

Ecological site R040XB232AZ

Sandy Slopes, Dunes 7"-10" p.z.

Last updated: 10/17/2024
Accessed: 11/21/2024

General information

Provisional. A provisional ecological site description has undergone quality control and quality assurance review. It contains a working state and transition model and enough information to identify the ecological site.

MLRA notes

Major Land Resource Area (MLRA): 040X–Sonoran Basin and Range

Major Land Resource Area (MLRA) 40 is the portion of Sonoran Desert that extends from northwest Mexico into southwestern Arizona and southeastern California. This MLRA is hot desert characterized by bimodal precipitation coupled with hot summers and mild winters. These conditions give rise to a rich biological diversity visually dominated by columnar cactus (saguaro) and leguminous trees (palo verde). This unit occurs within the Basin and Range Physiographic Province and is characterized by numerous mountain ranges that rise abruptly from broad, plain-like valleys and basins. Igneous and metamorphic rock classes dominate the mountain ranges, and basin sediments are combinations of fluvial, lacustrine, colluvial and alluvial deposits.

LRU notes

Land Resource Unit (LRU) 40-2, Middle Sonoran Desert, is characterized by desert scrub vegetation on relict fan remnants with a moderate amount of desert pavement. Trees are common in washes, bottoms and hillslopes. Elevations range from 1200 to 2000 feet, and precipitation averages 7 to 10 inches per year. Vegetation includes saguaro, palo verde, creosotebush, triangle bursage, brittlebush, prickly pear, cholla, desert saltbush, wolfberry bush muhly, threeawns, and big galleta. The soil temperature regime is hyperthermic and the soil moisture regime is typic 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 40 - Sonoran Basin and Range Land Resource Unit 2 - Middle Sonoran Desert Ecological Site Sandy Slopes, Dunes, 7"-10" p.z.

U.S. Environmental Protection Agency, Ecological Regions of North America: Level I, Region 10 North American Deserts Level II, 10.2 Warm Deserts Level III, Ecoregion 81, Sonoran Basin and Range Level IV, 81i, 81n, 81o

USDA-USFS Ecological Subregions: Sections of the Conterminous United States Section 322 American Semidesert and Desert Province Section 322B, Sonoran Desert

Ecological site concept

Sandy Slopes, Dunes, 7-10" p.z., occur in upland positions, with slopes greater than 15%, and windblown (eolian) fine sand forming large dunes greater than 10' in height.

Associated sites

| | |
|-------------|---|
| R040XB207AZ | Limy Fan 7"-10" p.z. inter-dune areas; loamy soils are alluvial |
|-------------|---|

Similar sites

| | |
|-------------|---|
| R040XC329AZ | Sandy Slopes, Dunes 3"-7" p.z. Elevations 300' - 1,200'; less precipitation |
|-------------|---|

Table 1. Dominant plant species

| | |
|------------|---|
| Tree | (1) <i>Parkinsonia florida</i> |
| Shrub | (1) <i>Fouquieria splendens</i> (2) <i>Larrea tridentata</i> |
| Herbaceous | (1) <i>Pleuraphis rigida</i> |

Physiographic features

This site occurs as dunes. Slopes are generally greater than 15%.

Table 2. Representative physiographic features

| | |
|-----------|----------------------------|
| Landforms | (1) Dune field (2) Dune |
|-----------|----------------------------|

Climatic features

Annual precipitation ranges from 7 to 10 inches. Annual rainfall is bimodal, with distinct rainy seasons occurring from December to March (winter) and July to September (summer). Rainfall ratios range from 40:60 (winter:summer) in the southern part, and 60:40 in the central and northern parts. Rainfall intensity differs between rainfall seasons. Winter frontal storms develop in the Pacific Ocean and Gulf of California, producing widespread, low-intensity and long duration precipitation events. Winter precipitation is the most dependable water source for vegetation, and snowfall is very rare. During summer months, atmospheric activity in the Gulf of Mexico produces convective thunderstorms when crossing over the mountains in the afternoon. These storms travel across the plains and valleys, producing precipitation of short duration, usually less than 30 minutes, but of moderate to heavy intensity. Between these two seasons, little to no effective precipitation can occur for several months at a time. May and June are the driest months, and overall humidity is very low.

