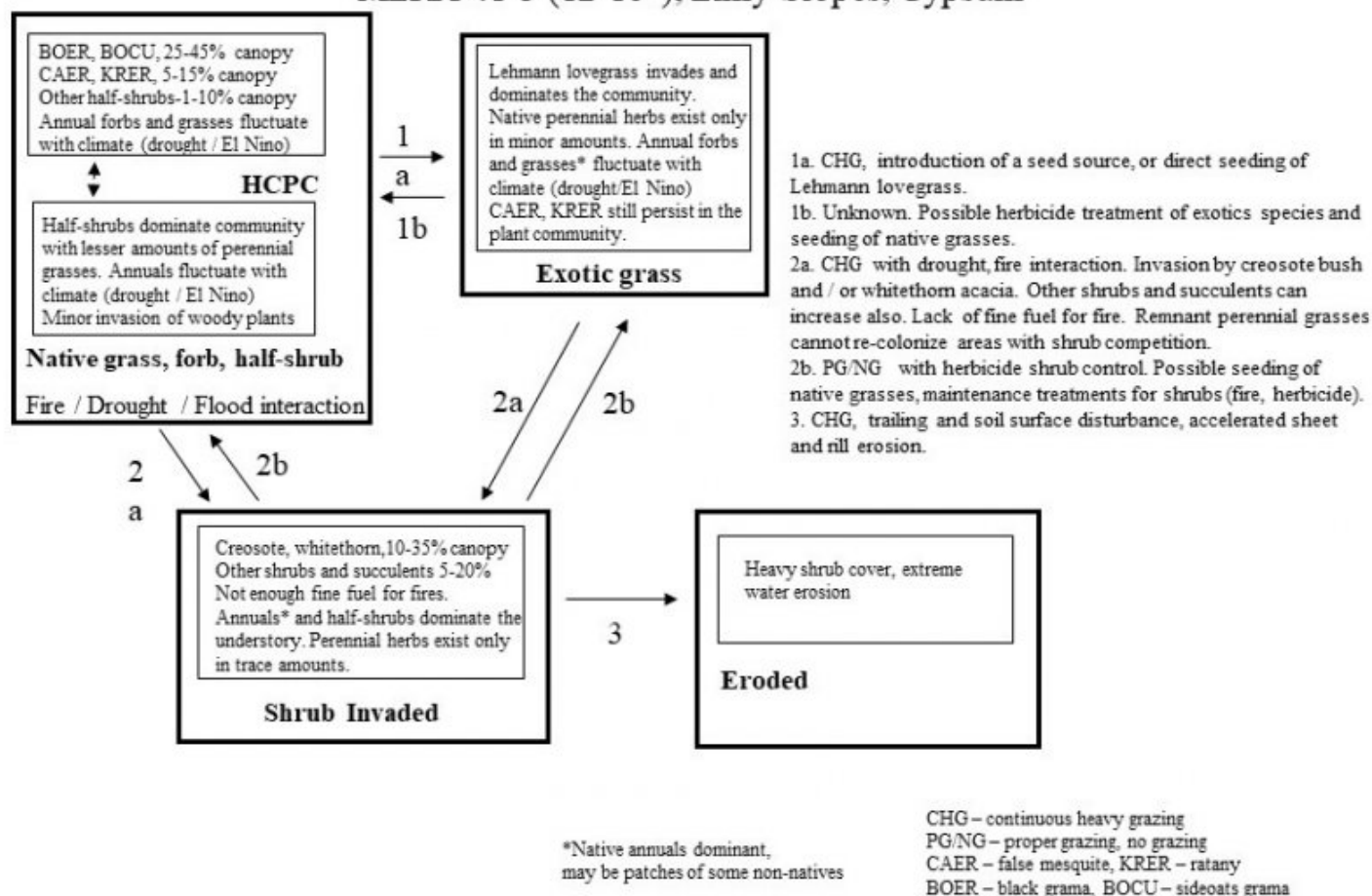


Figure 3. State and Transition, Limy Slopes, Gypsum, 12-16" p.z.

### State 1 Historic Climax Plant Community

#### Community 1.1 Historic Climax Plant Community



Figure 4. Limy Slopes 12-16" p.z. half shrubs dominant

The potential plant community on this site is dominated by warm season perennial grasses. Perennial forbs are well represented on the site, as well as a few species of half shrubs. Most of the major perennial grasses on the site are well dispersed throughout the plant community. Black grama occurs in patches of various sizes and these patches appear to be well dispersed over larger areas of the site. The aspect is open grassland. With continuous heavy

grazing, the potential dominant grasses are replaced by increases in species like red threeawn, blue threeawn, slim tridens and fluffgrass. Low shrubs that can increase on the site include paperflower, snakeweed, ratear coldenia, and desert zinnia. Large shrubs such as creosotebush, whitethorn, paloverde, little leaf sumac and tarbush can invade this site from adjacent areas of Limy Upland or Limestone Hills. Natural fire may have been a factor in the development of the potential plant community. Gravel size cover may be inadequate on steep slopes in preventing water erosion. Loss of dark colored surface soil (A horizon) can reduce site productivity. Lehmann lovegrass can invade and become dominant on areas of this site where perennial grass cover has been lost due the interactions of drought, fire and continuous grazing.

