

Ecological site R041XC308AZ Limy 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.

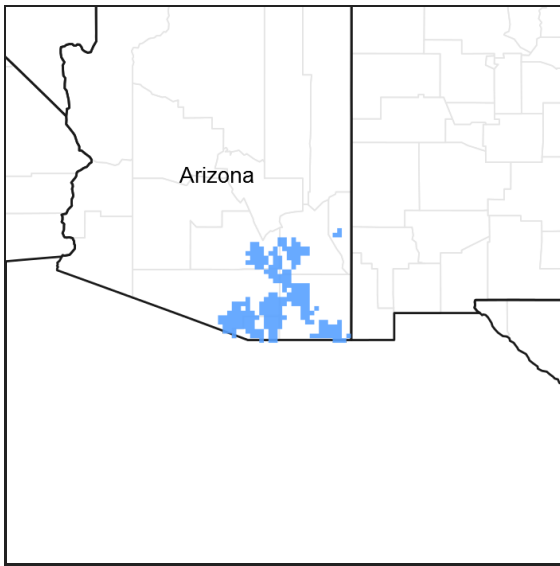


Figure 1. Mapped extent

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.

Ecological site concept

Limy Slopes, 12"-16" p.z., ecological site is a rolling upland (>8% slopes) with deep, calcareous soils.

Associated sites

R041XC309AZ	Limy Upland 12-16" p.z.
R041XC313AZ	Loamy Upland 12"-16" p.z.
R041XC314AZ	Loamy Slopes 12-16" p.z.
R041XC319AZ	Sandy Loam Upland 12-16" p.z.

Similar sites

R041XB207AZ	Limy Slopes 8-12" p.z.
R040XA110AZ	Limy Slopes 10"-13" p.z.
R041XA104AZ	Limy Slopes 16-20" p.z.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) <i>calliandra eriophylla</i> (2) <i>krameria erecta</i>
Herbaceous	(1) <i>bouteloua eriopoda</i> (2) <i>bouteloua curtispindula</i>

Physiographic features

This site occurs in the middle elevations of the Madrean Basin and Range province in southeastern Arizona. It occurs on the side slopes of fan terraces and on hill slopes and ridge-tops. Slopes range from 6-40%. Direction of slope is not site differentiating except where east-west trending ridges of the site occur near MLRA boundaries.

Table 2. Representative physiographic features

Landforms	(1) Fan piedmont (2) Ballena (3) Hill
Flooding frequency	None
Ponding frequency	None
Elevation	975–1,524 m
Slope	6–40%
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)	195 days
Freeze-free period (average)	
Precipitation total (average)	356 mm

Influencing water features

There are no water features associated with this site.

Soil features

These soils have developed on very calcareous, gravelly, loamy alluvium. They are moderately deep to deep and calcareous throughout. The surface 6-10 inches are dark colored. The soils have calcic horizons at shallow depths. Soil surfaces are well covered with gravels and rocks. Plant-soil moisture relationships are fair.

Soils mapped on this site include: SSA-661 Eastern Pinal & Southern Gila counties MU's 77 Powerline & 91 Tombstone; SSA-663 Gila-Duncan area MU 11 Also; SSA-666 Cochise county Northwest part MU's 36 Andrada, 61 Mule, 64 tombstone & 79 Stronghold; SSA-667 Santa Cruz area MU's BhD & WtF Hathaway, CvE2 & RIE2 Rillino eroded, HhE2 Hathaway eroded; SSA-669 Pima county Eastern part MU's 6, 51 & 79 Tombstone, 23 Andrada & 65 Powerline; SSA-671 Cochise county Douglas-Tombstone part MU's 56, 58 108 & 134 Stronghold and 133 Stronghold GrFSL.

Table 4. Representative soil features

Surface texture	(1) Gravelly sandy loam (2) Very gravelly sandy loam (3) Very gravelly loam
Family particle size	(1) Sandy
Drainage class	Well drained
Permeability class	Moderately rapid to moderate
Soil depth	76–152 cm
Surface fragment cover <=3"	25–50%
Surface fragment cover >3"	0–8%
Available water capacity (0-101.6cm)	7.11–15.24 cm
Calcium carbonate equivalent (0-101.6cm)	10–30%
Electrical conductivity (0-101.6cm)	0–8 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0–2
Soil reaction (1:1 water) (0-101.6cm)	7.9–8.6
Subsurface fragment volume <=3" (Depth not specified)	15–45%
Subsurface fragment volume >3" (Depth not specified)	0–5%

Ecological dynamics

The reference state (State 1. Native Grass) is a desert grassland on rolling to steep slopes. Perennial grasses from different growth forms dominate the site with sub-shrubs and perennial forbs comprising an understory. Trees are not present. Large shrubs are few and widely scattered. Black grama occurs in patches of various sizes and these patches appear to be well dispersed over larger areas of the site. The variety of perennial grass growth forms (i.e., suffrutescent, mid-grass, short-grass), along with the sub-shrubs and perennial forbs, provides mixed rooting depths and a variety of micro-habitats. With continuous heavy grazing, the potential dominant grasses are replaced by increases in species like red threeawn, blue threeawn, slim tridens, spike pappus grass and fluffgrass. Low shrubs that can increase on the site include paperflower, snakeweed, ratear coldenia, and desert zinnia. Large shrubs such as creosotebush, whitethorn, viscid acacia, paloverde, little leaf sumac, mariola and tarbush can invade this site from adjacent areas of Limy Upland or Limestone Hills. Natural fire may have been a factor in the development of the reference plant community.

Periodic fire on this site suppresses large shrubs and trees, maintaining the grassland aspect. Disturbances that remove the above-ground standing crop of perennial grasses also remove the potential for this site to burn. These disturbances are livestock grazing, extended drought and fire suppression. Over time, the shrubs dominate and perennial grasses become scarce. Once the shrub-dominance threshold at which fire will no longer spread, the site is in an alternate stable state (State 3. Shrub). Restoration from State 3 back to State 1 is not feasible on a large scale at this time. Chemical brush management is currently being applied to remove large shrubs and the resulting state (State 5, Chemically-treated) has a grassland aspect and will carry fire. Lehmann lovegrass and other African lovegrasses are very adapted to this site with it's deep, well-drained soils. Lehmann lovegrass may be present in the reference state but may not persist within the community at a low population. Lehmann lovegrass has a prolific seed bank, a high percentage of dormant seed, grows quickly from seed to maturity and will become dominant any time native perennial grass cover is lost. Once established, Lehmann lovegrass can dominate the site (State 2. Non-native Grass). In this state, fire may burn more frequently than at historic levels. The long, steep slopes on this site make it vulnerable to concentrated flow erosion from heavy rains during any time when vegetative cover is removed. Any of the states can transition to State 4, Eroded.

