USDA Natural Resources
Conservation Service

Ecological site R041XA103AZ
Limestone Hills 16-20 p.z.

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General information

Provisional. A provisional ecological site description has undergone quality control and quality assurance review. It contains a working state and transition model and enough information to identify the ecological site.

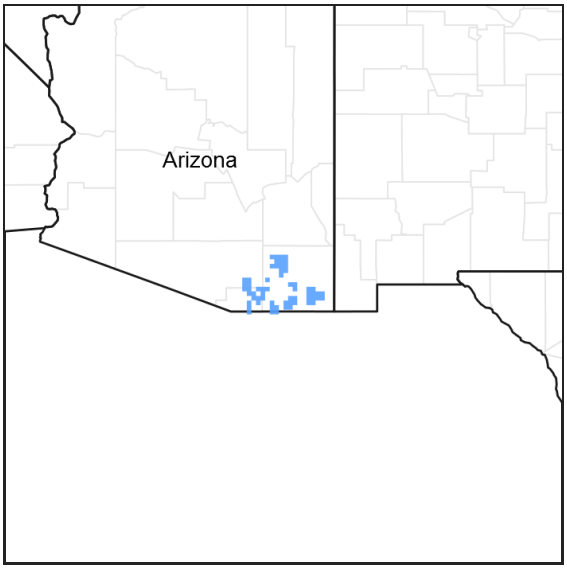

Figure 1. Mapped extent

Areas shown in blue indicate the maximum mapped extent of this ecological site. Other ecological sites likely occur within the highlighted areas. It is also possible for this ecological site to occur outside of highlighted areas if detailed soil survey has not been completed or recently updated.

MLRA notes

Major Land Resource Area (MLRA): 041X–Madrean Archipelago

Land Resource Unit: 41-1AZ Mexican Oak-Pine Forest and Oak Savannah

Elevations range from 4500 to 5500 feet and precipitation ranges from 16 to 20 inches. Vegetation includes Emory oak, Mexican blue oak, Arizona white oak, one-seed juniper, alligator juniper, sacahuista, California bricklebush, skunkbush sumac, Arizona rosewood, wait-a-bit mimosa, sideoats grama, blue grama, purple grama, wooly bunchgrass, plains lovegrass, squirreltail, and pinyon ricegrass. The soil temperature regime is thermic; the soil moisture regime is aridic ustic. This unit occurs within the Basin and Range Physiographic Province. It 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 their sediments fill the basins with representive combinations of fluvial, lacustrine, colluvial and alluvial deposits.

Ecological site concept

Limestone Hills ecological site occurs on steep uplands, all moisture is received from precipitation without additional moisture inputs from on-site surface flow.
Slopes are steep, exceeding 15 percent. The calcareous soils are shallow, less than 20 inches deep. Parent material and bedrock consist of calcareous sedimentary rock that includes limestone, marble, and calcareous

sandstone.

Associated sites

R041XA102AZ	**Shallow Hills 16-20" p.z.**
R041XA104AZ	**Limy Slopes 16-20" p.z.**
R041XA105AZ	**Limy Upland 16-20" p.z.**

Similar sites

R041XC307AZ	**Limestone Hills 12-16" p.z.**
F041XA121AZ	**Limestone Hills 20-23" p.z. (PIDI3, JUDE2)**

Table 1. Dominant plant species

Tree	(1) *vauquelinia californica*
Shrub	(1) *agave palmeri* (2) *cercocarpus montanus*
Herbaceous	(1) *bouteloua curtipendula* (2) *tridens muticus*

Physiographic features

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

Table 2. Representative physiographic features

Landforms	(1) Hill (2) Pediment (3) Mountain
Flooding frequency	None
Ponding frequency	None
Elevation	4,500–5,500 ft
Slope	15–70%
Aspect	N, E, S

Climatic features

Precipitation in this zone of the common resource area ranges from 16-20 inches per year with elevations from 4700-5500 feet. Approximately 40% of this moisture comes as gentle rain or snow during the winter-spring (Oct-Apr) season, originates in the north Pacific and Gulf of California and comes as frontal storms with long duration and low intensity. The remaining 60% falls in the summer season (May-Sep), originates in the Gulf of Mexico and are convective, usually brief, intense thunderstorms. Snow is common Dec-Mar, averaging 5-15 inches per year, but rarely lasts more than a week. May and June are the driest months. Humidity is low.

Temperatures are mild. Freezing temperatures are common at night from Oct-May, but daytime temperatures are almost always over 40 F. Below 0 F temperatures can occur Dec-Feb. Daytime summer highs rarely exceed 95 F.

Table 3. Representative climatic features

Frost-free period (average)	221 days
Freeze-free period (average)	255 days

Precipitation total (average)	20 in

Influencing water features

There are no water features associated with this site.

Soil features

These are shallow, calcareous soils formed on limestone bedrock, calcareous sedimentary and metamorphic rock. Parent material is high in carbonates. Soil surface textures range from cobbly loam to very gravelly sandy loam. Surface soil is dark colored and well protected by rocks, cobbles and gravels. Plant-soil moisture relationships are fair. Numerous areas of rock outcrop occur intermingled with soil areas. Bedrock is usually hard and unweathered. The soil series characteristic of this site is Yarbam.

Table 4. Representative soil features

Parent material	(1) Slope alluvium–limestone (2) Colluvium–marble
Surface texture	(1) Very gravelly sandy loam (2) Cobbly sandy loam (3) Cobbly loam
Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Moderately rapid
Soil depth	10–20 in
Surface fragment cover <=3"	20–55%
Surface fragment cover >3"	5–15%
Available water capacity (0-40in)	0.9–2.4 in
Calcium carbonate equivalent (0-40in)	20–40%
Electrical conductivity (0-40in)	0–2 mmhos/cm
Sodium adsorption ratio (0-40in)	0–2
Soil reaction (1:1 water) (0-40in)	7.4–8.4
Subsurface fragment volume <=3" (Depth not specified)	35–45%
Subsurface fragment volume >3" (Depth not specified)	5–15%

Ecological dynamics

The Reference Plant Community (RPC, see State and Transition Model below) of the 41-1AZ Limestone Hills ecological site is a diverse mixture of warm and cool perennial grasses, perennial forbs, succulents and large and small shrubs. Most perennial herbaceous species are well-dispersed throughout the plant community. This ecological site is a principle habitat for Parry and Palmer agave species with population within stands ranging from 20 to more than 1000 plants per acre. These two agave species are important food sources for nectar feeding birds, insects and bats in this region. The aspect is a grassy shrub-land.

Seasonal rainfall amounts affect amounts and composition of plant productivity. After a wet winter, cool season

plants like New Mexico feathergrass, southwestern stipa, cliffrose, shrubby dalea and mountain mahogany begin active growth in late March to April. The months of May and June present a period of little to no active plant growth. Warm season species, mostly perennial grasses, begin active growth after the onset of the summer rainy season usually in July or August; peak annual production occurs in October. Fire, short-term drought and herbivory (insects and mammals) are recurring disturbances to this ecological site. These disturbances interact to shape the plant community phases within the Reference State. Re-occurring fires shaped the RPC by periodically reducing shrub cover and killing many shrub seedlings. Natural fire-free periods are 10-20 years in length. Between fires, shrub growth continues unimpeded. Drought can extend the fire-free period by impairing perennial grass productivity and vigor. In the absence of fire, shrubs and succulents can attain dominance of the plant community. When average rainfall resumes, annual forbs can flourish and perennial grasses recover allowing a build-up of adequate fine fuels to carry fire. Subsequent fires remove the shrub dominance. Periodic drought has caused significant grass mortality. Droughts in the early 30s, mid 50s, 75-76, 88-89, 95-96 and 2002-present resulted in the loss of much of the grass cover on the site. The site recovers rapidly with its prevalence of gravel, and rock outcrop. The gravel and cobbles protect soil surface from erosion while rock outcrop areas act as micro-watersheds providing runoff water to soil areas

Steep slopes and shallow soils make this ecological site somewhat vulnerable to disturbance. As disturbances increase in intensity, repetition and duration, the effects they have on the site are compounded by slope. The site’s hydrology, biotic integrity and soil stability are impacted. The changes, especially to the plant community, can become long-lasting. If non-native perennial bunchgrass seed is present or brought onto this ecological site, any intense disturbance (fire, drought or grazing) may result in a monoculture of non-native lovegrass (Exotic Grass State). The aspect remains a grassy shrub-land, similar to RPC; however, this plant community does not offer adequate wildlife food and cover.

