USDA Natural Resources Conservation Service

Ecological site R041XC323AZ
Volcanic Hills 12-16" p.z. Loamy

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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.

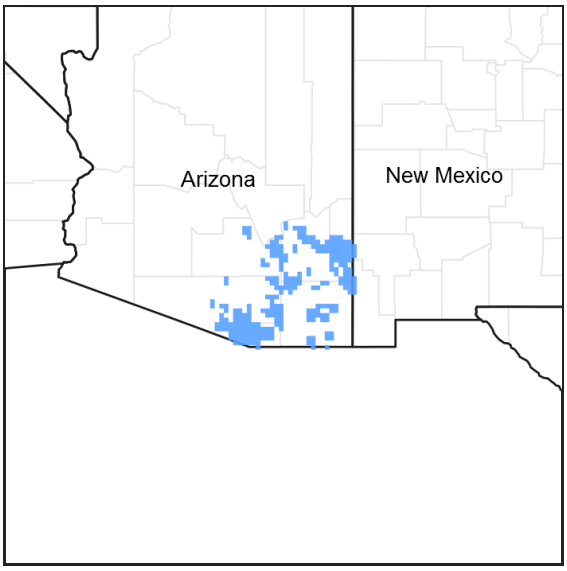

Figure 1. Mapped extent

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

R041XC304AZ	**Clayey Upland 12-16" p.z.**
R041XC305AZ	**Clay Loam Upland 12-16" p.z.**
R041XC313AZ	**Loamy Upland 12"-16" p.z.**

R041XC330AZ	**Volcanic Hills 12-16" p.z. Clayey**

Similar sites

R040XA123AZ	**Volcanic Hills 10"-13" P.Z.**
R041XB223AZ	**Basalt Hills 8-12" p.z.**
R041XA111AZ	**Volcanic Hills 16-20" p.z.**

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *eriogonum wrightii*
Herbaceous	(1) *bouteloua curtipendula* (2) *bouteloua hirsuta*

Physiographic features

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

Table 2. Representative physiographic features

Landforms	(1) Hill (2) Ridge
Flooding frequency	None
Ponding frequency	None
Elevation	3,500–5,500 ft
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)	0 days
Precipitation total (average)	16 in

Influencing water features

There are no water features associated with this site.

Soil features

These are shallow soils formed on intermediate igneous rock like andesite, dacite and related volcanic tuffs and welded ash. They are non-calcareous in the surface 10 inches and loam to clay loam textured. They have well developed covers of light colored cobbles, gravels and stones. Soils 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 E Pinal and S Gila counties MU 73 Pantak & Lampshire; SSA-663 Gila-Duncan area MU's 23 Graham, 31 Atascosa & Graham; SSA-664 San Simon area MU 5 Atascosa; SSA-665 Wilcox area LvE Luzena variant; SSA-666 Cochise NW part MU's 36 Deloro, 45 Lampshire and 80 Surge; SSA-667 Santa Cruz area MU's GhF & LgF Graham, ShF Schrap CbCL; SSA-669 Pima county E part MU's 23, 24 & 42 Deloro, 32 & 57 Pantak and 56 Deloro & Pantak; SSA-671 Cochise Douglas-Tombstone part MU 42 Deloro Lampshire and Leyte; SSA-675 San Carlos IR area MU's 55 Pantak & Lampshire, 72 Lampshire; SSA-703 Tohono O'odham Nation MU 41 Lampshire & Pantak.

Table 4. Representative soil features

Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Moderate
Soil depth	10–20 in
Surface fragment cover <=3"	25–50%
Surface fragment cover >3"	5–12%
Available water capacity (0-40in)	1.2–3.2 in
Calcium carbonate equivalent (0-40in)	0–8%
Electrical conductivity (0-40in)	0–2 mmhos/cm
Sodium adsorption ratio (0-40in)	0–2
Soil reaction (1:1 water) (0-40in)	6.6–8.4
Subsurface fragment volume <=3" (Depth not specified)	15–45%
Subsurface fragment volume >3" (Depth not specified)	1–10%

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 the 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 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 the group. Divide the resulting total by the total normal year production shown in the plant community description. If 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.

