

## Ecological site R038XA115AZ Volcanic Upland 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.

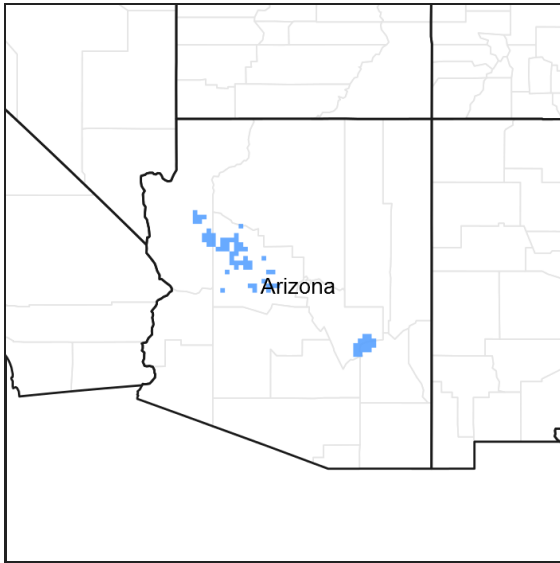


Figure 1. Mapped extent

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): 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.

### Associated sites

|             |                                   |
|-------------|-----------------------------------|
| R038XA102AZ | Clayey Upland 12-16" p.z.         |
| R038XA103AZ | Clay Loam Upland 12-16" p.z.      |
| R038XA117AZ | Volcanic Hills 12-16" p.z. Clayey |

## Similar sites

|             |                             |
|-------------|-----------------------------|
| R038XB213AZ | Volcanic Upland 16-20" p.z. |
|-------------|-----------------------------|

Table 1. Dominant plant species

|            |   |
|------------|---|
| Tree       | Not specified   |
| Shrub      | (1) <i>Eriogonum wrightii</i><br>(2) <i>Opuntia spinosior</i> |
| Herbaceous | (1) <i>Pleuraphis mutica</i><br>(2) <i>Hilaria belangeri</i>  |

## Physiographic features

This site occurs in the lower elevations of the Mogollon Transition zone south of the rim in central Arizona. This site occurs in an upland position. It occurs on gently sloping pediments, basalt flows and mesa tops.

Table 2. Representative physiographic features

|                    |   |
|--------------------|---|
| Landforms          | (1) Pediment<br>(2) Lava flow<br>(3) Mesa |
| Flooding frequency | None                                      |
| Ponding frequency  | None                                      |
| Elevation          | 3,200–4,600 ft                            |
| Slope              | 0–15%                                     |
| Ponding depth      | 0 in                                      |
| Aspect             | Aspect is not a significant factor        |

## Climatic features

Precipitation in this common resource area averages 12 to 16 inches. The winter-summer rainfall ratio ranges from about 60-40% in the northwest portion of the Land Resource Unit to about 50-50% in the southeast region. Summer rains fall July through September 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 northern 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. At the lower elevations, snow seldom persists longer than a day. 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., a thermic temperature regime. Daytime temperatures in summer are commonly in the 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 varies depending upon region, elevation, rain shadow effect, and aspect.

Table 3. Representative climatic features

|                               |          |
|-------------------------------|----------|
| Frost-free period (average)   | 230 days |
| Freeze-free period (average)  | 300 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 deep), clayey throughout and well drained. They are formed in alluvium from basalt, andesite and related volcanic tuff and ash. The surface textures are clayloam and clay. These soils have vertic properties and crack and churn with wetting and drying. The effective rooting depth is limited due to hard bedrock at 20 inches or less. Runoff is slow on dry soils due to cracks and holes, but is high on moist soils. The erosion hazard is slight unless heavy traffic causes trailing and compaction. The soils mapped here include: from SSA-627 Mohave County Southern Part MU Graham-54; SSA-637 Yavapai County Western Part MU's Faraway GrL, StVL-FaC & Venezia StVL-VnD, VsC & VtC; SSA-675 San Carlos IR Area MU Eskiminzin-640; SSA-697 Mohave County Central Part MU's Graham-45, Kingtut-72 & Promontory-72.

