

# Ecological site R041XC319AZ Sandy Loam 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.

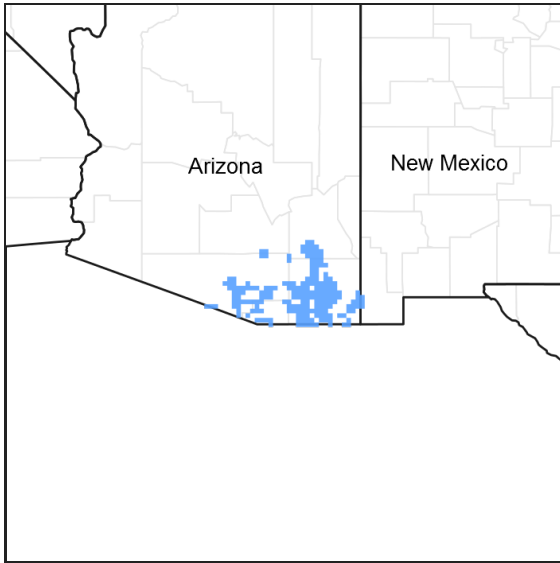


Figure 1. Mapped extent

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): 041X–Madrean Archipelago

Major Land Resource Area (MLRA) 41 represents the most northern extent of the Sierra Madre Occidental, or in English, the “mother mountains of the west.” The Sierra Madre Occidental is a massive, rugged mountain system that runs northwest from the Rio Grande de Santiago, in the state of Jalisco, Mexico, through the states of Sonora and Chihuahua, and ending in Arizona and New Mexico. Through Mexico, this mountain system runs parallel to the Pacific coast and, as it crosses into the United States and confronts the tectonic folding and rifting of the Basin and Range Physiographic Province, the land mass geographically breaks into smaller, isolated mountain ranges, called “sky islands.” The centralizing theme for this MLRA can be summed up as a series of inland islands extending from their mainland, the Sierra Madre Occidental, surrounded by a sea of desert grassland. To the west, the Madrean Archipelago bounds the Sonoran Basin and Range where several sky islands in southern Arizona grade into Sonoran Desert basins; to the north it bounds the contiguous mountains and geology of the Mogollon Transition area; and to the east, in New Mexico, it bounds the geology of the Rio Grande Rift. MLRA 41 is primarily a rangeland subdivision with small amounts of irrigated cropland. It encompasses approximately 13M acres.

## LRU notes

Land Resource Unit 41-3, Southern Arizona Semidesert Grassland. Elevations range from 3200 to 5000 feet and precipitation ranges from 12 to 16 inches per year. Vegetation includes mesquite, catclaw acacia, netleaf hackberry, palo verde, false mesquite, range ratany, fourwing saltbush, tarbush, littleleaf sumac, sideoats grama, black grama,

plains lovegrass, cane beardgrass, tobosa, vine mesquite, threeawns, Arizona cottontop and bush muhly. The soil temperature regime is thermic and the soil moisture regime is ustic aridic.

## Classification relationships

USDA-NRCS Land Resource Regions and Major Land Resource Areas of the United States, the Caribbean, and the Pacific Basin: Western Range and Irrigated Region D; Major Land Resource Area 41, Southeastern Arizona Basin and Range; Land Resource Unit 41-3, Semi-Desert Grassland; Ecological Site Sandy Loam Upland, 12"-16" p.z.

U.S. Environmental Protection Agency, Ecological Regions of North America: Level I, Region 12, Southern Semi-Arid Highlands; Level II, 12.1 Western Sierra Madre Piedmont, Level III, Ecoregion 79 Madrean Archipelago, 79a, Apachian Valleys and Low Hills.

USDA-USFS Ecological Subregions: Sections of the Conterminous United States: Section 321 Basin and Range; Section 321A, Basin and Range Section.

## Ecological site concept

Sandy Loam Upland, 12"-16" p.z., ecological site is found on gently sloping uplands with deep soils. An argillic horizon is below 4"-16" of sandy loam textured soils. While surface soils are non-calcareous (upper 10 inches), calcic horizons may be found below the argillic horizon.

## Associated sites

|             |                             |
|-------------|-----------------------------|
| R041XC308AZ | Limy Slopes 12-16" p.z.     |
| R041XC313AZ | Loamy Upland 12"-16" p.z.   |
| R041XC318AZ | Sandy Loam 12-16" p.z. Deep |

## Similar sites

|             |                               |
|-------------|-------------------------------|
| R041XA110AZ | Sandy Loam Upland 16-20" p.z. |
| R040XA116AZ | Sandy Upland 10"-13" p.z.     |

Table 1. Dominant plant species

|            |                                                                    |
|------------|--------------------------------------------------------------------|
| Tree       | Not specified                                                      |
| Shrub      | (1) <i>erigonum wrightii</i><br>(2) <i>calliandra eriophylla</i>   |
| Herbaceous | (1) <i>bouteloua eriopoda</i><br>(2) <i>bouteloua curtipendula</i> |

## Physiographic features

This site occurs in the middle elevations of the Madrean Basin and Range province in southeastern Arizona. It occurs on fan terraces and old stream terraces. It is always in an upland position.

Table 2. Representative physiographic features

|                    |                                              |
|--------------------|----------------------------------------------|
| Landforms          | (1) Terrace<br>(2) Fan piedmont<br>(3) Plain |
| Flooding frequency | None                                         |
| Ponding frequency  | None                                         |
| Elevation          | 3,300–5,000 ft                               |

|        |                                    |
|--------|------------------------------------|
| Slope  | 1–8%                               |
| Aspect | Aspect is not a significant factor |

## Climatic features

Precipitation in this land resource unit ranges from 12-16 inches yearly in the eastern part with elevations from 3600-5000 feet, and 13-17 inches in the western part where elevations are 3300-4500 feet. Winter-Summer rainfall ratios are 40-60% in the west and 30-70% in the east. Summer rains fall July-September, originate in the Gulf of Mexico and are convective, usually brief, intense thunderstorms. Cool season moisture tends to be frontal, originates in the Pacific and Gulf of California, and falls in widespread storms with long duration and low intensity. Snow rarely lasts more than one day. May and June are the driest months of the year. Humidity is generally very low.

Temperatures are mild. Freezing temperatures are common at night from December-April; however temperatures during the day are frequently above 50 F. Occasionally in December-February, brief 0 F temperatures may be experienced some nights. During June, July and August, some days may exceed 100 F.

Cool season plants start growth in early spring and mature in early summer. Warm season plants take advantage of summer rains and are growing and nutritious July-September. Warm season grasses may remain green throughout the year.

**Table 3. Representative climatic features**

|                               |          |
|-------------------------------|----------|
| Frost-free period (average)   | 220 days |
| Freeze-free period (average)  |          |
| Precipitation total (average) | 16 in    |

## Influencing water features

There are no water features associated with this site.

## Soil features

These are deep soils which have formed in loamy alluvium of mixed origin. Surface textures range from sandy loam to very gravelly sandy loam and must be at least 4 inches or thicker, (8 inches for Grv-SL). These soils have clayey (argillic) horizons at shallow depths. They are not calcareous in the upper 20 inches. Soil surfaces are dark colored. Plant-soil relationships are good. Although several soil series are correlated in map unit components to this ecological site, Sasabe soil series is most representative of Sandy Loam Upland, 12"-16" p.z.

