USDA Natural Resources
Conservation Service

Ecological site R040XA101AZ
Basalt Hills 10"-13" p.z.

Accessed: 05/11/2025

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.

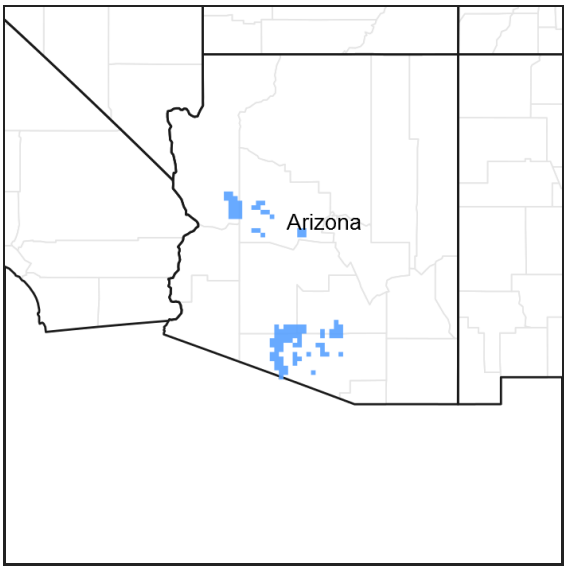

Figure 1. Mapped extent

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

R040XA105AZ	**Shallow Hills 10"-13" p.z.**
R040XA110AZ	**Limy Slopes 10"-13" p.z.**
R040XA111AZ	**Limy Upland 10"-13" p.z.**
R040XA123AZ	**Volcanic Hills 10"-13" P.Z.**

Similar sites

R040XA123AZ	**Volcanic Hills 10"-13" P.Z.**
R041XB223AZ	**Basalt Hills 8-12" p.z.**
R040XB201AZ	**Basalt Hills 7"-10" p.z.**

Table 1. Dominant plant species

Tree	(1) *Parkinsonia microphylla* (2) *Carnegia gigantea*
Shrub	(1) *Encelia farinosa* (2) *Fouquieria splendens*
Herbaceous	(1) *Muhlenbergia porteri*

Physiographic features

This site occurs in the upper elevations of the Sonoran Desert in southern Arizona. It occurs on hill-slopes, ridge-tops and mesas. Slope aspect is site differentiating at elevations near common resource area boundaries.

Table 2. Representative physiographic features

Landforms	(1) Hill (2) Ridge (3) Mesa
Flooding frequency	None
Ponding frequency	None
Elevation	2,200–4,000 ft
Slope	15–60%
Aspect	N, E, S

Climatic features

Precipitation in the common 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)	13 in

Influencing water features

There are no water features associated with this site.

Soil features

These are shallow soils formed on basic igneous parent material (Basalt) and related conglomerates. Bedrock is hard and unweathered. They are calcareous loams with extremely well developed, very dark colored, cobble and stone covers (malapais). Large area of talus or rock slides occur intermingled with soil areas. Rock outcrops make up from 5-20% of the area. Plants-soil moisture relationships are fair. Soils mapped on this site are: SSA-627 Southern Mohave County MU's Akela-1 & 8; SSA-637 Western Yavapai County MU's House Mountain-HmE & Graham-GsE, Rn; SSA-653 Gila Bend-Ajo area MU Winkel-26; SSA-659 Western Pinal County MU Akela-1, ; SSA-661 Eastern Pinal-Southern Gila Counties MU Lehmans-208, ; SSA-703 Tohono O'odham area MU's Delthorny-18 & Garzona-18.