Table 4. Representative soil features

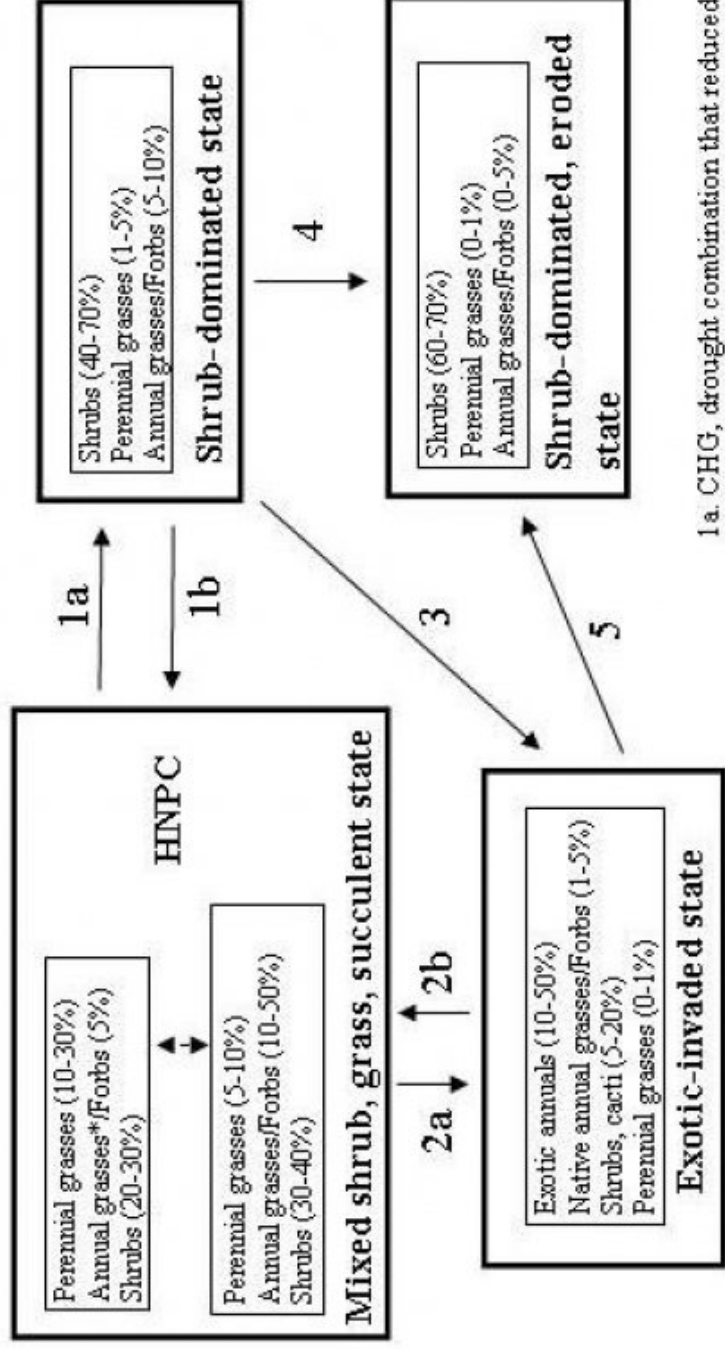
|  |   |
|--|---|
| Parent material  | (1) Alluvium–basalt                                   |
| Surface texture  | (1) Cobbly clay<br>(2) Gravelly clay loam<br>(3) Clay |
| Family particle size                                     | (1) Clayey  |
| Drainage class   | Well drained to moderately well drained               |
| Permeability class                                       | Moderate to slow                                      |
| Soil depth   | 10–20 in  |
| Surface fragment cover <=3"                              | 5–20%   |
| Surface fragment cover >3"                               | 0–10%   |
| Available water capacity<br>(0-40in)                     | 1.2–2.4 in  |
| Calcium carbonate equivalent<br>(0-40in)                 | 1–15%   |
| Electrical conductivity<br>(0-40in)                      | 0–2 mmhos/cm  |
| Sodium adsorption ratio<br>(0-40in)                      | 0–2   |
| Soil reaction (1:1 water)<br>(0-40in)                    | 7–8.2   |
| Subsurface fragment volume <=3"<br>(Depth not specified) | 0–10%   |
| Subsurface fragment volume >3"<br>(Depth not specified)  | 0–5%  |

## Ecological dynamics

The historic native plant community is a mixed shrub, succulent, grass community (tobosa dominated) with a diverse flora of native annual grasses and forbs of both the winter and summer season. Periodic wildfires which burned adjacent sites with deep soils, would not carry easily through these areas with shallow soils and poor fuel continuity. In the absence of fire for longer periods shrubs and cacti can exist in the potential plant community. The interactions of drought, grazing and fire can result in loss of tobosa cover. If tobosa canopy cover is reduced to less than 5% and is patchy in distribution; it may not be able to re-colonize large areas. In these situations, annual species, both native and non-native can dominate the plant community. Non-native annuals may, over time, diminish the soil seed-bank of native annual species.

## State and transition model

# MLRA 38.1 (12-16''), Volcanic Upland



1a. CHG, drought combination that reduced tobosa grass cover.

1b. Herbicide followed by possible seeding of tobosa.

2a. Introduction of seed source, CHG, drought combination.

2b. Unknown

3. Introduction of seed source, El Nino type event, catastrophic fire.

4, 5. Accelerated soil erosion may occur where herbaceous patches are absent. Usually heavy traffic from livestock or vehicles, soil compaction, rilling and loss of surface soil.

\* Annual grasses include natives and non-natives

**State 1**  
**Mixed Shrub-Grass State**

**Community 1.1**  
**Historic Native Plant Community**

The historic native plant community is a shrub, succulent, grass community dominated by tobosa grass with lesser amounts of shrubby buckwheat and cacti. 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 usually left these areas unburned due to lack of fine fuel continuity, shallow soils and rock outcrop.

