USDA Natural Resources
Conservation Service

Ecological site R041XA101AZ
Clayey Swale 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.

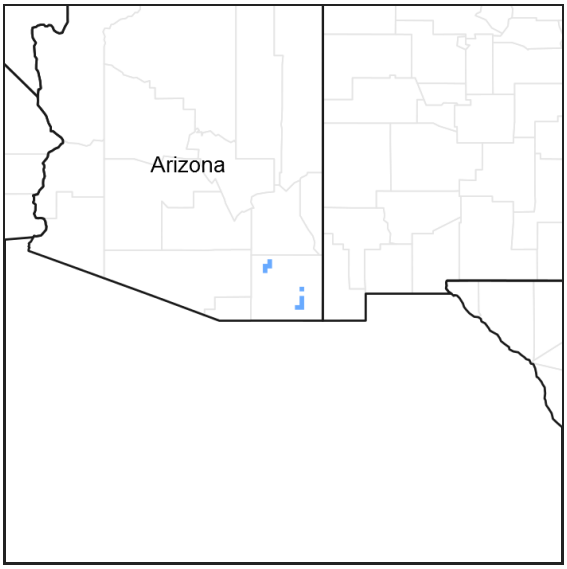


Figure 1. Mapped extent

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

R041XC304AZ	**Clayey Upland 12-16" p.z.**
R041XC305AZ	**Clay Loam Upland 12-16" p.z.**
R041XC312AZ	**Loamy Bottom 12-16" p.z.**

Similar sites

R040XA102AZ	**Clayey Swale 10"-13" p.z.**
R041XB202AZ	**Clayey Swale 8-12" p.z.**

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) *pleuraphis mutica* (2) *panicum obtusum*

Physiographic features

This site occurs in the middle elevations of the Madrean Basin and Range province in southeastern Arizona. It occurs on alluvial fans and floodplains. The site receives extra moisture in the form of runoff from adjacent upland areas.

Table 2. Representative physiographic features

Landforms	(1) Alluvial fan (2) Flood plain (3) Swale
Flooding duration	Extremely brief (0.1 to 4 hours) to very brief (4 to 48 hours)
Flooding frequency	Frequent
Ponding duration	Very brief (4 to 48 hours) to brief (2 to 7 days)
Ponding frequency	None to rare
Elevation	3,200–5,000 ft
Slope	0–2%
Aspect	Aspect is not a significant factor

Climatic features

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

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

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

Table 3. Representative climatic features

Frost-free period (average)	220 days
Freeze-free period (average)	
Precipitation total (average)	16 in

Influencing water features

There are no water features associated with this site.

Soil features

These are deep soils which have formed in clayey alluvium from basic igneous sources. They are very dark colored and have high shrink-swell potentials. Churning and cracking cause very rough surfaces. Plant-soil moisture relationships are very good due to extra water the site recieves.

Soils mapped on this site include;
SSA-666 Cochise county Northwestern Part-MU 4 Ashcreek; SSA-671 Cochise county Douglas-Tombstone area-MU's 4 Ashcreek & 26 Cazador.

Table 4. Representative soil features

Surface texture	(1) Silty clay loam
Family particle size	(1) Clayey
Drainage class	Well drained
Permeability class	Slow to very slow
Soil depth	60 in
Surface fragment cover <=3"	0–10%
Surface fragment cover >3"	0–1%
Available water capacity (0-40in)	8.4–9.6 in
Calcium carbonate equivalent (0-40in)	1–15%
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)	0–8%
Subsurface fragment volume >3" (Depth not specified)	0–1%