Table 4. Representative soil features

Surface texture	(1) Very cobbly sandy loam (2) Very gravelly sandy loam (3) Cobbly loam
Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Moderately rapid to moderate
Soil depth	5–20 in
Surface fragment cover <=3"	40–60%
Surface fragment cover >3"	20–40%
Available water capacity (0-40in)	0.6–2.3 in
Calcium carbonate equivalent (0-40in)	3–15%
Electrical conductivity (0-40in)	0–2 mmhos/cm
Sodium adsorption ratio (0-40in)	0–2
Soil reaction (1:1 water) (0-40in)	7.6–8.2
Subsurface fragment volume <=3" (Depth not specified)	35–65%
Subsurface fragment volume >3" (Depth not specified)	5–40%

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

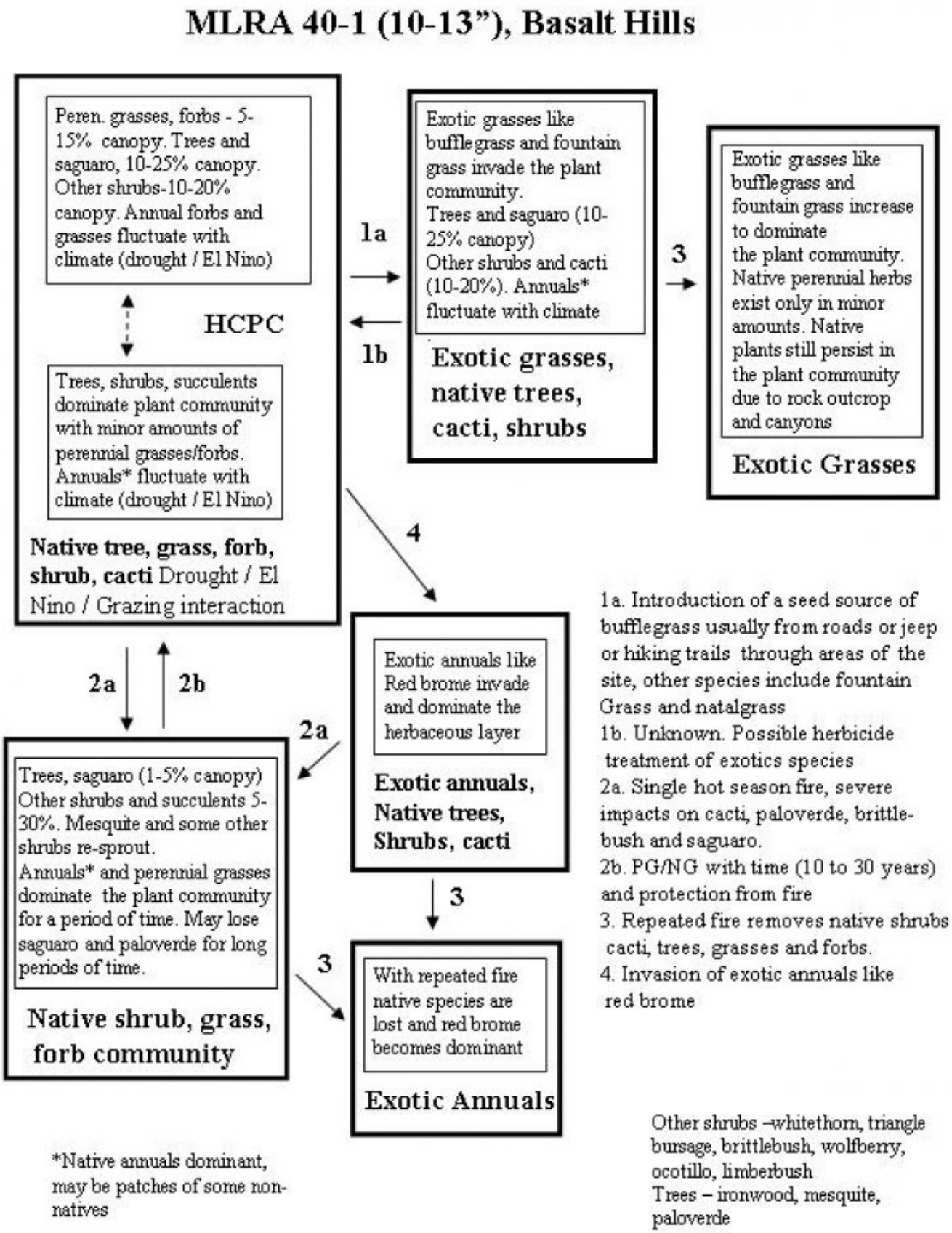

Figure 4. State and Transition, Basalt Hills 10-13" pz.

