USDA Natural Resources
Conservation Service

Ecological site R040XB210AZ
Limy Upland 7"-10" p.z.

Accessed: 05/11/2025

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.

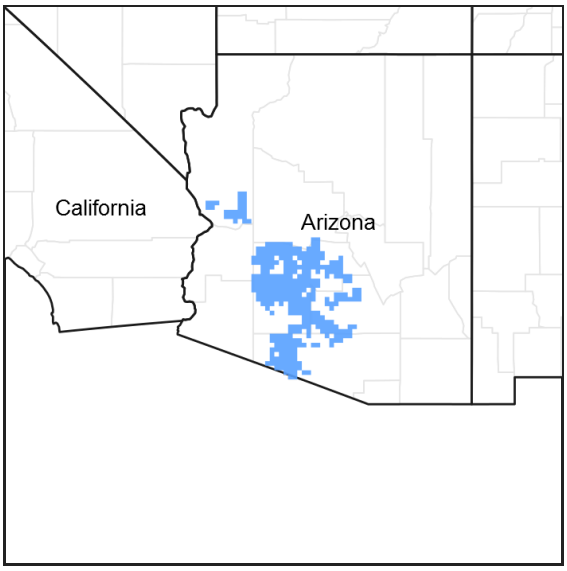

Figure 1. Mapped extent

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 40.2 – Middle Sonoran Desert

Elevations range from 1200 to 2000 feet and precipitation averages 7 to 10 inches per year. Vegetation includes saguaro, palo verde, creosotebush, triangle bursage, brittlebush, prickly pear, cholla, desert saltbush, wolfberry bush muhly, threeawns, and big galleta. The soil temperature regime is hyperthermic 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.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Larrea tridentata var. tridentata* (2) *Krameria grayi*
Herbaceous	Not specified

Physiographic features

This site occurs on fan terraces, ridgetops, pediments and mesa tops. Slopes are from 1 to 15%. Elevations range from 1000 to 2200 feet.

Table 2. Representative physiographic features

Landforms	(1) Terrace (2) Ridge (3) Mesa
Elevation	1,000–2,200 ft
Slope	1–15%

Climatic features

Precipitation in the sub-resource area ranges from 7 to 10 inches. Elevations range from 900 to 2050 feet. Winter-summer rainfall ratios range from 40% to 60% in the southern part along the international boundary, to 60% to 40% in the central and northern parts of the sub-resource area. As one moves from east to west in this resource area rains become more unpredictable and variable with Coefficients of Variation of annual rainfall equal to 38% at Florence and 46% at Aguila. Summer rains fall July- September, originate in the Gulf of Mexico, and are convective, usually brief, intense thunderstorms. Summer precipitation is extremely erratic and undependable in this area. Cool season moisture tends to be frontal, originates in the Pacific and Gulf of California, and falls in widespread storms with long duration and low intensity. This is the dependable moisture supply for vegetation in the area. Snow is very rare and usually melts on contact. May-June is the driest time of the year. Humidity is very low.

Winter temperatures are very mild with very few days recording freezing for short periods of time. Summertime temperatures are hot to very hot with many days in June-July exceeding 105 degrees F. Frost-free days range from 280 at stations in major river valleys with cold air drainage to 320 to 350 days at upland stations.

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)	350 days
Freeze-free period (average)	0 days
Precipitation total (average)	10 in

Influencing water features

Soil features

These are shallow soils over strongly cemented lime pans (duripans or petrocalcic horizons). These lime pans stop water movement and turn roots. They are coarse to loamy textured soils formed in old alluvium of mixed origins. They are very calcareous. Plant-soil moisture relationships are poor. This site is mapped in 9 Soil Survey areas in the D40-2 CRA of South Western Arizona.

Soils mapped on this site are: SSA-627 Southern Mohave County MU's Cacique family-16 & Cline-33; SSA-645 Aguila-Carefree area MU's Cave-39, Cipriano-9, 21, 47, 68, 74, 106 & 110, & Suncity-110; SSA-651 Central Maricopa County MU's Cherioni-CO, Pinal-GWD, PsA, PsB, PT, PvB & PWB, Suncity-PWB, Toltec-Ta; SSA-653 Gila Bend-Ajo area MU's Cherioni-7, Cipriano-10 & 35, Comobabi-51 & Pompeii-3; SSA-658 Gila River Indian Reservation MU's Cavelt-9 & Pompeii-25; SSA-659 Western Pinal County MU's Cipriano-8 & 25; SSA-661 Eastern Pinal-Southern Gila Counties MU's Gunsight-211 & 212, Hickiwan-204, 211 & 285; SSA-669 Eastern Pima County MU Pinamt-63; SSA-703 Tohono O'odham MU Hickiwan-36. Subsurface texture may be skeletal.