Overall, average annual rainfall is variable, but increases in variability from east to west across the region. For long-term precipitation data, the coefficient of variation, the ratio of the standard deviation to the mean expressed as a percentage, increases from 38% at Florence (east) to 46% at Aguila (west).

Winter temperatures are very mild, with very few days having short periods of freezing temperatures. Summertime temperatures are hot to very hot, with many days in June and July exceeding 105°F. The number of frost-free days ranges from 280 in major river valleys with cold air drainage to between 320 and 350 in upland areas.

Spring and the summer growing seasons are equally important for perennial grass, forb and shrub growth. With above average precipitation, cool and warm season annual forbs and grasses can be common in their respective seasons. Perennial forage species can remain green throughout the year with sufficient available moisture.

Table 3. Representative climatic features

| | |
|--|--------------|
| Frost-free period (characteristic range) | 240-365 days |
| Freeze-free period (characteristic range) | 344-365 days |
| Precipitation total (characteristic range) | 178-254 mm |
| Frost-free period (actual range) | 217-365 days |
| Freeze-free period (actual range) | 282-365 days |

| | |
|------------------------------------|------------|
| Precipitation total (actual range) | 178-254 mm |
| Frost-free period (average) | 291 days |
| Freeze-free period (average) | 344 days |
| Precipitation total (average) | 203 mm |

