USDA Natural Resources Conservation Service

Ecological site R041XC306AZ
Shallow Hills 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.

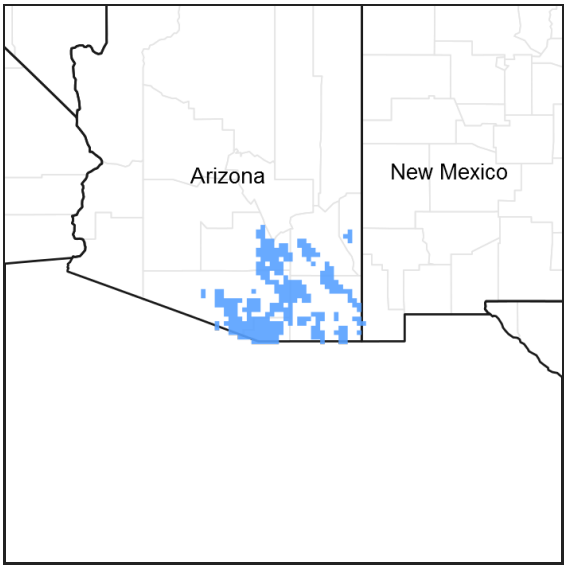

Figure 1. Mapped extent

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

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.

Associated sites

R041XC307AZ	**Limestone Hills 12-16" p.z.**
R041XC322AZ	**Shallow Upland 12-16" p.z.**
R041XC323AZ	**Volcanic Hills 12-16" p.z. Loamy**

Similar sites

R041XB205AZ	**Shallow Hills 8-12" p.z.**
R041XA102AZ	**Shallow Hills 16-20" p.z.**
R040XA105AZ	**Shallow Hills 10"-13" p.z.**

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *eriogonum wrightii* (2) *calliandra eriophylla*
Herbaceous	(1) *bouteloua curtipendula* (2) *artemisia ludoviciana*

Physiographic features

This site is in the middle elevations of the Southeastern Arizona Basin and Range province. It occurs on hill-slopes and ridge-tops. Slope aspect is site differentiating at elevations near land resource area boundaries.

Table 2. Representative physiographic features

Landforms	(1) Hill (2) Ridge (3) Mountain slope
Flooding frequency	None
Ponding frequency	None
Elevation	1,067–1,676 m
Slope	15–70%
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

Influencing water features

There are no water features associated with this site.

Soil features

These are shallow soils formed on acid igneous rocks (granite and rhyolite) and related metamorphic rocks like gneiss, schist and quartzite. They are non-calcareous, sandy loam to loamy textured with well developed covers of gravels and cobbles. They are dark colored in the surface. Numerous areas of rock outcrop occur intermingled with soil areas. Plant-soil moisture relationships are fair.

Soils mapped on this site include: SSA-661 Eastern Pinal & Southern Gila counties MU's 19 Lampshire, 87 Romero & Oracle, 89 Schiefflin, 90 Schrap; SSA-663 Gila-Duncan area MU's 32 Chiricahua variant & 33 Lampshire; SSA-664 San Simon area MU 4 Atascosa & Chiricahua; SSA-666 Cochise county Northwest part MU's 69 Romero & Nodman, 71 Romero & 74 Schrap; SSA-667 Santa Cruz area MU's CoE Chiricahua CbSL, CrD & LdF Lampshire, LcF Chiricahua & Lampshire, McF Chiricahua; SSA-669 Pima county Eastern part MU's 12 Cellar & Lampshire, 39 Lampshire & Pantak, 40 Lampshire & Romero, 52 Romero, 69 Lampshire & Romero, 70 Oracle & Romero, 74 Schrap; SSA-671 Cochise county Douglas-Tombstone part MU 19 Brunkcow, Chiricahua & Lampshire; SSA-703 Tohono O'odham Nation MU's 10 Cellar & Lampshire, 11 Chiricahua & Lampshire, 52 Lampshire & Romero, 53 Romero.

Table 4. Representative soil features

Parent material	(1) Slope alluvium–granite (2) Residuum–diorite
Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Moderately rapid to moderate
Soil depth	25–51 cm
Surface fragment cover <=3"	25–50%
Surface fragment cover >3"	0–10%
Available water capacity (0-101.6cm)	1.52–6.1 cm
Calcium carbonate equivalent (0-101.6cm)	0–5%
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)	6.1–7.9
Subsurface fragment volume <=3" (Depth not specified)	15–65%
Subsurface fragment volume >3" (Depth not specified)	0–10%

Ecological dynamics

The plant communities found on an ecological site are naturally variable. Composition and production will vary with yearly conditions, location, aspect, and the natural variability of the soils. The Historical Climax Plant Community represents the natural potential plant communities found on relict or relatively undisturbed sites. Other plant communities described here represent plant communities that are known to occur when teh site is disturbed by

factors such as fire, grazing, or drought.

Production data provided in this site description is standardized to air dry weight at the end of the summer growing season. The plant communities described in this site description are based on near normal rainfall years.

