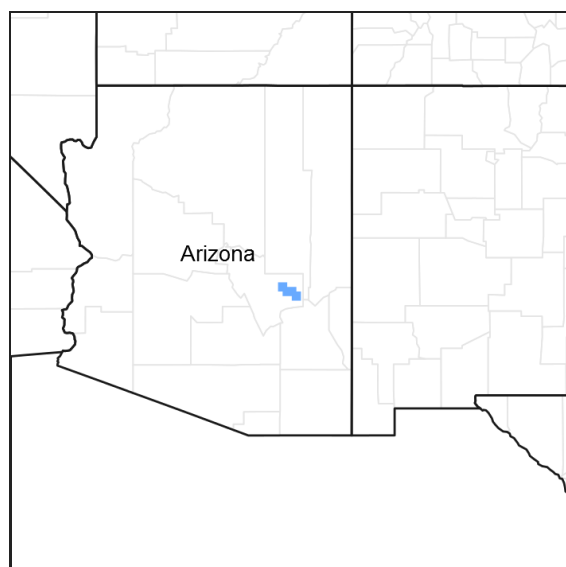


## **Ecological site R038XC318AZ Limestone Hills 20-24" p.z.**

Last updated: 9/05/2019  
 Accessed: 05/16/2024

### **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 38.3 – Upper Mogollon Transition

Elevations range from 5,100 to 7,000 feet and precipitation averages 20 to 27 inches per year. Vegetation includes Gambel oak, Arizona white oak, Emory oak, pinyon, alligator juniper, one- seed juniper, Arizona cypress, ponderosa pine, shrubby buckwheat, sacahuista, skunkbush sumac, Wright silktassle, blue grama, sideoats grama, muttongrass, western wheatgrass, and bottlebrush squirreltail. The soil temperature regime is mesic and the soil moisture regime is typic ustic. This MLRA 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.

### **Ecological site concept**

The Limestone Hills ecological site occurs on south and west facing aspects of narrow summits and back slopes with parent material of slope alluvium and/or residuum weathered from limestone.

**Table 1. Dominant plant species**

|            |               |
|------------|---------------|
| Tree       | Not specified |
| Shrub      | Not specified |
| Herbaceous | Not specified |

## Physiographic features

Popcorn soils occur south and west facing aspects of narrow summits and back slopes with parent material of slope alluvium and/or residuum weathered from limestone.

**Table 2. Representative physiographic features**

|           |               |
|-----------|---------------|
| Landforms | (1) Hill      |
| Elevation | 1,554–2,134 m |
| Slope     | 10–50%        |
| Aspect    | W, S          |

## Climatic features

Precipitation in this common resource area averages approximately 20 to 24 inches annually. Precipitation is lower and temperatures are cooler in the eastern part of the MLRA. The winter-summer rainfall ratio ranges from about 60/40% in the western part of the area to 45/55% in the eastern part. Summer rains fall July through September; and 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 10 to 18 inches per year and can occur from November through April. May and June are the driest months of the year. Humidity is generally low all year.

Average annual air temperatures range from 50 to 57 degrees F (mesic temperature regime). Daytime temps in the summer are commonly in the mid 80's in the eastern portion of the MLRA and the low to mid 90's in the western portion. Freezing temperatures are common from October through April. The actual precipitation, available moisture and temperature varies, depending on, region, elevation, rain shadow effect and aspect.

**Table 3. Representative climatic features**

|                               |          |
|-------------------------------|----------|
| Frost-free period (average)   | 167 days |
| Freeze-free period (average)  | 188 days |
| Precipitation total (average) | 610 mm   |

## Influencing water features

### Soil features

Popcorn soils occur south and west facing aspects of narrow summits and back slopes with parent material of slope alluvium and/or residuum weathered from limestone.

Soils mapped on this site include: from SSA-675 San Carlos IR Area - MU Popcorn-58.

