USDA Natural Resources
Conservation Service

Ecological site R038XA105AZ
Limestone Hills 12-16" p.z.

Last updated: 5/07/2020
Accessed: 05/10/2025

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.

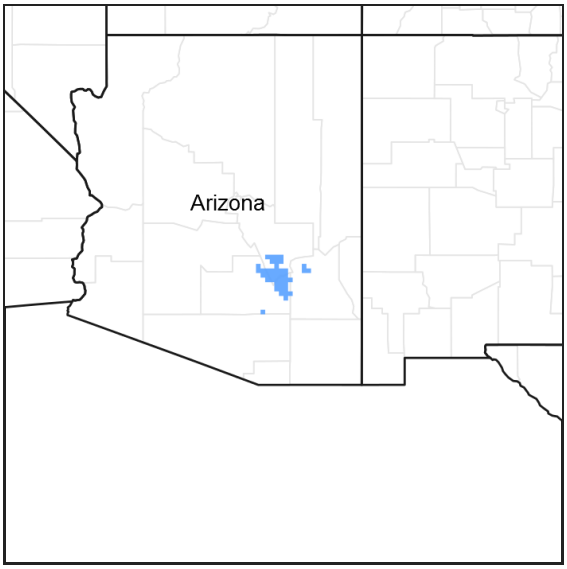


Figure 1. Mapped extent

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): 038X–Mogollon Transition South

AZ 38.1 – Lower Mogollon Transition

Elevations range from 3000 to 4500 feet and precipitation averages 12 to 16 inches per year. Vegetation includes canotia, one-seed juniper, mesquite, catclaw acacia, jojoba, turbinella oak, ratany, shrubby buckwheat, algerita, skunkbush, tobosa, vine mesquite, bottlebrush squirreltail, grama species, curly mesquite, desert needlegrass and New Mexico feathergrass. The soil temperature regime is thermic and the soil moisture regime is ustic aridic. This unit occurs within the Transition Zone Physiographic Province and is characterized by canyons and structural troughs or valleys. Igneous, metamorphic and sedimentary rock classes occur on rough mountainous terrain in association with less extensive sediment filled valleys exhibiting little integrated drainage.

Classification relationships

This site is similar to TE Site #350 on the Prescott National Forest.

Associated sites

R038XA104AZ	**Granitic Hills 12-16" p.z.**
R038XA117AZ	**Volcanic Hills 12-16" p.z. Clayey**
R038XA118AZ	**Basalt / Sandstone Hills 12-16" p.z.**
R038XA133AZ	**Volcanic/Metamorphic Hills 12-16" p.z.**
R038XA135AZ	**Diabase Hills 12-16" p.z.**

Similar sites

R040XA107AZ	**Limestone Hills 10"-13" p.z.**
R041XC307AZ	**Limestone Hills 12-16" p.z.**
R038XB205AZ	**Limestone Hills 16-20" p.z.**

Table 1. Dominant plant species

Tree	(1) *Parkinsonia* (2) *Canotia*
Shrub	(1) *Simmondsia chinensis* (2) *fouquieria splendens*
Herbaceous	(1) *aristida* (2) *marina parryi*

Physiographic features

This site occurs at the lowest elevations of the interior chaparral zone in the Mogollon Transition area. This site occurs in an upland position. It occurs on hill-slopes, ridge-tops and mountains.

Table 2. Representative physiographic features

Landforms	(1) Hill (2) Mountain slope (3) Ridge
Flooding frequency	None
Elevation	3,100–4,600 ft
Slope	15–75%
Aspect	N, E, S

Climatic features

Precipitation in this common resource area averages 12 to 16 inches annually. The winter-summer rainfall ratio ranges from about 60/40% in the northwest part of the area to 50/50% in the southeast part. Summer rains fall July through September; are from high-intensity, convective thunderstorms. This moisture originates primarily from the Gulf of Mexico, but can come from the remnants of Pacific hurricanes in September. Winter moisture is frontal, originates in the north Pacific, and falls as rain or snow in widespread storms of low intensity and long duration. Snowfall ranges from a trace to 10 inches per year and can occur from November through March. Snow seldom persists for more than a day except on north aspects. May and June are the driest months of the year. Humidity is generally low all year. Average annual air temperatures range from 59 to 70 degrees F (thermic temperature regime). Daytime temperatures in the summer are commonly in the high 90’s. Freezing temperatures are common from October through April, usually during the night or early morning hours. The actual precipitation, available moisture and temperature vary, depending on, region, elevation, rain shadow effect and aspect.

Table 3. Representative climatic features

Frost-free period (average)	230 days

Freeze-free period (average)	285 days
Precipitation total (average)	16 in

Influencing water features

There are no water features associated with this site.

Soil features

These soils are shallow (10 to 20 inches) and dark colored. They are loamy textured, very calcareous and well drained. They have formed in residuum and colluvium from limestone and related conglomerates. Soil surfaces are well covered by light colored gravels, cobbles and/or stones. The effective rooting depth is limited by hard, fractured bedrock at 10 to 20 inches. Runoff is moderate on moist soils due to porous bedrock. The erosion hazard is slight due to gravel, cobble and rock covers. Rock outcrop and can be as high as 20%.
Soils mapped to date on this site include: SSA-675 San Carlos Indian Reservation MU Maybray-570.

