USDA Natural Resources Conservation Service

Ecological site R040XA107AZ
Limestone Hills 10"-13" 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.

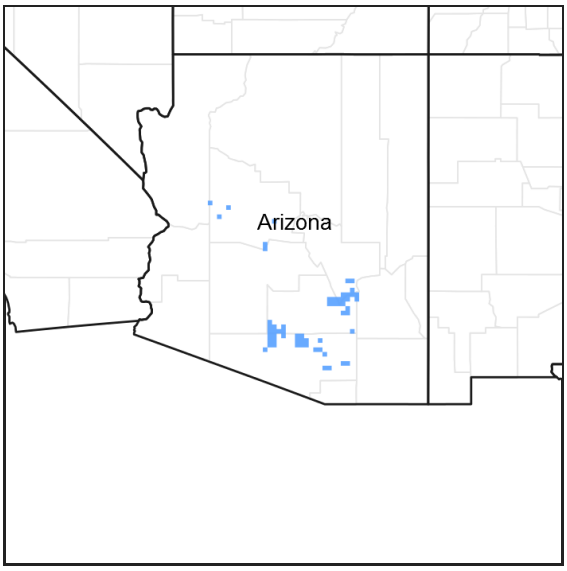

Figure 1. Mapped extent

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): 040X–Sonoran Basin and Range

AZ 40.1 – Upper Sonoran Desert

Elevations range from 2000 to 3200 feet and precipitation averages 10 to 13 inches per year. Vegetation includes saguaro, palo verde, mesquite, creosotebush, triangle bursage, prickly pear, cholla, limberbush, wolfberry, bush muhly, threeawns, ocotillo, and globe mallow. The soil temperature regime is thermic and the soil moisture regime is typic 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

R040XA110AZ	**Limy Slopes 10"-13" p.z.**
R040XA111AZ	**Limy Upland 10"-13" p.z.**
R040XA106AZ	**Limy Upland, Deep 10"-13" p.z.**

Similar sites

R038XA105AZ	**Limestone Hills 12-16" p.z.**
R041XC307AZ	**Limestone Hills 12-16" p.z.**
R041XB220AZ	**Limestone Hills 8-12" p.z.**

Table 1. Dominant plant species

Tree	(1) *Parkinsonia microphylla*
Shrub	(1) *Zinnia acerosa*
Herbaceous	(1) *Bouteloua trifida* (2) *Tridens muticus*

Physiographic features

This site occurs in the upper elevations of the Sonoran Desert in southern Arizona. Limestone rock outcrops are associated with this site and may make up as much as 50% of the area. Slope aspect is site differentiating at elevations near land resource area boundaries. It occurs on steep hill-slopes and ridge-tops.

Table 2. Representative physiographic features

Landforms	(1) Hill (2) Ridge (3) Mountain slope
Flooding frequency	None
Ponding frequency	None
Elevation	610–1,219 m
Slope	15–75%
Aspect	N, E, S

Climatic features

Precipitation in the sub resource area ranges from 10 to 13 inches in the southern part, along the Mexican border with elevations from about 1900 to 3200 feet. Precipitation in the northern part of the resource area ranges from 11 to 14 inches with elevations from about 1700 to 3500 feet. Winter-summer rainfall ratios range from 40%-60% in the southern portions of the land resource unit, to 50%-50% in the central portions, to 60%-40% in the northern part of the land resource unit. As one moves from east to west in this resource area rains become slightly more unpredictable and variable with Coefficients of Variation of annual rainfall equal to 29% at Tucson and 36% at Carefree. Summer rains fall July through Sept., originate in the Gulf of Mexico, and are convective, usually brief, intense thunderstorms. Cool season moisture tends to be frontal, originating in the Pacific and Gulf of California. This winter precipitation falls in widespread storms with long duration and low intensity. Snow is rare and seldom lasts more than an hour or two. May and June are the driest months of the year. Humidity is generally very low.

Winter temperatures are mild, with very few days recording freezing temperatures in the morning. Summer temperatures are warm to hot, with several days in June and July exceeding 105 degrees F.