State and transition model

41-3 Limy Slopes 12-16" p.z. (R041XC308AZ)

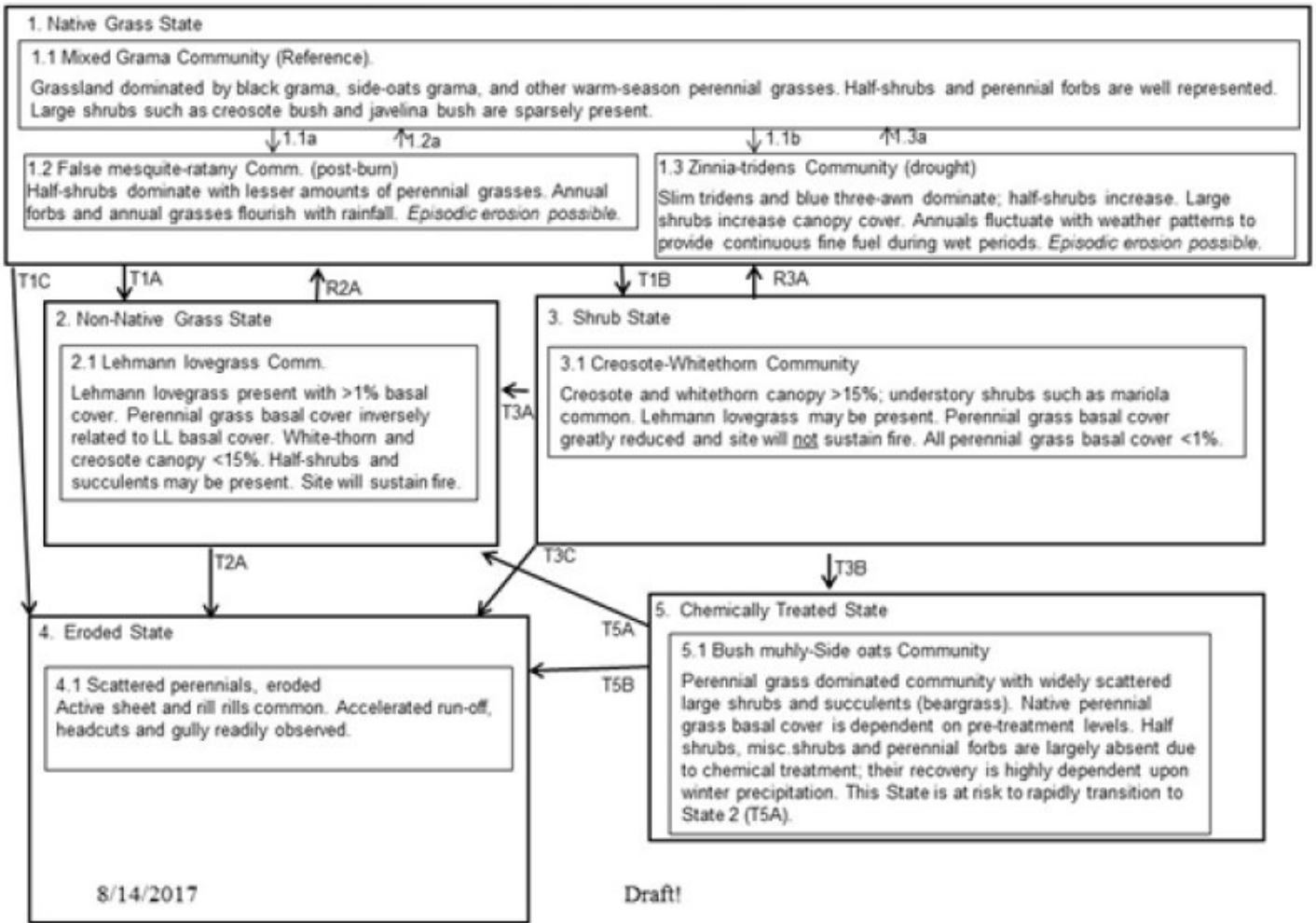


Figure 6. Limy slopes, 12-16" p.z. STM

Legend: 41-3 Limy Slopes 12-16" p.z. (R041XC308AZ) STM

Transition Pathway

T1A: any disturbance that diminishes native perennial grass basal cover creates opportunity for LL establishment. Disturbances driving this transition include fire, heavy grazing, prolonged drought

T1B: absence of fire, reduction in perennial grass cover by livestock grazing removes fuel to carry fire and can reduce perennial grass basal cover; over time, in extended absence of fire, shrubs grow unchecked. *excessive erosion and soil loss may occur during this transition*

T1C: Short-term heavy grazing, extreme drought, or fire followed by heavy rainfall

T2A: extreme drought, repeated burning, or fire followed by heavy rainfall

T3A: Chemical brush management with Lehmann lovegrass present or in proximity; current chemical brush management exerts mortality on all shrub and forb species. Succulents and perennial grasses are unaffected.

T3B: Chemical brush management in the absence of Lehmann lovegrass

T3C: Chemical brush management followed by heavy rainfall; climate change

T5A: Unknown presence of Lehmann lovegrass in seed bank, Lehmann lovegrass seed windblown or mechanically transported

T5B: Drought following chemical brush management; long-term drought or change in variability of rainfall events

Restoration Pathway

R2A: selective mechanical or chemical treatment to target only Lehmann lovegrass. At this time, only feasible on small areas or sparse infestations

R3A: not feasible at this time; current chemical brush management exerts mortality on all shrub and forb species, thus, eliminating functional groups (perennial forbs, dominant half shrubs, sub-dominant half shrubs, miscellaneous shrubs)

Plant Community Phase Pathway

1.1a: fire

1.2a: several years of average rainfall

1.1b: drought

1.2a: several years of average rainfall

2/26/2018

Draft!