**Table 4. Representative soil features**

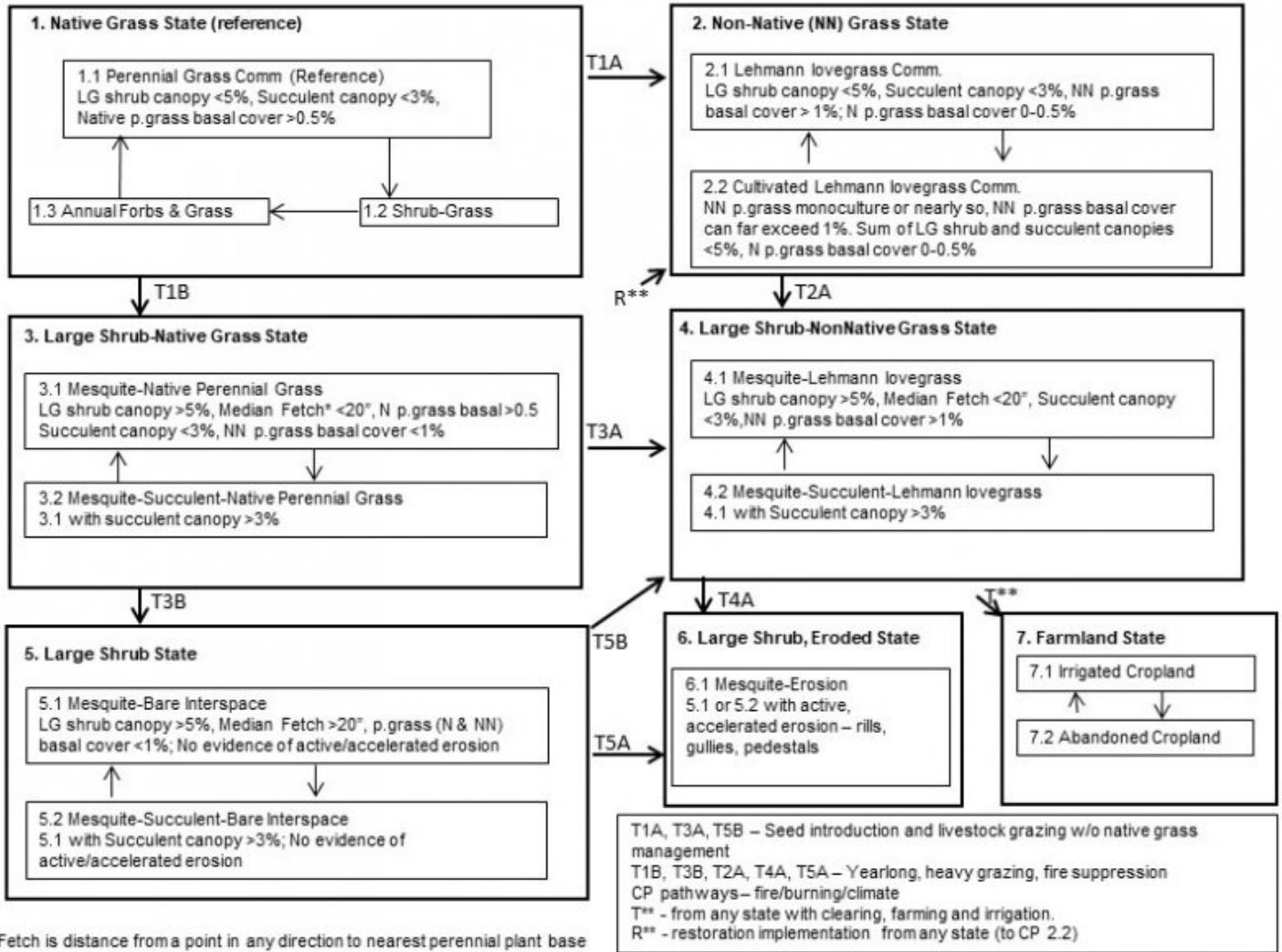
|                                   |                                                                           |
|-----------------------------------|---------------------------------------------------------------------------|
| Surface texture                   | (1) Sandy loam<br>(2) Gravelly sandy loam<br>(3) Very gravelly sandy loam |
| Family particle size              | (1) Loamy                                                                 |
| Drainage class                    | Well drained                                                              |
| Permeability class                | Moderate to moderately slow                                               |
| Soil depth                        | 60 in                                                                     |
| Surface fragment cover <=3"       | 5–40%                                                                     |
| Surface fragment cover >3"        | 0–5%                                                                      |
| Available water capacity (0-40in) | 4.8–9.6 in                                                                |

|                                                          |              |
|----------------------------------------------------------|--------------|
| Calcium carbonate equivalent<br>(0-40in)                 | 1-25%        |
| 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)                    | 6.6-8.4      |
| Subsurface fragment volume <=3"<br>(Depth not specified) | 5-40%        |
| Subsurface fragment volume >3"<br>(Depth not specified)  | 0-5%         |

## Ecological dynamics

Sandy Loam Upland, 12" - 16" p.z., ecological site is found on upland landscapes. Soils are deep and have a thick sandy loam surface horizon with an underlying argillic horizon, making excellent plant-soil conditions; the porous surface horizon allows rainfall infiltration that is slowed and perched by less porous argillic horizon. Natural fires are thought to have shaped the native grassland aspect of this ecological site. Heavy livestock grazing removes fine fuels for fire and changes plant community composition and distribution. As fire intervals become extended, woody species, such as mesquite, grow in size until they are no longer killed by fire; thus, the grassland aspect gives way to shrubland. African lovegrasses are the non-native plants that have impacted this ecological site the most of the many non-natives occurring in this LRU. Lehmann lovegrass, the most adapted non-native perennial grass, will maintain the site's grassland aspect but its dominance will decimate species diversity.

## State and transition model



**State 1  
Native Grass**

The potential plant community on this site is dominated by warm season perennial grasses. All the major perennial grass species on the site tend to be well dispersed throughout the plant community. Perennial forbs and shrubs are minor on the site. The aspect is open grassland.

**Characteristics and indicators.** Native perennial grass basal cover ≥ 0.5%, large shrub (mesquite) canopy <5%, and succulent canopy <3%.

**Community 1.1  
Perennial Grass**

The potential plant community on this site is dominated by warm season perennial grasses. All the major perennial grass species on the site tend to be well dispersed throughout the plant community. Perennial forbs are seasonal and diverse; they may be overlooked or unseen as they proliferate the understory after each rainy season. Shrubs and subshrubs, also diverse, are minor on the site. The aspect is open grassland. With continuous heavy grazing, palatable perennial grasses are removed from the plant community and species like Rothrock grama and threeawns will increase. With severe deterioration, shrubby species will increase or invade and dominate the plant community. This is the most productive upland site in the LRU, excluding altered, non-native lovegrass dominated sites. Natural fire was important in the development of the potential plant community. Stable areas of this site can produce effective herbaceous covers with up to 10% canopy cover of mesquite. In areas where half-shrubs dominate the under-story, the potential production of perennial grasses is equal to present production of half-shrubs once they are removed by fire or another type of brush management.