State and transition model

Figure 4. State and Transition, Volcanic Hills 12-16" p.z.,

State 1
Historic Climax Plant Community

Community 1.1
Historic Climax Plant Community

Figure 5. Volcanic Hills 12-16" pz, loamy,

The potential plant community on this site is dominated by warm season perennial grasses. Many species of shrubs and succulents are well represented on the site. Larger shrubs are concentrated at the edges of rock outcrops and in canyon bottoms. All the major grass species are well dispersed throughout the plant community. The aspect is shrub dotted grassland. Cool season plants start growth in early spring and mature early summer. Warm season plants take advantage of summer rains and are growing and nutritious July-September. Warm season grasses may remain green through the winter. In the absence of wildfire for long periods of time and with overgrazing, shrubs and succulents can increase to dominate the plant community. Climatic warming may be driving increase of shrubs like the mimosa species. Lehmann lovegrass can invade and increase on areas of this site. As fire, drought and/or continuous grazing act to reduce the cover of native perennial grasses, Lehmann can take advantage by increasing in dominance. Fires, in the presence of Lehmann, will use act to increase the spread of this non-native grass. Well developed gravel, stone and cobble covers protect the soil from erosion and protect forage species from heavy utilization. Large areas of rock outcrop and inaccessible areas hold reserves of perennial grasses and forbs to help reseed lower slopes as needed. Natural fire was an important factor in the development of the potential plant community and helped maintain a balance between grasses, forbs and shrubs. The natural fire free interval was about 10 years.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	340	700	980
Shrub/Vine	70	100	180
Forb	20	50	180
Tree	0	10	20
Total	**430**	**860**	**1360**

Table 6. Soil surface cover

Tree basal cover	0%
Shrub/vine/liana basal cover	1-3%
Grass/grasslike basal cover	3-8%
Forb basal cover	0-1%
Non-vascular plants	0-1%
Biological crusts	0-1%
Litter	20-50%
Surface fragments >0.25" and <=3"	25-50%
Surface fragments >3"	1-12%
Bedrock	1-15%
Water	0%
Bare ground	5-35%

Table 7. Canopy structure (% cover)

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

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
Shrub increased

Community 2.1

Shrub increased

Figure 8. Volcanic Hills 12-16" pz., loamy, shrubby conditio

This state occurs where shrubs like mesquite, mimosa species, ocotillo, whitethorn and succulents like prickly pear and cholla have increased, in the absence of fire for long periods, to dominate the site. Climatic warming may be responsible for increases in the mimosas and prickly pear. Many of these species are vigorous re-sprouters once they are well established and will quickly re-assume dominance after fire. Perennial grasses and forbs exist in declining amounts as shrub canopies increase.

State 3
Lehmann lovegrass invaded

Community 3.1
Lehmann lovegrass invaded

This state occurs where Lehmann lovegrass has invaded the site, usually from a seed source associated with roads and jeep trails running though the site. The interactions of fire, drought and continuous grazing can reduce the perennial grass cover allowing Lehmann to increase. Fires will act to further the dominance of Lehmann lovegrass. There will always be some diversity of native species left on the site due to diverse habitats in areas of rock outcrops and in canyon bottoms.

Additional community tables

Table 8. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	**Dominant Mid Grasses**			200–450	
	sideoats grama	BOCU	*Bouteloua curtipendula*	150–300	–
	plains lovegrass	ERIN	*Eragrostis intermedia*	10–150	–
	tanglehead	HECO10	*Heteropogon contortus*	10–50	–
	green sprangletop	LEDU	*Leptochloa dubia*	5–50	–
	bullgrass	MUEM	*Muhlenbergia emersleyi*	0–50	–
	cane bluestem	BOBA3	*Bothriochloa barbinodis*	10–50	–
2	**Dominant short grasses**			70–250	
	hairy grama	BOHI2	*Bouteloua hirsuta*	25–100	–
	purple grama	BORA	*Bouteloua radicosa*	25–100	–
	slender grama	BORE2	*Bouteloua repens*	10–50	–
	curly-mesquite	HIBE	*Hilaria belangeri*	25–50	–
	black grama	BOER4	*Bouteloua eriopoda*	25–50	

