USDA Natural Resources Conservation Service

Ecological site R040XB202AZ
Paralithic Hills 7"-10" p.z.

Accessed: 05/20/2025

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.

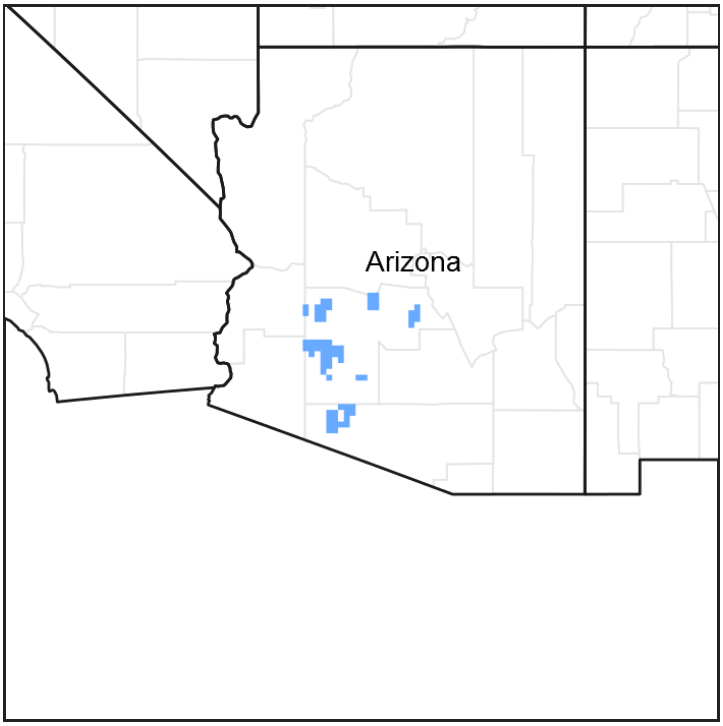

Figure 1. Mapped extent

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	(1) *Parkinsonia microphylla*
Shrub	(1) *Encelia farinosa* (2) *Olneya tesota*
Herbaceous	(1) *Muhlenbergia porteri* (2) *Tridens muticus*

Physiographic features

This site occurs on hillslopes and ridgetops. Slopes are from 15 to 65%. Elevations range from 1100 to 2500 feet.

Table 2. Representative physiographic features

Landforms	(1) Hill (2) Ridge
Elevation	335–762 m
Slope	15–65%

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)	254 mm

Influencing water features

Soil features

These are shallow soils formed on schist and limy volcanic, metamorphic, or conglomerate parent materials. Soils are calcareous and lime is found in the parent material as well. They are coarse textured, have well developed gravel covers, but lack the stone and cobble covers of other hill sites. Rock outcrop makes up a small perentage of the area. Plant-soil moisture relationships are poor. Parent material kind includes residuum. Parent material origin includes granodiorite, other metamorphic rock and conglomerate. Surface texture includes cobbly, very cobbly, and stony.
Soils mapped on this site include: in
SSA-645 Aguila-Carefree area MU's Beeline-9 & Lomitas(calcareous phase)-51;
SSA-653 Gila Bend-Ajo area MU's Hyder(non cobbly)-40 & 56.

Table 4. Representative soil features

Parent material	(1) Alluvium–basic volcanic breccia (2) Residuum–conglomerate
Surface texture	(1) Very gravelly sandy loam (2) Extremely gravelly loam (3) Cobbly
Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Moderately rapid

Soil depth	10–51 cm
Surface fragment cover <=3"	35–65%
Surface fragment cover >3"	1–15%
Available water capacity (0-101.6cm)	0.51–4.06 cm
Calcium carbonate equivalent (0-101.6cm)	2–10%
Electrical conductivity (0-101.6cm)	0 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0
Soil reaction (1:1 water) (0-101.6cm)	7.9–8.4
Subsurface fragment volume <=3" (Depth not specified)	35–65%
Subsurface fragment volume >3" (Depth not specified)	1–15%

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

State 1
Historical Climax Plant Community

Community 1.1
Historical Climax Plant Community

The potential plant community is a diverse mixture of desert trees, shrubs, cacti, and annual grasses and perennial forbs. The aspect is shrubland. Continuous heavy grazing can remove perennial forbs and grasses from the plant community. Gravel cover is continuous but size may be lacking to prevent erosion on steep slopes. Gravel cover averages 90%. Basal cover of perennial vegetation averages 2% and percent of bare ground is about 8. Cryptogam cover on the bare ground portion runs from low to moderate. Plant populations of major species range from 100 to 450 per acre for