NRCS uses a Similarity Index to compare existing plant communities to the plant communities described here. Similarity index is determined by comparing the production and composition of a plant community to the production and composition of a plant community described in this site description. To determine Similarity index, compare the production (air dry weight) of each species to that shown in the plant community description. For each species, count no more than the maximum amount shown for the species, and for each group, count no more than the maximum amount shown for that group. Divide the resulting total by the total normal year production shown in the plant community description. If the rainfall has been significantly above or below normal, use the total production shown for above or below normal years. If field data is not collected at the end of the summer growing season, then the field data must be corrected to the end of the year production before comparing it to the site description. The growth curve can be used as a guide for estimating production at the end of the summer growing season.

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 re-occupies the site with proper management.

State and transition model

Figure 4. State and Transition, Granitic Hills 12-16 " pz.

State 1
Historic Climax Plant Community

Community 1.1
Historic Climax Plant Community

Figure 5. Granitic hills 12-16" pz. HCPC

The potential plant community on this site is dominated by warm season perennial grasses. Several species of low shrubs are well represented on the site, but the aspect is grassland dotted with shrubs and cacti. Larger species of shrubs are concentrated at the edges of rock outcrop areas and in canyon bottoms. Most of the grass and low shrub species are well dispersed throughout the plant community. In the absence of wildfire and/or with overgrazing, shrubs increase to dominate the plant community. Well developed gravel and cobble covers protect the soil from erosion and protect forage species from heavy use. Natural fire was an important factor in development of the potential plant community. Natural fire frequencies were about once every ten years. Fires helped maintain a balance between grasses, forbs and shrubs. With continuous heavy grazing palatable forage species diminish in the plant community and can be replaced by shrubs and succulents. Areas of rock outcrop are little grazed and hold remnant perennial forage species to help reseed the slopes below once grazing is managed. The plant community described for the HCPC is at a midpoint in its fire free interval (5 to 7 years after fire).

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	404	785	1104
Shrub/Vine	146	168	336
Forb	28	56	247
Tree	11	17	45
Total	**589**	**1026**	**1732**

Table 6. Soil surface cover

Tree basal cover	0%
Shrub/vine/liana basal cover	2-4%
Grass/grasslike basal cover	3-7%

Forb basal cover	0-1%
Non-vascular plants	0-1%
Biological crusts	0-1%
Litter	25-45%
Surface fragments >0.25" and <=3"	25-50%
Surface fragments >3"	0-10%
Bedrock	0-10%
Water	0%
Bare ground	5-40%

Table 7. Canopy structure (% cover)

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

Figure 7. Plant community growth curve (percent production by month). AZ4131, 41.3 12-16" p.z. hill sites. Growth begins in the spring, semi-dormancy occurs during the June drought, most growth occurs during the summer rainy season..

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

State 2
Lehmann invaded state

Community 2.1
Lehmann invaded state

Figure 8. Granitic Hills 12-16" pz. Lehmann lovegrass invasi

This state occurs where Lehmann lovegrass has invaded, usually from a seed source associated with roads and jeep trails running though the site. The invasion is slow until the area burns; then Lehmann lovegrass can rapidly assume dominance of the plant community. There will always be some diversity of native species left on the site due to diverse habitats in areas of rock outcrop and canyon bottoms.

State 3
Shrub and mimosa increase state

Community 3.1
Shrub and mimosa increase state

This state occurs where wait-a-bit mimosa, velvet pod mimosa and other shrubs like mesquite, ocotillo and succulents like prickly pear have increased to dominate the site. All three species are vigorous sprouters after fire and quickly re-assume dominance after burning. Climatic warming seems to be driving the increases of the mimosa species. Periodic fire will not return this state to a grassy condition once shrubs are well established.

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	**Dominant Perennial Mid Grasses**			280–392	
	sideoats grama	BOCU	*Bouteloua curtipendula*	168–224	–
	plains lovegrass	ERIN	*Eragrostis intermedia*	11–168	–
	cane bluestem	BOBA3	*Bothriochloa barbinodis*	22–168	–
	tanglehead	HECO10	*Heteropogon contortus*	11–112	–
	Arizona cottontop	DICA8	*Digitaria californica*	22–112	–
2	**Suffrutescent Grasses**			34–280	
	black grama	BOER4	*Bouteloua eriopoda*	28–224	–
	bush muhly	MUPO2	*Muhlenbergia porteri*	6–56	–
3	**Dominant Perennial Short Grasses**			62–168	
	hairy grama	BOHI2	*Bouteloua hirsuta*	28–90	–
	slender grama	BORE2	*Bouteloua repens*	17–90	–
	Santa Rita Mountain grama	BOEL	*Bouteloua eludens*	0–39	–
	curly-mesquite	HIBE	*Hilaria belangeri*	6–39	–
	common wolfstail	LYPH	*Lycurus phleoides*	6–34	–
	blue grama	BOGR2	*Bouteloua gracilis*	0–22	–
	sprucetop grama	BOCH	*Bouteloua chondrosioides*	0–22	–
	fall witchgrass	DICO6	*Digitaria cognata*	1–22	–
	Arizona muhly	MUAR3	*Muhlenbergia arizonica*	0–11	–
4	**Annual Grasses**			11–112	
	Mexican sprangletop	LEFUU	*Leptochloa fusca ssp. uninervia*	1–34	–
	mucronate sprangeltop	LEPAB	*Leptochloa panicea ssp. brachiata*	1–34	–
	prairie threeawn	AROL	*Aristida oligantha*	1–34	–
	Mexican panicgrass	PAHI5	*Panicum hirticaule*	1–34	–
	sixweeks threeawn	ARAD	*Aristida adscensionis*	1–22	–
	Eastwood fescue	VUMIC	*Vulpia microstachys var. ciliata*	1–22	–