**Table 5. Annual production by plant type**

| Plant Type      | Low (Lb/Acre) | Representative Value (Lb/Acre) | High (Lb/Acre) |
|-----------------|---------------|--------------------------------|----------------|
| Grass/Grasslike | 170           | 400                            | 720            |
| Shrub/Vine      | 100           | 200                            | 325            |
| Forb            | 2             | 20                             | 265            |
| Tree            | 0             | 5                              | 25             |
| <b>Total</b>    | <b>272</b>    | <b>625</b>                     | <b>1335</b>    |

**Table 6. Soil surface cover**

|                                   |        |
|-----------------------------------|--------|
| Tree basal cover                  | 0-1%   |
| Shrub/vine/liana basal cover      | 1-2%   |
| Grass/grasslike basal cover       | 2-5%   |
| Forb basal cover                  | 0-1%   |
| Non-vascular plants               | 0%     |
| Biological crusts                 | 1-5%   |
| Litter                            | 10-40% |
| Surface fragments >0.25" and <=3" | 25-50% |
| Surface fragments >3"             | 5-15%  |
| Bedrock                           | 1-10%  |
| Water                             | 0%     |
| Bare ground                       | 5-55%  |

**Table 7. Canopy structure (% cover)**

| Height Above Ground (Ft) | Tree | Shrub/Vine | Grass/<br>Grasslike | Forb  |
|--------------------------|------|------------|---------------------|-------|
| <0.5                     | –    | 1-5%       | 1-10%               | 0-5%  |
| >0.5 <= 1                | –    | 5-10%      | 1-10%               | 1-10% |
| >1 <= 2                  | –    | 1-5%       | 15-30%              | 0-5%  |
| >2 <= 4.5                | –    | 5-10%      | 0-1%                | –     |
| >4.5 <= 13               | 0-1% | 0-5%       | –                   | –     |
| >13 <= 40                | 0-2% | –          | –                   | –     |
| >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   |

## State 2 Shrub Dominated State

### Community 2.1 Shrub Dominated Plant Community

Tobosa canopy cover is reduced due to the interactions of drought, grazing and / or fire. Shrubs, cacti and annual forbs and grasses dominate the plant community. Tobosa canopy cover is less than 5% and patchy in distribution. Tobosa may not be able to re-colonize large areas because of very poor seed production and no seed-bank. Vertic soil properties maintain good, surface, soil tilth and good infiltration rates when soils are dry. Plant production is high, even with the lack of perennial grass cover, due to soil cracking.

## State 3 Exotic Invaded State

### Community 3.1 Exotic Forb and Grass Plant Community

Non-native annual grasses and forbs like; red brome, cheatgrass, tumble mustard, wild oats and filaree, can invade and dominate areas of the site with very low tobosa cover. 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.

## State 4 Shrub Dominated, Eroded state

### Community 4.1 Shrub Dominated, Eroded Plant Community

Shrubs like; whitethorn acacia, mesquite, wait a bit mimosa and catclaw acacia; and succulents like; prickly pear, cholla and banana yucca increase to dominate the site. Tobosa cannot re-colonize large areas with low canopy cover levels and patchy distribution. Heavy livestock or vehicle traffic causes soil compaction, rilling and loss of soil surface.