	black grama	BOER4	*Bouteloua eriopoda*	25–50	–
	Hall's panicgrass	PAHA	*Panicum hallii*	5–50	–
	blue grama	BOGR2	*Bouteloua gracilis*	0–25	–
	common wolfstail	LYPH	*Lycurus phleoides*	5–25	–
	sprucetop grama	BOCH	*Bouteloua chondrosioides*	0–25	–
3	**Cool season grasses**			1–40	
	squirreltail	ELELE	*Elymus elymoides ssp. elymoides*	1–30	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	0–10	–
	woolyspike balsamscale	ELBA	*Elionurus barbiculmis*	0–10	–
	muttongrass	POFE	*Poa fendleriana*	0–5	–
	southwestern needlegrass	ACEM4	*Achnatherum eminens*	0–5	–
4	**miscellaneous perennial grasses**			10–50	
	silver bluestem	BOSA	*Bothriochloa saccharoides*	0–10	–
	Arizona cottontop	DICA8	*Digitaria californica*	0–10	–
	fall witchgrass	DICO6	*Digitaria cognata*	1–10	–
	maidencane	PAHE2	*Panicum hemitomon*	0–10	–
	bush muhly	MUPO2	*Muhlenbergia porteri*	0–10	–
	slim tridens	TRMU	*Tridens muticus*	0–10	–
	slim tridens	TRMUE	*Tridens muticus var. elongatus*	0–5	–
	deergrass	MURI2	*Muhlenbergia rigens*	0–5	–
	vine mesquite	PAOB	*Panicum obtusum*	0–5	–
	Texas bluestem	SCCI2	*Schizachyrium cirratum*	0–5	–
	little bluestem	SCSC	*Schizachyrium scoparium*	0–5	–
	southwestern bristlegrass	SESC2	*Setaria scheelei*	0–5	–
	plains bristlegrass	SEVU2	*Setaria vulpiseta*	0–5	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	0–5	–
	Mexican gamagrass	TRLA11	*Tripsacum lanceolatum*	0–5	–
	bamboo muhly	MUDU3	*Muhlenbergia dumosa*	0–5	–
	Rothrock's grama	BORO2	*Bouteloua rothrockii*	0–5	–
	low woollygrass	DAPU7	*Dasyochloa pulchella*	0–2	–
	nineawn pappusgrass	ENDE	*Enneapogon desvauxii*	0–2	–
	Arizona muhly	MUAR3	*Muhlenbergia arizonica*	0–2	–
5	**Perennial threeawns**			5–40	
	spidergrass	ARTE3	*Aristida ternipes*	5–20	–
	spidergrass	ARTEG	*Aristida ternipes var. gentilis*	0–15	–
	purple threeawn	ARPUP9	*Aristida purpurea var. perplexa*	0–10	–
	Wright's threeawn	ARPUW	*Aristida purpurea var. wrightii*	0–10	–
	Orcutt's threeawn	ARSCO	*Aristida schiedeana var. orcuttiana*	0–10	–
	Havard's threeawn	ARHA3	*Aristida havardii*	0–5	–
	Wooton's threeawn	ARPA9	*Aristida pansa*	0–5	–
	Fendler threeawn	ARPUL	*Aristida purpurea var. longiseta*	0–5	–
	blue threeawn	ARPUN	*Aristida purpurea var. nealleyi*	0–5	–
	Parish's threeawn	ARPUP5	*Aristida purpurea var. parishii*	0–5	–
	poverty threeawn	ARDI5	*Aristida divaricata*	0–2	

	poverty threeawn	ARDI5	*Aristida divaricata*	0–2	–
6	**Annual grasses**			5–100	
	Mexican sprangletop	LEFUU	*Leptochloa fusca ssp. uninervia*	1–25	–
	mucronate sprangeltop	LEPAB	*Leptochloa panicea ssp. brachiata*	1–25	–
	Mexican panicgrass	PAHI5	*Panicum hirticaule*	1–25	–
	prairie threeawn	AROL	*Aristida oligantha*	1–15	–
	Arizona signalgrass	URAR	*Urochloa arizonica*	0–15	–
	Eastwood fescue	VUMIC	*Vulpia microstachys var. ciliata*	0–15	–
	desert fescue	VUMIM	*Vulpia microstachys var. microstachys*	0–15	–
	sixweeks fescue	VUOC	*Vulpia octoflora*	0–10	–
	sixweeks threeawn	ARAD	*Aristida adscensionis*	0–10	–
	needle grama	BOAR	*Bouteloua aristidoides*	0–5	–
	Bigelow's bluegrass	POBI	*Poa bigelovii*	0–5	–
	delicate muhly	MUFR	*Muhlenbergia fragilis*	0–5	–
	littleseed muhly	MUMI	*Muhlenbergia microsperma*	0–5	–
	witchgrass	PACA6	*Panicum capillare*	0–5	–
	Arizona brome	BRAR4	*Bromus arizonicus*	0–5	–
	fragilegrass	AETE	*Aegopogon tenellus*	0–3	–
	feather fingergrass	CHVI4	*Chloris virgata*	0–2	–
	tapertip cupgrass	ERACA	*Eriochloa acuminata var. acuminata*	0–1	–
	Mexican lovegrass	ERME	*Eragrostis mexicana*	0–1	–
	desert lovegrass	ERPEM	*Eragrostis pectinacea var. miserrima*	0–1	–
	tufted lovegrass	ERPEP2	*Eragrostis pectinacea var. pectinacea*	0–1	–
	goldentop grass	LAAU	*Lamarckia aurea*	0–1	–
	sixweeks grama	BOBA2	*Bouteloua barbata*	0–1	–
Forb					
7	**Perennial forbs**			10–45	
	slender janusia	JAGR	*Janusia gracilis*	1–15	–
	shrubby deervetch	LORI3	*Lotus rigidus*	1–15	–
	American vetch	VIAM	*Vicia americana*	0–15	–
	desert globemallow	SPAM2	*Sphaeralcea ambigua*	1–10	–
	brownplume wirelettuce	STPA4	*Stephanomeria pauciflora*	1–10	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	1–10	–
	perennial rockcress	ARPE2	*Arabis perennans*	1–5	–
	lipfern	CHEIL	*Cheilanthes*	1–5	–
	longflower tube tongue	JULO3	*Justicia longii*	0–5	–
	pearly globe amaranth	GONI	*Gomphrena nitida*	0–5	–
	hairy false goldenaster	HEVI4	*Heterotheca villosa*	0–5	–
	bluedicks	DICA14	*Dichelostemma capitatum*	1–5	–
	Arizona foldwing	DIRE4	*Dicliptera resupinata*	0–5	–
	spreading fleabane	ERDI4	*Erigeron divergens*	0–5	–
	weakleaf bur ragweed	AMCO3	*Ambrosia confertiflora*	1–5	–
	wishbone-bush	MILAV	*Mirabilis laevis var. villosa*	0–5	–
	cloak fern	NOTHO	*Notholaena*	1–5	–

