USDA Natural Resources
Conservation Service

Ecological site R041XC314AZ
Loamy Slopes 12-16" 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.

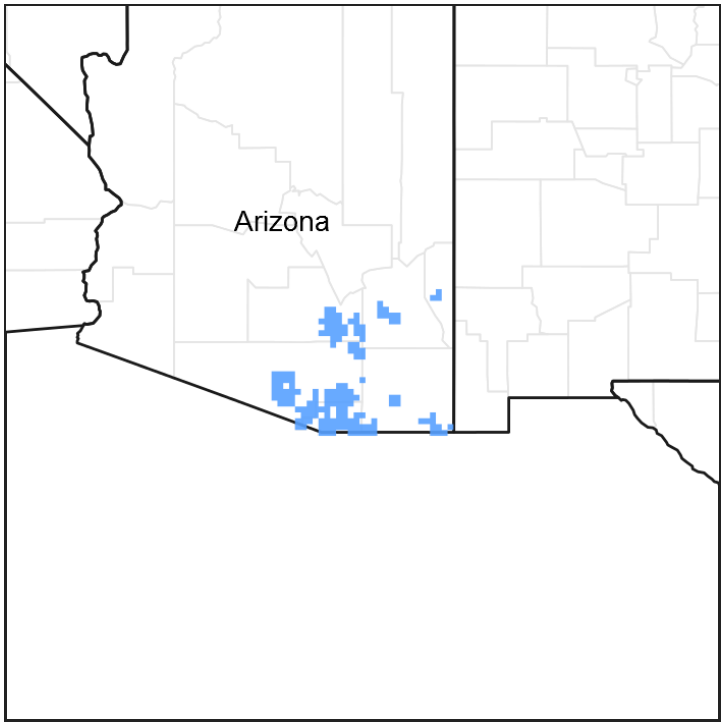

Figure 1. Mapped extent

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 41.3 – Chihuahuan – Sonoran Semidesert Grasslands

Elevations range from 3200 to 5000 feet and precipitation ranges from 12 to 16 inches per year. Vegetation includes mesquite, catclaw acacia, netleaf hackberry, palo verde, false mesquite, range ratany, fourwing saltbush, tarbush, littleleaf sumac, sideoats grama, black grama, plains lovegrass, cane beardgrass, tobosa, vine mesquite, threeawns, Arizona cottontop and bush muhly. The soil temperature regime is thermic and the soil moisture regime is ustic 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.

Associated sites

R041XC305AZ	**Clay Loam Upland 12-16" p.z.**
R041XC308AZ	**Limy Slopes 12-16" p.z.**
R041XC313AZ	**Loamy Upland 12"-16" p.z.**

Similar sites

R041XA107AZ	**Loamy Slopes 16-20" p.z.**
R040XA113AZ	**Loamy Slopes 10"-13" p.z.**
R041XB217AZ	**Loamy Slopes 8"-12" p.z.**

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *calliandra eriophylla*
Herbaceous	(1) *bouteloua curtipendula*

Physiographic features

This site occurs in the middle elevations of the Madrean Basin and Range province in southeastern Arizona. It occurs on hill-slopes and ridge-tops. Slope aspect is site differentiating at elevations near land resource area boundaries.

Table 2. Representative physiographic features

Landforms	(1) Hill (2) Ridge
Elevation	1,006–1,524 m
Slope	15–45%

Aspect	N, E, S

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, originates 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)	406 mm

Influencing water features

There are no water features associated with this site.

Soil features

These soils are moderately deep to deep soils which have formed on old, deeply dissected, gravelly alluvium of mixed origin. They are non-calcareous in the surface 10 inches and loamy textured. Some soils have calcic horizons at moderate (20-40 inches) depths. Soil surfaces have well developed covers of gravels and stones. Surface soils are dark colored. Plant-soil moisture relationships are good.

Soils mapped on this site include: SSA-661 Eastern Pinal & Southern Gila counties MU 91 Selevin; SSA-663 Gila-Duncan area MU's 11 Eloma and 12 Eloma & Whitehouse; SSA-667 Santa Cruz area MU's Ca haplargids, CgE Caralampi GrSL, CgF2 Caralampi GrSL

eroded, WgE Whitehouse GrL, WoE Caralampi; SSA-669 Pima county Eastern part MU 10 Caralampi; SSA-671 Cochise county Douglas-Tombstone part MU 134 Bernardino; SSA-703 Tohono O'odham Nation MU 7 Caralampi.

Table 4. Representative soil features

Surface texture	(1) Very gravelly sandy loam (2) Gravelly loam (3) Very gravelly loam
Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Slow to moderate
Soil depth	152 cm
Surface fragment cover <=3"	15–45%
Surface fragment cover >3"	0–8%
Available water capacity (0-101.6cm)	12.19–21.34 cm
Calcium carbonate equivalent (0-101.6cm)	1–25%
Electrical conductivity (0-101.6cm)	0–2 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0–2
Soil reaction (1:1 water) (0-101.6cm)	6.6–8.4
Subsurface fragment volume <=3" (Depth not specified)	5–45%
Subsurface fragment volume >3" (Depth not specified)	0–5%

Ecological dynamics

The plant communities found on an ecological site are naturally variable. Composition and production will vary with yearly conditions, location, aspect, and the natural variability of the soils. The 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 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 rainfall has been significantly above or below normal, use the total production shown for above or below normal years. If field data is not collected at the end of the summer growing season, then the field data must be corrected to the end of the year production before comparing it to the site description. The growth curve can be used as a guide for estimating production at the end of the summer growing season.

