USDA Natural Resources Conservation Service

Ecological site R041XA107AZ
Loamy Slopes 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.

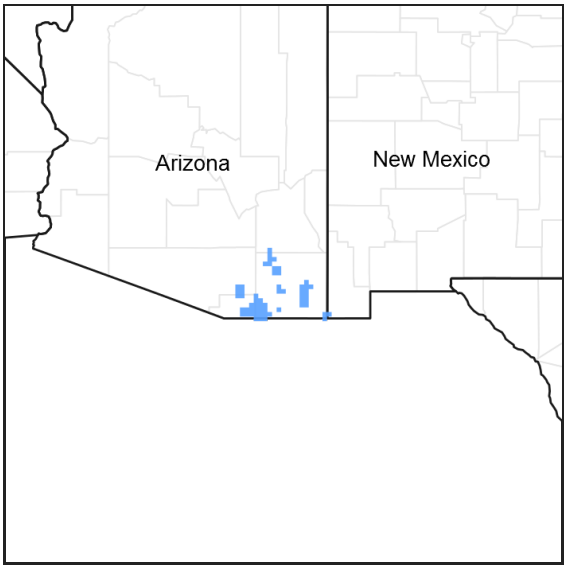

Figure 1. Mapped extent

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

AZ 41.1 – Mexican Oak-Pine Forest and Oak Savannah

Elevations range from 4500 to 10,700 feet and precipitation ranges from 16 to 30 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 ranges from thermic to mesic and the soil moisture regime ranges from aridic ustic to typic ustic. 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

R041XA104AZ	**Limy Slopes 16-20" p.z.**
R041XA108AZ	**Loamy Upland 16-20" p.z.**
R041XA114AZ	**Loamy Bottom 16-20" p.z.**

R041XA115AZ	**Loamy Swale 16-20" p.z.**

Similar sites

F041XA124AZ	**Loamy Hills 20-23" p.z. (QUAR, QUEM)**
R041XC314AZ	**Loamy Slopes 12-16" p.z.**

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *agave palmeri* (2) *nolina microcarpa*
Herbaceous	(1) *bouteloua curtipendula* (2) *eragrostis intermedia*

Physiographic features

This site occurs in the middle elevations of the Madrean Basin and Range province in southeastern Arizona. It occurs on hillslopes, ridges and saddles. Slope aspect is site differentiating at elevations near common resource area boundaries.

Table 2. Representative physiographic features

Landforms	(1) Hill (2) Ridge (3) Saddle
Flooding frequency	None
Elevation	1,372–1,676 m
Slope	15–45%
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.

Species like plains lovegrass, beargrass, false mesquite and shrubby buckwheat begin growth in late March to April. Warm season grasses begin growth in July or August with receipt of the first summer rains.

Table 3. Representative climatic features

Frost-free period (average)	200 days
Freeze-free period (average)	
Precipitation total (average)	508 mm

Influencing water features

There are no water features associated with this site.

Soil features

These are deep soils which have formed in loamy alluvium of mixed origin. Surface textures range from cobbly sandy loam to very gravelly loam. Very gravelly surface horizons are usually several inches thick. Soils have well-developed covers of rocks, cobbles and gravels. Surface soil is dark colored. Clayey subsoils occur at shallow depths. Some soils have calcic horizons at moderate depths. Plant-soil moisture relationships are good.

Soils mapped on this site include: SSA-666 Cochise county Northwestern part MU's 5 Blacktail, 22 Cherrycow; SSA-667 Santa Cruz and parts of Cochise & Pima counties MU's CdE Canelo GrVSL, CmE Casto GrVSL; SSA-671 Cochise county Douglas-Tombstone part MU's 27 Blacktail & Cherrycow, 41 Brunopeak, 140 Terrarossa, 141 Blacktail.

Table 4. Representative soil features

Surface texture	(1) Cobbly sandy loam (2) Very gravelly loam (3) Gravelly loam
Family particle size	(1) Clayey
Drainage class	Well drained
Permeability class	Moderately slow to slow
Soil depth	152 cm
Surface fragment cover <=3"	10–45%
Surface fragment cover >3"	1–10%
Available water capacity (0-101.6cm)	12.19–24.38 cm
Calcium carbonate equivalent (0-101.6cm)	0–25%
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)	6.1–7.8
Subsurface fragment volume <=3" (Depth not specified)	5–45%
Subsurface fragment volume >3" (Depth not specified)	0–5%

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 historic 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 like 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 listed 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 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, and for each group, count no more than the maximum 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 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

