

## Ecological site R041XC330AZ Volcanic Hills 12-16" p.z. Clayey

Accessed: 04/19/2024

### 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.

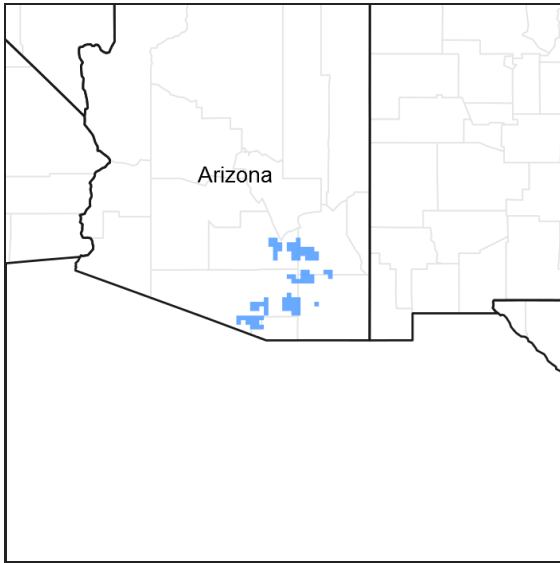


Figure 1. Mapped extent

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

## Similar sites

R041XA111AZ	<b>Volcanic Hills 16-20" p.z.</b>
R038XA117AZ	<b>Volcanic Hills 12-16" p.z. Clayey</b>
R041XB223AZ	<b>Basalt Hills 8-12" p.z.</b>
R038XB215AZ	<b>Clayey Hills 16-20" p.z.</b>

**Table 1. Dominant plant species**

Tree	Not specified
Shrub	(1) <i>erigonum wrightii</i>
Herbaceous	(1) <i>bouteloua curtipendula</i> (2) <i>pleuraphis mutica</i>

## Physiographic features

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

**Table 2. Representative physiographic features**

Landforms	(1) Hill (2) Ridge (3) Mesa
Elevation	1,067–1,676 m
Slope	15–70%
Aspect	N, E, S

## Climatic features

Precipitation in this common resource area ranges from 12-16 inches yearly in the eastern part with elevations from 3600-5000 feet, and 13-17 inches in the western part where elevations are 3300-4500 feet. Winter-Summer rainfall ratios are 40-60% in the west and 30-70% in the east. Summer rains fall July-September, originate in the Gulf of Mexico and are convective, usually brief, intense thunderstorms. Cool season moisture tends to be frontal, originates in the Pacific and Gulf of California, and falls in widespread storms with long duration and low intensity. Snow rarely lasts more than one day. May and June are the driest months of the year. Humidity is generally very low.

Temperatures are mild. Freezing temperatures are common at night from December-April; however temperatures during the day are frequently above 50 F. Occasionally in December-February, brief 0 F temperatures may be experienced some nights. During June, July and August, some days may exceed 100 F.

Cool season plants start growth in early spring and mature in early summer. Warm season plants take advantage of summer rains and are growing and nutritious July-September. Warm season grasses may remain green throughout the year.

**Table 3. Representative climatic features**

Frost-free period (average)	220 days
Freeze-free period (average)	0 days
Precipitation total (average)	406 mm

## Influencing water features

There are no water features associated with this site.

## Soil features

These are shallow soils formed on basic to intermediate igneous rocks like basalt and andesite. They are non-calcareous, clayey in texture and very dark colored. Some carbonates may be present at the bedrock contact. Bedrock is hard and un-weathered. Soil surfaces have well developed covers of dark colored gravels, stones and cobbles. Numerous areas of rock outcrop occur intermingled with soil areas. Plant - soil moisture relationships are good.

Soils mapped on this site include: SSA-661 E Pinal and S Gila counties MU's 19 Chiricahua & Delero, 37 38 & 39 Eskimizen; SSA-666 Cochise NW part MU 45 Graham.

**Table 4. Representative soil features**

Parent material	(1) Slope alluvium–quartzite
Family particle size	(1) Clayey
Drainage class	Well drained
Permeability class	Moderately slow to slow
Soil depth	25–51 cm
Surface fragment cover <=3"	25–50%
Surface fragment cover >3"	5–12%
Available water capacity (0-101.6cm)	2.54–6.1 cm
Calcium carbonate equivalent (0-101.6cm)	0–5%
Electrical conductivity (0-101.6cm)	0–2 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0–2
Soil reaction (1:1 water) (0-101.6cm)	6.6–8.4
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 community found on relict or relatively undisturbed areas of this site. Other plant communities described here represent plant communities that are known to occur when the site is disturbed by factors such as fire, grazing and 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.

