

Ecological site R041XC305AZ Clay Loam Upland 12-16" p.z.

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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.

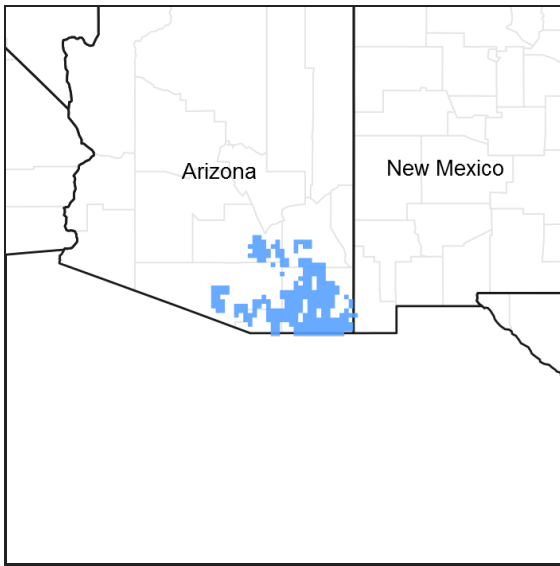


Figure 1. Mapped extent

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.

MLRA notes

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

Major Land Resource Area (MLRA) 41 represents the most northern extent of the Sierra Madre Occidental, or in English, the “mother mountains of the west.” The Sierra Madre Occidental is a massive, rugged mountain system that runs northwest from the Rio Grande de Santiago, in the state of Jalisco, Mexico, through the states of Sonora and Chihuahua, and ending in Arizona and New Mexico. Through Mexico, this mountain system runs parallel to the Pacific coast and, as it crosses into the United States and confronts the tectonic folding and rifting of the Basin and Range Physiographic Province, the land mass geographically breaks into smaller, isolated mountain ranges, called “sky islands.” The centralizing theme for this MLRA can be summed up as a series of inland islands extending from their mainland, the Sierra Madre Occidental, surrounded by a sea of desert grassland. To the west, the Madrean Archipelago bounds the Sonoran Basin and Range where several sky islands in southern Arizona grade into Sonoran Desert basins; to the north it bounds the contiguous mountains and geology of the Mogollon Transition area; and to the east, in New Mexico, it bounds the geology of the Rio Grande Rift. MLRA 41 is primarily a rangeland subdivision with small amounts of irrigated cropland. It encompasses approximately 13M acres.

LRU notes

Land Resource Unit 41-3, Southern Arizona Semidesert Grassland. 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.

Classification relationships

USDA-NRCS Land Resource Regions and Major Land Resource Areas of the United States, the Caribbean, and the Pacific Basin: Western Range and Irrigated Region D; Major Land Resource Area 41, Southeastern Arizona Basin and Range; Land Resource Unit 41-3, Semi-Desert Grassland; Ecological Site Clay Loam Upland, 12"-16" p.z.

U.S. Environmental Protection Agency, Ecological Regions of North America: Level I, Region 12, Southern Semi-Arid Highlands; Level II, 12.1 Western Sierra Madre Piedmont, Level III, Ecoregion 79 Madrean Archipelago, 79a, Apachian Valleys and Low Hills.

USDA-USFS Ecological Subregions: Sections of the Conterminous United States: Section 321 Basin and Range; Section 321A, Basin and Range Section.

Ecological site concept

Clay Loam Upland, 16"-20" p.z., ecological site is found on gently sloping uplands with deep soils. An argillic or clay cambic horizon is below a clay loam textured surface soil. Soil does not exhibit shrink-swell characteristics typical of vertic soils.

Associated sites

R041XC304AZ	Clayey Upland 12-16" p.z.
R041XC313AZ	Loamy Upland 12"-16" p.z.

Similar sites

R041XB204AZ	Clay Loam Upland 8-12" p.z.
R040XA120AZ	Clay Loam Upland 10"-13" p.z.
R041XA109AZ	Clay Loam Upland 16-20" p.z.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) <i>calliandra eriophylla</i>
Herbaceous	(1) <i>pleuraphis mutica</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 old fan terraces and old stream terraces. It is always in an upland position.

Table 2. Representative physiographic features

Landforms	(1) Fan piedmont (2) Stream terrace (3) Plain
Flooding frequency	None
Ponding frequency	None
Elevation	975–1,524 m

Slope	1-15%
Aspect	Aspect is not a significant factor

Climatic features

Precipitation in this land resource unit 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, originate 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

Influencing water features

There are no water features associated with this site.

Soil features

These are deep soils that have formed in clayey alluvium of mixed origin. Surface textures range from gravelly sandy-loam (less than one inch thick over an argillic horizon) to clay loam. Sub-soils are clayey, with mixed mineralogy, and lack vertic properties (soil cracking and churning). They are not calcareous in the upper 15 inches. They can have calcic horizons at moderate depths (20 to 40 inches). Plant-soil moisture relationships are fair to good. Soil surfaces are dark colored.

Soils mapped on this site include: SSA-661 Eastern Pinal & Southern Gila counties MU 91 Saddlebrook; SSA-663 Gila-Duncan area MU 37 Selevin; SSA-664 San Simon area MU's 19 Forrest & Whitehouse, 37 Signal, 45 Whitehouse; SSA-665 Willcox area MU's FrA & FrB Forrest, TwA Tubac; SSA-666 Cochise county Northwest part MU's 39 Eloma & 79 Elgin; SSA-667 Santa Cruz area MU's BhD Bernadino, EbC Eba GrVSL, SnD Signal; SSA-669 Pima county Eastern part MU 4 Arivaca; SSA-671 Cochise county Douglas-Tombstone part MU's 6 Banshee, 13 Forrest, 57 Elgin, 59 Eloma SL, 60 Eloma and 97 Libby; SSA-703 Tohono O'odham Nation MU 7 Selevin.