Both the spring and the summer growing seasons are equally important for perennial grass, forb and shrub growth. Cool and warm season annual forbs and grasses can be common in their respective seasons with above average rainfall. Perennial forage species can remain green throughout the year with available moisture.

Table 3. Representative climatic features

Frost-free period (average)	265 days
Freeze-free period (average)	0 days

Precipitation total (average)	330 mm

Influencing water features

There are no water features associated with this site.

Soil features

These are shallow and very shallow soils over hard limestone bedrock. They are calcareous throughout and are very gravelly to cobbly. Plant-soil moisture relationships are poor but large areas of rock outcrop tend to magnify the amount of moisture received by soil areas. Soils mapped on this site include: SSA-669 Eastern Pima County MU Saguaro-71 & SSA-703 Tohono O'odham area MU Kohatk-39.

Table 4. Representative soil features

Surface texture	(1) Very gravelly sandy loam (2) Gravelly sandy loam (3) Gravelly loam
Family particle size	(1) Loamy
Drainage class	Excessively drained to well drained
Permeability class	Rapid to moderately rapid
Soil depth	13–51 cm
Surface fragment cover <=3"	30–60%
Surface fragment cover >3"	5–20%
Available water capacity (0-101.6cm)	1.27–5.08 cm
Calcium carbonate equivalent (0-101.6cm)	15–60%
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)	8–8.4
Subsurface fragment volume <=3" (Depth not specified)	35–65%
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 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

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 the 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.