Table 4. Representative soil features

Surface texture	(1) Gravelly sandy loam (2) Very gravelly fine sandy loam (3) Extremely gravelly loam
Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Moderately rapid to rapid
Soil depth	4–20 in
Surface fragment cover <=3"	20–60%
Surface fragment cover >3"	1–5%
Available water capacity (0-40in)	0.24–2 in
Calcium carbonate equivalent (0-40in)	10–35%
Electrical conductivity (0-40in)	0–2 mmhos/cm
Sodium adsorption ratio (0-40in)	0
Soil reaction (1:1 water) (0-40in)	7.9–8.4
Subsurface fragment volume <=3" (Depth not specified)	20–60%
Subsurface fragment volume >3" (Depth not specified)	1–5%

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 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 the 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

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
Historical Climax Plant Community

Community 1.1
Historical Climax Plant Community

The potential plant community on this site is a mixture of desert shrubs, cacti, and perennial and annual grasses and forbs. The aspect is shrubland. Most of the perennial species found in the potential community are unpalatable. As a result, little change has occurred in species composition with past heavy grazing use. A few cool season, introduced annuals like; red brome, Mediterranean grass, London rocket mustard and black mustard occur on areas of this site and may compete with native annual forbs and grasses. The surfaces of these soils are usually very well protcted by either covers of gravels and cobbles or cryptogam or a combination of both. Plant populations for major species are from 50 to 200 plants per acre for creosotebush, 50 to 150 plants per acre for ratany species, 20 to 1000 plants per acre for cholla species, and 1 to 10 plants per acre for trees and saguaro.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Shrub/Vine	120	–	150
Tree	10	–	20
Forb	4	–	20
Grass/Grasslike	4	–	20
Total	**138**	**–**	**210**

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				2–10	
	bush muhly	MUPO2	*Muhlenbergia porteri*	0–5	–
	blue threeawn	ARPUN	*Aristida purpurea var. nealleyi*	0–3	–
	low woollygrass	DAPU7	*Dasyochloa pulchella*	0–2	–
	nineawn pappusgrass	ENDE	*Enneapogon desvauxii*	0–1	–
	purple threeawn	ARPU9	*Aristida purpurea*	0–1	–
	big galleta	PLRI3	*Pleuraphis rigida*	0–1	–
	slim tridens	TRMU	*Tridens muticus*	0–1	–
2				2–10	
	sixweeks threeawn	ARAD	*Aristida adscensionis*	0–5	–
	prairie threeawn	AROL	*Aristida oligantha*	0–5	–
	needle grama	BOAR	*Bouteloua aristidoides*	0–5	–
	sixweeks fescue	VUOC	*Vulpia octoflora*	0–5	–
	sixweeks grama	BOBA2	*Bouteloua barbata*	0–3	–
	Rothrock's grama	BORO2	*Bouteloua rothrockii*	0–3	–
	Arizona brome	BRAR4	*Bromus arizonicus*	0–1	–
	feather fingergrass	CHVI4	*Chloris virgata*	0–1	–
	canyon cupgrass	ERLE7	*Eriochloa lemmonii*	0–1	–
	desert lovegrass	ERPEM	*Eragrostis pectinacea var. miserrima*	0–1	–
	tufted lovegrass	ERPEP2	*Eragrostis pectinacea var. pectinacea*	0–1	–
	Mexican sprangletop	LEFUU	*Leptochloa fusca ssp. uninervia*	0–1	–
	mucronate sprangletop	LEPA6	*Leptochloa panicea*	0–1	–
	delicate muhly	MUFR	*Muhlenbergia fragilis*	0–1	–
	littleseed muhly	MUMI	*Muhlenbergia microsperma*	0–1	–
	Bigelow's bluegrass	POBI	*Poa bigelovii*	0–1	–
	Arizona signalgrass	URAR	*Urochloa arizonica*	0–1	–
	Eastwood fescue	VUMIC	*Vulpia microstachys var. ciliata*	0–1	–
	Pacific fescue	VUMIP	*Vulpia microstachys var. pauciflora*	0–1	–
3				20–30	
	Alga	2ALGA	*Alga*	5–15	–
	Fungus	2FUNGI	*Fungus*	0–5	–
	Lichen	2LICHN	*Lichen*	0–5	–
	Moss	2MOSS	*Moss*	0–5	–
Forb					
4				2–10	
	lacy tansyaster	MAPIP4	*Machaeranthera pinnatifida ssp. pinnatifida var. pinnatifida*	0–2	–
	desert globemallow	SPAM2	*Sphaeralcea ambigua*	0–2	–
	dwarf desertpeony	ACNA2	*Acourtia nana*	0–2	–