## Additional community tables

Table 8. Community 1.1 plant community composition

| Group                  | Common Name                            | Symbol | Scientific Name                          | Annual Production (Lb/Acre) | Foliar Cover (%) |
|------------------------|--|--------|--|-----------------------------|------------------|
| <b>Grass/Grasslike</b> |  |        |  |                             |                  |
| 1                      | <b>Dominant mid grasses</b>            |        |  | 150–300                     |                  |
|                        | tobosagrass                            | PLMU3  | <i>Pleuraphis mutica</i>                 | 150–300                     | –                |
| 2                      | <b>Cool season grasses</b>             |        |  | 2–20                        |                  |
|                        | squirreltail                           | ELEL5  | <i>Elymus elymoides</i>                  | 2–20                        | –                |
| 3                      | <b>Miscellaneous perennial grasses</b> |        |  | 10–200                      |                  |
|                        | curly-mesquite                         | HIBE   | <i>Hilaria belangeri</i>                 | 10–100                      | –                |
|                        | cane bluestem                          | BOBA3  | <i>Bothriochloa barbinodis</i>           | 1–50                        | –                |
|                        | sideoats grama                         | BOCU   | <i>Bouteloua curtipendula</i>            | 10–50                       | –                |
|                        | black grama                            | BOER4  | <i>Bouteloua eriopoda</i>                | 1–50                        | –                |
|                        | blue grama                             | BOGR2  | <i>Bouteloua gracilis</i>                | 0–50                        | –                |
|                        | hairy grama                            | BOHI2  | <i>Bouteloua hirsuta</i>                 | 0–50                        | –                |
|                        | spidergrass                            | ARTE3  | <i>Aristida ternipes</i>                 | 5–50                        | –                |
|                        | vine mesquite                          | PAOB   | <i>Panicum obtusum</i>                   | 0–50                        | –                |
|                        | tanglehead                             | HECO10 | <i>Heteropogon contortus</i>             | 0–20                        | –                |
|                        | slender grama                          | BORE2  | <i>Bouteloua repens</i>                  | 0–20                        | –                |
|                        | purple threeawn                        | ARPU9  | <i>Aristida purpurea</i>                 | 0–10                        | –                |
|                        | Fendler threeawn                       | ARPUL  | <i>Aristida purpurea var. longiseta</i>  | 0–10                        | –                |
|                        | Parish's threeawn                      | ARPUP5 | <i>Aristida purpurea var. parishii</i>   | 0–10                        | –                |
|                        | spidergrass                            | ARTEG  | <i>Aristida ternipes var. gentilis</i>   | 0–10                        | –                |
|                        | plains lovegrass                       | ERIN   | <i>Eragrostis intermedia</i>             | 0–2                         | –                |
|                        | green sprangletop                      | LEDU   | <i>Leptochloa dubia</i>                  | 0–2                         | –                |
| 4                      | <b>Annual grasses</b>                  |        |  | 5–200                       |                  |
|                        | mucronate sprangletop                  | LEPAB  | <i>Leptochloa panicea ssp. brachiata</i> | 1–150                       | –                |
|                        | little barley                          | HOPU   | <i>Hordeum pusillum</i>                  | 0–100                       | –                |
|                        | Mexican panicgrass                     | PAHI5  | <i>Panicum hirticaule</i>                | 0–50                        | –                |
|                        | sixweeks threeawn                      | ARAD   | <i>Aristida adscensionis</i>             | 0–50                        | –                |
|                        | Arizona signalgrass                    | URAR   | <i>Urochloa arizonica</i>                | 0–25                        | –                |
|                        | prairie threeawn                       | AROL   | <i>Aristida oligantha</i>                | 0–20                        | –                |
|                        | needle grama                           | BOAR   | <i>Bouteloua aristidoides</i>            | 0–20                        | –                |
|                        | Mexican sprangletop                    | LEFUU  | <i>Leptochloa fusca ssp. uninervia</i>   | 0–10                        | –                |
|                        | sixweeks fescue                        | VUOC   | <i>Vulpia octoflora</i>                  | 0–10                        | –                |
|                        | witchgrass                             | PACA6  | <i>Panicum capillare</i>                 | 0–10                        | –                |
|                        | feather fingergrass                    | CHVI4  | <i>Chloris virgata</i>                   | 0–5                         | –                |
|                        | small fescue                           | VUMI   | <i>Vulpia microstachys</i>               | 0–5                         | –                |
|                        | Eastwood fescue                        | VUMIC  | <i>Vulpia microstachys var. ciliata</i>  | 0–5                         | –                |
|                        | sticky sprangletop                     | LEVI5  | <i>Leptochloa viscida</i>                | 0–5                         | –                |
|                        | sixweeks grama                         | BOBA2  | <i>Bouteloua barbata</i>                 | 0–5                         | –                |
|                        | Arizona brome                          | BRAR4  | <i>Bromus arizonicus</i>                 | 0–2                         | –                |
|                        | delicate muhly                         | MUFR   | <i>Muhlenbergia fragilis</i>             | 0–2                         | –                |

|  |                     |       |   |     |   |
|--|---------------------|-------|---|-----|---|
|  | littleseed muhly    | MUMI  | <i>Muhlenbergia microsperma</i>                       | 0-2 | - |
|  | Bigelow's bluegrass | POBI  | <i>Poa bigelovii</i>                                  | 0-2 | - |
|  | canyon cupgrass     | ERLE7 | <i>Eriochloa lemmonii</i>                             | 0-2 | - |
|  | tufted lovegrass    | ERPE  | <i>Eragrostis pectinacea</i>                          | 0-2 | - |
|  | desert lovegrass    | ERPEM | <i>Eragrostis pectinacea</i> var.<br><i>miserrima</i> | 0-2 | - |