Ecological dynamics

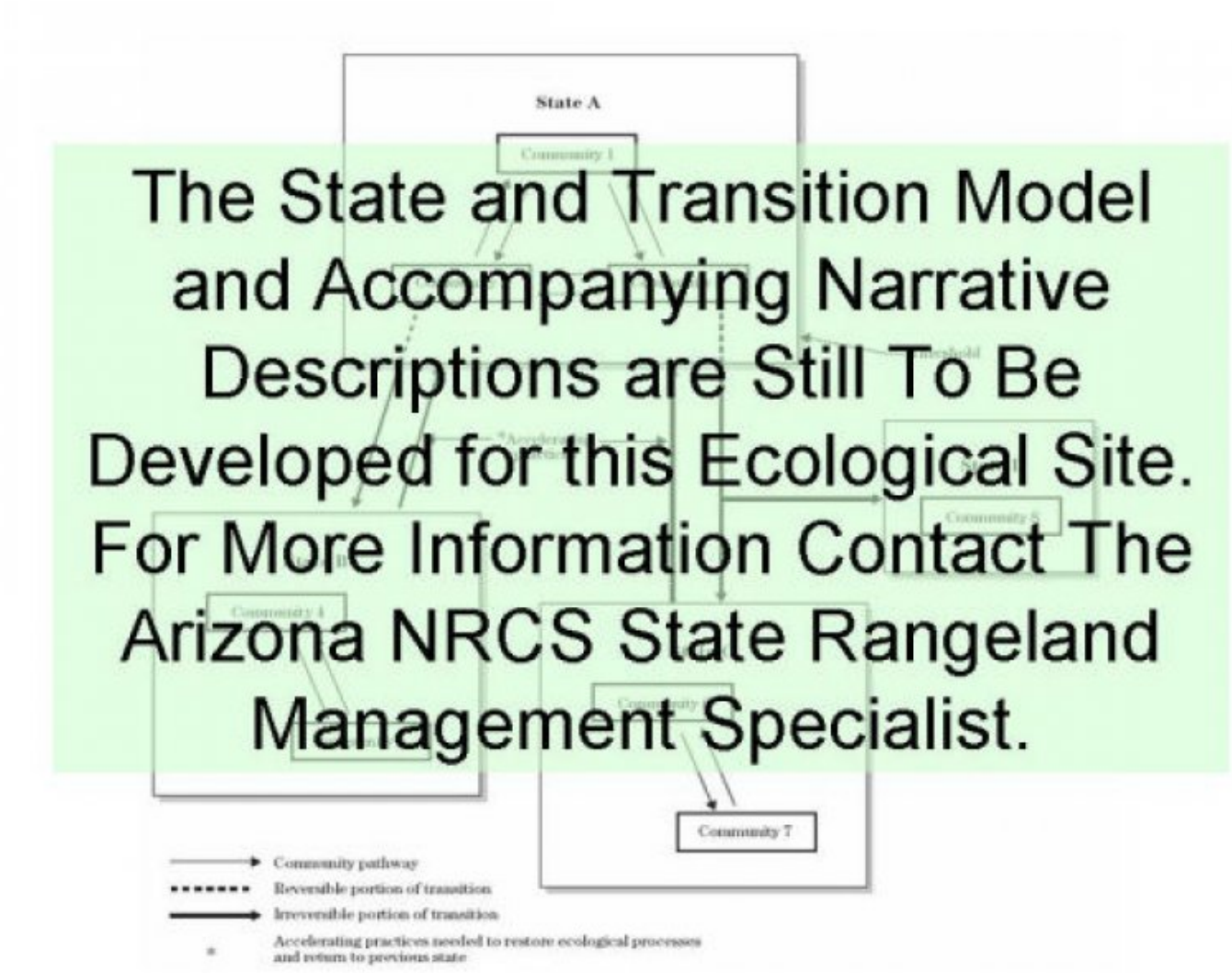
The plant communities found on an ecological site are naturally variable. Composition and production will vary with yearly conditions, location, aspect, and the natural variability of the soils. The Historical Climax Plant Community represents the natural potential plant communities found on relict or relatively undisturbed sites. Other plant communities described here represent plant communities that are known to occur when the site is disturbed by factors such as fire, grazing, or drought.

Production data provided in this site description is standardized to air dry weight at the end of the summer growing season. The plant communities described in this site description are based on near normal rainfall years.