If the disturbance is not managed, the productivity of the site ultimately declines as hydrology, soil stability and the biotic community all function differently from that in the Reference State. Continuous, unmanaged grazing on either grassy shrub-land community (Reference or Exotic Grasses States) removes fire fuel and reduces perennial bunchgrass vigor. The resulting plant community is dominated by shrubs with less perennial grass cover (Shrub Dominated State). Run-off and erosion is much higher in this state than the Reference State.

Extended continuous, unmanaged grazing occurring over long periods (50+ years) can severely impact soil and plant community functioning from the Reference or Shrub Dominated State. The resulting state has severe erosion, fires seldom occur and potential productivity is permanently reduced.

State and transition model

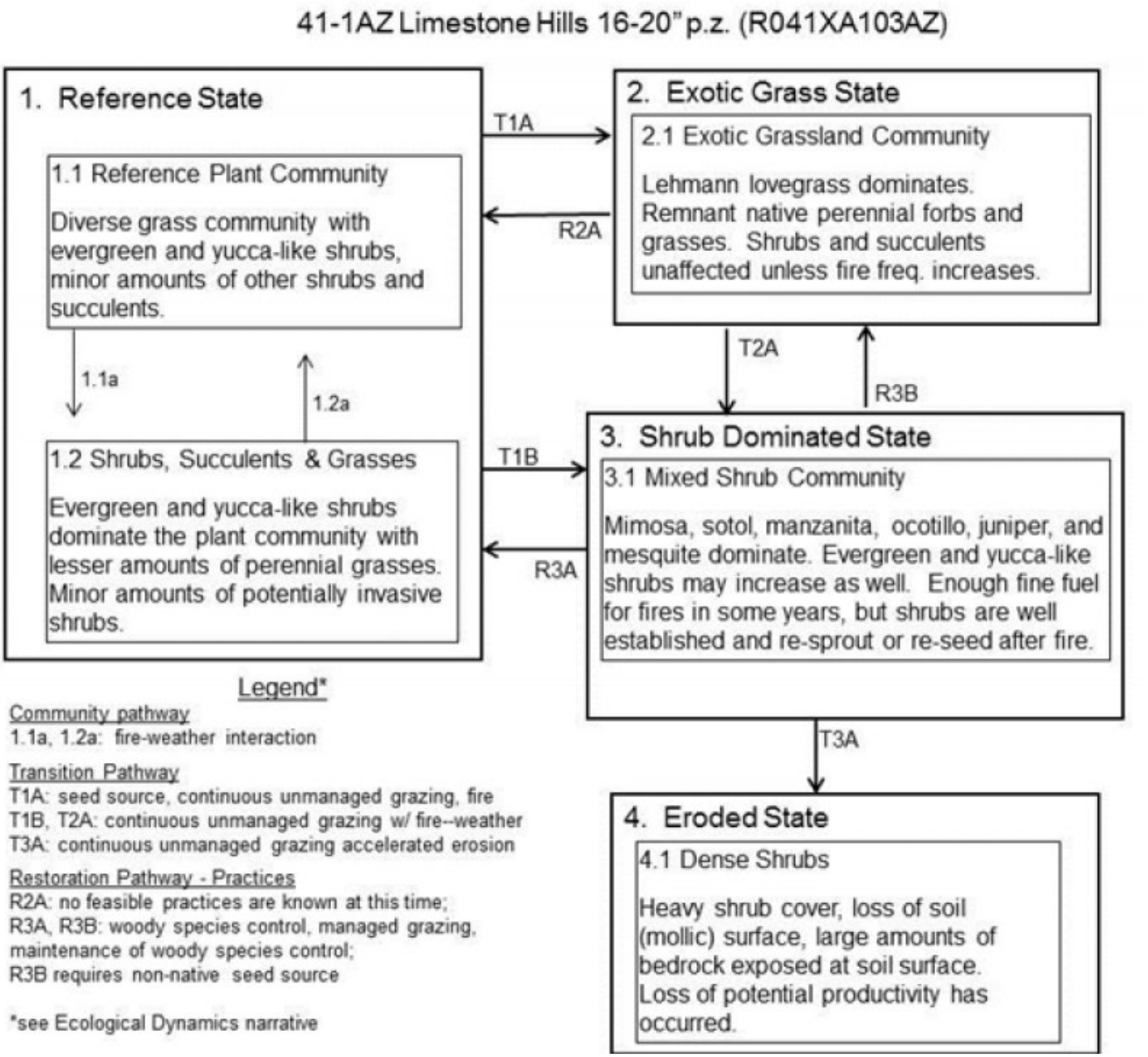

Figure 4. 41-1 Limestone Hills State and Transition Model

State 1
Reference

Community 1.1
Reference Community (RPC)

The potential plant community on this site is dominated by a diverse mixture of warm and cool perennial grasses, perennial forbs, succulents and large and small shrubs. Most perennial herbaceous species are well dispersed throughout the plant community. Hydrologic functioning is dynamic with diversity in root systems, herbaceous and woody plant roots, and rock outcrops providing additional runoff. With continuous, selective grazing, needlegrasses, crinkleawn and sideoats grama are removed from the perennial grass community and less palatable species like blue threeawn and tanglehead increase. Shrubby species like wait-a-bit, mesquite, juniper, ocotillo, sumac and sotol can increase to dominate the plant community with severe deterioration or in the absence of fire. The frequency of natural fires on this site was perhaps greater than on other hill sites in this precipitation zone due to very low live fuel moisture values of the plant community in June and early July. Well-developed gravel and cobble covers protect the soil from erosion and sometimes protect forage plants from heavy utilization.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	465	900	1020
Shrub/Vine	95	200	320
Forb	11	50	105
Tree	5	15	35
Total	**576**	**1165**	**1480**

Table 6. Soil surface cover

Tree basal cover	0-1%
Shrub/vine/liana basal cover	1-10%
Grass/grasslike basal cover	4-8%
Forb basal cover	0-1%
Non-vascular plants	0-1%
Biological crusts	0-1%
Litter	20-50%
Surface fragments >0.25" and <=3"	20-50%
Surface fragments >3"	5-15%
Bedrock	1-10%
Water	0%
Bare ground	2-10%

Table 7. Canopy structure (% cover)

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

Figure 6. Plant community growth curve (percent production by month). AZ4111, 41.1 16-30. 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	0	5	10	0	15	45	20	5	0	0

Community 1.2
Shrubs, Succulents & Grasses

Shrubs and succulents dominate the plant community with lesser amounts of perennial grasses. Forbs fluctuate with climate (drought/El Nino). Minor invasion of other woody plants.

Pathway 1.1a
Community 1.1 to 1.2

Drought, absence of fire, continuous grazing.

Conservation practices

Prescribed Burning
Prescribed Grazing

Pathway 1.2a
Community 1.2 to 1.1

Natural fire, managed grazing, prescribed burning.