**Table 5. Annual production by plant type**

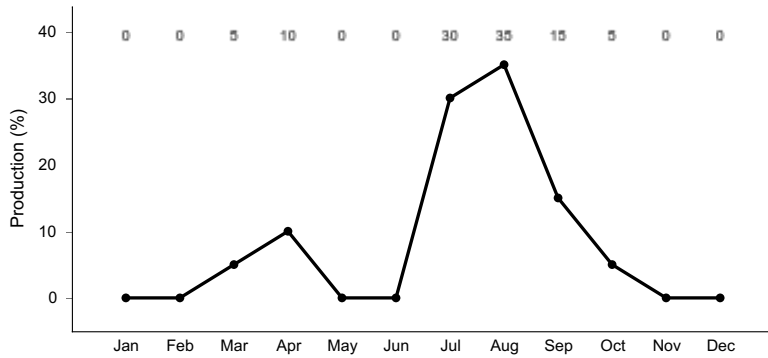
Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	504	925	1457
Shrub/Vine	73	140	275
Forb	45	56	224
Tree	–	–	22
<b>Total</b>	<b>622</b>	<b>1121</b>	<b>1978</b>

**Table 6. Soil surface cover**

Tree basal cover	0%
Shrub/vine/liana basal cover	2-10%
Grass/grasslike basal cover	6-20%
Forb basal cover	0-1%
Non-vascular plants	0%
Biological crusts	0-1%
Litter	10-50%
Surface fragments >0.25" and <=3"	25-50%
Surface fragments >3"	0-8%
Bedrock	0%
Water	0%
Bare ground	5-25%

**Table 7. Canopy structure (% cover)**

Height Above Ground (M)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.15	–	1-10%	2-20%	0-5%
>0.15 <= 0.3	–	5-15%	10-25%	1-2%
>0.3 <= 0.6	–	1-10%	10-20%	0-2%
>0.6 <= 1.4	–	0-5%	0-5%	–
>1.4 <= 4	–	0-2%	–	–
>4 <= 12	–	–	–	–
>12 <= 24	–	–	–	–
>24 <= 37	–	–	–	–
>37	–	–	–	–



**Figure 6. Plant community growth curve (percent production by month). AZ4134, 41.3 12-16" p.z. other sites. Growth begins in the spring, semi-dormancy occurs during the May through June drought, most growth occurs during the summer rains..**

## State 2

### Exotic perennial grass

#### Community 2.1

#### Exotic perennial grass



**Figure 7. Limy Slopes 12-16" p.z. Lehmann invades from ROW**

When the native perennial grass cover is depleted due the combination of continuous grazing and drought and / or fire, Lehmann lovegrass can invade areas of this site as long as a seed source is present. Over time Lehmann can dominate the grass and forb component of the plant community. The dominant half shrubs, false mesquite and range ratany, seem to be able to persist under these circumstances.

## State 3

### Shrub invaded state

#### Community 3.1

#### Shrub invaded state



**Figure 8. Limy slope 12-16" pz. creosote invasion, ocotillo**

In the absence of fire for long periods and with the interaction of drought, fire and continuous grazing, shrubs like creosotebush and whitethorn acacia can invade and increase to dominate the site. In some areas other shrubs like mesquite, mimosa, sandpaper bush, ocotillo, paloverde and succulents like prickly pear, soaptree yucca and banana yucca can also increase. As woody plants increase the herbaceous part of the plant community diminishes until there is no longer enough fine fuel produced to carry fire.

## **State 4 Eroded**

### **Community 4.1 Eroded**

The interaction of continuous heavy grazing with drought and / or fire can lead to accelerated sheet and rill erosion and loss of the entire A (mollic) horizon. This state has heavy shrub covers and the calcic horizon is exposed at the soil surface. It's potential to grow perennial grasses is greatly reduced. Shrub control with herbicides will be short lived as the new site potential is shrub-land. Shrubs like creosote, sandpaper bush and whitethorn dominate the plant community.

### **Transition T1A State 1 to 2**

Continuous Heavy Grazing, introduction of a seed source, or direct seeding of Lehmann lovegrass.

### **Transition T1B State 1 to 3**

Continuous Heavy Grazing with drought, fire interaction. Invasion by creosote bush and/or whitethorn acacia. Other shrubs and succulents can increase also. Lack of fine fuel for fire. Remnant perennial grasses cannot re-colonize areas with shrub competition.

### **Restoration pathway R2A State 2 to 1**

Unknown.

### **Transition T2A State 2 to 3**

Continuous Heavy Grazing with drought, fire interaction. Invasion by creosote bush and/or whitethorn acacia. Other shrubs and succulents can increase also. Lack of fine fuel for fire. Remnant perennial grasses cannot re-colonize areas with shrub competition.