State 1
Historic Climax Plant Community

Community 1.1
Historic Climax Plant Community

The Historic Native State includes the native plant communities that occur on the site, including the historic climax plant community. This state includes other plant communities that naturally occupy the site following drought and other natural disturbances. This plant community is a diverse mixture of desert trees, shrubs, cacti, grasses and forbs. Annuals, of both the winter and summer types, are very important in their respective seasons in wet years. North exposures have a higher percentage cover of perennial grasses and forbs than warm exposures. Grass cover ranges from 0-5% on north slopes and 0-1% on south slopes. Suffrutescent forb cover ranges from 1-25% on north slopes and 0-5% on south slopes. Warm exposures have a higher percentage of trees and succulents than north slopes. The half shrub community on north slopes is dominated by species like calliandra, goldeneye, mint bush and mormon tea while on south slopes brittlebush, ratany, limberbush and bursage are dominant. North aspects will have a higher cover of whitethorn while southern aspects will have more creosotebush. The percent of annual forbs and grasses in the plant community can range from 5% in dry years to nearly 70% in very wet winters or summers. The yearly production of annuals ranges from 20 lbs per acre to over 1500 lbs. per acre (from dry year to wet year). Severe drought can reduce the cover of perennial grasses and suffrutescent forbs to less than 1%. Drought can also reduce the cover of sub-shrubs like brittlebush and bursage. 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 (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	10	75	690
Forb	16	50	570
Shrub/Vine	100	450	540
Tree	80	200	300
Total	**206**	**775**	**2100**

Table 6. Soil surface cover

Tree basal cover	1%
Shrub/vine/liana basal cover	1-5%
Grass/grasslike basal cover	0-1%
Forb basal cover	0-1%
Non-vascular plants	0%
Biological crusts	0-5%
Litter	5-50%
Surface fragments >0.25" and <=3"	20-60%
Surface fragments >3"	25-60%
Bedrock	1-5%
Water	0%
Bare ground	5-35%

Table 7. Canopy structure (% cover)

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

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 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 bursage and brittlebush 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 brittlebush or triangle bursage. They may even result in mortality of large shrubs and cacti like paloverde, prickly pear and cholla.

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. 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 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 (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	**Dominant perennial grasses**			7–150	
	bush muhly	MUPO2	*Muhlenbergia porteri*	5–100	–
	spidergrass	ARTE3	*Aristida ternipes*	1–30	–
	spidergrass	ARTEG	*Aristida ternipes var. gentilis*	0–30	–
	tobosagrass	PLMU3	*Pleuraphis mutica*	0–30	–
	big galleta	PLRI3	*Pleuraphis rigida*	0–30	–
	slim tridens	TRMU	*Tridens muticus*	1–20	–
	Parish's threeawn	ARPUP5	*Aristida purpurea var. parishii*	0–20	–
	blue threeawn	ARPUN	*Aristida purpurea var. nealleyi*	0–10	–
	Arizona cottontop	DICA8	*Digitaria californica*	0–10	–
2	**Misc perennial grasses**			1–40	
	sideoats grama	BOCU	*Bouteloua curtipendula*	0–15	–
	black grama	BOER4	*Bouteloua eriopoda*	0–15	–
	slender grama	BORE2	*Bouteloua repens*	0–15	–
	purple threeawn	ARPU9	*Aristida purpurea*	0–10	–
	Wright's threeawn	ARPUW	*Aristida purpurea var. wrightii*	0–10	–
	cane bluestem	BOBA3	*Bothriochloa barbinodis*	0–5	–
	low woollygrass	DAPU7	*Dasyochloa pulchella*	0–5	–
	nineawn pappusgrass	ENDE	*Enneapogon desvauxii*	0–5	–
	tanglehead	HECO10	*Heteropogon contortus*	1–5	–
	Hall's panicgrass	PAHA	*Panicum hallii*	0–5	–
	southwestern	SESC2	*Setaria scheelei*	0–5	–