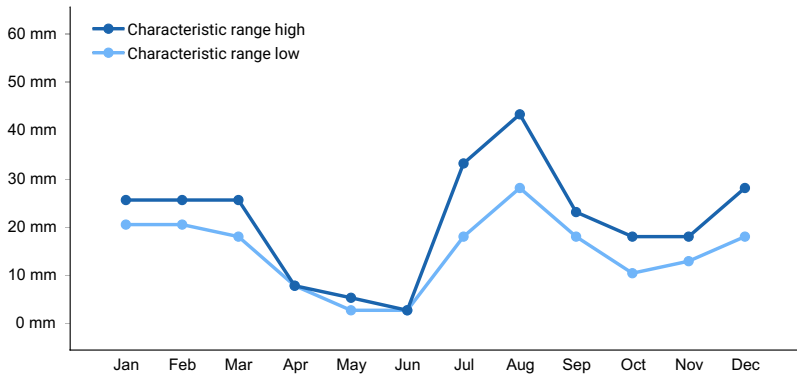


Figure 1. Monthly precipitation range

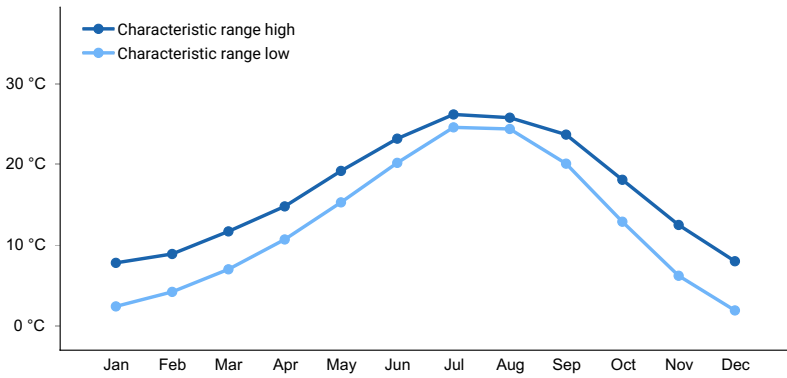


Figure 2. Monthly minimum temperature range

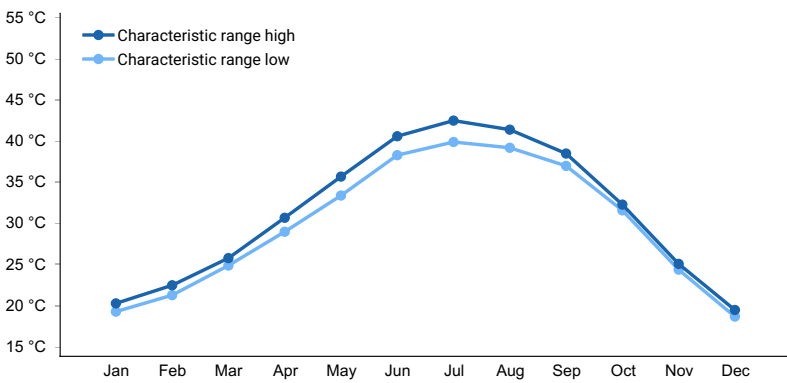


Figure 3. Monthly maximum temperature range

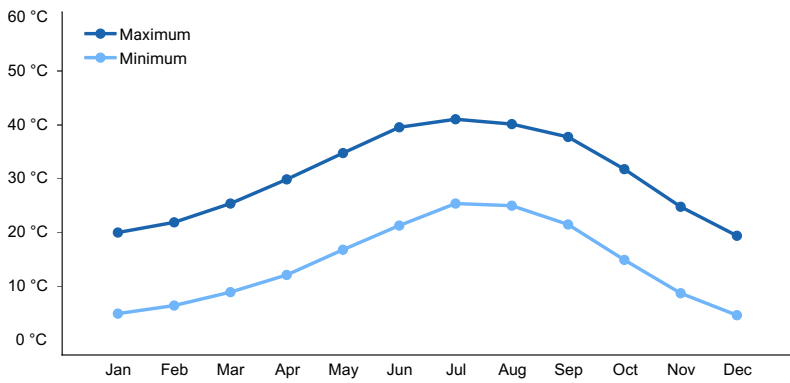


Figure 4. Monthly average minimum and maximum temperature

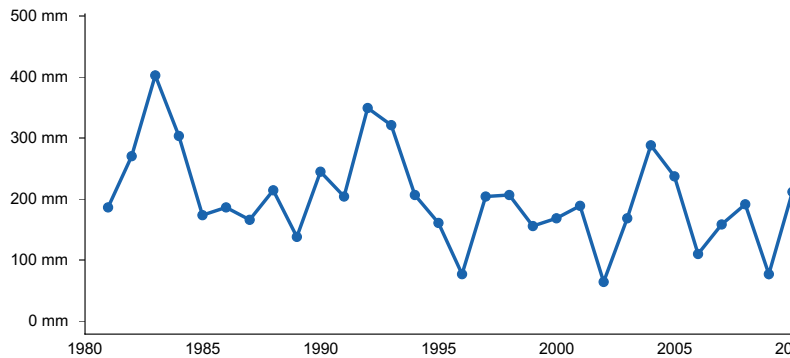


Figure 5. Annual precipitation pattern

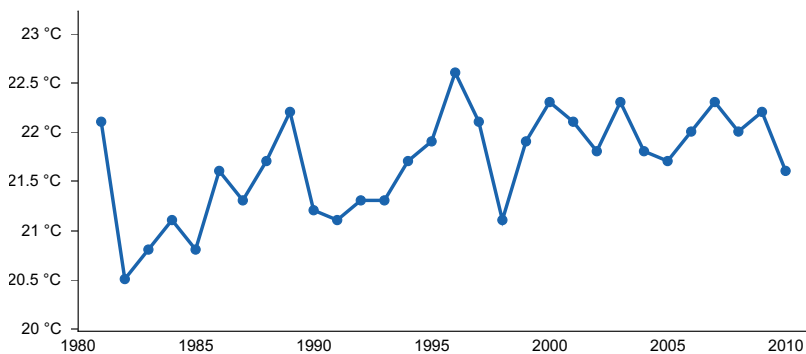


Figure 6. Annual average temperature pattern

Climate stations used

- (1) AJO [USC00020080], Ajo, AZ
- (2) ALAMO DAM [USC00020100], Salome, AZ
- (3) ARIZONA CITY [USC00020404], Arizona City, AZ
- (4) KOFA MINE [USC00024702], Wellton, AZ
- (5) MARICOPA 4 N [USC00025270], Laveen, AZ
- (6) ORGAN PIPE CACTUS NM [USC00026132], West Pima County, AZ