	desert trumpet	ERIN4	*Eriogonum inflatum*	0–2	–
	California fagonbush	FALA	*Fagonia laevis*	0–1	–
	Parry's false prairie-clover	MAPA7	*Marina parryi*	0–1	–
	trailing windmills	ALIN	*Allionia incarnata*	0–1	–
	New Mexico silverbush	ARNE2	*Argythamnia neomexicana*	0–1	–
	rush milkweed	ASSU	*Asclepias subulata*	0–1	–
	desert marigold	BAMU	*Baileya multiradiata*	0–1	–
	whitemargin sandmat	CHAL11	*Chamaesyce albomarginata*	0–1	–
	pricklyleaf dogweed	THAC	*Thymophylla acerosa*	0–1	–
	evening primrose	OENOT	*Oenothera*	0–1	–
	Coues' cassia	SECO10	*Senna covesii*	0–1	–
5				2–10	
	common fiddleneck	AMMEI2	*Amsinckia menziesii var. intermedia*	0–5	–
	bristly fiddleneck	AMTE3	*Amsinckia tessellata*	0–5	–
	desert Indianwheat	PLOV	*Plantago ovata*	0–5	–
	desert unicorn-plant	PRAL4	*Proboscidea althaeifolia*	0–1	–
	velvet turtleback	PSRA	*Psathyrotes ramosissima*	0–1	–
	New Mexico plumeseed	RANE	*Rafinesquia neomexicana*	0–1	–
	chia	SACO6	*Salvia columbariae*	0–1	–
	sleepy silene	SIAN2	*Silene antirrhina*	0–1	–
	Coulter's globemallow	SPCO2	*Sphaeralcea coulteri*	0–1	–
	longbeak streptanthella	STLO4	*Streptanthella longirostris*	0–1	–
	woollyhead neststraw	STMI2	*Stylocline micropoides*	0–1	–
	woolly tidestromia	TILA2	*Tidestromia lanuginosa*	0–1	–
	blazingstar	MENTZ	*Mentzelia*	0–1	–
	bristly nama	NAHI	*Nama hispidum*	0–1	–
	glandular threadplant	NEGL	*Nemacladus glanduliferus*	0–1	–
	Florida pellitory	PAFL3	*Parietaria floridana*	0–1	–
	combseed	PECTO	*Pectocarya*	0–1	–
	Emory's rockdaisy	PEEM	*Perityle emoryi*	0–1	–
	manybristle chinchweed	PEPA2	*Pectis papposa*	0–1	–
	phacelia	PHACE	*Phacelia*	0–1	–
	slimjim bean	PHFI3	*Phaseolus filiformis*	0–1	–
	smallflowered milkvetch	ASNU4	*Astragalus nuttallianus*	0–1	–
	aster	ASTER	*Aster*	0–1	–
	milkvetch	ASTRA	*Astragalus*	0–1	–
	Coulter's spiderling	BOCO2	*Boerhavia coulteri*	0–1	–
	hoary bowlesia	BOIN3	*Bowlesia incana*	0–1	–
	California suncup	CACA32	*Camissonia californica*	0–1	–
	exserted Indian paintbrush	CAEXE	*Castilleja exserta ssp. exserta*	0–1	–
	desert mariposa lily	CAKE	*Calochortus kennedyi*	0–1	–
	naked mariposa lily	CANU2	*Calochortus nudus*	0–1	–