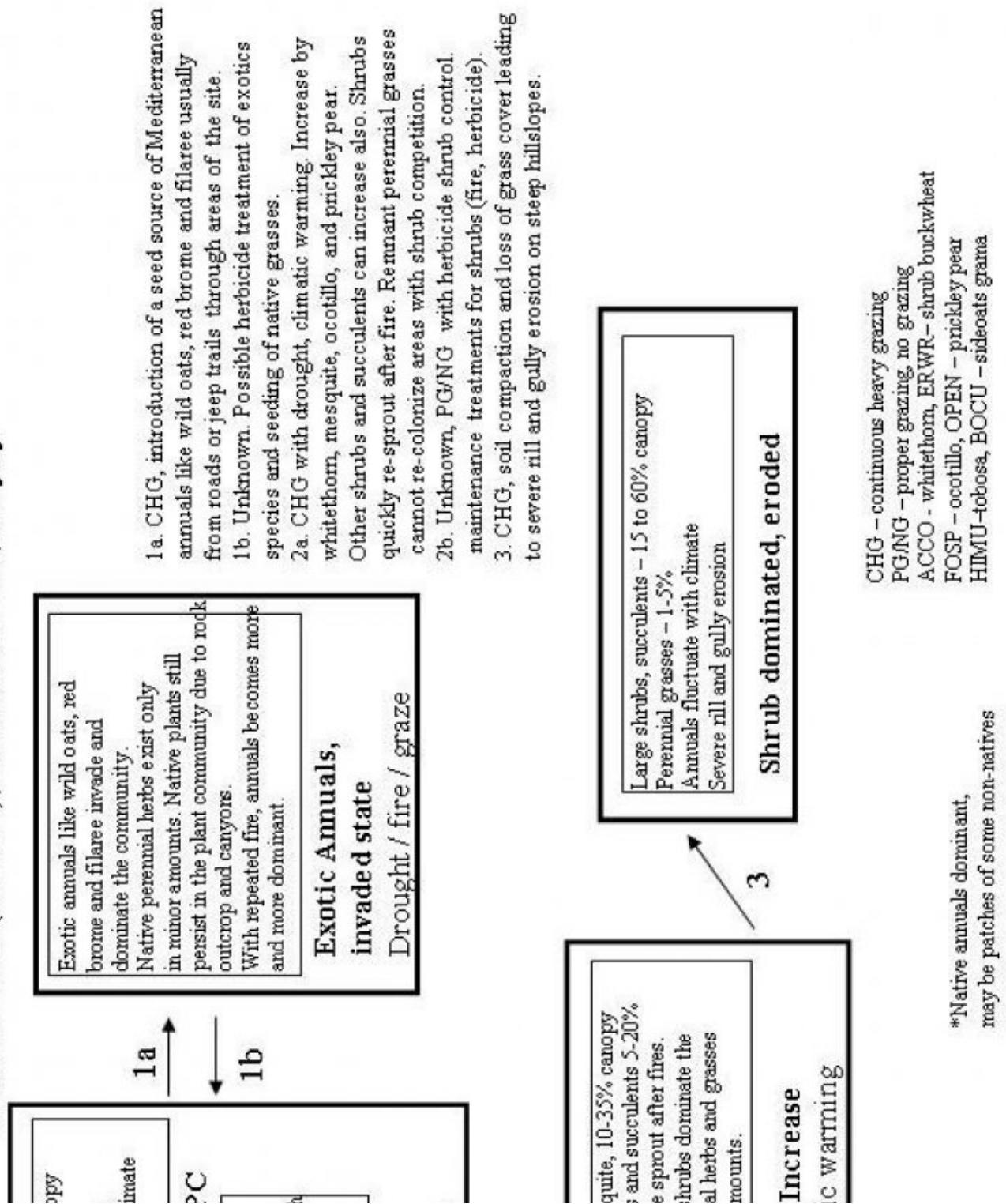
Similarity index is determined by comparing the production and composition of a plant community to the production and composition described in the site description. To determine similarity index, compare the production (air dry weight) of each species to that shown in the plant community description. For each species, count no more than the maximum amount shown for the species, and for each group, count no more than the amount shown for that group.

Divide the resulting total by the total, normal year, production shown in the plant community description. If the rainfall has been significantly above or below normal, use the total production shown for above or below normal years. If the field data is not collected at the end of the summer growing season, then the field data must be corrected to the end of year production before comparing it to the site description. The growth curve can be used as a guide for estimating production at the end of the summer growing season.

The historic native state includes the native plant communities that occur on the site, including the historic climax plant community. This state includes other plant communities that naturally occupy the site following fire, drought, flooding, herbivores and other natural disturbances. The historic climax plant community represents the natural climax community that eventually reoccupies the site with proper management and a return to near normal conditions and/or equilibrium.