NRCS uses a Similarity Index to compare existing plant communities to the plant communities described here. Similarity index is determined by comparing the production and composition of a plant community to the production and composition of a plant community described in this site description. To determine Similarity index, compare the

production (air dry weight) of each species to that shown in the plant community description. For each species, count no more than the maximum amount shown for the species, and for each group, count no more than the maximum amount shown for each group. Divide the resulting total by the total normal year production shown in the plant community description. If the rainfall has ben 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.
This plant community is a tobosa grassland with a canopy cover from 45 to 75%. Vine mesquite occurs in patches on the site. The plant community has a diverse flora of native annual and perennial forbs as well as annual grasses. Periodic wildfires occured, June thru August, and helped control shrubs encroaching from adjacent upland sites. Tobosa is a very poor seed producer and when reduced to canopy levels below 5%, may not be able to recover it's dominance. Johnson grass and bermuda grass can invade areas of this site but never dominate and exist only in minor amounts if the site is grazed as they are much more palatable than Tobosa. Possible, exotic, invasive weeds on this site include; yellow and malta starthistle, and Russian and spotted knapweed.

State and transition model



The State and Transition Model and Accompanying Narrative Descriptions are Still To Be Developed for this Ecological Site. For More Information Contact The Arizona NRCS State Rangeland Management Specialist.

State 1
Historic Climax Plant Community

Community 1.1
Historic Climax Plant Community

The potential plant community on this site is dominated by warm season perennial grasses, mainly tobosa and vine mesquite. The major perennial grasses on the site are well dispersed over areas of the site. The aspect is open grassland. With continuous heavy grazing, patches develop which are dominated by annual forbs and grasses. Also palatable forbs and vine mesquite are easily grazed out and replaced by annuals. Snakeweed, burroweed and mesquite can invade and become dominant on the site. Natural fire may have been important in development of the potential plant community.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	840	1500	2200
Forb	40	100	200
Shrub/Vine	0	45	130
Total	**880**	**1645**	**2530**

Figure 5. 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

State 2
Annual Forbs and grasses

Community 2.1
Annual Forbs and grasses

Tobosa canopy is reduced (less than 5%) due to the interactions of drought, heavy grazing and / or fire. In some circumstances the normal overland flow of floodwaters have been diverted by roads, drainage ditches and diversions. Some areas of this site have been created by cultivation for irrigated farming and subsequent abandonment. Native and non-native annual species dominate. Tobosa will not be able to recolonize this state because cover is too low and patchy in distribution, and a lack of viable seed in the soil seedbank. Vertic soil properties maintain good soil tilth and good infiltration rates (when soils are dry). Plant production remains high, even with the lack of perennial grass cover, due to soil activity and good hydrologic relationships.

State 3
Mesquite, native grasses

Community 3.1
Mesquite, native grasses

Mesquite has invaded and occurs at canopy levels from 2 to 15%. Other shrubs may also occur. Fire has been excluded for long periods of time. Tobosa still dominates the understory with annual forbs and grasses. Johnson grass and bermuda grass may be present in areas but will not dominate the state as long as it is grazed. Fires can burn through this community but mesquite is well established, it's root crowns protected by sediment accumulation, and it will sprout and quickley re-assume dominance.

State 4
Eroded state

Community 4.1
Eroded state

Very heavy traffic by livestock or machinery has caused persistant compaction. Diversion of overland flow and runoff water in farming areas may have caused rilling and gullies to form. Concentration of runoff by road and railroad culverts and bridges may also cause gullying. Some areas of this site are tributary to large bottoms that gullied at the turn of the century and base level changes in those systems have caused more recent gullying of the tributary bottoms. The soil profile no longer gets wet so the inherent, vertic, soil properties cannot act to maintain good tilth and promote infiltration of rainfall.

State 5
Tobosa unflooded

Community 5.1
Tobosa unflooded

This state occurs where the natural flooding regime has been interrupted by the construction of dikes. levees and roads and drainages ditches. It is usually found in cultivated areas like the Sulphur Springs Valley. The new site potential is the same as for Clayey Upland # R041XC304AZ.