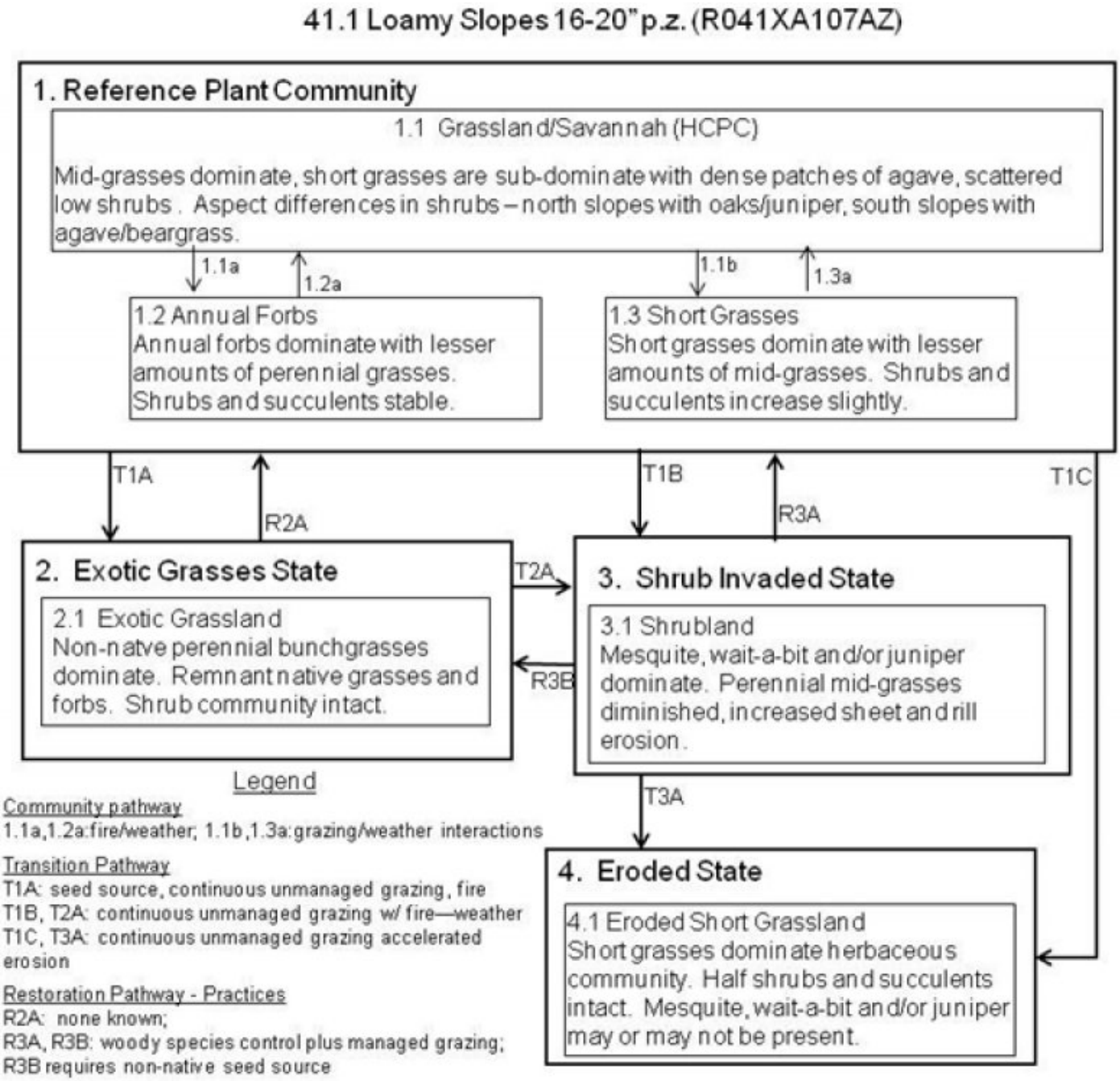

Figure 4. Loamy Slopes 41-1 STM diagram

State 1
Reference State

Community 1.1
Grassland/Savannah (HCPC)

Figure 5. Loamy Slopes 16-20" pz. Agave Palmeri

The historic native state includes the 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 re-occupies the site with proper management. The potential plant community on this site is dominated by warm season perennial mid-grasses. The major grass species are well dispersed throughout the plant community. Stands of Palmer agave occur in dense patches and are not well dispersed through areas of the site. Several species of low shrubs, cacti and other succulents, and forbs are well represented in this plant community. The aspect is open grassland to savannah. North slopes will often have an open canopy of oaks and / or juniper. South slopes will be agave dotted grassland. Mesquite and Lehmann lovegrass are at the upper limits of their elevation range, but can increase on the site, especially below 5000 feet elevation and on southern exposures. Climatic warming may allow these two species to push higher in elevation as time goes by. Naturally occurring fires in June-August were an important factor in shaping this plant community. Fire-free intervals range from 10-20 years. Periodic drought can occur in this LRA and cause significant grass mortality. Droughts in the early 30s, mid 50s, 1975-1976, 88-89, 95-96 and 2002 resulted in the loss of much of the grass cover on this site. This site is the principal habitat for the *Agave palmeri* in southeastern Arizona, an important food source for the endangered lesser long-nosed bat in June, July, and August. Dense stands of this species occur scattered throughout areas of this site. Nectar production in these stands ranges from 6-10 gallons per acre.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	829	1569	2174
Forb	12	67	280
Shrub/Vine	13	56	123
Tree	–	11	56
Total	**854**	**1703**	**2633**

Table 6. Soil surface cover

Tree basal cover	0-1%
Shrub/vine/liana basal cover	1-2%
Grass/grasslike basal cover	8-15%
Forb basal cover	0-1%
Non-vascular plants	0-1%
Biological crusts	0-5%
Litter	20-50%
Surface fragments >0.25" and <=3"	15-45%
Surface fragments >3"	0-5%
Bedrock	0%
Water	0%
Bare ground	15-40%

Table 7. Canopy structure (% cover)

Height Above Ground (M)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.15	–	1-5%	5-10%	1-10%
>0.15 <= 0.3	–	1-5%	10-20%	1-10%
>0.3 <= 0.6	–	1-10%	15-30%	1-20%
>0.6 <= 1.4	–	1-10%	5-15%	0-2%
>1.4 <= 4	0-5%	–	0-5%	–
>4 <= 12	0-5%	–	–	–
>12 <= 24	–	–	–	–
>24 <= 37	–	–	–	–
>37	–	–	–	–

Figure 7. 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
Annual Forbs

Live perennial mid-grass and short-grass basal cover both decrease by more than half compared to the Grassland/Savannah Community. Forbs like annual goldeneye, cudweed and camphorweed dominate the plant community.

Community 1.3
Short Grasses

Mid-grasses are largely absent from the plant community and replaced by short grasses such as curly mesquite, slender grama and sprucetop grama. The absence of mid-grasses reduces fire fuel load resulting in increased half-shrub and succulent shrubs.

Pathway 1.1a
Community 1.1 to 1.2

Extended periods with no disturbance (fire or grazing) allow the build-up of perennial grass biomass and results in plant decadence. Periodic drought also causes significant grass mortality. Droughts in the early 30s, mid 50s, 1975-1976, 88-89, 95-96 and 2002 resulted in the loss of much of the grass cover on this site.