Conservation practices

Prescribed Burning
Prescribed Grazing

State 2
Exotic Grass

Community 2.1
Exotic Grassland

This state occurs where non-native lovegrasses, namely Lehmann lovegrass, has increased from an adjacent seed source, usually along a roadway, to dominate the perennial grass community. Native perennial grasses and forbs are reduced to minor amounts. Shrubs and succulents may be unaffected unless the frequency of fire increases because of the presence of Lehmann lovegrass.

State 3
Shrub Dominated

Community 3.1
Mixed Shrub

Figure 7. Limestone hills 16-20" pz., Shrub Dominated State (one-seed juniper)

This plant community occurs where shrubs like catclaw mimosa, mesquite, one-seed juniper, ocotillo and sotol have invaded or increased to dominate the plant community. This happens in the absence of fire for long periods of time. Other shrubs like desert buckbrush, littleleaf and Mearns sumac may increase as well. Fine fuels may still exist for fires but many of the shrub species are well established and re-sprout quickly to assume dominance after fire.

State 4
Eroded

Community 4.1
Dense Shrub

This state occurs where sheet and rill erosion is accelerated due to severe trailing, compaction and lack of perennial grass cover. In some areas road construction has resulted in this condition. As the dark colored soil surface is lost and eroded down to bedrock, the site"s potential productivity is reduced.

Transition T1A
State 1 to 2

Non-native bunchgrass seed source (wind-blown or mechanical transport) paired with native perennial grass community disturbance such as fire or unmanaged grazing.

Transition T1B
State 1 to 3

Long-term unmanaged grazing with or without drought/fire interaction opens perennial grass canopy allowing shrubs to outcompete resources. Juniper, mimosa and other shrubs are likely to increase as well as yucca-like succulents. Remnant native perennial grasses cannot re-colonize areas with shrub competition.

Restoration pathway R2A
State 2 to 1

No restoration pathway known at this time. Perhaps future development of herbicide or biological treatment to remove perennial exotics will occur.

Conservation practices

Prescribed Burning
Prescribed Grazing

Transition T2A
State 2 to 3

Long-term unmanaged grazing with or without drought/fire interaction opens perennial grass canopy allowing shrubs to outcompete perennial grasses for resources. Juniper, mimosa and other shrubs are likely to increase as well as yucca-like succulents. Remnant native perennial grasses cannot re-colonize areas with shrub competition.

Restoration pathway R3A
State 3 to 1

Brush management, native species seeding (as needed) supported by managed grazing. Shrub control maintained with herbicide and/or prescribed burning.

Conservation practices

Prescribed Burning
Range Planting

Prescribed Grazing

Restoration pathway R3B
State 3 to 2

Long-term unmanaged grazing affects soil site stability and hydrologic functioning. Animal trailing and soil surface compaction compound the effect of plant community changes (increased shrub/decreased perennial grass community) to increase surface water run-off rather than infiltration. Over time (50-100+ years) the mollic A horizon can be lost leaving the site with a reduction in potential productivity.

Conservation practices

Brush Management
Prescribed Burning
Range Planting
Upland Wildlife Habitat Management
Prescribed Grazing

Transition T3A
State 3 to 4

Long-term unmanaged grazing affects soil site stability and hydrologic functioning. Animal trailing and soil surface compaction compound the effect of plant community changes (increased shrub/decreased perennial grass community) to increase surface water run-off rather than infiltration. Over time (50-100+ years) the mollic A horizon can be lost leaving the site with a reduction in potential productivity.

Additional community tables

Table 8. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	**Dominant mid-grasses**			300–450	
	sideoats grama	BOCU	*Bouteloua curtipendula*	100–300	–
	plains lovegrass	ERIN	*Eragrostis intermedia*	100–300	–
	woolyspike balsamscale	ELBA	*Elionurus barbiculmis*	0–100	–
	cane bluestem	BOBA3	*Bothriochloa barbinodis*	20–100	–
	bullgrass	MUEM	*Muhlenbergia emersleyi*	10–50	–
	Texas bluestem	SCCI2	*Schizachyrium cirratum*	0–50	–
	spiked crinkleawn	TRSP12	*Trachypogon spicatus*	10–50	–
2	**Dominant cool season grasses**			50–300	
	southwestern needlegrass	ACEM4	*Achnatherum eminens*	25–150	–
	New Mexico feathergrass	HENE5	*Hesperostipa neomexicana*	25–150	–
	squirreltail	ELELE	*Elymus elymoides ssp. elymoides*	1–25	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	0–20	–
	pinyon ricegrass	PIFI	*Piptochaetium fimbriatum*	0–20	–
	densetuft hairsedge	BUCA2	*Bulbostylis capillaris*	0–10	–
	sedge	CAREX	*Carex*	0–10	

	sedge	CAREX	*Carex*	0–10	–
	flatsedge	CYPER	*Cyperus*	0–5	–
3	**Short grasses**			100–150	
	black grama	BOER4	*Bouteloua eriopoda*	25–75	–
	slim tridens	TRMU	*Tridens muticus*	15–50	–
	Hall's panicgrass	PAHA	*Panicum hallii*	5–30	–
	hairy grama	BOHI2	*Bouteloua hirsuta*	5–30	–
	slim tridens	TRMUE	*Tridens muticus var. elongatus*	0–25	–
	shortleaf woollygrass	ERAV	*Erioneuron avenaceum*	1–15	–
	common wolfstail	LYPH	*Lycurus phleoides*	0–15	–
	desert muhly	MUGL2	*Muhlenbergia glauca*	0–15	–
	slender muhly	MUTE4	*Muhlenbergia tenuifolia*	0–10	–
	hairy woollygrass	ERPI5	*Erioneuron pilosum*	0–10	–
	purple grama	BORA	*Bouteloua radicosa*	0–10	–
	slender grama	BORE2	*Bouteloua repens*	0–10	–
	blue grama	BOGR2	*Bouteloua gracilis*	0–10	–
	sprucetop grama	BOCH	*Bouteloua chondrosioides*	0–10	–
4	**Threeawns**			10–50	
	blue threeawn	ARPUN	*Aristida purpurea var. nealleyi*	10–50	–
	spidergrass	ARTE3	*Aristida ternipes*	1–15	–
	Wright's threeawn	ARPUW	*Aristida purpurea var. wrightii*	1–10	–
	Orcutt's threeawn	ARSCO	*Aristida schiedeana var. orcuttiana*	0–10	–
	Fendler threeawn	ARPUL	*Aristida purpurea var. longiseta*	1–10	–
	spidergrass	ARTEG	*Aristida ternipes var. gentilis*	0–5	–
	poverty threeawn	ARDI5	*Aristida divaricata*	0–2	–
5	**Miscellaneous perennial grasses**			5–50	
	tanglehead	HECO10	*Heteropogon contortus*	1–25	–
	green sprangletop	LEDU	*Leptochloa dubia*	1–20	–
	plains bristlegrass	SEVU2	*Setaria vulpiseta*	1–20	–
	bush muhly	MUPO2	*Muhlenbergia porteri*	0–10	–
	little bluestem	SCSC	*Schizachyrium scoparium*	0–10	–
	southwestern bristlegrass	SESC2	*Setaria scheelei*	0–10	–
	silver bluestem	BOSA	*Bothriochloa saccharoides*	0–10	–
	Arizona cottontop	DICA8	*Digitaria californica*	0–10	–
	fall witchgrass	DICO6	*Digitaria cognata*	0–5	–
	low woollygrass	DAPU7	*Dasyochloa pulchella*	1–5	–
	curly-mesquite	HIBE	*Hilaria belangeri*	0–5	–
	purple muhly	MURI3	*Muhlenbergia rigida*	0–5	–
	maidencane	PAHE2	*Panicum hemitomon*	0–5	–
	vine mesquite	PAOB	*Panicum obtusum*	0–2	–
	tobosagrass	PLMU3	*Pleuraphis mutica*	0–2	–
	nineawn pappusgrass	ENDE	*Enneapogon desvauxii*	0–2	–
	Rothrock's grama	BORO2	*Bouteloua rothrockii*	0–2	–
6	**Annual grasses**			0–30	