**Table 4. Representative soil features**

|                      |                              |
|----------------------|------------------------------|
| Parent material      | (1) Slope alluvium–limestone |
| Surface texture      | (1) Very gravelly clay loam  |
| Family particle size | (1) Loamy                    |
| Soil depth           | 10–51 cm                     |

|  |         |
|--|---------|
| Surface fragment cover <=3"                              | 10–35%  |
| Surface fragment cover >3"                               | 0–5%    |
| Calcium carbonate equivalent<br>(0-101.6cm)              | 30–45%  |
| Soil reaction (1:1 water)<br>(0-101.6cm)                 | 7.4–8.8 |
| Subsurface fragment volume <=3"<br>(Depth not specified) | 15–45%  |
| Subsurface fragment volume >3"<br>(Depth not specified)  | 0–5%    |

## Ecological dynamics

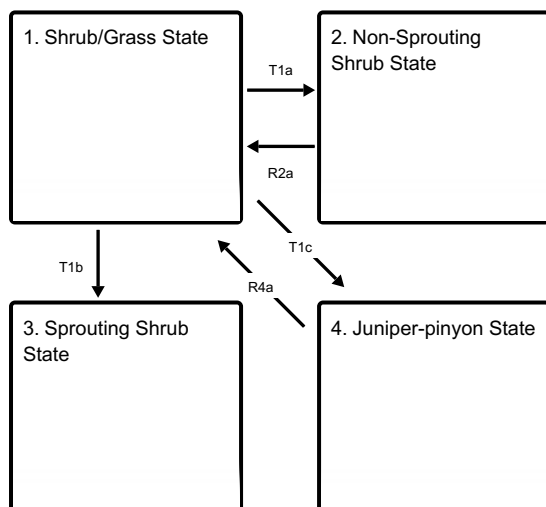
The plant communities found on an ecological site are naturally variable. Composition and production will vary with yearly conditions, location, aspect, and the natural variability of the soils. The Reference Plant Community represents the natural potential plant community found on relict or relatively undisturbed sites. Other plant communities described here represent plant communities that are known to occur when the site is disturbed by factors such as grazing, fire, absence of fire or drought.

Production data provided in this site description is standardized to air-dry weight at the end of the summer growing season. The plant communities described in this site description are based on near normal rainfall years.

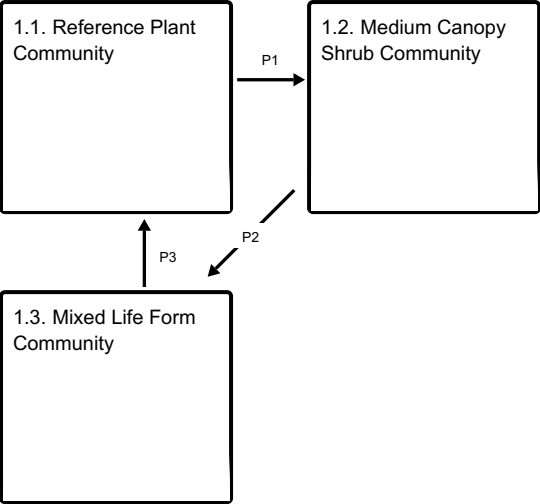
NRCS uses a Similarity Index to compare existing plant communities to the plant communities described here. Similarity Index is determined by comparing the production and composition of a plant community to the production and composition of a plant community described in this site description. To determine Similarity Index, compare the production (air-dry weight) of each species to that shown in the plant community description. For each species, count no more than the maximum amount shown for the species, and for each group, count no more than the maximum 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

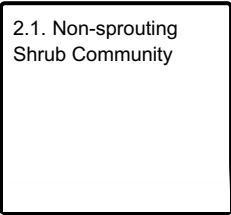
### Ecosystem states



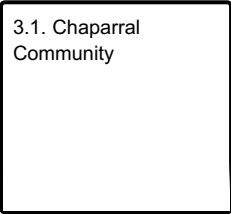
State 1 submodel, plant communities



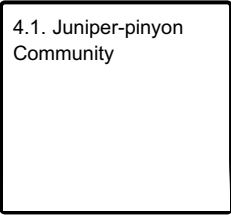
State 2 submodel, plant communities



State 3 submodel, plant communities



State 4 submodel, plant communities



State 1  
Shrub/Grass State

The Shrub/Grass State is the Reference Plant Community. Shrub canopy is 35-45% on all aspects.