	yellow tackstem	CAPA7	*Calycoseris parryi*	0–1	–
	white tackstem	CAWR	*Calycoseris wrightii*	0–1	–
	brittle spineflower	CHBR	*Chorizanthe brevicornu*	0–1	–
	pebble pincushion	CHCA	*Chaenactis carphoclinia*	0–1	–
	hyssopleaf sandmat	CHHY3	*Chamaesyce hyssopifolia*	0–1	–
	devil's spineflower	CHRI	*Chorizanthe rigida*	0–1	–
	Esteve's pincushion	CHST	*Chaenactis stevioides*	0–1	–
	New Mexico thistle	CINE	*Cirsium neomexicanum*	0–1	–
	sand pygmyweed	CRCO34	*Crassula connata*	0–1	–
	cryptantha	CRYPT	*Cryptantha*	0–1	–
	hairy prairie clover	DAMO	*Dalea mollis*	0–1	–
	American wild carrot	DAPU3	*Daucus pusillus*	0–1	–
	western tansymustard	DEPI	*Descurainia pinnata*	0–1	–
	flatcrown buckwheat	ERDE6	*Eriogonum deflexum*	0–1	–
	miniature woollystar	ERDI2	*Eriastrum diffusum*	0–1	–
	erigenia	ERIGE	*Erigenia*	0–1	–
	desert trumpet	ERIN4	*Eriogonum inflatum*	0–1	–
	buckwheat	ERIOG	*Eriogonum*	0–1	–
	common woolly sunflower	ERLA6	*Eriophyllum lanatum*	0–1	–
	Texas stork's bill	ERTE13	*Erodium texanum*	0–1	–
	California poppy	ESCAM	*Eschscholzia californica ssp. mexicana*	0–1	–
	pygmy poppy	ESMI	*Eschscholzia minutiflora*	0–1	–
	hairy desertsunflower	GECA2	*Geraea canescens*	0–1	–
	gilia	GILIA	*Gilia*	0–1	–
	Gordon's bladderpod	LEGO	*Lesquerella gordonii*	0–1	–
	shaggyfruit pepperweed	LELA	*Lepidium lasiocarpum*	0–1	–
	foothill deervetch	LOHU2	*Lotus humistratus*	0–1	–
	shrubby deervetch	LORI3	*Lotus rigidus*	0–1	–
	coastal bird's-foot trefoil	LOSAB	*Lotus salsuginosus var. brevivexillus*	0–1	–
	Arizona lupine	LUAR4	*Lupinus arizonicus*	0–1	–
	Coulter's lupine	LUSP2	*Lupinus sparsiflorus*	0–1	–
	macaranga	MACAR	*Macaranga*	0–1	–
	onyxflower	ACCO3	*Achyronychia cooperi*	0–1	–
Shrub/Vine					
6				20–40	
	creosote bush	LATR2	*Larrea tridentata*	20–40	–
7				60–80	
	triangle bur ragweed	AMDE4	*Ambrosia deltoidea*	20–30	–
	burrobush	AMDU2	*Ambrosia dumosa*	20–30	–
	brittlebush	ENFA	*Encelia farinosa*	5–10	–
	woody crinklemat	TICAC	*Tiquilia canescens var. canescens*	0–5	–
8				10–20	
	white ratany	KRGR	*Krameria grayi*	5–15	–