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

| Plant Type      | Low (Lb/Acre) | Representative Value (Lb/Acre) | High (Lb/Acre) |
|-----------------|---------------|--------------------------------|----------------|
| Grass/Grasslike | 570           | 1000                           | 1480           |
| Forb            | 20            | 40                             | 160            |
| Shrub/Vine      | 12            | 25                             | 110            |
| Tree            | 0             | 1                              | 5              |
| <b>Total</b>    | <b>602</b>    | <b>1066</b>                    | <b>1755</b>    |

**Table 6. Soil surface cover**

|                                   |        |
|-----------------------------------|--------|
| Tree basal cover                  | 0-1%   |
| Shrub/vine/liana basal cover      | 0-1%   |
| Grass/grasslike basal cover       | 8-15%  |
| Forb basal cover                  | 0-1%   |
| Non-vascular plants               | 0-1%   |
| Biological crusts                 | 1-10%  |
| Litter                            | 20-75% |
| Surface fragments >0.25" and <=3" | 5-40%  |
| Surface fragments >3"             | 0-5%   |
| Bedrock                           | 0%     |
| Water                             | 0%     |
| Bare ground                       | 10-20% |

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

| Height Above Ground (Ft) | Tree | Shrub/Vine | Grass/Grasslike | Forb |
|--------------------------|------|------------|-----------------|------|
| <0.5                     | –    | 1-5%       | 1-15%           | 0-5% |
| >0.5 <= 1                | –    | 1-10%      | 10-25%          | 0-2% |
| >1 <= 2                  | –    | 0-5%       | 15-25%          | 0-1% |
| >2 <= 4.5                | –    | 0-1%       | 0-5%            | –    |
| >4.5 <= 13               | 0-1% | 0-1%       | –               | –    |
| >13 <= 40                | –    | –          | –               | –    |
| >40 <= 80                | –    | –          | –               | –    |
| >80 <= 120               | –    | –          | –               | –    |
| >120                     | –    | –          | –               | –    |

**Figure 5. Plant community growth curve (percent production by month).** AZ4134, 41.3 12-16" p.z. other sites. Growth begins in the spring, semi-dormancy occurs during the May through June drought, most growth occurs during the summer rains..

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

## Community 1.2 Shrub-Grass

As time between natural fire cycles lengthens or during drought periods, perennial grasses become decadent with litter build-up. Shrubs and half-shrubs continue growth with winter moisture. Half shrubs, snakeweed and burroweed, respond positively with high germination following winter moisture; in contrast, both species have high mortality following dry winters.

### **Community 1.3**

#### **Annual Forbs and Grasses**

Post fire, or after extended drought, the plant community is dominated by annual forbs and grasses. Perennial grasses and shrubs are greatly diminished. This Community Phase is extremely vulnerable to both Transitions T1A (non-native perennial grass invasion) and T1B (permanent depletion of perennial grass understory). Lehmann lovegrass may spontaneously germinate from a latent soil seedbank with open, bare areas exposed (T1A) or existing perennial grasses will be grazed out (T1B).

#### **Pathway P1.1a**

##### **Community 1.1 to 1.2**

No burning or drought, disturbance free plant growth and decadence.

#### **Pathway P1.1b**

##### **Community 1.1 to 1.3**

Fire

#### **Pathway P1.2a**

##### **Community 1.2 to 1.3**

Fire, extended drought

#### **Pathway P1.3a**

##### **Community 1.3 to 1.1**

No burning/no fire

### **State 2**

#### **Non-Native (NN) Grass**

Non-native perennial grasses introduced from South Africa are well-adapted within this LRU. Once introduced to this site, the non-native perennial grasses will come to dominate when livestock grazing is not managed to ensure native perennial grass vigor. This State has two plant community phases.

#### **Community 2.1**

##### **Lehmann Lovegrass**

A suite of African lovegrasses can become entrenched on this ecological site; Lehmann lovegrass is the most common and has been seen to persist in the plant community once its basal cover exceeds 1%. The native perennial grasses can remain until a disturbance, such as drought, fire, yearlong or heavy growing season grazing, depletes vigor or causes perennial grass mortality. Large shrub and succulent canopy percentages are similar to State 1.

#### **Community 2.2**

##### **Cultivated Lehman lovegrass**

Restoration practices applied to any Sandy Loam Upland state, will likely result in a Cultivated Lehmann lovegrass community phase. Lehmann lovegrass, as well as several other non-native perennial grasses, has proliferated a robust seedbank throughout the LRU and will germinate following soil disturbance or burning. Most commonly,

brush management or mechanical land treatment (ripping) is applied to remove mesquite dominance and reduce erosion (from States 4 or 5, for example). While species like Lehmann, Boer, Wilman and Cochise lovegrass may be seeded, non-native perennial grasses will likely invade the site regardless because of their overwhelming presence across this LRU. With good grazing management, hydrologic relationships are good and non-native grass productivity remains high (although protein and nutrient values of LL are negligible). Treated areas typically have reduced runoff for long periods of time, depending on grazing management. Mesquite and other shrubs will re-invade these areas making brush management maintenance treatment necessary within 10-15 years.

### **State 3**

#### **Large Shrub-Native Grass**

Unmanaged or heavy livestock grazing impairs the perennial grass vigor and removes fuel loading for natural fire cycling. Large shrubs and cactus grow without the periodic reduction by burning. The open aspect is interrupted by large shrubs. The perennial grass community is diminished in diversity and basal cover.

**Characteristics and indicators.** Large shrub canopy >5%, median fetch\* <20", native perennial grass basal cover 0.5%, NN p.grass basal cover <1%; succulents may or may not be dominant, see CPs.

#### **Community 3.1**

##### **Mesquite-Native Perennial Grass**

Mesquite increases in the absence of fire for long periods of time. Native perennial grasses maintain dominance with good grazing management; mesquite canopy levels are from 5 to 10%. Native perennial grasses are present in herbaceous understory. Lehmann lovegrass may be present with less than 1% basal cover.

#### **Community 3.2**

##### **Mesquite-Succulent-Native Perennial Grass**

Succulents, usually prickly pear species, established within the plant community expand in canopy coverage until removed by fire.

### **State 4**

#### **Large Shrub-NonNative Grass**

Large shrubs and non-native lovegrasses are co-dominant. Native perennial grasses may remain intact, generally under large shrub canopies. Non-native perennial grasses include African lovegrasses (most commonly Lehmann and Cochise lovegrasses) and, at the low and high elevations of this LRU, bufflegass and yellow bluestem, respectively. The large shrubs are resistant to fire mortality and burning will not affect their removal from the plant community. Repeated burning or heavy grazing negatively affects the perennial grasses and puts the site at risk of excessive soil erosion. In these areas, mechanical brush management will likely result in transitioning the site to State 2, with a loss of native grasses, both their productivity and diversity.

#### **Community 4.1**

##### **Mesquite-Lehmann lovegrass**

#### **Community 4.2**

##### **Mesquite-Succulent-Lehmann lovegrass**

### **State 5**

#### **Large Shrub State**

Mesquite and other large shrubs have increased and are dominant with canopies greater than 5%. Native and non-native annual forbs and grasses, both cool and warm season, dominate the under-story. Snakeweed and burroweed cycle with climate, but both remain important in the plant community. Native perennial grasses are largely gone, due to the interactions of drought, fire and continuous, heavy grazing. Areas located close to mountains usually have higher soil cover of cobbles and gravel, thus, exhibit inherent soil and site stability. Hydrologic relationships have changed to increase the amount of runoff. Sandy loam upland in this State is at risk to transition to State 6 (Large



Shrub, Eroded).

