USDA Natural Resources Conservation Service

Ecological site R040XA109AZ
Loamy Hills 10"-13" p.z.

Last updated: 5/29/2025
Accessed: 12/17/2025

General information

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

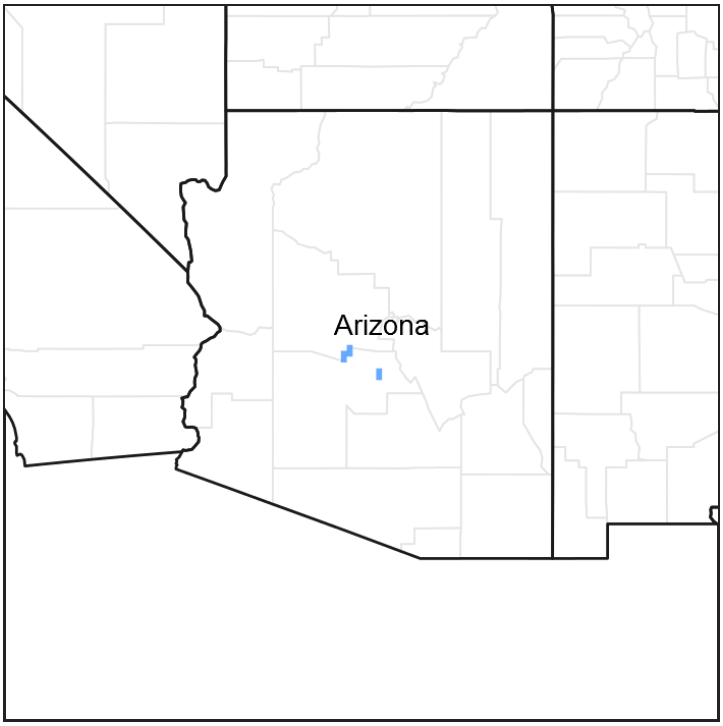

Figure 1. Mapped extent

Areas shown in blue indicate the maximum mapped extent of this ecological site. Other ecological sites likely occur within the highlighted areas. It is also possible for this ecological site to occur outside of highlighted areas if detailed soil survey has not been completed or recently updated.

MLRA notes

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

AZ 40.1 – Upper Sonoran Desert

Elevations range from 2000 to 3200 feet and precipitation averages 10 to 13 inches per year. Vegetation includes saguaro, palo verde, mesquite, creosotebush, triangle bursage, prickly pear, cholla, limberbush, wolfberry, bush muhly, threeawns, ocotillo, and globe mallow. The soil temperature regime is thermic and the soil moisture regime is typic aridic. 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 sediments filling the basins represent combinations of fluvial, lacustrine, colluvial and alluvial deposits.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Calliandra eriophylla*
Herbaceous	(1) *Pleuraphis mutica* (2) *Hilaria belangeri*

Physiographic features

This site occurs as rolling hills and side slopes of low mountains. It is always in an upland position.

Table 2. Representative physiographic features

Landforms	(1) Alluvial fan (2) Terrace
Flooding frequency	None
Ponding frequency	None
Elevation	2,000–3,200 ft
Slope	10–35%
Aspect	Aspect is not a significant factor

Climatic features

Precipitation in the sub resource area ranges from 10 to 13 inches in the southern part, along the Mexican border with elevations from about 1900 to 3200 feet. Precipitation in the northern part of the resource area ranges from 11 to 14 inches with elevations from about 1700 to 3500 feet. Winter-summer rainfall ratios range from 40%-60% in the southern portions of the land resource unit, to 50%-50% in the central portions, to 60%-40% in the northern part of the land resource unit. As one moves from east to west in this resource area rains become slightly more unpredictable and variable with Coefficients of Variation of annual rainfall equal to 29% at Tucson and 36% at Carefree. Summer rains fall July through Sept., originate in the Gulf of Mexico, and are convective, usually brief, intense

thunderstorms. Cool season moisture tends to be frontal, originating in the Pacific and Gulf of California. This winter precipitation falls in widespread storms with long duration and low intensity. Snow is rare and seldom lasts more than an hour or two. May and June are the driest months of the year. Humidity is generally very low.