## Restoration pathway R3A

### State 3 to 1

Prescribed Grazing/No Grazing with herbicide shrub control. Possible seeding of native grasses, maintenance treatments for shrubs (fire, herbicide). State 2, Exotic Grasses, is likely outcome.

## Restoration pathway R3B

### State 3 to 2

Prescribed Grazing/No Grazing with herbicide shrub control. Possible seeding of native grasses, maintenance treatments for shrubs (fire, herbicide). Non-native perennial grass soil seed bank and/or aggressive invasion makes non-native seeding unnecessary.

## Transition T3A

### State 3 to 4

Continuous Heavy Grazing, trailing and soil surface disturbance, accelerated sheet and rill erosion.

## Additional community tables

Table 8. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
<b>Grass/Grasslike</b>					
1	<b>Dominant grasses</b>			347–897	
	sideoats grama	BOCU	<i>Bouteloua curtipendula</i>	112–448	–
	black grama	BOER4	<i>Bouteloua eriopoda</i>	224–448	–
	bush muhly	MUPO2	<i>Muhlenbergia porteri</i>	11–168	–
2	<b>Sub-dominant grasses</b>			112–224	
	slim tridens	TRMU	<i>Tridens muticus</i>	56–112	–
	Hall's panicgrass	PAHA	<i>Panicum hallii</i>	28–112	–
	sand dropseed	SPCR	<i>Sporobolus cryptandrus</i>	11–56	–
	hairy grama	BOHI2	<i>Bouteloua hirsuta</i>	0–56	–
	fall witchgrass	DICO6	<i>Digitaria cognata</i>	0–28	–
3	<b>Perennial threeawns</b>			45–112	
	blue threeawn	ARPUN	<i>Aristida purpurea var. nealleyi</i>	28–112	–
	purple threeawn	ARPU9	<i>Aristida purpurea</i>	0–56	–
	spidergrass	ARTE3	<i>Aristida ternipes</i>	1–28	–
	spidergrass	ARTEG	<i>Aristida ternipes var. gentilis</i>	0–22	–
	Wright's threeawn	ARPUW	<i>Aristida purpurea var. wrightii</i>	0–22	–
	Fendler threeawn	ARPUL	<i>Aristida purpurea var. longiseta</i>	6–22	–
	poverty threeawn	ARDI5	<i>Aristida divaricata</i>	6–11	–
	Parish's threeawn	ARPUP5	<i>Aristida purpurea var. parishii</i>	0–11	–
	Havard's threeawn	ARHA3	<i>Aristida havardii</i>	0–6	–
	Wooton's threeawn	ARPA9	<i>Aristida pansa</i>	0–6	–
4	<b>Misc. peren. grasses</b>			11–112	
	New Mexico feathergrass	HENE5	<i>Hesperostipa neomexicana</i>	0–50	–
	tanglehead	HECO10	<i>Heteropogon contortus</i>	1–28	–