Conservation practices

Prescribed Burning
Fence
Livestock Pipeline
Range Planting
Watering Facility
Upland Wildlife Habitat Management
Prescribed Grazing
Grazing Management Plan - Written
Grazing Management Plan - Applied
Fish and Wildlife Habitat Plan - Written
Fish and Wildlife Habitat Plan - Applied

Pathway 1.1b
Community 1.1 to 1.3

Continuous unmanaged grazing with heavy to severe utilization impacts perennial mid-grass and affects natural fire cycles.

Conservation practices

Prescribed Burning
Fence
Livestock Pipeline
Upland Wildlife Habitat Management
Native Plant Community Restoration and Management
Prescribed Grazing
Fish and Wildlife Structure
Grazing Management Plan - Written
Grazing Management Plan - Applied
Fish and Wildlife Habitat Plan - Written
Fish and Wildlife Habitat Plan - Applied

Pathway 1.2a
Community 1.2 to 1.1

The site recovers rapidly due to excellent covers of stone, cobbles and gravel and the favorable climate that prevails in this common resource area.

Conservation practices

Prescribed Burning

Fence
Livestock Pipeline
Watering Facility
Water Well
Upland Wildlife Habitat Management
Prescribed Grazing
Fish and Wildlife Structure
Grazing Management Plan - Written
Grazing Management Plan - Applied
Fish and Wildlife Habitat Plan - Written
Fish and Wildlife Habitat Plan - Applied

Pathway 1.3a
Community 1.3 to 1.1

With managed grazing, native mid-grasses will be able to regain their dominance in the plant community, unless soil erosion is severe enough to strip away the surface horizon.

Conservation practices

Prescribed Burning
Fence
Livestock Pipeline
Pumping Plant
Watering Facility
Water Well
Upland Wildlife Habitat Management
Prescribed Grazing
Fish and Wildlife Structure
Grazing Management Plan - Written
Grazing Management Plan - Applied
Fish and Wildlife Habitat Plan - Written
Fish and Wildlife Habitat Plan - Applied

State 2
Exotic grasses

Community 2.1
Exotic grasses

Figure 8. Loamy Slopes 16-20" pz. Lehmann lovegrass

This state occurs where non-native lovegrass species or yellow bluestem, have invaded from adjacent areas or roads and right-of-ways with a seed source. As these species increase to dominate the plant community, native perennial grasses and forbs decrease to remnant amounts. Fire will usually act to increase species like Lehmann lovegrass. The native half shrubs seem to be able to stay in the plant community. It is not known how *Agave palmeri* fares under this condition.

State 3
Shrub invaded

Community 3.1
Shrub invaded

Figure 9. Loamy Slopes 16-20" pz. juniper invaded

This state occurs where mesquite, wait a bit mimosa, one-seed juniper and / or alligator juniper have invaded or increased to dominate the plant community. This occurs in the absence of fire for long periods of time, with continuous grazing and in the presence of a seed source of these species. As canopy levels of trees and shrubs approach 30%, sheet and rill erosion can begin to accelerate.

State 4
Eroded surface

Community 4.1
Eroded surface

Figure 10. Loamy Slopes 16-20" pz. trailed and eroded

This state occurs where severe soil compaction and trailing has resulted in loss of plant cover and an increase in runoff. Sheet and rill erosion accelerates and the surface (A) horizon is removed faster than it can be replaced by down-slope soil movement and weathering of the ridgetops. When the subsurface argillic (clayey) horizons are exposed, the site has lost its potential productivity. The plant community will shift from warm season plants to cool season plants and the ratio of runoff to infiltration will increase.

Transition T1A
State 1 to 2

Non-native bunchgrass seed is purposely or inadvertently introduced into the plant community (wind-blown or mechanical transport). Disturbances such as fire or drought can disrupt the native perennials allowing the non-native grasses an opportunity to expand their range from disturbed or planted areas. Long term events such as continuous unmanaged grazing or community phase pathway 1.1a (shift to the Annual Forbs community phase 1.2) allow non-native bunchgrasses a competitive advantage over natives.

Transition T1B
State 1 to 3

Continuous unmanaged grazing with heavy to severe utilization results in persistently low perennial grass cover and extended fire free periods. Shrubs increase in size and number. Remnant native perennial grasses cannot re-colonize areas with shrub competition.

Transition T1C
State 1 to 4

Long-term, continuous, unmanaged grazing with heavy to severe utilization 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. Drought conditions accelerate this transition.

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
Fence
Livestock Pipeline

Pumping Plant
Watering Facility
Water Well
Upland Wildlife Habitat Management
Prescribed Grazing
Fish and Wildlife Structure
Grazing Management Plan - Written
Grazing Management Plan - Applied
Fish and Wildlife Habitat Plan - Written
Fish and Wildlife Habitat Plan - Applied

Transition T2A
State 2 to 3

Continuous unmanaged grazing with heavy to severe utilization results in persistently low perennial grass cover and extended fire free periods. Shrubs increase in size and number. Remnant native perennial grasses cannot re-colonize areas with shrub competition.

Restoration pathway R3A
State 3 to 1

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

Conservation practices

Brush Management
Prescribed Burning
Fence
Firebreak
Livestock Pipeline
Pumping Plant
Grazing Land Mechanical Treatment
Range Planting
Watering Facility
Water Well
Upland Wildlife Habitat Management
Restoration and Management of Natural Ecosystems
Prescribed Grazing
Fuel Break
Fish and Wildlife Structure
Grazing Management Plan - Written
Grazing Management Plan - Applied
Fish and Wildlife Habitat Plan - Written
Fish and Wildlife Habitat Plan - Applied

Restoration pathway R3B
State 3 to 2

Restoration activities conducted when a non-native seed bank is present on site (Lehmann lovegrass or other non-natives present along trails, roads or in disturbed areas) can result in an exotic grassland community. Native species seeding may enhance the native grass component. Restoration practices are woody species control and native species seeding (as needed) supported by managed grazing. Shrub control maintained with herbicide may favor the native grasses while prescribed burning may favor non-natives. Burning the mixed shrub community with a non-native grass seed source present can result in an exotic grassland co-dominant with shrubs.