### Forb

|   |                          |        |  |      |   |
|---|--------------------------|--------|--|------|---|
| 5 | <b>Perennial forbs</b>   |        |  | 1-15 |   |
|   | wealeaf bur ragweed      | AMCO3  | <i>Ambrosia confertiflora</i>                    | 1-10 | - |
|   | largeflower onion        | ALMA4  | <i>Allium macropetalum</i>                       | 0-5  | - |
|   | bluedicks                | DICA14 | <i>Dichelostemma capitatum</i>                   | 1-5  | - |
|   | Indian rushpea           | HOGL2  | <i>Hoffmannseggia glauca</i>                     | 1-2  | - |
|   | desert globemallow       | SPAM2  | <i>Sphaeralcea ambigua</i>                       | 0-2  | - |
|   | brownplume wirelettuce   | STPA4  | <i>Stephanomeria pauciflora</i>                  | 0-2  | - |
|   | Louisiana vetch          | VILUL2 | <i>Vicia ludoviciana</i> ssp. <i>ludoviciana</i> | 0-2  | - |
|   | perennial rockcross      | ARPE2  | <i>Arabis perennans</i>                          | 0-2  | - |
|   | Watson's dutchman's pipe | ARWA   | <i>Aristolochia watsonii</i>                     | 0-1  | - |
|   | scarlet spiderling       | BOCO   | <i>Boerhavia coccinea</i>                        | 0-1  | - |
|   | Arizona wrightwort       | CAAR7  | <i>Carlowrightia arizonica</i>                   | 0-1  | - |
|   | desert mariposa lily     | CAKE   | <i>Calochortus kennedyi</i>                      | 0-1  | - |
|   | sego lily                | CANU3  | <i>Calochortus nuttallii</i>                     | 0-1  | - |
|   | Indian paintbrush        | CAST12 | <i>Castilleja</i>                                | 0-1  | - |
|   | lipfern                  | CHEIL  | <i>Cheilanthes</i>                               | 0-1  | - |
|   | rose heath               | CHER2  | <i>Chaetopappa ericoides</i>                     | 0-1  | - |
|   | dwarf desertpeony        | ACNA2  | <i>Acourtia nana</i>                             | 0-1  | - |
|   | brownfoot                | ACWR5  | <i>Acourtia wrightii</i>                         | 0-1  | - |
|   | trailing windmills       | ALIN   | <i>Allionia incarnata</i>                        | 0-1  | - |
|   | tuber anemone            | ANTU   | <i>Anemone tuberosa</i>                          | 0-1  | - |
|   | white sagebrush          | ARLU   | <i>Artemisia ludoviciana</i>                     | 0-1  | - |
|   | branched noseburn        | TRRA5  | <i>Tragia ramosa</i>                             | 0-1  | - |
|   | longflower tube tongue   | JULO3  | <i>Justicia longii</i>                           | 0-1  | - |
|   | Wright's deervetch       | LOWR   | <i>Lotus wrightii</i>                            | 0-1  | - |
|   | plains blackfoot         | MELE2  | <i>Melampodium leucanthum</i>                    | 0-1  | - |
|   | wishbone-bush            | MILAV  | <i>Mirabilis laevis</i> var. <i>villosa</i>      | 0-1  | - |
|   | tufted evening primrose  | OECA10 | <i>Oenothera caespitosa</i>                      | 0-1  | - |
|   | cliffbrake               | PELLA  | <i>Pellaea</i>                                   | 0-1  | - |
|   | Parry's beardtongue      | PEPA24 | <i>Penstemon parryi</i>                          | 0-1  | - |
|   | slimleaf bean            | PHAN3  | <i>Phaseolus angustissimus</i>                   | 0-1  | - |
|   | orange fameflower        | PHAU13 | <i>Phemeranthus aurantiacus</i>                  | 0-1  | - |
|   | canaigre dock            | RUHY   | <i>Rumex hymenosepalus</i>                       | 0-1  | - |
|   | twinleaf senna           | SEBA3  | <i>Senna bauhinioides</i>                        | 0-1  | - |
|   | Coues' cassia            | SECO10 | <i>Senna covesii</i>                             | 0-1  | - |
|   | New Mexico fanpetals     | SINE   | <i>Sida neomexicana</i>                          | 0-1  | - |
|   | silverleaf nightshade    | SOEL   | <i>Solanum elaeagnifolium</i>                    | 0-1  | - |