## State and transition model

### MLRA 41-3 (12-16"), Volcanic Hills, clayey



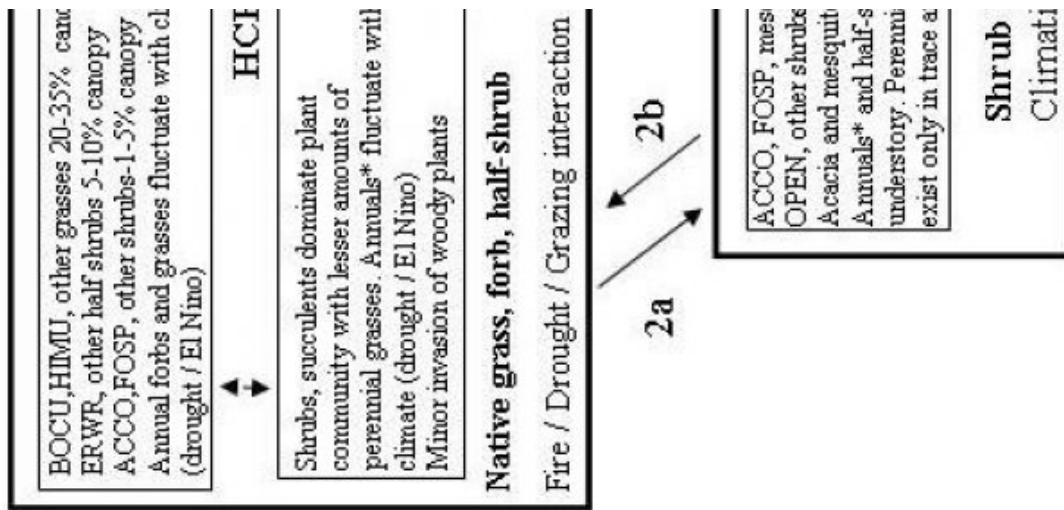


Figure 4. State and Transition, Volcanic Hills 12-16" p.z.,

**State 1**  
**Historic Climax Plant Community**

**Community 1.1**  
**Historic Climax Plant Community**

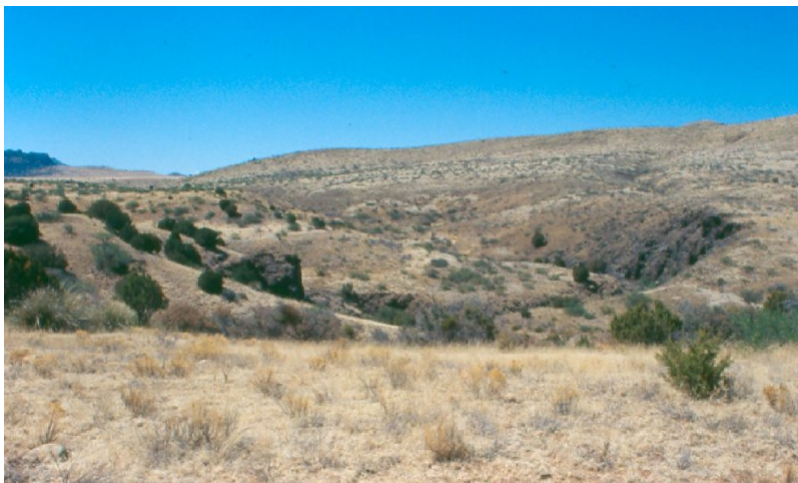


Figure 5. Volcanic Hills 12-16" p.z, clayey, HCPC

The potential plant community on this site is dominated by warm season perennial grasses and a variety of perennial forbs and half shrubs. Several species of shrubs and succulents are well represented on the site. Larger species of shrubs and low trees are concentrated along drainage ways and rock outcrops. In the absence of wildfire and/or with over grazing, shrubs increase to dominate the plant community. Well developed covers of gravels, stones and cobbles protect the soil from erosion and help protect forage species from overuse. Natural fires, with a frequency of about once in ten years, were important in shaping the potential plant community. Fire helps maintain a balance between grasses, forbs and shrubs. With continuous heavy grazing palatable forage species can diminish in the plant community and will be replaced by increases in shrubs, succulents and annuals. Areas of rock outcrop hold remnant perennial forage species that can reseed down slope as needed.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	448	897	1177
Shrub/Vine	67	168	286
Forb	22	67	280
Tree	–	11	34
<b>Total</b>	<b>537</b>	<b>1143</b>	<b>1777</b>

Table 6. Soil surface cover

Tree basal cover	0%
Shrub/vine/liana basal cover	0-1%
Grass/grasslike basal cover	4-10%
Forb basal cover	0-1%
Non-vascular plants	0-1%
Biological crusts	0-1%
Litter	25-55%
Surface fragments >0.25" and <=3"	25-60%
Surface fragments >3"	1-15%
Bedrock	0-10%
Water	0%
Bare ground	5-25%

Table 7. Canopy structure (% cover)

Height Above Ground (M)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.15	–	0-5%	1-10%	0-1%
>0.15 <= 0.3	–	5-10%	5-15%	1-5%
>0.3 <= 0.6	–	5-10%	15-30%	1-15%
>0.6 <= 1.4	–	0-5%	5-10%	0-5%
>1.4 <= 4	0-2%	0-5%	–	–
>4 <= 12	0-1%	–	–	–
>12 <= 24	–	–	–	–
>24 <= 37	–	–	–	–
>37	–	–	–	–

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

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

## State 2

### Exotic annual forbs and grasses

#### Community 2.1

## **Exotic annual forbs and grasses**

Non-native annual forbs and grasses like red brome, wild oats and filaree can dominate the herbaceous layer of the plant community. The interactions of fire, drought and continuous grazing cause the loss of perennial grasses and forbs. These exotic species may, over time, reduce the seed-bank of native species of grasses and forbs. Their presence may increase the frequency of man-made fires, especially where roads and urban areas are adjacent to the site.

### **State 3**

#### **Shrub increased**

#### **Community 3.1**

##### **Shrub increased**



**Figure 8. Volcanic Hills 12-16" pz, clayey, Shrub increase**

Perennial grass cover is reduced due to the interactions of drought, fire and continuous grazing. Native shrubs like mesquite, whitethorn, mimosa, ocotillo and succulents like prickly pear and cholla have increased in the absence of fire for long periods of time to dominate the plant community. Many of these species are vigorous sprouters after fire once they are well established. Climatic warming seems to be, at least part of the reason for increases in species like the mimosas and prickly pear.

### **State 4**

#### **Shrubby and eroded**

#### **Community 4.1**

##### **Shrubby and eroded**





Figure 9. Volcanic Hills 12-16" pz., clayey, eroded

Native shrubs like mesquite, whitethorn, juniper and mimosa with succulents like prickly pear and cholla dominate the plant community. Continuous heavy livestock grazing and trailing have caused severe soil compaction in accessible areas. The resulting increase and concentration in runoff has caused rills to form on the hill-slopes.

## Additional community tables

Table 8. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
<b>Grass/Grasslike</b>					
1	<b>Dominant Perennial Mid Grasses</b>			336–616	
	sideoats grama	BOCU	<i>Bouteloua curtipendula</i>	168–336	–
	plains lovegrass	ERIN	<i>Eragrostis intermedia</i>	56–168	–
	cane bluestem	BOBA3	<i>Bothriochloa barbinodis</i>	22–168	–
	green sprangletop	LEDU	<i>Leptochloa dubia</i>	17–112	–
	tobosagrass	PLMU3	<i>Pleuraphis mutica</i>	11–112	–
	tanglehead	HECO10	<i>Heteropogon contortus</i>	11–56	–
2	<b>Dominant Perennial Short Grasses</b>			90–280	
	black grama	BOER4	<i>Bouteloua eriopoda</i>	17–112	–
	hairy grama	BOHI2	<i>Bouteloua hirsuta</i>	17–84	–
	purple grama	BORA	<i>Bouteloua radicata</i>	11–56	–
	Hall's panicgrass	PAHA	<i>Panicum hallii</i>	11–56	–
	curly-mesquite	HIBE	<i>Hilaria belangeri</i>	17–56	–
	slender grama	BORE2	<i>Bouteloua repens</i>	6–28	–