Conservation practices

Brush Management
Prescribed Burning
Fence
Firebreak
Grade Stabilization Structure
Livestock Pipeline
Pumping Plant
Grazing Land Mechanical Treatment
Range Planting
Watering Facility
Water Well
Upland Wildlife Habitat Management
Prescribed Grazing
Fuel Break
Fish and Wildlife Structure
Grazing Management Plan - Written
Grazing Management Plan - Applied
Fish and Wildlife Habitat Plan - Written
Fish and Wildlife Habitat Plan - Applied

Transition T3A
State 3 to 4

Continuous unmanaged grazing with heavy to severe utilization resulting in persistently low perennial grass cover, extended fire free periods, and adverse soil changes (loss of A horizon organic matter, compaction, and accelerated erosion.)

Additional community tables

Table 8. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Dominant mid-grasses**			785–1681	
	sideoats grama	BOCU	*Bouteloua curtipendula*	448–785	–
	plains lovegrass	ERIN	*Eragrostis intermedia*	224–785	–
	Texas bluestem	SCCI2	*Schizachyrium cirratum*	0–224	–

	spiked crinkleawn	TRSP12	*Trachypogon spicatus*	0–224	–
	green sprangletop	LEDU	*Leptochloa dubia*	22–224	–
	bullgrass	MUEM	*Muhlenbergia emersleyi*	0–224	–
	Orcutt's threeawn	ARSCO	*Aristida schiedeana var. orcuttiana*	11–224	–
	cane bluestem	BOBA3	*Bothriochloa barbinodis*	56–224	–
	purple muhly	MURI3	*Muhlenbergia rigida*	0–112	–
	tanglehead	HECO10	*Heteropogon contortus*	22–112	–
	Arizona cottontop	DICA8	*Digitaria californica*	0–56	–
	woolyspike balsamscale	ELBA	*Elionurus barbiculmis*	0–56	–
2	**Dominant short grasses**			11–336	
	hairy grama	BOHI2	*Bouteloua hirsuta*	1–112	–
	curly-mesquite	HIBE	*Hilaria belangeri*	6–56	–
	sprucetop grama	BOCH	*Bouteloua chondrosioides*	0–56	–
	black grama	BOER4	*Bouteloua eriopoda*	0–56	–
	blue grama	BOGR2	*Bouteloua gracilis*	0–56	–
	purple grama	BORA	*Bouteloua radicosa*	0–50	–
	slender grama	BORE2	*Bouteloua repens*	0–28	–
	fall witchgrass	DICO6	*Digitaria cognata*	1–28	–
	common wolfstail	LYPH	*Lycurus phleoides*	0–28	–
	Hall's panicgrass	PAHA	*Panicum hallii*	0–28	–
3	**Cool season grasses**			2–56	
	prairie acacia	ACAN	*Acacia angustissima*	22–67	–
	yerba de pasmo	BAPT	*Baccharis pteronioides*	22–67	–
	fairyduster	CAER	*Calliandra eriophylla*	22–67	–
	Cooley's bundleflower	DECO2	*Desmanthus cooleyi*	22–67	–
	bastardsage	ERWR	*Eriogonum wrightii*	22–67	–
	littleleaf ratany	KRER	*Krameria erecta*	22–67	–
	trailing krameria	KRLA	*Krameria lanceolata*	22–67	–
	velvetpod mimosa	MIDY	*Mimosa dysocarpa*	22–67	–
	squirreltail	ELELE	*Elymus elymoides ssp. elymoides*	1–56	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	0–22	–
	pinyon ricegrass	PIFI	*Piptochaetium fimbriatum*	0–22	–
	sedge	CAREX	*Carex*	1–11	–
	flatsedge	CYPER	*Cyperus*	0–6	–
	densetuft hairsedge	BUCA2	*Bulbostylis capillaris*	0–6	–
	muttongrass	POFE	*Poa fendleriana*	0–2	–
4	**Miscellaneous perennial grasses**			6–84	
	spidergrass	ARTE3	*Aristida ternipes*	1–28	–
	silver bluestem	BOSA	*Bothriochloa saccharoides*	0–28	–
	tobosagrass	PLMU3	*Pleuraphis mutica*	0–22	–
	little bluestem	SCSC	*Schizachyrium scoparium*	0–11	–
	vine mesquite	PAOB	*Panicum obtusum*	0–11	–
	Fendler threeawn	ARPUL	*Aristida purpurea var. longiseta*	0–11	–
	Wright's threeawn	ARPUW	*Aristida purpurea var. wrightii*	0–6	–