State and transition model

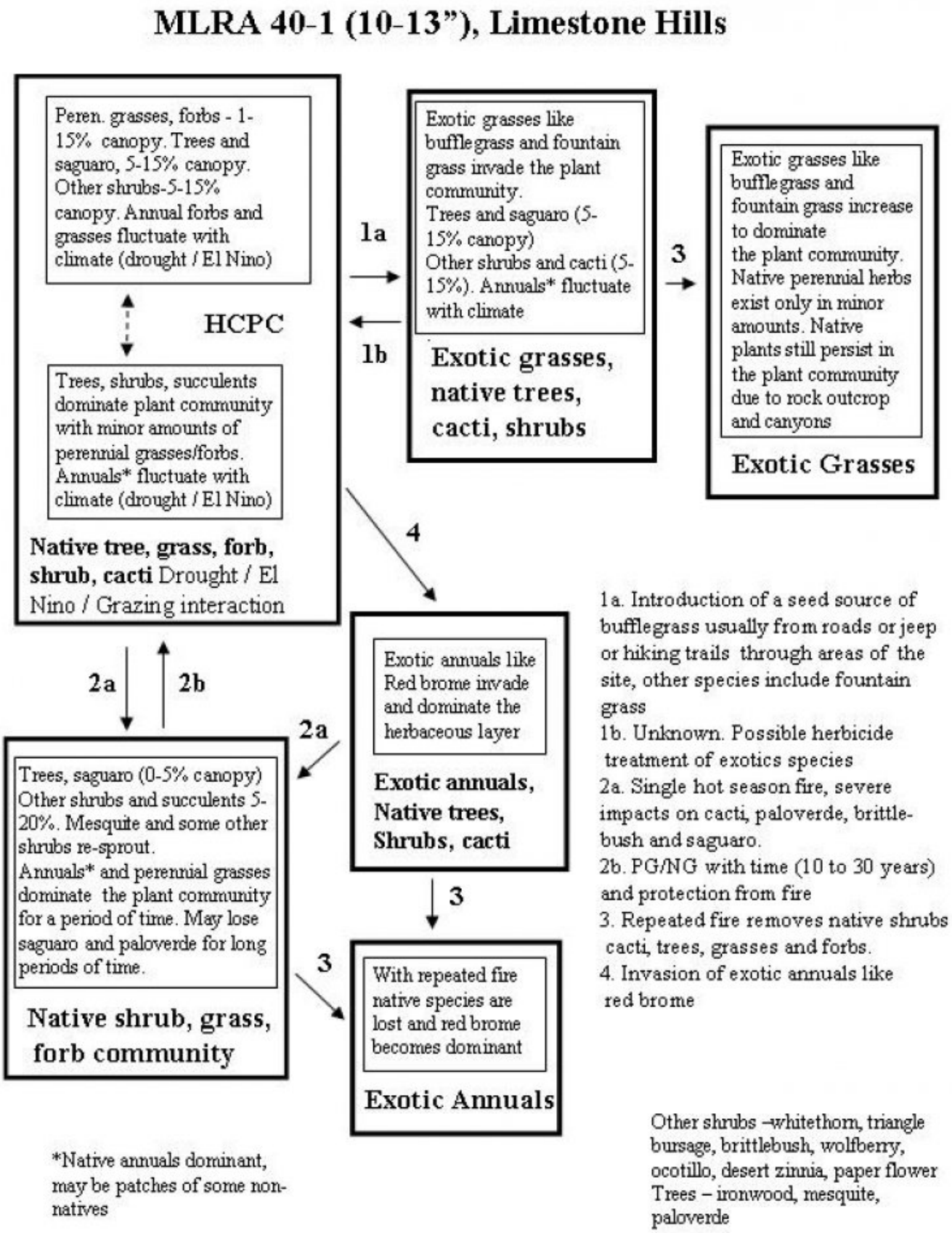

Figure 4. State and Transition, Limestone Hills 10-13" pz.

State 1
Historical Climax Plant Community

Community 1.1
Historical Climax Plant Community

The potential plant community on this site is a diverse mixture of desert trees, shrubs, cacti, and perennial grasses and forbs. Most perennial species are well dispersed throughout the plant community. The aspect is shrubland. With continuous heavy grazing, herbaceous and suffrutescent forage species are replaced by increases in shrubs, cacti and trees. Well developed gravel and cobble covers protect the soil from erosion and help protect forage species from heavy utilization. The large amount of rock outcrop on this site tends to magnify water received by adjacent soil areas. The dynamics of Saguaro on this site is unlike the 200-300 year cycle found on deep upland sites in the Upper Sonoran desert. Saguaro recruitment can occur in any favorable year due to numerous rocky habitats favorable for establishment. Saguaro populations tend to be multi-aged and persistent on this site although very favorable years for establishment may result in very heavy stands on some slopes many years later.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Shrub/Vine	112	280	387
Forb	20	84	196
Grass/Grasslike	6	84	191
Tree	56	112	168
Total	**194**	**560**	**942**

Table 6. Soil surface cover

Tree basal cover	0-1%
Shrub/vine/liana basal cover	1-3%
Grass/grasslike basal cover	0-1%
Forb basal cover	0-1%
Non-vascular plants	0%
Biological crusts	0-5%
Litter	5-40%
Surface fragments >0.25" and <=3"	30-60%
Surface fragments >3"	5-25%
Bedrock	5-20%
Water	0%
Bare ground	5-25%

Table 7. Canopy structure (% cover)

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

Figure 6. Plant community growth curve (percent production by month). AZ4011, 40.1 10-13" p.z. hill sites. Growth begins in the late winter, goes

semi-dormant in the drought period of late May through early July, growth continues in the summer through early fall..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	5	15	20	5	5	10	15	15	5	5	0

State 2
Native trees, cacti, shrubs and fire

Community 2.1
Native trees, cacti, shrubs and fire

This plant community occurs as a result of a single hot season fire. Paloverde, ironwood and saguaro can be severely impacted and may take long periods of time (30-50 years) to recover to pre-fire levels. Perennial and annual grasses and forbs dominate the community for some time until shrubs like ocotillo, wolfberry and jojoba can recover. This plant community can produce enough herbaceous fuel from native species of grasses and / or forbs to carry fire in El Nino years or after unusually wet summers. The natural incidence of fire in this MLRA is very low and fires are much more common from man-made ignitions. Areas of the site close to urban zones or along heavily travelled roads and highways will experience a higher rate of fires.