Table 4. Representative soil features

Surface texture	(1) Very gravelly clay loam (2) Clay loam (3) Gravelly sandy loam
Family particle size	(1) Clayey
Drainage class	Well drained
Permeability class	Moderate to slow
Soil depth	152 cm

Surface fragment cover <=3"	5–45%
Surface fragment cover >3"	0–5%
Available water capacity (0-101.6cm)	12.19–24.38 cm
Calcium carbonate equivalent (0-101.6cm)	1–25%
Electrical conductivity (0-101.6cm)	0–2 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0–2
Soil reaction (1:1 water) (0-101.6cm)	6.6–8.4
Subsurface fragment volume <=3" (Depth not specified)	5–45%
Subsurface fragment volume >3" (Depth not specified)	0–5%

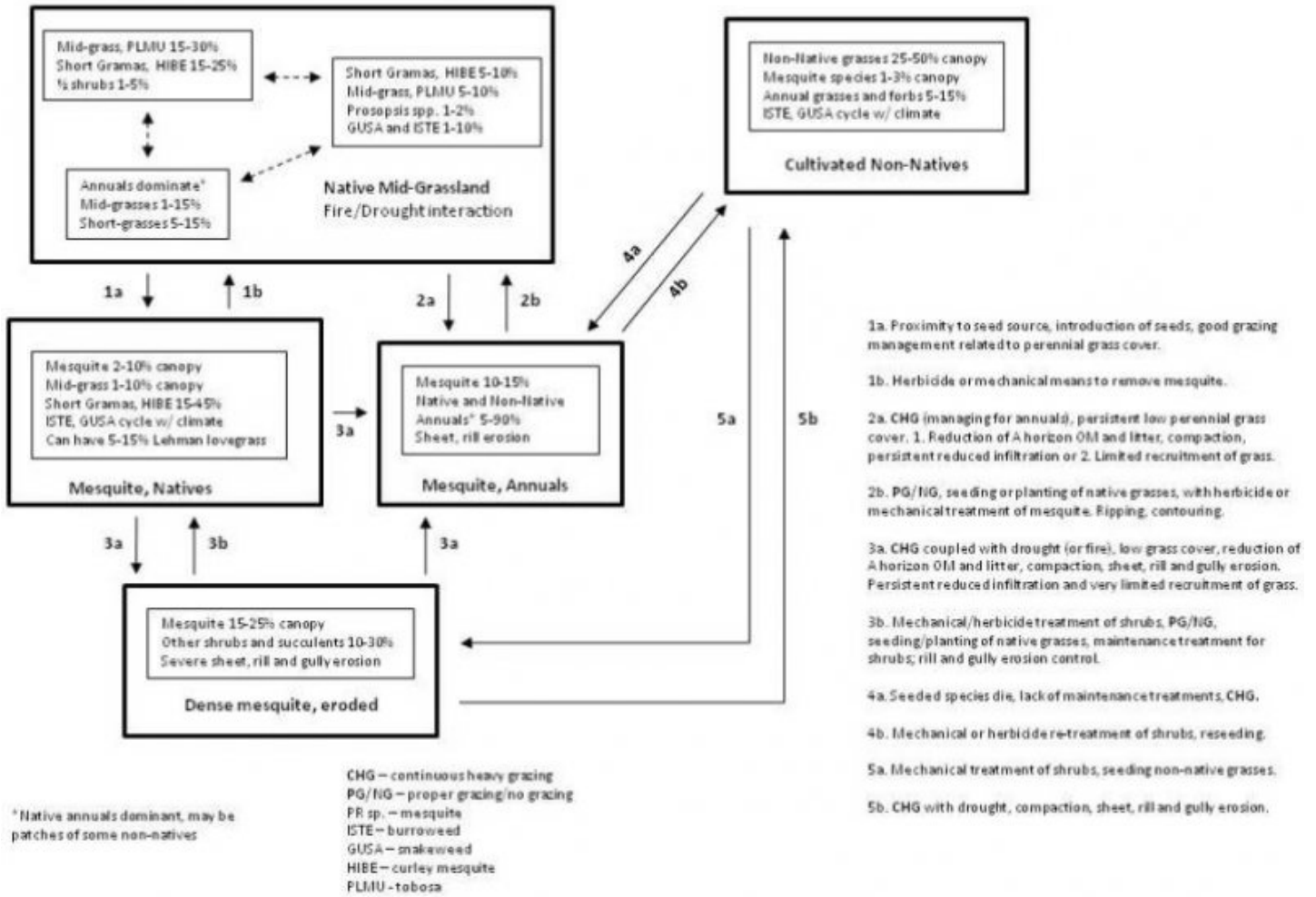
Ecological dynamics

Clay Loam Upland, 12"-16" p.z., is dominated by warm season perennial grasses. Most of the major perennial grass species on the site are well dispersed throughout their plant community. However, tobosa, vine mesquite, and curly mesquite tend to occur in patches on this site. These patches appear to be well dispersed and are variable in size. Perennial forbs are well represented on the site, as well as a few species of low shrubs. Natural fire was important in the development of the potential plant community. The aspect is open grassland.

Four alternate states are identified for this ecological site. State 2, Mesquite, Natives, comes about from years of yearlong livestock grazing at light-moderate intensity; livestock preferences for certain perennial grasses over others impact preferred species and removal of fine fuel extends natural fire intervals. State 3, Mesquite, Annuals, arises from years of high intensity livestock grazing; perennial native grasses are removed from plant community. State 4, Dense Mesquite, comes about from intense livestock grazing coupled with drought. State 5, Cultivated Non-Natives, is a restoration state following a combination of conservation practices; this state must be maintained with prescribed grazing and periodic brush management. Heavy livestock grazing will remove the seeded species and return the project area to State 3 or State 4.

State and transition model

MLRA 41-3 (12-16"), Clayloam Upland 12-16" p.z.