	blue grama	BOGR2	<i>Bouteloua gracilis</i>	6–28	–
	common wolfstail	LYPH	<i>Lycurus phleoides</i>	0–22	–
	sprucetop grama	BOCH	<i>Bouteloua chondrosioides</i>	0–17	–
	fall witchgrass	DICO6	<i>Digitaria cognata</i>	1–11	–
3	<b>Perennial threeawns</b>			11–50	
	spidergrass	ARTE3	<i>Aristida ternipes</i>	6–34	–
	spidergrass	ARTEG	<i>Aristida ternipes</i> var. <i>gentilis</i>	0–17	–
	Orcutt's threeawn	ARSCO	<i>Aristida schiedeana</i> var. <i>orcuttiana</i>	0–17	–
	Parish's threeawn	ARPUP5	<i>Aristida purpurea</i> var. <i>parishii</i>	0–11	–
	Wright's threeawn	ARPUW	<i>Aristida purpurea</i> var. <i>wrightii</i>	0–11	–
	purple threeawn	ARPU9	<i>Aristida purpurea</i>	0–11	–
	Fendler threeawn	ARPUL	<i>Aristida purpurea</i> var. <i>longiseta</i>	0–11	–
	blue threeawn	ARPUN	<i>Aristida purpurea</i> var. <i>nealleyi</i>	0–6	–
	poverty threeawn	ARDI5	<i>Aristida divaricata</i>	0–2	–
	Havard's threeawn	ARHA3	<i>Aristida havardii</i>	0–2	–
	Wooton's threeawn	ARPA9	<i>Aristida pansa</i>	0–2	–
4	<b>Miscellaneous Perennial grasses</b>			6–56	
	squirreltail	ELEL5	<i>Elymus elymoides</i>	1–22	–
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	0–17	–
	bullgrass	MUEM	<i>Muhlenbergia emersleyi</i>	1–17	–
	bush muhly	MUPO2	<i>Muhlenbergia porteri</i>	0–17	–
	vine mesquite	PAOB	<i>Panicum obtusum</i>	1–17	–
	southwestern bristlegrass	SESC2	<i>Setaria scheelei</i>	1–17	–
	sand dropseed	SPCR	<i>Sporobolus cryptandrus</i>	0–11	–
	slim tridens	TRMU	<i>Tridens muticus</i>	0–11	–
	spiked crinkleawn	TRSP12	<i>Trachypogon spicatus</i>	0–11	–
	Rothrock's grama	BORO2	<i>Bouteloua rothrockii</i>	0–11	–
	silver bluestem	BOSA	<i>Bothriochloa saccharoides</i>	0–6	–
	Mexican gamagrass	TRLA11	<i>Tripsacum lanceolatum</i>	0–6	–
	plains bristlegrass	SEVU2	<i>Setaria vulpiseta</i>	0–6	–
	Texas bluestem	SCCI2	<i>Schizachyrium cirratum</i>	0–6	–
	deergrass	MURI2	<i>Muhlenbergia rigens</i>	0–2	–
	bulb panicgrass	PABU	<i>Panicum bulbosum</i>	0–2	–
	nineawn pappusgrass	ENDE	<i>Enneapogon desvauxii</i>	0–2	–
	sedge	CAREX	<i>Carex</i>	0–2	–
	low woollygrass	DAPU7	<i>Dasyochloa pulchella</i>	0–2	–
	Arizona cottontop	DICA8	<i>Digitaria californica</i>	0–2	–
	sourgrass	DIIN2	<i>Digitaria insularis</i>	0–2	–
	woolyspike balsamscale	ELBA	<i>Elionurus barbiculmis</i>	0–2	–
5	<b>Annual Grasses</b>			11–168	
	Mexican panicgrass	PAHI5	<i>Panicum hirticaule</i>	1–56	–
	Mexican sprangletop	LEFUU	<i>Leptochloa fusca</i> ssp. <i>uninervia</i>	1–34	–
	mucronate sprangletop	LEPAB	<i>Leptochloa panicea</i> ssp. <i>brachiata</i>	1–34	–
	little barley	HOPI1	<i>Hordeum pusillum</i>	1–28	–

	Eastwood fescue	VUMIC	<i>Vulpia microstachys</i> var. <i>ciliata</i>	1–22	–
	desert fescue	VUMIM	<i>Vulpia microstachys</i> var. <i>microstachys</i>	1–22	–
	sixweeks fescue	VUOC	<i>Vulpia octoflora</i>	1–22	–
	Arizona signalgrass	URAR	<i>Urochloa arizonica</i>	1–17	–
	sixweeks threeawn	ARAD	<i>Aristida adscensionis</i>	1–11	–
	prairie threeawn	AROL	<i>Aristida oligantha</i>	1–11	–
	needle grama	BOAR	<i>Bouteloua aristoides</i>	0–6	–
	Bigelow's bluegrass	POBI	<i>Poa bigelovii</i>	0–6	–
	delicate muhly	MUFR	<i>Muhlenbergia fragilis</i>	0–6	–
	littleseed muhly	MUMI	<i>Muhlenbergia microsperma</i>	0–6	–
	witchgrass	PACA6	<i>Panicum capillare</i>	0–6	–
	Arizona brome	BRAR4	<i>Bromus arizonicus</i>	0–2	–
	feather fingergrass	CHVI4	<i>Chloris virgata</i>	0–2	–
	tapertip cupgrass	ERACA	<i>Eriochloa acuminata</i> var. <i>acuminata</i>	0–2	–
	Mexican lovegrass	ERME	<i>Eragrostis mexicana</i>	0–2	–
	desert lovegrass	ERPEM	<i>Eragrostis pectinacea</i> var. <i>miserrima</i>	0–2	–
	tufted lovegrass	ERPEP2	<i>Eragrostis pectinacea</i> var. <i>pectinacea</i>	0–2	–
	fragilegrass	AETE	<i>Aegopogon tenellus</i>	0–2	–
	sixweeks grama	BOBA2	<i>Bouteloua barbata</i>	0–1	–
<b>Forb</b>					
6	<b>Perennial Forbs</b>			11–112	
	largeflower onion	ALMA4	<i>Allium macropetalum</i>	0–28	–
	white sagebrush	ARLU	<i>Artemisia ludoviciana</i>	1–17	–
	slender janusia	JAGR	<i>Janusia gracilis</i>	1–17	–
	desert globemallow	SPAM2	<i>Sphaeralcea ambigua</i>	1–17	–
	brownplume wirelettuce	STPA4	<i>Stephanomeria pauciflora</i>	1–11	–
	American vetch	VIAM	<i>Vicia americana</i>	1–11	–
	Louisiana vetch	VILUL2	<i>Vicia ludoviciana</i> ssp. <i>ludoviciana</i>	0–11	–
	longflower tube tongue	JULO3	<i>Justicia longii</i>	0–11	–
	Trans-Pecos thimblehead	HYWI	<i>Hymenothrix wislizeni</i>	0–11	–
	Wright's deervetch	LOWR	<i>Lotus wrightii</i>	1–11	–
	weakleaf bur ragweed	AMCO3	<i>Ambrosia confertiflora</i>	1–11	–
	climbing wartclub	BOSC	<i>Boerhavia scandens</i>	0–11	–
	bluedicks	DICA14	<i>Dichelostemma capitatum</i>	1–11	–
	whitemouth dayflower	COER	<i>Commelina erecta</i>	0–6	–
	Arizona wrightwort	CAAR7	<i>Carlowrightia arizonica</i>	0–6	–
	tuber anemone	ANTU	<i>Anemone tuberosa</i>	1–6	–
	tarragon	ARDR4	<i>Artemisia dracunculus</i>	0–6	–
	Palmer's Indian mallow	ABPA	<i>Abutilon palmeri</i>	0–6	–
	brownfoot	ACWR5	<i>Acourtia wrightii</i>	0–6	–
	trailing windmills	ALIN	<i>Allionia incarnata</i>	1–6	–
	perennial rockcress	ARPE2	<i>Arabis perennans</i>	1–6	–
	plains blackfoot	MELE2	<i>Melampodium leucanthum</i>	1–6	–

