

Ecological site R040XB233AZ

Limy Slopes, Gypsum 7"-10" p.z.

Last updated: 10/17/2024
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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.

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 Limy Slopes, Gypsum, 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

Limy Slopes, Gypsum, 7"-10" p.z., occurs on moderately to steeply sloping uplands. Slopes are generally greater than 8%. The calcareous soils are deep with visible gypsum crystals. The gypsum content, combined with the steep slopes, make this ecological site extremely susceptible to water erosion, affecting use and management options.

Associated sites

R040XB234AZ	Limy Fan, Gypsum 7"-10" p.z. adjacent alluvial fans
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Similar sites

R040XB209AZ	Limy Slopes 7"-10" p.z. soils not gypsic
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Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) <i>Ambrosia dumosa</i> (2) <i>Larrea tridentata</i>
Herbaceous	(1) <i>Pleuraphis rigida</i>

Physiographic features

This site occurs on hillslopes and ridgetops generally associated with relict lakebed sediments.

Table 2. Representative physiographic features

Landforms	(1) Hill (2) Ridge
Elevation	1,200–2,000 ft
Slope	8–45%

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 more 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 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 (average)	291 days
Freeze-free period (average)	344 days
Precipitation total (average)	10 in

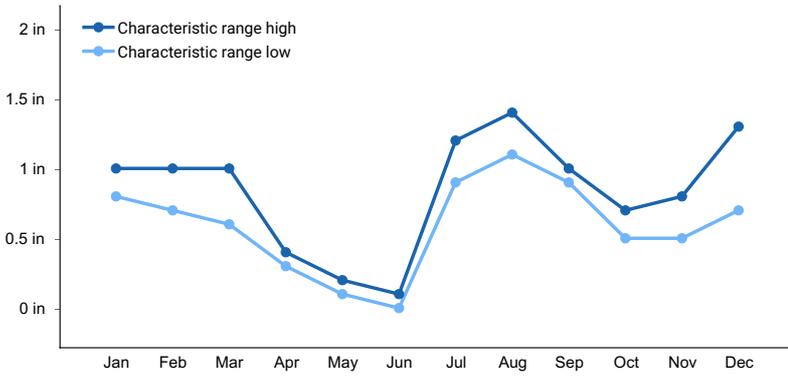


Figure 1. Monthly precipitation range

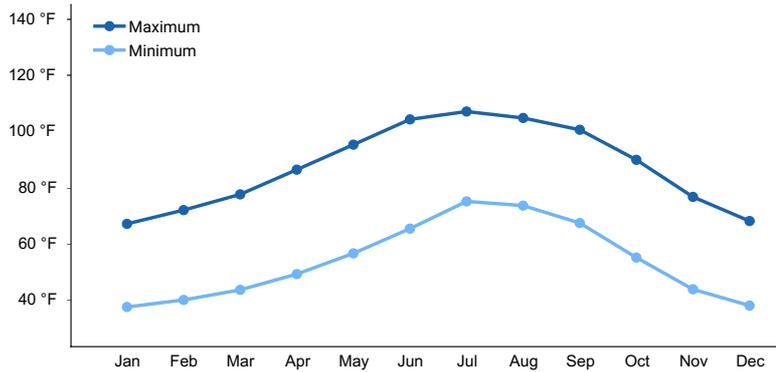


Figure 2. Monthly average minimum and maximum temperature

Influencing water features

Soil features

These are moderately deep to deep soils formed in relict lakebed deposits. They are very calcareous and gypsiferous, with greater than 15% gypsum content throughout the soil profile. Fine gypsum masses and fine gypsum crystals are visible in subsoils. The gypsum content makes the soil extremely vulnerable to water erosion. Plant-soil moisture relationships are poor.

Table 4. Representative soil features

Parent material	(1) Lacustrine deposits
Drainage class	Well drained
Permeability class	Moderate to moderately rapid
Soil depth	40–60 in
Surface fragment cover ≤3"	15–65%
Surface fragment cover >3"	1–10%
Available water capacity (0-40in)	3–6 in
Calcium carbonate equivalent (0-40in)	5–35%
Electrical conductivity (0-40in)	0–2 mmhos/cm
Sodium adsorption ratio (0-40in)	0
Soil reaction (1:1 water) (0-40in)	7.9–8.4

Subsurface fragment volume <=3" (Depth not specified)	15–65%
Subsurface fragment volume >3" (Depth not specified)	1–10%

Ecological dynamics

Limy Slopes, Gypsum, 7"-10" p.z., is a robust ecological site of limited areal extent. Only one state, Shrubland, has been observed. The soil gypsum content makes the site extremely vulnerable to water erosion. Any disturbance that removes the surface horizon could initiate extreme erosion. Areas of geological erosion are located adjacent to this ecological site (Figure 4). These barren areas are not caused by human disturbance, thus, are not considered to represent a separate state.