**State 1
 Native Mid-Grassland**

**Community 1.1
 Historical Climax Plant Community**

The historic native state includes the native plant communities that occur on the site, including the historic climax plant community. This state includes other plant communities that naturally occupy the site following fire, drought, flooding, herbivores, and other natural disturbances. The historic climax plant community represents the natural climax community that eventually reoccupies the site with proper management. The potential plant community on the site is dominated by warm season perennial grasses. Most of the major perennial grass species on the site are well dispersed throughout their plant community. However, tobosa, vine mesquite, and curly mesquite tend to occur in patches on this site. These patches appear to be well dispersed and are variable in size. Perennial forbs are well represented on the site, as well as a few species of low shrubs. The aspect is open grassland.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	516	841	1177
Forb	36	56	247
Shrub/Vine	11	67	157
Tree	–	6	17
Total	563	970	1598

Table 6. Soil surface cover

Tree basal cover	0%
Shrub/vine/liana basal cover	1-2%
Grass/grasslike basal cover	6-25%
Forb basal cover	0-1%
Non-vascular plants	0-1%
Biological crusts	1-10%
Litter	10-60%
Surface fragments >0.25" and <=3"	5-45%
Surface fragments >3"	0-5%
Bedrock	0%
Water	0%
Bare ground	15-25%

Table 7. Canopy structure (% cover)

Height Above Ground (M)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.15	–	1-5%	10-30%	0-5%
>0.15 <= 0.3	–	1-5%	10-20%	0-2%
>0.3 <= 0.6	–	0-3%	10-20%	0-2%
>0.6 <= 1.4	–	0-1%	1-5%	–
>1.4 <= 4	0-1%	–	–	–
>4 <= 12	–	–	–	–
>12 <= 24	–	–	–	–
>24 <= 37	–	–	–	–
>37	–	–	–	–

Figure 5. 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..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	5	10	0	0	30	35	15	5	0	0

**Community 1.2
Shrub-Grass**

**Community 1.3
Annuals-Grass**

**Pathway P1.1a
Community 1.1 to 1.2**

drought

**Pathway P1.1b
Community 1.1 to 1.3**

fire

Pathway P2.1a
Community 1.2 to 1.1

above average rain period

Pathway P1.2b
Community 1.2 to 1.3

fire

Pathway P1.3a
Community 1.3 to 1.1

average rainfall, wet summers

Pathway P1.3b
Community 1.3 to 1.2

average rainfall, wet winters

State 2
Mesquite, native grass

With continuous grazing, palatable perennial grasses like plains lovegrass, blue, black and sideoats grama decrease and species like tobosa and curly mesquite increase. Severe drought can reduce short grasses to very low levels. Drought - fire combinations can reduce perennial grass cover and allow annual herbs to become dominant for a short time (2-4 years) until grasses can recover. Due to heavy surface soil textures, this site can be an inefficient user of intense summer rainfall when the perennial grass cover has been removed or greatly reduced. Mesquite, when present on the site, tends to be shrubby due to the presence of clay horizons at shallow depths.

Community 2.1
Mesquite, native grass



Figure 6. Clayloam Upland 12-16" pz. mesquite, tobosa

Mesquite increases in the absence of fire for long periods of time. Native perennial grasses maintain dominance with good grazing management, and with mesquite canopy levels from 2 to 10%. Tobosa, curly mesquite and blue grama are dominant and the site remains stable as long as basal cover does not drop below 7 or 8%. Snakeweed and burroweed cycle with climate but never gain dominance. Lehmann lovegrass can invade the site in this state, but is not well adapted to the heavy soil textures and will not dominate the under-story. It will seldom exceed 5 to 15% canopy levels and will die during severe drought on this site. Some soil compaction has occurred due to livestock traffic, but hydrologic processes are not impaired.

State 3

Mesquite, annual grasses and forbs

Community 3.1

Mesquite, annual grasses and forbs



Figure 7. Clayloam Upland 12-16" pz. mesquite, shrubs, annua

Mesquite and other large shrubs have increased and are dominant with canopies from 10 to 15%. Native and non-native annual grasses and forbs, cool and warm season, dominate the under-story. Snakeweed and burroweed cycle with climate but remain co-dominant with annual species. Native perennial grasses are largely gone due to the interactions of drought, fire and continuous heavy grazing pressure. Tobosa may remain in remnant amounts but cover is very low and not well enough dispersed to recover. Usually soil compaction, from livestock traffic, and the loss of herbaceous cover has resulted in sheet and rill erosion on this site. Hydrologic relationships have changed to increase the ratio of runoff to infiltration.

State 4

Dense mesquite, cacti and other shrubs

Community 4.1

Dense mesquite, cacti and other shrubs

Mesquite continues to increase up to canopy levels of 25%. Other shrubs and succulents, especially prickly pear, dominate the under-story. Soil compaction, due to heavy livestock traffic, and loss of herbaceous cover has resulted in sheet, rill and gully erosion. Hydrologic relationships have changed to greatly increase the ratio of runoff to infiltration. In severe situations, cool season moisture is able to infiltrate the soil and the plant community is made up of mostly cool season plant species and cacti.

State 5

Cultivated, non-native perennial grasses

Community 5.1

Cultivated, non-native perennial grasses

This is a man made pasture of various introduced grasses including old world bluestems like, yellow, turkistan and King Ranch; and African lovegrasses like, Boer, Lehmann, Wilman and Cochise. It can be created from any of the mesquite states. Mesquite and other shrubs are bulldozed; brush is placed in rills and gullies, and non-native grasses are seeded. Root plowed areas are rough enough to eliminate most runoff for long periods of time (15 to 20 years) depending on grazing management. The African lovegrasses will not persist for long periods of time on this site and will die out in drought. The yellow bluestems appear to be more persistent on the site. Mesquite will reinvade areas of this state and will need maintenance treatments (every 10 to 15 years) of herbicides or mechanical methods to maintain a grassland aspect.