|   |                             |        |  |       |   |
|---|-----------------------------|--------|--|-------|---|
|   | whitestem goldenbush        | ERD114 | <i>Ericameria discoidea</i>                          | 0–1   | – |
|   | beeblossom                  | GAURA  | <i>Gaura</i>   | 0–1   | – |
|   | southwestern mock vervain   | GLGO   | <i>Glandularia gooddingii</i>                        | 0–1   | – |
|   | desert rosemallow           | HICO   | <i>Hibiscus coulteri</i>                             | 0–1   | – |
|   | whitemouth dayflower        | COER   | <i>Commelina erecta</i>                              | 0–1   | – |
|   | Cooley's bundleflower       | DECO2  | <i>Desmanthus cooleyi</i>                            | 0–1   | – |
| 6 | <b>Annual forbs</b>         |        |  | 1–250 |   |
|   | Coulter's spiderling        | BOCO2  | <i>Boerhavia coulteri</i>                            | 0–25  | – |
|   | California poppy            | ESCAM  | <i>Eschscholzia californica</i> ssp. <i>mexicana</i> | 0–25  | – |
|   | longleaf false goldeneye    | HELOA2 | <i>Helioomeris longifolia</i> var. <i>annua</i>      | 0–25  | – |
|   | Arizona popcornflower       | PLAR   | <i>Plagiobothrys arizonicus</i>                      | 1–25  | – |
|   | western tansymustard        | DEPI   | <i>Descurainia pinnata</i>                           | 0–15  | – |
|   | bristly fiddleneck          | AMTE3  | <i>Amsinckia tessellata</i>                          | 0–15  | – |
|   | sensitive partridge pea     | CHNI2  | <i>Chamaecrista nictitans</i>                        | 0–10  | – |
|   | Coulter's lupine            | LUSP2  | <i>Lupinus sparsiflorus</i>                          | 0–10  | – |
|   | thelypody                   | THELY  | <i>Thelypodium</i>                                   | 0–10  | – |
|   | woolly tidentromia          | TILA2  | <i>Tidentromia lanuginosa</i>                        | 0–5   | – |
|   | spreading fanpetals         | SIAB   | <i>Sida abutifolia</i>                               | 0–5   | – |
|   | manybristle chinchweed      | PEPA2  | <i>Pectis papposa</i>                                | 0–5   | – |
|   | phacelia                    | PHACE  | <i>Phacelia</i>                                      | 0–5   | – |
|   | creamcups                   | PLCA5  | <i>Platystemon californicus</i>                      | 0–5   | – |
|   | desert Indianwheat          | PLOV   | <i>Plantago ovata</i>                                | 1–5   | – |
|   | slender goldenweed          | MAGR10 | <i>Machaeranthera gracilis</i>                       | 0–5   | – |
|   | tanseyleaf tansyaster       | MATA2  | <i>Machaeranthera tanacetifolia</i>                  | 0–5   | – |
|   | miniature lupine            | LUBI   | <i>Lupinus bicolor</i>                               | 0–5   | – |
|   | pitseed goosefoot           | CHBE4  | <i>Chenopodium berlandieri</i>                       | 0–5   | – |
|   | shaggyfruit pepperweed      | LELA   | <i>Lepidium lasiocarpum</i>                          | 0–5   | – |
|   | Thurber's pepperweed        | LETH2  | <i>Lepidium thurberi</i>                             | 0–5   | – |
|   | foothill deervetch          | LOHU2  | <i>Lotus humistratus</i>                             | 0–5   | – |
|   | coastal bird's-foot trefoil | LOSA   | <i>Lotus salsuginosus</i>                            | 0–5   | – |
|   | crestrub morning-glory      | IPCO2  | <i>Ipomoea costellata</i>                            | 0–5   | – |
|   | cryptantha                  | CRYPT  | <i>Cryptantha</i>                                    | 0–5   | – |
|   | Arizona poppy               | KAGR   | <i>Kallstroemia grandiflora</i>                      | 0–5   | – |
|   | New Mexico thistle          | CINE   | <i>Cirsium neomexicanum</i>                          | 0–5   | – |
|   | miner's lettuce             | CLPEP  | <i>Claytonia perfoliata</i> ssp. <i>perfoliata</i>   | 0–5   | – |
|   | fivewing spiderling         | BOIN   | <i>Boerhavia intermedia</i>                          | 0–5   | – |
|   | fringed redmaids            | CACI2  | <i>Calandrinia ciliata</i>                           | 0–5   | – |
|   | exserted Indian paintbrush  | CAEXE  | <i>Castilleja exserta</i> ssp. <i>exserta</i>        | 0–5   | – |
|   | milkvetch                   | ASTRA  | <i>Astragalus</i>                                    | 0–5   | – |
|   | carelessweed                | AMPA   | <i>Amaranthus palmeri</i>                            | 0–5   | – |
|   | hoary bowlesia              | BOIN3  | <i>Bowlesia incana</i>                               | 0–2   | – |
|   | scrambled eggs              | COAU2  | <i>Corydalis aurea</i>                               | 0–2   | – |
|   | wedgeleaf draba             | DRCU   | <i>Draba cuneifolia</i>                              | 0–2   | – |