Community 1.1  
Reference Plant Community

The Shrub/Grass State is the Reference Plant Community. It is a diverse mixture of perennial grasses, suffrutescent forbs, shrubs, succulents, and scattered trees. A 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 Reference Plant Community. North slopes have a mixture of grass and evergreen chaparral shrubs like turbinella oak, mountain mahogany, and redberry buckthorn. Southern exposures will have a higher percentage of desert shrubs and succulents in the plant community. Shrub canopy is 35-45% on all aspects.

Table 5. Annual production by plant type

| Plant Type      | Low<br>(Kg/Hectare) | Representative Value<br>(Kg/Hectare) | High<br>(Kg/Hectare) |
|-----------------|---------------------|--------------------------------------|----------------------|
| Grass/Grasslike | 224                 | 448                                  | 673                  |
| Shrub/Vine      | 336                 | 482                                  | 527                  |
| Tree            | 45                  | 67                                   | 112                  |
| Forb            | 34                  | 78                                   | 101                  |
| <b>Total</b>    | <b>639</b>          | <b>1075</b>                          | <b>1413</b>          |

**Table 6. Ground cover**

|                                   |        |
|-----------------------------------|--------|
| Tree foliar cover                 | 0-1%   |
| Shrub/vine/liana foliar cover     | 2-4%   |
| Grass/grasslike foliar cover      | 3-6%   |
| Forb foliar cover                 | 0-1%   |
| Non-vascular plants               | 0%     |
| Biological crusts                 | 0-2%   |
| Litter                            | 30-50% |
| Surface fragments >0.25" and <=3" | 15-30% |
| Surface fragments >3"             | 20-25% |
| Bedrock                           | 0%     |
| Water                             | 0%     |
| Bare ground                       | 3-7%   |

**Figure 5. Plant community growth curve (percent production by month).**  
**AZ3812, 38.2 16-20" p.z. all sites. Growth begins in the spring and continues into the summer and fall..**

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 0   | 5   | 5   | 15  | 10  | 10  | 15  | 20  | 10  | 5   | 5   | 0   |

## Community 1.2

### Medium Canopy Shrub Community

Shrubs increase in canopy and density to approximately 45-60% canopy in the absence of fire. Herbaceous species are present in sufficient quantity and are evenly distributed to promote fire intensities sufficient to reduce abundance of shrub species.

## Community 1.3

### Mixed Life Form Community

Juniper or pinyon germinate and are present at densities of 5 to 10 per acre and are still small in size. One-seed or redberry juniper are the juniper species. Tree canopy is approximately 5-10%. Herbaceous production is approximately 700 lbs/ac and fires are effective at killing fire sensitive juniper and pinyon.

## Pathway P1

### Community 1.1 to 1.2

Shrub increase due to length of time between fire events

## Pathway P2

### Community 1.2 to 1.3

Fire

**Pathway P3**  
**Community 1.3 to 1.1**

Time

**State 2**  
**Non-Sprouting Shrub State**

Non sprouting shrubs have increased to 60-80% canopy.

**Community 2.1**  
**Non-sprouting Shrub Community**

Non sprouting shrubs have increased to 60-80% canopy. Cooler aspects are dominated by sotol and minor amounts of turbinella oak. Warmer aspects are dominated by prickly pear, ocotillo, agave, cat claw acacia, and minor amounts of wait a bit. Herbaceous species are less than 100 lbs/ac and are not well distributed on the site.

**State 3**  
**Sprouting Shrub State**

Sprouting shrubs have increased to 60-80% canopy.