Transition T1A

State 1 to 2

seed introduction/proximity

Transition T1B

State 1 to 3

yearlong, heavy grazing

Restoration pathway R2A

State 2 to 1

brush management, prescribed grazing

Transition T2A

State 2 to 3

yearlong heavy grazing coupled with drought or burning

Transition T2B

State 2 to 4

yearlong heavy grazing with drought or fire

Restoration pathway R3B

State 3 to 1

none known; see R3A

Transition T3A

State 3 to 4

yearlong heavy grazing

Restoration pathway R3A

State 3 to 5

non-native seed introduction, brush management, prescribed grazing

Restoration pathway R4A

State 4 to 5

brush management, mechanical land treatment, seeding, prescribed grazing

Transition T5A

State 5 to 3

yearlong heavy grazing, mortality of seeded species, absence of brush management maintenance

Transition T5B

State 5 to 4

yearlong, heavy grazing with drought

Additional community tables

Table 8. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	mid grasses			392–560	
	sideoats grama	BOCU	<i>Bouteloua curtipendula</i>	202–314	–
	tobosagrass	PLMU3	<i>Pleuraphis mutica</i>	157–235	–
	cane bluestem	BOBA3	<i>Bothriochloa barbinodis</i>	22–168	–
	plains lovegrass	ERIN	<i>Eragrostis intermedia</i>	11–112	–
2	short grasses			78–224	
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	22–168	–
	curly-mesquite	HIBE	<i>Hilaria belangeri</i>	22–112	–
	sprucetop grama	BOCH	<i>Bouteloua chondrosioides</i>	11–112	–
	black grama	BOER4	<i>Bouteloua eriopoda</i>	22–84	–
	hairy grama	BOHI2	<i>Bouteloua hirsuta</i>	0–56	–
	vine mesquite	PAOB	<i>Panicum obtusum</i>	0–56	–
	common wolfstail	LYPH	<i>Lycurus phleoides</i>	0–28	–

3	miscellaneous perennial grasses			11–112	
	whiplash pappusgrass	PAVA2	<i>Pappophorum vaginatum</i>	0–56	–
	squirreltail	ELEL5	<i>Elymus elymoides</i>	1–39	–
	green sprangletop	LEDU	<i>Leptochloa dubia</i>	0–34	–
	sand dropseed	SPCR	<i>Sporobolus cryptandrus</i>	0–34	–
	plains bristlegrass	SEVU2	<i>Setaria vulpiseta</i>	0–34	–
	Hall's panicgrass	PAHA	<i>Panicum hallii</i>	0–34	–
	big sacaton	SPWR2	<i>Sporobolus wrightii</i>	0–28	–
	burrograss	SCBR2	<i>Scleropogon brevifolius</i>	0–28	–
	bush muhly	MUPO2	<i>Muhlenbergia porteri</i>	0–28	–
	Rothrock's grama	BORO2	<i>Bouteloua rothrockii</i>	1–28	–
	tanglehead	HECO10	<i>Heteropogon contortus</i>	0–22	–
	Arizona cottontop	DICA8	<i>Digitaria californica</i>	0–22	–
	fall witchgrass	DICO6	<i>Digitaria cognata</i>	0–22	–
	slender grama	BORE2	<i>Bouteloua repens</i>	0–17	–
	Arizona muhly	MUAR3	<i>Muhlenbergia arizonica</i>	0–11	–
	purple grama	BORA	<i>Bouteloua radicata</i>	0–11	–
	creeping muhly	MURE	<i>Muhlenbergia repens</i>	0–11	–
	slim tridens	TRMU	<i>Tridens muticus</i>	0–11	–
	low woollygrass	DAPU7	<i>Dasyochloa pulchella</i>	0–6	–
	nineawn pappusgrass	ENDE	<i>Enneapogon desvauxii</i>	0–6	–
	alkali sacaton	SPAI	<i>Sporobolus airoides</i>	0–6	–
4	perennial threeawns			18–112	
	Fendler threeawn	ARPUL	<i>Aristida purpurea</i> var. <i>longiseta</i>	6–39	–
	poverty threeawn	ARDI5	<i>Aristida divaricata</i>	6–39	–
	spidergrass	ARTE3	<i>Aristida ternipes</i>	6–39	–
	spidergrass	ARTEG	<i>Aristida ternipes</i> var. <i>gentilis</i>	1–28	–
	purple threeawn	ARPU9	<i>Aristida purpurea</i>	0–28	–
	Parish's threeawn	ARPUP5	<i>Aristida purpurea</i> var. <i>parishii</i>	0–17	–
	Havard's threeawn	ARHA3	<i>Aristida havardii</i>	0–17	–
	Wooton's threeawn	ARPA9	<i>Aristida pansa</i>	0–17	–
	blue threeawn	ARPUN	<i>Aristida purpurea</i> var. <i>nealleyi</i>	0–11	–
5	annual grasses			19–168	
	little barley	HOPU	<i>Hordeum pusillum</i>	0–39	–
	Mexican sprangletop	LEFUU	<i>Leptochloa fusca</i> ssp. <i>uninervia</i>	1–39	–
	mucronate sprangletop	LEPAB	<i>Leptochloa panicea</i> ssp. <i>brachiata</i>	1–39	–
	sixweeks threeawn	ARAD	<i>Aristida adscensionis</i>	6–39	–
	prairie threeawn	AROL	<i>Aristida oligantha</i>	6–39	–
	needle grama	BOAR	<i>Bouteloua aristidoides</i>	1–39	–
	Arizona signalgrass	URAR	<i>Urochloa arizonica</i>	1–39	–
	sixweeks fescue	VUOC	<i>Vulpia octoflora</i>	1–39	–
	tapertip cupgrass	ERACA	<i>Eriochloa acuminata</i> var. <i>acuminata</i>	0–28	–
	Mexican panicgrass	PAHI5	<i>Panicum hirticaule</i>	1–28	–
	Mexican lovegrass	ERME	<i>Eragrostis mexicana</i>	0–17	–