State and transition model

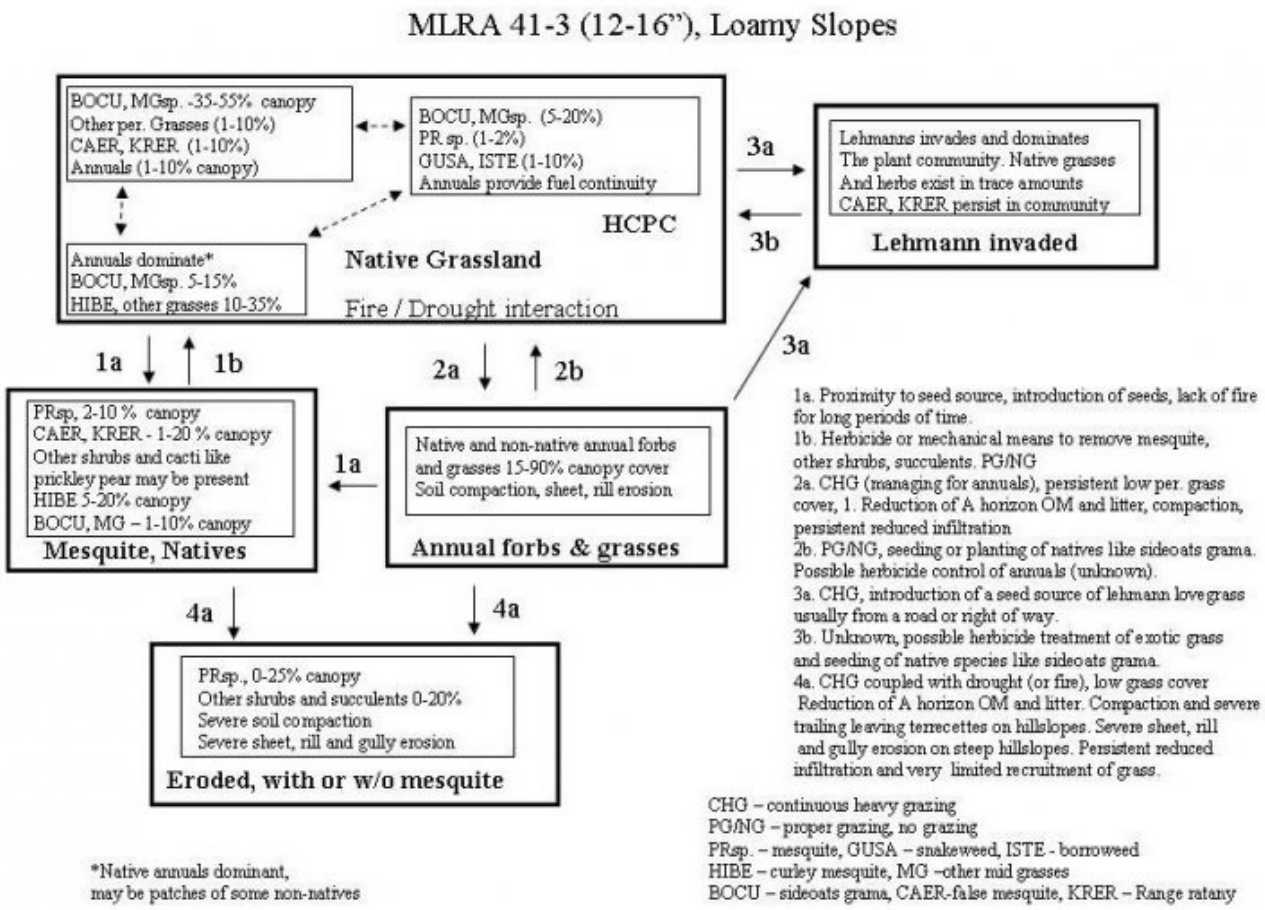

Figure 4. State and Transition, Loamy Slopes 12-16" p.z.

State 1
Historic Climax Plant Community

Community 1.1
Historic Climax Plant Community

Figure 5. Loamy Slopes 12-16" pz. HCPC

The potential plant community of this site is dominated by warm season perennial grasses with a variety of shrubs, succulents and forbs being well represented. The major perennial grasses are well dispersed throughout the plant community. The aspect is shrub dotted grassland. With continuous heavy grazing, palatable perennial grasses are removed and species like mesquite, catclaw acacia, mimosa, ocotillo, snakeweed, burroweed and prickly pear increase to dominate. Natural fire may have been an important part in the development of the potential plant community. With steep slopes and heavy textured horizons near the soil surface, this site becomes an ineffective user of intense summer rainfall if the perennial grass cover is depleted. The potential of the site to produce grass is reduced as tree canopy increases. The site can produce effective herbaceous covers with up to 5-10% tree canopy. Fire and drought interactions can deplete the perennial grass cover. When this is followed by a wet spring tremendous stands of annual forbs like goldeneye, poppy and lupine can result.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	375	785	1110
Shrub/Vine	73	168	269
Forb	28	56	258
Tree	1	6	50
Total	**477**	**1015**	**1687**

Table 6. Soil surface cover

Tree basal cover	0-1%
Shrub/vine/liana basal cover	0-2%
Grass/grasslike basal cover	6-15%
Forb basal cover	0-1%
Non-vascular plants	0-1%
Biological crusts	0-5%
Litter	10-50%
Surface fragments >0.25" and <=3"	15-55%
Surface fragments >3"	0-8%
Bedrock	0%
Water	0%
Bare ground	15-25%