**Community 3.1**  
**Chaparral Community**

Turbinella oak has increased to 60-80% canopy in the absence of fire for extended periods of time. Herbaceous species are less than 100 lbs/ac and are not well distributed on the site. A restoration pathway is unlikely from this state given the ability of turbinella oak to withstand substantial fire intensities (Pase 1965) and this species prolific root sprouting ability.

**State 4**  
**Juniper-pinyon State**

Juniper and/or pinyon have increased to 40-50% canopy in the absence of fire for very long periods of time.

**Community 4.1**  
**Juniper-pinyon Community**

Juniper and/or pinyon have increased to 40-50% canopy in the absence of fire for very long periods of time. The dominant juniper is one seed or redberry juniper. Herbaceous species are vigorous and evenly distributed in the interspaces of trees in areas where turbinella oak has not increased in the interspaces. These herbaceous species contribute to recovery of the site without the need for substantial inputs in the form of range planting. Turbinella oak has increased to 20-30% canopy in some areas where pinyon has increased to 40-50% canopy. Herbaceous species are less than 100 lbs/ac and not well distributed on the site. It is unknown if this community can return to the reference plant community. This would only be likely with range planting applied after wildfire.

**Transition T1a**  
**State 1 to 2**

Non-sprouting shrubs like sotol and prickly pear germinate and in the absence of fire for prolonged periods grow to maturity and eventually dominate the site.

**Transition T1b**  
**State 1 to 3**

Sprouting shrubs, primarily turbinella oak that is the dominant shrub on other sites in this Land Resource Unit (16-20" precipitation zone), germinate and in the absence of fire for prolonged periods grow to maturity and eventually dominate the site.

## Transition T1c State 1 to 4

Trees germinate and in the absence of fire for prolonged periods grow to maturity. High densities of perennial grasses can still occupy the interspaces of trees with tree canopy as high as 45-55%. Trees are of sufficient size that most practitioners are unlikely to apply prescribed fire.

## Restoration pathway R2a State 2 to 1

It is unknown if this restoration is possible. Chemical brush management is likely the only alternative to reduce shrub species given the rocky nature of these soils. Range planting would be necessary to restore the herbaceous community if brush management is effective. Range planting would have greater success in this Land Resource Unit due to the higher rainfall this site receives.

## Restoration pathway R4a State 4 to 1

Extreme wildfire is likely the only restoration pathway. Trees have reached such a large size that very high temperatures and wind speeds are needed to allow fires to burn through canopies and top kill non sprouting juniper or pinyon. Very costly mechanical brush management where soils have lower amount of cobbles or boulders and gentler slopes is possible followed by burning of tree skeletons. Perennial grass canopy in the interspaces of trees is > 50% in some areas with existing plants likely providing an adequate seed source for restoration following brush management or fires. Range planting should likely only be considered where perennial grass canopy in the interspaces of trees is less than 25%; however this threshold needs additional investigation.