6	**Annual grasses**			0–20	
	witchgrass	PACA6	*Panicum capillare*	0–5	–
	Mexican panicgrass	PAHI5	*Panicum hirticaule*	0–5	–
	Arizona signalgrass	URAR	*Urochloa arizonica*	0–5	–
	Eastwood fescue	VUMIC	*Vulpia microstachys var. ciliata*	0–5	–
	Pacific fescue	VUMIP	*Vulpia microstachys var. pauciflora*	0–5	–
	sixweeks fescue	VUOC	*Vulpia octoflora*	0–5	–
	Bigelow's bluegrass	POBI	*Poa bigelovii*	0–2	–
	Mexican sprangletop	LEFUU	*Leptochloa fusca ssp. uninervia*	0–2	–
	mucronate sprangeltop	LEPAB	*Leptochloa panicea ssp. brachiata*	0–2	–
	tapertip cupgrass	ERACA	*Eriochloa acuminata var. acuminata*	0–2	–
	sixweeks threeawn	ARAD	*Aristida adscensionis*	0–2	–
	prairie threeawn	AROL	*Aristida oligantha*	0–2	–
	needle grama	BOAR	*Bouteloua aristidoides*	0–2	–
	sixweeks grama	BOBA2	*Bouteloua barbata*	0–1	–
	fragilegrass	AETE	*Aegopogon tenellus*	0–1	–
	tufted lovegrass	ERPEP2	*Eragrostis pectinacea var. pectinacea*	0–1	–
	pitscale grass	HAGR3	*Hackelochloa granularis*	0–1	–
	sweet tanglehead	HEME	*Heteropogon melanocarpus*	0–1	–
	Arizona brome	BRAR4	*Bromus arizonicus*	0–1	–
	feather fingergrass	CHVI4	*Chloris virgata*	0–1	–
	delicate muhly	MUFR	*Muhlenbergia fragilis*	0–1	–
	littleseed muhly	MUMI	*Muhlenbergia microsperma*	0–1	–
	poverty dropseed	SPVA	*Sporobolus vaginiflorus*	0–1	–
	spiked bur grass	TRBE	*Tragus berteronianus*	0–1	–
	prairie false oat	TRIN5	*Trisetum interruptum*	0–1	–
Forb					
7	**Perennial forbs**			10–55	
	leatherweed	CRPO5	*Croton pottsii*	1–10	–
	trailing windmills	ALIN	*Allionia incarnata*	1–10	–
	shrubby copperleaf	ACPH3	*Acalypha phleoides*	1–5	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	1–5	–
	Cochise beardtongue	PEDA	*Penstemon dasyphyllus*	1–5	–
	bluedicks	DICA14	*Dichelostemma capitatum*	1–5	–
	spreading snakeherb	DYSCD	*Dyschoriste schiedeana var. decumbens*	0–2	–
	shrubby purslane	POSU3	*Portulaca suffrutescens*	0–2	–
	slimflower scurfpea	PSTE5	*Psoralidium tenuiflorum*	0–2	–
	Rocky Mountain zinnia	ZIGR	*Zinnia grandiflora*	0–2	–
	brownplume wirelettuce	STPA4	*Stephanomeria pauciflora*	0–2	–
	longstalk chinchweed	PELO	*Pectis longipes*	1–2	–
	Texas snoutbean	RHSET	*Rhynchosia senna var. texana*	0–2	–
	tuber anemone	ANTU	*Anemone tuberosa*	0–2	–
	weakleaf bur ragweed	AMCO3	*Ambrosia confertiflora*	1–2	–
	chaparral sonhead	ASHI3	*Asclepias hirtella*	1–2	

	chaparral asphead	ASHI3	*Asplicarpa hintelia*	1–2	–
	Cooley's bundleflower	DECO2	*Desmanthus cooleyi*	0–2	–
	Fendler's bladderpod	LEFE	*Lesquerella fendleri*	1–2	–
	Wright's deervetch	LOWR	*Lotus wrightii*	0–2	–
	tufted evening primrose	OECA10	*Oenothera caespitosa*	0–2	–
	spreading fleabane	ERDI4	*Erigeron divergens*	0–2	–
	trailing fleabane	ERFL	*Erigeron flagellaris*	0–2	–
	pearly globe amaranth	GONI	*Gomphrena nitida*	1–2	–
	bastard toadflax	COUM	*Comandra umbellata*	0–2	–
	purplenerve springparsley	CYMU2	*Cymopterus multinervatus*	0–2	–
	rose heath	CHER2	*Chaetopappa ericoides*	0–2	–
	hairyseed bahia	BAAB	*Bahia absinthifolia*	1–2	–
	beardlip penstemon	PEBA2	*Penstemon barbatus*	1–2	–
	lyreleaf greeneyes	BELY	*Berlandiera lyrata*	0–1	–
	scarlet spiderling	BOCO	*Boerhavia coccinea*	0–1	–
	copper fern	BOHI	*Bommeria hispida*	0–1	–
	dwarf stickpea	CAHUR	*Calliandra humilis var. reticulata*	0–1	–
	wholeleaf Indian paintbrush	CAIN14	*Castilleja integra*	0–1	–
	desert mariposa lily	CAKE	*Calochortus kennedyi*	0–1	–
	sego lily	CANU3	*Calochortus nuttallii*	0–1	–
	Indian paintbrush	CASTI2	*Castilleja*	0–1	–
	whitemargin sandmat	CHAL11	*Chamaesyce albomarginata*	0–1	–
	Eaton's lipfern	CHEA	*Cheilanthes eatonii*	0–1	–
	Fendler's lipfern	CHFE2	*Cheilanthes fendleri*	0–1	–
	fairyswords	CHLI	*Cheilanthes lindheimeri*	0–1	–
	mala mujer	CNAN	*Cnidoscolus angustidens*	0–1	–
	birdbill dayflower	CODI4	*Commelina dianthifolia*	0–1	–
	Texas bindweed	COEQ	*Convolvulus equitans*	0–1	–
	whitemouth dayflower	COER	*Commelina erecta*	0–1	–
	horsetail milkweed	ASSU2	*Asclepias subverticillata*	0–1	–
	dense ayenia	AYMI	*Ayenia microphylla*	0–1	–
	whiteflower prairie clover	DAAL	*Dalea albiflora*	0–1	–
	James' prairie clover	DAJA	*Dalea jamesii*	0–1	–
	dwarf prairie clover	DANA	*Dalea nana*	0–1	–
	downy prairie clover	DANE	*Dalea neomexicana*	0–1	–
	Thurber's cotton	GOTH	*Gossypium thurberi*	0–1	–
	small matweed	GUDE	*Guilleminea densa*	0–1	–
	red bluet	HORU	*Houstonia rubra*	0–1	–
	fineleaf hymenopappus	HYFI	*Hymenopappus filifolius*	0–1	–
	babyslippers	HYVE	*Hybanthus verticillatus*	0–1	–
	iron ipomopsis	IPLA2	*Ipomopsis laxiflora*	0–1	–
	pinkthroat morning-glory	IPLO	*Ipomoea longifolia*	0–1	–