	streambed bristlegrass	SELE6	*Setaria leucopila*	0–6	–
	bulb panicgrass	PABU	*Panicum bulbosum*	0–6	–
	maidencane	PAHE2	*Panicum hemitomon*	0–6	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	0–2	–
	big sacaton	SPWR2	*Sporobolus wrightii*	0–2	–
	Porter's melicgrass	MEPO	*Melica porteri*	0–2	–
	Arizona muhly	MUAR3	*Muhlenbergia arizonica*	0–2	–
	Rothrock's grama	BORO2	*Bouteloua rothrockii*	0–2	–
	nineawn pappusgrass	ENDE	*Enneapogon desvauxii*	0–1	–
	poverty threeawn	ARDI5	*Aristida divaricata*	0–1	–
	Havard's threeawn	ARHA3	*Aristida havardii*	0–1	–
	bush muhly	MUPO2	*Muhlenbergia porteri*	0–1	–
	slim tridens	TRMU	*Tridens muticus*	0–1	–
	slim tridens	TRMUE	*Tridens muticus var. elongatus*	0–1	–
5	**Annual grasses**			0–17	
	Mexican panicgrass	PAHI5	*Panicum hirticaule*	0–6	–
	sixweeks fescue	VUOC	*Vulpia octoflora*	0–6	–
	tapertip cupgrass	ERACA	*Eriochloa acuminata var. acuminata*	0–6	–
	Arizona signalgrass	URAR	*Urochloa arizonica*	0–2	–
	Eastwood fescue	VUMIC	*Vulpia microstachys var. ciliata*	0–2	–
	Pacific fescue	VUMIP	*Vulpia microstachys var. pauciflora*	0–2	–
	witchgrass	PACA6	*Panicum capillare*	0–2	–
	prairie threeawn	AROL	*Aristida oligantha*	0–2	–
	needle grama	BOAR	*Bouteloua aristidoides*	0–1	–
	sixweeks grama	BOBA2	*Bouteloua barbata*	0–1	–
	matted grama	BOSI2	*Bouteloua simplex*	0–1	–
	Arizona brome	BRAR4	*Bromus arizonicus*	0–1	–
	feather fingergrass	CHVI4	*Chloris virgata*	0–1	–
	fragilegrass	AETE	*Aegopogon tenellus*	0–1	–
	sixweeks threeawn	ARAD	*Aristida adscensionis*	0–1	–
	prairie false oat	TRIN5	*Trisetum interruptum*	0–1	–
	Mexican lovegrass	ERME	*Eragrostis mexicana*	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	–
	little barley	HOPU	*Hordeum pusillum*	0–1	–
	Mexican sprangletop	LEFUU	*Leptochloa fusca ssp. uninervia*	0–1	–
	mucronate sprangeltop	LEPAB	*Leptochloa panicea ssp. brachiata*	0–1	–
	delicate muhly	MUFR	*Muhlenbergia fragilis*	0–1	–
	littleseed muhly	MUMI	*Muhlenbergia microsperma*	0–1	–
Forb					
6	**Perennial forbs**			11–56	
	white sagebrush	ARLU	*Artemisia ludoviciana*	1–11	–

	Cooley's bundleflower	DECO2	*Desmanthus cooleyi*	1–11	–
	bluedicks	DICA14	*Dichelostemma capitatum*	1–11	–
	orange fameflower	PHAU13	*Phemeranthus aurantiacus*	0–11	–
	wild dwarf morning-glory	EVAR	*Evolvulus arizonicus*	0–6	–
	spreading snakeherb	DYSCD	*Dyschoriste schiedeana var. decumbens*	0–6	–
	trailing fleabane	ERFL	*Erigeron flagellaris*	1–6	–
	Texas snoutbean	RHSET	*Rhynchosia senna var. texana*	1–6	–
	rose heath	CHER2	*Chaetopappa ericoides*	0–6	–
	leatherweed	CRPO5	*Croton pottsii*	0–6	–
	Gregg's prairie clover	DAGR2	*Dalea greggii*	0–6	–
	bastard toadflax	COUM	*Comandra umbellata*	0–2	–
	dwarf stickpea	CAHUR	*Calliandra humilis var. reticulata*	1–2	–
	largeflower onion	ALMA4	*Allium macropetalum*	0–2	–
	weakleaf bur ragweed	AMCO3	*Ambrosia confertiflora*	1–2	–
	tuber anemone	ANTU	*Anemone tuberosa*	0–2	–
	shrubby purslane	POSU3	*Portulaca suffrutescens*	0–2	–
	Missouri goldenrod	SOMI2	*Solidago missouriensis*	0–2	–
	brownplume wirelettuce	STPA4	*Stephanomeria pauciflora*	0–2	–
	Rocky Mountain zinnia	ZIGR	*Zinnia grandiflora*	0–2	–
	Wright's deervetch	LOWR	*Lotus wrightii*	0–2	–
	New Mexico fleabane	ERNE3	*Erigeron neomexicanus*	0–2	–
	spreading fleabane	ERDI4	*Erigeron divergens*	0–2	–
	silver dwarf morning-glory	EVSE	*Evolvulus sericeus*	0–2	–
	small matweed	GUDE	*Guilleminea densa*	0–2	–
	lacy tansyaster	MAPI	*Machaeranthera pinnatifida*	0–2	–
	tufted evening primrose	OECA10	*Oenothera caespitosa*	0–2	–
	radishroot woodsorrel	OXAL	*Oxalis albicans*	0–1	–
	Drummond's woodsorrel	OXDR	*Oxalis drummondii*	0–1	–
	locoweed	OXYTR	*Oxytropis*	0–1	–
	beardlip penstemon	PEBA2	*Penstemon barbatus*	0–1	–
	Cochise beardtongue	PEDA	*Penstemon dasyphyllus*	0–1	–
	longstalk chinchweed	PELO	*Pectis longipes*	0–1	–
	Parry's beardtongue	PEPA24	*Penstemon parryi*	0–1	–
	slimleaf bean	PHAN3	*Phaseolus angustissimus*	0–1	–
	Mexican star	MIBI2	*Milla biflora*	0–1	–
	lemon beebalm	MOCIA	*Monarda citriodora ssp. austromontana*	0–1	–
	variableleaf bushbean	MAGI2	*Macroptilium gibbosifolium*	0–1	–
	ivyleaf groundcherry	PHHE4	*Physalis hederifolia*	0–1	–
	white milkwort	POAL4	*Polygala alba*	0–1	–
	velvetseed milkwort	POOB	*Polygala obscura*	0–1	–
	Indian rushpea	HOGL2	*Hoffmannseggia glauca*	0–1	–
	red bluet	HORU	*Houstonia rubra*	0–1	–
	babyslippers	HYVE	*Hybanthus verticillatus*	0–1	–