Table 4. Representative soil features

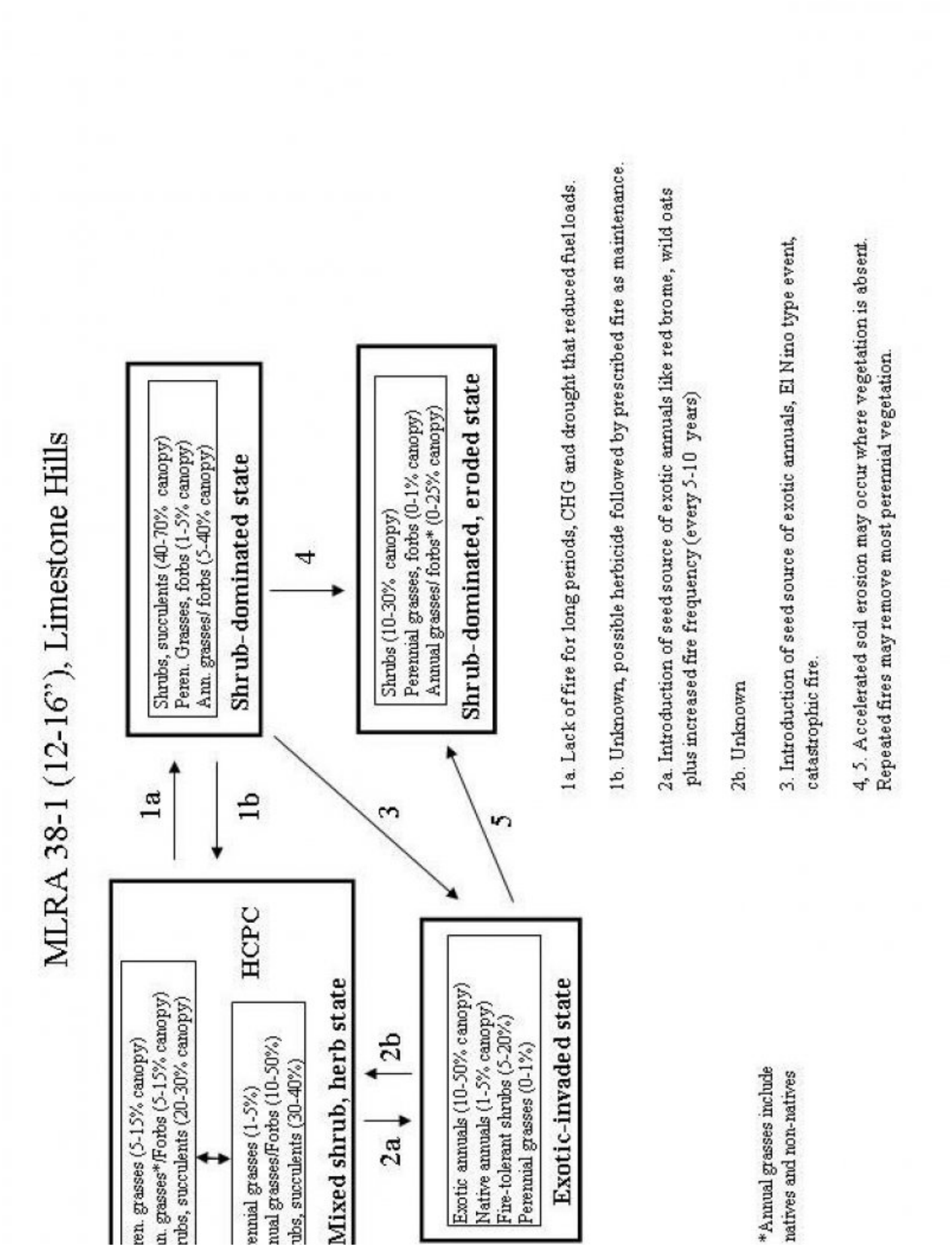
Parent material	(1) Residuum–limestone (2) Colluvium–conglomerate
Surface texture	(1) Cobbly sandy loam (2) Very gravelly sandy loam (3) Very cobbly sandy loam
Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Moderately rapid to moderate
Soil depth	5–20 in
Surface fragment cover <=3"	35–60%
Surface fragment cover >3"	5–20%
Available water capacity (0-40in)	0.4–1.4 in
Calcium carbonate equivalent (0-40in)	15–60%
Electrical conductivity (0-40in)	0–2 mmhos/cm
Sodium adsorption ratio (0-40in)	0–2
Soil reaction (1:1 water) (0-40in)	7.8–8.6
Subsurface fragment volume <=3" (Depth not specified)	35–65%
Subsurface fragment volume >3" (Depth not specified)	0–10%

Ecological dynamics

The historic native plant community is a diverse mixture of desert trees, shrubs, succulents, forbs and grasses. This includes a diverse flora of native annual grasses and forbs of both the winter and summer seasons. Periodic wildfires occurred at moderate intervals (15 to 30 years) and helped maintain a balance between herbs and shrubs. In the absence of fire for longer periods, shrubby species and cacti can become dominant. The interactions of drought, fire and continuous livestock grazing can, over time, result in the loss of palatable grasses, half shrubs and suffrutescent forbs. In some situations non-native annuals can dominate the site. These species can, over time,

diminish the soil seed-bank of native annual species. Non-native annuals can act to increase the fire frequency of areas of the site near roads and urban areas, where the incidence of man-made fires is high.

State and transition model



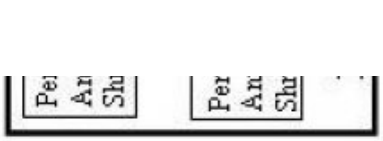


Figure 4. State and Transition, Limestone Hills 12-16" p.z.

State 1
Mixed Shrub-Herbaceous State

The historic native plant community is a diverse mixture of perennial grasses, suffrutescent forbs, shrubs, succulents and desert trees. A rich flora of native annual forbs and grasses, of both the winter and summer seasons, exist in the plant community. Periodic, naturally occurring, wildfires were important in maintaining the potential plant community. North slopes have a chaparral of evergreen shrubs like jojoba, turbinella oak, mountain mahogany, cliffrose, desert buckbrush and canotia. Southern exposures will have a higher percentage of desert shrubs, trees like paloverde and succulents in the plant community. More xeric grasses will dominate southern exposures (aristida, tridens). Grasses on cooler aspects include stipa species and sideoats grama.

Dominant plant species

- crucifixion thorn (*Canotia holacantha*), tree
- blue paloverde (*Parkinsonia florida*), tree
- jojoba (*Simmondsia chinensis*), shrub
- Sonoran scrub oak (*Quercus turbinella*), shrub
- mountain mahogany (*Cercocarpus*), shrub
- Arizona cliffrose (*Purshia ×subintegra*), shrub
- desert ceanothus (*Ceanothus greggii*), shrub
- threeawn (*Aristida*), grass
- tridens (*Tridens*), grass

- (*Stipa*), grass
- sideoats grama (*Bouteloua curtipendula*), grass

Community 1.1
Perennial grasses (5-15% canopy) Annual grasses/Forbs (5-15% canopy) Shrubs, succulents (20-30% canopy)

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Dominant plant species

- crucifixion thorn (*Canotia holacantha*), tree
- paloverde (*Parkinsonia*), tree
- jojoba (*Simmondsia chinensis*), shrub
- Sonoran scrub oak (*Quercus turbinella*), shrub
- mountain mahogany (*Cercocarpus*), shrub
- Arizona cliffrose (*Purshia ×subintegra*), shrub
- desert ceanothus (*Ceanothus greggii*), shrub
- threeawn (*Aristida*), grass
- tridens (*Tridens*), grass
- (*Stipa*), grass
- sideoats grama (*Bouteloua curtipendula*), grass

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	111	300	550
Shrub/Vine	70	250	445
Forb	25	75	150
Tree	5	25	100
Total	**211**	**650**	**1245**

Table 6. Soil surface cover

Tree basal cover	0-1%
Shrub/vine/liana basal cover	1-2%
Grass/grasslike basal cover	1-3%
Forb basal cover	1-2%
Non-vascular plants	0%
Biological crusts	0-1%
Litter	20-50%
Surface fragments >0.25" and <=3"	35-60%
Surface fragments >3"	5-20%
Bedrock	5-20%
Water	0%
Bare ground	5-30%