	Louisiana vetch	VILUL2	*Vicia ludoviciana ssp. ludoviciana*	0–5	–
	branched noseburn	TRRA5	*Tragia ramosa*	0–5	–
	Lewis flax	LILE3	*Linum lewisii*	0–5	–
	lacy tansyaster	MAPI	*Machaeranthera pinnatifida*	0–5	–
	cliffbrake	PELLA	*Pellaea*	1–5	–
	Parry's beardtongue	PEPA24	*Penstemon parryi*	1–2	–
	Parry's false prairie-clover	MAPA7	*Marina parryi*	0–2	–
	Arizona gumweed	GRARS	*Grindelia arizonica var. stenophylla*	0–2	–
	Lemmon's ragwort	SELE8	*Senecio lemmonii*	0–2	–
	Arizona snakecotton	FRAR2	*Froelichia arizonica*	0–2	–
	trailing fleabane	ERFL	*Erigeron flagellaris*	0–2	–
	desert trumpet	ERIN4	*Eriogonum inflatum*	0–2	–
	climbing wartclub	BOSC	*Boerhavia scandens*	0–2	–
	Arizona wrightwort	CAAR7	*Carlowrightia arizonica*	0–1	–
	desert mariposa lily	CAKE	*Calochortus kennedyi*	0–1	–
	sego lily	CANU3	*Calochortus nuttallii*	0–1	–
	Indian paintbrush	CASTI2	*Castilleja*	0–1	–
	whitemouth dayflower	COER	*Commelina erecta*	0–1	–
	leatherweed	CRPO5	*Croton pottsii*	0–1	–
	fingerleaf gourd	CUDI	*Cucurbita digitata*	0–1	–
	Cooley's bundleflower	DECO2	*Desmanthus cooleyi*	0–1	–
	desert larkspur	DEPA	*Delphinium parishii*	0–1	–
	milkvetch	ASTRA	*Astragalus*	0–1	–
	dense ayenia	AYMI	*Ayenia microphylla*	0–1	–
	hairyseed bahia	BAAB	*Bahia absinthifolia*	0–1	–
	desert marigold	BAMU	*Baileya multiradiata*	0–1	–
	scarlet spiderling	BOCO	*Boerhavia coccinea*	0–1	–
	Palmer's Indian mallow	ABPA	*Abutilon palmeri*	0–1	–
	dwarf desertpeony	ACNA2	*Acourtia nana*	0–1	–
	brownfoot	ACWR5	*Acourtia wrightii*	0–1	–
	San Felipe dogweed	ADPO	*Adenophyllum porophylloides*	0–1	–
	trailing windmills	ALIN	*Allionia incarnata*	0–1	–
	largeflower onion	ALMA4	*Allium macropetalum*	0–1	–
	wild dwarf morning-glory	EVAR	*Evolvulus arizonicus*	0–1	–
	beeblossom	GAURA	*Gaura*	0–1	–
	southwestern mock vervain	GLGO	*Glandularia gooddingii*	0–1	–
	tuber anemone	ANTU	*Anemone tuberosa*	0–1	–
	Arizona rosemallow	HIBI	*Hibiscus biseptus*	0–1	–
	desert rosemallow	HICO	*Hibiscus coulteri*	0–1	–
	paleface	HIDE	*Hibiscus denudatus*	0–1	–
	Trans-Pecos thimblehead	HYWI	*Hymenothrix wislizeni*	0–1	–
	Thurber's cotton	GOTH	*Gossypium thurberi*	0–1	–