	ragged nettlespurge	JAMA	*Jatropha macrorhiza*	0–1	–
	San Pedro daisy	LAPO4	*Lasianthaea podocephala*	0–1	–
	Fendler's bladderpod	LEFE	*Lesquerella fendleri*	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	–
	Arizona snakecotton	FRAR2	*Froelichia arizonica*	0–1	–
	scarlet beeblossom	GACO5	*Gaura coccinea*	0–1	–
	pearly globe amaranth	GONI	*Gomphrena nitida*	0–1	–
	shaggy dwarf morning-glory	EVNU	*Evolvulus nuttallianus*	0–1	–
	Mexican fireplant	EUHE4	*Euphorbia heterophylla*	0–1	–
	sun spurge	EURA2	*Euphorbia radians*	0–1	–
	Torrey's craglily	ECFL	*Echeandia flavescens*	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	–
	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	–
	copper globemallow	SPAN3	*Sphaeralcea angustifolia*	0–1	–
	gooseberryleaf globemallow	SPGR2	*Sphaeralcea grossulariifolia*	0–1	–
	slimflower scurfpea	PSTE5	*Psoralidium tenuiflorum*	0–1	–
	buffpetal	RHPH2	*Rhynchosida physocalyx*	0–1	–
	slimleaf plainsmustard	SCLI12	*Schoenocrambe linearifolia*	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	–
	perennial rockcress	ARPE2	*Arabis perennans*	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	–

	chaparral asphead	ASHI3	*Aspicarpa hirtella*	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	–
	horsetail milkweed	ASSU2	*Asclepias subverticillata*	0–1	–
	dense ayenia	AYMI	*Ayenia microphylla*	0–1	–
	hairyseed bahia	BAAB	*Bahia absinthifolia*	0–1	–
	lyreleaf greeneyes	BELY	*Berlandiera lyrata*	0–1	–
	scarlet spiderling	BOCO	*Boerhavia coccinea*	0–1	–
	copper fern	BOHI	*Bommeria hispida*	0–1	–
	trailing windmills	ALIN	*Allionia incarnata*	0–1	–
	melon loco	APUN	*Apodanthera undulata*	0–1	–
	Mexican yellowshow	AMPA3	*Amoreuxia palmatifida*	0–1	–
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	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	–
	Fendler's lipfern	CHFE2	*Cheilanthes fendleri*	0–1	–
	fairyswords	CHLI	*Cheilanthes lindheimeri*	0–1	–
	birdbill dayflower	CODI4	*Commelina dianthifolia*	0–1	–
	Texas bindweed	COEQ	*Convolvulus equitans*	0–1	–
	whitemouth dayflower	COER	*Commelina erecta*	0–1	–
	fingerleaf gourd	CUDI	*Cucurbita digitata*	0–1	–
	coyote gourd	CUPA	*Cucurbita palmata*	0–1	–
	whiteflower prairie clover	DAAL	*Dalea albiflora*	0–1	–
7	**Annual Forbs**			1–224	
	longleaf false goldeneye	HELOA2	*Heliomeris longifolia var. annua*	1–224	–
	camphorweed	HESU3	*Heterotheca subaxillaris*	0–56	–
	Wright's cudweed	PSCAC2	*Pseudognaphalium canescens ssp. canescens*	0–22	–
	mesa tansyaster	MATA	*Machaeranthera tagetina*	0–11	–
	woolly plantain	PLPA2	*Plantago patagonica*	0–11	–
	New Mexico thistle	CINE	*Cirsium neomexicanum*	0–11	–
	New Mexico goosefoot	CHNE3	*Chenopodium neomexicanum*	0–11	–
	sensitive partridge pea	CHNI2	*Chamaecrista nictitans*	0–11	–
	smallflowered milkvetch	ASNU4	*Astragalus nuttallianus*	0–11	–
	Thurber's milkvetch	ASTH	*Astragalus thurberi*	0–11	–
	pitseed goosefoot	CHBE4	*Chenopodium berlandieri*	0–11	–
	carelessweed	AMPA	*Amaranthus palmeri*	0–6	–
	western tansymustard	DEPI	*Descurainia pinnata*	0–6	–
	crestrib morning-glory	IPCO2	*Ipomoea costellata*	0–6	–

	redstar	IPCO3	*Ipomoea coccinea*	0–6	–
	ivyleaf morning-glory	IPHE	*Ipomoea hederacea*	0–6	–
	Abert's buckwheat	ERAB2	*Eriogonum abertianum*	0–6	–
	sorrel buckwheat	ERPO4	*Eriogonum polycladon*	0–6	–
	tanseyleaf tansyaster	MATA2	*Machaeranthera tanacetifolia*	0–6	–
	curlytop gumweed	GRNUA	*Grindelia nuda var. aphanactis*	0–6	–
	slender goldenweed	MAGR10	*Machaeranthera gracilis*	0–6	–
	Arizona poppy	KAGR	*Kallstroemia grandiflora*	0–6	–
	sweet four o'clock	MILO2	*Mirabilis longiflora*	0–6	–
	intermediate pepperweed	LEVIM	*Lepidium virginicum var. medium*	0–2	–
	sawtooth sage	SASU7	*Salvia subincisa*	0–2	–
	Thurber's morning-glory	IPTH	*Ipomoea thurberi*	0–2	–
	wedgeleaf draba	DRCU	*Draba cuneifolia*	0–2	–
	scrambled eggs	COAU2	*Corydalis aurea*	0–2	–
	New Mexico copperleaf	ACNE	*Acalypha neomexicana*	0–2	–
	miner's lettuce	CLPEP	*Claytonia perfoliata ssp. perfoliata*	0–1	–
	threadstem sandmat	CHRE4	*Chamaesyce revoluta*	0–1	–
	thymeleaf sandmat	CHSE6	*Chamaesyce serpyllifolia*	0–1	–
	slimseed sandmat	CHST8	*Chamaesyce stictospora*	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	–
	poorjoe	DITE2	*Diodia teres*	0–1	–
	El Paso skyrocket	IPTH2	*Ipomopsis thurberi*	0–1	–
	miniature woollystar	ERDI2	*Eriastrum diffusum*	0–1	–
	spreading fleabane	ERDI4	*Erigeron divergens*	0–1	–
	flaxflowered ipomopsis	IPLOL	*Ipomopsis longiflora ssp. longiflora*	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	–
	crested anoda	ANCR2	*Anoda cristata*	0–1	–
	southwestern pricklypoppy	ARPL3	*Argemone pleiacantha*	0–1	–
	halfmoon milkvetch	ASAL6	*Astragalus allochrous*	0–1	–
	royal sandmat	CHDI5	*Chamaesyce dioica*	0–1	–
	pillpod sandmat	CHHI3	*Chamaesyce hirta*	0–1	–
	hyssopleaf sandmat	CHHY3	*Chamaesyce hyssopifolia*	0–1	–
	wheelscale saltbush	ATEL	*Atriplex elegans*	0–1	–