**Characteristics and indicators.** Large shrub canopy >5%, Median Fetch\* >20", perennial grass basal cover <1%, no evidence of active, accelerated erosion \*Fetch is distance from a point in any direction to nearest perennial plant base

## **Community 5.1**

### **Mesquite-Bare Interspace**

The Mesquite-Bare Interspace Plant community is dominated by mesquite and other large shrubs with and understory of half-shrubs, snakeweed and burroweed; miscellaneous perennial forbs and annuals occur within the confines of the shrubs. Interspaces are open, herbaceous litter is moved by wind and water until obstructed. Remnant perennial grasses, such as bush muhly and plains bristlegrass, may occur well within protection of shrubs and indicate a seed source. Succulents are not dominant in this community phase.

## **Community 5.2**

### **Mesquite-Succulent-Bare Interspace**

The Mesquite-Succulent-Bare Interspace Plant community is dominated by mesquite and other large shrubs with and understory of half-shrubs and succulents (prickly pear and cane cholla). Interspaces are open, herbaceous litter is moved by wind and water until obstructed. Remnant perennial grasses, such as bush muhly and plains bristlegrass, may occur well within protection of shrubs and indicate a seed source. Succulents will continue growth until fine fuels accumulate to carry fire, such as after extremely wet spring flourish of annual forbs.

## **Pathway P5.1a**

### **Community 5.1 to 5.2**

Introduction of cactus, time without fire

## **Pathway P5.2a**

### **Community 5.2 to 5.1**

burning

## **State 6**

### **Large Shrub, Eroded**

The Large Shrub, Eroded State is very similar in structure to States 4 and 5 (mesquite dominated, half-shrub understory), however, the soil erosion threshold has been crossed; active, extreme soil loss (exposed argillic horizon, rills, pedestals, gullies) is occurring. Snakeweed and burroweed cycle with climate, but both remain important in the plant community. Native perennial grasses are largely gone, due to the interactions of drought, fire and continuous, heavy grazing. Remnant non-native lovegrasses may be present. Hydrologic relationships are permanently altered. Restoration practices can be applied to slow erosion rates and trap sediments; paired with prescribed grazing, non-native lovegrasses will colonize the site resulting in Plant Community 2.2, Cultivated Lehmann lovegrass Community.

**Characteristics and indicators.** Large shrub canopy >5%, Median Fetch\* >20", perennial grass basal cover <1%, active, accelerated erosion as indicted by water flow patterns, litter dams, and rills \*Fetch is distance from a point in any direction to nearest perennial plant base

## **Community 6.1**

### **Mesquite-Erosion**

## **Transition T1A**

### **State 1 to 2**

Seed introduction and livestock grazing without native perennial grass management

**Transition T1B****State 1 to 3**

Yearlong, heavy livestock grazing, fire suppression

**Transition T2A****State 2 to 4**

Yearlong, heavy livestock grazing, fire suppression

**Restoration pathway R3A****State 3 to 2**

brush management, seeding, do not do this

**Transition T3A****State 3 to 4**

Yearlong, heavy livestock grazing, fire suppression

**Transition T3B****State 3 to 5**

Yearlong, heavy livestock grazing, fire absent

**Restoration pathway R4A****State 4 to 2**

brush management, seeding

**Transition T4A****State 4 to 6**

frequent burning, extreme grazing

**Restoration pathway R5A****State 5 to 2**

brush management, seeding

**Restoration pathway R5A****State 5 to 4**

Seed introduction, prescribed grazing

**Transition T5A****State 5 to 6**

Yearlong, heavy livestock grazing, fire suppression

**Restoration pathway R6A****State 6 to 2**

brush management, seeding

## 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>            |        |                                                  | 200–480                     |                  |
|                        | sideoats grama                         | BOCU   | <i>Bouteloua curtipendula</i>                    | 100–300                     | –                |
|                        | Arizona cottontop                      | DICA8  | <i>Digitaria californica</i>                     | 100–300                     | –                |
|                        | plains lovegrass                       | ERIN   | <i>Eragrostis intermedia</i>                     | 0–100                       | –                |
|                        | cane bluestem                          | BOBA3  | <i>Bothriochloa barbinodis</i>                   | 0–100                       | –                |
| 2                      | <b>suffrutescent grasses</b>           |        |                                                  | 200–300                     |                  |
|                        | black grama                            | BOER4  | <i>Bouteloua eriopoda</i>                        | 100–300                     | –                |
|                        | bush muhly                             | MUPO2  | <i>Muhlenbergia porteri</i>                      | 0–100                       | –                |
|                        | Santa Rita threeawn                    | ARCAG  | <i>Aristida californica</i> var. <i>glabrata</i> | 0–100                       | –                |
| 3                      | <b>short lived grasses</b>             |        |                                                  | 15–120                      |                  |
|                        | Rothrock's grama                       | BORO2  | <i>Bouteloua rothrockii</i>                      | 15–100                      | –                |
|                        | sand dropseed                          | SPCR   | <i>Sporobolus cryptandrus</i>                    | 0–50                        | –                |
|                        | slender grama                          | BORE2  | <i>Bouteloua repens</i>                          | 0–50                        | –                |
| 4                      | <b>short gramas</b>                    |        |                                                  | 80–180                      |                  |
|                        | blue grama                             | BOGR2  | <i>Bouteloua gracilis</i>                        | 30–100                      | –                |
|                        | hairy grama                            | BOHI2  | <i>Bouteloua hirsuta</i>                         | 0–45                        | –                |
|                        | common wolfstail                       | LYPH   | <i>Lycurus phleoides</i>                         | 10–45                       | –                |
|                        | sprucetop grama                        | BOCH   | <i>Bouteloua chondrosioides</i>                  | 0–45                        | –                |
| 5                      | <b>Perennial threeawns</b>             |        |                                                  | 10–100                      |                  |
|                        | spidergrass                            | ARTEG  | <i>Aristida ternipes</i> var. <i>gentilis</i>    | 5–45                        | –                |
|                        | spidergrass                            | ARTE3  | <i>Aristida ternipes</i>                         | 5–40                        | –                |
|                        | purple threeawn                        | ARPU9  | <i>Aristida purpurea</i>                         | 0–15                        | –                |
|                        | poverty threeawn                       | ARDI5  | <i>Aristida divaricata</i>                       | 0–15                        | –                |
|                        | Havard's threeawn                      | ARHA3  | <i>Aristida havardii</i>                         | 0–10                        | –                |
|                        | Parish's threeawn                      | ARPUP5 | <i>Aristida purpurea</i> var. <i>parishii</i>    | 0–10                        | –                |
|                        | Fendler threeawn                       | ARPUL  | <i>Aristida purpurea</i> var. <i>longiseta</i>   | 0–5                         | –                |
|                        | Wooton's threeawn                      | ARPA9  | <i>Aristida pansa</i>                            | 0–5                         | –                |
| 6                      | <b>miscellaneous perennial grasses</b> |        |                                                  | 50–200                      |                  |
|                        | plains bristlegrass                    | SEVU2  | <i>Setaria vulpiseta</i>                         | 15–60                       | –                |
|                        | squirreltail                           | ELEL5  | <i>Elymus elymoides</i>                          | 0–50                        | –                |
|                        | whiplash pappusgrass                   | PAVA2  | <i>Pappophorum vaginatum</i>                     | 0–50                        | –                |
|                        | tanglehead                             | HECO10 | <i>Heteropogon contortus</i>                     | 5–45                        | –                |
|                        | green sprangletop                      | LEDU   | <i>Leptochloa dubia</i>                          | 5–45                        | –                |
|                        | Arizona muhly                          | MUAR3  | <i>Muhlenbergia arizonica</i>                    | 0–25                        | –                |
|                        | spike dropseed                         | SPCO4  | <i>Sporobolus contractus</i>                     | 0–25                        | –                |
|                        | mesa dropseed                          | SPFL2  | <i>Sporobolus flexuosus</i>                      | 0–15                        | –                |
|                        | slim tridens                           | TRMU   | <i>Tridens muticus</i>                           | 0–15                        | –                |
|                        | Hall's panicgrass                      | PAHA   | <i>Panicum hallii</i>                            | 0–15                        | –                |
|                        | curly-mesquite                         | HIBE   | <i>Hilaria belangeri</i>                         | 0–15                        | –                |