Table 7. Canopy structure (% cover)

Height Above Ground (Ft)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.5	–	1-5%	1-5%	1-5%
>0.5 <= 1	–	5-10%	1-10%	2-5%
>1 <= 2	–	1-10%	1-5%	0-5%
>2 <= 4.5	–	5-10%	0-2%	0-1%
>4.5 <= 13	1-5%	1-5%	–	–
>13 <= 40	0-5%	–	–	–
>40 <= 80	–	–	–	–
>80 <= 120	–	–	–	–
>120	–	–	–	–

Figure 6. Plant community growth curve (percent production by month). AZ3811, 38.1 12-16" p.z. all sites. Growth begins in the spring, most growth occurs in the summer..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	1	7	15	20	22	20	10	5	0	0

Community 1.2
Perennial grasses (1-5% canopy) Annual grasses/Forbs (10-50% canopy) Shrubs, succulents (30-40%)

The historic native plant community is a diverse mixture of perennial grasses, suffrutescent forbs, shrubs,

succulents and desert trees. A rich native flora of native annual forbs and grasses, of both the winter and summer seasons, exist in the plant community. Periodic, naturally occurring, wildfires were important in maintaining the potential plant community. North slopes have a chaparral of evergreen shrubs like jojoba, turbinella oak, mountain mahogany, cliffrose, desert buckbrush and canotia. Southern exposures will have a higher percentage of desert shrubs, trees like paloverde and succulents in the plant community. More xeric grasses will dominate southern exposures (aritida, tridens). Grasses on cooler aspects include stipa species and sideoats grama.

Dominant plant species

- crucifixion thorn (*Canotia holacantha*), tree
- paloverde (*Parkinsonia*), tree
- jojoba (*Simmondsia chinensis*), shrub
- Sonoran scrub oak (*Quercus turbinella*), shrub
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- threeawn (*Aristida*), grass
- tridens (*Tridens*), grass
- (*Stipa*), grass
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Table 8. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
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Non-vascular plants	0%
Biological crusts	0-1%
Litter	20-50%
Surface fragments >0.25" and <=3"	35-60%
Surface fragments >3"	5-20%
Bedrock	5-20%
Water	0%
Bare ground	5-30%

Table 10. Canopy structure (% cover)

Height Above Ground (Ft)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.5	–	1-5%	1-5%	1-5%
>0.5 <= 1	–	5-10%	1-10%	2-5%
>1 <= 2	–	1-10%	1-5%	0-5%
>2 <= 4.5	–	5-10%	0-2%	0-1%
>4.5 <= 13	1-5%	1-5%	–	–
>13 <= 40	0-5%	–	–	–
>40 <= 80	–	–	–	–
>80 <= 120	–	–	–	–
>120	–	–	–	–

Figure 8. Plant community growth curve (percent production by month). AZ3811, 38.1 12-16" p.z. all sites. Growth begins in the spring, most growth occurs in the summer..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	1	7	15	20	22	20	10	5	0	0

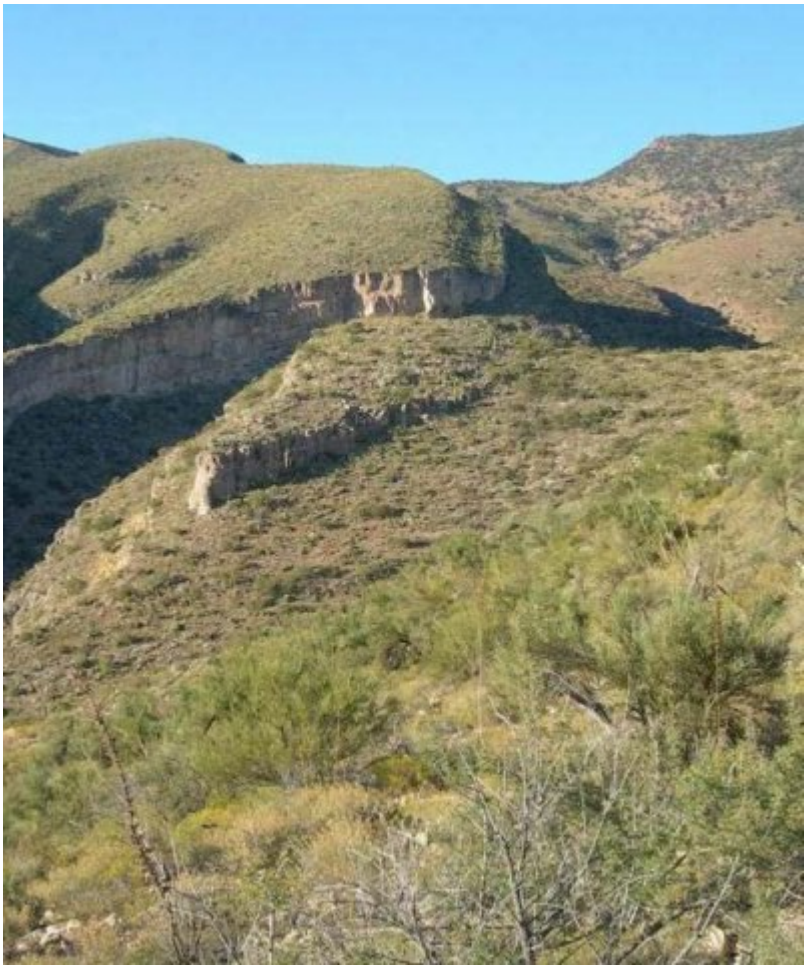
Pathway
Community 1.1 to 1.2

Increase in time since last burn. Fire interval is 15 to 30 years.

Pathway
Community 1.2 to 1.1

Recent burn. Fire interval is 15 to 30 years.

State 2
Shrub Dominated State



Perennial grass canopy cover is reduced due to the interactions of drought, grazing and fire. Desert shrubs and cacti dominate the plant community. Shrub cover exceeds 30%. Annuals, both native and non-native, dominate the under-story. Fire frequency is reduced but the site can still burn, especially after "El Nino" years produce heavy fuel loads of annual grasses and forbs.

Community 2.1
Shrubs, succulents (40-70% canopy) Perennial grasses, forbs (1-5% canopy) Annual grasses, forbs (5-40% canopy

Perennial grass canopy cover is reduced due to the interactions of drought, grazing and fire. Desert shrubs and cacti dominate the plant community. Shrub cover exceeds 30%. Annuals, both native and non-native, dominate the under-story. Fire frequency is reduced but the site can still burn, especially after "El Nino" years produce heavy fuel loads of annual grasses and forbs.