	tufted lovegrass	ERPE	<i>Eragrostis pectinacea</i>	0–17	–
	desert lovegrass	ERPEM	<i>Eragrostis pectinacea</i> var. <i>miserrima</i>	0–17	–
	sticky sprangletop	LEVI5	<i>Leptochloa viscida</i>	0–17	–
	sixweeks grama	BOBA2	<i>Bouteloua barbata</i>	0–17	–
	Arizona brome	BRAR4	<i>Bromus arizonicus</i>	0–17	–
	feather fingergrass	CHVI4	<i>Chloris virgata</i>	1–17	–
	witchgrass	PACA6	<i>Panicum capillare</i>	0–11	–
	Bigelow's bluegrass	POBI	<i>Poa bigelovii</i>	0–11	–
	delicate muhly	MUFR	<i>Muhlenbergia fragilis</i>	0–6	–
	littleseed muhly	MUMI	<i>Muhlenbergia microsperma</i>	0–6	–
Forb					
6	perennial Forbs			17–78	
	desert globemallow	SPAM2	<i>Sphaeralcea ambigua</i>	6–22	–
	brownplume wirelettuce	STPA4	<i>Stephanomeria pauciflora</i>	0–17	–
	Lewis flax	LILE3	<i>Linum lewisii</i>	0–17	–
	lacy tansyaster	MAPI	<i>Machaeranthera pinnatifida</i>	0–17	–
	largeflower onion	ALMA4	<i>Allium macropetalum</i>	0–17	–
	weakeaf bur ragweed	AMCO3	<i>Ambrosia confertiflora</i>	1–17	–
	scarlet spiderling	BOCO	<i>Boerhavia coccinea</i>	0–17	–
	leatherweed	CRPO5	<i>Croton pottsii</i>	0–17	–
	bluedicks	DICA14	<i>Dichelostemma capitatum</i>	1–17	–
	spreading fleabane	ERDI4	<i>Erigeron divergens</i>	1–17	–
	wild dwarf morning-glory	EVAR	<i>Evolvulus arizonicus</i>	1–11	–
	Indian rushpea	HOGL2	<i>Hoffmannseggia glauca</i>	1–11	–
	spreading snakeherb	DYSCD	<i>Dyschoriste schiedeana</i> var. <i>decumbens</i>	1–11	–
	tufted evening primrose	OECA10	<i>Oenothera caespitosa</i>	1–11	–
	slimleaf bean	PHAN3	<i>Phaseolus angustissimus</i>	0–11	–
	Wright's cudweed	PSCAC2	<i>Pseudognaphalium canescens</i> ssp. <i>canescens</i>	0–11	–
	New Mexico fanpetals	SINE	<i>Sida neomexicana</i>	1–11	–
	American vetch	VIAM	<i>Vicia americana</i>	0–6	–
	Louisiana vetch	VILU	<i>Vicia ludoviciana</i>	0–6	–
	Rocky Mountain zinnia	ZIGR	<i>Zinnia grandiflora</i>	1–6	–
	slender poreleaf	POGR5	<i>Porophyllum gracile</i>	0–6	–
	Greene's bird's-foot trefoil	LOGR4	<i>Lotus greenei</i>	0–6	–
	Wright's deervetch	LOWR	<i>Lotus wrightii</i>	0–6	–
	variableleaf bushbean	MAGI2	<i>Macroptilium gibbosifolium</i>	0–6	–
	lyreleaf greeneyes	BELY	<i>Berlandiera lyrata</i>	0–6	–
	whitemouth dayflower	COER	<i>Commelina erecta</i>	0–6	–
	fingerleaf gourd	CUDI	<i>Cucurbita digitata</i>	0–6	–
	coyote gourd	CUPA	<i>Cucurbita palmata</i>	0–6	–
	Cooley's bundleflower	DECO2	<i>Desmanthus cooleyi</i>	0–6	–

	southwestern mock vervain	GLGO	<i>Glandularia gooddingii</i>	0–6	–
	small matweed	GUDE	<i>Guilleminea densa</i>	1–6	–
	Arizona snakecotton	FRAR2	<i>Froelichia arizonica</i>	0–6	–
	Arizona wrightwort	CAAR7	<i>Carlwrightia arizonica</i>	0–6	–
	desert mariposa lily	CAKE	<i>Calochortus kennedyi</i>	0–6	–
	sego lily	CANU3	<i>Calochortus nuttallii</i>	0–6	–
	perennial rockcress	ARPE2	<i>Arabis perennans</i>	0–6	–
	dwarf desertpeony	ACNA2	<i>Acourtia nana</i>	0–6	–
	ragged nettlespurge	JAMA	<i>Jatropha macrorhiza</i>	0–3	–
	wishbone-bush	MILAV	<i>Mirabilis laevis</i> var. <i>villosa</i>	0–2	–
	desert tobacco	NIOB	<i>Nicotiana obtusifolia</i>	0–2	–
	velvetseed milkwort	POOB	<i>Polygala obscura</i>	0–2	–
	orange fameflower	PHAU13	<i>Phemeranthus aurantiacus</i>	0–2	–
	ivyleaf groundcherry	PHHE4	<i>Physalis hederifolia</i>	0–2	–
	silverleaf nightshade	SOEL	<i>Solanum elaeagnifolium</i>	0–2	–
	hairy fourwort	TENE	<i>Tetramerium nervosum</i>	0–2	–
	slimflower scurfpea	PSTE5	<i>Psoraleidium tenuiflorum</i>	0–2	–
	canaigre dock	RUHY	<i>Rumex hymenosepalus</i>	0–2	–
	twinleaf senna	SEBA3	<i>Senna bauhinioides</i>	0–2	–
	Lemmon's ragwort	SELE8	<i>Senecio lemmonii</i>	0–2	–
	brownfoot	ACWR5	<i>Acourtia wrightii</i>	0–2	–
	San Felipe dogweed	ADPO	<i>Adenophyllum porophylloides</i>	0–2	–
	trailing windmills	ALIN	<i>Allionia incarnata</i>	0–2	–
	tuber anemone	ANTU	<i>Anemone tuberosa</i>	0–2	–
	New Mexico silverbush	ARNE2	<i>Argythamnia neomexicana</i>	0–2	–
	southwestern pricklypoppy	ARPL3	<i>Argemone pleiacantha</i>	0–2	–
	Watson's dutchman's pipe	ARWA	<i>Aristolochia watsonii</i>	0–2	–
	dense ayenia	AYMI	<i>Ayenia microphylla</i>	0–2	–
	hairyseed bahia	BAAB	<i>Bahia absinthifolia</i>	0–2	–
	desert marigold	BAMU	<i>Baileya multiradiata</i>	0–2	–
	rose heath	CHER2	<i>Chaetopappa ericoides</i>	0–2	–
	beeblossom	GAURA	<i>Gaura</i>	0–2	–
	Trans-Pecos thimblehead	HYWI	<i>Hymenothrix wislizeni</i>	0–2	–
	Wright's thimblehead	HYWR	<i>Hymenothrix wrightii</i>	0–2	–
	branched noseburn	TRRA5	<i>Tragia ramosa</i>	0–2	–
	desert larkspur	DEPA	<i>Delphinium parishii</i>	0–1	–
	jewels of Opar	TAPA2	<i>Talinum paniculatum</i>	0–1	–
	Coulter's wrinklefruit	TECO	<i>Tetraclea coulteri</i>	0–1	–
	pricklyleaf dogweed	THAC	<i>Thymophylla acerosa</i>	0–1	–
	copper zephyrlily	ZELO	<i>Zephyranthes longifolia</i>	0–1	–
	shrubby purslane	POSU3	<i>Portulaca suffrutescens</i>	0–1	–