wishbone-bush	MILAV	<i>Mirabilis laevis var. villosa</i>	0-6	-
cliffbrake	PELLA	<i>Pellaea</i>	1-6	-
Parry's beardtongue	PEPA24	<i>Penstemon parryi</i>	1-6	-
desert penstemon	PEPS	<i>Penstemon pseudospectabilis</i>	0-6	-
Lewis flax	LILE3	<i>Linum lewisii</i>	0-6	-
desert rosemallow	HICO	<i>Hibiscus coulteri</i>	0-6	-
fineleaf hymenopappus	HYFIL	<i>Hymenopappus filifolius var. lugens</i>	0-6	-
beeblossom	GAURA	<i>Gaura</i>	0-6	-
southwestern mock vervain	GLGO	<i>Glandularia gooddingii</i>	0-6	-
scarlet spiderling	BOCO	<i>Boerhavia coccinea</i>	0-6	-
hairy false goldenaster	HEVIM3	<i>Heterotheca villosa var. minor</i>	0-6	-
shrubby deervetch	LORI3	<i>Lotus rigidus</i>	0-6	-
slender poreleaf	POGR5	<i>Porophyllum gracile</i>	0-2	-
Wright's cudweed	PSCAC2	<i>Pseudognaphalium canescens ssp. canescens</i>	0-2	-
Arizona rosemallow	HIBI	<i>Hibiscus biseptus</i>	0-2	-
Arizona snakecotton	FRAR2	<i>Froelichia arizonica</i>	0-2	-
pearly globe amaranth	GONI	<i>Gomphrena nitida</i>	0-2	-
Palmer's penstemon	PEPA8	<i>Penstemon palmeri</i>	0-2	-
desert tobacco	NIOB	<i>Nicotiana obtusifolia</i>	0-2	-
cloak fern	NOTHO	<i>Notholaena</i>	0-2	-
Greene's bird's-foot trefoil	LOGR4	<i>Lotus greenei</i>	0-2	-
desert marigold	BAMU	<i>Baileya multiradiata</i>	0-2	-
San Felipe dogweed	ADPO	<i>Adenophyllum porophylloides</i>	0-2	-
Indian paintbrush	CASTI2	<i>Castilleja</i>	0-2	-
lipfern	CHEIL	<i>Cheilanthes</i>	0-2	-
Cooley's bundleflower	DECO2	<i>Desmanthus cooleyi</i>	0-2	-
spreading fleabane	ERDI4	<i>Erigeron divergens</i>	0-2	-
trailing fleabane	ERFL	<i>Erigeron flagellaris</i>	0-2	-
wild dwarf morning-glory	EVAR	<i>Evolvulus arizonicus</i>	0-1	-
spreading snakeherb	DYSCD	<i>Dyschoriste schiedeana var. decumbens</i>	0-1	-
desert larkspur	DEPA	<i>Delphinium parishii</i>	0-1	-
leatherweed	CRPO5	<i>Croton pottsii</i>	0-1	-
rose heath	CHER2	<i>Chaetopappa ericoides</i>	0-1	-
mala mujer	CNAN	<i>Cnidoscolus angustidens</i>	0-1	-
desert mariposa lily	CAKE	<i>Calochortus kennedyi</i>	0-1	-
sego lily	CANU3	<i>Calochortus nuttallii</i>	0-1	-
dwarf desertpeony	ACNA2	<i>Acourtia nana</i>	0-1	-
Mexican yellowshow	AMPA3	<i>Amoreuxia palmatifida</i>	0-1	-
New Mexico silverbush	ARNE2	<i>Argythamnia neomexicana</i>	0-1	-
Watson's dutchman's pipe	ARWA	<i>Aristolochia watsonii</i>	0-1	-
chaparral asphhead	ASHI3	<i>Aspicarpa hirtella</i>	0-1	-