	bristlegrass				
	plains bristlegrass	SEVU2	*Setaria vulpiseta*	0–5	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	0–2	–
	squirreltail	ELEL5	*Elymus elymoides*	0–1	–
3	**Annual grasses**			5–500	
	mucronate sprangeltop	LEPAB	*Leptochloa panicea ssp. brachiata*	1–400	–
	sixweeks threeawn	ARAD	*Aristida adscensionis*	1–200	–
	Mexican panicgrass	PAHI5	*Panicum hirticaule*	1–200	–
	sixweeks grama	BOBA2	*Bouteloua barbata*	0–100	–
	Rothrock's grama	BORO2	*Bouteloua rothrockii*	0–15	–
	needle grama	BOAR	*Bouteloua aristidoides*	0–15	–
	sixweeks fescue	VUOC	*Vulpia octoflora*	0–10	–
	prairie threeawn	AROL	*Aristida oligantha*	0–5	–
	Mexican sprangletop	LEFUU	*Leptochloa fusca ssp. uninervia*	0–5	–
	Arizona brome	BRAR4	*Bromus arizonicus*	0–5	–
	delicate muhly	MUFR	*Muhlenbergia fragilis*	0–3	–
	Eastwood fescue	VUMIC	*Vulpia microstachys var. ciliata*	0–3	–
	littleseed muhly	MUMI	*Muhlenbergia microsperma*	0–3	–
	witchgrass	PACA6	*Panicum capillare*	0–3	–
	Bigelow's bluegrass	POBI	*Poa bigelovii*	0–2	–
	Arizona signalgrass	URAR	*Urochloa arizonica*	0–2	–
	canyon cupgrass	ERLE7	*Eriochloa lemmonii*	0–2	–
	desert lovegrass	ERPEM	*Eragrostis pectinacea var. miserrima*	0–2	–
	tufted lovegrass	ERPEP2	*Eragrostis pectinacea var. pectinacea*	0–2	–
Forb					
4	**Dominant perennial forbs**			15–70	
	desert globemallow	SPAM2	*Sphaeralcea ambigua*	1–25	–
	slender janusia	JAGR	*Janusia gracilis*	1–15	–
	trailing windmills	ALIN	*Allionia incarnata*	1–10	–
	narrowleaf silverbush	ARLA12	*Argythamnia lanceolata*	1–10	–
	rough menodora	MESC	*Menodora scabra*	1–10	–
	wishbone-bush	MILAV	*Mirabilis laevis var. villosa*	0–5	–
	brownplume wirelettuce	STPA4	*Stephanomeria pauciflora*	0–5	–
	longflower tube tongue	JULO3	*Justicia longii*	0–5	–
	Parry's false prairie-clover	MAPA7	*Marina parryi*	0–5	–
	Chihuahua tansyaster	MAPIC	*Machaeranthera pinnatifida ssp. pinnatifida var. chihuahuana*	0–5	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	0–5	–
	weakleaf bur ragweed	AMCO3	*Ambrosia confertiflora*	1–5	–
5	**Annual forbs and trace perennials**			5–500	
	California poppy	ESCAM	*Eschscholzia californica ssp. mexicana*	0–150	–
	goosefoot	CHENO	*Chenopodium*	0–100	–
	Arizona poppy	KAGR	*Kallstroemia grandiflora*	0–100	–
	Coulter's spiderling	BOCO2	*Boerhavia coulteri*	0–100	–