Table 7. Canopy structure (% cover)

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

Figure 7. Plant community growth curve (percent production by month). AZ4131, 41.3 12-16" p.z. hill sites. 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	5	10	10	0	30	30	10	5	0	0

State 2
Mesquite, native grasses and forbs

Community 2.1
Mesquite, native grasses and forbs

Figure 8. Loamy Slopes 12-16" pz. shrubby state

Mesquite increases or invades in the absence of fire for long periods of time. Other shrubs like prickly pear, blue paloverde, ocotillo, cholla, snakeweed and brittlebush can increase to make the site appear shrubby. Native perennial grasses and forbs still dominate the herbaceous layer of the plant community.

State 3
Annual forbs and grasses

Community 3.1
Annual forbs and grasses

Figure 9. Loamy Slopes 12-16" pz. Selevin soil profile

The interactions of fire, drought and continuous grazing act to remove perennial grasses from the plant community. Annuals, both native and non-native dominate the herbaceous layer of the plant community. The shrubby component of the community remains unchanged. Some soil compaction has occurred and sheet erosion has accelerated.

State 4
Lehmann lovegrass invaded

Community 4.1
Lehmann lovegrass invaded

Lehmann lovegrass invades from seeded areas and roadsides, trails and right of ways. The interactions of fire, drought and continuous grazing cause openings in the native grass community which are filled by Lehmann. As Lehmann becomes dominant the diversity of native herbaceous species declines. The shrubby component of the site does not appear to be as affected as the herbaceous component by increases in Lehmann lovegrass.

State 5
Eroded w/wo mesquite.

Community 5.1
Eroded w/wo mesquite.

Severe soil compaction and trailing from heavy, continuous livestock grazing results in loss of plant cover, changes in hydrology and accelerated sheet and rill erosion. Gullies can form where runoff is concentrated from roadways or trails. Shrubs like mesquite and cacti may or may not have increased to dominate. Perennial grasses and forbs are present only in trace amounts.

Transition T1A
State 1 to 2

Proximity to seed source, introduction of seeds, lack of fire for long periods of time

Transition T1B
State 1 to 3

Continuous Heavy Grazing (managing for annuals), persistent low perennial grass cover. Reduction of A Horizon, Organic Matter and litter, compaction, persistently reduced infiltration.

Transition T1C

State 1 to 4

Continuous Heavy Grazing, introduction of seed source for non-native perennial grasses, usually from a road or right of way.

Restoration pathway R2A
State 2 to 1

Herbicide or mechanical means to remove mesquite, other shrubs, succulents. Prescribed Grazing/No Grazing. Implementing brush management (chemical or mechanical) puts site at risk to transition to State 2.

Transition T2A
State 2 to 4

Continuous Heavy Grazing coupled with drought (or fire), low perennial grass cover, reduction of A Horizon, Organic Matter and litter. Compaction and severe trailing leaving terracettes on hillslopes. Severe sheet, rill and gully erosion on steep hillslopes. Persistently reduced infiltration and limited recruitment of grass.

Transition T2B
State 2 to 5

Continuous Heavy Grazing coupled with drought (or fire), low perennial grass cover, reduction of A Horizon, Organic Matter and litter. Compaction and severe trailing leaving terracettes on hillslopes. Severe sheet, rill and gully erosion on steep hillslopes. Persistently reduced infiltration and limited recruitment of grass.

Restoration pathway R3A
State 3 to 1

Prescribed Grazing/No Grazing, seeding or planting of natives like sideoats grama. Possible herbicide control of annuals (unknown).

Restoration pathway R3B
State 3 to 2

Proximity to seed source, introduction of seeds, lack of fire for long periods of time

Transition T3B
State 3 to 4

Introduction of seed source for non-native perennial grasses, usually from a road or right of way.

Transition T3C
State 3 to 5

Continuous Heavy Grazing coupled with drought (or fire), low perennial grass cover, reduction of A Horizon, Organic Matter and litter. Compaction and severe trailing leaving terracettes on hillslopes. Severe sheet, rill and gully erosion on steep hillslopes. Persistently reduced infiltration and limited recruitment of grass.

Restoration pathway R4A
State 4 to 1

Unknown, possible herbicide treatment of exotic grass and seeding of native species like sideoats grama.

Additional community tables

Table 8. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Dominant mid grasses**			202–392	
	sideoats grama	BOCU	*Bouteloua curtipendula*	112–280	–
	green sprangletop	LEDU	*Leptochloa dubia*	22–168	–
	cane bluestem	BOBA3	*Bothriochloa barbinodis*	22–112	–
	tanglehead	HECO10	*Heteropogon contortus*	11–112	–
	Arizona cottontop	DICA8	*Digitaria californica*	11–56	–
	plains bristlegrass	SEVU2	*Setaria vulpiseta*	0–45	–
2	**Cool season grasses**			11–112	
	plains lovegrass	ERIN	*Eragrostis intermedia*	6–112	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	0–28	–
	squirreltail	ELEL5	*Elymus elymoides*	1–28	–
3	**Dominant short grasses**			123–168	
	black grama	BOER4	*Bouteloua eriopoda*	22–112	–
	hairy grama	BOHI2	*Bouteloua hirsuta*	11–112	–
	purple grama	BORA	*Bouteloua radicosa*	0–28	–
	common wolfstail	LYPH	*Lycurus phleoides*	1–28	–
	Hall's panicgrass	PAHA	*Panicum hallii*	0–28	–
	blue grama	BOGR2	*Bouteloua gracilis*	0–28	–
	sprucetop grama	BOCH	*Bouteloua chondrosioides*	0–28	–