	red grama	BOTR2	<i>Bouteloua trifida</i>	0–28	–
	low woollygrass	DAPU7	<i>Dasyochloa pulchella</i>	6–28	–
	Arizona cottontop	DICA8	<i>Digitaria californica</i>	0–28	–
	cane bluestem	BOBA3	<i>Bothriochloa barbinodis</i>	0–28	–
	plains bristlegrass	SEVU2	<i>Setaria vulpiseta</i>	0–28	–
	Rothrock's grama	BORO2	<i>Bouteloua rothrockii</i>	0–22	–
	nineawn pappusgrass	ENDE	<i>Enneapogon desvauxii</i>	6–22	–
	shortleaf woollygrass	ERAV	<i>Erioneuron avenaceum</i>	0–22	–
	squirreltail	ELELE	<i>Elymus elymoides</i> ssp. <i>elymoides</i>	0–17	–
	slender grama	BORE2	<i>Bouteloua repens</i>	0–17	–
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	0–17	–
	plains muhly	MUCU3	<i>Muhlenbergia cuspidata</i>	0–17	–
	slender muhly	MUTE4	<i>Muhlenbergia tenuifolia</i>	0–17	–
	woolyspike balsamscale	ELBA	<i>Elionurus barbiculmis</i>	0–11	–
	plains lovegrass	ERIN	<i>Eragrostis intermedia</i>	0–11	–
	curly-mesquite	HIBE	<i>Hilaria belangeri</i>	0–11	–
	common wolfstail	LYPH	<i>Lycurus phleoides</i>	0–11	–
	Arizona muhly	MUAR3	<i>Muhlenbergia arizonica</i>	0–11	–
	sprucetop grama	BOCH	<i>Bouteloua chondrosioides</i>	0–11	–
	southwestern needlegrass	ACEM4	<i>Achnatherum eminens</i>	0–11	–
	green sprangletop	LEDU	<i>Leptochloa dubia</i>	0–6	–
	tobosagrass	PLMU3	<i>Pleuraphis mutica</i>	0–6	–
	purple muhly	MURI3	<i>Muhlenbergia rigida</i>	0–6	–
	slim tridens	TRMUE	<i>Tridens muticus</i> var. <i>elongatus</i>	0–6	–
	spiked crinkleawn	TRSP12	<i>Trachypogon spicatus</i>	0–6	–
	purple grama	BORA	<i>Bouteloua radicata</i>	0–2	–
5	<b>Annual grasses</b>			1–112	
	sixweeks threeawn	ARAD	<i>Aristida adscensionis</i>	0–45	–
	sixweeks fescue	VUOC	<i>Vulpia octoflora</i>	0–45	–
	Mexican panicgrass	PAHI5	<i>Panicum hirticaule</i>	0–39	–
	Arizona signalgrass	URAR	<i>Urochloa arizonica</i>	0–22	–
	prairie threeawn	AROL	<i>Aristida oligantha</i>	1–22	–
	Mexican sprangletop	LEFUU	<i>Leptochloa fusca</i> ssp. <i>uninervia</i>	0–22	–
	mucronate sprangletop	LEPAB	<i>Leptochloa panicea</i> ssp. <i>brachiata</i>	0–17	–
	needle grama	BOAR	<i>Bouteloua aristidoides</i>	0–11	–
	sixweeks grama	BOBA2	<i>Bouteloua barbata</i>	0–11	–
	Parry's grama	BOPA2	<i>Bouteloua parryi</i>	0–11	–
	feather fingergrass	CHVI4	<i>Chloris virgata</i>	0–6	–
	witchgrass	PACA6	<i>Panicum capillare</i>	0–6	–
	Bigelow's bluegrass	POBI	<i>Poa bigelovii</i>	0–2	–
	tapertip cupgrass	ERACA	<i>Eriochloa acuminata</i> var. <i>acuminata</i>	0–2	–
	Mexican lovegrass	ERME	<i>Eragrostis mexicana</i>	0–2	–
	desert lovegrass	ERDEM	<i>Eragrostis pectinacea</i> var. <i>micrripa</i>	0–2	–

	tufted lovegrass	ERPE2	<i>Eragrostis pectinacea</i> var. <i>miserabilis</i>	0-2	-
	tufted lovegrass	ERPEP2	<i>Eragrostis pectinacea</i> var. <i>pectinacea</i>	0-2	-
	delicate muhly	MUFR	<i>Muhlenbergia fragilis</i>	0-2	-
	littleseed muhly	MUMI	<i>Muhlenbergia microsperma</i>	0-2	-
<b>Forb</b>					
6	<b>Perennial Forb</b>			34-112	
	weakeaf bur ragweed	AMCO3	<i>Ambrosia confertiflora</i>	1-22	-
	leatherweed	CRPO5	<i>Croton pottsii</i>	2-22	-
	desert globemallow	SPAM2	<i>Sphaeralcea ambigua</i>	1-22	-
	brownplume wirelettuce	STPA4	<i>Stephanomeria pauciflora</i>	1-17	-
	lacy tansyaster	MAPI	<i>Machaeranthera pinnatifida</i>	1-17	-
	hairyseed bahia	BAAB	<i>Bahia absinthifolia</i>	1-17	-
	desert marigold	BAMU	<i>Baileya multiradiata</i>	0-11	-
	desert mariposa lily	CAKE	<i>Calochortus kennedyi</i>	1-11	-
	sego lily	CANU3	<i>Calochortus nuttallii</i>	1-11	-
	trailing windmills	ALIN	<i>Allionia incarnata</i>	1-11	-
	Cochise beardtongue	PEDA	<i>Penstemon dasyphyllus</i>	0-11	-
	Parry's false prairie-clover	MAPA7	<i>Marina parryi</i>	0-11	-
	slender poreleaf	POGR5	<i>Porophyllum gracile</i>	0-11	-
	slimflower scurfpea	PSTE5	<i>Psoraleidum tenuiflorum</i>	1-11	-
	pricklyleaf dogweed	THAC	<i>Thymophylla acerosa</i>	1-6	-
	rue of the mountains	THTE2	<i>Thamnosma texana</i>	0-6	-
	ivyleaf groundcherry	PHHEH2	<i>Physalis hederifolia</i> var. <i>hederifolia</i>	1-6	-
	tufted evening primrose	OECA10	<i>Oenothera caespitosa</i>	0-6	-
	Parry's beardtongue	PEPA24	<i>Penstemon parryi</i>	0-6	-
	southwestern mock vervain	GLGO	<i>Glandularia gooddingii</i>	0-6	-
	Fendler's bladderpod	LEFE	<i>Lesquerella fendleri</i>	1-6	-
	Lewis flax	LILE3	<i>Linum lewisii</i>	0-6	-
	tuber anemone	ANTU	<i>Anemone tuberosa</i>	0-6	-
	perennial rockcress	ARPE2	<i>Arabis perennans</i>	1-6	-
	rose heath	CHER2	<i>Chaetopappa ericoides</i>	1-6	-
	whitemouth dayflower	COER	<i>Commelina erecta</i>	0-6	-
	dense ayenia	AYMI	<i>Ayenia microphylla</i>	0-6	-
	purplenerve springparsley	CYMU2	<i>Cymopterus multinervatus</i>	1-6	-
	scarlet spiderling	BOCO	<i>Boerhavia coccinea</i>	0-6	-
	spreading fleabane	ERDI4	<i>Erigeron divergens</i>	0-6	-
	wild dwarf morning-glory	EVAR	<i>Evolvulus arizonicus</i>	1-6	-
	spreading snakeherb	DYSCD	<i>Dyschoriste schiedeana</i> var. <i>decumbens</i>	0-2	-
	James' prairie clover	DAJA	<i>Dalea jamesii</i>	0-2	-
	Cooley's bundleflower	DECO2	<i>Desmanthus cooleyi</i>	0-2	-
	milkvetch	ASTRA	<i>Astragalus</i>	0-2	-