	Eastwood fescue	VUMIC	*Vulpia microstachys var. ciliata*	1–22	
	desert fescue	VUMIM	*Vulpia microstachys var. microstachys*	1–22	–
	sixweeks fescue	VUOC	*Vulpia octoflora*	1–22	–
	sweet tanglehead	HEME	*Heteropogon melanocarpus*	0–22	–
	delicate muhly	MUFR	*Muhlenbergia fragilis*	1–17	–
	littleseed muhly	MUMI	*Muhlenbergia microsperma*	0–6	–
	witchgrass	PACA6	*Panicum capillare*	0–6	–
	Bigelow's bluegrass	POBI	*Poa bigelovii*	0–6	–
	Arizona signalgrass	URAR	*Urochloa arizonica*	0–6	–
	needle grama	BOAR	*Bouteloua aristidoides*	0–6	–
	Arizona brome	BRAR4	*Bromus arizonicus*	0–2	–
	feather fingergrass	CHVI4	*Chloris virgata*	0–2	–
	tapertip cupgrass	ERACA	*Eriochloa acuminata var. acuminata*	0–2	–
	Mexican lovegrass	ERME	*Eragrostis mexicana*	0–2	–
	desert lovegrass	ERPEM	*Eragrostis pectinacea var. miserrima*	0–2	–
	tufted lovegrass	ERPEP2	*Eragrostis pectinacea var. pectinacea*	0–2	–
	fragilegrass	AETE	*Aegopogon tenellus*	0–2	–
	sixweeks grama	BOBA2	*Bouteloua barbata*	0–1	–
5	**Perennial threeawns**			11–50	
	spidergrass	ARTE3	*Aristida ternipes*	6–34	–
	spidergrass	ARTEG	*Aristida ternipes var. gentilis*	0–17	–
	Orcutt's threeawn	ARSCO	*Aristida schiedeana var. orcuttiana*	0–17	–
	purple threeawn	ARPU9	*Aristida purpurea*	0–11	–
	Fendler threeawn	ARPUL	*Aristida purpurea var. longiseta*	0–11	–
	Parish's threeawn	ARPUP5	*Aristida purpurea var. parishii*	0–11	–
	Wright's threeawn	ARPUW	*Aristida purpurea var. wrightii*	0–11	–
	blue threeawn	ARPUN	*Aristida purpurea var. nealleyi*	0–6	–
	poverty threeawn	ARDI5	*Aristida divaricata*	0–2	–
	Havard's threeawn	ARHA3	*Aristida havardii*	0–2	–
	Wooton's threeawn	ARPA9	*Aristida pansa*	0–2	–
6	**Miscellaneous Perennial grasses**			11–67	
	cliff muhly	MUPO	*Muhlenbergia polycaulis*	0–30	–
	green sprangletop	LEDU	*Leptochloa dubia*	1–22	–
	bullgrass	MUEM	*Muhlenbergia emersleyi*	1–17	–
	Hall's panicgrass	PAHA	*Panicum hallii*	0–11	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	0–11	–
	slim tridens	TRMU	*Tridens muticus*	0–11	–
	spiked crinkleawn	TRSP12	*Trachypogon spicatus*	0–11	–
	squirreltail	ELEL5	*Elymus elymoides*	1–11	–
	Rothrock's grama	BORO2	*Bouteloua rothrockii*	0–6	–
	silver bluestem	BOSA	*Bothriochloa saccharoides*	0–6	–
	Mexican gamagrass	TRLA11	*Tripsacum lanceolatum*	0–6	–
	Texas bluestem	SCCI2	*Schizachyrium cirratum*	0–6	–
	southwestern bristlegrass	SESC2	*Setaria scheelei*	1–6	–