4	**Short lived grasses**			11–224	
	curly-mesquite	HIBE	*Hilaria belangeri*	6–112	–
	Rothrock's grama	BORO2	*Bouteloua rothrockii*	1–84	–
	slender grama	BORE2	*Bouteloua repens*	6–56	–
5	**Miscellaneous perennial grasses**			6–50	
	bush muhly	MUPO2	*Muhlenbergia porteri*	1–28	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	0–17	–
	slim tridens	TRMU	*Tridens muticus*	0–17	–
	fall witchgrass	DICO6	*Digitaria cognata*	1–17	–
	red grama	BOTR2	*Bouteloua trifida*	0–11	–
	vine mesquite	PAOB	*Panicum obtusum*	0–11	–
	tobosagrass	PLMU3	*Pleuraphis mutica*	0–11	–
	bullgrass	MUEM	*Muhlenbergia emersleyi*	0–11	–
	Texas bluestem	SCCI2	*Schizachyrium cirratum*	0–6	–
	southwestern bristlegrass	SESC2	*Setaria scheelei*	0–6	–
	spike dropseed	SPCO4	*Sporobolus contractus*	0–6	–
	spiked crinkleawn	TRSP12	*Trachypogon spicatus*	0–6	–
	low woollygrass	DAPU7	*Dasyochloa pulchella*	0–6	–
	woolyspike balsamscale	ELBA	*Elionurus barbiculmis*	0–6	–
	nineawn pappusgrass	ENDE	*Enneapogon desvauxii*	0–6	–
	Arizona muhly	MUAR3	*Muhlenbergia arizonica*	0–6	–
	purple muhly	MURI3	*Muhlenbergia rigida*	0–2	–
6	**Perennial threeawns**			11–50	
	Fendler threeawn	ARPUL	*Aristida purpurea var. longiseta*	1–28	–
	spidergrass	ARTE3	*Aristida ternipes*	6–28	–
	spidergrass	ARTEG	*Aristida ternipes var. gentilis*	1–17	–
	purple threeawn	ARPU9	*Aristida purpurea*	1–17	–
	Parish's threeawn	ARPUP5	*Aristida purpurea var. parishii*	0–11	–
	Orcutt's threeawn	ARSCO	*Aristida schiedeana var. orcuttiana*	0–11	–

	Wright's threeawn	ARPUW	*Aristida purpurea var. wrightii*	0–6	–
	Santa Rita threeawn	ARCAG	*Aristida californica var. glabrata*	0–6	–
	poverty threeawn	ARDI5	*Aristida divaricata*	0–6	–
	Havard's threeawn	ARHA3	*Aristida havardii*	0–6	–
	Wooton's threeawn	ARPA9	*Aristida pansa*	0–6	–
	blue threeawn	ARPUN	*Aristida purpurea var. nealleyi*	0–1	–
7	**Annual grasses**			11–112	
	sixweeks threeawn	ARAD	*Aristida adscensionis*	1–45	–
	prairie threeawn	AROL	*Aristida oligantha*	1–28	–
	Mexican sprangletop	LEFUU	*Leptochloa fusca ssp. uninervia*	1–28	–
	mucronate sprangletop	LEPA6	*Leptochloa panicea*	1–28	–
	Arizona signalgrass	URAR	*Urochloa arizonica*	0–28	–
	Eastwood fescue	VUMIC	*Vulpia microstachys var. ciliata*	0–17	–
	desert fescue	VUMIM	*Vulpia microstachys var. microstachys*	0–17	–
	sixweeks fescue	VUOC	*Vulpia octoflora*	0–17	–
	needle grama	BOAR	*Bouteloua aristidoides*	0–17	–
	Mexican panicgrass	PAHI5	*Panicum hirticaule*	1–17	–
	Bigelow's bluegrass	POBI	*Poa bigelovii*	0–6	–
	sixweeks grama	BOBA2	*Bouteloua barbata*	0–6	–
	feather fingergrass	CHVI4	*Chloris virgata*	0–6	–
	tapertip cupgrass	ERACA	*Eriochloa acuminata var. acuminata*	0–6	–
	Mexican lovegrass	ERME	*Eragrostis mexicana*	0–6	–
	tufted lovegrass	ERPE	*Eragrostis pectinacea*	0–6	–
	desert lovegrass	ERPEM	*Eragrostis pectinacea var. miserrima*	0–6	–
	delicate muhly	MUFR	*Muhlenbergia fragilis*	0–6	–
	littleseed muhly	MUMI	*Muhlenbergia*	0–6	–