Figure 7. Limy slopes, 12-16"p.z., STM Legend

State 1

Native Grass State

The potential plant community on this site is dominated by warm season perennial grasses. Perennial forbs are well represented on the site, as well as a few species of half shrubs. Most of the major perennial grasses on the site are well dispersed throughout the plant community. Black grama occurs in patches of various sizes and these patches appear to be well dispersed over larger areas of the site. The aspect is open grassland. The plant community structure fluctuates in the Native Grass State with time since burning or drought. In periods of average rainfall dynamics, the Reference Plant community (CP 1.1) persists as a perennial grassland with scattered shrubs. Perennial grasses will mature and standing biomass will build-up, litter cover increases. The half shrubs and perennial forbs grow to maturity. The site receives light utilization by grassland wildlife (rodents, antelope, etc.) and insects (grasshoppers, pollinators). Once ignited, fire will easily spread bringing about Community Phase 1.2, Half Shrubs. Black grama and the other dominant herbaceous components are susceptible to burning. Immature large shrubs are removed by summer fire. Half-shrubs are burned over but quickly recover to dominate while perennial grasses recover. Annual forbs and grasses will flourish in the open bare plant interspaces with rainfall. CP 1.2 is at risk to transition to either State 2, Non-native grassland, or State 4, Eroded. Prolonged fire intervals will allow large shrubs to grow to maturity and drive transition to State 3, Shrub when large shrub canopy levels exceed 15%. Prolonged drought on CP 1.1., Reference, will first impact shallow-rooted perennial grasses as soil moisture depletes. Blue three-awn and slim tridens will quickly re-establish from the seed bank after drought. Black and side-oats grama need more time to regain dominance in the plant community after drought/fire mortality. The Native Grass State is resilient and recovery from drought is possible; however, the site is at risk to transition to State 2, Non-native grassland, or State 4, Eroded. Drought following fire is especially bad. Plant mortality is high and when heavy rains occur the site is extremely vulnerable to erosion, State 4.

Community 1.1

Mixed Grama Comm. (Reference)



Figure 8. Limy Slopes 12-16" pz. half shrubs dominant



Figure 9. 1.1 Mixed Grama Community Phase

The potential plant community on this site is dominated by warm season perennial grasses. Perennial forbs are well represented on the site, as well as a few species of half shrubs. Most of the major perennial grasses on the site are well dispersed throughout the plant community. Black grama occurs in patches of various sizes and these patches appear to be well dispersed over larger areas of the site. The aspect is open grassland. With continuous heavy grazing, the potential dominant grasses are replaced by increases in species like red threeawn, blue threeawn, slim tridens and fluffgrass. Low shrubs that can increase on the site include paperflower, snakeweed, ratear coldenia, and desert zinnia. Large shrubs such as creosotebush, whitethorn, paloverde, little leaf sumac and tarbush can invade this site from adjacent areas of Limy Upland or Limestone Hills. Natural fire may have been a factor in the development of the potential plant community. Gravel size cover may be inadequate on steep slopes in preventing water erosion. Loss of dark colored surface soil (A horizon) can reduce site productivity. Lehmann lovegrass can invade and become dominant on areas of this site where perennial grass cover has been lost due the interactions of drought, fire and continuous grazing.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	504	925	1457
Shrub/Vine	73	140	275
Forb	45	56	224
Tree	–	–	22
Total	622	1121	1978

Table 6. Soil surface cover

Tree basal cover	0%
Shrub/vine/liana basal cover	2-10%
Grass/grasslike basal cover	6-20%
Forb basal cover	0-1%
Non-vascular plants	0%
Biological crusts	0-1%
Litter	10-50%
Surface fragments >0.25" and <=3"	25-50%
Surface fragments >3"	0-8%
Bedrock	0%
Water	0%
Bare ground	5-25%

Table 7. Canopy structure (% cover)

Height Above Ground (M)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.15	–	1-10%	2-20%	0-5%
>0.15 <= 0.3	–	5-15%	10-25%	1-2%
>0.3 <= 0.6	–	1-10%	10-20%	0-2%
>0.6 <= 1.4	–	0-5%	0-5%	–
>1.4 <= 4	–	0-2%	–	–
>4 <= 12	–	–	–	–
>12 <= 24	–	–	–	–
>24 <= 37	–	–	–	–
>37	–	–	–	–

Figure 11. Plant community growth curve (percent production by month). AZ4134, 41.3 12-16" p.z. other sites. Growth begins in the spring, semi-dormancy occurs during the May through June drought, most growth occurs during the summer rains..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	5	10	0	0	30	35	15	5	0	0

Community 1.2 False mesquite-ratany Comm. (post-burn)

False mesquite and ratany dominate for several years following fire. Litter cover immediately following fire is nearly absent; its recovery follows with perennial grass re-establishment. Perennial grasses recover from basal growth and seed germination.

Community 1.3 Zinnia-tridens Comm. (post-drought)

Short-term drought increases perennial grass and half-shrub mortality. Slim tridens, blue three-awn and fluffgrass are short-lived perennials that colonize along with remaining half-shrubs, zinnia being most resistant to drought.

State 2 Non-native Grass State

Lehmann lovegrass is well-adapted to Limy Slopes ecological site. When the native perennial grass cover is depleted due the combination of continuous grazing, drought, or fire, Lehmann lovegrass can quickly establish large areas as long as a seed source is present. Once Lehmann lovegrass has more than 1% live basal cover, it will persist on this ecological site. The lovegrasses produce abundant, small seed with a high percentage of dormancy. Seeds are dispersed by wind, in the manure of animals and via vehicles. Quite often, Lehmann lovegrass is present along jeep trails, roadsides, fencelines or similar heavily trafficked areas if present in this state. Sometimes, the seed source may be unknown to land managers (dormant in soil), making the rapid spread of Lehmann lovegrass after disturbance (fire, heavy grazing, drought) startling. Management may be able to maintain a native perennial grass presence within the community, unmanaged livestock grazing will not. Lehmann lovegrass will vigorously germinate and establish after fire or other disturbance while native perennial grasses do not. The dominant half shrubs, false mesquite and range ratany, seem to be able to persist under these circumstances. Management actions that can accelerate transition to a Lehmann lovegrass monoculture and the near absence of shrubs and perennial forbs include repeated fire and chemical brush management. Severe drought, especially in the cool season (Oct-April) can also accelerate Lehmann lovegrass dominance. Lehmann lovegrass annual production in this state will exceed that of native perennial grasses. It is unpalatable to livestock and remaining native perennial grass species will be selectively grazed in the presence of Lehmann. The biotic integrity of the plant community is highly altered. Dense, thick growth of LL eventually excludes most native perennial grasses and forbs. Wildlife habitat is diminished for many species. Shrubs like whitethorn and creosote bush occur in minor amounts. Fine fuel to carry continuous fire is ample. Aspect is open grassland.

Community 2.1 Lehmann lovegrass Comm.



Figure 12. Limy Slopes 12-16" pz. Lehmann invades from ROW



Figure 13. Limy Slopes, Lehmann lovegrass community phase

When the native perennial grass cover is depleted due the combination of continuous grazing and drought and / or fire, Lehmann lovegrass can invade areas of this site as long as a seed source is present. Over time Lehmann can dominate the grass and forb component of the plant community. The dominant half shrubs, false mesquite and range ratany, seem to be able to persist under these circumstances.