Additional community tables

Table 6. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	**Dominant mid-grasses**			720–1500	
	tobosagrass	PLMU3	*Pleuraphis mutica*	700–1100	–
	vine mesquite	PAOB	*Panicum obtusum*	50–200	–
2	**Misc. perennial grasses**			100–200	
	big sacaton	SPWR2	*Sporobolus wrightii*	0–100	–
	sideoats grama	BOCU	*Bouteloua curtipendula*	0–100	–
	blue grama	BOGR2	*Bouteloua gracilis*	0–100	–
	squirreltail	ELEL5	*Elymus elymoides*	0–50	–
	cane bluestem	BOBA3	*Bothriochloa barbinodis*	0–50	–
	curly-mesquite	HIBE	*Hilaria belangeri*	0–25	–
	green sprangletop	LEDU	*Leptochloa dubia*	0–25	–
	creeping muhly	MURE	*Muhlenbergia repens*	0–25	–
	whiplash pappusgrass	PAVA2	*Pappophorum vaginatum*	0–25	–
	hairy grama	BOHI2	*Bouteloua hirsuta*	0–25	–
	plains bristlegrass	SEVU2	*Setaria vulpiseta*	0–25	–
	alkali sacaton	SPAI	*Sporobolus airoides*	0–25	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	0–15	–
	burrograss	SCBR2	*Scleropogon brevifolius*	0–10	–
	Arizona cottontop	DICA8	*Digitaria californica*	0–2	–
3	**Perennial threeawns**			10–50	
	spidergrass	ARTE3	*Aristida ternipes*	0–25	–
	spidergrass	ARTEG	*Aristida ternipes var. gentilis*	0–20	–
	Fendler threeawn	ARPUL	*Aristida purpurea var. longiseta*	0–10	–
	Parish's threeawn	ARPUP5	*Aristida purpurea var. parishii*	0–10	

	Parish's threeawn	ARPUP5	*Aristida purpurea var. parishii*	0–10	–
	poverty threeawn	ARDI5	*Aristida divaricata*	0–5	–
4	**Annual grasses**			10–250	
	little barley	HOPU	*Hordeum pusillum*	1–100	–
	Mexican sprangletop	LEFUU	*Leptochloa fusca ssp. uninervia*	1–100	–
	mucronate sprangeltop	LEPAB	*Leptochloa panicea ssp. brachiata*	1–100	–
	Mexican panicgrass	PAHI5	*Panicum hirticaule*	0–50	–
	Arizona signalgrass	URAR	*Urochloa arizonica*	0–50	–
	sixweeks fescue	VUOC	*Vulpia octoflora*	1–50	–
	tapertip cupgrass	ERACA	*Eriochloa acuminata var. acuminata*	0–25	–
	sticky sprangletop	LEVI5	*Leptochloa viscida*	0–25	–
	Arizona brome	BRAR4	*Bromus arizonicus*	0–20	–
	prairie threeawn	AROL	*Aristida oligantha*	0–10	–
	needle grama	BOAR	*Bouteloua aristidoides*	0–5	–
	sixweeks grama	BOBA2	*Bouteloua barbata*	0–5	–
	delicate muhly	MUFR	*Muhlenbergia fragilis*	0–5	–
	littleseed muhly	MUMI	*Muhlenbergia microsperma*	0–5	–
	witchgrass	PACA6	*Panicum capillare*	0–5	–
	sixweeks threeawn	ARAD	*Aristida adscensionis*	0–5	–
	Mexican lovegrass	ERME	*Eragrostis mexicana*	0–5	–
	desert lovegrass	ERPEM	*Eragrostis pectinacea var. miserrima*	0–5	–
	Bigelow's bluegrass	POBI	*Poa bigelovii*	0–5	–
Forb					
5	**Perennial Forbs**			10–50	
	Missouri gourd	CUFO	*Cucurbita foetidissima*	0–25	–
	Cooley's bundleflower	DECO2	*Desmanthus cooleyi*	0–25	–
	desert globemallow	SPAM2	*Sphaeralcea ambigua*	0–25	–
	Indian rushpea	HOGL2	*Hoffmannseggia glauca*	1–20	–
	Lewis flax	LILE3	*Linum lewisii*	0–20	–
	dwarf desertpeony	ACNA2	*Acourtia nana*	0–20	–
	spear globemallow	SPHA	*Sphaeralcea hastulata*	1–20	–
	weakleaf bur ragweed	AMCO3	*Ambrosia confertiflora*	1–15	–
	bluedicks	DICA14	*Dichelostemma capitatum*	1–15	–
	spreading fleabane	ERDI4	*Erigeron divergens*	0–10	–
	scarlet spiderling	BOCO	*Boerhavia coccinea*	0–10	–
	small matweed	GUDE	*Guilleminea densa*	0–10	–
	largeflower onion	ALMA4	*Allium macropetalum*	0–5	–
	Wright's cudweed	PSCAC2	*Pseudognaphalium canescens ssp. canescens*	0–5	–
	New Mexico fanpetals	SINE	*Sida neomexicana*	0–5	–
	silverleaf nightshade	SOEL	*Solanum elaeagnifolium*	0–5	–
	Wright's deervetch	LOWR	*Lotus wrightii*	0–5	–
	brownfoot	ACWR5	*Acourtia wrightii*	0–5	–
	southwestern mock vervain	GLGO	*Glandularia gooddingii*	0–5	–