Influencing water features

Soil features

These deep, fine sand soils absorb and hold precipitation, making water readily available to plants on the site.

Table 4. Representative soil features

| | |
|-----------------|---------------|
| Surface texture | (1) Fine sand |
|-----------------|---------------|

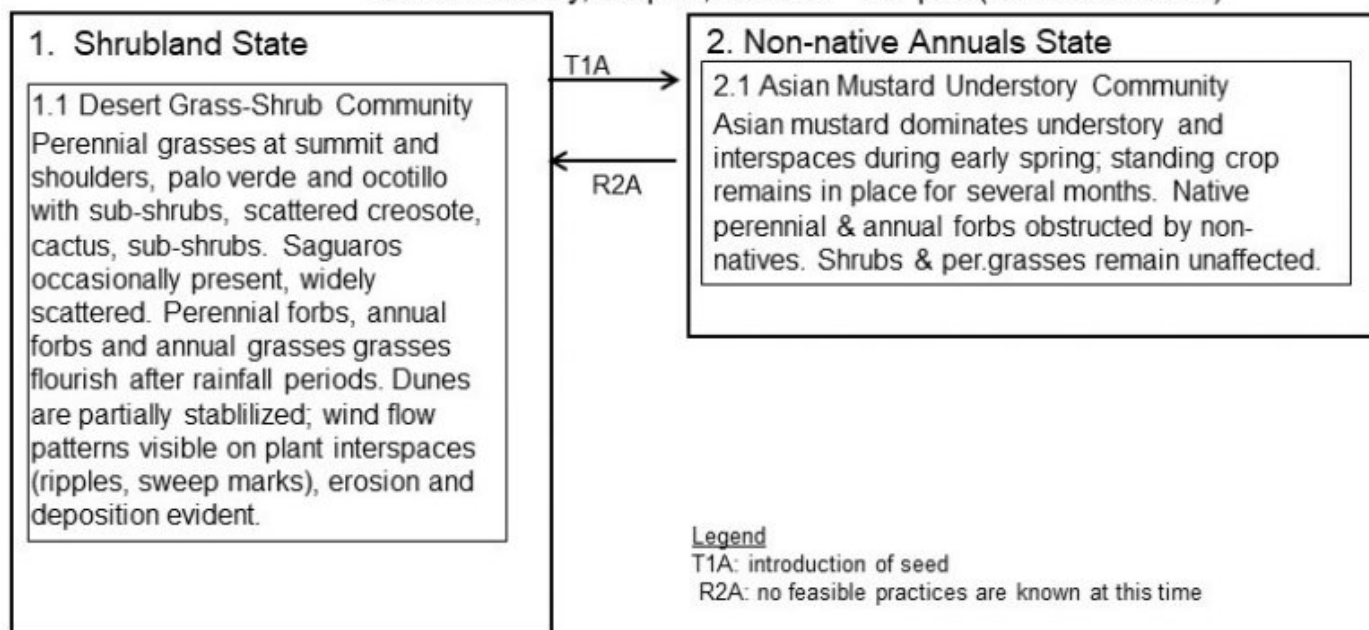
| | |
|---|---------------|
| Family particle size | (1) Fine |
| Drainage class | Well drained |
| Permeability class | Very rapid |
| Soil depth | 152 cm |
| Available water capacity (0-101.6cm) | 9.14–12.19 cm |
| Calcium carbonate equivalent (0-101.6cm) | 0–3% |
| Electrical conductivity (0-101.6cm) | 0 mmhos/cm |
| Sodium adsorption ratio (0-101.6cm) | 0 |
| Soil reaction (1:1 water) (0-101.6cm) | 7.4–8.4 |

