

Ecological site R040XA104AZ Clayey Upland 10"-13" p.z.

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General information

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

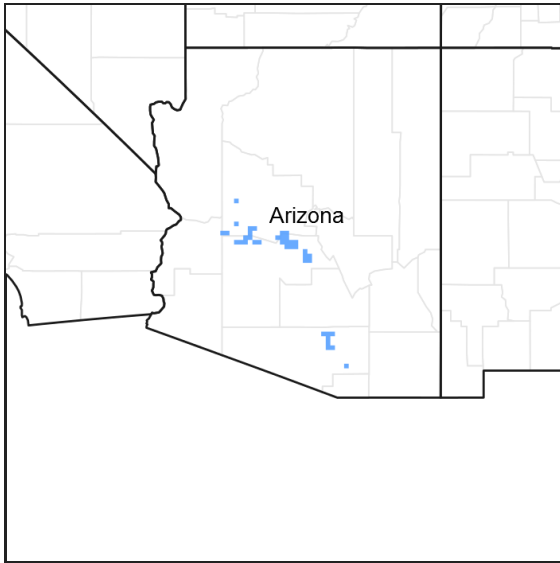


Figure 1. Mapped extent

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

MLRA notes

Major Land Resource Area (MLRA): 040X–Sonoran Basin and Range

AZ 40.1 – Upper Sonoran Desert

Elevations range from 2000 to 3200 feet and precipitation averages 10 to 13 inches per year. Vegetation includes saguaro, palo verde, mesquite, creosotebush, triangle bursage, prickly pear, cholla, limberbush, wolfberry, bush muhly, threeawns, ocotillo, and globe mallow. The soil temperature regime is thermic and the soil moisture regime is typic aridic. This unit occurs within the Basin and Range Physiographic Province and is characterized by numerous mountain ranges that rise abruptly from broad, plain-like valleys and basins. Igneous and metamorphic rock classes dominate the mountain ranges and sediments filling the basins represent combinations of fluvial, lacustrine, colluvial and alluvial deposits.

Ecological site concept

Clayey upland, 10-13" p.z., ecological site is located in upland position (receiving moisture from rainfall only). Soils are moderately deep to deep, clayey textured, and have vertic properties.

Table 1. Dominant plant species

Tree	Not specified
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Shrub	(1) <i>Opuntia engelmannii</i>
Herbaceous	(1) <i>Pleuraphis mutica</i>

Physiographic features

This site occurs in the upper elevations of the Sonoran Desert in southern Arizona.

Table 2. Representative physiographic features

Landforms	(1) Terrace (2) Stream terrace (3) Mesa
Elevation	671–1,006 m
Slope	1–15%

Climatic features

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

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

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

Table 3. Representative climatic features

Frost-free period (average)	265 days
Freeze-free period (average)	0 days
Precipitation total (average)	330 mm

Influencing water features

Soil features

These are deep and moderately deep soils formed in clayey alluvium of montmorillinitic origin. They have high shrink-swell potential. Soil churning and cracking cause uneven surfaces. Plant-soil moisture relationships are good. Soils mapped on this site are: SSA-637 Western Yavapai County MU's Graham-GrB & Rimrock-GrB, Rk, Rm & Rn; SSA-645 Aguila-Carefree MU's Continental-24, 25, 26, 27, 28, 36, 37 & 38; SSA-668 Tucson-Avra Valley Area MU's Tubac-Tv2 & Vekol-Vo.

Table 4. Representative soil features

Surface texture	(1) Clay loam (2) Loam
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Family particle size	(1) Clayey
Drainage class	Well drained
Permeability class	Moderately slow to slow
Soil depth	152 cm
Surface fragment cover <=3"	0–10%
Surface fragment cover >3"	0–1%
Available water capacity (0-101.6cm)	17.78–22.86 cm
Calcium carbonate equivalent (0-101.6cm)	0–10%
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)	7.4–8.4
Subsurface fragment volume <=3" (Depth not specified)	0–5%
Subsurface fragment volume >3" (Depth not specified)	0–1%