	plains bristlegrass	SEVU2	*Setaria vulpiseta*	0–6	–
	vine mesquite	PAOB	*Panicum obtusum*	0–6	–
	Kunth's smallgrass	MIKU	*Microchloa kunthii*	0–6	–
	bamboo muhly	MUDU3	*Muhlenbergia dumosa*	0–6	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	0–6	–
	nineawn pappusgrass	ENDE	*Enneapogon desvauxii*	0–2	–
	tobosagrass	PLMU3	*Pleuraphis mutica*	0–2	–
	deergrass	MURI2	*Muhlenbergia rigens*	0–2	–
	slender muhly	MUTE4	*Muhlenbergia tenuifolia*	0–2	–
	bulb panicgrass	PABU	*Panicum bulbosum*	0–2	–
	sedge	CAREX	*Carex*	0–2	–
	low woollygrass	DAPU7	*Dasyochloa pulchella*	0–2	–
	sourgrass	DIIN2	*Digitaria insularis*	0–2	–
	woolyspike balsamscale	ELBA	*Elionurus barbiculmis*	0–2	–
	purple grama	BORA	*Bouteloua radicosa*	0–2	–
Forb					
7	**Perennial Forbs**			11–112	
	white sagebrush	ARLU	*Artemisia ludoviciana*	1–17	–
	slender janusia	JAGR	*Janusia gracilis*	1–17	–
	shrubby deervetch	LORI3	*Lotus rigidus*	0–17	–
	desert globemallow	SPAM2	*Sphaeralcea ambigua*	0–17	–
	brownplume wirelettuce	STPA4	*Stephanomeria pauciflora*	0–17	–
	Trans-Pecos thimblehead	HYWI	*Hymenothrix wislizeni*	0–11	–
	Schott's yellowhood	NISC	*Nissolia schottii*	0–11	–
	weakleaf bur ragweed	AMCO3	*Ambrosia confertiflora*	1–11	–
	climbing wartclub	BOSC	*Boerhavia scandens*	1–11	–
	spreading fleabane	ERDI4	*Erigeron divergens*	0–11	–
	trailing fleabane	ERFL	*Erigeron flagellaris*	0–11	–
	Thurber's cotton	GOTH	*Gossypium thurberi*	1–11	–
	hairy false goldenaster	HEVIM3	*Heterotheca villosa var. minor*	0–6	–
	desert rosemallow	HICO	*Hibiscus coulteri*	0–6	–
	fineleaf hymenopappus	HYFIL	*Hymenopappus filifolius var. lugens*	0–6	–
	bluedicks	DICA14	*Dichelostemma capitatum*	1–6	–
	scarlet spiderling	BOCO	*Boerhavia coccinea*	0–6	–
	whitemouth dayflower	COER	*Commelina erecta*	0–6	–
	Arizona wrightwort	CAAR7	*Carlowrightia arizonica*	0–6	–
	perennial rockcress	ARPE2	*Arabis perennans*	1–6	–
	dense ayenia	AYMI	*Ayenia microphylla*	1–6	–
	tuber anemone	ANTU	*Anemone tuberosa*	1–6	–
	tarragon	ARDR4	*Artemisia dracunculus*	0–6	–
	Palmer's Indian mallow	ABPA	*Abutilon palmeri*	0–6	–
	brownfoot	ACWR5	*Acourtia wrightii*	0–6	–
	trailing windmills	ALIN	*Allionia incarnata*	1–6	–
	wishbone-bush	MILAV	*Mirabilis laevis var. villosa*	0–6	–

	desert tobacco	NIOB	*Nicotiana obtusifolia*	0–6	–
	Parry's beardtongue	PEPA24	*Penstemon parryi*	1–6	–
	desert penstemon	PEPS	*Penstemon pseudospectabilis*	0–6	–
	slender poreleaf	POGR5	*Porophyllum gracile*	0–6	–
	Wright's cudweed	PSCAC2	*Pseudognaphalium canescens ssp. canescens*	0–6	–
	Lemmon's ragwort	SELE8	*Senecio lemmonii*	0–6	–
	beeblossom	GAURA	*Gaura*	0–6	–
	southwestern mock vervain	GLGO	*Glandularia gooddingii*	0–6	–
	Wright's deervetch	LOWR	*Lotus wrightii*	0–6	–
	Lewis flax	LILE3	*Linum lewisii*	0–6	–
	Parry's false prairie-clover	MAPA7	*Marina parryi*	0–6	–
	lacy tansyaster	MAPI	*Machaeranthera pinnatifida*	1–6	–
	hairy fournwort	TENE	*Tetramerium nervosum*	0–6	–
	branched noseburn	TRRA5	*Tragia ramosa*	1–6	–
	American vetch	VIAM	*Vicia americana*	0–6	–
	Louisiana vetch	VILU	*Vicia ludoviciana*	0–6	–
	gooseberryleaf globemallow	SPGR2	*Sphaeralcea grossulariifolia*	0–2	–
	New Mexico fanpetals	SINE	*Sida neomexicana*	0–2	–
	plains blackfoot	MELE2	*Melampodium leucanthum*	0–2	–
	variableleaf bushbean	MAGI2	*Macroptilium gibbosifolium*	0–2	–
	roving sailor	MAAN9	*Maurandella antirrhiniflora*	0–2	–
	Arizona snakecotton	FRAR2	*Froelichia arizonica*	0–2	–
	longflower tube tongue	JULO3	*Justicia longii*	0–2	–
	Greene's bird's-foot trefoil	LOGR4	*Lotus greenei*	0–2	–
	Coues' cassia	SECO10	*Senna covesii*	0–2	–
	velvetseed milkwort	POOB	*Polygala obscura*	0–2	–
	shrubby purslane	POSU3	*Portulaca suffrutescens*	0–2	–
	largeflower onion	ALMA4	*Allium macropetalum*	0–2	–
	San Felipe dogweed	ADPO	*Adenophyllum porophylloides*	0–2	–
	Cooley's bundleflower	DECO2	*Desmanthus cooleyi*	0–2	–
	desert marigold	BAMU	*Baileya multiradiata*	0–2	–
	Indian paintbrush	CASTI2	*Castilleja*	0–2	–
	rose heath	CHER2	*Chaetopappa ericoides*	0–1	–
	desert larkspur	DEPA	*Delphinium parishii*	0–1	–
	leatherweed	CRPO5	*Croton pottsii*	0–1	–
	spreading snakeherb	DYSCD	*Dyschoriste schiedeana var. decumbens*	0–1	–
	wild dwarf morning-glory	EVAR	*Evolvulus arizonicus*	0–1	–
	New Mexico silverbush	ARNE2	*Argythamnia neomexicana*	0–1	–
	hairyseed bahia	BAAB	*Bahia absinthifolia*	0–1	–
	Watson's dutchman's pipe	ARWA	*Aristolochia watsonii*	0–1	–