	Coulter's lupine	LUSP2	*Lupinus sparsiflorus*	0–100	–
	phacelia	PHACE	*Phacelia*	0–100	–
	desert Indianwheat	PLOV	*Plantago ovata*	1–100	–
	thelypody	THELY	*Thelypodium*	0–100	–
	shaggyfruit pepperweed	LELA	*Lepidium lasiocarpum*	0–50	–
	Emory's rockdaisy	PEEM	*Perityle emoryi*	0–25	–
	combseed	PECTO	*Pectocarya*	0–15	–
	milkvetch	ASTRA	*Astragalus*	0–15	–
	western tansymustard	DEPI	*Descurainia pinnata*	0–15	–
	cryptantha	CRYPT	*Cryptantha*	0–10	–
	carelessweed	AMPA	*Amaranthus palmeri*	0–10	–
	bristly fiddleneck	AMTE3	*Amsinckia tessellata*	0–10	–
	woolly tidestromia	TILA2	*Tidestromia lanuginosa*	0–10	–
	Coulter's globemallow	SPCO2	*Sphaeralcea coulteri*	0–5	–
	lyreleaf jewelflower	STCA5	*Streptanthus carinatus*	0–5	–
	slender poreleaf	POGR5	*Porophyllum gracile*	0–5	–
	cliffbrake	PELLA	*Pellaea*	0–5	–
	Coulter's lyrepod	LYCO4	*Lyrocarpa coulteri*	0–5	–
	coastal bird's-foot trefoil	LOSA	*Lotus salsuginosus*	0–5	–
	Gordon's bladderpod	LEGO	*Lesquerella gordonii*	0–5	–
	green carpetweed	MOVE	*Mollugo verticillata*	0–5	–
	bristly nama	NAHI	*Nama hispidum*	0–5	–
	glandular threadplant	NEGL	*Nemacladus glanduliferus*	0–5	–
	fringepod	THYSA	*Thysanocarpus*	0–5	–
	brownfoot	ACWR5	*Acourtia wrightii*	0–5	–
	poreleaf dogweed	ADPO2	*Adenophyllum porophyllum*	0–5	–
	hoary bowlesia	BOIN3	*Bowlesia incana*	0–5	–
	Tucson Mountain spiderling	BOME	*Boerhavia megaptera*	0–5	–
	exserted Indian paintbrush	CAEXE	*Castilleja exserta ssp. exserta*	0–5	–
	whitemargin sandmat	CHAL11	*Chamaesyce albomarginata*	0–5	–
	brittle spineflower	CHBR	*Chorizanthe brevicornu*	0–5	–
	lipfern	CHEIL	*Cheilanthes*	0–5	–
	hairy prairie clover	DAMO	*Dalea mollis*	0–5	–
	American wild carrot	DAPU3	*Daucus pusillus*	0–5	–
	hyssopleaf sandmat	CHHY3	*Chamaesyce hyssopifolia*	0–5	–
	scarlet spiderling	BOCO	*Boerhavia coccinea*	0–5	–
	New Mexico thistle	CINE	*Cirsium neomexicanum*	0–5	–
	beetle spurge	EUER2	*Euphorbia eriantha*	0–5	–
	bluedicks	DICA14	*Dichelostemma capitatum*	0–5	–
	flatcrown buckwheat	ERDE6	*Eriogonum deflexum*	0–5	–
	spreading fleabane	ERDI4	*Erigeron divergens*	0–5	–
	buckwheat	ERIOG	*Eriogonum*	0–5	