Ecological dynamics

Clayey Upland, 10-13" p.z., is a tobosa dominated desert grassland (tobosa patches with very few shrubs, succulents). The climate limits shrink-swell action of clayey soils so shrub recruitment and growth is only slightly restricted; fire does not play a role in maintaining the open aspect. The plant community phases within State 1. Desert Grassland are a Perennial Grass Community (1.1) and a Perennial Grass and Annuals Community. These community phases cycle with drought and excessive grazing pressure. The Perennial Grass>>Shrub Community (1.1), responds to drought and grazing with decreasing tobosa cover. As drought or excessive grazing pressure persists, tobosa vigor then basal cover declines. When normal rainfall patterns resume, or excessive grazing pressure removed, the perennial grass community will recover. However, when tobosa basal cover drops to less than 1%, a recovery threshold is crossed. The transition pathway from State 1 will go to one of three alternate states depending on inherent shrub and succulents in community (T1A to State 2. Desert Shrubland), presence of heavy stone and cobble cover (T1B to State 3. Shrub-Succulent-Grass), or introduction of non-native annuals with or without burning (T1C to State 4. Non-native Annuals).

Recovery pathways from State 2 and State 3 include removal of excessive grazing pressure, rangeland planting and a long-term commitment to prescribed grazing. Brush management may be applied to remove dominant succulent or shrub cover. This ecological site should not be burned.

Long-term excessive livestock grazing will permanently impair the site forcing the threshold to State 5 (T2B, T3A, T4A), Eroded State. Active erosion prevails. No recovery pathway is possible, however, management practices to limit soil loss are prescribed grazing and mechanical land treatment. (Community Pathway 5.1A). Pathway 5.2A will revert site to active erosion if excessive grazing pressure is resumed.