State 3
Exotic perennial grasses with natives

Community 3.1
Exotic perennial grasses with natives

This community occurs where bufflegrass and / or fountain grass invade the native plant community. These species occupy the niches of low shrubs like desert zinnia, brittlebush and grasses like red grama and slim tridens.

State 4
Exotic perennial grasses and fire

Community 4.1
Exotic perennial grasses and fire

This community occurs where a native plant community that has been invaded by bufflegrass or fountain grass has burned one or more times. Increasing amounts of bufflegrass leads to more uniform fine fuels. In areas adjacent to roads and urban areas the risk of repeated fires will increase. As fire frequency increases the dominance of the exotic grasses increase.

State 5
Native plant community with exotic annuals

Community 5.1
Native plant community with exotic annuals

This plant community occurs where the native community has been invaded by red brome and / or schismus. Red brome occupies the niche of the native winter annual forbs and grasses. This exotic annual grass will fluctuate from nearly nothing in a dry winter to dominance of the understory plant community in a El Nino winter.

State 6
Exotic annuals and fire

Community 6.1
Exotic annuals and fire

This plant community occurs where a native plant community which has been invaded by red brome and / or schismus, and has burned repeatedly. As fires become more frequent the native trees, shrubs and succulents are removed from the plant community and red brome becomes dominant. In areas of the site near urban areas and along heavily travelled roads this will be a more common occurence due to an increased source of ignitions.

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 grasses**			6–112	
	slim tridens	TRMU	*Tridens muticus*	1–39	–
	blue threeawn	ARPUN	*Aristida purpurea var. nealleyi*	1–34	–
	bush muhly	MUPO2	*Muhlenbergia porteri*	1–34	–
	red grama	BOTR2	*Bouteloua trifida*	0–28	–
	low woollygrass	DAPU7	*Dasyochloa pulchella*	1–28	–
	black grama	BOER4	*Bouteloua eriopoda*	0–22	–
	nineawn pappusgrass	ENDE	*Enneapogon desvauxii*	1–17	–
	purple threeawn	ARPU9	*Aristida purpurea*	0–11	–
	slender grama	BORE2	*Bouteloua repens*	0–6	–
	Hall's panicgrass	PAHA	*Panicum hallii*	0–6	–
2	**Miscellaneous perennial grasses**			0–28	
	sideoats grama	BOCU	*Bouteloua curtipendula*	0–11	–
	tanglehead	HECO10	*Heteropogon contortus*	0–11	–
	plains bristlegrass	SEVU2	*Setaria vulpiseta*	0–6	–
	Parish's threeawn	ARPUP5	*Aristida purpurea var. parishii*	0–6	–
	Wright's threeawn	ARPUW	*Aristida purpurea var. wrightii*	0–6	–
	spidergrass	ARTE3	*Aristida ternipes*	0–6	–
	cane bluestem	BOBA3	*Bothriochloa barbinodis*	0–2	–
	Arizona cottontop	DICA8	*Digitaria californica*	0–2	–
	squirreltail	ELELE	*Elymus elymoides ssp. elymoides*	0–2	–
	desert needlegrass	ACSP12	*Achnatherum speciosum*	0–2	–
	Havard's threeawn	ARHA3	*Aristida havardii*	0–2	–
	spike dropseed	SPCO4	*Sporobolus contractus*	0–2	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	0–2	–
3	**Annual grasses**			0–50	
	sixweeks threeawn	ARAD	*Aristida adscensionis*	0–11	–
	mucronate sprangeltop	LEPAB	*Leptochloa panicea ssp. brachiata*	0–11	–
	Rothrock's grama	BORO2	*Bouteloua rothrockii*	0–11	–
	sixweeks fescue	VUOC	*Vulpia octoflora*	0–11	–
	prairie threeawn	AROL	*Aristida oligantha*	0–6	–
	delicate muhly	MUFR	*Muhlenbergia fragilis*	0–3	–
	littleseed muhly	MUMI	*Muhlenbergia microsperma*	0–3	–
	Bigelow's bluegrass	POBI	*Poa bigelovii*	0–2	–
	Arizona signalgrass	URAR	*Urochloa arizonica*	0–2	–