	littleseed muhly	MUMI	*Muhlenbergia microsperma*		
	witchgrass	PACA6	*Panicum capillare*	0–6	–
	Arizona brome	BRAR4	*Bromus arizonicus*	0–2	–
	prairie false oat	TRIN5	*Trisetum interruptum*	0–2	–
Forb					
8	**Perennial Forbs**			17–90	
	slender janusia	JAGR	*Janusia gracilis*	1–22	–
	slender poreleaf	POGR5	*Porophyllum gracile*	1–22	–
	desert globemallow	SPAM2	*Sphaeralcea ambigua*	6–22	–
	bluedicks	DICA14	*Dichelostemma capitatum*	1–17	–
	spreading fleabane	ERDI4	*Erigeron divergens*	1–11	–
	poreleaf dogweed	ADPO2	*Adenophyllum porophyllum*	0–11	–
	trailing windmills	ALIN	*Allionia incarnata*	1–11	–
	weakleaf bur ragweed	AMCO3	*Ambrosia confertiflora*	1–11	–
	dense ayenia	AYMI	*Ayenia microphylla*	0–11	–
	brownplume wirelettuce	STPA4	*Stephanomeria pauciflora*	2–11	–
	Lewis flax	LILE3	*Linum lewisii*	0–11	–
	plains blackfoot	MELE2	*Melampodium leucanthum*	1–11	–
	Indian rushpea	HOGL2	*Hoffmannseggia glauca*	0–6	–
	lacy tansyaster	MAPI	*Machaeranthera pinnatifida*	0–6	–
	tufted evening primrose	OECA10	*Oenothera caespitosa*	0–6	–
	American vetch	VIAM	*Vicia americana*	0–6	–
	Louisiana vetch	VILUL2	*Vicia ludoviciana ssp. ludoviciana*	0–6	–
	perennial rockcress	ARPE2	*Arabis perennans*	1–6	–
	dwarf desertpeony	ACNA2	*Acourtia nana*	0–6	–
	tuber anemone	ANTU	*Anemone tuberosa*	0–6	–
	narrowleaf silverbush	ARLA12	*Argythamnia lanceolata*	0–6	–

	white sagebrush	ARLU	*Artemisia ludoviciana*	0–6	–
	wild dwarf morning-glory	EVAR	*Evolvulus arizonicus*	0–6	–
	Cooley's bundleflower	DECO2	*Desmanthus cooleyi*	0–6	–
	desert trumpet	ERIN4	*Eriogonum inflatum*	0–2	–
	scarlet spiderling	BOCO	*Boerhavia coccinea*	0–2	–
	climbing wartclub	BOSC	*Boerhavia scandens*	0–2	–
	Arizona wrightwort	CAAR7	*Carlowrightia arizonica*	0–2	–
	Indian paintbrush	CASTI2	*Castilleja*	0–2	–
	Texas bindweed	COEQ	*Convolvulus equitans*	0–2	–
	whitemouth dayflower	COER	*Commelina erecta*	0–2	–
	leatherweed	CRPO5	*Croton pottsii*	0–2	–
	largeflower onion	ALMA4	*Allium macropetalum*	0–2	–
	Coues' cassia	SECO10	*Senna covesii*	0–2	–
	cudweed	PSEUD43	*Pseudognaphalium*	0–2	–
	Parry's beardtongue	PEPA24	*Penstemon parryi*	0–2	–
	Parry's false prairie-clover	MAPA7	*Marina parryi*	0–2	–
	southwestern mock vervain	GLGO	*Glandularia gooddingii*	0–2	–
	pearly globe amaranth	GONI	*Gomphrena nitida*	0–1	–
	small matweed	GUDE	*Guilleminea densa*	0–1	–
	Arizona rosemallow	HIBI	*Hibiscus biseptus*	0–1	–
	desert rosemallow	HICO	*Hibiscus coulteri*	0–1	–
	ragged nettlespurge	JAMA	*Jatropha macrorhiza*	0–1	–
	San Pedro daisy	LAPO4	*Lasianthaea podocephala*	0–1	–
	orange fameflower	PHAU13	*Phemeranthus aurantiacus*	0–1	–
	ivyleaf groundcherry	PHHE4	*Physalis hederifolia*	0–1	–
	wishbone-bush	MILAV	*Mirabilis laevis var. villosa*	0–1	–
	desert tobacco	NIOB	*Nicotiana obtusifolia*	0–1	–

	slimflower scurfpea	PSTE5	*Psoralidium tenuiflorum*	0–1	–
	twinleaf senna	SEBA3	*Senna bauhinioides*	0–1	–
	velvetseed milkwort	POOB	*Polygala obscura*	0–1	–
	shrubby purslane	POSU3	*Portulaca suffrutescens*	0–1	–
	New Mexico fanpetals	SINE	*Sida neomexicana*	0–1	–
	silverleaf nightshade	SOEL	*Solanum elaeagnifolium*	0–1	–
	gooseberryleaf globemallow	SPGR2	*Sphaeralcea grossulariifolia*	0–1	–
	Rocky Mountain zinnia	ZIGR	*Zinnia grandiflora*	0–1	–
	jewels of Opar	TAPA2	*Talinum paniculatum*	0–1	–
	hairy fournwort	TENE	*Tetramerium nervosum*	0–1	–
	spiderwort	TRADE	*Tradescantia*	0–1	–
	branched noseburn	TRRA5	*Tragia ramosa*	0–1	–
	brownfoot	ACWR5	*Acourtia wrightii*	0–1	–
	New Mexico silverbush	ARNE2	*Argythamnia neomexicana*	0–1	–
	Watson's dutchman's pipe	ARWA	*Aristolochia watsonii*	0–1	–
	anoda	ANODA	*Anoda*	0–1	–
	hairyseed bahia	BAAB	*Bahia absinthifolia*	0–1	–
	desert marigold	BAMU	*Baileya multiradiata*	0–1	–
	lyreleaf greeneyes	BELY	*Berlandiera lyrata*	0–1	–
	desert mariposa lily	CAKE	*Calochortus kennedyi*	0–1	–
	sego lily	CANU3	*Calochortus nuttallii*	0–1	–
	Arizona snakecotton	FRAR2	*Froelichia arizonica*	0–1	–
	beeblossom	GAURA	*Gaura*	0–1	–
	Palmer's Indian mallow	ABPA	*Abutilon palmeri*	0–1	–
	spreading snakeherb	DYSCD	*Dyschoriste schiedeana var. decumbens*	0–1	–
9	**Annual forbs**			11–168	