State and transition model

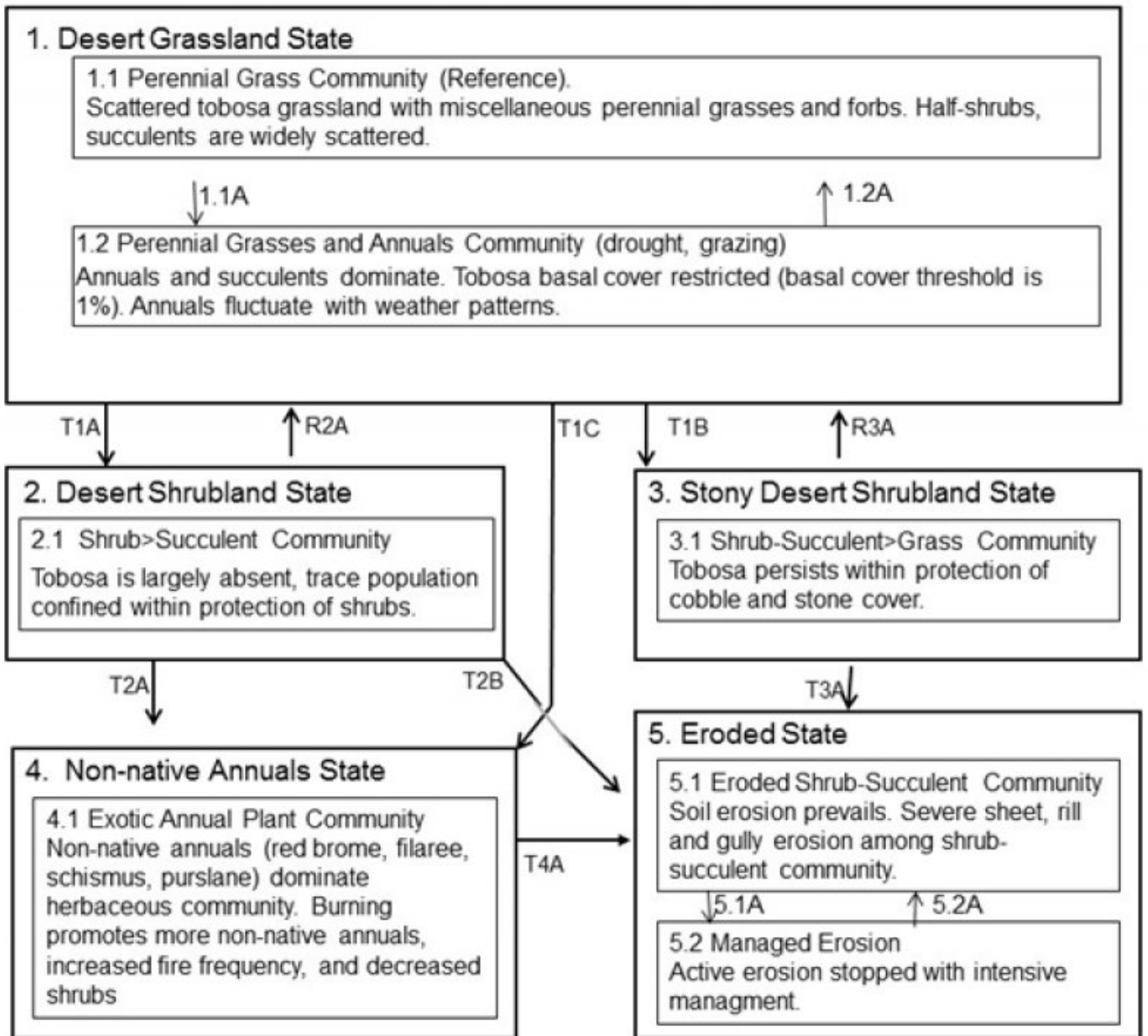


Figure 4. Clayey Upland STM

Legend: 40-1 Clayey Upland 10- 13" p.z. (R040XA104AZ) – DRAFT

Transition Pathway

T1A, T1B, T1C continuous excessive grazing

T1C continuous excessive grazing and introduction of non-native annuals

T2A, T2B, T3A, T4A: fire/burning, continuous excessive grazing

Restoration Pathway - Practices

R2A, R3A: long-term prescribed grazing with range planting;

Figure 5. STM Legend

State 1 Desert Grassland State

Community 1.1 Perennial Grass Community (Reference)

The Perennial Grass Community (1.1) has 15-30% tobosa canopy (ungrazed) with other perennial grasses such as purple three-awn, red grama and curly mesquite mixed within widely scattered shrubs and prickly pear. The aspect is open grassland. With continuous, heavy grazing, the perennial grass cover is thinned and species like prickly pear increase. Cool season annual grasses will replace perennial grasses. Introduced species like red brome, wild oats, and foxtail barley can be troublesome on this site.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	549	–	628
Forb	78	–	157
Shrub/Vine	39	–	78
Total	666	–	863

Figure 7. Plant community growth curve (percent production by month). AZ4013, 40.1 10-13" p.z. other sites. Growth begins in the late winter, goes semi-dormant in the drought period of late May through early July, growth continues in the summer through early fall..

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

Community 1.2

Perennial Grasses and Annuals Community

The Perennial Grass Community (1.1) has diminished tobosa canopy. Other perennial grasses such as purple three-awn, red grama and curly mesquite may be hard to find. Shrubs and succulents are scattered. Annual forbs and grasses flourish with rainfall. The aspect is open grassland.

Pathway 1.1A

Community 1.1 to 1.2

Drought or short-term excessive grazing pressure impacts tobosa cover.

Pathway 1.2A

Community 1.1 to 1.2

Average rainfall patterns resume, excessive grazing pressure removed

State 2

Desert Shrubland State

Large shrubs and prickly pear dominate. Annuals and half-shrubs dominate the understory with tobosa basal cover below 1% recovery threshold.

Community 2.1

Shrub > Succulent Community

Large shrub canopy cover increases to 5-15%; prickly pear and other succulent canopy cover increases to 5-20%. Annual forbs and grasses (native annuals dominant, isolated patches of non-native annuals may be present). Tobosa and other perennial grasses and forbs may be present in trace amounts. Hydrology of site is altered with rooting depth and soil moisture uptake having shifted from many fibrous roots within upper 2-3' to few woody roots at depths >3'.

State 3

Stony Desert Shrubland State

Remnant tobosa basal cover is protected by stones and cobbles on the soil surface. Large shrubs and prickly pear co-dominant with half shrubs.

Community 3.1

Shrub - Succulent > Grass Community

On some soil series, cobbly or stony surfaces protect tobosa from heavy grazing events, leaving remnant tobosa on this site (tobosa basal cover <1%). Large shrub canopy cover increases to 5-15%; prickly pear and other succulent canopy cover increases to 5-20%. Annual forbs and grasses (native annuals dominant, isolated patches of non-native annuals may be present). Hydrology of site is only slightly shifted by dominance of rooting depth and soil moisture uptake with some fibrous roots within upper 2-3' and woody roots at depths >3'.