brittlebush, 40 to 160 for creosotebush, 50 to 150 for paloverde, 1 to 10 for saguaro, 1 to 30 for ocotillo, 20 to 80 for wolfberry, and 50 to 200 for chola species. Buckhorn cholla tends to predominate on north slopes and teddybear cholla on south slopes. Desert globemallow tends to predominate on northern exposures and brittlebush on southern exposures. Both species are very sensitive to drought on this site and it is not uncommon to have 50-75% mortality of these two species after a severe drought period. A wet summer following a drought induced die-off of shrubs will result in an abundance of annual grasses like little seed muhly, mexican sprangletop, needle grama, and six week threeawn giving the site a grassy appearance. This is a temporary condition that changes as brittlebush and globemallow regain their predominance in the community.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Shrub/Vine	278	–	429
Tree	278	–	429
Grass/Grasslike	26	–	151
Forb	26	–	76
Total	**608**	**–**	**1085**

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				6–22	
	bush muhly	MUPO2	*Muhlenbergia porteri*	0–3	–
	low woollygrass	DAPU7	*Dasyochloa pulchella*	0–2	–
	slim tridens	TRMU	*Tridens muticus*	0–2	–
	Arizona cottontop	DICA8	*Digitaria californica*	0–1	–
	nineawn pappusgrass	ENDE	*Enneapogon desvauxii*	0–1	–
	tanglehead	HECO10	*Heteropogon contortus*	0–1	–
	big galleta	PLRI3	*Pleuraphis rigida*	0–1	–
	purple threeawn	ARPU9	*Aristida purpurea*	0–1	–
	Fendler's threeawn	ARPUF	*Aristida purpurea var. fendleriana*	0–1	–
	blue threeawn	ARPUN	*Aristida purpurea var. nealleyi*	0–1	–

	Parish's threeawn	ARPUP5	*Aristida purpurea var. parishii*	0–1	–
	Wright's threeawn	ARPUW	*Aristida purpurea var. wrightii*	0–1	–
	spidergrass	ARTE3	*Aristida ternipes*	0–1	–
	spidergrass	ARTEG	*Aristida ternipes var. gentilis*	0–1	–
2				22–123	
	sixweeks fescue	VUOC	*Vulpia octoflora*	4–22	–
	sixweeks threeawn	ARAD	*Aristida adscensionis*	0–11	–
	prairie threeawn	AROL	*Aristida oligantha*	0–11	–
	needle grama	BOAR	*Bouteloua aristidoides*	0–11	–
	sixweeks grama	BOBA2	*Bouteloua barbata*	0–11	–
	Eastwood fescue	VUMIC	*Vulpia microstachys var. ciliata*	0–11	–
	Pacific fescue	VUMIP	*Vulpia microstachys var. pauciflora*	0–11	–
	Rothrock's grama	BORO2	*Bouteloua rothrockii*	0–6	–
	tufted lovegrass	ERPEP2	*Eragrostis pectinacea var. pectinacea*	0–2	–
	Mexican sprangletop	LEFUU	*Leptochloa fusca ssp. uninervia*	0–2	–
	mucronate sprangeltop	LEPAB	*Leptochloa panicea ssp. brachiata*	0–2	–
	delicate muhly	MUFR	*Muhlenbergia fragilis*	0–2	–
	littleseed muhly	MUMI	*Muhlenbergia microsperma*	0–2	–
	witchgrass	PACA6	*Panicum capillare*	0–2	–
	Bigelow's bluegrass	POBI	*Poa bigelovii*	0–1	–
	Arizona brome	BRAR4	*Bromus arizonicus*	0–1	–
Forb					
3				6–22	
	narrowleaf silverbush	ARLA12	*Argythamnia lanceolata*	0–3	–
	California fagonbush	FALA	*Fagonia laevis*	0–2	–
	lacy tansyaster	MAPIP4	*Machaeranthera pinnatifida ssp. pinnatifida var. pinnatifida*	0–2	–
	Newberry's	HONE	*Horsfordia newberryi*	0–2	–

	velvetmallow				
	slender janusia	JAGR	*Janusia gracilis*	0–1	–
	Parry's false prairie-clover	MAPA7	*Marina parryi*	0–1	–
	rough menodora	MESC	*Menodora scabra*	0–1	–
	slender poreleaf	POGR5	*Porophyllum gracile*	0–1	–
	Coues' cassia	SECO10	*Senna covesii*	0–1	–
	brownplume wirelettuce	STPA4	*Stephanomeria pauciflora*	0–1	–
	desert rosemallow	HICO	*Hibiscus coulteri*	0–1	–
	paleface	HIDE	*Hibiscus denudatus*	0–1	–
	poreleaf dogweed	ADPO2	*Adenophyllum porophyllum*	0–1	–
	trailing windmills	ALIN	*Allionia incarnata*	0–1	–
	New Mexico silverbush	ARNE2	*Argythamnia neomexicana*	0–1	–
	whitemargin sandmat	CHAL11	*Chamaesyce albomarginata*	0–1	–
	desert trumpet	ERIN4	*Eriogonum inflatum*	0–1	–
4				6–50	
	desert Indianwheat	PLOV	*Plantago ovata*	0–11	–
	combseed	PECTO	*Pectocarya*	0–6	–
	bristly fiddleneck	AMTE3	*Amsinckia tessellata*	0–6	–
	cryptantha	CRYPT	*Cryptantha*	0–3	–
	western tansymustard	DEPI	*Descurainia pinnata*	0–2	–
	tall mountain larkspur	DESC	*Delphinium scaposum*	0–1	–
	bluedicks	DICA14	*Dichelostemma capitatum*	0–1	–
	miniature woollystar	ERDI2	*Eriastrum diffusum*	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	–
	Gordon's	LEGO	*Lesquerella gordonii*	0–1	–