	buckwheat	ERIOG	*Eriogonum*	0–5	–
	woollyhead neststraw	STMI2	*Stylocline micropoides*	0–3	–
	Coues' cassia	SECO10	*Senna covesii*	0–2	–
	sleepy silene	SIAN2	*Silene antirrhina*	0–2	–
	cloak fern	NOTHO	*Notholaena*	0–2	–
	Florida pellitory	PAFL3	*Parietaria floridana*	0–2	–
	Parry's beardtongue	PEPA24	*Penstemon parryi*	0–1	–
	evening primrose	OENOT	*Oenothera*	0–1	–
	whitestem blazingstar	MEAL6	*Mentzelia albicaulis*	0–1	–
	desert tobacco	NIOBO	*Nicotiana obtusifolia var. obtusifolia*	0–1	–
	polygala	POLYG	*Polygala*	0–1	–
	chia	SACO6	*Salvia columbariae*	0–1	–
	woolly plantain	PLPA2	*Plantago patagonica*	0–1	–
	Arizona popcornflower	PLAR	*Plagiobothrys arizonicus*	0–1	–
	sand fringepod	THCU	*Thysanocarpus curvipes*	0–1	–
	branched noseburn	TRRA5	*Tragia ramosa*	0–1	–
	fringed twinevine	FUCY	*Funastrum cynanchoides*	0–1	–
	desert rosemallow	HICO	*Hibiscus coulteri*	0–1	–
	devil's spineflower	CHRI	*Chorizanthe rigida*	0–1	–
	desert larkspur	DEPA	*Delphinium parishii*	0–1	–
	tall mountain larkspur	DESC	*Delphinium scaposum*	0–1	–
	Arizona wrightwort	CAAR7	*Carlowrightia arizonica*	0–1	–
	common fiddleneck	AMMEI2	*Amsinckia menziesii var. intermedia*	0–1	–
	desert marigold	BAMU	*Baileya multiradiata*	0–1	–
	New Mexico silverbush	ARNE2	*Argythamnia neomexicana*	0–1	–
	perennial rockcress	ARPE2	*Arabis perennans*	0–1	–
	Palmer's Indian mallow	ABPA	*Abutilon palmeri*	0–1	–
	angel's trumpets	ACLO2	*Acleisanthes longiflora*	0–1	–
Shrub/Vine					
6	**Dominant shrubs**			25–160	
	triangle bur ragweed	AMDE4	*Ambrosia deltoidea*	10–150	–
	brittlebush	ENFA	*Encelia farinosa*	15–150	–
7	**Miscellaneous shrubs**			10–140	
	triangle bur ragweed	AMDE4	*Ambrosia deltoidea*	18–36	–
	brittlebush	ENFA	*Encelia farinosa*	18–36	–
	Parish's goldeneye	VIPA14	*Viguiera parishii*	1–20	–
	white ratany	KRGR	*Krameria grayi*	1–10	–
	whitestem paperflower	PSCO2	*Psilostrophe cooperi*	0–10	–
	fourwing saltbush	ATCA2	*Atriplex canescens*	0–10	–
	cattle saltbush	ATPO	*Atriplex polycarpa*	0–10	–
	spiny hackberry	CEEH	*Celtis ehrenbergiana*	0–10	–
	Nevada jointfir	EPNE	*Ephedra nevadensis*	0–5	–
	Eastern Mojave buckwheat	ERFA2	*Eriogonum fasciculatum*	0–5	–
	Coulter's brickellbush	BRCO	*Brickellia coulteri*	1–5	