|             |                            |        |                                                     |        |   |
|-------------|----------------------------|--------|-----------------------------------------------------|--------|---|
|             | fall witchgrass            | DICO6  | <i>Digitaria cognata</i>                            | 0–15   | – |
|             | nineawn pappusgrass        | ENDE   | <i>Enneapogon desvauxii</i>                         | 0–5    | – |
|             | low woollygrass            | DAPU7  | <i>Dasyochloa pulchella</i>                         | 0–5    | – |
| 7           | <b>annual grasses</b>      |        |                                                     | 10–100 |   |
|             | prairie threeawn           | AROL   | <i>Aristida oligantha</i>                           | 1–50   | – |
|             | needle grama               | BOAR   | <i>Bouteloua aristidoides</i>                       | 1–50   | – |
|             | Parry's grama              | BOPA2  | <i>Bouteloua parryi</i>                             | 0–50   | – |
|             | sixweeks fescue            | VUOC   | <i>Vulpia octoflora</i>                             | 1–50   | – |
|             | Mexican panicgrass         | PAHI5  | <i>Panicum hirticaule</i>                           | 0–25   | – |
|             | tapertip cupgrass          | ERACA  | <i>Eriochloa acuminata</i> var. <i>acuminata</i>    | 0–25   | – |
|             | sixweeks grama             | BOBA2  | <i>Bouteloua barbata</i>                            | 1–25   | – |
|             | sixweeks threeawn          | ARAD   | <i>Aristida adscensionis</i>                        | 1–25   | – |
|             | feather fingergrass        | CHVI4  | <i>Chloris virgata</i>                              | 1–15   | – |
|             | desert lovegrass           | ERPEM  | <i>Eragrostis pectinacea</i> var. <i>miserrima</i>  | 0–15   | – |
|             | tufted lovegrass           | ERPEP2 | <i>Eragrostis pectinacea</i> var. <i>pectinacea</i> | 0–15   | – |
|             | mucronate sprangletop      | LEPAB  | <i>Leptochloa panicea</i> ssp. <i>brachiata</i>     | 0–15   | – |
|             | Bigelow's bluegrass        | POBI   | <i>Poa bigelovii</i>                                | 0–15   | – |
|             | Arizona signalgrass        | URAR   | <i>Urochloa arizonica</i>                           | 0–15   | – |
|             | Mexican sprangletop        | LEFUU  | <i>Leptochloa fusca</i> ssp. <i>uninervia</i>       | 0–10   | – |
|             | Mexican lovegrass          | ERME   | <i>Eragrostis mexicana</i>                          | 0–10   | – |
|             | littleseed muhly           | MUMI   | <i>Muhlenbergia microsperma</i>                     | 0–5    | – |
|             | Arizona brome              | BRAR4  | <i>Bromus arizonicus</i>                            | 0–5    | – |
|             | witchgrass                 | PACA6  | <i>Panicum capillare</i>                            | 1–4    | – |
|             | delicate muhly             | MUFR   | <i>Muhlenbergia fragilis</i>                        | 0–4    | – |
| <b>Forb</b> |                            |        |                                                     |        |   |
| 8           | <b>perennial forbs</b>     |        |                                                     | 10–60  |   |
|             | weakleaf bur ragweed       | AMCO3  | <i>Ambrosia confertiflora</i>                       | 1–25   | – |
|             | spreading fleabane         | ERDI4  | <i>Erigeron divergens</i>                           | 1–25   | – |
|             | wild dwarf morning-glory   | EVAR   | <i>Evolvulus arizonicus</i>                         | 3–20   | – |
|             | lacy tansyaster            | MAPI   | <i>Machaeranthera pinnatifida</i>                   | 1–20   | – |
|             | scarlet spiderling         | BOCO   | <i>Boerhavia coccinea</i>                           | 1–15   | – |
|             | desert globemallow         | SPAM2  | <i>Sphaeralcea ambigua</i>                          | 3–15   | – |
|             | brownplume wirelettuce     | STPA4  | <i>Stephanomeria pauciflora</i>                     | 1–15   | – |
|             | hairy fourwort             | TENE   | <i>Tetramerium nervosum</i>                         | 0–10   | – |
|             | desert marigold            | BAMU   | <i>Baileya multiradiata</i>                         | 0–10   | – |
|             | petite flamboyant bauhinia | BAMU3  | <i>Bauhinia multinervia</i>                         | 0–10   | – |
|             | leatherweed                | CRPO5  | <i>Croton pottsii</i>                               | 0–10   | – |
|             | trailing windmills         | ALIN   | <i>Allionia incarnata</i>                           | 0–10   | – |
|             | New Mexico fanpetals       | SINE   | <i>Sida neomexicana</i>                             | 1–10   | – |
|             | silverleaf nightshade      | SOEL   | <i>Solanum elaeagnifolium</i>                       | 1–10   | – |
|             | southwestern mock vervain  | GLGO   | <i>Glandularia gooddingii</i>                       | 0–10   | – |
|             | Wright's deervetch         | LOWR   | <i>Lotus wrightii</i>                               | 1–10   | – |