	desert lovegrass	ERPEM	*Eragrostis pectinacea var. miserrima*	0–2	–
	Arizona brome	BRAR4	*Bromus arizonicus*	0–1	–
	needle grama	BOAR	*Bouteloua aristidoides*	0–1	–
	sixweeks grama	BOBA2	*Bouteloua barbata*	0–1	–
Forb					
4	**Dominant perennial forbs**			11–56	
	paleface	HIDE	*Hibiscus denudatus*	1–17	–
	slender janusia	JAGR	*Janusia gracilis*	2–17	–
	Parry's false prairie-clover	MAPA7	*Marina parryi*	1–11	–
	rough menodora	MESC	*Menodora scabra*	0–11	–
	glandleaf milkwort	POMA7	*Polygala macradenia*	1–11	–
	trailing windmills	ALIN	*Allionia incarnata*	1–11	–
	desert globemallow	SPAM2	*Sphaeralcea ambigua*	1–11	–
	desert marigold	BAMU	*Baileya multiradiata*	1–6	–
	leatherweed	CRPOP	*Croton pottsii var. pottsii*	1–6	–
	lacy tansyaster	MAPIP4	*Machaeranthera pinnatifida ssp. pinnatifida var. pinnatifida*	1–6	–
	Coues' cassia	SECO10	*Senna covesii*	0–3	–
	desert trumpet	ERIN4	*Eriogonum inflatum*	1–3	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	0–3	–
	dense ayenia	AYMI	*Ayenia microphylla*	0–3	–
	New Mexico silverbush	ARNE2	*Argythamnia neomexicana*	0–2	–
	weakleaf bur ragweed	AMCO3	*Ambrosia confertiflora*	0–2	–
	narrowleaf silverbush	ARLA12	*Argythamnia lanceolata*	0–2	–
	California fagonbush	FALA	*Fagonia laevis*	0–2	–
	Parry's beardtongue	PEPA24	*Penstemon parryi*	0–2	–
	slender poreleaf	POGR5	*Porophyllum gracile*	0–2	–
	brownplume wirelettuce	STPA4	*Stephanomeria pauciflora*	0–2	–
	plains blackfoot	MELE2	*Melampodium leucanthum*	0–1	–
	scarlet spiderling	BOCO	*Boerhavia coccinea*	0–1	–
5	**Ferns and fern allies**			8–62	
	Arizona spikemoss	SEAR2	*Selaginella arizonica*	6–34	–
	lipfern	CHEIL	*Cheilanthes*	1–11	–
	cliffbrake	PELLA	*Pellaea*	1–11	–
	cloak fern	NOTHO	*Notholaena*	0–6	–
6	**Annual forbs and minor perennials**			1–73	
	phacelia	PHACE	*Phacelia*	0–17	–
	desert Indianwheat	PLOV	*Plantago ovata*	0–11	–
	lyreleaf jewelflower	STCA5	*Streptanthus carinatus*	0–11	–
	western tansymustard	DEPI	*Descurainia pinnata*	0–11	–
	cryptantha	CRYPT	*Cryptantha*	0–11	–
	California poppy	ESCAM	*Eschscholzia californica ssp. mexicana*	0–11	–
	Gordon's bladderpod	LEGO	*Lesquerella gordonii*	0–11	–