	desert mariposa lily	CAKE	*Calochortus kennedyi*	0–1	–
	sego lily	CANU3	*Calochortus nuttallii*	0–1	–
	twinleaf senna	SEBA3	*Senna bauhinioides*	0–1	–
	velvet leaf senna	SELI4	*Senna lindheimeriana*	0–1	–
	slimleaf bean	PHAN3	*Phaseolus angustissimus*	0–1	–
	orange fameflower	PHAU13	*Phemeranthus aurantiacus*	0–1	–
	ivyleaf groundcherry	PHHE4	*Physalis hederifolia*	0–1	–
	tufted evening primrose	OECA10	*Oenothera caespitosa*	0–1	–
	fetid passionflower	PAFO2	*Passiflora foetida*	0–1	–
	San Pedro daisy	LAPO4	*Lasianthaea podocephala*	0–1	–
	narrowleaf stoneseed	LIIN2	*Lithospermum incisum*	0–1	–
	ragged nettlespurge	JAMA	*Jatropha macrorhiza*	0–1	–
	fernleaf biscuitroot	LODI	*Lomatium dissectum*	0–1	–
	Thurber's checkerbloom	SINET	*Sidalcea neomexicana ssp. thurberi*	0–1	–
	silverleaf nightshade	SOEL	*Solanum elaeagnifolium*	0–1	–
	jewels of Opar	TAPA2	*Talinum paniculatum*	0–1	–
	Coulter's wrinklefruit	TECO	*Tetraclea coulteri*	0–1	–
8	**Annual Forbs**			11–112	
	longleaf false goldeneye	HELOA2	*Heliomeris longifolia var. annua*	1–56	–
	California poppy	ESCAM	*Eschscholzia californica ssp. mexicana*	0–50	–
	goosefoot	CHENO	*Chenopodium*	0–22	–
	milkvetch	ASTRA	*Astragalus*	0–22	–
	sensitive partridge pea	CHNI2	*Chamaecrista nictitans*	1–17	–
	western tansymustard	DEPI	*Descurainia pinnata*	1–11	–
	fewflower beggarticks	BILE	*Bidens leptocephala*	0–11	–
	carelessweed	AMPA	*Amaranthus palmeri*	0–11	–
	foothill deervetch	LOHU2	*Lotus humistratus*	0–11	–
	coastal bird's-foot trefoil	LOSAB	*Lotus salsuginosus var. brevivexillus*	0–11	–
	slender goldenweed	MAGR10	*Machaeranthera gracilis*	1–11	–
	tanseyleaf tansyaster	MATA2	*Machaeranthera tanacetifolia*	1–11	–
	phacelia	PHACE	*Phacelia*	0–11	–
	intermediate pepperweed	LEVIM	*Lepidium virginicum var. medium*	0–6	–
	sawtooth sage	SASU7	*Salvia subincisa*	0–6	–
	spreading fanpetals	SIAB	*Sida abutifolia*	1–6	–
	streamside bur cucumber	SIAM	*Sicyos ampelophyllus*	0–6	–
	sleepy silene	SIAN2	*Silene antirrhina*	0–6	–
	cutleaf bur cucumber	SILA	*Sicyos laciniatus*	0–6	–
	minerslettuce	MONTI	*Montia*	0–6	–
	desert Indianwheat	PLOV	*Plantago ovata*	0–6	–
	woolly plantain	PLPA2	*Plantago patagonica*	0–6	–
	whitestem blazingstar	MEAL6	*Mentzelia albicaulis*	0–6	–
	sweet four o'clock	MILO2	*Mirabilis longiflora*	0–6	–
	Arizona lupine	LUAR4	*Lupinus arizonicus*	0–6	–