State 3
Shrub Dominated and Eroded State

Shrubs like jojoba, whitethorn acacia, mesquite, ocotillo and canotia, and succulents like prickly pear, cholla and banana yucca can increase to dominate the site in the absence of fire for very long periord of time. Native and non-native annual forbs and grasses dominate the under-story. In "El Nino" years, herbaceous fuels can be sufficient to carry fire through the heavy canopy of shrubs. The major woody shrubs are, however, fire resistant once established. Such fires would remove less tolerant species like cacti and leave intact the sprouting woody plants to become more and more dominant. Extreme rainfall events coupled with the fire, drought and grazing interaction, can lead to rilling of steep slopes. Compaction of soils can occur with heavy trailing from continuous livestock use. Loss of plant cover after repeated fire can lead to accelerated rill erosion under these circumstances.

Dominant plant species

- jojoba (*Simmondsia chinensis*), shrub
- whitethorn acacia (*Acacia constricta*), shrub
- mesquite (*Prosopis*), shrub
- crucifixion thorn (*Canotia holacantha*), shrub
- cholla (*Cylindropuntia*), shrub
- banana yucca (*Yucca baccata*), shrub
- pricklypear (*Opuntia*), shrub

Dominant resource concerns

- Sheet and rill erosion
- Compaction

Community 3.1
Shrubs (10-30% canopy) Perennial grasses, forbs (0-1% canopy) Annual grasses/forbs (0-25% canopy)

Shrubs like jojoba, whitethorn acacia, mesquite, ocotillo and canotia, and succulents like prickly pear, cholla and banana yucca can increase to dominate the site in the absence of fire for very long periord of time. Native and non-native annual forbs and grasses dominate the under-story. In "El Nino" years, herbaceous fuels can be sufficient to carry fire through the heavy canopy of shrubs. The major woody shrubs are, however, fire resistant once established. Such fires would remove less tolerant species like cacti and leave intact the sprouting woody plants to become more and more dominant. Extreme rainfall events coupled with the fire, drought and grazing interaction, can lead to rilling of steep slopes. Compaction of soils can occur with heavy trailing from continuous livestock use. Loss of plant cover after repeated fire can lead to accelerated rill erosion under these circumstances.

Dominant plant species

- jojoba (*Simmondsia chinensis*), shrub
- whitethorn acacia (*Acacia constricta*), shrub
- mesquite (*Prosopis*), shrub
- ocotillo (*Fouquieria*), shrub
- crucifixion thorn (*Canotia holacantha*), shrub
- cholla (*Cylindropuntia*), shrub
- banana yucca (*Yucca baccata*), shrub
- pricklypear (*Opuntia*), shrub

Dominant resource concerns

- Sheet and rill erosion
- Compaction

State 4
Exotic Invaded State

Non-native annual grasses and forbs like red brome, cheatgrass, and wild oats can invade and dominate areas of the site. These species can, over time, reduce the seed-bank of native annual grasses and forbs. Their presence can increase the fire frequency (of man made fires) especially where roads and urban areas are adjacent to areas of the site. Repeated fires tend to remove fire sensitive species like paloverde, cacti and canotia, and leave fire tolerant species like turbinella oak, mesquite, whitethorn and jojoba.

Dominant plant species

- red brome (*Bromus rubens*), grass
- cheatgrass (*Bromus tectorum*), grass
- wild oat (*Avena fatua*), grass

Dominant resource concerns

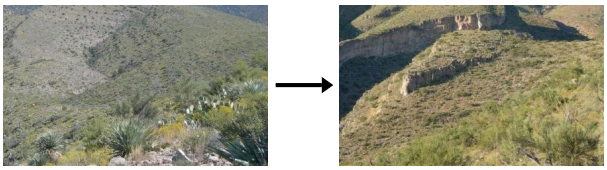
- Wildfire hazard from biomass accumulation

Community 4.1
Shrubs (10-30% canopy) Perennial grasses, forbs (0-1% canopy) Annual grasses, forbs (0-25% canopy)

Shrubs like jojoba, whitethorn acacia, mesquite, ocotillo and canotia, and succulents like prickly pear, cholla and banana yucca can increase to dominate the site in the absence of fire for very long periods of time. Native and non-native annual forbs and grasses dominate the under-story. In "El Nino" years, herbaceous fuels can be sufficient to carry fire through the heavy canopy of shrubs. The major woody shrubs are, however, fire resistant once established. Such fires would remove less tolerant species like cacti and leave intact the sprouting woody plants to become more and more dominant. Extreme rainfall events coupled with; the fire, drought and grazing interaction, can lead to rilling of steep slopes. Compaction of soils can occur with heavy trailing from continuous livestock use.

Loss of plant cover after repeated fire can lead to accelerated rill erosion under these circumstances.

Transition 1a
State 1 to 2



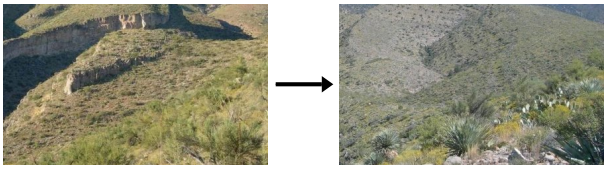
Mixed Shrub-Herbaceous State | Shrub Dominated State

Lack of fire for long periods, continuous heavy grazing and drought that reduced fuel loads.

Transition 2a
State 1 to 3

Introduction of seed source of exotic annuals like red brome and wild oats plus increased fire frequency (every 5 to 10 years).

Restoration pathway 1b
State 2 to 1



Shrub Dominated State | Mixed Shrub-Herbaceous State

Unknown, possible herbicide followed by prescribed fire as maintenance.

Restoration pathway 2b
State 3 to 1

Unknown

Additional community tables

Table 11. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	**Dominant perennial grasses**			100–300	
	sideoats grama	BOCU	*Bouteloua curtipendula*	50–100	–
	black grama	BOER4	*Bouteloua eriopoda*	10–50	–
	slim tridens	TRMU	*Tridens muticus*	10–50	–
	slim tridens	TRMUE	*Tridens muticus var. elongatus*	1–50	–
	blue threeawn	ARPUN	*Aristida purpurea var. nealleyi*	20–50	–
	cane bluestem	BOBA3	*Bothriochloa barbinodis*	1–40	–
	Parish's threeawn	ARPUP5	*Aristida purpurea var. parishii*	0–30	–
	purple threeawn	ARPU9	*Aristida purpurea*	0–20	–
	tanglehead	HECO10	*Heteropogon contortus*	1–20	–
	bush muhly	MUPO2	*Muhlenbergia porteri*	1–20	–
2	**Cool season grasses**			5–100	