State 4 Non-native Annuals State

Non-native annuals (including red brome, filaree, schisms and purslane) dominate understory (continuous, non-patchy distribution of non-native annuals). Shrubs and succulents may be absent if site has fire or brush management history.

Community 4.1 Exotic Annual Plant Community

The Exotic Annuals Plant Community is an ephemeral community of non-native annual forbs and grasses that flourishes after rainfall events. Occasionally, this site will produce enough fine fuels to carry fire. Fire within this community promotes non-native annuals to the detriment of native shrubs, succulents. Hydrology of site is greatly impaired. Fine roots are only present in upper 6" of soil profile; presence of woody roots at depth depends on presence of shrub and succulents.

State 5 Eroded State

Large shrubs and prickly pear may be absent or up to 30% canopy cover depending on fire and brush management history. Perennial grasses and forbs are absent. Annuals fluctuate with rainfall but are unable to establish in active soil movement areas. Active soil erosion is evident by severe sheet, rill and gully erosion. Non-stony soil surfaces erode easily. Sites with stone and cobble cover are naturally more resistant to transitioning to this state but it can happen.

Community 5.1 Eroded Shrub-Succulent Community

Large shrubs and succulents can be present up to 30% canopy cover. Perennial forbs and grasses are absent. Gone. Annuals only establish in stable areas after rainfall.

Community 5.2 Managed Erosion Community

Active soil erosion can be reduced with application of intensive practices such as mechanical land treatment and installation of small rock dams. The site does not have a restoration pathway but can be stabilized in a managed community. Success of the managed erosion community is highly dependent upon long-term prescribed grazing. Annuals will proliferate in stabilized areas. Success of any range planting depends on post-seeding rainfall and management

Additional community tables

Table 6. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	Dominant Grass			471–549	
	tobosagrass	PLMU3	<i>Pleuraphis mutica</i>	471–549	–
2	Miscellaneous Grasses			39–78	
	purple threave	APD110	<i>Aristida purpurea</i>	0–11	

	purple threeawn	ARPUP5	<i>Aristida purpurea</i>	0-11	-
	Parish's threeawn	ARPUP5	<i>Aristida purpurea</i> var. <i>parishii</i>	0-11	-
	Wright's threeawn	ARPUW	<i>Aristida purpurea</i> var. <i>wrightii</i>	0-11	-
	spidergrass	ARTE3	<i>Aristida ternipes</i>	0-11	-
	spidergrass	ARTEG	<i>Aristida ternipes</i> var. <i>gentilis</i>	0-11	-
	curly-mesquite	HIBE	<i>Hilaria belangeri</i>	1-11	-
	vine mesquite	PAOB	<i>Panicum obtusum</i>	1-6	-
	big galleta	PLRI3	<i>Pleuraphis rigida</i>	0-6	-
	sideoats grama	BOCU	<i>Bouteloua curtipendula</i>	1-3	-
	squirreltail	ELELE	<i>Elymus elymoides</i> ssp. <i>elymoides</i>	1-2	-
3	Annual Grasses			6-78	
	Rothrock's grama	BORO2	<i>Bouteloua rothrockii</i>	1-22	-
	needle grama	BOAR	<i>Bouteloua aristoides</i>	1-17	-
	sixweeks threeawn	ARAD	<i>Aristida adscensionis</i>	1-11	-
	sixweeks fescue	VUOC	<i>Vulpia octoflora</i>	1-11	-
	little barley	HOPU	<i>Hordeum pusillum</i>	1-9	-
	Mexican sprangletop	LEFUU	<i>Leptochloa fusca</i> ssp. <i>uninervia</i>	1-6	-
	mucronate sprangletop	LEPAB	<i>Leptochloa panicea</i> ssp. <i>brachiata</i>	1-6	-
	sticky sprangletop	LEVI5	<i>Leptochloa viscida</i>	1-6	-
	delicate muhly	MUFR	<i>Muhlenbergia fragilis</i>	1-6	-
	littleseed muhly	MUMI	<i>Muhlenbergia microsperma</i>	1-6	-
	Bigelow's bluegrass	POBI	<i>Poa bigelovii</i>	1-6	-
	sixweeks grama	BOBA2	<i>Bouteloua barbata</i>	1-6	-
	burrograss	SCBR2	<i>Scleropogon brevifolius</i>	0-3	-
	Pacific fescue	VUMIP	<i>Vulpia microstachys</i> var. <i>pauciflora</i>	1-3	-
	Arizona brome	BRAR4	<i>Bromus arizonicus</i>	0-2	-
	feather fingergrass	CHVI4	<i>Chloris virgata</i>	1-2	-
Forb					
4	Perennial Forbs			39-78	
	desert globemallow	SPAM2	<i>Sphaeralcea ambigua</i>	22-45	-
	bluedicks	DICAC5	<i>Dichelostemma capitatum</i> ssp. <i>capitatum</i>	6-17	-
	dwarf desertpeony	ACNA2	<i>Acourtia nana</i>	6-11	-
	Indian rushpea	HOGL2	<i>Hoffmannseggia glauca</i>	0-9	-
	Louisiana vetch	VILUL2	<i>Vicia ludoviciana</i> ssp. <i>ludoviciana</i>	0-6	-
5	Annual & Trace Perennials			39-78	
	desert Indianwheat	PLOV	<i>Plantago ovata</i>	1-17	-
	western tansymustard	DEPI	<i>Descurainia pinnata</i>	1-11	-
	weakeaf bur ragweed	AMCO3	<i>Ambrosia confertiflora</i>	1-11	-
	Coulter's globemallow	SPCO2	<i>Sphaeralcea coulteri</i>	2-11	-
	Arizona popcornflower	PLAR	<i>Plagiobothrys arizonicus</i>	1-6	-
	carelessweed	AMPA	<i>Amaranthus palmeri</i>	1-6	-
	fringed redmaids	CACI2	<i>Calandrinia ciliata</i>	1-6	-
	spreading fleabane	ERDI4	<i>Erigeron divergens</i>	1-6	-
	Texas stork's bill	ERTE13	<i>Erodium texanum</i>	1-6	-