Ecological dynamics

Sandy Slopes, Dunes, 7"-12" p.z., is a mixed desert community on wind-blown fine sands with two ecological states, Shrubland and Non-Native Annuals. Shrubland cover is predominantly big galleta, with abundant palo verde, ocotillo, shrubs and cactus. Wet winters support very productive early spring growth of annual and showy perennial forbs, such as desert lily and birdcage evening primrose. The Non-native Annuals state is easiest to discern during spring growing period when Asian mustard, the predominant non-native species, proliferates. It readily breaks up and disperses with wind following maturity. Fire is not a typical disturbance, though Non-native Annuals may carry a fire under the right weather and fuel conditions. Lightning is an unlikely ignition source as Asian mustard biomass is typically dispersed prior to the occurrence of summer convective thunderstorms. Current field observations indicate burned areas are confined to roadsides. Plant-soil relationships are excellent. Aspect is desert shrubland.

State and transition model

40-2AZ Sandy, Slopes, Dunes 7"-10" p.z. (R040XB232AZ)



State 1 Shrubland (Reference)

Shrubland is a mixed desert plant community occurring on wind-blown fine sands. The plant community is highly productive since all rainfall is captured and retained in the soil for long periods. Some very large shrub specimens can be found on this site. Palo verde, cholla and ocotillo are widely scattered, mostly occurring on more stable side-slope and interdune areas, while big galleta and white bursage are well-distributed on the less stable, windblown summit and shoulder positions. Creosote is sparsely present. Spring annuals and spring seasonal perennials (such as desert lily and birdcage evening primrose) flourish with sufficient winter precipitation as an ephemeral understory within persistent shrub and grass canopies.

Community 1.1 Desert Grass-Shrub



Figure 7. Sandy Slopes, Dunes, 7"-10" pz. (remnants of non-native forbs visible at lower right)

The plant community is a mixture of perennial and annual grasses, forbs and desert shrubs. When plant cover is depleted, these soils are very susceptible to wind erosion.

Table 5. Annual production by plant type

| Plant Type | Low (Kg/Hectare) | Representative Value (Kg/Hectare) | High (Kg/Hectare) |
|-----------------|---------------------|--------------------------------------|----------------------|
| Grass/Grasslike | 37 | 75 | 211 |
| Forb | 78 | 123 | 168 |
| Shrub/Vine | 22 | 104 | 168 |
| Tree | 11 | 37 | 56 |
| Total | 148 | 339 | 603 |

State 2 Non-native Annuals

Community 2.1 Asian Mustard-Grass-Shrub



Figure 9. Asian mustard (light brown standing dead stems) flourish after wet winter

Non-native Annuals occurs primarily after Asian mustard seeds are introduced to the site. Asian mustard germinates early in the season, uses available moisture, and spreads a dense, low canopy that may impede germination and growth of native annual forbs such as birdcage primrose and desert lily. Other non-native annual forbs or grasses may be present, but seem to not affect ecosystem dynamics as much as Asian mustard. Seed transport mechanisms are mechanical, either via wind-blown transport (the entire mature plant will tumble) or via animal

transport of sticky (mucilaginous) seeds. Non-native Annuals will look much like native Shrubland for except during, and for a short time after, wet springs when Asian mustard flourishes. Currently, no conservation practices have succeeded in removing Asian mustard, thus, no restoration pathway R2A.

Transition T1A State 1 to 2

Introduction of non-native seed by wind or animal transport.