	fewflower beggarticks	BILE	*Bidens leptocephala*	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	–
	spreading fanpetals	SIAB	*Sida abutifolia*	0–1	–
	sleepy silene	SIAN2	*Silene antirrhina*	0–1	–
	streptanthella	STREP	*Streptanthella*	0–1	–
	golden crownbeard	VEEN	*Verbesina encelioides*	0–1	–
	Abert's creeping zinnia	SAAB	*Sanvitalia abertii*	0–1	–
	whitestem blazingstar	MEAL6	*Mentzelia albicaulis*	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	–
	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	–
	warty caltrop	KAPA	*Kallstroemia parviflora*	0–1	–
	Coulter's horseweed	LACO13	*Laennecia coulteri*	0–1	–
	Gordon's bladderpod	LEGO	*Lesquerella gordonii*	0–1	–
	broadleaved pepperweed	LELA2	*Lepidium latifolium*	0–1	–
	green carpetweed	MOVE	*Mollugo verticillata*	0–1	–
	desert evening primrose	OEPR	*Oenothera primiveris*	0–1	–
	purplewhite owl's-clover	ORPU2	*Orthocarpus purpureoalbus*	0–1	–
	Arizona phacelia	PHAR13	*Phacelia arizonica*	0–1	–
	Mangas Spring phacelia	PHBO4	*Phacelia bombycina*	0–1	–
	Arizona popcornflower	PLAR	*Plagiobothrys arizonicus*	0–1	–
Shrub/Vine					
8	**Dominant half shrubs**			11–56	
	fairyduster	CAER	*Calliandra eriophylla*	6–22	–
	cliff goldenbush	ERCUS	*Ericameria cuneata var. spathulata*	0–11	–
	bastardsage	ERWR	*Eriogonum wrightii*	1–11	–
	prairie acacia	ACAN	*Acacia angustissima*	1–11	–
	yerba de pasmo	BAPT	*Baccharis pteronioides*	1–11	–
	littleleaf ratany	KRER	*Krameria erecta*	0–6	–
	trailing krameria	KRLA	*Krameria lanceolata*	0–6	–
9	**Succulents**			2–56	
	Palmer's century plant	AGPA3	*Agave palmeri*	1–45	–

	sacahuista	NOMI	*Nolina microcarpa*	1–34	–
	common sotol	DAWH2	*Dasylirion wheeleri*	0–2	–
	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	–
	rainbow cactus	ECPE	*Echinocereus pectinatus*	0–1	–
	kingcup cactus	ECTR	*Echinocereus triglochidiatus*	0–1	–
	spinystar	ESVI2	*Escobaria vivipara*	0–1	–
	Graham's nipple cactus	MAGR9	*Mammillaria grahamii*	0–1	–
	Macdougal's nipple cactus	MAHEM	*Mammillaria heyderi var. macdougalii*	0–1	–
	Parry's agave	AGPA4	*Agave parryi*	0–1	–
	Parry's agave	AGPAP5	*Agave parryi ssp. parryi*	0–1	–
	Santa Cruz beehive cactus	CORE3	*Coryphantha recurvata*	0–1	–
	walkingstick cactus	CYSP8	*Cylindropuntia spinosior*	0–1	–
	cactus apple	OPEN3	*Opuntia engelmannii*	0–1	–
	tulip pricklypear	OPPH	*Opuntia phaeacantha*	0–1	–
	banana yucca	YUBA	*Yucca baccata*	0–1	–
	soaptree yucca	YUEL	*Yucca elata*	0–1	–
	Schott's yucca	YUSC	*Yucca ×schottii*	0–1	–
10	**Miscellaneous shrubs**			0–11	
	Sonoran scrub oak	QUTU2	*Quercus turbinella*	0–2	–
	California brickellbush	BRCA3	*Brickellia californica*	0–2	–
	false boneset	BREU	*Brickellia eupatorioides*	0–1	–
	littleleaf sumac	RHMI3	*Rhus microphylla*	0–1	–
	skunkbush sumac	RHTR	*Rhus trilobata*	0–1	–
	evergreen sumac	RHVIC	*Rhus virens var. choriophylla*	0–1	–
	heartleaf goldeneye	VICO	*Viguiera cordifolia*	0–1	–
	longleaf jointfir	EPTR	*Ephedra trifurca*	0–1	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	0–1	–
	catclaw mimosa	MIACB	*Mimosa aculeaticarpa var. biuncifera*	0–1	–
	velvetpod mimosa	MIDY	*Mimosa dysocarpa*	0–1	–
	Graham's mimosa	MIGR2	*Mimosa grahamii*	0–1	–
	catclaw acacia	ACGR	*Acacia greggii*	0–1	–
	milfoil wattle	ACMI	*Acacia millefolia*	0–1	–
	Wright's beebrush	ALWR	*Aloysia wrightii*	0–1	–
	Thurber's desert honeysuckle	ANTH2	*Anisacanthus thurberi*	0–1	–
	Pringle manzanita	ARPR	*Arctostaphylos pringlei*	0–1	–
	pointleaf manzanita	ARPU5	*Arctostaphylos pungens*	0–1	–
Tree					
11	**Trees**			0–56	
	Arizona white oak	QUAR	*Quercus arizonica*	0–28	–

	Emory oak	QUEM	*Quercus emoryi*	0–28	–
	Mexican blue oak	QUOB	*Quercus oblongifolia*	0–22	–
	Abert's buckwheat	ERAB2	*Eriogonum abertianum*	2–9	–
	hoary tansyaster	MACA2	*Machaeranthera canescens*	2–9	–
	alligator juniper	JUDE2	*Juniperus deppeana*	0–6	–
	oneseed juniper	JUMO	*Juniperus monosperma*	0–6	–

Animal community

The plant community on this site is suitable for grazing by all classes of livestock at any season. The plant community provides adequate nutrition throughout the year. Steep slopes and very gravelly and/or cobbly surfaces limit livestock grazing distribution on this site. Large areas of this site should be fenced separately from the uplands and bottom sites it is associated with to effectively manage the forage resource it has. The presence of cool season grass species and plains lovegrass cause livestock to forage widely in the early spring on this site making this the best season to effectively use the site. Annual goldeneye can cause poisoning problems in the fall after unusually wet winter-spring seasons.