State and transition model

40-2AZ Limy Slopes, Gypsum, 7-10" p.z. (R040XB233AZ)

1. Shrubland State

1.1 Shrub Community

Scattered shrubland. Creosote is dominant over bursages and ratany, with a miscellaneous shrubs and cactus throughout. Perennial grasses and forb are present, not common. Annual forbs and annual grasses minor, flourish after rainfall.

State 1

Shrubland (Reference)

Community 1.1

Creosote-Bursage-Mixed Shrub



Figure 3. Reference community on left, eroded slopes on right

The potential plant community on this site is a mixture of desert shrubs, cacti, perennial grasses and forbs. Annual grasses and forbs make up a small percentage of the potential community. The aspect is shrubland.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Shrub/Vine	195	225	255
Grass/Grasslike	15	30	45
Forb	30	37	45
Total	240	292	345

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					
1	Perennial Grasses			15–30	
	big galleta	PLRI3	<i>Pleuraphis rigida</i>	0–15	–
	bush muhly	MUPO2	<i>Muhlenbergia porteri</i>	0–5	–
	spidergrass	ARTE3	<i>Aristida ternipes</i>	0–1	–
	low woollygrass	DAPU7	<i>Dasyochloa pulchella</i>	0–1	–
2	Annual Grasses			3–15	
	needle grama	BOAR	<i>Bouteloua aristidoides</i>	0–5	–
	Rothrock's grama	BORO2	<i>Bouteloua rothrockii</i>	0–5	–
	Arizona brome	BRAR4	<i>Bromus arizonicus</i>	0–1	–
	feather fingergrass	CHVI4	<i>Chloris virgata</i>	0–1	–
	Arizona signalgrass	URAR	<i>Urochloa arizonica</i>	0–1	–
Forb					
4	Perennial Forbs			15–30	
	desert globemallow	SPAM2	<i>Sphaeralcea ambigua</i>	5–10	–
	desert trumpet	ERIN4	<i>Eriogonum inflatum</i>	2–5	–
	Parry's false prairie-clover	MAPA7	<i>Marina parryi</i>	0–2	–
	lacy tansyaster	MAPIP4	<i>Machaeranthera pinnatifida</i> ssp. <i>pinnatifida</i>	0–2	–

			<i>var. pinnatifida</i>		
	rough menodora	MESC	<i>Menodora scabra</i>	0–1	–
	evening primrose	OENOT	<i>Oenothera</i>	0–1	–
	slender poreleaf	POGR5	<i>Porophyllum gracile</i>	0–1	–
	Coues' cassia	SECO10	<i>Senna covesii</i>	0–1	–
	California fagonbush	FALA	<i>Fagonia laevis</i>	0–1	–
	paleface	HIDE	<i>Hibiscus denudatus</i>	0–1	–
	slender janusia	JAGR	<i>Janusia gracilis</i>	0–1	–
	dwarf desertpeony	ACNA2	<i>Acourtia nana</i>	0–1	–
	brownfoot	ACWR5	<i>Acourtia wrightii</i>	0–1	–
	poreleaf dogweed	ADPO2	<i>Adenophyllum porophyllum</i>	0–1	–
	trailing windmills	ALIN	<i>Allionia incarnata</i>	0–1	–
	narrowleaf silverbush	ARLA12	<i>Argythamnia lanceolata</i>	0–1	–
	New Mexico silverbush	ARNE2	<i>Argythamnia neomexicana</i>	0–1	–
	rush milkweed	ASSU	<i>Asclepias subulata</i>	0–1	–
	desert marigold	BAMU	<i>Baileya multiradiata</i>	0–1	–
	whitemargin sandmat	CHAL11	<i>Chamaesyce albomarginata</i>	0–1	–
	desert larkspur	DEPA	<i>Delphinium parishii</i>	0–1	–
	tall mountain larkspur	DESC	<i>Delphinium scaposum</i>	0–1	–
	bluedicks	DICA14	<i>Dichelostemma capitatum</i>	0–1	–
	brownplume wirelettuce	STPA4	<i>Stephanomeria pauciflora</i>	0–1	–
5	Annual Forbs			3–15	
	sand pygmyweed	CRCO34	<i>Crassula connata</i>	0–3	–
	combseed	PECTO	<i>Pectocarya</i>	0–3	–
	woolly tidestromia	TILA2	<i>Tidestromia lanuginosa</i>	0–3	–
	coastal bird's-foot trefoil	LOSAB	<i>Lotus salsuginosus var. brevivexillus</i>	0–2	–
	strigose bird's-foot trefoil	LOSTT	<i>Lotus strigosus var. tomentellus</i>	0–2	–
	cryptantha	CRYPT	<i>Cryptantha</i>	0–2	–
	hairy prairie clover	DAMO	<i>Dalea mollis</i>	0–1	–
	American wild carrot	DAPU3	<i>Daucus pusillus</i>	0–1	–
	western tansymustard	DEPI	<i>Descurainia pinnata</i>	0–1	–
	flatcrown buckwheat	ERDE6	<i>Eriogonum deflexum</i>	0–1	–
	miniature woollystar	ERDI2	<i>Eriastrum diffusum</i>	0–1	–
	erigenia	ERIGE	<i>Erigenia</i>	0–1	–
	buckwheat	ERIOG	<i>Eriogonum</i>	0–1	–
	Texas stork's bill	ERTE13	<i>Erodium texanum</i>	0–1	–
	California poppy	ESCAM	<i>Eschscholzia californica ssp. mexicana</i>	0–1	–
	pygmy poppy	ESMI	<i>Eschscholzia minutiflora</i>	0–1	–
	glia	GILIA	<i>Gilia</i>	0–1	–
	Gordon's bladderpod	LEGO	<i>Lesquerella gordonii</i>	0–1	–
	shaggyfruit pepperweed	LELA	<i>Lepidium lasiocarpum</i>	0–1	–
	foothill deervetch	LOHU2	<i>Lotus humistratus</i>	0–1	–
	Arizona lupine	LUAR4	<i>Lupinus arizonicus</i>	0–1	–