	false springparsley	PSEUD4	<i>Pseudocymopterus</i>	0-1	-
	San Pedro daisy	LAP04	<i>Lasianthaea podocephala</i>	0-1	-
	narrowleaf stoneseed	LIIN2	<i>Lithospermum incisum</i>	0-1	-
7	annual forbs			19-168	
	tanseyleaf tansyaster	MATA2	<i>Machaeranthera tanacetifolia</i>	1-56	-
	intermediate pepperweed	LEVIM	<i>Lepidium virginicum</i> var. <i>medium</i>	1-39	-
	slender goldenweed	MAGR10	<i>Machaeranthera gracilis</i>	1-39	-
	Coulter's spiderling	BOCO2	<i>Boerhavia coulteri</i>	1-39	-
	carelessweed	AMPA	<i>Amaranthus palmeri</i>	1-39	-
	goosefoot	CHENO	<i>Chenopodium</i>	1-39	-
	sensitive partridge pea	CHNI2	<i>Chamaecrista nictitans</i>	1-39	-
	western tansymustard	DEPI	<i>Descurainia pinnata</i>	1-39	-
	longleaf false goldeneye	HELOA2	<i>Heliomeris longifolia</i> var. <i>annua</i>	1-39	-
	sprucetop grama	BOCH	<i>Bouteloua chondrosioides</i>	8-39	-
	black grama	BOER4	<i>Bouteloua eriopoda</i>	8-39	-
	hairy grama	BOHI2	<i>Bouteloua hirsuta</i>	8-39	-
	purple grama	BORA	<i>Bouteloua radicata</i>	8-39	-
	Rothrock's grama	BORO2	<i>Bouteloua rothrockii</i>	8-39	-
	squirreltail	ELELE	<i>Elymus elymoides</i> ssp. <i>elymoides</i>	8-39	-
	common wolfstail	LYPH	<i>Lycurus phleoides</i>	8-39	-
	bush muhly	MUPO2	<i>Muhlenbergia porteri</i>	8-39	-
	creeping muhly	MURE	<i>Muhlenbergia repens</i>	8-39	-
	Hall's panicgrass	PAHA	<i>Panicum hallii</i>	8-39	-
	whiplash pappusgrass	PAVA2	<i>Pappophorum vaginatum</i>	8-39	-
	burrograss	SCBR2	<i>Scleropogon brevifolius</i>	8-39	-
	spike dropseed	SPCO4	<i>Sporobolus contractus</i>	8-39	-
	sand dropseed	SPCR	<i>Sporobolus cryptandrus</i>	8-39	-
	big sacaton	SPWR2	<i>Sporobolus wrightii</i>	8-39	-
	Texas fluffgrass	TRTE2	<i>Tridens texanus</i>	8-39	-
	Arizona poppy	KAGR	<i>Kallstroemia grandiflora</i>	1-28	-
	shaggyfruit pepperweed	LELA	<i>Lepidium lasiocarpum</i>	1-28	-
	desert Indianwheat	PLOV	<i>Plantago ovata</i>	1-28	-
	woolly plantain	PLPA2	<i>Plantago patagonica</i>	0-28	-
	purslane	PORTU	<i>Portulaca</i>	1-28	-
	spreading fanpetals	SIAB	<i>Sida abutifolia</i>	1-17	-
	woolly tidestromia	TILA2	<i>Tidestromia lanuginosa</i>	0-17	-
	Gordon's bladderpod	LEGO	<i>Lesquerella gordonii</i>	0-17	-
	foothill deervetch	LOHU2	<i>Lotus humistratus</i>	0-17	-
	coastal bird's-foot trefoil	LOSAB	<i>Lotus salsuginosus</i> var. <i>brevivexillus</i>	0-17	-
	whitestem blazingstar	MEAL6	<i>Mentzelia albicaulis</i>	0-17	-
	Nuttall's povertyweed	MONU	<i>Monolepis nuttalliana</i>	0-17	-
	green carpetweed	MOVE	<i>Mollugo verticillata</i>	0-17	-