	Annual forbs				
	bristly fiddleneck	AMTE3	*Amsinckia tessellata*	0–56	–
	longleaf false goldeneye	HELOA2	*Heliomeris longifolia var. annua*	1–56	–
	goosefoot	CHENO	*Chenopodium*	1–50	–
	sensitive partridge pea	CHNI2	*Chamaecrista nictitans*	1–28	–
	western tansymustard	DEPI	*Descurainia pinnata*	1–28	–
	tanseyleaf tansyaster	MATA2	*Machaeranthera tanacetifolia*	0–28	–
	carelessweed	AMPA	*Amaranthus palmeri*	1–22	–
	Coulter's spiderling	BOCO2	*Boerhavia coulteri*	0–17	–
	milkvetch	ASTRA	*Astragalus*	0–17	–
	New Mexico thistle	CINE	*Cirsium neomexicanum*	1–17	–
	cryptantha	CRYPT	*Cryptantha*	0–17	–
	California poppy	ESCAM	*Eschscholzia californica ssp. mexicana*	0–17	–
	crestrib morning-glory	IPCO2	*Ipomoea costellata*	0–17	–
	Arizona poppy	KAGR	*Kallstroemia grandiflora*	0–17	–
	phacelia	PHACE	*Phacelia*	0–17	–
	shaggyfruit pepperweed	LELA	*Lepidium lasiocarpum*	0–17	–
	intermediate pepperweed	LEVIM	*Lepidium virginicum var. medium*	0–17	–
	coastal bird's-foot trefoil	LOSAB	*Lotus salsuginosus var. brevivexillus*	0–17	–
	Coulter's lupine	LUSP2	*Lupinus sparsiflorus*	0–17	–
	slender goldenweed	MAGR10	*Machaeranthera gracilis*	0–17	–
	woolly tidestromia	TILA2	*Tidestromia lanuginosa*	0–17	–
	Arizona popcornflower	PLAR	*Plagiobothrys arizonicus*	0–17	–
	desert Indianwheat	PLOV	*Plantago ovata*	0–11	–
	combseed	PECTO	*Pectocarya*	0–11	–
	miniature	ERDI2	*Eriastrum diffusum*	0–11	–

	woollystar				
	sorrel buckwheat	ERPO4	*Eriogonum polycladon*	0–11	–
	exserted Indian paintbrush	CAEXE	*Castilleja exserta ssp. exserta*	0–11	–
	fewflower beggarticks	BILE	*Bidens leptocephala*	0–6	–
	American wild carrot	DAPU3	*Daucus pusillus*	0–6	–
	warty caltrop	KAPA	*Kallstroemia parviflora*	0–6	–
	Thurber's morning-glory	IPTH	*Ipomoea thurberi*	0–6	–
	camphorweed	HESU3	*Heterotheca subaxillaris*	0–6	–
	Arizona gumweed	GRAR2	*Grindelia arizonica*	0–6	–
	foothill deervetch	LOHU2	*Lotus humistratus*	0–6	–
	woolly plantain	PLPA2	*Plantago patagonica*	0–6	–
	New Mexico plumeseed	RANE	*Rafinesquia neomexicana*	0–6	–
	sawtooth sage	SASU7	*Salvia subincisa*	0–6	–
	spreading fanpetals	SIAB	*Sida abutifolia*	1–6	–
	sleepy silene	SIAN2	*Silene antirrhina*	1–6	–
	New Mexico copperleaf	ACNE	*Acalypha neomexicana*	0–6	–
	purslane	PORTU	*Portulaca*	0–2	–
	manybristle chinchweed	PEPA2	*Pectis papposa*	0–2	–
	Arizona lupine	LUAR4	*Lupinus arizonicus*	0–2	–
	green carpetweed	MOVE	*Mollugo verticillata*	0–2	–
	desert evening primrose	OEPR	*Oenothera primiveris*	0–2	–
	star gilia	GIST	*Gilia stellata*	0–2	–
	southwestern mock vervain	GLGO	*Glandularia gooddingii*	0–2	–
	wedgeleaf draba	DRCU	*Draba cuneifolia*	0–2	–
	wheelscale saltbush	ATEL	*Atriplex elegans*	0–2	–
	fringed redmaids	CACI2	*Calandrinia ciliata*	0–2	–
	scrambled eggs	COAU2	*Corydalis aurea*	0–2	–
	lipfern	CHEIL	*Cheilanthes*	0–1	