	littleleaf ratany	KRER	*Krameria erecta*	0–5	–
9				1–10	
	lotebush	ZIOB	*Ziziphus obtusifolia*	0–2	–
	whitethorn acacia	ACCO2	*Acacia constricta*	0–1	–
	rayless goldenhead	ACSP	*Acamptopappus sphaerocephalus*	0–1	–
	Wright's beebrush	ALWR	*Aloysia wrightii*	0–1	–
	Nevada jointfir	EPNE	*Ephedra nevadensis*	0–1	–
	Eastern Mojave buckwheat	ERFA2	*Eriogonum fasciculatum*	0–1	–
	sangre de cristo	JACA2	*Jatropha cardiophylla*	0–1	–
	crown of thorns	KOSP	*Koeberlinia spinosa*	0–1	–
	water jacket	LYAN	*Lycium andersonii*	0–1	–
	Arizona desert-thorn	LYEX	*Lycium exsertum*	0–1	–
	desert wolfberry	LYMA	*Lycium macrodon*	0–1	–
	whitestem paperflower	PSCO2	*Psilostrophe cooperi*	0–1	–
	jojoba	SICH	*Simmondsia chinensis*	0–1	–
	turpentinebroom	THMO	*Thamnosma montana*	0–1	–
	Parish's goldeneye	VIPA14	*Viguiera parishii*	0–1	–
10				10–20	
	beavertail pricklypear	OPBA2	*Opuntia basilaris*	0–1	–
	senita cactus	PASC14	*Pachycereus schottii*	0–1	–
	nightblooming cereus	PEGRG	*Peniocereus greggii var. greggii*	0–1	–
	organpipe cactus	STTH3	*Stenocereus thurberi*	0–1	–
	desert agave	AGDE	*Agave deserti*	0–1	–
	Engelmann's hedgehog cactus	ECEN	*Echinocereus engelmannii*	0–1	–
	Leconte's barrel cactus	FECYL	*Ferocactus cylindraceus var. lecontei*	0–1	–
	candy barrelcactus	FEWI	*Ferocactus wislizeni*	0–1	–
	common fishhook cactus	MATE4	*Mammillaria tetrancistra*	0–1	–
Tree					
11				10–20	
	ocotillo	FOSP2	*Fouquieria splendens*	2–10	–
	yellow paloverde	PAMI5	*Parkinsonia microphylla*	0–3	–
	velvet mesquite	PRVE	*Prosopis velutina*	0–2	–
	desert ironwood	OLTE	*Olneya tesota*	0–2	–

Animal community

This site produces small amounts of herbaceous and shrubby forage for year-round use. Even in wet winters the production of cool season annuals is low and provides for little additional carrying capacity.

This site lacks the cover and diversity for the larger desert mammals. It is home mainly to small mammals, reptiles and their predators.

Other information

T&E: Antilocapra Americana sonoriensis

(Sonoran pronghorn)
Leptonycteris curasoae yerbe buena
(Lesser long-nosed bat)

Type locality

Location 1: Pima County, AZ	
Township/Range/Section	T9S R5W S23
General legal description	Tucson FO - Barry Goldwater Gunnery Rnage - relict area on top of Hat Mountain
Location 2: Maricopa County, AZ	
Township/Range/Section	T5N R10W S23
General legal description	Phoenix FO - Bonar Ranch
Location 3: Maricopa County, AZ	
Township/Range/Section	T2N R7E S31
General legal description	Chandler FO - South of Spook Hill
Location 4: Pima County, AZ	
Township/Range/Section	T13S R8E S5
General legal description	Sells FO - Shuck Toak Dist., Aguirre Valley
Location 5: Pima County, AZ	
Township/Range/Section	T14S R6W S19
General legal description	Tucson FO - Organ Pipe National Monument

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)	Dave Womack, Byron Lambeth, Dan Robinett
Contact for lead author	NRCS Tucson Area Office
Date	03/02/2005
Approved by	S. Cassady
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** Common on this site where gravel cover is low.

2. **Presence of water flow patterns:** Water flow patterns are common, continuous and cover 15-20% of area.

3. **Number and height of erosional pedestals or terracettes:** Accumulated pedestals on most perennial plants, not so much so in high gravel cover areas, 2-5 inches high. Erosional pedestals not present on most perennial plants.

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** 10-60% (low values due to high gravel cover and El Nino years)

5. **Number of gullies and erosion associated with gullies:** none

6. **Extent of wind scoured, blowouts and/or depositional areas:** none

7. **Amount of litter movement (describe size and distance expected to travel):** Most litter size classes stay in place due to high gravel cover.

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** Soil surface resistance to erosion is good under shrub canopies to moderate in interspaces due to crusts formed by raindrop impact.

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Weak to moderate fine subangular blocky; color is 7.5YR6/4 dry, 7.5YR5/6 moist; thickness to 1 inch.

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Canopy cover estimated at 20-25%, Basal cover 1-2%: 50% is shrubs, 20% trees and 30% succulents. Cover is well dispersed throughout the site.

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

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: shrubs > subshrubs > trees > succulents > forbs = perennial grasses (note: in El Nino years annual forbs & grasses are #1 in above ground weight.)

    Sub-dominant:

    Other:

Additional:

13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** 0-50% canopy mortality

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):** 100 lbs/ac unfavorable precipitation; 200 lbs/ac normal precipitation; 300 lbs/ac favorable precipitation

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:** Sahara mustard

17. **Perennial plant reproductive capability:** Not impaired for shrubs, drought impaired for perennial grasses and forbs.