combseed	PECTO	<i>Pectocarya</i>	0–17	–
manybristle chinchweed	PEPA2	<i>Pectis papposa</i>	0–17	–
curlytop gumweed	GRNUA	<i>Grindelia nuda</i> var. <i>aphanactis</i>	0–17	–
camphorweed	HESU3	<i>Heterotheca subaxillaris</i>	0–17	–
manystem woolly sunflower	ERMU6	<i>Eriophyllum multicaule</i>	0–17	–
sorrel buckwheat	ERPO4	<i>Eriogonum polycladon</i>	1–17	–
California poppy	ESCAM	<i>Eschscholzia californica</i> ssp. <i>mexicana</i>	0–17	–
New Mexico thistle	CINE	<i>Cirsium neomexicanum</i>	1–17	–
milkvetch	ASTRA	<i>Astragalus</i>	0–17	–
wheelscale saltbush	ATEL	<i>Atriplex elegans</i>	0–17	–
fringed redmaids	CACI2	<i>Calandrinia ciliata</i>	0–17	–
miner's lettuce	CLPEP	<i>Claytonia perfoliata</i> ssp. <i>perfoliata</i>	0–11	–
scrambled eggs	COAU2	<i>Corydalis aurea</i>	0–6	–
cryptantha	CRYPT	<i>Cryptantha</i>	0–6	–
American wild carrot	DAPU3	<i>Daucus pusillus</i>	0–6	–
fivewing spiderling	BOIN	<i>Boerhavia intermedia</i>	0–6	–
hoary bowlesia	BOIN3	<i>Bowlesia incana</i>	0–6	–
bristly fiddleneck	AMTE3	<i>Amsinckia tessellata</i>	0–6	–
aster	ASTER	<i>Aster</i>	0–6	–
spurge	EUPHO	<i>Euphorbia</i>	1–6	–
star gilia	GIST	<i>Gilia stellata</i>	0–6	–
pearly globe amaranth	GONI	<i>Gomphrena nitida</i>	1–6	–
Texas stork's bill	ERTE13	<i>Erodium texanum</i>	0–6	–
wedgeleaf draba	DRCU	<i>Draba cuneifolia</i>	0–6	–
crestrib morning-glory	IPCO2	<i>Ipomoea costellata</i>	0–6	–
flatcrown buckwheat	ERDE6	<i>Eriogonum deflexum</i>	0–6	–
phacelia	PHACE	<i>Phacelia</i>	0–6	–
phlox	PHLOX	<i>Phlox</i>	0–6	–
Arizona popcornflower	PLAR	<i>Plagiobothrys arizonicus</i>	0–6	–
Arizona lupine	LUAR4	<i>Lupinus arizonicus</i>	0–6	–
Coulter's lupine	LUSP2	<i>Lupinus sparsiflorus</i>	0–6	–
hollowleaf annual lupine	LUSU3	<i>Lupinus succulentus</i>	0–6	–
Thurber's morning-glory	IPTH	<i>Ipomoea thurberi</i>	0–6	–
plains flax	LIPU4	<i>Linum puberulum</i>	0–6	–
sawtooth sage	SASU7	<i>Salvia subincisa</i>	0–6	–
oneseed bur cucumber	SIAN	<i>Sicyos angulatus</i>	0–6	–
sleepy silene	SIAN2	<i>Silene antirrhina</i>	0–6	–
New Mexico copperleaf	ACNE	<i>Acalypha neomexicana</i>	0–6	–
desert unicorn-plant	PRAL4	<i>Proboscidea althaeifolia</i>	0–2	–
doubleclaw	PRPA2	<i>Proboscidea parviflora</i>	0–2	–
New Mexico plumeseed	RANE	<i>Rafinesquia neomexicana</i>	0–2	–

	golden crownbeard	VEEN	<i>Verbesina encelioides</i>	0–2	–
	warty caltrop	KAPA	<i>Kallstroemia parviflora</i>	0–2	–
	redstar	IPCO3	<i>Ipomoea coccinea</i>	0–2	–
	Arizona blanketflower	GAAR2	<i>Gaillardia arizonica</i>	0–2	–
	sacred thorn-apple	DAWR2	<i>Datura wrightii</i>	0–2	–
	sanddune wallflower	ERCA14	<i>Erysimum capitatum</i>	0–1	–
	Fendler's desertdandelion	MAFE	<i>Malacothrix fendleri</i>	0–1	–
Shrub/Vine					
8	dominant half shrubs			6–62	
	fairyduster	CAER	<i>Calliandra eriophylla</i>	6–39	–
	bastardsage	ERWR	<i>Eriogonum wrightii</i>	0–17	–
	littleleaf ratany	KRER	<i>Krameria erecta</i>	0–17	–
	trailing krameria	KRLA	<i>Krameria lanceolata</i>	0–6	–
	yerba de pasmo	BAPT	<i>Baccharis pteronioides</i>	0–6	–
9	succulent shrubs			2–39	
	cactus apple	OPEN3	<i>Opuntia engelmannii</i>	1–11	–
	purple pricklypear	OPMAM	<i>Opuntia macrocentra</i> var. <i>macrocentra</i>	0–11	–
	banana yucca	YUBA	<i>Yucca baccata</i>	0–11	–
	soaptree yucca	YUEL	<i>Yucca elata</i>	1–11	–
	Palmer's century plant	AGPA3	<i>Agave palmeri</i>	0–11	–
	Parry's agave	AGPA4	<i>Agave parryi</i>	0–11	–
	candy barrelcactus	FEWI	<i>Ferocactus wislizeni</i>	0–11	–
	staghorn cholla	CYVE3	<i>Cylindropuntia versicolor</i>	0–11	–
	Arizona pencil cholla	CYAR14	<i>Cylindropuntia arbuscula</i>	0–6	–
	jumping cholla	CYFU10	<i>Cylindropuntia fulgida</i>	0–6	–
	Christmas cactus	CYLE8	<i>Cylindropuntia leptocaulis</i>	0–6	–
	walkingstick cactus	CYSP8	<i>Cylindropuntia spinosior</i>	0–6	–
	tulip pricklypear	OPPH	<i>Opuntia phaeacantha</i>	0–6	–
	Santa Rita pricklypear	OPSA	<i>Opuntia santa-rita</i>	0–6	–
	sacahuista	NOMI	<i>Nolina microcarpa</i>	0–2	–
	beehive cactus	CORYP	<i>Coryphantha</i>	0–2	–
	hedgheg cactus	ECHIN3	<i>Echinocereus</i>	0–2	–
	rainbow cactus	ECPEP	<i>Echinocereus pectinatus</i> var. <i>pectinatus</i>	0–1	–
	spinystar	ESVI2	<i>Escobaria vivipara</i>	0–1	–
	little nipple cactus	MAHE2	<i>Mammillaria heyderi</i>	0–1	–
10	increaser half shrubs			2–28	
	broom snakeweed	GUSA2	<i>Gutierrezia sarothrae</i>	1–22	–
	burroweed	ISTE2	<i>Isocoma tenuisecta</i>	1–22	–
	turpentine bush	ERLA12	<i>Ericameria laricifolia</i>	0–11	–
	threadleaf snakeweed	GUMI	<i>Gutierrezia microcephala</i>	0–11	–
11	miscellaneous shrubs			0–28	
	catclaw acacia	ACGR	<i>Acacia greggii</i>	0–11	–