	dense ayenia	AYMI	<i>Ayenia microphylla</i>	0-1	-
	hairyseed bahia	BAAB	<i>Bahia absinthifolia</i>	0-1	-
	roving sailor	MAAN9	<i>Maurandella antirrhiniflora</i>	0-1	-
	tufted evening primrose	OECA10	<i>Oenothera caespitosa</i>	0-1	-
	firecracker penstemon	PEEA	<i>Penstemon eatonii</i>	0-1	-
	variableleaf bushbean	MAGI2	<i>Macroptilium gibbosifolium</i>	0-1	-
	lacy tansyaster	MAPI	<i>Machaeranthera pinnatifida</i>	0-1	-
	slimleaf bean	PHAN3	<i>Phaseolus angustissimus</i>	0-1	-
	orange fameflower	PHAU13	<i>Phemeranthus aurantiacus</i>	0-1	-
	ivyleaf groundcherry	PHHE4	<i>Physalis hederifolia</i>	0-1	-
	Thurber's cotton	GOTH	<i>Gossypium thurberi</i>	0-1	-
	ragged nettlespurge	JAMA	<i>Jatropha macrorhiza</i>	0-1	-
	fernleaf biscuitroot	LODI	<i>Lomatium dissectum</i>	0-1	-
	San Pedro daisy	LAPO4	<i>Lasianthaea podocephala</i>	0-1	-
	narrowleaf stoneseed	LIIN2	<i>Lithospermum incisum</i>	0-1	-
	slimflower scurfpea	PSTE5	<i>Psoralidium tenuiflorum</i>	0-1	-
	twinleaf senna	SEBA3	<i>Senna bauhinioides</i>	0-1	-
	Coues' cassia	SECO10	<i>Senna covesii</i>	0-1	-
	Lemmon's ragwort	SELE8	<i>Senecio lemmonii</i>	0-1	-
	New Mexico fanpetals	SINE	<i>Sida neomexicana</i>	0-1	-
	silverleaf nightshade	SOEL	<i>Solanum elaeagnifolium</i>	0-1	-
	velvetseed milkwort	POOB	<i>Polygala obscura</i>	0-1	-
	shrubby purslane	POSU3	<i>Portulaca suffrutescens</i>	0-1	-
	gooseberryleaf globemallow	SPGR2	<i>Sphaeralcea grossulariifolia</i>	0-1	-
	jewels of Opar	TAPA2	<i>Talinum paniculatum</i>	0-1	-
	hairy fourwort	TENE	<i>Tetramerium nervosum</i>	0-1	-
	branched noseburn	TRRA5	<i>Tragia ramosa</i>	0-1	-
7	<b>Annual Forbs</b>			11-168	
	longleaf false goldeneye	HELOA2	<i>Heliomeris longifolia</i> var. <i>annua</i>	1-56	-
	California poppy	ESCAM	<i>Eschscholzia californica</i> ssp. <i>mexicana</i>	0-50	-
	milkvetch	ASTRA	<i>Astragalus</i>	0-22	-
	goosefoot	CHENO	<i>Chenopodium</i>	0-22	-
	sensitive partridge pea	CHNI2	<i>Chamaecrista nictitans</i>	1-17	-
	Arizona poppy	KAGR	<i>Kallstroemia grandiflora</i>	0-17	-
	Coulter's lupine	LUSP2	<i>Lupinus sparsiflorus</i>	0-17	-
	minerslettuce	MONTI	<i>Montia</i>	0-17	-
	slender goldenweed	MAGR10	<i>Machaeranthera gracilis</i>	1-11	-
	tanseyleaf tansyaster	MATA2	<i>Machaeranthera tanacetifolia</i>	1-11	-
	phacelia	PHACE	<i>Phacelia</i>	0-11	-
	foothill deervetch	LOHU2	<i>Lotus humistratus</i>	0-11	-
	coastal bird's-foot trefoil	LOSAB	<i>Lotus salsuginosus</i> var. <i>brevivexillus</i>	0-11	-
	fewflower beggarticks	BILE	<i>Bidens leptcephala</i>	0-11	-
	western tansymustard	DEPI	<i>Descurainia pinnata</i>	1-11	-

	carelessweed	AMPA	<i>Amaranthus palmeri</i>	0–11	–
	bristly fiddleneck	AMTE3	<i>Amsinckia tessellata</i>	0–6	–
	New Mexico copperleaf	ACNE	<i>Acalypha neomexicana</i>	0–6	–
	sorrel buckwheat	ERPO4	<i>Eriogonum polycladon</i>	0–6	–
	Coulter's spiderling	BOCO2	<i>Boerhavia coulteri</i>	0–6	–
	New Mexico thistle	CINE	<i>Cirsium neomexicanum</i>	0–6	–
	Arizona lupine	LUAR4	<i>Lupinus arizonicus</i>	0–6	–
	Thurber's morning-glory	IPTH	<i>Ipomoea thurberi</i>	0–6	–
	longleaf false goldeneye	HELOL	<i>Heliomeris longifolia</i> var. <i>longifolia</i>	0–6	–
	camphorweed	HESU3	<i>Heterotheca subaxillaris</i>	0–6	–
	crestrub morning-glory	IPCO2	<i>Ipomoea costellata</i>	0–6	–
	intermediate pepperweed	LEVIM	<i>Lepidium virginicum</i> var. <i>medium</i>	0–6	–
	desert Indianwheat	PLOV	<i>Plantago ovata</i>	0–6	–
	woolly plantain	PLPA2	<i>Plantago patagonica</i>	0–6	–
	whitestem blazingstar	MEAL6	<i>Mentzelia albicaulis</i>	0–6	–
	sweet four o'clock	MILO2	<i>Mirabilis longiflora</i>	0–6	–
	woolly tidestromia	TILA2	<i>Tidestromia lanuginosa</i>	0–6	–
	sawtooth sage	SASU7	<i>Salvia subincisa</i>	0–6	–
	spreading fanpetals	SIAB	<i>Sida abutifolia</i>	1–6	–
	streamside bur cucumber	SIAM	<i>Sicyos ampelophyllus</i>	0–6	–
	sleepy silene	SIAN2	<i>Silene antirrhina</i>	0–6	–
	cutleaf bur cucumber	SILA	<i>Sicyos laciniatus</i>	0–6	–
	sand fringe-pod	THCU	<i>Thysanocarpus curvipes</i>	0–2	–
	Florida pellitory	PAFL3	<i>Parietaria floridana</i>	0–2	–
	combseed	PECTO	<i>Pectocarya</i>	0–2	–
	chia	SACO6	<i>Salvia columbariae</i>	0–2	–
	Arizona popcornflower	PLAR	<i>Plagiobothrys arizonicus</i>	0–2	–
	redstar	IPCO3	<i>Ipomoea coccinea</i>	0–2	–
	star gilia	GIST	<i>Gilia stellata</i>	0–2	–
	pearly globe amaranth	GONI	<i>Gomphrena nitida</i>	0–2	–
	American wild carrot	DAPU3	<i>Daucus pusillus</i>	0–2	–
	warty caltrop	KAPA	<i>Kallstroemia parviflora</i>	0–2	–
	shaggyfruit pepperweed	LELA	<i>Lepidium lasiocarpum</i>	0–2	–
	Fendler's desertydandelion	MAFE	<i>Malacothrix fendleri</i>	0–2	–
	fringed redmaids	CACI2	<i>Calandrinia ciliata</i>	0–2	–
	wedgeleaf draba	DRCU	<i>Draba cuneifolia</i>	0–2	–
	sanddune wallflower	ERCA14	<i>Erysimum capitatum</i>	0–1	–
	miniature woollystar	ERDI2	<i>Eriastrum diffusum</i>	0–1	–
	Texas stork's bill	ERTE13	<i>Erodium texanum</i>	0–1	–
	scrambled eggs	COAU2	<i>Corydalis aurea</i>	0–1	–
	hoary bowlesia	BOIN3	<i>Bowlesia incana</i>	0–1	–
	wheelscale saltbush	ATEL	<i>Atriplex elegans</i>	0–1	–
	spurge	EUPHO	<i>Euphorbia</i>	0–1	–