	American wild carrot	DAPU3	<i>Daucus pusillus</i>	1-4	-
	whitemargin sandmat	CHAL11	<i>Chamaesyce albomarginata</i>	1-3	-
	goosefoot	CHENO	<i>Chenopodium</i>	1-3	-
	California poppy	ESCAM	<i>Eschscholzia californica ssp. mexicana</i>	1-3	-
	shaggyfruit pepperweed	LELA	<i>Lepidium lasiocarpum</i>	1-2	-
	coastal bird's-foot trefoil	LOSA	<i>Lotus salsuginosus</i>	1-2	-
	lacy tansyaster	MAPIP4	<i>Machaeranthera pinnatifida ssp. pinnatifida var. pinnatifida</i>	1-2	-
	purslane	PORTU	<i>Portulaca</i>	1-2	-
	doubleclaw	PRPA2	<i>Proboscidea parviflora</i>	1-2	-
	Nuttall's povertyweed	MONU	<i>Monolepis nuttalliana</i>	1-2	-
	desert tobacco	NIOBO	<i>Nicotiana obtusifolia var. obtusifolia</i>	1-2	-
	evening primrose	OENOT	<i>Oenothera</i>	1-2	-
	Florida pellitory	PAFL3	<i>Parietaria floridana</i>	1-2	-
	manybristle chinchweed	PEPA2	<i>Pectis papposa</i>	1-2	-
	hyssopleaf sandmat	CHHY3	<i>Chamaesyce hyssopifolia</i>	1-2	-
	New Mexico thistle	CINE	<i>Cirsium neomexicanum</i>	1-2	-
	fingerleaf gourd	CUDI	<i>Cucurbita digitata</i>	1-2	-
	Missouri gourd	CUFO	<i>Cucurbita foetidissima</i>	1-2	-
	coyote gourd	CUPA	<i>Cucurbita palmata</i>	1-2	-
	milkvetch	ASTRA	<i>Astragalus</i>	1-2	-
	hoary bowlesia	BOIN3	<i>Bowlesia incana</i>	1-2	-
	California suncup	CACA32	<i>Camissonia californica</i>	0-1	-
	tuber anemone	ANTU	<i>Anemone tuberosa</i>	0-1	-
	mariposa lily	CALOC	<i>Calochortus</i>	0-1	-
	silverleaf nightshade	SOEL	<i>Solanum elaeagnifolium</i>	0-1	-
	woolly plantain	PLPA2	<i>Plantago patagonica</i>	0-1	-
	redseed plantain	PLRH	<i>Plantago rhodosperma</i>	0-1	-
	Lindley's silverpuffs	MILI5	<i>Microseris lindleyi</i>	0-1	-
Shrub/Vine					
6	Misc Shrubs			6-39	
	fairyduster	CAER	<i>Calliandra eriophylla</i>	1-6	-
	blue paloverde	PAFL6	<i>Parkinsonia florida</i>	1-6	-
	jojoba	SICH	<i>Simmondsia chinensis</i>	1-3	-
	soaptree yucca	YUEL	<i>Yucca elata</i>	1-3	-
	lotebush	ZIOB	<i>Ziziphus obtusifolia</i>	1-2	-
	banana yucca	YUBA	<i>Yucca baccata</i>	0-2	-
	Joshua tree	YUBR	<i>Yucca brevifolia</i>	0-2	-
	honey mesquite	PRGLG	<i>Prosopis glandulosa var. glandulosa</i>	1-2	-
	hollyleaf redberry	RHIL	<i>Rhamnus ilicifolia</i>	0-2	-
	desert-thorn	LYCIU	<i>Lycium</i>	1-2	-
	pale desert-thorn	LYPA	<i>Lycium pallidum</i>	1-2	-
	whitethorn acacia	ACCO2	<i>Acacia constricta</i>	1-2	-