State 3

Shrub State

The Shrub State is characterized by the dominance of the large shrubs particularly, but not limited to, whitethorn, viscid acacia and creosotebush. The large shrub canopy cover exceeds 15%. Native perennial grass species exist as widely scattered remnant plants. In this state, herbaceous productivity potential, both annual and perennial biomass, is very limited and fire will not carry even after rest from livestock grazing. Aspect is shrubland.

Community 3.1

Creosote-Whitethorn Community



Figure 14. Limy slope 12-16" pz. creosote invasion, ocotillo

In the absence of fire for long periods and with the interaction of drought, fire and continuous grazing, shrubs like creosotebush and acacia species can invade and increase to dominate the site. In some areas other shrubs like mesquite, mimosa, sandpaper bush, ocotillo, paloverde and succulents like prickly pear, soaptree yucca and banana yucca can also increase. As woody plants increase the herbaceous part of the plant community diminishes until there is no longer enough fine fuel produced to carry fire.

State 4

Eroded State

This ecological site is vulnerable to active water erosion in any state when the soil surface is exposed by removal of vegetative cover. Gravel size is inadequate to overcome the energy of run-off from the long, steep slopes. Headcuts and gullies develop at the bottom of the slope and move upward. Sheet and rill erosion is common throughout the site; sheet and rill erosion is rarely visible in any of the grassland states. Altered hydrological functioning, impaired infiltration and accelerated run-off, limits site herbaceous productivity. The plant community in this state can be grass or shrub dominated depending upon the prior state. If grass dominated, the site will not carry fire and will transition to a shrub dominated, eroded condition. Aspect is scattered grass-shrubland or shrubland.

Community 4.1

Scattered Perennials, Eroded



Figure 15. Scattered perennials, eroded

The interaction of continuous heavy grazing with drought and / or fire, over time (50-100 years) can lead to accelerated sheet and rill erosion and loss of the entire A (mollic) horizon. This state has heavy shrub covers and the calcic horizon is exposed at the soil surface. It's potential to grow perennial grasses is greatly reduced. Shrub control with herbicides will be short lived as the new site potential is shrub-land. Shrubs like creosote, sandpaper bush and whitethorn dominate the plant community.

State 5

Chemically Treated State

The Chemically Treated State is characterized by native perennial grasses and the near absence of live woody species and perennial forbs. Dead standing shrubs and sub-shrubs will persist for several years following treatment. The commonly used herbicide kills dicotyledon plants, including perennial forbs and half shrubs that are valuable for wildlife. Succulents (beargrass, yuccas, and cactus) and grasses are unaffected by herbicide. The presence of live shrubs depends upon the efficacy of treatment. Perennial grasses like blue 3-awn and fluffgrass pioneer on the site after herbicide treatment. Species like bush muhly, black and side-oats will take longer to re-establish. The risk to transition to the Eroded State is high in the years following chemical brush management or severe drought. At the time of this writing, limited monitoring data of this state is available since the cultural practice of chemical brush management on the shrub state has only been effectively practiced for about the past 10 years. Observation of treated sites shows even if Lehmann lovegrass is not present prior to treatment, it will dominate shortly after chemical brush management (see State 2, Non-native Perennial Grass State). Aspect is grassland.

Community 5.1

Bush muhly-Side oats Comm

Post-chemical brush management, a bush-muhly-side oats grama community will result if the pre-treatment community has these native perennial grasses present. Blue three awn and fluffgrass will pioneer with eventual re-establishment of bush muhly and side oats grama. This community phase will be eclipsed by Lehmann lovegrass after chemical brush management in areas with Lehmann lovegrass.

Transition T1A

State 1 to 2

Any disturbance that diminishes native perennial grass basal cover creates opportunity for non-native perennial grass establishment. Disturbances driving this transition include fire, heavy grazing, prolonged drought.

Transition T1B

State 1 to 3

Absence of fire, reduction in perennial grass cover by livestock grazing removes fuel to carry fire and can reduce perennial grass basal cover; over time, shrubs grow unchecked, excessive erosion and soil loss may occur during this transition.

Transition T1C

State 1 to 4

Short-term heavy grazing, extreme drought or fire followed by heavy rainfall

Restoration pathway R2A

State 2 to 1

Unknown

Transition T2A

State 2 to 4

extreme drought, repeated burning or fire followed by heavy rainfall

Restoration pathway R3A

State 3 to 1

unknown

Transition T3A

State 3 to 2

Chemical brush management with Lehmann lovegrass present or in proximity, current brush management exerts mortality on all shrub and forbs (not specific to target species). Existing succulents and perennial grasses are unaffected.

Transition T3C

State 3 to 4

Chemical brush management followed by heavy rainfall.

Transition T3B

State 3 to 5

Chemical brush management in the absence of Lehmann lovegrass.

Transition T5A

State 5 to 2

Introduction of seed source, germination of undetected soil seed bank, spontaneous transition after chemical brush management

Transition T5B

State 5 to 4

Drought following chemical brush management, long term drought, continuous heavy grazing

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 grasses			347–897	
	sideoats grama	BOCU	<i>Bouteloua curtipendula</i>	112–448	–