	Coulter's brickellbush	BRCO	*Brickellia coulteri*	1–5	–
	fairyduster	CAER	*Calliandra eriophylla*	0–5	–
	starry bedstraw	GAST	*Galium stellatum*	0–5	–
	sweetbush	BEJU	*Bebbia juncea*	0–5	–
	catclaw acacia	ACGR	*Acacia greggii*	0–5	–
	Arizona mimosa	MIDIL	*Mimosa distachya var. laxiflora*	0–5	–
	littleleaf ratany	KRER	*Krameria erecta*	0–5	–
	arrow poision plant	SEBI9	*Sebastiania bilocularis*	0–5	–
	jojoba	SICH	*Simmondsia chinensis*	0–5	–
	American threefold	TRCA8	*Trixis californica*	1–5	–
	lotebush	ZIOB	*Ziziphus obtusifolia*	0–3	–
	Mexican bladdersage	SAME	*Salazaria mexicana*	0–3	–
	desert lavender	HYEM	*Hyptis emoryi*	0–3	–
	knifeleaf condalia	COSP3	*Condalia spathulata*	0–2	–
	ragged rockflower	CRBI2	*Crossosoma bigelovii*	0–2	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	0–2	–
	slender janusia	JAGR	*Janusia gracilis*	0–2	–
	rough menodora	MESC	*Menodora scabra*	0–2	–
	woody crinklemat	TICAC	*Tiquilia canescens var. canescens*	0–2	–
	Mojave woodyaster	XYTOT	*Xylorhiza tortifolia var. tortifolia*	0–1	–
	lacy tansyaster	MAPIP4	*Machaeranthera pinnatifida ssp. pinnatifida var. pinnatifida*	0–1	–
	bush arrowleaf	PLPL	*Pleurocoronis pluriseta*	0–1	–
	slender poreleaf	POGR5	*Porophyllum gracile*	0–1	–
	sangre de cristo	JACA2	*Jatropha cardiophylla*	0–1	–
	wand fleabane	EROX2	*Erigeron oxyphyllus*	0–1	–
	Mexican croton	CRCI	*Croton ciliatoglandulifer*	0–1	–
	Sonoran croton	CRSO	*Croton sonorae*	0–1	–
	featherplume	DAFO	*Dalea formosa*	0–1	–
	spearleaf brickellbush	BRAT	*Brickellia atractyloides*	0–1	–
	desertbroom	BASA2	*Baccharis sarothroides*	0–1	–
	narrowleaf silverbush	ARLA12	*Argythamnia lanceolata*	0–1	–
	pelotazo	ABIN	*Abutilon incanum*	0–1	–
	California copperleaf	ACCA3	*Acalypha californica*	0–1	–
8	**Dominant large shrubs**			20–100	
	whitethorn acacia	ACCO2	*Acacia constricta*	5–25	–
	ocotillo	FOSP2	*Fouquieria splendens*	1–25	–
	creosote bush	LATR2	*Larrea tridentata*	5–25	–
	Berlandier's wolfberry	LYBE	*Lycium berlandieri*	1–15	–
	Wright's beebrush	ALWR	*Aloysia wrightii*	1–15	–
	Arizona desert-thorn	LYEX	*Lycium exsertum*	1–10	–
	banana yucca	YUBA	*Yucca baccata*	1–5	–
	water jacket	LYAN	*Lycium andersonii*	0–5	–
9	**Succulents**			15–140	
	saguaro	CAGI10	*Carnegiea gigantea*	1–50	

	saguaro	CAGI10	*Carnegiea gigantea*	1–30	–
	ocotillo	FOSP2	*Fouquieria splendens*	5–20	–
	cactus apple	OPEN3	*Opuntia engelmannii*	1–20	–
	staghorn cholla	CYVE3	*Cylindropuntia versicolor*	1–15	–
	teddybear cholla	CYBI9	*Cylindropuntia bigelovii*	0–10	–
	organpipe cactus	STTH3	*Stenocereus thurberi*	0–10	–
	desert agave	AGDE	*Agave deserti*	0–10	–
	buck-horn cholla	CYAC8	*Cylindropuntia acanthocarpa*	0–5	–
	banana yucca	YUBA	*Yucca baccata*	0–5	–
	candy barrelcactus	FEWI	*Ferocactus wislizeni*	1–5	–
	dollarjoint pricklypear	OPCH	*Opuntia chlorotica*	0–5	–
	jumping cholla	CYFU10	*Cylindropuntia fulgida*	0–5	–
	Christmas cactus	CYLE8	*Cylindropuntia leptocaulis*	1–5	–
	Graham's nipple cactus	MAGR9	*Mammillaria grahamii*	0–1	–
	Engelmann's hedgehog cactus	ECEN	*Echinocereus engelmannii*	0–1	–
	pinkflower hedgehog cactus	ECFA	*Echinocereus fasciculatus*	0–1	–
	rainbow cactus	ECPE	*Echinocereus pectinatus*	0–1	–
	spinystar	ESVIV	*Escobaria vivipara var. vivipara*	0–1	–
Tree					
10	**Native trees**			80–200	
	yellow paloverde	PAMI5	*Parkinsonia microphylla*	80–260	–
	velvet mesquite	PRVE	*Prosopis velutina*	0–20	–
	desert ironwood	OLTE	*Olneya tesota*	0–20	–