## Additional community tables

Table 7. Community 1.1 plant community composition

| Group                  | Common Name                         | Symbol | Scientific Name                               | Annual Production<br>(Kg/Hectare) | Foliar Cover<br>(%) |
|------------------------|-------------------------------------|--------|---|-----------------------------------|---------------------|
| <b>Grass/Grasslike</b> |                                     |        |   |                                   |                     |
| 1                      | <b>Dominant Warm Season Grasses</b> |        |   | 90–488                            |                     |
|                        | sideoats grama                      | BOCU   | <i>Bouteloua curtipendula</i>                 | 56–224                            | –                   |
|                        | blue threeawn                       | ARPUN  | <i>Aristida purpurea</i> var. <i>nealleyi</i> | 6–112                             | –                   |
|                        | hairy grama                         | BOHI2  | <i>Bouteloua hirsuta</i>                      | 17–95                             | –                   |
|                        | black grama                         | BOER4  | <i>Bouteloua eriopoda</i>                     | 11–56                             | –                   |
| 2                      | <b>Cool Season Grasses</b>          |        |   | 0–50                              |                     |
|                        | desert needlegrass                  | ACSP12 | <i>Achnatherum speciosum</i>                  | 0–11                              | –                   |
|                        | squirreltail                        | ELEL5  | <i>Elymus elymoides</i>                       | 0–11                              | –                   |
|                        | New Mexico feathergrass             | HENE5  | <i>Hesperostipa neomexicana</i>               | 0–11                              | –                   |
|                        | prairie Junegrass                   | KOMA   | <i>Koeleria macrantha</i>                     | 0–11                              | –                   |
|                        | needle and thread                   | HECO26 | <i>Hesperostipa comata</i>                    | 0–6                               | –                   |
| 3                      | <b>Miscellaneous grasses</b>        |        |   | 6–168                             |                     |
|                        | bullgrass                           | MUEM   | <i>Muhlenbergia emersleyi</i>                 | 0–39                              | –                   |
|                        | curly-mesquite                      | HIBE   | <i>Hilaria belangeri</i>                      | 6–17                              | –                   |
|                        | Arizona threeawn                    | ARAR6  | <i>Aristida arizonica</i>                     | 0–17                              | –                   |
|                        | cane bluestem                       | BOBA3  | <i>Bothriochloa barbinodis</i>                | 1–11                              | –                   |