	lyreleaf greeneyes	BELY	<i>Berlandiera lyrata</i>	0–2	–
	Indian paintbrush	CAST12	<i>Castilleja</i>	0–2	–
	New Mexico silverbush	ARNE2	<i>Argythamnia neomexicana</i>	0–2	–
	dwarf desertpeony	ACNA2	<i>Acourtia nana</i>	0–2	–
	brownfoot	ACWR5	<i>Acourtia wrightii</i>	0–2	–
	Wright's deervetch	LOWR	<i>Lotus wrightii</i>	0–2	–
	variableleaf bushbean	MAG12	<i>Macroptilium gibbosifolium</i>	0–2	–
	ragged nettlespurge	JAMA	<i>Jatropha macrorhiza</i>	0–2	–
	San Pedro daisy	LAP04	<i>Lasianthea podocephala</i>	0–2	–
	plains blackfoot	MELE2	<i>Melampodium leucanthum</i>	0–2	–
	wishbone-bush	MILAV	<i>Mirabilis laevis var. villosa</i>	0–2	–
	slimleaf bean	PHAN3	<i>Phaseolus angustissimus</i>	0–2	–
	orange fameflower	PHAU13	<i>Phemeranthus aurantiacus</i>	0–2	–
	clammy groundcherry	PHHE5	<i>Physalis heterophylla</i>	0–2	–
	locoweed	OXYTR	<i>Oxytropis</i>	0–2	–
	twinleaf senna	SEBA3	<i>Senna bauhinioides</i>	1–2	–
	New Mexico fanpetals	SINE	<i>Sida neomexicana</i>	0–2	–
	silverleaf nightshade	SOEL	<i>Solanum elaeagnifolium</i>	0–2	–
	velvetseed milkwort	POOB	<i>Polygala obscura</i>	0–2	–
	shrubby purslane	POSU3	<i>Portulaca suffrutescens</i>	0–2	–
	Wright's cudweed	PSCAC2	<i>Pseudognaphalium canescens ssp. canescens</i>	0–2	–
	copper zephyrlily	ZELO	<i>Zephyranthes longifolia</i>	0–1	–
	jewels of Opar	TAPA2	<i>Talinum paniculatum</i>	0–1	–
	Watson's dutchman's pipe	ARWA	<i>Aristolochia watsonii</i>	0–1	–
	clasping milkweed	ASAM	<i>Asclepias amplexicaulis</i>	0–1	–
	desert larkspur	DEPA	<i>Delphinium parishii</i>	0–1	–
	Arizona snakecotton	FRAR2	<i>Froelichia arizonica</i>	0–1	–
7	<b>Annual forbs</b>			11–112	
	longleaf false goldeneye	HELOA2	<i>Heliomeris longifolia var. annua</i>	1–56	–
	Gordon's bladderpod	LEGO	<i>Lesquerella gordonii</i>	1–28	–
	intermediate pepperweed	LEVIM	<i>Lepidium virginicum var. medium</i>	0–28	–
	sensitive partridge pea	CHNI2	<i>Chamaecrista nictitans</i>	1–28	–
	western tansymustard	DEPI	<i>Descurainia pinnata</i>	1–28	–
	woolly tidestromia	TILA2	<i>Tidestromia lanuginosa</i>	0–28	–
	slender goldenweed	MAGR10	<i>Machaeranthera gracilis</i>	1–28	–
	tanseyleaf tansyaster	MATA2	<i>Machaeranthera tanacetifolia</i>	1–28	–
	phacelia	PHACE	<i>Phacelia</i>	0–28	–
	desert Indianwheat	PLOV	<i>Plantago ovata</i>	0–28	–
	woolly plantain	PLPA2	<i>Plantago patagonica</i>	0–28	–
	milkvetch	ASTRA	<i>Astragalus</i>	0–22	–
	Coulter's spiderling	BOCO2	<i>Boerhavia coulteri</i>	0–17	–