	Coulter's lupine	LUSP2	*Lupinus sparsiflorus*	0–11	–
	exserted Indian paintbrush	CAEXE	*Castilleja exserta ssp. exserta*	0–11	–
	shaggyfruit pepperweed	LELA	*Lepidium lasiocarpum*	0–6	–
	hairy prairie clover	DAMO	*Dalea mollis*	0–6	–
	thelypody	THELY	*Thelypodium*	0–6	–
	Texas stork's bill	ERTE13	*Erodium texanum*	0–6	–
	chia	SACO6	*Salvia columbariae*	0–2	–
	American wild carrot	DAPU3	*Daucus pusillus*	0–2	–
	wishbone-bush	MILAV	*Mirabilis laevis var. villosa*	0–2	–
	Florida pellitory	PAFL3	*Parietaria floridana*	0–1	–
	whitestem blazingstar	MEAL6	*Mentzelia albicaulis*	0–1	–
	foothill deervetch	LOHU2	*Lotus humistratus*	0–1	–
	Mexican fireplant	EUHE4	*Euphorbia heterophylla*	0–1	–
	Parish's larkspur	DEPAP3	*Delphinium parishii ssp. parishii*	0–1	–
	bluedicks	DICAC5	*Dichelostemma capitatum ssp. capitatum*	0–1	–
	flatcrown buckwheat	ERDE6	*Eriogonum deflexum*	0–1	–
	sleepy silene	SIAN2	*Silene antirrhina*	0–1	–
	slimjim bean	PHFI3	*Phaseolus filiformis*	0–1	–
	Arizona popcornflower	PLAR	*Plagiobothrys arizonicus*	0–1	–
	woolly tidestromia	TILA2	*Tidestromia lanuginosa*	0–1	–
	pricklyleaf dogweed	THAC	*Thymophylla acerosa*	0–1	–
	sand fringepod	THCU	*Thysanocarpus curvipes*	0–1	–
	desert mariposa lily	CAKE	*Calochortus kennedyi*	0–1	–
	whitemargin sandmat	CHAL11	*Chamaesyce albomarginata*	0–1	–
	brittle spineflower	CHBR	*Chorizanthe brevicornu*	0–1	–
	hyssopleaf sandmat	CHHY3	*Chamaesyce hyssopifolia*	0–1	–
	Palmer's Indian mallow	ABPA	*Abutilon palmeri*	0–1	–
	brownfoot	ACWR5	*Acourtia wrightii*	0–1	–
	San Felipe dogweed	ADPO	*Adenophyllum porophylloides*	0–1	–
	tuber anemone	ANTU	*Anemone tuberosa*	0–1	–
	rockcress	ARABI2	*Arabis*	0–1	–
	aster	ASTER	*Aster*	0–1	–
	hairyseed bahia	BAAB	*Bahia absinthifolia*	0–1	–
	Coulter's spiderling	BOCO2	*Boerhavia coulteri*	0–1	–
	hoary bowlesia	BOIN3	*Bowlesia incana*	0–1	–
	Arizona wrightwort	CAAR7	*Carlowrightia arizonica*	0–1	–
Shrub/Vine					
7	**Dominant low shrubs**			45–163	
	desert zinnia	ZIAC	*Zinnia acerosa*	22–45	–
	mariola	PAIN2	*Parthenium incanum*	17–34	–
	woody crinklemat	TICAC	*Tiquilia canescens var. canescens*	6–28	–
	white ratany	KRGR	*Krameria grayi*	6–28	–
	fairyduster	CAER	*Calliandra eriophylla*	1–23	