	New Mexico feathergrass	HENE5	*Hesperostipa neomexicana*	5–50	–
	desert needlegrass	ACSP12	*Achnatherum speciosum*	0–30	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	0–20	–
	squirreltail	ELEL5	*Elymus elymoides*	0–10	–
	needle and thread	HECO26	*Hesperostipa comata*	0–5	–
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	0–5	–
3	**Misc. perennial grasses**			5–100	
	red grama	BOTR2	*Bouteloua trifida*	0–25	–
	big galleta	PLRI3	*Pleuraphis rigida*	0–25	–
	Hall's panicgrass	PAHA	*Panicum hallii*	1–25	–
	hairy grama	BOHI2	*Bouteloua hirsuta*	0–20	–
	low woollygrass	DAPU7	*Dasyochloa pulchella*	1–10	–
	nineawn pappusgrass	ENDE	*Enneapogon desvauxii*	1–10	–
	fall witchgrass	DICO6	*Digitaria cognata*	0–5	–
	green sprangletop	LEDU	*Leptochloa dubia*	0–5	–
	slender grama	BORE2	*Bouteloua repens*	0–5	–
	Fendler threeawn	ARPUL	*Aristida purpurea var. longiseta*	0–5	–
	spidergrass	ARTE3	*Aristida ternipes*	0–5	–
	spidergrass	ARTEG	*Aristida ternipes var. gentilis*	0–5	–
	southwestern bristlegrass	SESC2	*Setaria scheelei*	0–5	–
	plains bristlegrass	SEVU2	*Setaria vulpiseta*	0–5	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	0–5	–
	Arizona cottontop	DICA8	*Digitaria californica*	0–2	–
	curly-mesquite	HIBE	*Hilaria belangeri*	0–2	–
	shortleaf woollygrass	ERAV	*Erioneuron avenaceum*	0–2	–
	plains lovegrass	ERIN	*Eragrostis intermedia*	0–1	–
	tobosagrass	PLMU3	*Pleuraphis mutica*	0–1	–
4	**Annual grasses**			1–50	
	small fescue	VUMI	*Vulpia microstachys*	0–10	–
	Eastwood fescue	VUMIC	*Vulpia microstachys var. ciliata*	0–10	–
	sixweeks fescue	VUOC	*Vulpia octoflora*	0–10	–
	Mexican panicgrass	PAHI5	*Panicum hirticaule*	0–10	–
	sixweeks threeawn	ARAD	*Aristida adscensionis*	1–10	–
	prairie threeawn	AROL	*Aristida oligantha*	0–5	–
	witchgrass	PACA6	*Panicum capillare*	0–5	–
	Arizona signalgrass	URAR	*Urochloa arizonica*	0–5	–
	mucronate sprangeltop	LEPAB	*Leptochloa panicea ssp. brachiata*	0–5	–
	delicate muhly	MUFR	*Muhlenbergia fragilis*	0–2	–
	littleseed muhly	MUMI	*Muhlenbergia microsperma*	0–2	–
	Rothrock's grama	BORO2	*Bouteloua rothrockii*	0–2	–
	Arizona brome	BRAR4	*Bromus arizonicus*	0–2	–
	feather fingergrass	CHVI4	*Chloris virgata*	0–2	–
	canyon cupgrass	ERLE7	*Eriochloa lemmonii*	0–1	–
	tufted lovegrass	ERPE	*Eragrostis pectinacea*	0–1	–

	desert lovegrass	ERPEM	*Eragrostis pectinacea var. miserrima*	0–1	–
	little barley	HOPU	*Hordeum pusillum*	0–1	–
	Mexican sprangletop	LEFUU	*Leptochloa fusca ssp. uninervia*	0–1	–
	needle grama	BOAR	*Bouteloua aristidoides*	0–1	–
	sixweeks grama	BOBA2	*Bouteloua barbata*	0–1	–
	Bigelow's bluegrass	POBI	*Poa bigelovii*	0–1	–
Forb					
5	**Perennial forbs**			20–100	
	white sagebrush	ARLU	*Artemisia ludoviciana*	0–10	–
	white sagebrush	ARLUM2	*Artemisia ludoviciana ssp. mexicana*	0–10	–
	perennial rockcress	ARPE2	*Arabis perennans*	1–10	–
	paleface	HIDE	*Hibiscus denudatus*	0–10	–
	glandleaf milkwort	POMA7	*Polygala macradenia*	1–10	–
	spikemoss	SELAG	*Selaginella*	0–10	–
	brownplume wirelettuce	STPA4	*Stephanomeria pauciflora*	1–10	–
	desert globemallow	SPAM2	*Sphaeralcea ambigua*	1–5	–
	cliffbrake	PELLA	*Pellaea*	0–5	–
	slender janusia	JAGR	*Janusia gracilis*	0–5	–
	Fendler's bladderpod	LEFE	*Lesquerella fendleri*	0–5	–
	Parry's false prairie-clover	MAPA7	*Marina parryi*	1–5	–
	plains blackfoot	MELE2	*Melampodium leucanthum*	0–5	–
	lipfern	CHEIL	*Cheilanthes*	0–5	–
	leatherweed	CRPO5	*Croton pottsii*	0–5	–
	trailing windmills	ALIN	*Allionia incarnata*	1–5	–
	weakleaf bur ragweed	AMCO3	*Ambrosia confertiflora*	1–5	–
	hairyseed bahia	BAAB	*Bahia absinthifolia*	0–5	–
	tarragon	ARDR4	*Artemisia dracunculus*	0–2	–
	desert trumpet	ERIN4	*Eriogonum inflatum*	0–2	–
	Mojave spurge	EUSC6	*Euphorbia schizoloba*	0–2	–
	southwestern mock vervain	GLGO	*Glandularia gooddingii*	0–2	–
	wishbone-bush	MILAV	*Mirabilis laevis var. villosa*	0–2	–
	lacy tansyaster	MAPI	*Machaeranthera pinnatifida*	0–2	–
	cloak fern	NOTHO	*Notholaena*	0–2	–
	shrubby deervetch	LORI3	*Lotus rigidus*	0–2	–
	bluedicks	DICA14	*Dichelostemma capitatum*	0–2	–
	Coues' cassia	SECO10	*Senna covesii*	0–2	–
	rue of the mountains	THTE2	*Thamnosma texana*	0–2	–
	branched noseburn	TRRA5	*Tragia ramosa*	0–1	–
	Louisiana vetch	VILUL2	*Vicia ludoviciana ssp. ludoviciana*	0–1	–
	turpentinebroom	THMO	*Thamnosma montana*	0–1	–
	Lemmon's ragwort	SELE8	*Senecio lemmonii*	0–1	–
	New Mexico fanpetals	SINE	*Sida neomexicana*	0–1	–
	silverleaf nightshade	SOEL	*Solanum elaeagnifolium*	0–1	–