	narrowleaf stoneseed	LIIN2	*Lithospermum incisum*	0–1	–
	New Mexico fanpetals	SINE	*Sida neomexicana*	0–1	–
	silverleaf nightshade	SOEL	*Solanum elaeagnifolium*	0–1	–
	Rocky Mountain zinnia	ZIGR	*Zinnia grandiflora*	0–1	–
	tufted evening primrose	OECA10	*Oenothera caespitosa*	0–1	–
	desert tobacco	NIOB	*Nicotiana obtusifolia*	0–1	–
	jewels of Opar	TAPA2	*Talinum paniculatum*	0–1	–
	Coulter's wrinklefruit	TECO	*Tetraclea coulteri*	0–1	–
	hairy fournwort	TENE	*Tetramerium nervosum*	0–1	–
	plains blackfoot	MELE2	*Melampodium leucanthum*	0–1	–
	Greene's bird's-foot trefoil	LOGR4	*Lotus greenei*	0–1	–
	Wright's deervetch	LOWR	*Lotus wrightii*	0–1	–
	desert penstemon	PEPS	*Penstemon pseudospectabilis*	0–1	–
	slimleaf bean	PHAN3	*Phaseolus angustissimus*	0–1	–
	orange fameflower	PHAU13	*Phemeranthus aurantiacus*	0–1	–
	slender poreleaf	POGR5	*Porophyllum gracile*	0–1	–
	velvetseed milkwort	POOB	*Polygala obscura*	0–1	–
	shrubby purslane	POSU3	*Portulaca suffrutescens*	0–1	–
	Wright's cudweed	PSCAC2	*Pseudognaphalium canescens ssp. canescens*	0–1	–
	twinleaf senna	SEBA3	*Senna bauhinioides*	0–1	–
	Coues' cassia	SECO10	*Senna covesii*	0–1	–
8	**Annual Forbs**			10–140	
	longleaf false goldeneye	HELOA2	*Heliomeris longifolia var. annua*	1–50	–
	California poppy	ESCAM	*Eschscholzia californica ssp. mexicana*	0–45	–
	milkvetch	ASTRA	*Astragalus*	0–20	–
	goosefoot	CHENO	*Chenopodium*	0–20	–
	sensitive partridge pea	CHNI2	*Chamaecrista nictitans*	1–15	–
	carelessweed	AMPA	*Amaranthus palmeri*	0–10	–
	fewflower beggarticks	BILE	*Bidens leptocephala*	0–10	–
	western tansymustard	DEPI	*Descurainia pinnata*	1–10	–
	foothill deervetch	LOHU2	*Lotus humistratus*	0–10	–
	coastal bird's-foot trefoil	LOSAB	*Lotus salsuginosus var. brevivexillus*	0–10	–
	slender goldenweed	MAGR10	*Machaeranthera gracilis*	1–10	–
	tanseyleaf tansyaster	MATA2	*Machaeranthera tanacetifolia*	1–10	–
	phacelia	PHACE	*Phacelia*	0–10	–
	desert Indianwheat	PLOV	*Plantago ovata*	0–5	–
	woolly plantain	PLPA2	*Plantago patagonica*	0–5	–
	whitestem blazingstar	MEAL6	*Mentzelia albicaulis*	0–5	–
	sweet four o'clock	MILO2	*Mirabilis longiflora*	0–5	–
	minerslettuce	MONTI	*Montia*	0–5	–
	woolly tidestromia	TILA2	*Tidestromia lanuginosa*	0–5	–
	intermediate pepperweed	LEVIM	*Lepidium virginicum var. medium*	0–5	–