	catclaw acacia	ACGR	<i>Acacia greggii</i>	1-2	-
	crucifixion thorn	CAHO3	<i>Canotia holacantha</i>	0-1	-
	Cooley's bundleflower	DECO2	<i>Desmanthus cooleyi</i>	0-1	-
7	Succulents			0-39	
	desert agave	AGDE	<i>Agave deserti</i>	0-3	-
	dollarjoint pricklypear	OPCH	<i>Opuntia chlorotica</i>	0-3	-
	cactus apple	OPEN3	<i>Opuntia engelmannii</i>	0-3	-
	candy barrelcactus	FEWI	<i>Ferocactus wislizeni</i>	0-2	-
	buckhorn cholla	CYACA2	<i>Cylindropuntia acanthocarpa</i> var. <i>acanthocarpa</i>	0-1	-
	Arizona pencil cholla	CYAR14	<i>Cylindropuntia arbuscula</i>	0-1	-
	Whipple cholla	CYWH	<i>Cylindropuntia whipplei</i>	0-1	-
	Engelmann's hedgehog cactus	ECEN	<i>Echinocereus engelmannii</i>	0-1	-
8	Shrubs			0-8	
	triangle bur ragweed	AMDE4	<i>Ambrosia deltoidea</i>	1-3	-
	brittlebush	ENFA	<i>Encelia farinosa</i>	1-3	-
	jojoba	SICH	<i>Simmondsia chinensis</i>	0-3	-
	goldeneye	VIGUI	<i>Viguiera</i>	0-2	-
	trailing krameria	KRLA	<i>Krameria lanceolata</i>	0-2	-
	bastardsage	ERWR	<i>Eriogonum wrightii</i>	0-2	-
	fourwing saltbush	ATCA2	<i>Atriplex canescens</i>	0-2	-
	broom snakeweed	GUSA2	<i>Gutierrezia sarothrae</i>	0-1	-
Tree					
9	Tree			0-2	
	yellow paloverde	PAMI5	<i>Parkinsonia microphylla</i>	0-2	-

Animal community

Tobosa, the dominate forage species, is very unpalatable when cured and is best used when green in either the spring or summer growing season. Perennial forage species grow year-round with available moisture. The plant community on this site lacks in digestible protein in the fall and winter.

Water developments are very important to wildlife species on this site. Vegetative cover and forage diversity are lacking for the large desert mammals and this site is mainly a seasonal forage area for them. The site is home to a variety of small mammals and their predators.

Type locality

Location 1: Maricopa County, AZ	
Township/Range/Section	T7N R2E S18
General legal description	Phoenix - NO Ranch - Wild Burro Mesa

Contributors

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Rangeland health reference sheet

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

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

Indicators

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

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

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

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

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

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

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

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

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

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial**

distribution on infiltration and runoff:

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

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

Dominant:

Sub-dominant:

Other:

Additional:

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

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

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

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

17. **Perennial plant reproductive capability:**
-