Animal community

Herbaceous forage production on this site is less palatable than on that of other hill sites because of high pH (lime) which ties up essential nutrients and makes soil water less available to plants. Steep slopes and extremely rough, cobbly surfaces hinder livestock distribution. This site is not well suited to grazing by cows in the hot season. Mother cow-pairs will only use 200 to 300 feet, up or down in elevation, from a water source in summer. Dry cows will use double that in the cool season. Stocker cattle are best suited to use this site. 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 spring greenup. North aspects, being shaded and cooler, are used more in the fall due to longer green periods for forage species. Seep and canyon water are available in the rainy seasons for short times. The plant community has a good variety of valuable browse species making it especially well suited for winter-spring grazing. Water developments are very important to wildlife on this site. Cover, forage diversity, and topography are good enough to make this site home to a variety of wildlife including the larger desert mammals. The desert tortoise dens on the cobble covered south slopes in the winter. Javalina and mule deer use north aspects extensively for herd bed areas.

Hydrological functions

This site is a fair producer of runoff due to steep slopes and shallow soils. Very cobbly soil surfaces tend to hold water on the site.

Recreational uses

Hunting, hiking, birdwatching, photography

Wood products

Very limited paloverde and mesquite for camp-fires and branding fires.

Other products

Malapais cobbles, saguaro ribs, cholla skeletons. Tradtional foods like saguaro fruits, prickly pear tunas, cactus flower buds. Traditional herbs like coyote tobacco, mint bush, creosote and limberbush.

Inventory data references

Range 417s include 8 in good to excellent condition.

Type locality

Location 1: Pima County, AZ	
Township/Range/Section	T11S R3W S17
General legal description	Sells Field Office - Sauceda Mountains
Location 2: Pima County, AZ	
Township/Range/Section	T17S R1W S31
General legal description	Sells Field Office - Mesquite Mountains
Location 3: Pima County, AZ	
Township/Range/Section	T17S R4E S6
General legal description	Sells Field Office - Bird Nest Hills
Location 4: Maricopa County, AZ	
Township/Range/Section	T7N R2W S8
General legal description	Buckeye Field Office - Sand Tank Mountains
Location 5: Maricopa County, AZ	
Township/Range/Section	T5N R2E S28
General legal description	Phoenix Field Office - Lockett Ranch
Location 6: Maricopa County, AZ	
Township/Range/Section	T1S R10E S9
General legal description	Chandler Field Office - Quarter Circle U Ranch
Location 7: Pima County, AZ	
Township/Range/Section	T14S R13E S15
General legal description	Tumamoc Hill, UA Desert Laboratory, Ungrazed since 1906, 536 acres private, 320 acres state land.

Other references

Vegetation change and plant demography in permanent plots in the Sonoran Desert. Deb Goldberg, Ray Turner. Ecology 67(3), 1986, pp. 695-712.

Effects of drought on shrub survival and longevity in the northern Sonoran Desert. Janice Bowers. Journal of the Torrey Botanical Society 132(3), 2005, pp. 421-431.

The Changing Mile Re-visited. Ray Turner, Robert Webb. University of Arizona press, 2003.

Exotic plants at the desert Laboratory, Tucson, Arizona. Tony Burgess, Janice Bowers and Ray Turner. Madrono, 38(2). 1991, pp. 96-114.

Contributors

C.M. Michaels
Dan Robinett
Larry D. Ellicott

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)	
Contact for lead author	
Date	
Approved by	
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:**

2. **Presence of water flow patterns:**

3. **Number and height of erosional pedestals or terracettes:**

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

5. **Number of gullies and erosion associated with gullies:**

6. **Extent of wind scoured, blowouts and/or depositional areas:**

7. **Amount of litter movement (describe size and distance expected to travel):**

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

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):**

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:**

11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):**

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:

    Sub-dominant:

    Other:

    Additional:

13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):**

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):**

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:**

17. **Perennial plant reproductive capability:**