	fairyduster	CAER	*Calliandra eriophylla*	1–22	–
	featherplume	DAFO	*Dalea formosa*	1–11	–
	brittlebush	ENFA	*Encelia farinosa*	0–11	–
	whitestem paperflower	PSCO2	*Psilostrophe cooperi*	1–11	–
	littleleaf ratany	KRER	*Krameria erecta*	1–11	–
	pelotazo	ABIN	*Abutilon incanum*	0–11	–
	triangle bur ragweed	AMDE4	*Ambrosia deltoidea*	0–11	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	0–2	–
	American threefold	TRCA8	*Trixis californica*	0–2	–
8	**Dominant large shrubs**			45–112	
	ocotillo	FOSP2	*Fouquieria splendens*	17–56	–
	whitethorn acacia	ACCO2	*Acacia constricta*	11–34	–
	creosote bush	LATRT	*Larrea tridentata var. tridentata*	11–28	–
	jojoba	SICH	*Simmondsia chinensis*	0–22	–
9	**Miscellaneous shrubs**			6–28	
	Wright's beebrush	ALWR	*Aloysia wrightii*	1–11	–
	Nevada jointfir	EPNE	*Ephedra nevadensis*	0–2	–
	fourwing saltbush	ATCA2	*Atriplex canescens*	0–2	–
	Warnock's snakewood	COWA	*Condalia warnockii*	1–2	–
	Rio Grande saddlebush	MOSC	*Mortonia scabrella*	0–2	–
	Parish's goldeneye	VIPA14	*Viguiera parishii*	0–2	–
	lotebush	ZIOB	*Ziziphus obtusifolia*	0–1	–
	littleleaf sumac	RHMI3	*Rhus microphylla*	0–1	–
	spiny hackberry	CEEH	*Celtis ehrenbergiana*	0–1	–
	javelina bush	COER5	*Condalia ericoides*	0–1	–
	knifeleaf condalia	COSP3	*Condalia spathulata*	0–1	–
	desert lavender	HYEM	*Hyptis emoryi*	0–1	–
	sangre de cristo	JACA2	*Jatropha cardiophylla*	0–1	–
	water jacket	LYAN	*Lycium andersonii*	0–1	–
	Arizona desert-thorn	LYEX	*Lycium exsertum*	0–1	–
	algerita	MATR3	*Mahonia trifoliolata*	0–1	–
	catclaw acacia	ACGR	*Acacia greggii*	0–1	–
10	**Succulents**			17–84	
	saguaro	CAGI10	*Carnegiea gigantea*	1–22	–
	buck-horn cholla	CYAC8	*Cylindropuntia acanthocarpa*	1–17	–
	teddybear cholla	CYBI9	*Cylindropuntia bigelovii*	0–11	–
	cactus apple	OPEN3	*Opuntia engelmannii*	1–11	–
	purple pricklypear	OPMA8	*Opuntia macrocentra*	0–11	–
	tulip pricklypear	OPPH	*Opuntia phaeacantha*	1–11	–
	banana yucca	YUBA	*Yucca baccata*	1–6	–
	Nichol's echinocactus	ECHON	*Echinocactus horizonthalonius var. nicholii*	0–6	–
	Bigelow's nolina	NOBI	*Nolina bigelovii*	0–6	–
	jumping cholla	CYFU10	*Cylindropuntia fulgida*	0–6	–
	Christmas cactus	CYLE8	*Cylindropuntia leptocaulis*	1–6	–

	staghorn cholla	CYVE3	*Cylindropuntia versicolor*	0–6	–
	common sotol	DAWH2	*Dasylirion wheeleri*	1–6	–
	desert agave	AGDE	*Agave deserti*	0–6	–
	Schott's century plant	AGSC3	*Agave schottii*	0–6	–
	California barrel cactus	FECY	*Ferocactus cylindraceus*	0–2	–
	Emory's barrel cactus	FEEM	*Ferocactus emoryi*	0–2	–
	candy barrelcactus	FEWI	*Ferocactus wislizeni*	0–2	–
	Graham's nipple cactus	MAGR9	*Mammillaria grahamii*	0–1	–
	Thornber's nipple cactus	MATH	*Mammillaria thornberi*	0–1	–
	rainbow cactus	ECPE	*Echinocereus pectinatus*	0–1	–
	desert woollystar	ERER2	*Eriastrum eremicum*	0–1	–
	spinystar	ESVIV	*Escobaria vivipara var. vivipara*	0–1	–
	Scheer's beehive cactus	COROS	*Coryphantha robustispina ssp. scheeri*	0–1	–
	Engelmann's hedgehog cactus	ECEN	*Echinocereus engelmannii*	0–1	–
	redspine fishhook cactus	ECER2	*Echinomastus erectocentrus*	0–1	–
Tree					
11	**Trees**			56–168	
	yellow paloverde	PAMI5	*Parkinsonia microphylla*	56–168	–
	velvet mesquite	PRVE	*Prosopis velutina*	0–11	–
	Arizona rosewood	VACA5	*Vauquelinia californica*	0–11	–
	oneseed juniper	JUMO	*Juniperus monosperma*	0–11	–
	desert ironwood	OLTE	*Olneya tesota*	0–11	–