|  |                           |        |                                 |     |   |
|--|---------------------------|--------|---------------------------------|-----|---|
|  | miniature woollystar      | ERDI2  | <i>Eriastrum diffusum</i>       | 0–2 | – |
|  | American wild carrot      | DAPU3  | <i>Daucus pusillus</i>          | 0–2 | – |
|  | sacred thorn-apple        | DAWR2  | <i>Datura wrightii</i>          | 0–2 | – |
|  | Arizona lupine            | LUAR4  | <i>Lupinus arizonicus</i>       | 0–2 | – |
|  | Goodding's bladderpod     | LEGO2  | <i>Lesquerella gooddingii</i>   | 0–2 | – |
|  | hollowleaf annual lupine  | LUSU3  | <i>Lupinus succulentus</i>      | 0–2 | – |
|  | desert evening primrose   | OEPR   | <i>Oenothera primiveris</i>     | 0–2 | – |
|  | woolly plantain           | PLPA2  | <i>Plantago patagonica</i>      | 0–2 | – |
|  | purslane                  | PORTU  | <i>Portulaca</i>                | 0–2 | – |
|  | New Mexico plumeseed      | RANE   | <i>Rafinesquia neomexicana</i>  | 0–2 | – |
|  | sleepy silene             | SIAN2  | <i>Silene antirrhina</i>        | 0–2 | – |
|  | sand fringe-pod           | THCU   | <i>Thysanocarpus curvipes</i>   | 0–1 | – |
|  | sawtooth sage             | SASU7  | <i>Salvia subincisa</i>         | 0–1 | – |
|  | desert unicorn-plant      | PRAL4  | <i>Proboscidea althaeifolia</i> | 0–1 | – |
|  | doubleclaw                | PRPA2  | <i>Proboscidea parviflora</i>   | 0–1 | – |
|  | Florida pellitory         | PAFL3  | <i>Parietaria floridana</i>     | 0–1 | – |
|  | green carpetweed          | MOVE   | <i>Mollugo verticillata</i>     | 0–1 | – |
|  | Fendler's desertdandelion | MAFE   | <i>Malacothrix fendleri</i>     | 0–1 | – |
|  | warty caltrop             | KAPA   | <i>Kallstroemia parviflora</i>  | 0–1 | – |
|  | California goldfields     | LACA7  | <i>Lasthenia californica</i>    | 0–1 | – |
|  | redstar                   | IPCO3  | <i>Ipomoea coccinea</i>         | 0–1 | – |
|  | ivyleaf morning-glory     | IPHE   | <i>Ipomoea hederacea</i>        | 0–1 | – |
|  | sorrel buckwheat          | ERPO4  | <i>Eriogonum polycladon</i>     | 0–1 | – |
|  | Texas stork's bill        | ERTE13 | <i>Erodium texanum</i>          | 0–1 | – |
|  | Mexican fireplant         | EUHE4  | <i>Euphorbia heterophylla</i>   | 0–1 | – |
|  | spurge                    | EUPHO  | <i>Euphorbia</i>                | 0–1 | – |
|  | star gilia                | GIST   | <i>Gilia stellata</i>           | 0–1 | – |
|  | five eyes                 | CHAMA8 | <i>Chamaesaracha</i>            | 0–1 | – |
|  | annual agoseris           | AGHE2  | <i>Agoseris heterophylla</i>    | 0–1 | – |

#### Shrub/Vine

|   |                        |       |   |       |   |
|---|------------------------|-------|---|-------|---|
| 7 | <b>Shrubs</b>          |       |   | 15–75 |   |
|   | catclaw acacia         | ACGR  | <i>Acacia greggii</i>                                 | 10–35 | – |
|   | Sonoran scrub oak      | QUTU2 | <i>Quercus turbinella</i>                             | 0–10  | – |
|   | spiny hackberry        | CEEH  | <i>Celtis ehrenbergiana</i>                           | 0–5   | – |
|   | catclaw mimosa         | MIACB | <i>Mimosa aculeaticarpa</i> var.<br><i>biuncifera</i> | 0–5   | – |
|   | blue paloverde         | PAFL6 | <i>Parkinsonia florida</i>                            | 0–5   | – |
|   | western honey mesquite | PRGLT | <i>Prosopis glandulosa</i> var. <i>torreyana</i>      | 0–5   | – |
|   | velvet mesquite        | PRVE  | <i>Prosopis velutina</i>                              | 0–5   | – |
|   | fourwing saltbush      | ATCA2 | <i>Atriplex canescens</i>                             | 0–5   | – |
|   | whitethorn acacia      | ACCO2 | <i>Acacia constricta</i>                              | 0–5   | – |
|   | jojoba                 | SICH  | <i>Simmondsia chinensis</i>                           | 0–5   | – |
|   | lotebush               | ZIOBC | <i>Ziziphus obtusifolia</i> var. <i>canescens</i>     | 0–2   | – |
|   | Berlandier's wolfberry | LYBE  | <i>Lycium berlandieri</i>                             | 0–2   | – |