|   |                              |        |                                                         |        |   |
|---|------------------------------|--------|---------------------------------------------------------|--------|---|
|   | wishbone-bush                | MILAV  | <i>Mirabilis laevis</i> var. <i>villosa</i>             | 0–6    | – |
|   | ivyleaf groundcherry         | PHHE4  | <i>Physalis hederifolia</i>                             | 0–5    | – |
|   | velvetseed milkwort          | POOB   | <i>Polygala obscura</i>                                 | 0–5    | – |
|   | shrubby purslane             | POSU3  | <i>Portulaca suffrutescens</i>                          | 0–5    | – |
|   | Wright's cudweed             | PSCAC2 | <i>Pseudognaphalium canescens</i> ssp. <i>canescens</i> | 0–5    | – |
|   | twinleaf senna               | SEBA3  | <i>Senna bauhinioides</i>                               | 0–5    | – |
|   | Lemmon's ragwort             | SELE8  | <i>Senecio lemmonii</i>                                 | 0–5    | – |
|   | variableleaf bushbean        | MAGI2  | <i>Macroptilium gibbosifolium</i>                       | 0–5    | – |
|   | whitemouth dayflower         | COER   | <i>Commelina erecta</i>                                 | 0–5    | – |
|   | bluedicks                    | DICA14 | <i>Dichelostemma capitatum</i>                          | 0–5    | – |
|   | Trans-Pecos thimblehead      | HYWI   | <i>Hymenothrix wislizeni</i>                            | 0–5    | – |
|   | ragged nettlespurge          | JAMA   | <i>Jatropha macrorhiza</i>                              | 0–5    | – |
|   | Greene's bird's-foot trefoil | LOGR4  | <i>Lotus greenei</i>                                    | 0–5    | – |
|   | dwarf desertpeony            | ACNA2  | <i>Acourtia nana</i>                                    | 0–5    | – |
|   | brownfoot                    | ACWR5  | <i>Acourtia wrightii</i>                                | 0–5    | – |
|   | New Mexico silverbush        | ARNE2  | <i>Argythamnia neomexicana</i>                          | 0–5    | – |
|   | Watson's dutchman's pipe     | ARWA   | <i>Aristolochia watsonii</i>                            | 0–5    | – |
|   | dense ayenia                 | AYMI   | <i>Ayenia microphylla</i>                               | 0–5    | – |
|   | fingerleaf gourd             | CUDI   | <i>Cucurbita digitata</i>                               | 0–5    | – |
|   | coyote gourd                 | CUPA   | <i>Cucurbita palmata</i>                                | 0–5    | – |
|   | Rocky Mountain zinnia        | ZIGR   | <i>Zinnia grandiflora</i>                               | 0–5    | – |
|   | Arizona wrightwort           | CAAR7  | <i>Carlowrightia arizonica</i>                          | 0–2    | – |
|   | hairyseed bahia              | BAAB   | <i>Bahia absinthifolia</i>                              | 0–2    | – |
|   | southwestern pricklypoppy    | ARPL3  | <i>Argemone pleiacantha</i>                             | 0–2    | – |
|   | orange fameflower            | PHAU13 | <i>Phemeranthus aurantiacus</i>                         | 0–2    | – |
|   | onion                        | ALLIU  | <i>Allium</i>                                           | 0–1    | – |
|   | desert larkspur              | DEPA   | <i>Delphinium parishii</i>                              | 0–1    | – |
| 9 | <b>annual forbs</b>          |        |                                                         | 10–100 |   |
|   | sensitive partridge pea      | CHNI2  | <i>Chamaecrista nictitans</i>                           | 1–50   | – |
|   | New Mexico thistle           | CINE   | <i>Cirsium neomexicanum</i>                             | 1–25   | – |
|   | milkvetch                    | ASTRA  | <i>Astragalus</i>                                       | 1–25   | – |
|   | Coulter's spiderling         | BOCO2  | <i>Boerhavia coulteri</i>                               | 0–25   | – |
|   | carelessweed                 | AMPA   | <i>Amaranthus palmeri</i>                               | 1–25   | – |
|   | California poppy             | ESCAM  | <i>Eschscholzia californica</i> ssp. <i>mexicana</i>    | 1–25   | – |
|   | Arizona poppy                | KAGR   | <i>Kallstroemia grandiflora</i>                         | 0–25   | – |
|   | spreading fanpetals          | SIAB   | <i>Sida abutifolia</i>                                  | 1–25   | – |
|   | woolly plantain              | PLPA2  | <i>Plantago patagonica</i>                              | 0–25   | – |
|   | Arizona popcornflower        | PLAR   | <i>Plagiobothrys arizonicus</i>                         | 0–25   | – |
|   | slender goldenweed           | MAGR10 | <i>Machaeranthera gracilis</i>                          | 1–25   | – |
|   | tanseyleaf tansyaster        | MATA2  | <i>Machaeranthera tanacetifolia</i>                     | 0–25   | – |
|   | Arizona adder's-mouth        | MATE2  | <i>Malaxis tenuis</i>                                   | 0–25   | – |

|                          |        |                                                |  |      |   |
|--------------------------|--------|------------------------------------------------|--|------|---|
| orchid                   |        |                                                |  |      |   |
| whitestem blazingstar    | MEAL6  | <i>Mentzelia albicaulis</i>                    |  | 1–25 | – |
| intermediate pepperweed  | LEVIM  | <i>Lepidium virginicum</i> var. <i>medium</i>  |  | 0–25 | – |
| desert Indianwheat       | PLOV   | <i>Plantago ovata</i>                          |  | 0–20 | – |
| western tansymustard     | DEPI   | <i>Descurainia pinnata</i>                     |  | 0–20 | – |
| miniature woollystar     | ERDI2  | <i>Eriastrum diffusum</i>                      |  | 0–20 | – |
| cryptantha               | CRYPT  | <i>Cryptantha</i>                              |  | 0–20 | – |
| scrambled eggs           | COAU2  | <i>Corydalis aurea</i>                         |  | 0–15 | – |
| bristly fiddleneck       | AMTE3  | <i>Amsinckia tessellata</i>                    |  | 0–15 | – |
| sorrel buckwheat         | ERPO4  | <i>Eriogonum polycladon</i>                    |  | 0–15 | – |
| shaggyfruit pepperweed   | LELA   | <i>Lepidium lasiocarpum</i>                    |  | 0–15 | – |
| sacred thorn-apple       | DAWR2  | <i>Datura wrightii</i>                         |  | 0–15 | – |
| New Mexico plumeseed     | RANE   | <i>Rafinesquia neomexicana</i>                 |  | 0–15 | – |
| Arizona lupine           | LUAR4  | <i>Lupinus arizonicus</i>                      |  | 0–15 | – |
| Coulter's lupine         | LUSP2  | <i>Lupinus sparsiflorus</i>                    |  | 0–15 | – |
| Texas bluebonnet         | LUSU   | <i>Lupinus subcarnosus</i>                     |  | 0–15 | – |
| hollowleaf annual lupine | LUSU3  | <i>Lupinus succulentus</i>                     |  | 0–15 | – |
| combseed                 | PECTO  | <i>Pectocarya</i>                              |  | 0–15 | – |
| manybristle chinchweed   | PEPA2  | <i>Pectis papposa</i>                          |  | 0–15 | – |
| longleaf false goldeneye | HELOA2 | <i>Heliomeris longifolia</i> var. <i>annua</i> |  | 0–10 | – |
| camphorweed              | HESU3  | <i>Heterotheca subaxillaris</i>                |  | 0–10 | – |
| wheelscale saltbush      | ATEL   | <i>Atriplex elegans</i>                        |  | 0–10 | – |
| hoary bowlesia           | BOIN3  | <i>Bowlesia incana</i>                         |  | 0–6  | – |
| goosefoot                | CHENO  | <i>Chenopodium</i>                             |  | 0–6  | – |
| American wild carrot     | DAPU3  | <i>Daucus pusillus</i>                         |  | 0–6  | – |
| anoda                    | ANODA  | <i>Anoda</i>                                   |  | 0–6  | – |
| rockcress                | ARABI  | <i>Arabidopsis</i>                             |  | 0–6  | – |
| aster                    | ASTER  | <i>Aster</i>                                   |  | 0–6  | – |
| blanketflower            | GAILL  | <i>Gaillardia</i>                              |  | 0–6  | – |
| Lemmon's linanthus       | LELE29 | <i>Leptosiphon lemmonii</i>                    |  | 0–6  | – |
| Gordon's bladderpod      | LEGO   | <i>Lesquerella gordonii</i>                    |  | 0–6  | – |
| Texas stork's bill       | ERTE13 | <i>Erodium texanum</i>                         |  | 0–6  | – |
| spurge                   | EUPHO  | <i>Euphorbia</i>                               |  | 0–6  | – |
| woolly sunflower         | ERIOP2 | <i>Eriophyllum</i>                             |  | 0–6  | – |
| phacelia                 | PHACE  | <i>Phacelia</i>                                |  | 0–6  | – |
| bean                     | PHASE  | <i>Phaseolus</i>                               |  | 0–6  | – |
| phlox                    | PHLOX  | <i>Phlox</i>                                   |  | 0–6  | – |
| four o'clock             | MIRAB  | <i>Mirabilis</i>                               |  | 0–6  | – |
| Nuttall's povertyweed    | MONU   | <i>Monolepis nuttalliana</i>                   |  | 0–6  | – |
| green carpetweed         | MOVE   | <i>Mollugo verticillata</i>                    |  | 0–6  | – |
| desert evening primrose  | OEPR   | <i>Oenothera primiveris</i>                    |  | 0–6  | – |
| sage                     | SALVI  | <i>Salvia</i>                                  |  | 0–6  | – |
| ragwort                  | SENEC  | <i>Senecio</i>                                 |  | 0–6  | – |
| slender noreleaf         | POGR5  | <i>Poronhullum aracile</i>                     |  | 0–6  | – |