	fingerleaf gourd	CUDI	*Cucurbita digitata*	0–5	–
	white prairie aster	SYFAC	*Symphyotrichum falcatum var. commutatum*	0–5	–
	American vetch	VIAM	*Vicia americana*	0–5	–
	Louisiana vetch	VILUL2	*Vicia ludoviciana ssp. ludoviciana*	0–5	–
	coyote gourd	CUPA	*Cucurbita palmata*	0–5	–
	whitemouth dayflower	COER	*Commelina erecta*	0–5	–
	leatherweed	CRPO5	*Croton pottsii*	0–5	–
	ivyleaf groundcherry	PHHE4	*Physalis hederifolia*	0–3	–
	tuber anemone	ANTU	*Anemone tuberosa*	0–3	–
	twinleaf senna	SEBA3	*Senna bauhinioides*	0–3	–
	brownplume wirelettuce	STPA4	*Stephanomeria pauciflora*	0–2	–
	variableleaf bushbean	MAGI2	*Macroptilium gibbosifolium*	0–2	–
	slimleaf bean	PHAN3	*Phaseolus angustissimus*	0–2	–
	orange fameflower	PHAU13	*Phemeranthus aurantiacus*	0–2	–
	Greenman's biscuitroot	LOGR2	*Lomatium greenmanii*	0–2	–
	Greene's bird's-foot trefoil	LOGR4	*Lotus greenei*	0–2	–
	southwestern pricklypoppy	ARPL3	*Argemone pleiacantha*	0–2	–
	lyreleaf greeneyes	BELY	*Berlandiera lyrata*	0–2	–
	trailing windmills	ALIN	*Allionia incarnata*	0–2	–
	desert mariposa lily	CAKE	*Calochortus kennedyi*	0–2	–
	sego lily	CANU3	*Calochortus nuttallii*	0–2	–
6	**Annual Forbs**			20–100	
	common sunflower	HEAN3	*Helianthus annuus*	1–100	–
	longleaf false goldeneye	HELOA2	*Heliomeris longifolia var. annua*	1–50	–
	camphorweed	HESU3	*Heterotheca subaxillaris*	1–50	–
	sensitive partridge pea	CHNI2	*Chamaecrista nictitans*	1–50	–
	carelessweed	AMPA	*Amaranthus palmeri*	1–40	–
	morning-glory	IPOMO	*Ipomoea*	0–25	–
	spreading fanpetals	SIAB	*Sida abutifolia*	1–25	–
	tanseyleaf tansyaster	MATA2	*Machaeranthera tanacetifolia*	1–25	–
	Nuttall's povertyweed	MONU	*Monolepis nuttalliana*	0–25	–
	Arizona popcornflower	PLAR	*Plagiobothrys arizonicus*	0–25	–
	intermediate pepperweed	LEVIM	*Lepidium virginicum var. medium*	0–20	–
	goosefoot	CHENO	*Chenopodium*	1–20	–
	wheelscale saltbush	ATEL	*Atriplex elegans*	0–15	–
	crestrib morning-glory	IPCO2	*Ipomoea costellata*	0–15	–
	slender goldenweed	MAGR10	*Machaeranthera gracilis*	1–15	–
	woolly plantain	PLPA2	*Plantago patagonica*	0–15	–
	woolly tidestromia	TILA2	*Tidestromia lanuginosa*	0–10	–
	western tansymustard	DEPI	*Descurainia pinnata*	1–10	–