|             |                            |        |   |        |   |
|-------------|----------------------------|--------|---|--------|---|
|             | green sprangletop          | LEDU   | <i>Leptochloa dubia</i>                         | 1–11   | – |
|             | tanglehead                 | HECO10 | <i>Heteropogon contortus</i>                    | 0–11   | – |
|             | longtongue muhly           | MULO   | <i>Muhlenbergia longiligula</i>                 | 0–11   | – |
|             | slim tridens               | TRMU   | <i>Tridens muticus</i>                          | 0–11   | – |
|             | slim tridens               | TRMUE  | <i>Tridens muticus</i> var. <i>elongatus</i>    | 0–11   | – |
|             | plains lovegrass           | ERIN   | <i>Eragrostis intermedia</i>                    | 0–6    | – |
|             | hairy woollygrass          | ERPI5  | <i>Erioneuron pilosum</i>                       | 0–6    | – |
|             | Fendler threeawn           | ARPUL  | <i>Aristida purpurea</i> var. <i>longiseta</i>  | 0–6    | – |
|             | sand dropseed              | SPCR   | <i>Sporobolus cryptandrus</i>                   | 0–6    | – |
|             | Arizona brome              | BRAR4  | <i>Bromus arizonicus</i>                        | 0–1    | – |
|             | ring muhly                 | MUTO2  | <i>Muhlenbergia torreyi</i>                     | 0–1    | – |
|             | Hall's panicgrass          | PAHA   | <i>Panicum hallii</i>                           | 0–1    | – |
|             | common wolfstail           | LYPH   | <i>Lycurus phleoides</i>                        | 0–1    | – |
| 4           | <b>Annual grasses</b>      |        |   | 0–39   |   |
|             | sixweeks threeawn          | ARAD   | <i>Aristida adscensionis</i>                    | 0–11   | – |
|             | sixweeks fescue            | VUOC   | <i>Vulpia octoflora</i>                         | 0–11   | – |
|             | mucronate sprangletop      | LEPAB  | <i>Leptochloa panicea</i> ssp. <i>brachiata</i> | 0–6    | – |
|             | witchgrass                 | PACA6  | <i>Panicum capillare</i>                        | 0–6    | – |
|             | Mexican panicgrass         | PAHI5  | <i>Panicum hirticaule</i>                       | 0–6    | – |
|             | little barley              | HOPU   | <i>Hordeum pusillum</i>                         | 0–2    | – |
|             | delicate muhly             | MUFR   | <i>Muhlenbergia fragilis</i>                    | 0–1    | – |
| <b>Forb</b> |                            |        |   |        |   |
| 5           | <b>Perennial Forbs</b>     |        |   | 11–140 |   |
|             | variableleaf bushbean      | MAGI2  | <i>Macroptilium gibbosifolium</i>               | 0–45   | – |
|             | desert globemallow         | SPAM2  | <i>Sphaeralcea ambigua</i>                      | 6–22   | – |
|             | brownfoot                  | ACWR5  | <i>Acourtia wrightii</i>                        | 0–17   | – |
|             | white sagebrush            | ARLU   | <i>Artemisia ludoviciana</i>                    | 0–11   | – |
|             | perennial rockcress        | ARPE2  | <i>Arabis perennans</i>                         | 1–11   | – |
|             | cliffbrake                 | PELLA  | <i>Pellaea</i>                                  | 1–11   | – |
|             | trailing windmills         | ALIN   | <i>Allionia incarnata</i>                       | 1–6    | – |
|             | wishbone-bush              | MILAV  | <i>Mirabilis laevis</i> var. <i>villosa</i>     | 0–2    | – |
|             | Colorado four o'clock      | MIMU   | <i>Mirabilis multiflora</i>                     | 0–1    | – |
|             | dwarf Indian mallow        | ABPA3  | <i>Abutilon parvulum</i>                        | 0–1    | – |
|             | aster                      | ASTER  | <i>Aster</i>                                    | 0–1    | – |
|             | mariposa lily              | CALOC  | <i>Calochortus</i>                              | 0–1    | – |
|             | Indian paintbrush          | CASTI2 | <i>Castilleja</i>                               | 0–1    | – |
|             | bastard toadflax           | COUM   | <i>Comandra umbellata</i>                       | 0–1    | – |
|             | bluedicks                  | DICA14 | <i>Dichelostemma capitatum</i>                  | 0–1    | – |
|             | fleabane                   | ERIGE2 | <i>Erigeron</i>                                 | 0–1    | – |
|             | desert trumpet             | ERIN4  | <i>Eriogonum inflatum</i>                       | 0–1    | – |
|             | wild dwarf morning-glory   | EVAR   | <i>Evolvulus arizonicus</i>                     | 0–1    | – |
|             | silver dwarf morning-glory | EVSE   | <i>Evolvulus sericeus</i>                       | 0–1    | – |
|             | southwestern mock vervain  | GLGO   | <i>Glandularia gooddingii</i>                   | 0–1    | – |
|             | tufted globe amaranth      | GOCA   | <i>Gomphrena caespitosa</i>                     | 0–1    | – |