|                   |                              |        |                                                    |       |   |
|-------------------|------------------------------|--------|----------------------------------------------------|-------|---|
|                   | purslane                     | PORTU  | <i>Portulaca</i>                                   | 0–6   | – |
|                   | sleepy silene                | SIAN2  | <i>Silene antirrhina</i>                           | 0–6   | – |
|                   | woolly tidesstromia          | TILA2  | <i>Tidestromia lanuginosa</i>                      | 0–6   | – |
|                   | doubleclaw                   | PRPA2  | <i>Proboscidea parviflora</i>                      | 0–6   | – |
|                   | verbena                      | VEPO4  | <i>Verbena polystachya</i>                         | 0–6   | – |
|                   | golden crownbeard            | VEEN   | <i>Verbesina encelioides</i>                       | 0–5   | – |
|                   | desert unicorn-plant         | PRAL4  | <i>Proboscidea althaeifolia</i>                    | 0–5   | – |
|                   | Fendler's<br>desertdandelion | MAFE   | <i>Malacothrix fendleri</i>                        | 0–5   | – |
|                   | poorjoe                      | DITE2  | <i>Diodia teres</i>                                | 0–5   | – |
|                   | wedgeleaf draba              | DRCU   | <i>Draba cuneifolia</i>                            | 0–5   | – |
|                   | Arizona blanketflower        | GAAR2  | <i>Gaillardia arizonica</i>                        | 0–5   | – |
| <b>Shrub/Vine</b> |                              |        |                                                    |       |   |
| 10                | <b>half shrubs</b>           |        |                                                    | 10–50 |   |
|                   | bastardsage                  | ERWR   | <i>Eriogonum wrightii</i>                          | 10–50 | – |
|                   | fairyduster                  | CAER   | <i>Calliandra eriophylla</i>                       | 0–20  | – |
| 11                | <b>increaser half-shrubs</b> |        |                                                    | 1–35  |   |
|                   | broom snakeweed              | GUSA2  | <i>Gutierrezia sarothrae</i>                       | 0–25  | – |
|                   | burroweed                    | ISTE2  | <i>Isocoma tenuisecta</i>                          | 0–25  | – |
|                   | threadleaf snakeweed         | GUMI   | <i>Gutierrezia microcephala</i>                    | 0–10  | – |
|                   | turpentine bush              | ERLA12 | <i>Ericameria laricifolia</i>                      | 0–5   | – |
| 12                | <b>miscellaneous shrubs</b>  |        |                                                    | 1–25  |   |
|                   | soaptree yucca               | YUEL   | <i>Yucca elata</i>                                 | 1–15  | – |
|                   | littleleaf ratany            | KRER   | <i>Krameria erecta</i>                             | 0–10  | – |
|                   | trailing krameria            | KRLA   | <i>Krameria lanceolata</i>                         | 0–10  | – |
|                   | spiny hackberry              | CEEH   | <i>Celtis ehrenbergiana</i>                        | 1–10  | – |
|                   | catclaw acacia               | ACGR   | <i>Acacia greggii</i>                              | 0–5   | – |
|                   | fourwing saltbush            | ATCA2  | <i>Atriplex canescens</i>                          | 0–5   | – |
|                   | shortleaf baccharis          | BABR   | <i>Baccharis brachyphylla</i>                      | 0–5   | – |
|                   | yerba de pasmo               | BAPT   | <i>Baccharis pteronioides</i>                      | 0–5   | – |
|                   | walkingstick cactus          | CYSP8  | <i>Cylindropuntia spinosior</i>                    | 0–5   | – |
|                   | desert zinnia                | ZIAC   | <i>Zinnia acerosa</i>                              | 0–5   | – |
|                   | cactus apple                 | OPEN3  | <i>Opuntia engelmannii</i>                         | 0–5   | – |
|                   | longleaf jointfir            | EPTR   | <i>Ephedra trifurca</i>                            | 0–5   | – |
|                   | banana yucca                 | YUBA   | <i>Yucca baccata</i>                               | 0–5   | – |
|                   | candy barrelcactus           | FEWI   | <i>Ferocactus wislizeni</i>                        | 0–2   | – |
|                   | purple pricklypear           | OPMAM  | <i>Opuntia macrocentra</i> var. <i>macrocentra</i> | 0–2   | – |
|                   | jumping cholla               | CYFU10 | <i>Cylindropuntia fulgida</i>                      | 0–2   | – |
|                   | desert-thorn                 | LYCIU  | <i>Lycium</i>                                      | 0–2   | – |
|                   | whitethorn acacia            | ACCO2  | <i>Acacia constricta</i>                           | 0–2   | – |
|                   | beehive cactus               | CORYP  | <i>Coryphantha</i>                                 | 0–1   | – |
|                   | catclaw mimosa               | MIACB  | <i>Mimosa aculeaticarpa</i> var. <i>biuncifera</i> | 0–1   | – |
|                   | velvetpod mimosa             | MIDY   | <i>Mimosa dysocarpa</i>                            | 0–1   | – |
|                   | sacahuista                   | NOMI   | <i>Nolina microcarpa</i>                           | 0–1   | – |