	black grama	BOER4	<i>Bouteloua eriopoda</i>	224–448	–
	bush muhly	MUPO2	<i>Muhlenbergia porteri</i>	11–168	–
2	Sub-dominant grasses			112–224	
	Hall's panicgrass	PAHA	<i>Panicum hallii</i>	28–112	–
	slim tridens	TRMU	<i>Tridens muticus</i>	56–112	–
	sand dropseed	SPCR	<i>Sporobolus cryptandrus</i>	11–56	–
	hairy grama	BOH12	<i>Bouteloua hirsuta</i>	0–56	–
	fall witchgrass	DICO6	<i>Digitaria cognata</i>	0–28	–
3	Perennial threeawns			45–112	
	blue threeawn	ARPUN	<i>Aristida purpurea</i> var. <i>nealleyi</i>	28–112	–
	purple threeawn	ARPU9	<i>Aristida purpurea</i>	0–56	–
	spidergrass	ARTE3	<i>Aristida ternipes</i>	1–28	–
	spidergrass	ARTEG	<i>Aristida ternipes</i> var. <i>gentilis</i>	0–22	–
	Fendler threeawn	ARPUL	<i>Aristida purpurea</i> var. <i>longiseta</i>	6–22	–
	Wright's threeawn	ARPUW	<i>Aristida purpurea</i> var. <i>wrightii</i>	0–22	–
	Parish's threeawn	ARPUP5	<i>Aristida purpurea</i> var. <i>parishii</i>	0–11	–
	poverty threeawn	ARDI5	<i>Aristida divaricata</i>	6–11	–
	Havard's threeawn	ARHA3	<i>Aristida havardii</i>	0–6	–
	Wooton's threeawn	ARPA9	<i>Aristida pansa</i>	0–6	–
4	Misc. peren. grasses			11–112	
	New Mexico feathergrass	HENE5	<i>Hesperostipa neomexicana</i>	0–50	–
	red grama	BOTR2	<i>Bouteloua trifida</i>	0–28	–
	low woollygrass	DAPU7	<i>Dasyochloa pulchella</i>	6–28	–
	Arizona cottontop	DICA8	<i>Digitaria californica</i>	0–28	–
	plains bristlegrass	SEVU2	<i>Setaria vulpiseta</i>	0–28	–
	tanglehead	HECO10	<i>Heteropogon contortus</i>	1–28	–
	cane bluestem	BOBA3	<i>Bothriochloa barbinodis</i>	0–28	–
	Rothrock's grama	BORO2	<i>Bouteloua rothrockii</i>	0–22	–
	nineawn pappusgrass	ENDE	<i>Enneapogon desvauxii</i>	6–22	–
	shortleaf woollygrass	ERAV	<i>Erioneuron avenaceum</i>	0–22	–
	squirreltail	ELELE	<i>Elymus elymoides</i> ssp. <i>elymoides</i>	0–17	–
	slender grama	BORE2	<i>Bouteloua repens</i>	0–17	–
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	0–17	–
	plains muhly	MUCU3	<i>Muhlenbergia cuspidata</i>	0–17	–
	slender muhly	MUTE4	<i>Muhlenbergia tenuifolia</i>	0–17	–
	woolyspike balsamscale	ELBA	<i>Elionurus barbiculmis</i>	0–11	–
	plains lovegrass	ERIN	<i>Eragrostis intermedia</i>	0–11	–
	curly-mesquite	HIBE	<i>Hilaria belangeri</i>	0–11	–
	common wolfstail	LYPH	<i>Lycurus phleoides</i>	0–11	–
	Arizona muhly	MUAR3	<i>Muhlenbergia arizonica</i>	0–11	–
	sprucetop grama	BOCH	<i>Bouteloua chondrosioides</i>	0–11	–
	southwestern needlegrass	ACEM4	<i>Achnatherum eminens</i>	0–11	–

	green sprangletop	LEDU	<i>Leptochloa dubia</i>	0–6	–
	tobosagrass	PLMU3	<i>Pleuraphis mutica</i>	0–6	–
	purple muhly	MURI3	<i>Muhlenbergia rigida</i>	0–6	–
	slim tridens	TRMUE	<i>Tridens muticus</i> var. <i>elongatus</i>	0–6	–
	spiked crinkleawn	TRSP12	<i>Trachypogon spicatus</i>	0–6	–
	purple grama	BORA	<i>Bouteloua radicata</i>	0–2	–
5	Annual grasses			1–112	
	sixweeks threeawn	ARAD	<i>Aristida adscensionis</i>	0–45	–
	sixweeks fescue	VUOC	<i>Vulpia octoflora</i>	0–45	–
	Mexican panicgrass	PAHI5	<i>Panicum hirticaule</i>	0–39	–
	Arizona signalgrass	URAR	<i>Urochloa arizonica</i>	0–22	–
	prairie threeawn	AROL	<i>Aristida oligantha</i>	1–22	–
	Mexican sprangletop	LEFUU	<i>Leptochloa fusca</i> ssp. <i>uninervia</i>	0–22	–
	mucronate sprangletop	LEPAB	<i>Leptochloa panicea</i> ssp. <i>brachiata</i>	0–17	–
	needle grama	BOAR	<i>Bouteloua aristoides</i>	0–11	–
	sixweeks grama	BOBA2	<i>Bouteloua barbata</i>	0–11	–
	Parry's grama	BOPA2	<i>Bouteloua parryi</i>	0–11	–
	feather fingergrass	CHVI4	<i>Chloris virgata</i>	0–6	–
	witchgrass	PACA6	<i>Panicum capillare</i>	0–6	–
	Bigelow's bluegrass	POBI	<i>Poa bigelovii</i>	0–2	–
	tapertip cupgrass	ERACA	<i>Eriochloa acuminata</i> var. <i>acuminata</i>	0–2	–
	Mexican lovegrass	ERME	<i>Eragrostis mexicana</i>	0–2	–
	desert lovegrass	ERPEM	<i>Eragrostis pectinacea</i> var. <i>miserrima</i>	0–2	–
	tufted lovegrass	ERPEP2	<i>Eragrostis pectinacea</i> var. <i>pectinacea</i>	0–2	–
	delicate muhly	MUFR	<i>Muhlenbergia fragilis</i>	0–2	–
	littleseed muhly	MUMI	<i>Muhlenbergia microsperma</i>	0–2	–
Forb					
6	Perennial Forb			34–112	
	weakleaf bur ragweed	AMCO3	<i>Ambrosia confertiflora</i>	1–22	–
	leatherweed	CRPO5	<i>Croton pottsii</i>	2–22	–
	desert globemallow	SPAM2	<i>Sphaeralcea ambigua</i>	1–22	–
	brownplume wirelettuce	STPA4	<i>Stephanomeria pauciflora</i>	1–17	–
	lacy tansyaster	MAPI	<i>Machaeranthera pinnatifida</i>	1–17	–
	hairyseed bahia	BAAB	<i>Bahia absinthifolia</i>	1–17	–
	desert marigold	BAMU	<i>Baileya multiradiata</i>	0–11	–
	desert mariposa lily	CAKE	<i>Calochortus kennedyi</i>	1–11	–
	sego lily	CANU3	<i>Calochortus nuttallii</i>	1–11	–
	trailing windmills	ALIN	<i>Allionia incarnata</i>	1–11	–
	Parry's false prairie-clover	MAPA7	<i>Marina parryi</i>	0–11	–
	slimflower scurfpea	PSTE5	<i>Psoraleidum tenuiflorum</i>	1–11	–
	Cochise beardtongue	PEDA	<i>Penstemon dasyphyllus</i>	0–11	–
	slender poreleaf	POGR5	<i>Porophyllum gracile</i>	0–11	–
	Parry's beardtongue	PEPA24	<i>Penstemon parryi</i>	0–6	–