|                   |                             |        |  |        |   |
|-------------------|-----------------------------|--------|--|--------|---|
|                   | Gordon's bladderpod         | LEGO   | <i>Lesquerella gordonii</i>                        | 0–1    | – |
|                   | Chihuahuan flax             | LIVE2  | <i>Linum vernale</i>                               | 0–1    | – |
|                   | brownplume wirelettuce      | STPA4  | <i>Stephanomeria pauciflora</i>                    | 0–1    | – |
|                   | jewels of Opar              | TAPA2  | <i>Talinum paniculatum</i>                         | 0–1    | – |
| 6                 | <b>Annual Forbs</b>         |        |  | 0–56   |   |
|                   | spurge                      | EUPHO  | <i>Euphorbia</i>                                   | 1–17   | – |
|                   | longleaf false goldeneye    | HELOA2 | <i>Heliomeris longifolia</i> var. <i>annua</i>     | 0–11   | – |
|                   | phacelia                    | PHACE  | <i>Phacelia</i>                                    | 0–11   | – |
|                   | bristly fiddleneck          | AMTE3  | <i>Amsinckia tessellata</i>                        | 0–11   | – |
|                   | desert Indianwheat          | PLOV   | <i>Plantago ovata</i>                              | 0–6    | – |
|                   | woolly plantain             | PLPA2  | <i>Plantago patagonica</i>                         | 0–6    | – |
|                   | purslane                    | PORTU  | <i>Portulaca</i>                                   | 0–1    | – |
|                   | Thurber's pepperweed        | LETH2  | <i>Lepidium thurberi</i>                           | 0–1    | – |
|                   | Arizona lupine              | LUAR4  | <i>Lupinus arizonicus</i>                          | 0–1    | – |
|                   | pitseed goosefoot           | CHBE4  | <i>Chenopodium berlandieri</i>                     | 0–1    | – |
|                   | cryptantha                  | CRYPT  | <i>Cryptantha</i>                                  | 0–1    | – |
|                   | dodder                      | CUSCU  | <i>Cuscuta</i>                                     | 0–1    | – |
|                   | American wild carrot        | DAPU3  | <i>Daucus pusillus</i>                             | 0–1    | – |
|                   | flatcrown buckwheat         | ERDE6  | <i>Eriogonum deflexum</i>                          | 0–1    | – |
|                   | New Mexico copperleaf       | ACNE   | <i>Acalypha neomexicana</i>                        | 0–1    | – |
| <b>Shrub/Vine</b> |                             |        |  |        |   |
| 7                 | <b>Evergreen shrubs</b>     |        |  | 11–163 |   |
|                   | Sonoran scrub oak           | QUTU2  | <i>Quercus turbinella</i>                          | 11–106 | – |
|                   | alderleaf mountain mahogany | CEMO2  | <i>Cercocarpus montanus</i>                        | 0–17   | – |
|                   | Palmer oak                  | QUPA10 | <i>Quercus palmeri</i>                             | 0–11   | – |
|                   | redberry buckthorn          | RHCR   | <i>Rhamnus crocea</i>                              | 0–9    | – |
|                   | Mexican cliffrose           | PUME   | <i>Purshia mexicana</i>                            | 0–6    | – |
|                   | desert ceanothus            | CEGR   | <i>Ceanothus greggii</i>                           | 0–6    | – |
|                   | California buckthorn        | FRCAU  | <i>Frangula californica</i> ssp. <i>ursina</i>     | 0–2    | – |
|                   | ashy silktassel             | GAFL2  | <i>Garrya flavescens</i>                           | 0–2    | – |
|                   | Wright's silktassel         | GAWR3  | <i>Garrya wrightii</i>                             | 0–2    | – |
|                   | red barberry                | MAHA4  | <i>Mahonia haematocarpa</i>                        | 0–1    | – |
|                   | Apache plume                | FAPA   | <i>Fallugia paradoxa</i>                           | 0–1    | – |
| 8                 | <b>Large shrubs</b>         |        |  | 6–56   |   |
|                   | catclaw mimosa              | MIACB  | <i>Mimosa aculeaticarpa</i> var. <i>biuncifera</i> | 6–28   | – |
|                   | mariola                     | PAIN2  | <i>Parthenium incanum</i>                          | 0–11   | – |
|                   | skunkbush sumac             | RHTR   | <i>Rhus trilobata</i>                              | 0–7    | – |
|                   | Wright's beebrush           | ALWR   | <i>Aloysia wrightii</i>                            | 0–6    | – |
|                   | stretchberry                | FOPUP  | <i>Forestiera pubescens</i> var. <i>pubescens</i>  | 0–2    | – |
|                   | rockspirea                  | HODU   | <i>Holodiscus dumosus</i>                          | 0–1    | – |
|                   | pale desert-thorn           | LYPA   | <i>Lycium pallidum</i>                             | 0–1    | – |