Winter temperatures are mild, with very few days recording freezing temperatures in the morning. Summer temperatures are warm to hot, with several days in June and July exceeding 105 degrees F.

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

Table 3. Representative climatic features

Frost-free period (average)	265 days
Freeze-free period (average)	
Precipitation total (average)	13 in

Influencing water features

Soil features

These are deep, loamy soils. They may be gravelly. They are not limy and have fair to good plant-soil moisture relationships.
Soils mapped on this site include: in
SSA-637 Western Yavapai county MU Palo Verdes-PcE and
SSA-645 Aguila-Carefree area MU's Eba-42 & Pinaleno-43.

Table 4. Representative soil features

Surface texture	(1) Gravelly sandy loam (2) Very gravelly loam (3) Very gravelly clay loam
Family particle size	(1) Loamy
Drainage class	Moderately well drained to well drained
Permeability class	Slow to moderately slow
Soil depth	60–80 in
Surface fragment cover <=3"	5–65%
Surface fragment cover >3"	0–5%

Available water capacity (0-40in)	4–8 in
Calcium carbonate equivalent (0-40in)	10–35%
Electrical conductivity (0-40in)	0–2 mmhos/cm
Sodium adsorption ratio (0-40in)	0–3
Soil reaction (1:1 water) (0-40in)	7.8–8.4

Ecological dynamics

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

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

NRCS uses a Similarity Index to compare existing plant communities to the plant communities described here. Similarity Index is determined by comparing the production and composition of a plant community to the production and composition of a plant community described in this site description. To determine Similarity Index, compare the production (air-dry weight) of each species to that shown in the plant community description. For each species, count no more than the maximum amount shown for the species, and for each group, count no more than the maximum shown for the group. Divide the resulting total by the total normal year production shown in the plant community description. If rainfall has been significantly above or below normal, use the total production shown for above or below normal years. If field data is not collected at the end of the summer growing season, then the field data must be corrected to the end of the year production before comparing it to the site description. The growth curve can be used as a guide for estimating production at the end of the summer growing season.

State and transition model

The State and Transition Model and Accompanying Narrative Descriptions are Still To Be Developed for this Ecological Site. For More Information Contact The Arizona NRCS State Rangeland Management Specialist.

State 1
Historic Climax Plant Community

Community 1.1
Historic Climax Plant Community

The native, potential plant community is perennial grasses with lesser amounts of perennial and annual forbs and desert shrub species. As the site deteriorates from improper use, shrubby species and cactii increase to dominate it.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	420	450	480
Shrub/Vine	90	120	150
Forb	60	75	90
Total	**570**	**645**	**720**

Figure 5. Plant community growth curve (percent production by month). AZ4011, 40.1 10-13" p.z. hill sites. Growth begins in the late winter, goes semi-dormant in the drought period of late May through early July, growth continues in the summer through early fall..

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

Figure 6. Plant community growth curve (percent production by month). AZ4032, 40-3AZ 10-12" p.z. all sites. Growth begins in the spring, most growth occurs during the summer rainy season..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	0	10	15	20	30	20	5	0	0	0

Additional community tables

Table 6. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
0	**Dominant Perennial Grasses**			270–390	
1				60–90	
	threeawn	ARIST	*Aristida*	10–15	–
	sideoats grama	BOCU	*Bouteloua curtipendula*	10–15	–
	black grama	BOER4	*Bouteloua eriopoda*	10–15	–
	bush muhly	MUPO2	*Muhlenbergia porteri*	10–15	–
	big galleta	PLRI3	*Pleuraphis rigida*	10–15	–
	desert needlegrass	ACSP12	*Achnatherum speciosum*	10–15	–
2	**Misc Perennial Grasses**			6–30	
	cane bluestem	BOBA3	*Bothriochloa barbinodis*	2–8	–
	Arizona cottontop	DICA8	*Digitaria californica*	2–8	–
	large-spike bristlegrass	SEMA5	*Setaria macrostachya*	2–8	–
	slim tridens	TRMU	*Tridens muticus*	2–8	–
3	**Annual Grasses**			6–30	
	sixweeks threeawn	ARAD	*Aristida adscensionis*	1–3	–
	needle grama	BOAR	*Bouteloua aristidoides*	1–3	–