New Mexico thistle	CINE	<i>Cirsium neomexicanum</i>	1-17	-
goosefoot	CHENO	<i>Chenopodium</i>	0-17	-
flatcrown buckwheat	ERDE6	<i>Eriogonum deflexum</i>	0-17	-
miniature woollystar	ERDI2	<i>Eriastrum diffusum</i>	0-17	-
sorrel buckwheat	ERPO4	<i>Eriogonum polycladon</i>	0-17	-
foothill deervetch	LOHU2	<i>Lotus humistratus</i>	0-17	-
coastal bird's-foot trefoil	LOSAB	<i>Lotus salsuginosus var. brevivexillus</i>	0-17	-
crestrub morning-glory	IPCO2	<i>Ipomoea costellata</i>	0-17	-
Arizona poppy	KAGR	<i>Kallstroemia grandiflora</i>	0-17	-
warty caltrop	KAPA	<i>Kallstroemia parviflora</i>	0-17	-
California poppy	ESCAM	<i>Eschscholzia californica ssp. mexicana</i>	0-17	-
combseed	PECTO	<i>Pectocarya</i>	0-17	-
Coulter's lupine	LUSP2	<i>Lupinus sparsiflorus</i>	0-17	-
sawtooth sage	SASU7	<i>Salvia subincisa</i>	0-17	-
carelessweed	AMPA	<i>Amaranthus palmeri</i>	0-17	-
bristly fiddleneck	AMTE3	<i>Amsinckia tessellata</i>	0-17	-
spreading fanpetals	SIAB	<i>Sida abutifolia</i>	1-11	-
spurge	EUPHO	<i>Euphorbia</i>	1-11	-
shaggyfruit pepperweed	LELA	<i>Lepidium lasiocarpum</i>	0-11	-
exserted Indian paintbrush	CAEXE	<i>Castilleja exserta ssp. exserta</i>	0-11	-
hoary bowlesia	BOIN3	<i>Bowlesia incana</i>	0-6	-
fringed redmaids	CACI2	<i>Calandrinia ciliata</i>	0-6	-
wheelscale saltbush	ATEL	<i>Atriplex elegans</i>	0-6	-
wedgeleaf draba	DRCU	<i>Draba cuneifolia</i>	0-6	-
hairy prairie clover	DAMO	<i>Dalea mollis</i>	0-6	-
American wild carrot	DAPU3	<i>Daucus pusillus</i>	0-6	-
star gilia	GIST	<i>Gilia stellata</i>	0-6	-
Arizona lupine	LUAR4	<i>Lupinus arizonicus</i>	0-6	-
sleepy silene	SIAN2	<i>Silene antirrhina</i>	0-6	-
lyreleaf jewelflower	STCAA	<i>Streptanthus carinatus ssp. arizonicus</i>	0-6	-
chia	SACO6	<i>Salvia columbariae</i>	0-6	-
bristly nama	NAHI	<i>Nama hispidum</i>	0-6	-
desert evening primrose	OEPR	<i>Oenothera primiveris</i>	0-6	-
manybristle chinchweed	PEPA2	<i>Pectis papposa</i>	0-6	-
Arizona popcornflower	PLAR	<i>Plagiobothrys arizonicus</i>	0-6	-
New Mexico copperleaf	ACNE	<i>Acalypha neomexicana</i>	0-6	-
southwestern pricklypoppy	ARPL3	<i>Argemone pleiakantha</i>	0-2	-
whitestem blazingstar	MEAL6	<i>Mentzelia albicaulis</i>	0-2	-
green carpetweed	MOVE	<i>Mollugo verticillata</i>	0-2	-
New Mexico plumeseed	RANE	<i>Rafinesquia neomexicana</i>	0-2	-
plains flax	LIPU4	<i>Linum puberulum</i>	0-2	-