	sawtooth sage	SASU7	*Salvia subincisa*	0–5	–
	spreading fanpetals	SIAB	*Sida abutifolia*	1–5	–
	streamside bur cucumber	SIAM	*Sicyos ampelophyllus*	0–5	–
	sleepy silene	SIAN2	*Silene antirrhina*	0–5	–
	cutleaf bur cucumber	SILA	*Sicyos laciniatus*	0–5	–
	Arizona lupine	LUAR4	*Lupinus arizonicus*	0–5	–
	Coulter's lupine	LUSP2	*Lupinus sparsiflorus*	0–5	–
	Thurber's morning-glory	IPTH	*Ipomoea thurberi*	0–5	–
	Arizona poppy	KAGR	*Kallstroemia grandiflora*	0–5	–
	sorrel buckwheat	ERPO4	*Eriogonum polycladon*	0–5	–
	longleaf false goldeneye	HELOL	*Heliomeris longifolia var. longifolia*	0–5	–
	camphorweed	HESU3	*Heterotheca subaxillaris*	0–5	–
	crestrib morning-glory	IPCO2	*Ipomoea costellata*	0–5	–
	Coulter's spiderling	BOCO2	*Boerhavia coulteri*	0–5	–
	bristly fiddleneck	AMTE3	*Amsinckia tessellata*	0–5	–
	New Mexico thistle	CINE	*Cirsium neomexicanum*	0–5	–
	New Mexico copperleaf	ACNE	*Acalypha neomexicana*	0–5	–
	fringed redmaids	CACI2	*Calandrinia ciliata*	0–2	–
	American wild carrot	DAPU3	*Daucus pusillus*	0–2	–
	wedgeleaf draba	DRCU	*Draba cuneifolia*	0–2	–
	redstar	IPCO3	*Ipomoea coccinea*	0–2	–
	warty caltrop	KAPA	*Kallstroemia parviflora*	0–2	–
	shaggyfruit pepperweed	LELA	*Lepidium lasiocarpum*	0–2	–
	Fendler's desertdandelion	MAFE	*Malacothrix fendleri*	0–2	–
	sand fringepod	THCU	*Thysanocarpus curvipes*	0–2	–
	chia	SACO6	*Salvia columbariae*	0–2	–
	star gilia	GIST	*Gilia stellata*	0–2	–
	pearly globe amaranth	GONI	*Gomphrena nitida*	0–2	–
	Arizona popcornflower	PLAR	*Plagiobothrys arizonicus*	0–2	–
	Florida pellitory	PAFL3	*Parietaria floridana*	0–2	–
	combseed	PECTO	*Pectocarya*	0–2	–
	desert unicorn-plant	PRAL4	*Proboscidea althaeifolia*	0–1	–
	doubleclaw	PRPA2	*Proboscidea parviflora*	0–1	–
	New Mexico plumeseed	RANE	*Rafinesquia neomexicana*	0–1	–
	green carpetweed	MOVE	*Mollugo verticillata*	0–1	–
	desert evening primrose	OEPR	*Oenothera primiveris*	0–1	–
	Arizona monardella	MOAR	*Monardella arizonica*	0–1	–
	Texas stork's bill	ERTE13	*Erodium texanum*	0–1	–
	spurge	EUPHO	*Euphorbia*	0–1	–
	sanddune wallflower	ERCA14	*Erysimum capitatum*	0–1	–
	miniature woollystar	ERDI2	*Eriastrum diffusum*	0–1	–
	hoary bowlesia	BOIN3	*Bowlesia incana*	0–1	–
	scrambled eggs	COAU2	*Corydalis aurea*	0–1	–

	wheelscale saltbush	ATEL	*Atriplex elegans*	0–1	–
Shrub/Vine					
9	**Dominant Half Shrubs**			25–70	
	bastardsage	ERWR	*Eriogonum wrightii*	10–35	–
	fairyduster	CAER	*Calliandra eriophylla*	5–30	–
	Gregg's prairie clover	DAGR2	*Dalea greggii*	0–25	–
	rough menodora	MESC	*Menodora scabra*	0–20	–
	littleleaf ratany	KRER	*Krameria erecta*	1–15	–
	Schott's stickpea	ZAFOS	*Zapoteca formosa var. schottii*	0–10	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	1–10	–
	prairie acacia	ACAN	*Acacia angustissima*	0–10	–
10	**Miscellaneous Shrubs**			25–75	
	pelotazo	ABIN	*Abutilon incanum*	1–15	–
	whitethorn acacia	ACCOC	*Acacia constricta var. constricta*	1–10	–
	ocotillo	FOSP2	*Fouquieria splendens*	1–10	–
	velvetpod mimosa	MIDY	*Mimosa dysocarpa*	1–10	–
	Sonoran scrub oak	QUTU2	*Quercus turbinella*	0–10	–
	desert-thorn	LYCIU	*Lycium*	0–5	–
	algerita	MATR3	*Mahonia trifoliolata*	0–5	–
	catclaw mimosa	MIACB	*Mimosa aculeaticarpa var. biuncifera*	1–5	–
	spiny hackberry	CEEH	*Celtis ehrenbergiana*	0–5	–
	Wright's beebrush	ALWR	*Aloysia wrightii*	0–5	–
	Eastern Mojave buckwheat	ERFA2	*Eriogonum fasciculatum*	0–5	–
	coralbean	ERFL7	*Erythrina flabelliformis*	0–5	–
	turpentine bush	ERLA12	*Ericameria laricifolia*	0–5	–
	Tahitian kidneywood	EYOR	*Eysenhardtia orthocarpa*	0–5	–
	desert olive	FOSH	*Forestiera shrevei*	0–5	–
	jojoba	SICH	*Simmondsia chinensis*	0–5	–
	yellow trumpetbush	TEST	*Tecoma stans*	1–5	–
	blue paloverde	PAFL6	*Parkinsonia florida*	0–5	–
	catclaw acacia	ACGR	*Acacia greggii*	1–5	–
	Coulter's brickellbush	BRCO	*Brickellia coulteri*	1–2	–
	American threefold	TRCA8	*Trixis californica*	0–2	–
	Parish's goldeneye	VIPA14	*Viguiera parishii*	0–2	–
	button brittlebush	ENFR	*Encelia frutescens*	0–2	–
	Pringle manzanita	ARPR	*Arctostaphylos pringlei*	0–2	–
	fourwing saltbush	ATCA2	*Atriplex canescens*	0–2	–
	yerba de pasmo	BAPT	*Baccharis pteronioides*	1–2	–
	Schott's yellowhood	NISC	*Nissolia schottii*	0–2	–
	skunkbush sumac	RHTR	*Rhus trilobata*	0–2	–
	fringed twinevine	FUCYC	*Funastrum cynanchoides ssp. cynanchoides*	0–2	–
	physicnut	JACU	*Jatropha cuneata*	0–2	–
	Arizona water-willow	JUCA9	*Justicia candicans*	0–2	–