This site is a primary habitat for pronghorn antelope in southeastern Arizona. It is also habitat for mule and whitetail deer having enough topography and/or tree and shrub cover to maintain both deer species in residence. The potential plant community is rich in both grass and forb species making the site home to a great variety of insect, bird, small mammal and reptile species. The lesser long-nosed bat uses the abundant nectar in the flowers of the Agave Plameri as it flowers throughout June, July, and August. Natural water is lacking on the site and water developments are very important to large mammals and many species of birds and small mammals on the site.

Hydrological functions

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

Recreational uses

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

Wood products

Limited oak and juniper on north exposures. Mesquite may be present and furnish fuel-wood for campfires.

Other products

Agave for tequila or mescal, beargrass for fibers, medicinal plants like yerba de pasmo.

Inventory data references

Range 417s include 3 in excellent condition, 4 in good condition and 1 in fair condition.

Type locality

Location 1: Cochise County, AZ	
Township/Range/Section	T21S R19E S30
General legal description	SE 1/4 of section - Ft. Huachuca- West Range
Location 2: Cochise County, AZ	
Township/Range/Section	T22S R20E S8
General legal description	NW 1/4 section - Ft. Huachuca - South Range
Location 3: Pima County, AZ	

Township/Range/Section	T19S R17E S36
General legal description	Tucson - Empire Ranch, Hilton Pasture at KA #11 and 12.
Location 4: Cochise County, AZ	
Township/Range/Section	T13S R22E S18
General legal description	NW 1/4 - Willcox - Warbonnet Ranch
Location 5: Santa Cruz County, AZ	
Township/Range/Section	T21S R18E S17
General legal description	Audubon Research Ranch

Contributors

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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)	Wilma Renken, Dan Robinett, Larry Humphrey, Scott Stratton, Linda Kennedy
Contact for lead author	USDA-NRCS Tucson MLRA Soil Survey Office
Date	05/01/2014
Approved by	Curtis Talbot
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** North and South aspects: No rills.

   Note: When evaluating range health on this ecological site, aspect and slope affect expected reference conditions and should be factored into evaluation. Reference conditions described here are from north- and south-facing aspects with 20% slope, 11 years post-burn (Ryan Fire).

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2. **Presence of water flow patterns:**
   North aspect: very short, indistinguishable among high cobble/gravel/vegetation cover.
   South aspect: common, short (<5') and discontinuous.

3. **Number and height of erosional pedestals or terracettes:**
   North aspect: pedestals <1" in height occassionally observed on short-grasses; terracettes common, 3-5 ft apart with 1" elevation difference.
   South aspect: pedestals 1/2"-1" in height common on perennial grasses; terracettes common, 1-2 ft apart with 1"-2" elevation difference.

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):**
   North aspect: 3-6% bare ground evenly distributed among gravel/rock cover; non-vegetated areas are scarce. After fire, 25-30% bare ground is observed.
   South aspect: 7-8% bare ground evenly distributed among gravel/rock cover; small non-vegetated areas <1 ft in diam. occasionally observed. After fire, 25-30% bare ground is observed.

5. **Number of gullies and erosion associated with gullies:** North and South aspects: None

6. **Extent of wind scoured, blowouts and/or depositional areas:** North and South aspects: None

7. **Amount of litter movement (describe size and distance expected to travel):** North and South aspects: Fine litter moving less than 1 foot, course litter stays in place.

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** North and South aspects: No difference between canopy-protected and unprotected soil slake values. All values rated as 5's and 6's.

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** North and South aspects: Soil surface horizon 0-3" depth, gravelly sandy loam, granular structure. Color 7.5 YR 3/3 moist.

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:**
    North aspect: Perennial grasses are well-dispersed across site with basal cover 15-20%. Foliar cover is 50-70% perennial grasses and 5-10% low shrubs.
    South aspect: Perennial mid-grasses occur within an evenly dispersed short-grass community. Basal cover of perennial grasses is >10%. Foliar cover is 50-70% within mid-grass patches and 30-50% within short-grasses.

11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):** North and South aspects: No compaction. Clay horizon at 5" depth may be mistaken for compaction.

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:
    North aspect: Warm season mid-grasses;
    South aspect: Warm season mid-grasses > short-grasses

    Sub-dominant:
    North aspect: short-grasses > low shrubs > perennial forbs > trees;
    South aspect: low shrubs > perennial forbs

    Other: succulents

    Additional: Annual forbs and annual grasses fluctuate with precipitation and can flourish after fire or drought.

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** North and South aspects: Perennial grass decadence increases with time since last fire. Current observation (11 years post-burning), both aspects exhibit some perennial grass decadence, little mortality seen overall. Mortality from fire depends upon season and intensity of burn.

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14. **Average percent litter cover (%) and depth (in):** North aspect: 55% litter cover; South aspect: 45% litter cover. Litter cover on the low end of the range is expected immmediately post-burn and increases with favorable weather and time.

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 763 lbs/ac. in a below average year; 1520 lbs/ac. in an average year; 2350 lbs/ac. in an above average year.

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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:** Lehmann lovegrass, Boer lovegrass, yellow bluestem, velvet mesquite

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17. **Perennial plant reproductive capability:** Not impaired. Warm season perennial grass seed production highly dependent upon the amount and timing of summer monsoons.