	pearly globe amaranth	GONI	<i>Gomphrena nitida</i>	0–2	–
	Arizona blanketflower	GAAR2	<i>Gaillardia arizonica</i>	0–2	–
	blanketflower	GAILL	<i>Gaillardia</i>	0–2	–
	sanddune wallflower	ERCA14	<i>Erysimum capitatum</i>	0–2	–
	Texas stork's bill	ERTE13	<i>Erodium texanum</i>	0–2	–
	manystem woolly sunflower	ERMU6	<i>Eriophyllum multicaule</i>	0–2	–
	scrambled eggs	COAU2	<i>Corydalis aurea</i>	0–2	–
	Fendler's desertdandelion	MAFE	<i>Malacothrix fendleri</i>	0–1	–
	desert unicorn-plant	PRAL4	<i>Proboscidea althaeifolia</i>	0–1	–
	doubleclaw	PRPA2	<i>Proboscidea parviflora</i>	0–1	–
<b>Shrub/Vine</b>					
8	<b>Dominant half shrubs</b>			50–112	
	fairyduster	CAER	<i>Calliandra eriophylla</i>	22–101	–
	littleleaf ratany	KRER	<i>Krameria erecta</i>	6–45	–
	trailing krameria	KRLA	<i>Krameria lanceolata</i>	0–28	–
9	<b>Sub-dom. half shrubs</b>			6–50	
	rough menodora	MESC	<i>Menodora scabra</i>	6–45	–
	desert zinnia	ZIAC	<i>Zinnia acerosa</i>	6–34	–
	featherplume	DAFO	<i>Dalea formosa</i>	6–34	–
	paleface	HIDE	<i>Hibiscus denudatus</i>	0–22	–
	slender janusia	JAGR	<i>Janusia gracilis</i>	0–11	–
	woody crinklemat	TICAC	<i>Tiquilia canescens var. canescens</i>	0–11	–
10	<b>Miscellaneous shrubs</b>			17–112	
	sacahuista	NOMI	<i>Nolina microcarpa</i>	0–28	–
	catclaw mimosa	MIACB	<i>Mimosa aculeaticarpa var. biuncifera</i>	0–17	–
	ocotillo	FOSP2	<i>Fouquieria splendens</i>	1–17	–
	winterfat	KRLA2	<i>Krascheninnikovia lanata</i>	0–17	–
	banana yucca	YUBA	<i>Yucca baccata</i>	1–17	–
	soaptree yucca	YUEL	<i>Yucca elata</i>	0–17	–
	littleleaf sumac	RHMI3	<i>Rhus microphylla</i>	1–17	–
	longleaf jointfir	EPTR	<i>Ephedra trifurca</i>	1–17	–
	desert ceanothus	CEGR	<i>Ceanothus greggii</i>	0–17	–
	javelina bush	COER5	<i>Condalia ericoides</i>	0–17	–
	knifeleaf condalia	COSP3	<i>Condalia spathulata</i>	0–17	–
	Wright's beebrush	ALWR	<i>Aloysia wrightii</i>	0–17	–
	common sotol	DAWH2	<i>Dasyllirion wheeleri</i>	0–11	–
	Warnock's snakewood	COWA	<i>Condalia warnockii</i>	0–11	–
	Kearney's snakewood	COWAK	<i>Condalia warnockii var. kearneyana</i>	0–6	–
	walkingstick cactus	CYSP8	<i>Cylindropuntia spinosior</i>	0–6	–
	spiny hackberry	CEEH	<i>Celtis ehrenbergiana</i>	0–6	–
	whitethorn acacia	ACCOC	<i>Acacia constricta var. constricta</i>	0–6	–
	whitethorn acacia	ACCOP9	<i>Acacia constricta var. paucispina</i>	0–6	–
	catclaw acacia	ACGR	<i>Acacia areaaii</i>	0–6	–

	brittlebush	ENFA	<i>Encelia farinosa</i>	0–6	–
	skunkbush sumac	RHTR	<i>Rhus trilobata</i>	0–6	–
	jojoba	SICH	<i>Simmondsia chinensis</i>	0–6	–
	Arizona necklacepod	SOAR3	<i>Sophora arizonica</i>	0–6	–
	whitestem paperflower	PSCO2	<i>Psilostrophe cooperi</i>	0–6	–
	Mexican cliffrose	PUME	<i>Purshia mexicana</i>	0–6	–
	Kearney's sumac	RHKE	<i>Rhus kearneyi</i>	0–6	–
	creosote bush	LATRT	<i>Larrea tridentata</i> var. <i>tridentata</i>	0–6	–
	desert-thorn	LYCIU	<i>Lycium</i>	0–6	–
	threadleaf snakeweed	GUMI	<i>Gutierrezia microcephala</i>	0–6	–
	broom snakeweed	GUSA2	<i>Gutierrezia sarothrae</i>	0–6	–
	velvetpod mimosa	MIDY	<i>Mimosa dysocarpa</i>	0–6	–
	Rio Grande saddlebush	MOSC	<i>Mortonia scabrella</i>	0–6	–
	Utah fendlerbush	FEUTC	<i>Fendlerella utahensis</i> var. <i>cymosa</i>	0–6	–
	cactus apple	OPEN3	<i>Opuntia engelmannii</i>	1–6	–
	mariola	PAIN2	<i>Parthenium incanum</i>	0–6	–
	crown of thorns	KOSP	<i>Koeberlinia spinosa</i>	0–6	–
	viscid acacia	ACNE4	<i>Acacia neovernicosa</i>	0–3	–
	Palmer's century plant	AGPA3	<i>Agave palmeri</i>	0–2	–
	prairie acacia	ACAN	<i>Acacia angustissima</i>	0–2	–
	fourwing saltbush	ATCA2	<i>Atriplex canescens</i>	0–2	–
	yellow paloverde	PAMI5	<i>Parkinsonia microphylla</i>	0–2	–
	purple pricklypear	OPMAM	<i>Opuntia macrocentra</i> var. <i>macrocentra</i>	0–2	–
	candy barrelcactus	FEWI	<i>Ferocactus wislizeni</i>	0–2	–
	American tarwort	FLCE	<i>Flourensia cernua</i>	0–2	–
	burroweed	ISTE2	<i>Isocoma tenuisecta</i>	0–2	–
	Eastern Mojave buckwheat	ERFAP	<i>Eriogonum fasciculatum</i> var. <i>polifolium</i>	0–2	–
	bastardsage	ERWR	<i>Eriogonum wrightii</i>	0–2	–
	spiny star	ESVI2	<i>Escobaria vivipara</i>	0–1	–
	rainbow cactus	ECPEP	<i>Echinocereus pectinatus</i> var. <i>pectinatus</i>	0–1	–
	little nipple cactus	MAHE2	<i>Mammillaria heyderi</i>	0–1	–
	pinkflower hedgehog cactus	ECFE	<i>Echinocereus fendleri</i>	0–1	–
	Parry's agave	AGPA4	<i>Agave parryi</i>	0–1	–
<b>Tree</b>					
11	<b>Trees</b>			0–22	
	oneseed juniper	JUMO	<i>Juniperus monosperma</i>	0–22	–
	blue paloverde	PAFL6	<i>Parkinsonia florida</i>	0–11	–
	mesquite	PROSO	<i>Prosopis</i>	0–11	–