	Arizona watercress	JUCA3	*Justicia candicans*	0–2	
	littleleaf ratany	KRER	*Krameria erecta*	0–1	–
	trailing krameria	KRLA	*Krameria lanceolata*	0–1	–
	gumhead	GYGL	*Gymnosperma glutinosum*	0–1	–
	burroweed	ISTE2	*Isocoma tenuisecta*	0–1	–
	evergreen sumac	RHVIC	*Rhus virens var. choriophylla*	0–1	–
	western soapberry	SASAD	*Sapindus saponaria var. drummondii*	0–1	–
	desertbroom	BASA2	*Baccharis sarothroides*	0–1	–
	California brickellbush	BRCA3	*Brickellia californica*	0–1	–
	javelina bush	COER5	*Condalia ericoides*	0–1	–
	Warnock's snakewood	COWA	*Condalia warnockii*	0–1	–
	Kearney's snakewood	COWAK	*Condalia warnockii var. kearneyana*	0–1	–
	ragged rockflower	CRBI2	*Crossosoma bigelovii*	0–1	–
	Florida hopbush	DOVI	*Dodonaea viscosa*	0–1	–
	brittlebush	ENFA	*Encelia farinosa*	0–1	–
	longleaf jointfir	EPTR	*Ephedra trifurca*	0–1	–
	Thurber's desert honeysuckle	ANTH2	*Anisacanthus thurberi*	0–1	–
	lotebush	ZIOB	*Ziziphus obtusifolia*	0–1	–
	heartleaf goldeneye	VICO	*Viguiera cordifolia*	0–1	–
	yellow paloverde	PAMI5	*Parkinsonia microphylla*	0–1	–
	milfoil wattle	ACMI	*Acacia millefolia*	0–1	–
	whitethorn acacia	ACCOP9	*Acacia constricta var. paucispina*	0–1	–
11	**Succulents**			5–35	
	Schott's century plant	AGSC3	*Agave schottii*	0–10	–
	common sotol	DAWH2	*Dasylirion wheeleri*	0–10	–
	sacahuista	NOMI	*Nolina microcarpa*	0–10	–
	cactus apple	OPEN3	*Opuntia engelmannii*	1–10	–
	banana yucca	YUBA	*Yucca baccata*	1–5	–
	candy barrelcactus	FEWI	*Ferocactus wislizeni*	1–5	–
	smallflower century plant	AGPA5	*Agave parviflora*	0–5	–
	Palmer's century plant	AGPA3	*Agave palmeri*	0–5	–
	saguaro	CAGI10	*Carnegiea gigantea*	0–2	–
	hedgehog cactus	ECHIN3	*Echinocereus*	0–2	–
	white fishhook cactus	ECIN2	*Echinomastus intertextus*	0–1	–
	rainbow cactus	ECPE	*Echinocereus pectinatus*	0–1	–
	Graham's nipple cactus	MAGR9	*Mammillaria grahamii*	0–1	–
	little nipple cactus	MAHE2	*Mammillaria heyderi*	0–1	–
	dollarjoint pricklypear	OPCH	*Opuntia chlorotica*	0–1	–
	soaptree yucca	YUEL	*Yucca elata*	0–1	–
	purple pricklypear	OPMAM	*Opuntia macrocentra var. macrocentra*	0–1	–
	tulip pricklypear	OPPH	*Opuntia phaeacantha*	0–1	–
	Arizona pencil cholla	CYAR14	*Cylindropuntia arbuscula*	0–1	–
	jumping cholla	CYFU10	*Cylindropuntia fulgida*	0–1	–
	Christmas cactus	CYLE8	*Cylindropuntia leptocaulis*	0–1	–