|             |                        |        |                                           |     |   |
|-------------|------------------------|--------|-------------------------------------------|-----|---|
|             | purple coneflower      | ECHIN  | <i>Echinacea</i>                          | 0-1 | - |
|             | hedgehog cactus        | ECHIN3 | <i>Echinocereus</i>                       | 0-1 | - |
|             | Santa Rita pricklypear | OPSA   | <i>Opuntia santa-rita</i>                 | 0-1 | - |
|             | whitestem paperflower  | PSCO2  | <i>Psilostrophe cooperi</i>               | 0-1 | - |
|             | spiny star             | ESVI2  | <i>Escobaria vivipara</i>                 | 0-1 | - |
|             | lotebush               | ZIOB   | <i>Ziziphus obtusifolia</i>               | 0-1 | - |
| <b>Tree</b> |                        |        |                                           |     |   |
| 13          | <b>native trees</b>    |        |                                           | 0-5 |   |
|             | beehive cactus         | CORYP  | <i>Coryphantha</i>                        | 6-9 | - |
|             | common sotol           | DAWH2  | <i>Dasyilirion wheeleri</i>               | 6-9 | - |
|             | hedgehog cactus        | ECHIN3 | <i>Echinocereus</i>                       | 6-9 | - |
|             | candy barrelcactus     | FEWI   | <i>Ferocactus wislizeni</i>               | 6-9 | - |
|             | ocotillo               | FOSP2  | <i>Fouquieria splendens</i>               | 6-9 | - |
|             | limestone adderstongue | OPEN   | <i>Ophioglossum engelmannii</i>           | 6-9 | - |
|             | western honey mesquite | PRGLT  | <i>Prosopis glandulosa var. torreyana</i> | 0-2 | - |
|             | velvet mesquite        | PRVE   | <i>Prosopis velutina</i>                  | 0-2 | - |
|             | Jerusalem thorn        | PAAC3  | <i>Parkinsonia aculeata</i>               | 0-1 | - |
|             | blue paloverde         | PAFL6  | <i>Parkinsonia florida</i>                | 0-1 | - |

## Animal community

The plant community on this site is suitable for grazing by all classes of cattle at any season. Due to thick, coarse textured surfaces which absorb most of the rainfall and an argillic horizon below to slowly release this moisture to the plants, this site has a long summer green season. This site occurs on soils that are extremely well suited to producing grassland vegetation and, thus, are fairly resilient to grazing and respond very well to improved grazing management. This is a site that Lehman lovegrass invades aggressively. At the first signs of invasion, management must shift to light or proper use of the palatable native perennials on this site to avoid letting lovegrass become dominant. Herbaceous forage will be deficient in protein in the winter.

Water developments are very important to wildlife species on the site. Being grassland, the site is home to a number of small herbivores, birds, and their associated predators. With the exception of antelope, larger wildlife species use the site mainly as a foraging area.

## Hydrological functions

Thick coarse textured surfaces act to catch intense summer rainfall. Shallow, clayey horizons prevent deep moisture penetration and allow shallow rooted plants to utilize most of the moisture.

## Recreational uses

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

## Wood products

Where mesquite has increased and grown to tree size, it provides some fuel-wood and posts.

## Inventory data references

Range 417s include 12 in excellent condition, 7 in good condition and 14 in fair condition.



## Type locality

|                                |                                                                                               |
|--------------------------------|-----------------------------------------------------------------------------------------------|
| Location 1: Pinal County, AZ   |                                                                                               |
| Township/Range/Section         | T9S R14E S34                                                                                  |
| General legal description      | Page-Towbridge Ranch                                                                          |
| Location 2: Pima County, AZ    |                                                                                               |
| Township/Range/Section         | T21S R8E S18                                                                                  |
| General legal description      | Buenos Aires Refuge                                                                           |
| Location 3: Cochise County, AZ |                                                                                               |
| Township/Range/Section         | T21S R19E S20                                                                                 |
| General legal description      | Un-surveyed. Fort Huachuca                                                                    |
| Location 4: Cochise County, AZ |                                                                                               |
| Township/Range/Section         | T17S R28E S27                                                                                 |
| General legal description      | Oak Ranch                                                                                     |
| Location 5: Pima County, AZ    |                                                                                               |
| Township/Range/Section         | T19S R17E S9                                                                                  |
| General legal description      | KA # 8 on Empire ranch in the North pasture. Trend monitoring transect and range health plot. |

## Contributors

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Unknown

## 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)                    | Womack, Robinett, Carrillo, Buono |
| Contact for lead author                     | NRCS Tucson Area Office           |
| Date                                        | 03/04/2005                        |
| Approved by                                 | S. Cassady                        |
| Approval date                               |                                   |
| Composition (Indicators 10 and 12) based on | Annual Production                 |

## Indicators

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

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2. **Presence of water flow patterns:** Water flow paths occupy 10-15% of area; short (3-5 feet) in length and discontinuous and sinuous

- 
3. **Number and height of erosional pedestals or terracettes:** Pedestals are infrequent on long lived perennial grasses; Approximately 10% of perennial grass plants have pedestals no more than 1 inch above surrounding soil surface; Black grama dominated areas have formed terracettes 2-5 feet apart with a 1 inch elevation difference from above to below the terracette; Bunchgrass dominated areas have formed terracettes 10-15 feet apart with a 1 inch elevation difference from above to below the terracette.
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4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Bare soil 15-25%, gravel and rock 10%, litter 20-30%, vegetation canopy/basal 45-50%; bare patches 1-3ft in diameter
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5. **Number of gullies and erosion associated with gullies:** None
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6. **Extent of wind scoured, blowouts and/or depositional areas:** None
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7. **Amount of litter movement (describe size and distance expected to travel):** All size classes remaining in place and masking water flow patterns, no loss of litter from the site
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8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** Aggregate stability test average >5.
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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Soil surface ranges from fine sandyloam to loamy sand; slight physical crust in interspaces, weak granular structure, OM throughout (greater under perennial plants), A-horizon 4-8+ in
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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Canopy 25-30%, Basal 5-10%, Litter 65-75%; 75-80% of canopy cover is perennial grasses and 5-10% is trees and shrubs. Cover is well dispersed throughout site
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11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):** None, unrestricted root development throughout profile
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12. **Functional/Structural Groups (list in order of descending dominance by above-ground annual-production or live foliar cover using symbols: >>, >, = to indicate much greater than, greater than, and equal to):**
- Dominant: Perennial mid-grasses > annual forbs & grasses > shrubs > succulents > short grasses Mesquite canopy >= 10% may inhibit grass cover/production
- Sub-dominant:

Other:

Additional:

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** Some scattered mortality/decadence of low shrubs and smaller perennial grasses as may be expected for drought. May exhibit high degree of decadence due to lack of fire on the site.
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14. **Average percent litter cover (%) and depth ( in):** 20-30% litter cover in canopy interspaces (65-75% total litter cover) with depths of 0.25 – 0.5in. Cover much higher under vegetation, some litter persisting since last season, uniform distribution throughout site. Almost all litter is herbaceous
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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** annual production 2000 lbs/ac in favorable rainfall years, 1200 lbs/ac in normal years and 700 lbs/ac in poor years
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16. **Potential invasive (including noxious) species (native and non-native). List species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicators, we are describing what is NOT expected in the reference state for the ecological site:** Lehmann's love grass can dominate site to the exclusion of other grasses, Mesquite can also dominate site and tend to inhibit grass cover/production after roughly 10% canopy cover, prickly pear also be invasive
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17. **Perennial plant reproductive capability:** Not impaired in anyway, even in prolonged drought black gramma producing stolons
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