	Coulter's lupine	LUSP2	*Lupinus sparsiflorus*	0–6	–
	longleaf false goldeneye	HELOL	*Heliomeris longifolia var. longifolia*	0–6	–
	camphorweed	HESU3	*Heterotheca subaxillaris*	0–6	–
	crestrib morning-glory	IPCO2	*Ipomoea costellata*	0–6	–
	Thurber's morning-glory	IPTH	*Ipomoea thurberi*	0–6	–
	Arizona poppy	KAGR	*Kallstroemia grandiflora*	0–6	–
	bristly fiddleneck	AMTE3	*Amsinckia tessellata*	0–6	–
	Coulter's spiderling	BOCO2	*Boerhavia coulteri*	0–6	–
	New Mexico copperleaf	ACNE	*Acalypha neomexicana*	0–6	–
	New Mexico thistle	CINE	*Cirsium neomexicanum*	0–6	–
	sorrel buckwheat	ERPO4	*Eriogonum polycladon*	0–6	–
	woolly tidestromia	TILA2	*Tidestromia lanuginosa*	0–6	–
	fringed redmaids	CACI2	*Calandrinia ciliata*	0–2	–
	American wild carrot	DAPU3	*Daucus pusillus*	0–2	–
	star gilia	GIST	*Gilia stellata*	0–2	–
	pearly globe amaranth	GONI	*Gomphrena nitida*	0–2	–
	wedgeleaf draba	DRCU	*Draba cuneifolia*	0–2	–
	warty caltrop	KAPA	*Kallstroemia parviflora*	0–2	–
	shaggyfruit pepperweed	LELA	*Lepidium lasiocarpum*	0–2	–
	redstar	IPCO3	*Ipomoea coccinea*	0–2	–
	Fendler's desertdandelion	MAFE	*Malacothrix fendleri*	0–2	–
	Florida pellitory	PAFL3	*Parietaria floridana*	0–2	–
	combseed	PECTO	*Pectocarya*	0–2	–
	sand fringepod	THCU	*Thysanocarpus curvipes*	0–2	–
	chia	SACO6	*Salvia columbariae*	0–2	–
	Arizona popcornflower	PLAR	*Plagiobothrys arizonicus*	0–2	–
	green carpetweed	MOVE	*Mollugo verticillata*	0–1	–
	desert evening primrose	OEPR	*Oenothera primiveris*	0–1	–
	desert unicorn-plant	PRAL4	*Proboscidea althaeifolia*	0–1	–
	doubleclaw	PRPA2	*Proboscidea parviflora*	0–1	–
	New Mexico plumeseed	RANE	*Rafinesquia neomexicana*	0–1	–
	Arizona monardella	MOAR	*Monardella arizonica*	0–1	–
	sanddune wallflower	ERCA14	*Erysimum capitatum*	0–1	–
	miniature woollystar	ERDI2	*Eriastrum diffusum*	0–1	–
	scrambled eggs	COAU2	*Corydalis aurea*	0–1	–
	spurge	EUPHO	*Euphorbia*	0–1	–
	Texas stork's bill	ERTE13	*Erodium texanum*	0–1	–
	hoary bowlesia	BOIN3	*Bowlesia incana*	0–1	–
	wheelscale saltbush	ATEL	*Atriplex elegans*	0–1	–
9	**Perennial ferns**			6–22	
	spikemoss	SELAG	*Selaginella*	1–22	–
	cliffbrake	PELLA	*Pellaea*	1–11	–
	lipfern	CHEIL	*Cheilanthes*	1–6	–

	cloak fern	NOTHO	*Notholaena*	0–6	–
Shrub/Vine					
10	**Dominant Half Shrubs**			112–168	
	fairyduster	CAER	*Calliandra eriophylla*	11–90	–
	bastardsage	ERWR	*Eriogonum wrightii*	22–78	–
	Gregg's prairie clover	DAGR2	*Dalea greggii*	11–45	–
	pelotazo	ABIN	*Abutilon incanum*	0–34	–
	rough menodora	MESC	*Menodora scabra*	0–28	–
	prairie acacia	ACAN	*Acacia angustissima*	0–17	–
	yerba de pasmo	BAPT	*Baccharis pteronioides*	0–11	–
	Coulter's brickellbush	BRCO	*Brickellia coulteri*	0–11	–
	American threefold	TRCA8	*Trixis californica*	1–11	–
	littleleaf ratany	KRER	*Krameria erecta*	1–11	–
	trailing krameria	KRLA	*Krameria lanceolata*	0–11	–
11	**Miscellaneous Shrubs**			11–56	
	Tahitian kidneywood	EYOR	*Eysenhardtia orthocarpa*	1–28	–
	ocotillo	FOSP2	*Fouquieria splendens*	1–28	–
	desert lavender	HYEM	*Hyptis emoryi*	1–17	–
	sacahuista	NOMI	*Nolina microcarpa*	0–17	–
	jojoba	SICH	*Simmondsia chinensis*	0–17	–
	common sotol	DAWH2	*Dasylirion wheeleri*	1–17	–
	rosary babybonnets	COGL8	*Coursetia glandulosa*	0–17	–
	Florida hopbush	DOVI	*Dodonaea viscosa*	0–11	–
	coralbean	ERFL7	*Erythrina flabelliformis*	1–11	–
	catclaw acacia	ACGRG3	*Acacia greggii var. greggii*	1–11	–
	blue paloverde	PAFL6	*Parkinsonia florida*	0–11	–
	Sonoran scrub oak	QUTU2	*Quercus turbinella*	0–11	–
	catclaw mimosa	MIACB	*Mimosa aculeaticarpa var. biuncifera*	1–11	–
	velvetpod mimosa	MIDY	*Mimosa dysocarpa*	1–11	–
	physicnut	JACU	*Jatropha cuneata*	0–6	–
	beloperone	JUCA8	*Justicia californica*	0–6	–
	Arizona water-willow	JUCA9	*Justicia candicans*	0–6	–
	winterfat	KRLA2	*Krascheninnikovia lanata*	0–6	–
	desert-thorn	LYCIU	*Lycium*	0–6	–
	skunkbush sumac	RHTR	*Rhus trilobata*	0–6	–
	heartleaf goldeneye	VICO	*Viguiera cordifolia*	0–6	–
	Parish's goldeneye	VIPA14	*Viguiera parishii*	0–6	–
	Schott's stickpea	ZAFOS	*Zapoteca formosa var. schottii*	0–6	–
	algerita	MATR3	*Mahonia trifoliolata*	0–6	–
	Wright's beebrush	ALWR	*Aloysia wrightii*	0–6	–
	Thurber's desert honeysuckle	ANTH2	*Anisacanthus thurberi*	0–6	–
	fourwing saltbush	ATCA2	*Atriplex canescens*	0–6	–
	whitethorn acacia	ACCOC	*Acacia constricta var. constricta*	0–6	–