	Christmas cactus	CYLE3	*Cylindropuntia leptocaulis*	0–1	–
	walkingstick cactus	CYSP8	*Cylindropuntia spinosior*	0–1	–
	staghorn cholla	CYVE3	*Cylindropuntia versicolor*	0–1	–
	Parry's agave	AGPA4	*Agave parryi*	0–1	–
Tree					
12	**Trees**			0–20	
	oneseed juniper	JUMO	*Juniperus monosperma*	0–10	–
	western honey mesquite	PRGLT	*Prosopis glandulosa var. torreyana*	0–5	–
	velvet mesquite	PRVE	*Prosopis velutina*	0–5	–
	Arizona white oak	QUAR	*Quercus arizonica*	0–5	–
	Emory oak	QUEM	*Quercus emoryi*	0–5	–
	Mexican blue oak	QUOB	*Quercus oblongifolia*	0–5	–
	netleaf hackberry	CELAR	*Celtis laevigata var. reticulata*	0–5	–

Animal community

This site produces fair quality herbaceous forage. Protein and phosphorous will be deficient in the winter. The 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 water in the summer. Dry cows will use double the distance up or down the slope in the winter-spring season. Yearlings use the areas of the site well in any season. Slopes above 50% and large areas of bluff and rim and rock outcrops can hinder livestock movement on the site. Slope and aspect affects both the intensity of utilization and seasonal use patterns. North-south trending ridges will be utilized fairly well even in the summer as the west facing slope is shady in the morning and the east facing slope is shady in the afternoon. South facing slopes are extensively used in the winter and spring due to warmth from cold weather and early green-up of warm season grasses. North facing slopes are little used at any time of year. Seep and canyon water is available in most winters from December-February.
Water is very important to wildlife on this site, especially whitetail deer. This site is home to a tremendous variety of wildlife species, due to the diversity of food, cover and aspect.

Hydrological functions

With steep slopes and loamy soils this site is a good producer of runoff.

Recreational uses

Hunting, hiking, horseback riding, photography, bird-watching, camping, rock-hounding,

Wood products

Shrubby mesquite, juniper and catclaw acacia supply limited amounts of wood for campfires.

Inventory data references

Range 417s include 14 in excellent condition, 24 in good condition, and 4 in fair condition.

Type locality

Location 1: Pima County, AZ	
Township/Range/Section	T18S R12E S32
General legal description	Caterpillar proving grounds, Green Valley
Location 2: Pima County, AZ	
Township/Range/Section	T21S R9E S14

General legal description	Buenos Aires NWR
Location 3: Pima County, AZ	
Township/Range/Section	T18S R17E S10
General legal description	Empire ranch, KA 7 in the Rockhouse pasture.

Other references

Field Office Locations:
Douglas
Higley
Safford
San Carlos
Sells
Tucson
Willcox

Contributors

Dan Robinett
Larry D. Ellicott
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Unknown

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 Carillo
Contact for lead author	NRCS Tucson Area Office
Date	03/07/2005
Approved by	S. Cassady
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:** Uncomon; probably cover no more than 10% of area, discontinuous, very short, usually less than 1 foot in length; broken primarily by high rock and gravel cover.

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3. **Number and height of erosional pedestals or terracettes:** Pedestals are uncommon on perennial grass and shrubs; limited soil material not conducive to forming continuous stands of plants that promote terracettes; high rock cover forms limited natural terracettes.

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** 0-5%

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

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

7. **Amount of litter movement (describe size and distance expected to travel):** 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 1-3 in canopy interspaces and 4-6 under plant canopies.

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Weak coarse granular; color is 7.5YR4/4 dru" 7.5YR3/4 moist; thickness to 2 inches.

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** cover estimated as: canopy 20-40%; basal 5%; litter 45-55%; and gravel 30%. 45-55% of canopy cover is perennial grasses, 5% perennial forbs, 30% shrubs, 10% subshrubs. 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

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 > annual grasses and forbs > subshrubs = shrubs > succulents = perennial forbs.

    Sub-dominant:

    Other:

    Additional:

13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** 50% of basil cover of perennial grasses has likely been lost in recent prolonged drouth.

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):** 700 lbs/ac unfavorable precipitation; 1000 lbs/ac normal precipitation; 1800 lbs/ac 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:** turpentine bush, jojoba, whitethorn, mesquite, prickley pear, cane cholla, ocotillo may increase to undesirable levels in absence of natural fires; Red brome and wild oats.

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