tufted evening primrose	OECA10	<i>Oenothera caespitosa</i>	0-6	-
pricklyleaf dogweed	THAC	<i>Thymophylla acerosa</i>	1-6	-
rue of the mountains	THTE2	<i>Thamnosma texana</i>	0-6	-
ivyleaf groundcherry	PHHEH2	<i>Physalis hederifolia</i> var. <i>hederifolia</i>	1-6	-
Fendler's bladderpod	LEFE	<i>Lesquerella fendleri</i>	1-6	-
Lewis flax	LILE3	<i>Linum lewisii</i>	0-6	-
purpleneve springparsley	CYMU2	<i>Cymopterus multinervatus</i>	1-6	-
spreading fleabane	ERDI4	<i>Erigeron divergens</i>	0-6	-
wild dwarf morning- glory	EVAR	<i>Evolvulus arizonicus</i>	1-6	-
southwestern mock vervain	GLGO	<i>Glandularia gooddingii</i>	0-6	-
perennial rockcress	ARPE2	<i>Arabis perennans</i>	1-6	-
tuber anemone	ANTU	<i>Anemone tuberosa</i>	0-6	-
rose heath	CHER2	<i>Chaetopappa ericoides</i>	1-6	-
whitemouth dayflower	COER	<i>Commelina erecta</i>	0-6	-
dense ayenia	AYMI	<i>Ayenia microphylla</i>	0-6	-
scarlet spiderling	BOCO	<i>Boerhavia coccinea</i>	0-6	-
lyreleaf greeneyes	BELY	<i>Berlandiera lyrata</i>	0-2	-
Indian paintbrush	CAST12	<i>Castilleja</i>	0-2	-
New Mexico silverbush	ARNE2	<i>Argythamnia neomexicana</i>	0-2	-
dwarf desertpeony	ACNA2	<i>Acourtia nana</i>	0-2	-
brownfoot	ACWR5	<i>Acourtia wrightii</i>	0-2	-
milkvetch	ASTRA	<i>Astragalus</i>	0-2	-
ragged nettlespurge	JAMA	<i>Jatropha macrorhiza</i>	0-2	-
San Pedro daisy	LAPO4	<i>Lasianthea podocephala</i>	0-2	-
James' prairie clover	DAJA	<i>Dalea jamesii</i>	0-2	-
Cooley's bundleflower	DECO2	<i>Desmanthus cooleyi</i>	0-2	-
Wright's deervetch	LOWR	<i>Lotus wrightii</i>	0-2	-
variableleaf bushbean	MAGI2	<i>Macroptilium gibbosifolium</i>	0-2	-
spreading snakeherb	DYSCD	<i>Dyschoriste schiedeana</i> var. <i>decumbens</i>	0-2	-
plains blackfoot	MELE2	<i>Melampodium leucanthum</i>	0-2	-
wishbone-bush	MILAV	<i>Mirabilis laevis</i> var. <i>villosa</i>	0-2	-
locoweed	OXYTR	<i>Oxytropis</i>	0-2	-
twinleaf senna	SEBA3	<i>Senna bauhinioides</i>	1-2	-
New Mexico fanpetals	SINE	<i>Sida neomexicana</i>	0-2	-
silverleaf nightshade	SOEL	<i>Solanum elaeagnifolium</i>	0-2	-
slimleaf bean	PHAN3	<i>Phaseolus angustissimus</i>	0-2	-
orange fameflower	PHAU13	<i>Phemeranthus aurantiacus</i>	0-2	-
clammy groundcherry	PHHE5	<i>Physalis heterophylla</i>	0-2	-
velvetseed milkwort	POOB	<i>Polygala obscura</i>	0-2	-
shrubby purslane	POSU3	<i>Portulaca suffrutescens</i>	0-2	-
Wright's cudweed	PSCAC2	<i>Pseudognaphalium canescens</i> ssp.	0-2	-

			<i>canescens</i>		
	jewels of Opar	TAPA2	<i>Talinum paniculatum</i>	0-1	-
	copper zephyrlily	ZELO	<i>Zephyranthes longifolia</i>	0-1	-
	desert larkspur	DEPA	<i>Delphinium parishii</i>	0-1	-
	Arizona snakecotton	FRAR2	<i>Froelichia arizonica</i>	0-1	-
	Watson's dutchman's pipe	ARWA	<i>Aristolochia watsonii</i>	0-1	-
	clasping milkweed	ASAM	<i>Asclepias amplexicaulis</i>	0-1	-
7	Annual forbs			11-112	
	longleaf false goldeneye	HELOA2	<i>Heliomeris longifolia var. annua</i>	1-56	-
	western tansymustard	DEPI	<i>Descurainia pinnata</i>	1-28	-
	Gordon's bladderpod	LEGO	<i>Lesquerella gordonii</i>	1-28	-
	intermediate pepperweed	LEVIM	<i>Lepidium virginicum var. medium</i>	0-28	-
	slender goldenweed	MAGR10	<i>Machaeranthera gracilis</i>	1-28	-
	tanseyleaf tansyaster	MATA2	<i>Machaeranthera tanacetifolia</i>	1-28	-
	woolly tidentromia	TILA2	<i>Tidentromia lanuginosa</i>	0-28	-
	desert Indianwheat	PLOV	<i>Plantago ovata</i>	0-28	-
	woolly plantain	PLPA2	<i>Plantago patagonica</i>	0-28	-
	phacelia	PHACE	<i>Phacelia</i>	0-28	-
	sensitive partridge pea	CHNI2	<i>Chamaecrista nictitans</i>	1-28	-
	milkvetch	ASTRA	<i>Astragalus</i>	0-22	-
	carelessweed	AMPA	<i>Amaranthus palmeri</i>	0-17	-
	bristly fiddleneck	AMTE3	<i>Amsinckia tessellata</i>	0-17	-
	New Mexico thistle	CINE	<i>Cirsium neomexicanum</i>	1-17	-
	Coulter's spiderling	BOCO2	<i>Boerhavia coulteri</i>	0-17	-
	goosefoot	CHENO	<i>Chenopodium</i>	0-17	-
	sawtooth sage	SASU7	<i>Salvia subincisa</i>	0-17	-
	combseed	PECTO	<i>Pectocarya</i>	0-17	-
	foothill deervetch	LOHU2	<i>Lotus humistratus</i>	0-17	-
	coastal bird's-foot trefoil	LOSAB	<i>Lotus salsuginosus var. brevivexillus</i>	0-17	-
	Coulter's lupine	LUSP2	<i>Lupinus sparsiflorus</i>	0-17	-
	flatcrown buckwheat	ERDE6	<i>Eriogonum deflexum</i>	0-17	-
	miniature woollystar	ERDI2	<i>Eriastrum diffusum</i>	0-17	-
	California poppy	ESCAM	<i>Eschscholzia californica ssp. mexicana</i>	0-17	-
	crestrub morning-glory	IPCO2	<i>Ipomoea costellata</i>	0-17	-
	Arizona poppy	KAGR	<i>Kallstroemia grandiflora</i>	0-17	-
	warty caltrop	KAPA	<i>Kallstroemia parviflora</i>	0-17	-
	sorrel buckwheat	ERPO4	<i>Eriogonum polycladon</i>	0-17	-
	spurge	EUPHO	<i>Euphorbia</i>	1-11	-
	shaggyfruit pepperweed	LELA	<i>Lepidium lasiocarpum</i>	0-11	-
	spreading fanpetals	SIAB	<i>Sida abutifolia</i>	1-11	-
	exserted Indian paintbrush	CAEXE	<i>Castilleja exserta ssp. exserta</i>	0-11	-