Animal community

Herbaceous forage produced on this site is less palatable than that of other hill sites because high pH (due to lime) ties up essential plant nutrients and the very droughty soils make for a short green season. The plant community has a good variety of perennial grasses and low browse species for year-round use but steep, rocky slopes hinder utilization in the heat of summer. The site is best suited to cool season use with dry cows or stocker types. Slope aspect affects both the intensity of utilization as well as seasonal use patterns. South facing slopes are used more in winter due to warm temperatures and early greenup. North aspects, being shaded and cooler, are used more in the fall due to the longer green periods for forage species. This site tends to be dry even in the winter when other hill sites have canyon water.

Water developments are very important to wildlife on this site. Cover, forage plant diversity, and topography are good enough to make this site home to a wide variety of wildlife including the large desert mammals.

Hydrological functions

This site is a fair producer of runoff due to steep slopes and shallow soils. Very gravelly and cobbly soil surfaces tend to hold water on the site. In areas with lots of rock outcrop there is a potential to develop water sources using rock catchments.

Recreational uses

Hunting, hiking, bird watching, photography, horseback riding, rock hounding, fossil collecting

Wood products

Some paloverde, ironwood and mesquite for camp-fires and branding fires.

Other products

Stones and cobbles; limestone for cement and flux. Saguaro ribs, cholla skeletons and rosewood. Tradtional foods like saguaro fruits, prickly pear tunas, cactus flower buds and jojoba nuts. Traditional herbs like coyote tobacco, mint bush, club moss, croton, creosotebush and limberbush.

Inventory data references

Range 417s include 2 in good condition

Type locality

Location 1: Pima County, AZ	
Township/Range/Section	T12S R9E S36
General legal description	Tucson Field Office: Waterman Mountains NW 1/4 sec. 36
Location 2: Pima County, AZ	
Township/Range/Section	T9S R12E S22
General legal description	Sells Field Office: Vekol Mountains NE 1/4 sec. 22
Location 3: Pima County, AZ	
Township/Range/Section	T10S R17E S244
General legal description	Tucson Field Office: Magma Copper Co Lime Quarry SE 1/4 sec. 244

Contributors

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Rangeland health reference sheet

Interpreting Indicators of Rangeland Health is a qualitative assessment protocol used to determine ecosystem condition based on benchmark characteristics described in the Reference Sheet. A suite of 17 (or more) indicators are typically considered in an assessment. The ecological site(s) representative of an assessment location must be known prior to applying the protocol and must be verified based on soils and climate. Current plant community cannot be used to identify the ecological site.

Author(s)/participant(s)	Dave Womack, Dan Robinett, Emilio Carrillo
Contact for lead author	NRCS Tucson Area Office
Date	03/07/2005
Approved by	S. Cassady
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** Rills are present on this site but seem to follow bedding planes, joints and fractures in the bedrock parent materials.

2. **Presence of water flow patterns:** Uncommon; probably cover no more than 10% of the area; discontinuous, usually less than 10-15 feet in length

3. **Number and height of erosional pedestals or terracettes:** Pedestals are uncommon on perennial grass and shrubs; terracettes uncommon.

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** 10-15%

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):** most litter size classes stay in place

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** 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 thir platy to weak granular; color is 7.5-10YR6/4 dry; 7.5-10YR4/4 moist; thickness to 1 inch.

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** canopy 15-25%, 70-80% of canopy cover is shrubs, 5% trees, and 10-15% succulents, 1-2% perennial grass. Cover is well dispersed throughout the 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: subshrubs > shrubs & trees > annual grasses & forbs > succulents = perennial forbs = perennial grasses.

    Sub-dominant:

    Other:

Additional:

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

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

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 173 lbs/ac unfavorable precipitation; 500 lbs/ac normal precipitaton; 840 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:** bufflegrass, whitethorn, mesquite, prickly pear, cane cholla & ocotillo may increase

17. **Perennial plant reproductive capability:** not impaired for shrubs, drought impaired for perennial grasses and forbs.