	shaggyfruit pepperweed	LELA	*Lepidium lasiocarpum*	0–10	–
	Arizona poppy	KAGR	*Kallstroemia grandiflora*	0–10	–
	Coulter's spiderling	BOCO2	*Boerhavia coulteri*	0–10	–
	bristly fiddleneck	AMTE3	*Amsinckia tessellata*	0–10	–
	milkvetch	ASTRA	*Astragalus*	0–10	–
	scrambled eggs	COAU2	*Corydalis aurea*	0–5	–
	hoary bowlesia	BOIN3	*Bowlesia incana*	0–5	–
	fringed redmaids	CACI2	*Calandrinia ciliata*	0–5	–
	New Mexico copperleaf	ACNE	*Acalypha neomexicana*	0–5	–
	California poppy	ESCAM	*Eschscholzia californica ssp. mexicana*	0–5	–
	spurge	EUPHO	*Euphorbia*	1–5	–
	Lemmon's linanthus	LELE29	*Leptosiphon lemmonii*	0–5	–
	wedgeleaf draba	DRCU	*Draba cuneifolia*	0–5	–
	miniature woollystar	ERDI2	*Eriastrum diffusum*	0–5	–
	spreading fleabane	ERDI4	*Erigeron divergens*	0–5	–
	sorrel buckwheat	ERPO4	*Eriogonum polycladon*	0–5	–
	golden crownbeard	VEEN	*Verbesina encelioides*	0–5	–
	sleepy silene	SIAN2	*Silene antirrhina*	0–5	–
	sawtooth sage	SASU7	*Salvia subincisa*	0–5	–
	ragwort	SENEC	*Senecio*	0–5	–
	doubleclaw	PRPA2	*Proboscidea parviflora*	0–5	–
	star gilia	GIST	*Gilia stellata*	0–5	–
	desert Indianwheat	PLOV	*Plantago ovata*	0–5	–
	green carpetweed	MOVE	*Mollugo verticillata*	0–5	–
	foothill deervetch	LOHU2	*Lotus humistratus*	0–5	–
	coastal bird's-foot trefoil	LOSAB	*Lotus salsuginosus var. brevivexillus*	0–5	–
	Arizona lupine	LUAR4	*Lupinus arizonicus*	0–5	–
	Coulter's lupine	LUSP2	*Lupinus sparsiflorus*	0–5	–
	hollowleaf annual lupine	LUSU3	*Lupinus succulentus*	0–5	–
	American wild carrot	DAPU3	*Daucus pusillus*	0–4	–
	Arizona blanketflower	GAAR2	*Gaillardia arizonica*	0–3	–
	Goodding's bladderpod	LEGO2	*Lesquerella gooddingii*	0–2	–
	plains flax	LIPU4	*Linum puberulum*	0–2	–
	Texas stork's bill	ERTE13	*Erodium texanum*	0–2	–
	sacred thorn-apple	DAWR2	*Datura wrightii*	0–2	–
	manybristle chinchweed	PEPA2	*Pectis papposa*	0–2	–
	New Mexico plumeseed	RANE	*Rafinesquia neomexicana*	0–2	–
	desert unicorn-plant	PRAL4	*Proboscidea althaeifolia*	0–2	–
	Fendler's desertdandelion	MAFE	*Malacothrix fendleri*	0–1	–
Shrub/Vine					
7	**Miscellaneous shrubs**			0–40	
	western honey mesquite	PRGLT	*Prosopis glandulosa var. torreyana*	0–20	–
	velvet mesquite	PRVE	*Prosopis velutina*	0–20	–