	hoary bowlesia	BOIN3	<i>Bowlesia incana</i>	0–6	–
	fringed redmaids	CACI2	<i>Calandrinia ciliata</i>	0–6	–
	hairy prairie clover	DAMO	<i>Dalea mollis</i>	0–6	–
	American wild carrot	DAPU3	<i>Daucus pusillus</i>	0–6	–
	wheelscale saltbush	ATEL	<i>Atriplex elegans</i>	0–6	–
	New Mexico copperleaf	ACNE	<i>Acalypha neomexicana</i>	0–6	–
	sleepy silene	SIAN2	<i>Silene antirrhina</i>	0–6	–
	lyreleaf jewelflower	STCAA	<i>Streptanthus carinatus ssp. arizonicus</i>	0–6	–
	Arizona popcornflower	PLAR	<i>Plagiobothrys arizonicus</i>	0–6	–
	chia	SACO6	<i>Salvia columbariae</i>	0–6	–
	Arizona lupine	LUAR4	<i>Lupinus arizonicus</i>	0–6	–
	manybristle chinchweed	PEPA2	<i>Pectis papposa</i>	0–6	–
	bristly nama	NAHI	<i>Nama hispidum</i>	0–6	–
	desert evening primrose	OEPR	<i>Oenothera primiveris</i>	0–6	–
	wedgeleaf draba	DRCU	<i>Draba cuneifolia</i>	0–6	–
	star gilia	GIST	<i>Gilia stellata</i>	0–6	–
	pearly globe amaranth	GONI	<i>Gomphrena nitida</i>	0–2	–
	Texas stork's bill	ERTE13	<i>Erodium texanum</i>	0–2	–
	sanddune wallflower	ERCA14	<i>Erysimum capitatum</i>	0–2	–
	manystem woolly sunflower	ERMU6	<i>Eriophyllum multicaule</i>	0–2	–
	Arizona blanketflower	GAAR2	<i>Gaillardia arizonica</i>	0–2	–
	blanketflower	GAILL	<i>Gaillardia</i>	0–2	–
	whitestem blazingstar	MEAL6	<i>Mentzelia albicaulis</i>	0–2	–
	green carpetweed	MOVE	<i>Mollugo verticillata</i>	0–2	–
	plains flax	LIPU4	<i>Linum puberulum</i>	0–2	–
	New Mexico plumeseed	RANE	<i>Rafinesquia neomexicana</i>	0–2	–
	southwestern pricklypoppy	ARPL3	<i>Argemone pleiacantha</i>	0–2	–
	scrambled eggs	COAU2	<i>Corydalis aurea</i>	0–2	–
	desert unicorn-plant	PRAL4	<i>Proboscidea althaeifolia</i>	0–1	–
	doubleclaw	PRPA2	<i>Proboscidea parviflora</i>	0–1	–
	Fendler's desertdandelion	MAFE	<i>Malacothrix fendleri</i>	0–1	–

Shrub/Vine

8	Dominant half shrubs			50–112	
	fairyduster	CAER	<i>Calliandra eriophylla</i>	22–101	–
	littleleaf ratany	KRER	<i>Krameria erecta</i>	6–45	–
	trailing krameria	KRLA	<i>Krameria lanceolata</i>	0–28	–
9	Sub-dom. half shrubs			6–50	
	rough menodora	MESC	<i>Menodora scabra</i>	6–45	–
	desert zinnia	ZIAC	<i>Zinnia acerosa</i>	6–34	–
	featherplume	DAFO	<i>Dalea formosa</i>	6–34	–
	paleface	HIDE	<i>Hibiscus denudatus</i>	0–22	–

	slender janusia	JAGR	<i>Janusia gracilis</i>	0–11	–
	woody crinklemat	TICAC	<i>Tiquilia canescens var. canescens</i>	0–11	–
10	Miscellaneous shrubs			17–112	
	sacahuista	NOMI	<i>Nolina microcarpa</i>	0–28	–
	catclaw mimosa	MIACB	<i>Mimosa aculeaticarpa var. biuncifera</i>	0–17	–
	ocotillo	FOSP2	<i>Fouquieria splendens</i>	1–17	–
	winterfat	KRLA2	<i>Krascheninnikovia lanata</i>	0–17	–
	banana yucca	YUBA	<i>Yucca baccata</i>	1–17	–
	soaptree yucca	YUEL	<i>Yucca elata</i>	0–17	–
	littleleaf sumac	RHMI3	<i>Rhus microphylla</i>	1–17	–
	Wright's beebrush	ALWR	<i>Aloysia wrightii</i>	0–17	–
	desert ceanothus	CEGR	<i>Ceanothus greggii</i>	0–17	–
	javelina bush	COER5	<i>Condalia ericoides</i>	0–17	–
	knifeleaf condalia	COSP3	<i>Condalia spathulata</i>	0–17	–
	longleaf jointfir	EPTR	<i>Ephedra trifurca</i>	1–17	–
	common sotol	DAWH2	<i>Dasyilirion wheeleri</i>	0–11	–
	Warnock's snakewood	COWA	<i>Condalia warnockii</i>	0–11	–
	Kearney's snakewood	COWAK	<i>Condalia warnockii var. kearneyana</i>	0–6	–
	walkingstick cactus	CYSP8	<i>Cylindropuntia spinosior</i>	0–6	–
	spiny hackberry	CEEH	<i>Celtis ehrenbergiana</i>	0–6	–
	Utah fendlerbush	FEUTC	<i>Fendlerella utahensis var. cymosa</i>	0–6	–
	whitethorn acacia	ACCOC	<i>Acacia constricta var. constricta</i>	0–6	–
	whitethorn acacia	ACCOP9	<i>Acacia constricta var. paucispina</i>	0–6	–
	catclaw acacia	ACGR	<i>Acacia greggii</i>	0–6	–
	skunkbush sumac	RHTR	<i>Rhus trilobata</i>	0–6	–
	jojoba	SICH	<i>Simmondsia chinensis</i>	0–6	–
	Arizona necklacepod	SOAR3	<i>Sophora arizonica</i>	0–6	–
	whitestem paperflower	PSCO2	<i>Psilostrophe cooperi</i>	0–6	–
	Mexican cliffrose	PUME	<i>Purshia mexicana</i>	0–6	–
	Kearney's sumac	RHKE	<i>Rhus kearneyi</i>	0–6	–
	creosote bush	LATRT	<i>Larrea tridentata var. tridentata</i>	0–6	–
	desert-thorn	LYCIU	<i>Lycium</i>	0–6	–
	threadleaf snakeweed	GUMI	<i>Gutierrezia microcephala</i>	0–6	–
	broom snakeweed	GUSA2	<i>Gutierrezia sarothrae</i>	0–6	–
	velvetpod mimosa	MIDY	<i>Mimosa dysocarpa</i>	0–6	–
	Rio Grande saddlebush	MOSC	<i>Mortonia scabrella</i>	0–6	–
	brittlebush	ENFA	<i>Encelia farinosa</i>	0–6	–
	crown of thorns	KOSP	<i>Koeberlinia spinosa</i>	0–6	–
	cactus apple	OPEN3	<i>Opuntia engelmannii</i>	1–6	–
	mariola	PAIN2	<i>Parthenium incanum</i>	0–6	–
	viscid acacia	ACNE4	<i>Acacia neovernicosa</i>	0–3	–
	Palmer's century plant	AGPA3	<i>Agave palmeri</i>	0–2	–
	prairie acacia	ACAN	<i>Acacia angustissima</i>	0–2	–
	sandy barrelcactus	FEWI	<i>Ferocactus wislizeni</i>	0–2	–