	sixweeks grama	BOBA2	*Bouteloua barbata*	1–3	–
	Arizona brome	BRAR4	*Bromus arizonicus*	1–3	–
	low woollygrass	DAPU7	*Dasyochloa pulchella*	1–3	–
	Bigelow's bluegrass	POBI	*Poa bigelovii*	0–3	–
	Eastwood fescue	VUMIC	*Vulpia microstachys var. ciliata*	0–3	–
	sixweeks fescue	VUOC	*Vulpia octoflora*	0–3	–
	Arizona signalgrass	URAR	*Urochloa arizonica*	0–2	–
	muhly	MUHLE	*Muhlenbergia*	0–2	–
	littleseed muhly	MUMI	*Muhlenbergia microsperma*	0–2	–
Forb					
4	**Annual Forbs**			30–60	
	desert Indianwheat	PLOV	*Plantago ovata*	4–10	–
	New Mexico thistle	CINE	*Cirsium neomexicanum*	4–10	–
	Coulter's lupine	LUSP2	*Lupinus sparsiflorus*	4–8	–
	evening primrose	OENOT	*Oenothera*	0–5	–
	phacelia	PHACE	*Phacelia*	1–5	–
	cryptantha	CRYPT	*Cryptantha*	1–5	–
	American wild carrot	DAPU3	*Daucus pusillus*	1–5	–
	California poppy	ESCAM	*Eschscholzia californica ssp. mexicana*	1–5	–
	gilia	GILIA	*Gilia*	1–5	–
	pepperweed	LEPID	*Lepidium*	2–5	–
	trefoil	LOTUS	*Lotus*	0–5	–
	trailing windmills	ALIN	*Allionia incarnata*	2–5	–
	ragweed	AMBRO	*Ambrosia*	2–5	–
	common fiddleneck	AMMEI2	*Amsinckia menziesii var. intermedia*	1–5	–
	bristly fiddleneck	AMTE3	*Amsinckia tessellata*	1–5	–
	milkvetch	ASTRA	*Astragalus*	2–5	–
	hoary bowlesia	BOIN3	*Bowlesia incana*	0–5	–
	mariposa lily	CALOC	*Calochortus*	0–5	–
	woolly plantain	PLPA2	*Plantago patagonica*	2–5	–

	New Mexico plumeseed	RANE	*Rafinesquia neomexicana*	1–5	–
	ragwort	SENEC	*Senecio*	2–5	–
	catchfly	SILEN	*Silene*	1–5	–
	Coulter's globemallow	SPCO2	*Sphaeralcea coulteri*	2–5	–
5	**Perennial Forbs**			30–60	
	dwarf desertpeony	ACNA2	*Acourtia nana*	1–2	–
	brownfoot	ACWR5	*Acourtia wrightii*	1–2	–
	tuber anemone	ANTU	*Anemone tuberosa*	1–2	–
	California suncup	CACA32	*Camissonia californica*	1–2	–
	bluedicks	DICAC5	*Dichelostemma capitatum ssp. capitatum*	1–2	–
	desert trumpet	ERIN4	*Eriogonum inflatum*	1–2	–
	Parry's false prairie-clover	MAPA7	*Marina parryi*	1–2	–
	wishbone-bush	MILAV	*Mirabilis laevis var. villosa*	1–2	–
	Coues' cassia	SECO10	*Senna covesii*	1–2	–
	desert globemallow	SPAM2	*Sphaeralcea ambigua*	1–2	–
	globemallow	SPHAE	*Sphaeralcea*	1–2	–
	brownplume wirelettuce	STPA4	*Stephanomeria pauciflora*	1–2	–
Shrub/Vine					
6	**Dominant Shrubs**			60–90	
	Nevada jointfir	EPNE	*Ephedra nevadensis*	10–15	–
	Mexican bladdersage	SAME	*Salazaria mexicana*	10–15	–
	toothleaf goldeneye	VIDE3	*Viguiera dentata*	10–15	–
	littleleaf ratany	KRER	*Krameria erecta*	10–15	–
	rough menodora	MESC	*Menodora scabra*	5–10	–
	slender janusia	JAGR	*Janusia gracilis*	5–10	–
	fairyduster	CAER	*Calliandra eriophylla*	5–10	–
7	**Misc Shrubs**			30–60	
	whitethorn acacia	ACCO2	*Acacia constricta*	2–5	–
	catclaw acacia	ACGR	*Acacia greggii*	2–5	–