	desert olive	FOSH	*Forestiera shrevei*	0–6	–
	Apache plume	FAPA	*Fallugia paradoxa*	0–6	–
	button brittlebush	ENFR	*Encelia frutescens*	0–6	–
	knifeleaf condalia	COSP3	*Condalia spathulata*	0–6	–
	Warnock's snakewood	COWA	*Condalia warnockii*	0–6	–
	California brickellbush	BRCA3	*Brickellia californica*	0–6	–
	spiny hackberry	CEEH	*Celtis ehrenbergiana*	0–6	–
	javelina bush	COER5	*Condalia ericoides*	0–2	–
	sweetbush	BEJUA	*Bebbia juncea var. aspera*	0–2	–
	Kearney's snakewood	COWAK	*Condalia warnockii var. kearneyana*	0–2	–
	ragged rockflower	CRBI2	*Crossosoma bigelovii*	0–2	–
	cliff fendlerbush	FERU	*Fendlera rupicola*	0–2	–
	whitethorn acacia	ACCOP9	*Acacia constricta var. paucispina*	0–2	–
	pointleaf manzanita	ARPU5	*Arctostaphylos pungens*	0–2	–
	milfoil wattle	ACMI	*Acacia millefolia*	0–2	–
	evergreen sumac	RHVIC	*Rhus virens var. choriophylla*	0–2	–
	western soapberry	SASAD	*Sapindus saponaria var. drummondii*	0–2	–
	yellow trumpetbush	TEST	*Tecoma stans*	0–2	–
	littleleaf false tamarind	LYWA	*Lysiloma watsonii*	0–2	–
	Graham's mimosa	MIGR2	*Mimosa grahamii*	0–2	–
	starry bedstraw	GAST	*Galium stellatum*	0–1	–
	whitestem paperflower	PSCO2	*Psilostrophe cooperi*	0–1	–
	lotebush	ZIOB	*Ziziphus obtusifolia*	0–1	–
	ambrosia leaf bur ragweed	AMAM2	*Ambrosia ambrosioides*	0–1	–
	shortleaf baccharis	BABR	*Baccharis brachyphylla*	0–1	–
12	**Increaser Shrubs**			11–50	
	turpentine bush	ERLA12	*Ericameria laricifolia*	0–22	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	1–22	–
	gumhead	GYGL	*Gymnosperma glutinosum*	0–6	–
	burroweed	ISTE2	*Isocoma tenuisecta*	0–2	–
	desertbroom	BASA2	*Baccharis sarothroides*	0–2	–
13	**Succulents**			17–62	
	cactus apple	OPEN3	*Opuntia engelmannii*	1–22	–
	Palmer's century plant	AGPA3	*Agave palmeri*	1–11	–
	Schott's century plant	AGSC3	*Agave schottii*	0–11	–
	saguaro	CAGI10	*Carnegiea gigantea*	0–6	–
	smallflower century plant	AGPA5	*Agave parviflora*	0–6	–
	walkingstick cactus	CYSP8	*Cylindropuntia spinosior*	0–6	–
	tulip pricklypear	OPPH	*Opuntia phaeacantha*	0–6	–
	Santa Rita pricklypear	OPSA	*Opuntia santa-rita*	0–2	–
	banana yucca	YUBA	*Yucca baccata*	0–2	–
	soaptree yucca	YUEL	*Yucca elata*	0–2	–
	purple pricklypear	OPMAM	*Opuntia macrocentra var. macrocentra*	0–2	–