	desert unicorn-plant	PRAL4	<i>Proboscidea althaeitolia</i>	0-1	-
	doubleclaw	PRPA2	<i>Proboscidea parviflora</i>	0-1	-
	New Mexico plumeseed	RANE	<i>Rafinesquia neomexicana</i>	0-1	-
	green carpetweed	MOVE	<i>Mollugo verticillata</i>	0-1	-
	desert evening primrose	OEPR	<i>Oenothera primiveris</i>	0-1	-
	Arizona monardella	MOAR	<i>Monardella arizonica</i>	0-1	-
<b>Shrub/Vine</b>					
8	<b>Dominant Half Shrubs</b>			45-168	
	bastardsage	ERWR	<i>Eriogonum wrightii</i>	34-112	-
	rough menodora	MESC	<i>Menodora scabra</i>	1-28	-
	Schott's stickpea	ZAFOS	<i>Zapoteca formosa var. schottii</i>	1-28	-
	fairyduster	CAER	<i>Calliandra eriophylla</i>	6-28	-
	yerba de pasmo	BAPT	<i>Baccharis pteronioides</i>	0-11	-
	Coulter's brickellbush	BRCO	<i>Brickellia coulteri</i>	0-11	-
	pelotazo	ABIN	<i>Abutilon incanum</i>	0-11	-
	prairie acacia	ACAN	<i>Acacia angustissima</i>	0-6	-
	American threefold	TRCA8	<i>Trixis californica</i>	0-6	-
	littleleaf ratany	KRER	<i>Krameria erecta</i>	0-6	-
9	<b>Succulents</b>			11-62	
	Tahitian kidneywood	EYOR	<i>Eysenhardtia orthocarpa</i>	1-28	-
	ocotillo	FOSP2	<i>Fouquieria splendens</i>	1-28	-
	broom snakeweed	GUSA2	<i>Gutierrezia sarothrae</i>	1-22	-
	turpentine bush	ERLA12	<i>Ericameria laricifolia</i>	0-22	-
	desert lavender	HYEM	<i>Hyptis emoryi</i>	1-17	-
	sacahuista	NOMI	<i>Nolina microcarpa</i>	0-17	-
	jojoba	SICH	<i>Simmondsia chinensis</i>	0-17	-
	whitethorn acacia	ACCOC	<i>Acacia constricta var. constricta</i>	0-17	-
	whitethorn acacia	ACCOP9	<i>Acacia constricta var. paucispina</i>	0-17	-
	catclaw acacia	ACGRG3	<i>Acacia greggii var. greggii</i>	1-11	-
	Florida hopbush	DOVI	<i>Dodonaea viscosa</i>	0-11	-
	blue paloverde	PAFL6	<i>Parkinsonia florida</i>	0-11	-
	Sonoran scrub oak	QUTU2	<i>Quercus turbinella</i>	0-11	-
	catclaw mimosa	MIACB	<i>Mimosa aculeaticarpa var. biuncifera</i>	1-11	-
	velvetpod mimosa	MIDY	<i>Mimosa dysocarpa</i>	1-11	-
	winterfat	KRLA2	<i>Krascheninnikovia lanata</i>	0-6	-
	desert-thorn	LYCIU	<i>Lycium</i>	0-6	-
	algerita	MATR3	<i>Mahonia trifoliolata</i>	0-6	-
	physicnut	JACU	<i>Jatropha cuneata</i>	0-6	-
	desert olive	FOSH	<i>Forestiera shrevei</i>	0-6	-
	Apache plume	FAPA	<i>Fallugia paradoxa</i>	0-6	-
	gumhead	GYGL	<i>Gymnosperma glutinosum</i>	0-6	-
	skunkbush sumac	RHTR	<i>Rhus trilobata</i>	0-6	-
	heartleaf goldeneye	VICO	<i>Viguiera cordifolia</i>	0-6	-
	Parish's goldeneye	VIPA14	<i>Viguiera parishii</i>	0-6	-



	button brittlebush	ENFR	<i>Encelia frutescens</i>	0-6	-
	knifeleaf condalia	COSP3	<i>Condalia spathulata</i>	0-6	-
	Warnock's snakewood	COWA	<i>Condalia warnockii</i>	0-6	-
	Wright's beebrush	ALWR	<i>Aloysia wrightii</i>	0-6	-
	Thurber's desert honeysuckle	ANTH2	<i>Anisacanthus thurberi</i>	0-6	-
	fourwing saltbush	ATCA2	<i>Atriplex canescens</i>	0-6	-
	yerba de pasmo	BAPT	<i>Baccharis pteronioides</i>	0-6	-
	California brickellbush	BRCA3	<i>Brickellia californica</i>	0-6	-
	spiny hackberry	CEEH	<i>Celtis ehrenbergiana</i>	0-6	-
	javelina bush	COER5	<i>Condalia ericoides</i>	0-2	-
	desertbroom	BASA2	<i>Baccharis sarothroides</i>	0-2	-
	pointleaf manzanita	ARPU5	<i>Arctostaphylos pungens</i>	0-2	-
	Kearney's snakewood	COWAK	<i>Condalia warnockii</i> var. <i>kearneyana</i>	0-2	-
	ragged rockflower	CRBI2	<i>Crossosoma bigelovii</i>	0-2	-
	milfoil wattle	ACMI	<i>Acacia millefolia</i>	0-2	-
	evergreen sumac	RHVIC	<i>Rhus virens</i> var. <i>choriophylla</i>	0-2	-
	western soapberry	SASAD	<i>Sapindus saponaria</i> var. <i>drummondii</i>	0-2	-
	yellow trumpetbush	TEST	<i>Tecoma stans</i>	0-2	-
	cliff fendlerbush	FERU	<i>Fendlera rupicola</i>	0-2	-
	Arizona water-willow	JUCA9	<i>Justicia candidans</i>	0-2	-
	burroweed	ISTE2	<i>Isocoma tenuisecta</i>	0-2	-
	Graham's mimosa	MIGR2	<i>Mimosa grahamii</i>	0-2	-
	starry bedstraw	GAST	<i>Galium stellatum</i>	0-1	-
	whitestem paperflower	PSCO2	<i>Psilostrophe cooperi</i>	0-1	-
	lotebush	ZIOB	<i>Ziziphus obtusifolia</i>	0-1	-
	longleaf jointfir	EPTR	<i>Ephedra trifurca</i>	0-1	-
	brittlebush	ENFA	<i>Encelia farinosa</i>	0-1	-
	Gregg's prairie clover	DAGR2	<i>Dalea greggii</i>	0-1	-
	ambrosia leaf bur ragweed	AMAM2	<i>Ambrosia ambrosioides</i>	0-1	-
10	<b>Succulents</b>			11-62	
	cactus apple	OPEN3	<i>Opuntia engelmannii</i>	1-34	-
	Schott's century plant	AGSC3	<i>Agave schottii</i>	6-28	-
	Palmer's century plant	AGPA3	<i>Agave palmeri</i>	1-11	-
	sacahuista	NOMI	<i>Nolina microcarpa</i>	0-11	-
	candy barrelcactus	FEWI	<i>Ferocactus wislizeni</i>	1-6	-
	buck-horn cholla	CYAC8	<i>Cylindropuntia acanthocarpa</i>	1-6	-
	walkingstick cactus	CYSP8	<i>Cylindropuntia spinosior</i>	1-6	-
	tulip pricklypear	OPPH	<i>Opuntia phaeacantha</i>	0-6	-
	smallflower century plant	AGPA5	<i>Agave parviflora</i>	0-6	-
	Santa Rita pricklypear	OPSA	<i>Opuntia santa-rita</i>	0-2	-
	banana yucca	YUBA	<i>Yucca baccata</i>	0-2	-
	soaptree yucca	YUEL	<i>Yucca elata</i>	0-2	-