	canyon barrelcactus	FLVW	<i>Ferocactus wislizenii</i>	0-2	-
	American tarwort	FLCE	<i>Flourensia cernua</i>	0-2	-
	Eastern Mojave buckwheat	ERFAP	<i>Eriogonum fasciculatum</i> var. <i>polifolium</i>	0-2	-
	bastardsage	ERWR	<i>Eriogonum wrightii</i>	0-2	-
	fourwing saltbush	ATCA2	<i>Atriplex canescens</i>	0-2	-
	yellow paloverde	PAMI5	<i>Parkinsonia microphylla</i>	0-2	-
	purple pricklypear	OPMAM	<i>Opuntia macrocentra</i> var. <i>macrocentra</i>	0-2	-
	burroweed	ISTE2	<i>Isocoma tenuisecta</i>	0-2	-
	little nipple cactus	MAHE2	<i>Mammillaria heyderi</i>	0-1	-
	spiny star	ESVI2	<i>Escobaria vivipara</i>	0-1	-
	pinkflower hedgehog cactus	ECFE	<i>Echinocereus fendleri</i>	0-1	-
	rainbow cactus	ECPEP	<i>Echinocereus pectinatus</i> var. <i>pectinatus</i>	0-1	-
	Parry's agave	AGPA4	<i>Agave parryi</i>	0-1	-
Tree					
11	Trees			0-22	
	oneseed juniper	JUMO	<i>Juniperus monosperma</i>	0-22	-
	blue paloverde	PAFL6	<i>Parkinsonia florida</i>	0-11	-
	mesquite	PROSO	<i>Prosopis</i>	0-11	-

Animal community

High soil pH is somewhat offset by organic matter in the soil surface and the site produces fair quality herbaceous forage. This site usually occurs as long ridges with moderate to steep side-slopes. Ridge-tops and canyon bottoms will be overused before the slopes are used. In addition, this site often occurs in complex with level areas of non-calcareous uplands. Due to the differences in the length of green season, forage quality and topography, these non-limy uplands will be overused before use is made of this range sites. Fencing and grazing systems are needed to overcome the problems associated with this range site. Black grama retains perennial culms and forms a thatch on this site which will regain green through the winter. In addition, several low, evergreen browse species occur on the site, which make it a valuable winter grazing source.

This is an important site for a variety of grassland birds and other wildlife species. It is also an important habitat for pronghorn.

Hydrological functions

Deep, coarse textured soils produce little runoff except in exceptionally wet seasons.

Recreational uses

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

Wood products

None

Other products

In places, especially on north exposures, beargrass (sacahuista) is found in sufficient quantities to provide harvest of leaves used as fibers in broom and mat making. Stands should not be harvested more than once every four or five years.

Inventory data references

Range 417s include 18 in excellent condition, 23 in good condition and 7 in fair condition.

Type locality

Location 1: Cochise County, AZ	
Township/Range/Section	T21S R19E S17
General legal description	Fort Huachuca, west range
Location 2: Pima County, AZ	
Township/Range/Section	T18S R17E S29
General legal description	Empire Ranch at KA #4, near fence between the North pasture and 49 pasture. Along gasoline road.
Location 3: Pinal County, AZ	
Township/Range/Section	T10S R19E S17
General legal description	YLE ranch
Location 4: Pima County, AZ	
Township/Range/Section	T22S R8E S15
General legal description	Buenos Aires National Wildlife refuge

Contributors

Dan Robinett
Larry D. Ellicott
Steve Barker
Unknown
Unknwon

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	03/04/2005
Approved by	Scott Woodall
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

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

2. **Presence of water flow patterns:** 10-20 feet long, discontinuous

3. **Number and height of erosional pedestals or terracettes:** Pedestals common on perennial bunch grasses. Terracettes common on black grama plants.

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** 10-20%

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):** Herbaceous litter in vicinity of flow paths moves in flow paths.

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** Expect values of 4-6 across site.

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Weak granular; color is 7.5YR5/3 dry, 7.5YR3/2 moist; thickness to 2 inches.

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Canopy 30-40%, basal 5-10%, litter 15-40%; 75-80% of canopy cover is perennial grasses, 10-15% is subshrubs and 5% is trees & shrubs. 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: perennial midgrasses >> annual forbs & grasses > subshrubs > large shrubs > succulents

Sub-dominant:

Other:

Additional:

13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** Approximately 50% of canopy and basal cover of midgrass species lost in recent prolonged drought.
-

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; 1500 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:** Lehmann lovegrass, creosote, whitethorn, mesquite, prickly pear, burroweed, wait-a-bit
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17. **Perennial plant reproductive capability:** Not affected due regional prolonged drought.
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