	glory				
	Macomb's ipomopsis	IPMA2	*Ipomopsis macombii*	0–1	–
	El Paso skyrocket	IPTH2	*Ipomopsis thurberi*	0–1	–
	ragged nettlespurge	JAMA	*Jatropha macrorhiza*	0–1	–
	San Pedro daisy	LAPO4	*Lasianthaea podocephala*	0–1	–
	Mexican fireplant	EUHE4	*Euphorbia heterophylla*	0–1	–
	sun spurge	EURA2	*Euphorbia radians*	0–1	–
	wild dwarf morning-glory	EVAR	*Evolvulus arizonicus*	0–1	–
	shaggy dwarf morning-glory	EVNU	*Evolvulus nuttallianus*	0–1	–
	silver dwarf morning-glory	EVSE	*Evolvulus sericeus*	0–1	–
	Arizona snakecotton	FRAR2	*Froelichia arizonica*	0–1	–
	scarlet beeblossom	GACO5	*Gaura coccinea*	0–1	–
	radishroot woodsorrel	OXAL	*Oxalis albicans*	0–1	–
	Drummond's woodsorrel	OXDR	*Oxalis drummondii*	0–1	–
	locoweed	OXYTR	*Oxytropis*	0–1	–
	variableleaf bushbean	MAGI2	*Macroptilium gibbosifolium*	0–1	–
	lacy tansyaster	MAPI	*Machaeranthera pinnatifida*	0–1	–
	Mexican star	MIBI2	*Milla biflora*	0–1	–
	narrowleaf four o'clock	MILI3	*Mirabilis linearis*	0–1	–
	lemon beebalm	MOCIA	*Monarda citriodora ssp. austromontana*	0–1	–
	narrowleaf stoneseed	LIIN2	*Lithospermum incisum*	0–1	–
	Lewis flax	LILE3	*Linum lewisii*	0–1	–
	Greene's bird's-foot trefoil	LOGR4	*Lotus greenei*	0–1	–
	desert larkspur	DEPA	*Delphinium parishii*	0–1	–
	fingerleaf gourd	CUDI	*Cucurbita digitata*	0–1	–
	coyote gourd	CUPA	*Cucurbita palmata*	0–1	–
	hybrid cloakfern	ASIN19	*Astrolepis integerrima*	0–1	–
	broadleaf milkweed	ASLA4	*Asclepias latifolia*	0–1	–
	woolly locoweed	ASMOB	*Astragalus mollissimus var. bigelovii*	0–1	–
	sheep milkvetch	ASNO3	*Astragalus nothoxys*	0–1	–
	wavy scaly cloakfern	ASSI9	*Astrolepis sinuata*	0–1	–
	Mexican yellowshow	AMPA3	*Amoreuxia palmatifida*	0–1	–
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	0–1	–
	crested anoda	ANCR2	*Anoda cristata*	0–1	–
	Indianhemp	APCA	*Apocynum cannabinum*	0–1	–
	largeflower onion	ALMA4	*Allium macropetalum*	0–1	–
	perennial rockcress	ARPE2	*Arabis perennans*	0–1	–
	southwestern pricklypoppy	ARPL3	*Argemone pleiacantha*	0–1	–
	Watson's dutchman's pipe	ARWA	*Aristolochia watsonii*	0–1	–
	Arizona milkvetch	ASAR6	*Astragalus arizonicus*	0–1	–

	spider milkweed	ASAS	*Asclepias asperula*	0–1	–
	Cochise scaly cloakfern	ASCO42	*Astrolepis cochisensis*	0–1	–
	slimleaf plainsmustard	SCLI12	*Schoenocrambe linearifolia*	0–1	–
	Arizona spikemoss	SEAR2	*Selaginella arizonica*	0–1	–
	twinleaf senna	SEBA3	*Senna bauhinioides*	0–1	–
	Lemmon's ragwort	SELE8	*Senecio lemmonii*	0–1	–
	New Mexico fanpetals	SINE	*Sida neomexicana*	0–1	–
	silverleaf nightshade	SOEL	*Solanum elaeagnifolium*	0–1	–
	copper globemallow	SPAN3	*Sphaeralcea angustifolia*	0–1	–
	gooseberryleaf globemallow	SPGR2	*Sphaeralcea grossulariifolia*	0–1	–
	Parry's beardtongue	PEPA24	*Penstemon parryi*	0–1	–
	slimleaf bean	PHAN3	*Phaseolus angustissimus*	0–1	–
	orange fameflower	PHAU13	*Phemeranthus aurantiacus*	0–1	–
	Cory's mistletoe	PHCO14	*Phoradendron coryae*	0–1	–
	ivyleaf groundcherry	PHHE4	*Physalis hederifolia*	0–1	–
	white milkwort	POAL4	*Polygala alba*	0–1	–
	velvetseed milkwort	POOB	*Polygala obscura*	0–1	–
	jewels of Opar	TAPA2	*Talinum paniculatum*	0–1	–
	Coulter's wrinklefruit	TECO	*Tetraclea coulteri*	0–1	–
	hairy fournwort	TENE	*Tetramerium nervosum*	0–1	–
	longstalk greenthread	THLO	*Thelesperma longipes*	0–1	–
	Hopi tea greenthread	THME	*Thelesperma megapotamicum*	0–1	–
	pinewoods spiderwort	TRPI	*Tradescantia pinetorum*	0–1	–
	branched noseburn	TRRA5	*Tragia ramosa*	0–1	–
	Fort Huachuca vervain	VEGR2	*Verbena gracilis*	0–1	–
	American vetch	VIAM	*Vicia americana*	0–1	–
	Louisiana vetch	VILUL2	*Vicia ludoviciana ssp. ludoviciana*	0–1	–
	copper zephyrlily	ZELO	*Zephyranthes longifolia*	0–1	–
	buffpetal	RHPH2	*Rhynchosida physocalyx*	0–1	–
	Torrey's craglily	ECFL	*Echeandia flavescens*	0–1	–
8	**Annual Forbs**			1–50	
	pitseed goosefoot	CHBE4	*Chenopodium berlandieri*	0–10	–
	fewflower beggarticks	BILE	*Bidens leptocephala*	0–5	–
	longleaf false goldeneye	HELOA2	*Heliomeris longifolia var. annua*	0–5	–
	New Mexico goosefoot	CHNE3	*Chenopodium neomexicanum*	0–3	–
	sensitive partridge pea	CHNI2	*Chamaecrista nictitans*	0–3	–
	New Mexico thistle	CINE	*Cirsium neomexicanum*	0–2	–
	Wright's bird's beak	COWR2	*Cordylanthus wrightii*	0–2	–
	New Mexico copperleaf	ACNE	*Acalypha neomexicana*	0–2	–
	smallflowered milkvetch	ASNU4	*Astragalus nuttallianus*	0–2	–
	Thurber's milkvetch	ASTH	*Astragalus thurberi*	0–2	–