Additional community tables

Table 6. Community 1.1 plant community composition

| Group | Common Name | Symbol | Scientific Name | Annual Production (Kg/Hectare) | Foliar Cover (%) |
|------------------------|---------------------------|--------|---|--------------------------------|------------------|
| Grass/Grasslike | | | | | |
| 1 | Perennial Grass | | | 37–211 | |
| | big galleta | PLRI3 | <i>Pleuraphis rigida</i> | 37–168 | – |
| | bush muhly | MUPO2 | <i>Muhlenbergia porteri</i> | 0–56 | – |
| 3 | Annual Grasses | | | 39–78 | |
| | needle grama | BOAR | <i>Bouteloua aristidoides</i> | 0–11 | – |
| | sixweeks grama | BOBA2 | <i>Bouteloua barbata</i> | 0–11 | – |
| | sixweeks fescue | VUOC | <i>Vulpia octoflora</i> | 0–11 | – |
| | Arizona brome | BRAR4 | <i>Bromus arizonicus</i> | 0–1 | – |
| | Arizona signalgrass | URAR | <i>Urochloa arizonica</i> | 0–1 | – |
| Forb | | | | | |
| 4 | Perennial Forbs | | | 8–39 | |
| | birdcage evening primrose | OEDE2 | <i>Oenothera deltoides</i> | 0–8 | – |
| | desert lily | HEUN2 | <i>Hesperocallis undulata</i> | 0–8 | – |
| | whitemargin sandmat | CHAL11 | <i>Chamaesyce albomarginata</i> | 1–4 | – |
| | desert sand verbena | ABVI | <i>Abronia villosa</i> | 0–3 | – |
| 5 | Annual Forbs | | | 39–78 | |
| | desert Indianwheat | PLOV | <i>Plantago ovata</i> | 0–11 | – |
| | common fiddleneck | AMMEI2 | <i>Amsinckia menziesii</i> var. <i>intermedia</i> | 0–6 | – |
| | bristly fiddleneck | AMTE3 | <i>Amsinckia tessellata</i> | 0–6 | – |
| | Coulter's globemallow | SPCO2 | <i>Sphaeralcea coulteri</i> | 0–6 | – |
| | Booth's evening primrose | CABOI | <i>Camissonia boothii</i> ssp. <i>intermedia</i> | 0–3 | – |
| | chuckwalla combseed | PEHE | <i>Pectocarya heterocarpa</i> | 0–3 | – |
| | broadfruit combseed | PEPL | <i>Pectocarya platycarpa</i> | 0–2 | – |
| | wingnut cryptantha | CRPT | <i>Cryptantha pterocarya</i> | 0–2 | – |
| | hairy prairie clover | DAMO | <i>Dalea mollis</i> | 0–1 | – |
| | soft prairie clover | DAMO2 | <i>Dalea mollissima</i> | 0–1 | – |
| | California shieldpod | DICA7 | <i>Dithyrea californica</i> | 0–1 | – |
| | miniature woollystar | ERDI2 | <i>Eriastrum diffusum</i> | 0–1 | – |
| | kidneyleaf buckwheat | ERRE3 | <i>Eriogonum reniforme</i> | 0–1 | – |
| | Thomas' buckwheat | ERTH | <i>Eriogonum thomasii</i> | 0–1 | – |