	lipiem	CHEIL	*Cheilanthes*	0–1	–
	miner's lettuce	CLPEP	*Claytonia perfoliata ssp. perfoliata*	0–1	–
	southwestern pricklypoppy	ARPL3	*Argemone pleiacantha*	0–1	–
	hoary bowlesia	BOIN3	*Bowlesia incana*	0–1	–
	sanddune wallflower	ERCA14	*Erysimum capitatum*	0–1	–
	Texas stork's bill	ERTE13	*Erodium texanum*	0–1	–
	Arizona blanketflower	GAAR2	*Gaillardia arizonica*	0–1	–
	Goodding's bladderpod	LEGO2	*Lesquerella gooddingii*	0–1	–
	Florida pellitory	PAFL3	*Parietaria floridana*	0–1	–
	Nuttall's povertyweed	MONU	*Monolepis nuttalliana*	0–1	–
	cliffbrake	PELLA	*Pellaea*	0–1	–
	phlox	PHLOX	*Phlox*	0–1	–
	plains flax	LIPU4	*Linum puberulum*	0–1	–
	golden crownbeard	VEEN	*Verbesina encelioides*	0–1	–
	desert unicorn-plant	PRAL4	*Proboscidea althaeifolia*	0–1	–
	doubleclaw	PRPA2	*Proboscidea parviflora*	0–1	–
	chia	SACO6	*Salvia columbariae*	0–1	–
Shrub/Vine					
10	**Dominant half shrubs**			67–168	
	bastardsage	ERWR	*Eriogonum wrightii*	11–112	–
	fairyduster	CAER	*Calliandra eriophylla*	22–112	–
	littleleaf ratany	KRER	*Krameria erecta*	6–56	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	1–22	–
	brittlebush	ENFA	*Encelia farinosa*	0–17	–
	button brittlebush	ENFR	*Encelia frutescens*	0–11	–
	trailing krameria	KRLA	*Krameria lanceolata*	0–11	–
	rough menodora	MESC	*Menodora scabra*	0–11	–
	desert zinnia	ZIAC	*Zinnia acerosa*	0–11	–
11	**Miscellaneous Shrubs**			0–45	
	pelotazo	ABIN	*Abutilon incanum*	0–11	

	pelota20	ABIN	*Abutilon incanum*	0–11	–
	Sonoran scrub oak	QUTU2	*Quercus turbinella*	0–11	–
	skunkbush sumac	RHTR	*Rhus trilobata*	0–6	–
	desert-thorn	LYCIU	*Lycium*	0–6	–
	algerita	MATR3	*Mahonia trifoliolata*	0–6	–
	catclaw mimosa	MIACB	*Mimosa aculeaticarpa var. biuncifera*	0–6	–
	velvetpod mimosa	MIDY	*Mimosa dysocarpa*	0–6	–
	ocotillo	FOSP2	*Fouquieria splendens*	0–6	–
	jojoba	SICH	*Simmondsia chinensis*	0–6	–
	prairie acacia	ACAN	*Acacia angustissima*	0–6	–
	fourwing saltbush	ATCA2	*Atriplex canescens*	0–6	–
	shortleaf baccharis	BABR	*Baccharis brachyphylla*	0–6	–
	yerba de pasmo	BAPT	*Baccharis pteronioides*	0–6	–
	Coulter's brickellbush	BRCO	*Brickellia coulteri*	0–6	–
	spiny hackberry	CEEH	*Celtis ehrenbergiana*	0–6	–
	javelina bush	COER5	*Condalia ericoides*	0–6	–
	knifeleaf condalia	COSP3	*Condalia spathulata*	0–6	–
	Warnock's snakewood	COWA	*Condalia warnockii*	0–6	–
	Kearney's snakewood	COWAK	*Condalia warnockii var. kearneyana*	0–6	–
	longleaf jointfir	EPTR	*Ephedra trifurca*	0–6	–
	Eastern Mojave buckwheat	ERFA2	*Eriogonum fasciculatum*	0–2	–
	whitethorn acacia	ACCO2	*Acacia constricta*	0–2	–
	Wright's beebrush	ALWR	*Aloysia wrightii*	0–2	–
	American threefold	TRCA8	*Trixis californica*	0–2	–
	Parish's goldeneye	VIPA14	*Viguiera parishii*	0–2	–
	winterfat	KRLA2	*Krascheninnikovia lanata*	0–2	–
	yellow paloverde	PAMI5	*Parkinsonia microphylla*	0–2	–
	marvel dewberry	RUMI3	*Rubus mirus*	0–2	–
	mock buckthorn	SAGER	*Sageretia*	0–2	–

	threadleaf ragwort	SEFLF	*Senecio flaccidus var. flaccidus*	0–1	–
	whitestem paperflower	PSCO2	*Psilostrophe cooperi*	0–1	–
	threadleaf snakeweed	GUMI	*Gutierrezia microcephala*	0–1	–
	gumhead	GYGL	*Gymnosperma glutinosum*	0–1	–
	burroweed	ISTE2	*Isocoma tenuisecta*	0–1	–
	lotebush	ZIOB	*Ziziphus obtusifolia*	0–1	–
	turpentine bush	ERLA12	*Ericameria laricifolia*	0–1	–
12	**Succulents**			6–56	
	Palmer's century plant	AGPA3	*Agave palmeri*	0–17	–
	cactus apple	OPEN3	*Opuntia engelmannii*	1–17	–
	purple pricklypear	OPMAM	*Opuntia macrocentra var. macrocentra*	0–6	–
	tulip pricklypear	OPPH	*Opuntia phaeacantha*	0–6	–
	banana yucca	YUBA	*Yucca baccata*	0–6	–
	soaptree yucca	YUEL	*Yucca elata*	0–6	–
	walkingstick cactus	CYSP8	*Cylindropuntia spinosior*	0–6	–
	candy barrelcactus	FEWI	*Ferocactus wislizeni*	1–6	–
	sacahuista	NOMI	*Nolina microcarpa*	0–6	–
	dollarjoint pricklypear	OPCH	*Opuntia chlorotica*	0–6	–
	saguaro	CAGI10	*Carnegiea gigantea*	0–6	–
	hedgehog cactus	ECHIN3	*Echinocereus*	0–6	–
	jumping cholla	CYFU10	*Cylindropuntia fulgida*	0–2	–
	Christmas cactus	CYLE8	*Cylindropuntia leptocaulis*	0–2	–
	staghorn cholla	CYVE3	*Cylindropuntia versicolor*	0–2	–
	common sotol	DAWH2	*Dasylirion wheeleri*	0–2	–
	Graham's nipple cactus	MAGR9	*Mammillaria grahamii*	0–1	–
	little nipple cactus	MAHE2	*Mammillaria heyderi*	0–1	–
	Arizona pencil cholla	CYAR14	*Cylindropuntia arbuscula*	0–1	–