	slender goldenweed	MAGR10	*Machaeranthera gracilis*	0–2	–
	Arizona poppy	KAGR	*Kallstroemia grandiflora*	0–2	–
	tanseyleaf tansyaster	MATA2	*Machaeranthera tanacetifolia*	0–2	–
	whitestem blazingstar	MEAL6	*Mentzelia albicaulis*	0–1	–
	sweet four o'clock	MILO2	*Mirabilis longiflora*	0–1	–
	desert evening primrose	OEPR	*Oenothera primiveris*	0–1	–
	Arizona phacelia	PHAR13	*Phacelia arizonica*	0–1	–
	Mangas Spring phacelia	PHBO4	*Phacelia bombycina*	0–1	–
	Arizona popcornflower	PLAR	*Plagiobothrys arizonicus*	0–1	–
	woolly plantain	PLPA2	*Plantago patagonica*	0–1	–
	purslane	PORTU	*Portulaca*	0–1	–
	yerba porosa	PORU6	*Porophyllum ruderale*	0–1	–
	desert unicorn-plant	PRAL4	*Proboscidea althaeifolia*	0–1	–
	doubleclaw	PRPA2	*Proboscidea parviflora*	0–1	–
	Wright's cudweed	PSCAC2	*Pseudognaphalium canescens ssp. canescens*	0–1	–
	Abert's creeping zinnia	SAAB	*Sanvitalia abertii*	0–1	–
	sawtooth sage	SASU7	*Salvia subincisa*	0–1	–
	spreading fanpetals	SIAB	*Sida abutifolia*	0–1	–
	sleepy silene	SIAN2	*Silene antirrhina*	0–1	–
	hillside vervain	VENE	*Verbena neomexicana*	0–1	–
	warty caltrop	KAPA	*Kallstroemia parviflora*	0–1	–
	Gordon's bladderpod	LEGO	*Lesquerella gordonii*	0–1	–
	broadleaved pepperweed	LELA2	*Lepidium latifolium*	0–1	–
	intermediate pepperweed	LEVIM	*Lepidium virginicum var. medium*	0–1	–
	dotted blazing star	LIPU	*Liatris punctata*	0–1	–
	plains flax	LIPU4	*Linum puberulum*	0–1	–
	foothill deervetch	LOHU2	*Lotus humistratus*	0–1	–
	coastal bird's-foot trefoil	LOSAB	*Lotus salsuginosus var. brevivexillus*	0–1	–
	shortstem lupine	LUBR2	*Lupinus brevicaulis*	0–1	–
	bajada lupine	LUCOC	*Lupinus concinnus ssp. concinnus*	0–1	–
	Fendler's desertdandelion	MAFE	*Malacothrix fendleri*	0–1	–
	mesa tansyaster	MATA	*Machaeranthera tagetina*	0–1	–
	wheelscale saltbush	ATEL	*Atriplex elegans*	0–1	–
	camphorweed	HESU3	*Heterotheca subaxillaris*	0–1	–
	crestrib morning-glory	IPCO2	*Ipomoea costellata*	0–1	–
	redstar	IPCO3	*Ipomoea coccinea*	0–1	–
	ivyleaf morning-glory	IPHE	*Ipomoea hederacea*	0–1	–
	flaxflowered ipomopsis	IPLOL	*Ipomopsis longiflora ssp. longiflora*	0–1	–
	Thurber's morning-glory	IPTH	*Ipomoea thurberi*	0–1	–

	glory				
	carelessweed	AMPA	*Amaranthus palmeri*	0–1	–
	crested anoda	ANCR2	*Anoda cristata*	0–1	–
	southwestern pricklypoppy	ARPL3	*Argemone pleiacantha*	0–1	–
	halfmoon milkvetch	ASAL6	*Astragalus allochrous*	0–1	–
	cryptantha	CRYPT	*Cryptantha*	0–1	–
	Chihuahuan prairie clover	DAEX2	*Dalea exigua*	0–1	–
	American wild carrot	DAPU3	*Daucus pusillus*	0–1	–
	sacred thorn-apple	DAWR2	*Datura wrightii*	0–1	–
	New Mexico ticktrefoil	DENE	*Desmodium neomexicanum*	0–1	–
	western tansymustard	DEPI	*Descurainia pinnata*	0–1	–
	western trailing ticktrefoil	DEPR2	*Desmodium procumbens*	0–1	–
	poorjoe	DITE2	*Diodia teres*	0–1	–
	wedgeleaf draba	DRCU	*Draba cuneifolia*	0–1	–
	Abert's buckwheat	ERAB2	*Eriogonum abertianum*	0–1	–
	sanddune wallflower	ERCA14	*Erysimum capitatum*	0–1	–
	miniature woollystar	ERDI2	*Eriastrum diffusum*	0–1	–
	spreading fleabane	ERDI4	*Erigeron divergens*	0–1	–
	sorrel buckwheat	ERPO4	*Eriogonum polycladon*	0–1	–
	California poppy	ESCAM	*Eschscholzia californica ssp. mexicana*	0–1	–
	Arizona blanketflower	GAAR2	*Gaillardia arizonica*	0–1	–
	red dome blanketflower	GAPI	*Gaillardia pinnatifida*	0–1	–
	lesser yellowthroat gilia	GIFL	*Gilia flavocincta*	0–1	–
	El Paso gilia	GIME	*Gilia mexicana*	0–1	–
	Dakota mock vervain	GLBIB	*Glandularia bipinnatifida var. bipinnatifida*	0–1	–
	curlytop gumweed	GRNUA	*Grindelia nuda var. aphanactis*	0–1	–
	miner's lettuce	CLPEP	*Claytonia perfoliata ssp. perfoliata*	0–1	–
	scrambled eggs	COAU2	*Corydalis aurea*	0–1	–
	southwestern cosmos	COPA12	*Cosmos parviflorus*	0–1	–
	threadstem sandmat	CHRE4	*Chamaesyce revoluta*	0–1	–
	thymeleaf sandmat	CHSE6	*Chamaesyce serpyllifolia*	0–1	–
	slimseed sandmat	CHST8	*Chamaesyce stictospora*	0–1	–
	Coulter's spiderling	BOCO2	*Boerhavia coulteri*	0–1	–
	erect spiderling	BOER	*Boerhavia erecta*	0–1	–
	hoary bowlesia	BOIN3	*Bowlesia incana*	0–1	–
	purple spiderling	BOPU	*Boerhavia purpurascens*	0–1	–
	fringed redmaids	CACI2	*Calandrinia ciliata*	0–1	–
	royal sandmat	CHDI5	*Chamaesyce dioica*	0–1	–
	pillpod sandmat	CHHI3	*Chamaesyce hirta*	0–1	–
	hyssopleaf sandmat	CHHY3	*Chamaesyce hyssopifolia*	0–1	–
Shrub/Vine					
9	**Half shrubs**			20–70	

	James' buckwheat	ERJA	*Eriogonum jamesii*	0–20	–
	fairyduster	CAER	*Calliandra eriophylla*	1–15	–
	featherplume	DAFO	*Dalea formosa*	1–10	–
	tarragon	ARDR4	*Artemisia dracunculus*	0–10	–
	yerba de pasmo	BAPT	*Baccharis pteronioides*	1–5	–
	California brickellbush	BRCA3	*Brickellia californica*	0–5	–
	Utah fendlerbush	FEUTC	*Fendlerella utahensis var. cymosa*	0–5	–
	heartleaf goldeneye	VICO	*Viguiera cordifolia*	0–5	–
	desert zinnia	ZIAC	*Zinnia acerosa*	0–5	–
	rough menodora	MESC	*Menodora scabra*	0–5	–
	trailing krameria	KRLA	*Krameria lanceolata*	1–5	–
	winterfat	KRLA2	*Krascheninnikovia lanata*	0–2	–
	littleleaf ratany	KRER	*Krameria erecta*	0–2	–
	bastardsage	ERWR	*Eriogonum wrightii*	0–2	–
	Gregg's prairie clover	DAGR2	*Dalea greggii*	0–2	–
	cliff goldenbush	ERCUC	*Ericameria cuneata var. cuneata*	0–2	–
	false boneset	BREU	*Brickellia eupatorioides*	0–2	–
	prairie acacia	ACAN	*Acacia angustissima*	0–2	–
	mariola	PAIN2	*Parthenium incanum*	0–1	–
	woody crinklemat	TICAC	*Tiquilia canescens var. canescens*	0–1	–
	American threefold	TRCA8	*Trixis californica*	0–1	–
10	**Evergreen shrubs**			50–100	
	Mexican cliffrose	PUME	*Purshia mexicana*	0–50	–
	desert ceanothus	CEGR	*Ceanothus greggii*	1–50	–
	hairy mountain mahogany	CEMOP	*Cercocarpus montanus var. paucidentatus*	1–50	–
	cliffbrake	PELLA	*Pellaea*	6–36	–
	pungent oak	QUPU	*Quercus pungens*	0–25	–
	evergreen sumac	RHVIC	*Rhus virens var. choriophylla*	1–25	–
	longstalk chinchweed	PELO	*Pectis longipes*	6–20	–
	Parry's beardtongue	PEPA24	*Penstemon parryi*	6–20	–
	Palmer's penstemon	PEPA8	*Penstemon palmeri*	6–20	–
	white milkwort	POAL4	*Polygala alba*	6–20	–
	Wright's cudweed	PSCAC2	*Pseudognaphalium canescens ssp. canescens*	6–20	–
	Texas snoutbean	RHSET	*Rhynchosia senna var. texana*	6–20	–
	twinleaf senna	SEBA3	*Senna bauhinioides*	6–20	–
	spreading fanpetals	SIAB	*Sida abutifolia*	6–20	–
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	6–20	–
	caliche globemallow	SPLA	*Sphaeralcea laxa*	6–20	–
	brownplume wirelettuce	STPA4	*Stephanomeria pauciflora*	6–20	–
	pricklyleaf dogweed	THAC	*Thymophylla acerosa*	6–20	–
	Hopi tea greenthread	THME	*Thelesperma megapotamicum*	6–20	–
	rue of the mountains	THTE2	*Thamnosma texana*	6–20	–