	bladderpod				
	shaggyfruit pepperweed	LELA	*Lepidium lasiocarpum*	0–1	–
	Bigelow's linanthus	LIBI2	*Linanthus bigelovii*	0–1	–
	foothill deervetch	LOHU2	*Lotus humistratus*	0–1	–
	strigose bird's-foot trefoil	LOSTT	*Lotus strigosus var. tomentellus*	0–1	–
	Coulter's lupine	LUSP2	*Lupinus sparsiflorus*	0–1	–
	hoary tansyaster	MACAC3	*Machaeranthera canescens ssp. canescens var. canescens*	0–1	–
	blazingstar	MENTZ	*Mentzelia*	0–1	–
	green carpetweed	MOVE	*Mollugo verticillata*	0–1	–
	glandular threadplant	NEGL	*Nemacladus glanduliferus*	0–1	–
	desert tobacco	NIOB	*Nicotiana obtusifolia*	0–1	–
	evening primrose	OENOT	*Oenothera*	0–1	–
	Emory's rockdaisy	PEEM	*Perityle emoryi*	0–1	–
	manybristle chinchweed	PEPA2	*Pectis papposa*	0–1	–
	phacelia	PHACE	*Phacelia*	0–1	–
	New Mexico plumeseed	RANE	*Rafinesquia neomexicana*	0–1	–
	chia	SACO6	*Salvia columbariae*	0–1	–
	smooth threadleaf ragwort	SEFLM	*Senecio flaccidus var. monoensis*	0–1	–
	sleepy silene	SIAN2	*Silene antirrhina*	0–1	–
	Coulter's globemallow	SPCO2	*Sphaeralcea coulteri*	0–1	–
	woollyhead neststraw	STMI2	*Stylocline micropoides*	0–1	–
	bigseed alfalfa dodder	CUIN	*Cuscuta indecora*	0–1	–
	hairy prairie clover	DAMO	*Dalea mollis*	0–1	–
	American wild carrot	DAPU3	*Daucus pusillus*	0–1	–

	desert larkspur	DEPA	*Delphinium parishii*	0–1	–
	weakleaf bur ragweed	AMCO3	*Ambrosia confertiflora*	0–1	–
	carelessweed	AMPA	*Amaranthus palmeri*	0–1	–
	milkvetch	ASTRA	*Astragalus*	0–1	–
	desert marigold	BAMU	*Baileya multiradiata*	0–1	–
	Coulter's spiderling	BOCO2	*Boerhavia coulteri*	0–1	–
	Tucson Mountain spiderling	BOME	*Boerhavia megaptera*	0–1	–
	California suncup	CACA32	*Camissonia californica*	0–1	–
	fringed redmaids	CACI2	*Calandrinia ciliata*	0–1	–
	exserted Indian paintbrush	CAEXE	*Castilleja exserta ssp. exserta*	0–1	–
	white tackstem	CAWR	*Calycoseris wrightii*	0–1	–
	brittle spineflower	CHBR	*Chorizanthe brevicornu*	0–1	–
	pebble pincushion	CHCA	*Chaenactis carphoclinia*	0–1	–
	goosefoot	CHENO	*Chenopodium*	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	–
Shrub/Vine					
5				101–168	
	brittlebush	ENFA	*Encelia farinosa*	45–90	–
	desert globemallow	SPAM2	*Sphaeralcea ambigua*	34–78	–
6				22–50	
7				50–123	
	ocotillo	FOSP2	*Fouquieria splendens*	11–56	–
	creosote bush	LATR2	*Larrea tridentata*	6–34	–
	water jacket	LYAN	*Lycium andersonii*	6–17	–
	Fremont's desert-thorn	LYFR	*Lycium fremontii*	6–17	–