|             |                              |        |  |        |   |
|-------------|------------------------------|--------|--|--------|---|
|             | Coulter's brickellibush      | BRCO   | <i>Brickellia coulteri</i>                           | 0–1    | – |
|             | Torrey's jointfir            | EPTO   | <i>Ephedra torreyana</i>                             | 0–1    | – |
| 9           | <b>Half shrubs</b>           |        |  | 62–213 |   |
|             | fairyduster                  | CAER   | <i>Calliandra eriophylla</i>                         | 28–112 | – |
|             | featherplume                 | DAFO   | <i>Dalea formosa</i>                                 | 34–45  | – |
|             | littleleaf ratany            | KRER   | <i>Krameria erecta</i>                               | 0–28   | – |
|             | bastardsage                  | ERWR   | <i>Eriogonum wrightii</i>                            | 1–22   | – |
|             | rough menodora               | MESC   | <i>Menodora scabra</i>                               | 0–6    | – |
|             | yerba de pasmo               | BAPT   | <i>Baccharis pteronioides</i>                        | 0–2    | – |
|             | winterfat                    | KRLA2  | <i>Krascheninnikovia lanata</i>                      | 0–1    | – |
| 10          | <b>Succulents</b>            |        |  | 90–426 |   |
|             | common sotol                 | DAWH2  | <i>Dasyliirion wheeleri</i>                          | 56–135 | – |
|             | sacahuista                   | NOMI   | <i>Nolina microcarpa</i>                             | 0–135  | – |
|             | Schott's century plant       | AGSC3  | <i>Agave schottii</i>                                | 11–67  | – |
|             | banana yucca                 | YUBA   | <i>Yucca baccata</i>                                 | 22–56  | – |
|             | cactus apple                 | OPEN3  | <i>Opuntia engelmannii</i>                           | 1–11   | – |
|             | ocotillo                     | FOSP2  | <i>Fouquieria splendens</i>                          | 0–11   | – |
|             | tulip pricklypear            | OPPH   | <i>Opuntia phaeacantha</i>                           | 0–6    | – |
|             | goldenflower century plant   | AGCH2  | <i>Agave chrysantha</i>                              | 0–1    | – |
|             | Parry's agave                | AGPA4  | <i>Agave parryi</i>                                  | 0–1    | – |
|             | crucifixion thorn            | CAHO3  | <i>Canotia holacantha</i>                            | 0–1    | – |
|             | Christmas cactus             | CYLE8  | <i>Cylindropuntia leptocaulis</i>                    | 0–1    | – |
|             | walkingstick cactus          | CYSP8  | <i>Cylindropuntia spinosior</i>                      | 0–1    | – |
|             | Whipple cholla               | CYWH   | <i>Cylindropuntia whipplei</i>                       | 0–1    | – |
|             | Arizona hedgehog cactus      | ECCOA  | <i>Echinocereus coccineus</i> var. <i>arizonicus</i> | 0–1    | – |
|             | Engelmann's hedgehog cactus  | ECEN   | <i>Echinocereus engelmannii</i>                      | 0–1    | – |
|             | candy barrelcactus           | FEWI   | <i>Ferocactus wislizeni</i>                          | 0–1    | – |
| 11          | <b>Increaser half-shrubs</b> |        |  | 6–22   |   |
|             | broom snakeweed              | GUSA2  | <i>Gutierrezia sarothrae</i>                         | 6–22   | – |
|             | turpentine bush              | ERLA12 | <i>Ericameria laricifolia</i>                        | 0–1    | – |
| <b>Tree</b> |                              |        |  |        |   |
| 12          | <b>Trees</b>                 |        |  | 11–135 |   |
|             | redberry juniper             | JUCO11 | <i>Juniperus coahuilensis</i>                        | 11–56  | – |
|             | oneseed juniper              | JUMO   | <i>Juniperus monosperma</i>                          | 11–56  | – |
|             | singleleaf pinyon            | PIMO   | <i>Pinus monophylla</i>                              | 0–56   | – |
|             | twoneedle pinyon             | PIED   | <i>Pinus edulis</i>                                  | 0–28   | – |
|             | alligator juniper            | JUDE2  | <i>Juniperus deppeana</i>                            | 0–22   | – |

## Type locality

|                             |              |
|-----------------------------|--------------|
| Location 1: Gila County, AZ |              |
| Township/Range/Section      | T4N R20E S11 |

|                           |   |
|---------------------------|---|
| General legal description | Popcorn soil location 1,490 feet north and 890 feet west of the southeast corner of Section 11, Township 4N, Range 20E. |
|---------------------------|---|

### Contributors

Dave Womack  
 Larry D. Ellicott

### Approval

Scott Woodall, 9/05/2019

### 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  |                   |
| Approved by                                 |                   |
| 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:**