	Parry's beardtongue	PEPA24	*Penstemon parryi*	0–1	–
	desert penstemon	PEPS	*Penstemon pseudospectabilis*	0–1	–
	orange fameflower	PHAU13	*Phemeranthus aurantiacus*	0–1	–
	slender poreleaf	POGR5	*Porophyllum gracile*	0–1	–
	scurfpea	PSORA2	*Psoralidium*	0–1	–
	canaigre dock	RUHY	*Rumex hymenosepalus*	0–1	–
	twinleaf senna	SEBA3	*Senna bauhinioides*	0–1	–
	fleabane	ERIGE2	*Erigeron*	0–1	–
	Indian rushpea	HOGL2	*Hoffmannseggia glauca*	0–1	–
	Wright's deervetch	LOWR	*Lotus wrightii*	0–1	–
	ragged nettlespurge	JAMA	*Jatropha macrorhiza*	0–1	–
	longflower tube tongue	JULO3	*Justicia longii*	0–1	–
	New Mexico groundsel	PANE7	*Packera neomexicana*	0–1	–
	Oak Creek ragwort	PAQU8	*Packera quercetorum*	0–1	–
	toadflax penstemon	PELI2	*Penstemon linarioides*	0–1	–
	desert tobacco	NIOB	*Nicotiana obtusifolia*	0–1	–
	desert rosemallow	HICO	*Hibiscus coulteri*	0–1	–
	dense ayenia	AYMI	*Ayenia microphylla*	0–1	–
	New Mexico silverbush	ARNE2	*Argythamnia neomexicana*	0–1	–
	purplenerve springparsley	CYMU2	*Cymopterus multinervatus*	0–1	–
	Gregg's prairie clover	DAGR2	*Dalea greggii*	0–1	–
	James' prairie clover	DAJA	*Dalea jamesii*	0–1	–
	Cooley's bundleflower	DECO2	*Desmanthus cooleyi*	0–1	–
	desert larkspur	DEPA	*Delphinium parishii*	0–1	–
	tall mountain larkspur	DESC	*Delphinium scaposum*	0–1	–
	narrowleaf silverbush	ARLA12	*Argythamnia lanceolata*	0–1	–
	tuber anemone	ANTU	*Anemone tuberosa*	0–1	–
	largeflower onion	ALMA4	*Allium macropetalum*	0–1	–
	dwarf desertpeony	ACNA2	*Acourtia nana*	0–1	–
	brownfoot	ACWR5	*Acourtia wrightii*	0–1	–
	San Felipe dogweed	ADPO	*Adenophyllum porophylloides*	0–1	–
	desert marigold	BAMU	*Baileya multiradiata*	0–1	–
	scarlet spiderling	BOCO	*Boerhavia coccinea*	0–1	–
	climbing wartclub	BOSC	*Boerhavia scandens*	0–1	–
	wavyleaf Indian paintbrush	CAAPM	*Castilleja applegatei ssp. martinii*	0–1	–
	Arizona wrightwort	CAAR7	*Carlowrightia arizonica*	0–1	–
	desert mariposa lily	CAKE	*Calochortus kennedyi*	0–1	–
	sego lily	CANU3	*Calochortus nuttallii*	0–1	–
6	**Annual forbs**			1–50	
	bristly fiddleneck	AMTE3	*Amsinckia tessellata*	0–10	–
	phacelia	PHACE	*Phacelia*	0–10	–
	chia	SACO6	*Salvia columbariae*	0–5	–
	lyreleaf jewelflower	STCA5	*Streptanthus carinatus*	0–5	–
	thelypody	THELY	*Thelypodium*	0–5	–

	woolly tidestromia	TILA2	*Tidestromia lanuginosa*	0–5	–
	foothill deervetch	LOHU2	*Lotus humistratus*	0–5	–
	desertparsley	LOMAT	*Lomatium*	0–5	–
	coastal bird's-foot trefoil	LOSA	*Lotus salsuginosus*	0–5	–
	slender goldenweed	MAGR10	*Machaeranthera gracilis*	0–5	–
	Coulter's lupine	LUSP2	*Lupinus sparsiflorus*	0–5	–
	combseed	PECTO	*Pectocarya*	0–5	–
	desert Indianwheat	PLOV	*Plantago ovata*	0–5	–
	woolly plantain	PLPA2	*Plantago patagonica*	0–5	–
	Coulter's spiderling	BOCO2	*Boerhavia coulteri*	0–5	–
	fivewing spiderling	BOIN	*Boerhavia intermedia*	0–5	–
	pitseed goosefoot	CHBE4	*Chenopodium berlandieri*	0–5	–
	western tansymustard	DEPI	*Descurainia pinnata*	0–5	–
	longleaf false goldeneye	HELOA2	*Heliomeris longifolia var. annua*	0–5	–
	California poppy	ESCAM	*Eschscholzia californica ssp. mexicana*	0–5	–
	shaggyfruit pepperweed	LELA	*Lepidium lasiocarpum*	0–5	–
	Thurber's pepperweed	LETH2	*Lepidium thurberi*	0–2	–
	spurge	EUPHO	*Euphorbia*	0–2	–
	crestrib morning-glory	IPCO2	*Ipomoea costellata*	0–2	–
	wedgeleaf draba	DRCU	*Draba cuneifolia*	0–2	–
	American wild carrot	DAPU3	*Daucus pusillus*	0–2	–
	sorrel buckwheat	ERPO4	*Eriogonum polycladon*	0–2	–
	exserted Indian paintbrush	CAEXE	*Castilleja exserta ssp. exserta*	0–2	–
	New Mexico thistle	CINE	*Cirsium neomexicanum*	0–2	–
	cryptantha	CRYPT	*Cryptantha*	0–2	–
	purslane	PORTU	*Portulaca*	0–2	–
	tanseyleaf tansyaster	MATA2	*Machaeranthera tanacetifolia*	0–2	–
	Gordon's bladderpod	LEGO	*Lesquerella gordonii*	0–2	–
	sleepy silene	SIAN2	*Silene antirrhina*	0–2	–
	Arizona popcornflower	PLAR	*Plagiobothrys arizonicus*	0–1	–
	creamcups	PLCA5	*Platystemon californicus*	0–1	–
	sawtooth sage	SASU7	*Salvia subincisa*	0–1	–
	ragwort	SENEC	*Senecio*	0–1	–
	spreading fanpetals	SIAB	*Sida abutifolia*	0–1	–
	woollyhead neststraw	STMI2	*Stylocline micropoides*	0–1	–
	sand fringepod	THCU	*Thysanocarpus curvipes*	0–1	–
	whitestem blazingstar	MEAL6	*Mentzelia albicaulis*	0–1	–
	green carpetweed	MOVE	*Mollugo verticillata*	0–1	–
	desert evening primrose	OEPR	*Oenothera primiveris*	0–1	–
	Florida pellitory	PAFL3	*Parietaria floridana*	0–1	–
	Arizona lupine	LUAR4	*Lupinus arizonicus*	0–1	–
	miniature lupine	LUBI	*Lupinus bicolor*	0–1	–
	desert unicorn-plant	PRAL4	*Proboscidea althaeifolia*	0–1	–