	Arizona bluecurls	TRAR	*Trichostema arizonicum*	6–20	–
	pinewoods spiderwort	TRPI	*Tradescantia pinetorum*	6–20	–
	branched noseburn	TRRA5	*Tragia ramosa*	6–20	–
	Fort Huachuca vervain	VEGR2	*Verbena gracilis*	6–20	–
	mariposa lily	CALOC	*Calochortus*	6–20	–
	Indian paintbrush	CASTI2	*Castilleja*	6–20	–
	field bindweed	COAR4	*Convolvulus arvensis*	6–20	–
	whitemouth dayflower	COER	*Commelina erecta*	6–20	–
	pale bastard toadflax	COUMP	*Comandra umbellata ssp. pallida*	6–20	–
	leatherweed	CRPOP	*Croton pottsii var. pottsii*	6–20	–
	spreading fleabane	ERDI4	*Erigeron divergens*	6–20	–
	trailing fleabane	ERFL	*Erigeron flagellaris*	6–20	–
	New Mexico fleabane	ERNE3	*Erigeron neomexicanus*	6–20	–
	wild dwarf morning-glory	EVAR	*Evolvulus arizonicus*	6–20	–
	shaggy dwarf morning-glory	EVNU	*Evolvulus nuttallianus*	6–20	–
	beeblossom	GAURA	*Gaura*	6–20	–
	pineywoods geranium	GECA3	*Geranium caespitosum*	6–20	–
	hairy false goldenaster	HEVI4	*Heterotheca villosa*	6–20	–
	fineleaf hymenopappus	HYFIL	*Hymenopappus filifolius var. lugens*	6–20	–
	El Paso skyrocket	IPTH2	*Ipomopsis thurberi*	6–20	–
	Lewis flax	LILE3	*Linum lewisii*	6–20	–
	plains flax	LIPU4	*Linum puberulum*	6–20	–
	variableleaf bushbean	MAGI2	*Macroptilium gibbosifolium*	6–20	–
	Organ Mountain blazingstar	MEAS2	*Mentzelia asperula*	6–20	–
	rough menodora	MESC	*Menodora scabra*	6–20	–
	alpine woodsorrel	OXAL2	*Oxalis alpina*	6–20	–
	brownfoot	ACWR5	*Acourtia wrightii*	6–20	–
	trailing windmills	ALIN	*Allionia incarnata*	6–20	–
	weakleaf bur ragweed	AMCO3	*Ambrosia confertiflora*	6–20	–
	tuber anemone	ANTU	*Anemone tuberosa*	6–20	–
	rockcress	ARABI2	*Arabis*	6–20	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	6–20	–
	chaparral asphead	ASHI3	*Aspicarpa hirtella*	6–20	–
	dense ayenia	AYMI	*Ayenia microphylla*	6–20	–
	hairyseed bahia	BAAB	*Bahia absinthifolia*	6–20	–
	firecrackerbush	BOTE2	*Bouvardia ternifolia*	6–20	–
	Warnock's snakewood	COWA	*Condalia warnockii*	0–5	–
	Kearney's snakewood	COWAK	*Condalia warnockii var. kearneyana*	0–5	–
	Wright's silktassel	GAWR3	*Garrya wrightii*	0–5	–
	Arizona water-willow	JUCA9	*Justicia candicans*	0–2	–
11	**Deciduous shrubs**			15–50	
	Mexican copperleaf	ACME7	*Acalypha mexicana*	5–36	–

	carelessweed	AMPA	*Amaranthus palmeri*	5–36	–
	milkvetch	ASTRA	*Astragalus*	5–36	–
	hoary bowlesia	BOIN3	*Bowlesia incana*	5–36	–
	exserted Indian paintbrush	CAEXE	*Castilleja exserta ssp. exserta*	5–36	–
	lambsquarters	CHAL7	*Chenopodium album*	5–36	–
	sensitive partridge pea	CHNIL	*Chamaecrista nictitans ssp. nictitans var. leptadenia*	5–36	–
	nodding bird's-beak	COLA4	*Cordylanthus laxiflorus*	5–36	–
	American wild carrot	DAPU3	*Daucus pusillus*	5–36	–
	New Mexico ticktrefoil	DENE	*Desmodium neomexicanum*	5–36	–
	western tansymustard	DEPI	*Descurainia pinnata*	5–36	–
	miniature woollystar	ERDI2	*Eriastrum diffusum*	5–36	–
	leafy spurge	EUESE	*Euphorbia esula var. esula*	5–36	–
	blanketflower	GAILL	*Gaillardia*	5–36	–
	Parry's dwarf-sunflower	HEPA	*Helianthella parryi*	5–36	–
	Arizona poppy	KAGR	*Kallstroemia grandiflora*	5–36	–
	intermediate pepperweed	LEVIM	*Lepidium virginicum var. medium*	5–36	–
	hoary tansyaster	MACA2	*Machaeranthera canescens*	5–36	–
	whitestem blazingstar	MEAL6	*Mentzelia albicaulis*	5–36	–
	green carpetweed	MOVE	*Mollugo verticillata*	5–36	–
	Florida pellitory	PAFL3	*Parietaria floridana*	5–36	–
	lakeshore panicgrass	PALA	*Panicum lacustre*	5–36	–
	phacelia	PHACE	*Phacelia*	5–36	–
	phlox	PHLOX	*Phlox*	5–36	–
	sweetscent	PLODO	*Pluchea odorata var. odorata*	5–36	–
	desert Indianwheat	PLOV	*Plantago ovata*	5–36	–
	slimflower scurfpea	PSTE5	*Psoralidium tenuiflorum*	5–36	–
	chia	SACO6	*Salvia columbariae*	5–36	–
	sleepy silene	SIAN2	*Silene antirrhina*	5–36	–
	staggerweed	STAR	*Stachys arvensis*	5–36	–
	garden vetch	VISAN2	*Vicia sativa ssp. nigra*	5–36	–
	Tahitian kidneywood	EYOR	*Eysenhardtia orthocarpa*	1–25	–
	ocotillo	FOSP2	*Fouquieria splendens*	5–25	–
	Arizona necklacepod	SOAR3	*Sophora arizonica*	0–10	–
	littleleaf sumac	RHMI3	*Rhus microphylla*	0–10	–
	skunkbush sumac	RHTR	*Rhus trilobata*	0–5	–
	Wright's mock buckthorn	SAWR	*Sageretia wrightii*	0–5	–
	catclaw acacia	ACGR	*Acacia greggii*	1–5	–
	Wright's beebrush	ALWR	*Aloysia wrightii*	1–5	–
	catclaw mimosa	MIACB	*Mimosa aculeaticarpa var. biuncifera*	0–5	–
	Rio Grande saddlebush	MOSC	*Mortonia scabrella*	0–5	–