	catclaw acacia	ACGR	*Acacia greggii*	2–5	–
	rayless goldenhead	ACSP	*Acamptopappus sphaerocephalus*	2–5	–
	San Felipe dogweed	ADPO	*Adenophyllum porophylloides*	1–5	–
	shortleaf baccharis	BABR	*Baccharis brachyphylla*	2–5	–
	Goodding's tansyaster	MAPIG2	*Machaeranthera pinnatifida ssp. gooddingii var. gooddingii*	2–5	–
	plains blackfoot	MELE2	*Melampodium leucanthum*	1–5	–
	whitestem paperflower	PSCO2	*Psilostrophe cooperi*	2–5	–
	Eastern Mojave buckwheat	ERFA2	*Eriogonum fasciculatum*	2–5	–
	bastardsage	ERWR	*Eriogonum wrightii*	2–5	–
	threadleaf snakeweed	GUMI	*Gutierrezia microcephala*	1–4	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	1–4	–
	desert-thorn	LYCIU	*Lycium*	1–4	–
	starry bedstraw	GASTE2	*Galium stellatum ssp. eremicum*	1–3	–
	Lemmon's ragwort	SELE8	*Senecio lemmonii*	1–3	–
	American threefold	TRCA8	*Trixis californica*	1–3	–
	Chihuahuan brickellbush	BRFL	*Brickellia floribunda*	1–3	–
	rough brickellbush	BRMIS	*Brickellia microphylla var. scabra*	1–3	–
	crucifixion thorn	CAHO3	*Canotia holacantha*	1–3	–
	brittlebush	ENFA	*Encelia farinosa*	1–3	–
	Wright's beebrush	ALWR	*Aloysia wrightii*	1–3	–
8	**Succulents**			6–30	
	saguaro	CAGI10	*Carnegiea gigantea*	1–5	–
	ocotillo	FOSP2	*Fouquieria splendens*	1–5	–
	banana yucca	YUBA	*Yucca baccata*	1–5	–
	cactus apple	OPEN3	*Opuntia engelmannii*	1–3	–
	buckhorn cholla	CYACA2	*Cylindropuntia acanthocarpa var. acanthocarpa*	1–3	–
	Engelmann's	ECEN	*Echinocereus engelmannii*	1–3	–

	hedgehog cactus				
	candy barrelcactus	FEWI	*Ferocactus wislizeni*	1–3	–
Tree					
9	**Tree**			5–10	
	yellow paloverde	PAMI5	*Parkinsonia microphylla*	5–10	–

Animal community

This site is accessible for and produces forage for use, yearlong, by all classes of livestock. Fencing and water developments my be needed to improve distribution and facilitate management.

For wildlife this site is an important one for smaller animals. As natural waters are lacking, stockwater developments are very important on the site. Numerous inclusions of drainageways provide adequate cover for larger animals such as mule deer.

Recreational uses

This site is located on rolling hills and side slopes of desert mountains consisting of grassy hills with good desert wildflower production in years of good winter moisture.
Very few days in the fall, winter and spring are too uncomfortable to enjoy out-of-door activities. In June, July and August the afternoon heat restricts activity. The major activities are rockhounding, hunting, horseback riding, prospecting and photography.

Wood products

None.

Other products

Mining occurs in places on the site.

Type locality

Location 1: Yavapai County, AZ	
Township/Range/Section	T9N R4W S16
General legal description	State Location: Section 16, T9N, R4W, Prescott F.O., JJ Coughlin Ranch. Other Field Office locations are Phoenix F.O. Section 12, T7N, R6W, Flying E Ranch on right-of-way of Wickenburh-Aguila Highway, Southside.

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	12/17/2025
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:**

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

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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):**

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

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

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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):**

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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:

    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):**

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

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

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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:**

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17. **Perennial plant reproductive capability:**