	doubleclaw	PRPA2	*Proboscidea parviflora*	0–1	–
	New Mexico plumeseed	RANE	*Rafinesquia neomexicana*	0–1	–
	manybristle chinchweed	PEPA2	*Pectis papposa*	0–1	–
	Fendler's desertdandelion	MAFE	*Malacothrix fendleri*	0–1	–
	hairy prairie clover	DAMO	*Dalea mollis*	0–1	–
	miner's lettuce	CLPEP	*Claytonia perfoliata ssp. perfoliata*	0–1	–
	scrambled eggs	COAU2	*Corydalis aurea*	0–1	–
	yellow tackstem	CAPA7	*Calycoseris parryi*	0–1	–
	white tackstem	CAWR	*Calycoseris wrightii*	0–1	–
	brittle spineflower	CHBR	*Chorizanthe brevicornu*	0–1	–
	Esteve's pincushion	CHST	*Chaenactis stevioides*	0–1	–
	hoary bowlesia	BOIN3	*Bowlesia incana*	0–1	–
	milkvetch	ASTRA	*Astragalus*	0–1	–
	annual agoseris	AGHE2	*Agoseris heterophylla*	0–1	–
	carelessweed	AMPA	*Amaranthus palmeri*	0–1	–
	Texas stork's bill	ERTE13	*Erodium texanum*	0–1	–
	sacred thorn-apple	DAWR2	*Datura wrightii*	0–1	–
	flatcrown buckwheat	ERDE6	*Eriogonum deflexum*	0–1	–
	miniature woollystar	ERDI2	*Eriastrum diffusum*	0–1	–
	spreading fleabane	ERDI4	*Erigeron divergens*	0–1	–
	redstar	IPCO3	*Ipomoea coccinea*	0–1	–
	ivyleaf morning-glory	IPHE	*Ipomoea hederacea*	0–1	–
	Arizona poppy	KAGR	*Kallstroemia grandiflora*	0–1	–
	California goldfields	LACA7	*Lasthenia californica*	0–1	–
	star gilia	GIST	*Gilia stellata*	0–1	–
Shrub/Vine					
7	**Evergreen shrubs**			10–150	
	Sonoran scrub oak	QUTU2	*Quercus turbinella*	0–30	–
	jojoba	SICH	*Simmondsia chinensis*	0–30	–
	desert ceanothus	CEGR	*Ceanothus greggii*	0–20	–
	alderleaf mountain mahogany	CEMOM4	*Cercocarpus montanus var. montanus*	0–20	–
	hairy mountain mahogany	CEMOP	*Cercocarpus montanus var. paucidentatus*	0–20	–
	algerita	MATR3	*Mahonia trifoliolata*	0–10	–
	Stansbury cliffrose	PUST	*Purshia stansburiana*	0–10	–
	sugar sumac	RHOV	*Rhus ovata*	0–5	–
	snapdragon penstemon	KEANM	*Keckiella antirrhinoides ssp. microphylla*	0–5	–
	red barberry	MAHA4	*Mahonia haematocarpa*	0–1	–
	Arizona cliffrose	PUSU2	*Purshia ×subintegra*	0–1	–
	redberry buckthorn	RHCR	*Rhamnus crocea*	0–1	–
8	**Large shrubs**			15–60	
	Wright's beebrush	ALWR	*Aloysia wrightii*	1–20	–
	ocotillo	FOSP2	*Fouquieria splendens*	5–20	–

	mariola	PAIN2	*Parthenium incanum*	1–15	–
	whitethorn acacia	ACCO2	*Acacia constricta*	0–10	–
	catclaw acacia	ACGR	*Acacia greggii*	0–10	–
	Berlandier's wolfberry	LYBE	*Lycium berlandieri*	1–5	–
	Arizona desert-thorn	LYEX	*Lycium exsertum*	0–5	–
	Kearney's snakewood	COWAK	*Condalia warnockii var. kearneyana*	0–2	–
	crown of thorns	KOSP	*Koeberlinia spinosa*	0–2	–
	winterfat	KRLA2	*Krascheninnikovia lanata*	0–2	–
	creosote bush	LATR2	*Larrea tridentata*	0–2	–
	littleleaf sumac	RHMI3	*Rhus microphylla*	0–2	–
	Wright's mock buckthorn	SAWR	*Sageretia wrightii*	0–2	–
	Arizona necklacepod	SOAR3	*Sophora arizonica*	0–2	–
	catclaw mimosa	MIACB	*Mimosa aculeaticarpa var. biuncifera*	0–2	–
	lotebush	ZIOBC	*Ziziphus obtusifolia var. canescens*	0–1	–
	skunkbush sumac	RHTR	*Rhus trilobata*	0–1	–
	Florida hopbush	DOVI	*Dodonaea viscosa*	0–1	–
	pale desert-thorn	LYPA	*Lycium pallidum*	0–1	–
	Thurber's desert honeysuckle	ANTH2	*Anisacanthus thurberi*	0–1	–
	fourwing saltbush	ATCA2	*Atriplex canescens*	0–1	–
	California brickellbush	BRCA3	*Brickellia californica*	0–1	–
	spiny hackberry	CEEH	*Celtis ehrenbergiana*	0–1	–
	desert sweet	CHMI2	*Chamaebatiaria millefolium*	0–1	–
	Warnock's snakewood	COWA	*Condalia warnockii*	0–1	–
9	**Dominant half shrubs**			35–150	
	fairyduster	CAER	*Calliandra eriophylla*	15–50	–
	featherplume	DAFO	*Dalea formosa*	1–50	–
	littleleaf ratany	KRER	*Krameria erecta*	1–50	–
	desert zinnia	ZIAC	*Zinnia acerosa*	1–25	–
	rough menodora	MESC	*Menodora scabra*	1–20	–
	purple sage	SADOM	*Salvia dorrii ssp. mearnsii*	0–15	–
	woody crinklemat	TICA3	*Tiquilia canescens*	0–10	–
	bastardsage	ERWR	*Eriogonum wrightii*	0–5	–
	longleaf phlox	PHLO2	*Phlox longifolia*	0–5	–
	starry bedstraw	GAST	*Galium stellatum*	0–1	–
	Eastern Mojave buckwheat	ERFA2	*Eriogonum fasciculatum*	0–1	–
	American threefold	TRCA8	*Trixis californica*	0–1	–
	Parish's goldeneye	VIPA14	*Viguiera parishii*	0–1	–
	ragged rockflower	CRBI2	*Crossosoma bigelovii*	0–1	–
	shortleaf baccharis	BABR	*Baccharis brachyphylla*	0–1	–
	yerba de pasmo	BAPT	*Baccharis pteronioides*	0–1	–
	sweetbush	BEJU	*Bebbia juncea*	0–1	–
	Coulter's brickellbush	BRCO	*Brickellia coulteri*	0–1	–
10	**Succulents**			5–60	