	western honey mesquite	PRGLT	*Prosopis glandulosa var. torreyana*	0–2	–
	velvet mesquite	PRVE	*Prosopis velutina*	0–2	–
	spiny hackberry	CEEH	*Celtis ehrenbergiana*	0–2	–
	javelina bush	COER5	*Condalia ericoides*	0–2	–
	knifeleaf condalia	COSP3	*Condalia spathulata*	0–2	–
	whitethorn acacia	ACCO2	*Acacia constricta*	0–2	–
	longleaf jointfir	EPTR	*Ephedra trifurca*	0–1	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	0–1	–
12	**Succulents**			10–100	
	sacahuista	NOMI	*Nolina microcarpa*	5–50	–
	Palmer's century plant	AGPA3	*Agave palmeri*	1–20	–
	Parry's agave	AGPA4	*Agave parryi*	1–20	–
	common sotol	DAWH2	*Dasylirion wheeleri*	5–20	–
	Parry's agave	AGPAP5	*Agave parryi ssp. parryi*	1–10	–
	Schott's century plant	AGSC3	*Agave schottii*	0–10	–
	dollarjoint pricklypear	OPCH	*Opuntia chlorotica*	0–5	–
	cactus apple	OPEN3	*Opuntia engelmannii*	0–5	–
	Schott's yucca	YUSC	*Yucca ×schottii*	0–5	–
	banana yucca	YUBA	*Yucca baccata*	0–5	–
	purple pricklypear	OPMA8	*Opuntia macrocentra*	0–2	–
	tulip pricklypear	OPPH	*Opuntia phaeacantha*	0–2	–
	candy barrelcactus	FEWI	*Ferocactus wislizeni*	0–2	–
	Graham's nipple cactus	MAGR9	*Mammillaria grahamii*	0–1	–
	Macdougal's nipple cactus	MAHEM	*Mammillaria heyderi var. macdougalii*	0–1	–
	soaptree yucca	YUEL	*Yucca elata*	0–1	–
	Scheer's beehive cactus	COROS	*Coryphantha robustispina ssp. scheeri*	0–1	–
	walkingstick cactus	CYSP8	*Cylindropuntia spinosior*	0–1	–
	pinkflower hedgehog cactus	ECBO2	*Echinocereus bonkerae*	0–1	–
	scarlet hedgehog cactus	ECCOC	*Echinocereus coccineus var. coccineus*	0–1	–
	pinkflower hedgehog cactus	ECFEF3	*Echinocereus fendleri ssp. fendleri*	0–1	–
	white fishhook cactus	ECIN2	*Echinomastus intertextus*	0–1	–
	Leding's hedgehog cactus	ECLE2	*Echinocereus ledingii*	0–1	–
	rainbow hedgehog cactus	ECRI3	*Echinocereus rigidissimus*	0–1	–
	Bisbee spinystar	ESVIB	*Escobaria vivipara var. bisbeeana*	0–1	–
Tree					
13	**Trees**			5–35	
	Arizona rosewood	VACA5	*Vauquelinia californica*	5–25	–
	Arizona white oak	QUAR	*Quercus arizonica*	0–20	–

	Emory oak	QUEM	*Quercus emoryi*	0–20	–
	Mexican blue oak	QUOB	*Quercus oblongifolia*	0–10	–
	alligator juniper	JUDE2	*Juniperus deppeana*	0–10	–
	oneseed juniper	JUMO	*Juniperus monosperma*	0–10	–
	Mexican pinyon	PICE	*Pinus cembroides*	0–5	–

Animal community

The plant community on this site is suitable for grazing by all classes of livestock at any season. High soil pH can limit the availability of some essential plant nutrients reducing forage quality especially compared to adjacent non-limy sites. Due to the abundance of cool season grasses and many species of palatable evergreen browse, this site is especially well suited for winter-spring grazing when nearby upland areas are deficient in protein. Steep slopes, very cobbly surfaces and large areas of rock outcrop limit grazing distribution on this site. Fencing large areas of this site separately from non-limy hills and uplands and grazing during the cool season will allow effective management of the forage resource it has. This site is very dry, but springs will be found at the lower end areas of this site where it contacts with more impervious metamorphic rocks like slate, mudstone, and quartzite. Canyons throughout areas of this site tend to be dry even in winter due to the extreme porosity of the limestone parent material. Mountain mahogany and Wright eupatorium can cause cyanide poisoning in the fall. Cattle should not be turned into areas of the site until after several frosts have occurred in late fall or early winter. Mountain lion predation on calves can be severe on this site. Grazing dry cows and/or yearlings in the cool season and moving cows off as they calve will help avoid predation.

This site provides excellent habitat for both whitetail and mule deer. Large amounts of palatable evergreen browse species on this site gives it a high carrying capacity for deer. Periodic fires will help keep species like desert ceanothus, cliffrose and mahogany from growing out of reach of deer. The potential plant community is rich in grass and forb species making the site home to a variety of insect, bird, small mammal and reptile species. Extensive stands of Agave Palmeri and Parryi are a primary food source for the Mexican long-tongue bat, as well as several other bird and insect species. Numerous caverns in the porous limestone bedrock are habitat for a variety of species, including summertime roosts for the endangered lesser long-nosed bat. Natural water is limited on this site unless contact springs occur where more impervious rock like slate or mudstone block the gravitational flow of water through the limestone and allow surface flow to occur. Water developments are very important to large mammals, as well as several bird and small mammal species that use this habitat.

Hydrological functions

This site is a poor producer of runoff due to the porous nature of the limestone parent material.

Recreational uses

Hunting, hiking, bird watching, camping, picnicking, fossil hunting, photography, horseback riding.

Wood products

Limited fuel-wood from juniper. Limited hobby wood from Arizona rosewood.

Other products

Beargrass and yucca for fibers, agave for tequila and mescal making, medicinal plants like yerba de pasmo, herbaceous sage and terragon, fossils, limestone for cement making.

Inventory data references

Range 417s include 1 in excellent condition.

Type locality

Location 1: Cochise County, AZ	
Township/Range/Section	T23S R19E S32
General legal description	NE 1//4 of section - Ft. Huachuca - West range by Pyeatt Cave
Location 2: Cochise County, AZ	
Township/Range/Section	T23S R24E S1
General legal description	Douglas FO - Miller Ranch, Mule Mtns., Mexican Canyon
Location 3: Cochise County, AZ	
Township/Range/Section	T15S R22E S22
General legal description	Willcox FO - Little Dragoon Mtns., Johnson Mine
Location 4: Pinal County, AZ	
Township/Range/Section	T10S R16E S19
General legal description	Tucson FO - Three C Ranch, Catalina Mtns.
Location 5: Santa Cruz County, AZ	
Township/Range/Section	T21S R17E S9
General legal description	Babocomari Ranch, Encinos Pasture at KA #5.

Other references

Conservation Technical Assistance Staff, Natural Resources Conservation Service, United States Department of Agriculture. Range and Pasture Conservation Technical Resources. Site includes links to the National Range and Pasture Handbook. Available online at http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/landuse/rangepasture. Accessed 9/18/2013.

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Approval

Curtis Talbot, 4/09/2021

Rangeland health reference sheet

Interpreting Indicators of Rangeland Health is a qualitative assessment protocol used to determine ecosystem condition based on benchmark characteristics described in the Reference Sheet. A suite of 17 (or more) indicators are typically considered in an assessment. The ecological site(s) representative of an assessment location must be

known prior to applying the protocol and must be verified based on soils and climate. Current plant community cannot be used to identify the ecological site.

Author(s)/participant(s)	
Contact for lead author	
Date	02/10/2025
Approved by	Curtis Talbot
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):

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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:

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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:**