	candy barrelcactus	FEWI	*Ferocactus wislizeni*	0–2	–
	dollarjoint pricklypear	OPCH	*Opuntia chlorotica*	0–2	–
	staghorn cholla	CYVE3	*Cylindropuntia versicolor*	0–2	–
	jumping cholla	CYFU10	*Cylindropuntia fulgida*	0–2	–
	rainbow cactus	ECPE	*Echinocereus pectinatus*	1–2	–
	desert agave	AGDE	*Agave deserti*	0–2	–
	buck-horn cholla	CYAC8	*Cylindropuntia acanthocarpa*	0–1	–
	spinystar	ESVI2	*Escobaria vivipara*	0–1	–
	Christmas cactus	CYLE8	*Cylindropuntia leptocaulis*	0–1	–
	pinkflower hedgehog cactus	ECBO2	*Echinocereus bonkerae*	0–1	–
	scarlet hedgehog cactus	ECCO5	*Echinocereus coccineus*	0–1	–
	Engelmann's hedgehog cactus	ECEN	*Echinocereus engelmannii*	0–1	–
	pinkflower hedgehog cactus	ECFEF3	*Echinocereus fendleri ssp. fendleri*	0–1	–
	Graham's nipple cactus	MAGR9	*Mammillaria grahamii*	0–1	–
	little nipple cactus	MAHE2	*Mammillaria heyderi*	0–1	–
Tree					
14	**Trees**			11–45	
	oneseed juniper	JUMO	*Juniperus monosperma*	0–11	–
	Arizona rosewood	VACA5	*Vauquelinia californica*	0–11	–
	velvet mesquite	PRVE	*Prosopis velutina*	0–11	–
	Arizona white oak	QUAR	*Quercus arizonica*	0–6	–
	Emory oak	QUEM	*Quercus emoryi*	0–6	–
	Mexican blue oak	QUOB	*Quercus oblongifolia*	0–6	–
	western honey mesquite	PRGLT	*Prosopis glandulosa var. torreyana*	0–6	–

Animal community

This site is not well suited to summertime grazing by cows with calves. Mother cow-pairs will only use 300-400 feet up or down in elevation from a water in summer. Dry cows in the winter-spring season will use double the distance up or down the slope. Yearling cattle use areas of the site well in any season. Slope aspect affects both the intensity of use and seasonal use patterns. North-south trending ridges will be used fairly well even in summer as the west slope is shady in the morning and the east slope is shady in the afternoon. South facing slopes are extensively used in winter and spring due to warmth from cold weather and early green-up of warm season grasses. North slopes, being shady and cooler, are more used in summer, but never used nearly as much as warmer exposures. Canyon and seep water is available some years in winter (December-February).

Water developments are very important to wildlife on the site, especially whitetail deer. Due to extreme diversity in food, cover and edge, this site is home to a tremendous variety of wildlife species.

Hydrological functions

Shallow soils, hard bedrock and steep slopes make for lots of runoff. In wet winter - spring seasons, seeps and canyon stream-flow can last until May.

Recreational uses

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

Wood products

Limited hobby woods like Arizona rosewood.

Other products

Limited harvest of beargrass for fibers and agaves for tequila and mescal. Gold, silver, turquoise and decomposed granite for decorative rock.

Inventory data references

Range 417s, 18 in Excellent Condition,
22 in Good Condition, 11 in Fair Condition,

Type locality

Location 1: Pima County, AZ	
Township/Range/Section	T17S R8E S29
General legal description	Anvil Ranch - Saucito Mountain
Location 2: Pinal County, AZ	
Township/Range/Section	T7S R14E S1
General legal description	Flying W. Ranch - Antelope Peak
Location 3: Santa Cruz County, AZ	
Township/Range/Section	T23S R14E S28
General legal description	Santa Fe Ranch - Mount Benedict
Location 4: Pima County, AZ	
Township/Range/Section	T18S R15E S20
General legal description	Huerfano Butte on the Santa Rite Experimental Range.

Contributors

Dan Robinett
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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)	Dave Womack, Emilio Carrillo, Tom Reis, Dan Robinett
Contact for lead author	NRCS Tucson Area Office

Date	02/17/2005
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:** Occupy < 5% of area, broken by rock and gravel cover, <1 foot in length, highly discontinuous.

3. **Number and height of erosional pedestals or terracettes:** Erosional pedestals are very uncommon (1 per 20 plants observed); Terracettes are fairly uncommon, 10-20 feet apart with a 3-4 inch elevation difference from above to below the terracette

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

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 are staying in place.

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** Expect ratings of 1-3 in plant, rock and gravel interspaces.

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Weak granular; Color is 10YR6/2 Dry, 10YR4/2 Moist; thickness to 3 inches.

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Cover estimated in 9.6ft2 frames as: Canopy 30%, Basal 6%, Litter 10%; 60-70% of canopy cover is perennial mid grasses, 20-30% sub shrubs, 5% is perennial forbs , 5-10% is annual forbs & grasses, and <1% trees & shrubs. Cover is well dispersed throughout site.

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.

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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 shrubs

    Sub-dominant: annual forbs & grasses > perennial forbs > trees & shrubs > succulents

    Other:

    Additional:

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** Very low; most basal area loss is masked by litter decomposition.

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

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 600 lbs/acre unfavorable precipitation; 900 lbs/acre normal precipitation; 1,600 lbs/acre 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

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