	white fishhook cactus	ECIN2	*Echinomastus intertextus*	0–1	–
	rainbow cactus	ECPE	*Echinocereus pectinatus*	0–1	–
	spinystar	ESVI2	*Escobaria vivipara*	0–1	–
	Parry's agave	AGPA4	*Agave parryi*	0–1	–
	desert agave	AGDE	*Agave deserti*	0–1	–
Tree					
13	**Trees**			1–50	
	western honey mesquite	PRGLT	*Prosopis glandulosa var. torreyana*	0–28	–
	velvet mesquite	PRVE	*Prosopis velutina*	0–28	–
	catclaw acacia	ACGR	*Acacia greggii*	1–17	–
	oneseed juniper	JUMO	*Juniperus monosperma*	0–17	–
	blue paloverde	PAFL6	*Parkinsonia florida*	0–17	–

Animal community

The plant community on this site is suitable for grazing by all classes of cattle. Steep slopes can hinder utilization. Ridge-tops, canyon bottoms and adjacent areas of level uplands will be overused before appreciable use is made of this site. Cool season use or fencing and grazing systems will be needed to overcome the grazing distribution problems. Herbaceous forage will be deficient in protein in the winter.

Water developments are very important to wildlife on this site. Even though the site is open grassland, it is topographically diverse and home to a variety of large and small wildlife species.

Hydrological functions

Steep slopes and loamy textured soils make this site a producer of runoff.

Recreational uses

Hunting, horseback riding, hiking, photography, bird-watching, camping

Wood products

Limited fuel-wood available from shrubby mesquite, juniper and catclaw acacia; where these trees have increased on the site.

Inventory data references

Range 417s include 1 in excellent condition, 5 in good condition and 2 in fair condition.

Type locality

Location 1: Cochise County, AZ	
Township/Range/Section	T21S R20E S28
General legal description	Fort Huachuca, East Range
Location 2: Pinal County, AZ	
Township/Range/Section	T10S R14E S14
General legal description	Sunspace Ranch
Location 3: Pinal County, AZ	
Township/Range/Section	T9S R18E S9
General legal description	Rafter T Ranch
Location 4: Pima County, AZ	
Township/Range/Section	T17S R16E S36
General legal description	Sonoita Hwy 83 ROW
Location 5: Cochise County, AZ	
Township/Range/Section	T13S R22E S7
General legal description	Warbonnet Ranch
Location 6: Pima County, AZ	
Township/Range/Section	T19S R17E S36
General legal description	Empire ranch KA 11 (south exposure), Hilton Pasture above Road Canyon well.
Location 7: Pima County, AZ	
Township/Range/Section	T19S R16E S11
General legal description	Empire Ranch KA2 (south exposure), in North pasture near Oak Tree well.

Contributors

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Approval

Scott Woodall, 8/06/2020

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	03/07/2005
Approved by	Scott Woodall
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** None

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2. **Presence of water flow patterns:** Uncommon, probably cover no more than 10% of area; discontinuous, very short, usually less than 1-3 feet in length.

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3. **Number and height of erosional pedestals or terracettes:** Pedestals are uncommon on perennial grass and shrubs. Terracettes uncommon.

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4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** 0-5%

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

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

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7. **Amount of litter movement (describe size and distance expected to travel):** All litter size classes stay in place.

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8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** Expect values of 1-3 in canopy interspaces, and 4-6 under plant canopies.

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Weak granular; color is 10YR4/2 dry, 10YR3/2 moist; thickness to 2 inches.

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Canopy 30-40%, Basal 5%, Litter 45-55%; 60-70% of canopy cover is perennial grasses, 5% perennial forbs, 15-25% shrubs & subshrubs. Cover is well dispersed throughout site.

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

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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: perennial grass > subshrubs > annual grasses & forbs > shrubs succulents = perennial forbs

    Sub-dominant:

    Other:

    Additional:

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** 50% of basal cover of perennial grasses has likely been lost in recent prolonged drought.

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

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 600 lbs/ac unfavorable precipitation, 900 lbs/ac normal precipitation, 1300 lbs/ac favorable precipitation

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16. **Potential invasive (including noxious) species (native and non-native). List species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicators, we are describing what is NOT expected in the reference state for the ecological site:** jojoba, whitethorn, mesquite, prickley pear, cane cholla & ocotillo may increast to undesirable levels in the absence of natural fires; red brome and wild oats.

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17. **Perennial plant reproductive capability:** Not affected even following several years of prolonged drought period for region.