|             |                             |        |                                    |        |   |
|-------------|-----------------------------|--------|------------------------------------|--------|---|
|             | pale desert-thorn           | LYPA   | <i>Lycium pallidum</i>             | 0–2    | – |
|             | red barberry                | MAHA4  | <i>Mahonia haematocarpa</i>        | 0–2    | – |
|             | algerita                    | MATR3  | <i>Mahonia trifoliolata</i>        | 0–2    | – |
|             | littleleaf sumac            | RHMI3  | <i>Rhus microphylla</i>            | 0–2    | – |
|             | skunkbush sumac             | RHTR   | <i>Rhus trilobata</i>              | 0–1    | – |
|             | desert sweet                | CHMI2  | <i>Chamaebatiaria millefolium</i>  | 0–1    | – |
|             | California brickellbush     | BRCA3  | <i>Brickellia californica</i>      | 0–1    | – |
| 8           | <b>Half shrubs</b>          |        |                                    | 50–150 |   |
|             | bastardsage                 | ERWR   | <i>Eriogonum wrightii</i>          | 10–60  | – |
|             | winterfat                   | KRLA2  | <i>Krascheninnikovia lanata</i>    | 0–15   | – |
|             | littleleaf ratany           | KRER   | <i>Krameria erecta</i>             | 0–10   | – |
|             | broom snakeweed             | GUSA2  | <i>Gutierrezia sarothrae</i>       | 0–10   | – |
|             | fairyduster                 | CAER   | <i>Calliandra eriophylla</i>       | 0–10   | – |
|             | rough menodora              | MESC   | <i>Menodora scabra</i>             | 0–5    | – |
|             | burroweed                   | ISTE2  | <i>Isocoma tenuisecta</i>          | 0–1    | – |
|             | turpentine bush             | ERLA12 | <i>Ericameria laricifolia</i>      | 0–1    | – |
|             | threadleaf snakeweed        | GUMI   | <i>Gutierrezia microcephala</i>    | 0–1    | – |
|             | pelotazo                    | ABIN   | <i>Abutilon incanum</i>            | 0–1    | – |
|             | yerba de pasmo              | BAPT   | <i>Baccharis pteronioides</i>      | 0–1    | – |
| 9           | <b>Succulents</b>           |        |                                    | 25–100 |   |
|             | walkingstick cactus         | CYSP8  | <i>Cylindropuntia spinosior</i>    | 5–50   | – |
|             | cactus apple                | OPEN3  | <i>Opuntia engelmannii</i>         | 10–50  | – |
|             | banana yucca                | YUBA   | <i>Yucca baccata</i>               | 1–15   | – |
|             | tulip pricklypear           | OPPH   | <i>Opuntia phaeacantha</i>         | 1–10   | – |
|             | Christmas cactus            | CYLE8  | <i>Cylindropuntia leptocaulis</i>  | 0–10   | – |
|             | Schott's century plant      | AGSC3  | <i>Agave schottii</i>              | 0–5    | – |
|             | sacahuista                  | NOMI   | <i>Nolina microcarpa</i>           | 0–5    | – |
|             | candy barrelcactus          | FEWI   | <i>Ferocactus wislizeni</i>        | 0–2    | – |
|             | goldenflower century plant  | AGCH2  | <i>Agave chrysantha</i>            | 0–2    | – |
|             | dollarjoint pricklypear     | OPCH   | <i>Opuntia chlorotica</i>          | 0–2    | – |
|             | soaptree yucca              | YUEL   | <i>Yucca elata</i>                 | 0–1    | – |
|             | Palmer's century plant      | AGPA3  | <i>Agave palmeri</i>               | 0–1    | – |
|             | buck-horn cholla            | CYAC8  | <i>Cylindropuntia acanthocarpa</i> | 0–1    | – |
|             | Whipple cholla              | CYWH   | <i>Cylindropuntia whipplei</i>     | 0–1    | – |
|             | common sotol                | DAWH2  | <i>Dasylirion wheeleri</i>         | 0–1    | – |
|             | pinkflower hedgehog cactus  | ECBO2  | <i>Echinocereus bonkerae</i>       | 0–1    | – |
|             | Engelmann's hedgehog cactus | ECEN   | <i>Echinocereus engelmannii</i>    | 0–1    | – |
|             | pinkflower hedgehog cactus  | ECFA   | <i>Echinocereus fasciculatus</i>   | 0–1    | – |
|             | spiny star                  | ESVI2  | <i>Escobaria vivipara</i>          | 0–1    | – |
| <b>Tree</b> |                             |        |                                    |        |   |
| 10          | <b>Trees</b>                |        |                                    | 0–25   |   |
|             | oneseed juniper             | JUMO   | <i>Juniperus monosperma</i>        | 0–20   | – |
|             | Utah juniper                | JUOS   | <i>Juniperus osteosperma</i>       | 0–20   | – |

|  |                   |        |                               |      |   |
|--|-------------------|--------|-------------------------------|------|---|
|  | redberry juniper  | JUCO11 | <i>Juniperus coahuilensis</i> | 0–20 | – |
|  | alligator juniper | JUDE2  | <i>Juniperus deppeana</i>     | 0–5  | – |
|  | twoneedle pinyon  | PIED   | <i>Pinus edulis</i>           | 0–5  | – |
|  | crucifixion thorn | CAHO3  | <i>Canotia holacantha</i>     | 0–5  | – |

## Animal community

This site is suitable for grazing year round and is traversed by all classes of livestock. Very stony and cobbly surfaces can hinder livestock movement. The site is susceptible to erosion only in overgrazed areas, old roads, cattle trails and concentration areas like bed grounds, water-lots and salt grounds.

This site has good habitat diversity for a variety of desert and grassland wildlife species.

## Hydrological functions

Due to soil cracking and high gravel, rock covers (producing rough surfaces), this site has high, initial, infiltration rates. It produces runoff when rain falls or snow melts, and the soils are moist.

## Recreational uses

Climate is characterized by warm summers and cold winters. Recreation activities include hunting, hiking, camping, photography, bird watching and backpacking.

## Wood products

There are no significant wood products produced on this site.

## Other products

There is some native harvest of food plants like wild onions, grassnuts, prickly pear and cholla fruits and thistle. Clay for pot making. Malapai rock for building.

## Type locality

|                               |                          |
|-------------------------------|--------------------------|
| Location 1: Graham County, AZ |                          |
| Township/Range/Section        | T8S R22E S18             |
| General legal description     | On Eureka Springs ranch. |

## Contributors

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## 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):**

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

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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:**
-