	banana yucca	YUBA	*Yucca baccata*	1–20	–
	common sotol	DAWH2	*Dasylirion wheeleri*	1–15	–
	Schott's century plant	AGSC3	*Agave schottii*	0–15	–
	sacahuista	NOMI	*Nolina microcarpa*	0–10	–
	cactus apple	OPEN3	*Opuntia engelmannii*	1–10	–
	tulip pricklypear	OPPH	*Opuntia phaeacantha*	1–10	–
	goldenflower century plant	AGCH2	*Agave chrysantha*	0–5	–
	saguaro	CAGI10	*Carnegiea gigantea*	0–5	–
	buck-horn cholla	CYAC8	*Cylindropuntia acanthocarpa*	0–2	–
	candy barrelcactus	FEWI	*Ferocactus wislizeni*	0–2	–
	Graham's nipple cactus	MAGR9	*Mammillaria grahamii*	0–1	–
	dollarjoint pricklypear	OPCH	*Opuntia chlorotica*	0–1	–
	Parry's agave	AGPA4	*Agave parryi*	0–1	–
	pinkflower hedgehog cactus	ECBO2	*Echinocereus bonkerae*	0–1	–
	Arizona hedgehog cactus	ECCOA	*Echinocereus coccineus var. arizonicus*	0–1	–
	Engelmann's hedgehog cactus	ECEN	*Echinocereus engelmannii*	0–1	–
	redspine fishhook cactus	ECER2	*Echinomastus erectocentrus*	0–1	–
	pinkflower hedgehog cactus	ECFA	*Echinocereus fasciculatus*	0–1	–
	spinystar	ESVI2	*Escobaria vivipara*	0–1	–
	Leconte's barrel cactus	FECYL	*Ferocactus cylindraceus var. lecontei*	0–1	–
	soaptree yucca	YUEL	*Yucca elata*	0–1	–
	teddybear cholla	CYBI9	*Cylindropuntia bigelovii*	0–1	–
	jumping cholla	CYFU10	*Cylindropuntia fulgida*	0–1	–
	Christmas cactus	CYLE8	*Cylindropuntia leptocaulis*	0–1	–
	walkingstick cactus	CYSP8	*Cylindropuntia spinosior*	0–1	–
	Whipple cholla	CYWH	*Cylindropuntia whipplei*	0–1	–
11	**Increaser half-shrubs**			1–25	
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	1–20	–
	whitestem paperflower	PSCO2	*Psilostrophe cooperi*	0–5	–
	turpentine bush	ERLA12	*Ericameria laricifolia*	0–2	–
	narrowleaf goldenbush	ERLI6	*Ericameria linearifolia*	0–1	–
	threadleaf snakeweed	GUMI	*Gutierrezia microcephala*	0–1	–
	brittlebush	ENFA	*Encelia farinosa*	0–1	–
	button brittlebush	ENFR	*Encelia frutescens*	0–1	–
	burroweed	ISTE2	*Isocoma tenuisecta*	0–1	–
Tree					
12	**Trees**			5–100	
	crucifixion thorn	CAHO3	*Canotia holacantha*	1–50	–
	yellow paloverde	PAMI5	*Parkinsonia microphylla*	0–15	–
	oneseed juniper	JUMO	*Juniperus monosperma*	0–15	–
	redberry juniper	JUCO11	*Juniperus coahuilensis*	0–10	–

	western honey mesquite	PRGLT	*Prosopis glandulosa var. torreyana*	0–5	–
	velvet mesquite	PRVE	*Prosopis velutina*	0–5	–
	blue paloverde	PAFL6	*Parkinsonia florida*	0–5	–

Animal community

This site is suitable for grazing year round, but is not easily traversed by livestock. Livestock grazing use is concentrated on south slopes, canyon bottoms and ridge-tops. North slopes may be little used. Slopes greater than 50% and areas with very cobbly surfaces limit grazing use by cattle. Areas of rock outcrop can form barriers to livestock movement. The site is susceptible to erosion in overgrazed areas like bed-grounds, livestock trails and lower slopes adjacent to water.
The site has good habitat diversity for a great variety of desert wildlife species. Water developments are very important to both livestock and wildlife on this site.

Hydrological functions

This site has rough surfaces, due to a high cover of gravels, cobbles and stones, which act to hold water on the site. The bedrock is very porous. When the soils are dry, it produces little runoff. It produces significant runoff only when heavy rain falls on snow or moist soils.

Recreational uses

Hunting, camping, horseback riding, backpacking, rock hounding, fossil hunting, photography.

Wood products

Limited harvest of fuel-wood, fence posts and stays from mesquite, juniper, canotia and saguaro.

Other products

There is some native harvest of food plants like pinyon nuts, thistle, prickly pear tunas, jojoba nuts and mescal. There is limited harvest of herbs like, terragon, herbaceous sage, mormon tea and dogweed.

Type locality

Location 1: Gila County, AZ	
Township/Range/Section	T3S R15E S30
General legal description	Links 7VT Ranch (old Bar Flag Ranch) in the dripping Springs mountains on jeep trail to the Manhattan Mine.

Contributors

Dan Robinett
Larry D. Ellicott

Approval

Scott Woodall, 5/07/2020

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)	
Contact for lead author	
Date	05/10/2025
Approved by	Scott Woodall
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:**

2. **Presence of water flow patterns:**

3. **Number and height of erosional pedestals or terracettes:**

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

5. **Number of gullies and erosion associated with gullies:**

6. **Extent of wind scoured, blowouts and/or depositional areas:**

7. **Amount of litter movement (describe size and distance expected to travel):**

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

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):**

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:**

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

12. **Functional/Structural Groups (list in order of descending dominance by above-ground annual-production or live foliar cover using symbols: >>, >, = to indicate much greater than, greater than, and equal to):**

    Dominant:

    Sub-dominant:

    Other:

    Additional:

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

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

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):**

16. **Potential invasive (including noxious) species (native and non-native). List species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicators, we are describing what is NOT expected in the reference state for the ecological site:**

17. **Perennial plant reproductive capability:**