	purple pricklypear	OPMAM	<i>Opuntia macrocentra</i> var. <i>macrocentra</i>	0-2	-
	staghorn cholla	CYVE3	<i>Cylindropuntia versicolor</i>	0-2	-
	common sotol	DAWH2	<i>Dasyilirion wheeleri</i>	0-2	-
	jumping cholla	CYFU10	<i>Cylindropuntia fulgida</i>	0-2	-
	rainbow cactus	ECPE	<i>Echinocereus pectinatus</i>	1-2	-
	dollarjoint pricklypear	OPCH	<i>Opuntia chlorotica</i>	0-2	-
	Parry's agave	AGPA4	<i>Agave parryi</i>	0-2	-
	saguaro	CAGI10	<i>Carnegiea gigantea</i>	0-2	-
	desert agave	AGDE	<i>Agave deserti</i>	0-2	-
	Santa Cruz beehive cactus	CORE3	<i>Coryphantha recurvata</i>	0-1	-
	Graham's nipple cactus	MAGR9	<i>Mammillaria grahamii</i>	0-1	-
	little nipple cactus	MAHE2	<i>Mammillaria heyderi</i>	0-1	-
	spiny star	ESVI2	<i>Escobaria vivipara</i>	0-1	-
	Christmas cactus	CYLE8	<i>Cylindropuntia leptocaulis</i>	0-1	-
	pinkflower hedgehog cactus	ECBO2	<i>Echinocereus bonkeriae</i>	0-1	-
	scarlet hedgehog cactus	ECCO5	<i>Echinocereus coccineus</i>	0-1	-
	Engelmann's hedgehog cactus	ECEN	<i>Echinocereus engelmannii</i>	0-1	-
	pinkflower hedgehog cactus	ECFEF3	<i>Echinocereus fendleri</i> ssp. <i>fendleri</i>	0-1	-
	white fishhook cactus	ECIN2	<i>Echinomastus intertextus</i>	0-1	-
<b>Tree</b>					
11	<b>Trees</b>			0-34	
	oneseed juniper	JUMO	<i>Juniperus monosperma</i>	0-11	-
	Arizona rosewood	VACA5	<i>Vauquelinia californica</i>	0-11	-
	velvet mesquite	PRVE	<i>Prosopis velutina</i>	0-11	-
	Arizona white oak	QUAR	<i>Quercus arizonica</i>	0-6	-
	Emory oak	QUEM	<i>Quercus emoryi</i>	0-6	-
	western honey mesquite	PRGLT	<i>Prosopis glandulosa</i> var. <i>torreyana</i>	0-6	-
	netleaf hackberry	CELAR	<i>Celtis laevigata</i> var. <i>reticulata</i>	0-6	-

## Animal community

This site produces good quality herbaceous forage due to fertile soils with high quantities of exchangeable bases. The site is not well suited to summertime grazing by cows with calves. Mother cow pairs will only use 300 or 400 feet in elevation, up or down slope from a water development in the summer. Dry cows will use double that distance in the winter. Yearling cattle make good use of the site in any season. Slopes above 50% and extremely cobbly areas may restrict livestock movement on the site. Slope and aspect affect both the intensity of use and seasonal use patterns. North aspects are little used throughout the year. South slopes are often overused in winter and spring due to warm temperatures and early green-up of forage species. Seep and canyon water are usually available in the winter and spring after snowfall.

Water developments are very important to wildlife on the site. The site is diverse in habitats and forage species for a great variety of wildlife species. This is an especially good site for Javalina.

## Hydrological functions

Steep slopes and heavy textured soils make this site a good producer of runoff.

## Recreational uses

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

## Wood products

Limited wood for campfires and branding fires from shrubby mesquite, juniper or catclaw acacia.

## Other products

Malpais rock for building, cinders in a few locations.

## Inventory data references

Range 417s include 9 in excellent condition, 8 in good condition and 4 in fair condition.

## Type locality

Location 1: Cochise County, AZ	
Township/Range/Section	T20S R24E S7
General legal description	Cowan Ranch, Stockton Hill
Location 2: Cochise County, AZ	
Township/Range/Section	T23S R29E S29
General legal description	Rocker M Ranch
Location 3: Pima County, AZ	
Township/Range/Section	T18S R10E S28
General legal description	Batamote Ranch, Penitas Hills

## 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)	
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:**

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

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

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

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

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

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

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

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

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

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

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12. **Functional/Structural Groups (list in order of descending dominance by above-ground annual-production or live foliar cover using symbols: >>, >, = to indicate much greater than, greater than, and equal to):**

Dominant:

Sub-dominant:

Other:

Additional:

---

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

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

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):**

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16. **Potential invasive (including noxious) species (native and non-native). List species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicators, we are describing what is NOT expected in the reference state for the ecological site:**

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17. **Perennial plant reproductive capability:**

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