	pale desert-thorn	LYPA	<i>Lycium pallidum</i>	0–11	–
	catclaw mimosa	MIACB	<i>Mimosa aculeaticarpa var. biuncifera</i>	0–11	–
	velvetpod mimosa	MIDY	<i>Mimosa dysocarpa</i>	0–11	–
	longleaf jointfir	EPTR	<i>Ephedra trifurca</i>	0–6	–
	ocotillo	FOSP2	<i>Fouquieria splendens</i>	0–6	–
	littleleaf sumac	RHMI3	<i>Rhus microphylla</i>	0–6	–
	fourwing saltbush	ATCA2	<i>Atriplex canescens</i>	0–6	–
	yerba de pasmo	BAPT	<i>Baccharis pteronioides</i>	0–6	–
	spiny hackberry	CEEH	<i>Celtis ehrenbergiana</i>	0–6	–
	knifeleaf condalia	COSP3	<i>Condalia spathulata</i>	0–6	–
	whitethorn acacia	ACCO2	<i>Acacia constricta</i>	0–6	–
	Warnock's snakewood	COWA	<i>Condalia warnockii</i>	0–2	–
	ragwort	SENEC	<i>Senecio</i>	0–2	–
	desert zinnia	ZIAC	<i>Zinnia acerosa</i>	0–2	–
	whitestem paperflower	PSCO2	<i>Psilostrophe cooperi</i>	0–2	–
	winterfat	KRLA2	<i>Krascheninnikovia lanata</i>	0–1	–
	desert-thorn	LYCIU	<i>Lycium</i>	0–1	–
	American tarwort	FLCE	<i>Flourensia cernua</i>	0–1	–
	lotebush	ZIOB	<i>Ziziphus obtusifolia</i>	0–1	–
Tree					
12	trees			0–17	
	western honey mesquite	PRGLT	<i>Prosopis glandulosa var. torreyana</i>	0–11	–
	velvet mesquite	PRVE	<i>Prosopis velutina</i>	0–6	–
	oneseed juniper	JUMO	<i>Juniperus monosperma</i>	0–6	–

Animal community

The plant community on this site is suitable for grazing at any season by all classes of cattle. Clayey soils release moisture to plants slowly making for a long summer green season. Care must be taken to avoid overuse of palatable perennial grasses in attempts to utilize tobosa grass on the site. Areas of this site are often associated with large areas of Clayey Upland ecological site, dominated by tobosa grass. In these situations, livestock concentrate on areas of this site before using tobosa areas. Fencing and grazing systems are needed to adequately manage the plant community which consists of nearly equal amounts of palatable perennial grasses and the very unpalatable, tobosa grass. Dark colored soils with good organic matter and quantities of exchangeable bases produce good quality herbaceous forage. Protein will be deficient in the winter on this site.

Water developments are very important to wildlife species on this site. Being open grassland, this site is home to a variety of small herbivores, birds, and their associated predators. With the exception of antelope, larger wildlife species use this site mainly as a foraging area.

Hydrological functions

Heavy soil textures at the surface reduce the infiltration of high intensity, summer rainfall. The site is very sensitive to loss of perennial grass cover and runoff greatly increases under these circumstances. These soils can compact easily when moist and further reduce the effectiveness of warm season moisture in penetrating the soil.

Recreational uses

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

Wood products

Mesquite remains shrubby on this site due to clayey soil textures at the surface. Mesquite offers little more than fuel wood for campfires or branding fires and nothing big enough for posts or stays.

Inventory data references

Range 417s include 3 in excellent condition, 8 in good condition and 8 in fair condition.

Type locality

Location 1: Cochise County, AZ	
Township/Range/Section	T23S R27E S4
General legal description	Douglas International Airport
Location 2: Cochise County, AZ	
Township/Range/Section	T13S R22E S33
General legal description	Warbonnet Ranch

Contributors

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Unknown

Approval

Curtis Talbot, 4/12/2021

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)	Wilma Renken, Dave Womack, Dan Robinett, Emilio Carrillo
Contact for lead author	USDA-NRCS Tucson MLRA Soil Survey Office
Date	07/22/2013
Approved by	Curtis Talbot
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** None present on this site.

2. **Presence of water flow patterns:** Uncommon; probably cover no more than 2-5% of area; discontinuous, 2-20 feet in

length.

3. **Number and height of erosional pedestals or terracettes:** Accumulated pedestals are 1 inch tall and are common on perennial grass plants. The presence of terracettes depends on slope; terracettes are very uncommon on low slopes (1-2%) and become common, with heights between 1-2 inches, as slopes increase (3-6%).

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Estimated from 200 points at 55%. This site is characterized by perennial grass patches alternating with bare areas 10-20 feet in diameter.

5. **Number of gullies and erosion associated with gullies:** None present on this site.

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

7. **Amount of litter movement (describe size and distance expected to travel):** All litter size classes staying in place.

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** No slake test done; expect values of 1-2 in bare ground areas and 4-6 in canopy areas.

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Thin (1/8 inch) rain drop compacted laminar layer, weak granular; Color is 10YR5/4 Dry, 10YR3/4 Moist; A horizon to 2 inches.

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Cover estimated from 200 points was: Canopy 9%, Basal 9%, Litter 8%, and Gravel 18%; 85% of canopy cover is perennial grasses and 13% is subshrubs and 2% shrubs & succulents. Cover is relatively well dispersed throughout site, with bare patches 10-20 feet wide dispersed throughout site. Bare areas tend to shed water into the grassy areas.

11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):** None present on this site. Penetrometer tests with weight dropped 5 times at a distance from top of weight to top of impact ring = 2.24 feet were: average = 2.91 inches, s.d = 0.40 inches. Subsurface argillic horizon may be mistaken for compaction.

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 grass >>

Sub-dominant: subshrubs > annual forbs > shrubs > perennial

forbs > succulents

Other:

Additional:

13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** 20% basal mortality (prior years mortality not well evidenced).
-

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/acre unfavorable precipitation, 1,000 lbs/acre normal precipitation, 1,500 lbs/acre favorable precipitation.
-

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:** Snakeweed, burroweed
-

17. **Perennial plant reproductive capability:** Not affected even following several years of prolonged drought period for region.
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