## Animal community

High soil pH is somewhat offset by organic matter in the soil surface and the site produces fair quality herbaceous

forage. This site usually occurs as long ridges with moderate to steep side-slopes. Ridge-tops and canyon bottoms will be overused before the slopes are used. In addition, this site often occurs in complex with level areas of non-calcareous uplands. Due to the differences in the length of green season, forage quality and topography, these non-limy uplands will be overused before use is made of this range sites. Fencing and grazing systems are needed to overcome the problems associated with this range site. Black grama retains perennial culms and forms a thatch on this site which will regain green through the winter. In addition, several low, evergreen browse species occur on the site, which make it a valuable winter grazing source.

This is an important site for a variety of grassland birds and other wildlife species. It is also an important habitat for pronghorn.

## Hydrological functions

Deep, coarse textured soils produce little runoff except in exceptionally wet seasons.

## Recreational uses

Hunting, horseback riding, bird-watching, camping, hiking, photography.

## Wood products

None

## Other products

In places, especially on north exposures, beargrass (sacahuista) is found in sufficient quantities to provide harvest of leaves used as fibers in broom and mat making. Stands should not be harvested more than once every four or five years.

## Inventory data references

Range 417s include 18 in excellent condition, 23 in good condition and 7 in fair condition.

## Type locality

Location 1: Pima County, AZ	
Township/Range/Section	T22S R8E S15
General legal description	Buenos Aires National Wildlife refuge
Location 2: Cochise County, AZ	
Township/Range/Section	T21S R19E S17
General legal description	Fort Huachuca, west range
Location 3: Pima County, AZ	
Township/Range/Section	T18S R17E S29
General legal description	Empire Ranch at KA #4, near fence between the North pasture and 49 pasture. Along gasoline road.
Location 4: Pinal County, AZ	
Township/Range/Section	T10S R19E S17
General legal description	YLE ranch

## Contributors

Wilma J Renken



## Approval

Scott Woodall, 8/06/2020

### 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)	Dave Womack, Dan Robinett, Emilio Carrillo
Contact for lead author	NRCS Tucson Area Office
Date	03/04/2005
Approved by	Scott Woodall
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

### Indicators

1. **Number and extent of rills:** None

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2. **Presence of water flow patterns:** 10-20 feet long, discontinuous

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3. **Number and height of erosional pedestals or terracettes:** Pedestals common on perennial bunch grasses.  
Terracettes common on black grama plants.

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4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** 10-20%

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

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

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7. **Amount of litter movement (describe size and distance expected to travel):** Herbaceous litter in vicinity of flow paths moves in flow paths.

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8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** Expect values of 4-6 across site.

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Weak granular; color is 7.5YR5/3 dry, 7.5YR3/2 moist; thickness to 2 inches.
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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Canopy 30-40%, basal 5-10%, litter 15-40%; 75-80% of canopy cover is perennial grasses, 10-15% is subshrubs and 5% is trees & shrubs. Cover is well dispersed throughout site.
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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: perennial midgrasses >> annual forbs & grasses > subshrubs > large shrubs > succulents
- Sub-dominant:
- Other:
- Additional:
- 
13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** Approximately 50% of canopy and basal cover of midgrass species lost in recent prolonged drought.
- 
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 lbs/ac unfavorable precipitation; 900 lbs/ac normal precipitation; 1500 lbs/ac favorable precipitation.
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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:** Lehmann lovegrass, creosote, whitethorn, mesquite, prickly pear, burroweed, wait-a-bit
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17. **Perennial plant reproductive capability:** Not affected due regional prolonged drought.
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