	fourwing saltbush	ATCA2	*Atriplex canescens*	0–10	–
	whitethorn acacia	ACCO2	*Acacia constricta*	0–10	–
	pale desert-thorn	LYPA	*Lycium pallidum*	0–10	–
	catclaw mimosa	MIACB	*Mimosa aculeaticarpa var. biuncifera*	0–10	–
	catclaw acacia	ACGR	*Acacia greggii*	0–5	–
	knifeleaf condalia	COSP3	*Condalia spathulata*	0–5	–
	littleleaf sumac	RHMI3	*Rhus microphylla*	0–5	–
	Warnock's snakewood	COWA	*Condalia warnockii*	0–3	–
	American tarwort	FLCE	*Flourensia cernua*	0–2	–
	winterfat	KRLA2	*Krascheninnikovia lanata*	0–2	–
	lotebush	ZIOB	*Ziziphus obtusifolia*	0–2	–
8	**Half shrubs**			0–50	
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	0–20	–
	burroweed	ISTE2	*Isocoma tenuisecta*	0–20	–
	bastardsage	ERWR	*Eriogonum wrightii*	0–15	–
	yerba de pasmo	BAPT	*Baccharis pteronioides*	0–10	–
	fairyduster	CAER	*Calliandra eriophylla*	0–5	–
	threadleaf snakeweed	GUMI	*Gutierrezia microcephala*	0–5	–
9	**Succulents**			0–40	
	dollarjoint pricklypear	OPCH	*Opuntia chlorotica*	0–15	–
	cactus apple	OPEN3	*Opuntia engelmannii*	0–15	–
	tulip pricklypear	OPPH	*Opuntia phaeacantha*	0–10	–
	Christmas cactus	CYLE8	*Cylindropuntia leptocaulis*	0–10	–
	walkingstick cactus	CYSP8	*Cylindropuntia spinosior*	0–10	–
	banana yucca	YUBA	*Yucca baccata*	0–5	–
	soaptree yucca	YUEL	*Yucca elata*	0–5	–
	candy barrelcactus	FEWI	*Ferocactus wislizeni*	0–2	–
	sacahuista	NOMI	*Nolina microcarpa*	0–2	–
	spinystar	ESVI2	*Escobaria vivipara*	0–1	–

Animal community

Herbaceous forage produced on this site is best used in the summer rainy season when tobosa is green and growing. Large areas of the site should be fenced exclusively to best manage the forage resource. Care must be taken to avoid overgrazing of more palatable species associated with tobosa on the site. Burning or mowing can be used to freshen old growth tobosa grass. Burning should be done in years with good winter-spring rainfall and, then in late February or March. Spring regrowth should be rested until the onset of summer rains. Tobosa can be cut and baled for fair quality hay. Summer growth should be cut in full flower, left to dry one day, and baled the next day for best quality.
Dormant tobosa is very unpalatable.

This site is mainly a foraging area for large wildlife species. Free water is usually available in the summer rainy season in natural charcos and discontinued gullies. Being open grassland, the site is home to a variety of small herbivores and their associated predators.

Hydrological functions

Due to severe soil cracking and churning (producing rough and porous surfaces), this site has very high infiltration

rates when dry. Vertic soil properties eliminate most surface compaction each year as long as stocking rates are moderate and heavy stocking is not persistent during times of the year when soils are moist.

Recreational uses

Hunting, hiking, horseback riding, photography and bird-watching.

Wood products

Mesquite is shrubby on this site due to clayey soils. Invaded areas may have limited fuelwood but nothing big enough for posts or stays.

Other products

Clay

Inventory data references

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

Type locality

Location 1: Cochise County, AZ	
Township/Range/Section	T17S R27E S5
Location 2: Pima County, AZ	
Township/Range/Section	T19S R17E S29
General legal description	Enzenberg Pasture, Empire Ranch, Empire-Cienega National Conservation Area

Contributors

Dan Robinett
Larry D. Ellicott

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	05/11/2025
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):**

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:**