	thorn				
8				6–22	
	beavertail pricklypear	OPBA2	*Opuntia basilaris*	0–2	–
	cactus apple	OPEN3	*Opuntia engelmannii*	0–1	–
	senita cactus	PASC14	*Pachycereus schottii*	0–1	–
	organpipe cactus	STTH3	*Stenocereus thurberi*	0–1	–
	Engelmann's hedgehog cactus	ECEN	*Echinocereus engelmannii*	0–1	–
	Leconte's barrel cactus	FECYL	*Ferocactus cylindraceus var. lecontei*	0–1	–
	Emory's barrel cactus	FEEM	*Ferocactus emoryi*	0–1	–
	candy barrelcactus	FEWI	*Ferocactus wislizeni*	0–1	–
	Thornber's nipple cactus	MATH	*Mammillaria thornberi*	0–1	–
9				22–50	
	triangle bur ragweed	AMDE4	*Ambrosia deltoidea*	2–9	–
	burrobush	AMDU2	*Ambrosia dumosa*	2–9	–
	sangre de cristo	JACA2	*Jatropha cardiophylla*	0–6	–
	littleleaf ratany	KRER	*Krameria erecta*	2–6	–
	white ratany	KRGR	*Krameria grayi*	2–6	–
	American threefold	TRCA8	*Trixis californica*	0–3	–
	Coulter's brickellbush	BRCO	*Brickellia coulteri*	0–2	–
	rush milkweed	ASSU	*Asclepias subulata*	0–2	–
	sweetbush	BEJU	*Bebbia juncea*	0–1	–
	catclaw acacia	ACGR	*Acacia greggii*	0–1	–
	Nevada jointfir	EPNE	*Ephedra nevadensis*	0–1	–
	starry bedstraw	GASTE2	*Galium stellatum ssp. eremicum*	0–1	–
	desert lavender	HYEM	*Hyptis emoryi*	0–1	–
	giant salvinia	SABI9	*Salvinia biloba*	0–1	–
	woody crinklemat	TICAC	*Tiquilia canescens var. canescens*	0–1	–
	Parish's goldeneye	VIPA14	*Viguiera parishii*	0–1	–

Tree					
10				22–50	
	yellow paloverde	PAMI5	*Parkinsonia microphylla*	17–34	–
	desert ironwood	OLTE	*Olneya tesota*	11–28	–

Animal community

Steep slopes and gravelly surfaces hinder livestock distribution. Stocker cattle are best adapted to use this site. The plant community provides limited amounts of useable forage in the winter-spring periods. Natural water is unavailable on this site.

Water developments are very important to wildlife species on this site. Cover, diversity, and topography make this site home to a variety of desert animals. Large mammals use this site seasonally unless permanent water supplies exist in the area.

Other information

T&E: Leptoncycteris curasoae yerbe buena
(lesser long-nosed bat)

Type locality

Location 1: Maricopa County, AZ	
Township/Range/Section	T3S R6W S16
General legal description	Buckeye FO - Woolsey Peak
Location 2: Pima County, AZ	
Township/Range/Section	T9S R5E S4
General legal description	Sells FO - Tat Momolikot Mountains
Location 3: Maricopa County, AZ	
Township/Range/Section	T3S R7E S28
General legal description	Chandler FO - Santan Mountains
Location 4: Maricopa County, AZ	
Township/Range/Section	T6N R1E S30
General legal description	Phoenix FO - Lake Pleasant Reg. Park
Location 5: Pima County, AZ	
Township/Range/Section	T12S R3E S33
General legal description	Sells FO - Gu Achi District, Anegam Hills

Location 6: Pima County, AZ	
Township/Range/Section	T14S R5W S11
General legal description	Tucson FO - Organ Pipe National Monument, Gunsight Hills

Contributors

Dan Robinett
Larry D. Ellicott
Steve Barker

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, Dan Robinett, Emilio Carrillo
Contact for lead author	NRCS Tucson Area Office
Date	12/28/2005
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 only in areas where rock and gravel cover is low.

---

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

---

3. **Number and height of erosional pedestals or terracettes:** None.

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** 10-15%

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

6. **Extent of wind scoured, blowouts and/or depositional areas:** No evidence of soil movement by wind.

7. **Amount of litter movement (describe size and distance expected to travel):** Herbaceous litter can move by wind and water. Woody litter remains under shrub canopies.

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 & areas with high rock and gravel cover to moderate in soil 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):** fine granular; to 2 inches thick.

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Canopy 10-15%; 70-80% shrubs, 5% trees and 10-15% succulents. Cover is well dispersed throughout 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: subshrubs > large shrubs > winter annuals > summer annulas > perennial grasses and forbs > crytogams (Note: in El Nino years annual forbs and 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):** Herbaceous litter is not persistent on the site and may be 20-60% in El Nino years.

---

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 250 lbs/ac unfavorable precipitation; 450 lbs/ac normal precipitation; 800 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 (potential)

---

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