| | | | | | |
|-------------------|----------------------------|--------|--------------------------------------|--------|---|
| | little deserttrumpet | ERTR8 | <i>Eriogonum trichopes</i> | 0–1 | – |
| | spurge | EUPHO | <i>Euphorbia</i> | 0–1 | – |
| | shaggyfruit pepperweed | LELA | <i>Lepidium lasiocarpum</i> | 0–1 | – |
| | Bigelow's linanthus | LIBI2 | <i>Linanthus bigelovii</i> | 0–1 | – |
| | desert deervetch | LOMI | <i>Lotus micranthus</i> | 0–1 | – |
| | bajada lupine | LUCO | <i>Lupinus concinnus</i> | 0–1 | – |
| | Coulter's lupine | LUSP2 | <i>Lupinus sparsiflorus</i> | 0–1 | – |
| | onyxflower | ACCO3 | <i>Achyronychia cooperi</i> | 0–1 | – |
| | small wirelettuce | STEX | <i>Stephanomeria exigua</i> | 0–1 | – |
| | manybristle chinchweed | PEPA2 | <i>Pectis papposa</i> | 0–1 | – |
| | New Mexico plumeseed | RANE | <i>Rafinesquia neomexicana</i> | 0–1 | – |
| | California desertdandelion | MACA6 | <i>Malacothrix californica</i> | 0–1 | – |
| | yellowcomet | MEAF2 | <i>Mentzelia affinis</i> | 0–1 | – |
| | whitestem blazingstar | MEAL6 | <i>Mentzelia albicaulis</i> | 0–1 | – |
| | cottonheads | NEDE | <i>Nemacaulis denudata</i> | 0–1 | – |
| | glandular threadplant | NEGL | <i>Nemacladus glanduliferus</i> | 0–1 | – |
| | desert evening primrose | OEPR | <i>Oenothera primiveris</i> | 0–1 | – |
| | giant Spanish needle | PAARG | <i>Palafoxia arida var. gigantea</i> | 0–1 | – |
| | brittle spineflower | CHBR | <i>Chorizanthe brevicornu</i> | 0–1 | – |
| | Esteve's pincushion | CHST | <i>Chaenactis stevioides</i> | 0–1 | – |
| | Panamint cryptantha | CRAN4 | <i>Cryptantha angustifolia</i> | 0–1 | – |
| | spiderling | BOERH2 | <i>Boerhavia</i> | 0–1 | – |
| | redroot cryptantha | CRMI | <i>Cryptantha micrantha</i> | 0–1 | – |
| Shrub/Vine | | | | | |
| 6 | Shrubs | | | 39–78 | |
| | ocotillo | FOSP2 | <i>Fouquieria splendens</i> | 34–123 | – |
| | burrobush | AMDU2 | <i>Ambrosia dumosa</i> | 2–25 | – |
| | creosote bush | LATR2 | <i>Larrea tridentata</i> | 6–22 | – |
| | white ratany | KRGR | <i>Krameria grayi</i> | 0–9 | – |
| 7 | Cactus | | | 8–39 | |
| | Wiggins' cholla | CYEC3 | <i>Cylindropuntia echinocarpa</i> | 2–13 | – |
| | jumping cholla | CYFU10 | <i>Cylindropuntia fulgida</i> | 0–2 | – |
| | Arizona pencil cholla | CYAR14 | <i>Cylindropuntia arbuscula</i> | 0–2 | – |
| | Christmas cactus | CYLE8 | <i>Cylindropuntia leptocaulis</i> | 0–1 | – |
| Tree | | | | | |
| 7 | Tree | | | 11–56 | |
| | blue paloverde | PAFL6 | <i>Parkinsonia florida</i> | 6–17 | – |
| | yellow paloverde | PAMI5 | <i>Parkinsonia microphylla</i> | 6–17 | – |

Other references

Griffith, G.E., Omernik, J.M., Johnson, C.B., and Turner, D.S., 2014, Ecoregions of Arizona (poster): U.S. Geological Survey Open-File Report 2014-1141, with map, scale 1:1,325,000, <https://dx.doi.org/10.3133/ofr20141141>. ISSN 2331-1258 (online)

United States Department of Agriculture, Natural Resources Conservation Service. 2006. Land Resource Regions and Major Land Resource Areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296.

Contributors

Wilma Renken

Approval

Kendra Moseley, 10/17/2024

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 | 11/21/2024 |
| Approved by | Kendra Moseley |
| Approval date | |
| Composition (Indicators 10 and 12) based on | Annual Production |

Indicators

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

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

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

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

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

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

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

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

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

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

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

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

Dominant:

Sub-dominant:

Other:

Additional:

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

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

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

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

17. **Perennial plant reproductive capability:**