	Coulter's lupine	LUSP2	<i>Lupinus sparsiflorus</i>	0-1	-
	blazingstar	MENTZ	<i>Mentzelia</i>	0-1	-
	bristly nama	NAHI	<i>Nama hispidum</i>	0-1	-
	glandular threadplant	NEGL	<i>Nemacladus glanduliferus</i>	0-1	-
	Florida pellitory	PAFL3	<i>Parietaria floridana</i>	0-1	-
	manybristle chinchweed	PEPA2	<i>Pectis papposa</i>	0-1	-
	phacelia	PHACE	<i>Phacelia</i>	0-1	-
	desert Indianwheat	PLOV	<i>Plantago ovata</i>	0-1	-
	New Mexico plumeseed	RANE	<i>Rafinesquia neomexicana</i>	0-1	-
	chia	SACO6	<i>Salvia columbariae</i>	0-1	-
	sleepy silene	SIAN2	<i>Silene antirrhina</i>	0-1	-
	Coulter's globemallow	SPCO2	<i>Sphaeralcea coulteri</i>	0-1	-
	woollyhead neststraw	STMI2	<i>Stylocline micropoides</i>	0-1	-
	common fiddleneck	AMMEI2	<i>Amsinckia menziesii var. intermedia</i>	0-1	-
	bristly fiddleneck	AMTE3	<i>Amsinckia tessellata</i>	0-1	-
	milkvetch	ASTRA	<i>Astragalus</i>	0-1	-
	Esteve's pincushion	CHST	<i>Chaenactis stevioides</i>	0-1	-
	New Mexico thistle	CINE	<i>Cirsium neomexicanum</i>	0-1	-
	Coulter's spiderling	BOCO2	<i>Boerhavia coulteri</i>	0-1	-
	hoary bowlesia	BOIN3	<i>Bowlesia incana</i>	0-1	-
	California suncup	CACA32	<i>Camissonia californica</i>	0-1	-
	exserted Indian paintbrush	CAEXE	<i>Castilleja exserta ssp. exserta</i>	0-1	-
	yellow tackstem	CAPA7	<i>Calycoseris parryi</i>	0-1	-
	white tackstem	CAWR	<i>Calycoseris wrightii</i>	0-1	-
	brittle spineflower	CHBR	<i>Chorizanthe brevicornu</i>	0-1	-
	pebble pincushion	CHCA	<i>Chaenactis carphoclinia</i>	0-1	-
	hyssopleaf sandmat	CHHY3	<i>Chamaesyce hyssopifolia</i>	0-1	-
	devil's spineflower	CHRI	<i>Chorizanthe rigida</i>	0-1	-

Shrub/Vine

6	Dominant Large Shrub			90-135	
	creosote bush	LATR2	<i>Larrea tridentata</i>	90-135	-
7	Dominant Half Shrubs			20-45	
	burrobush	AMDU2	<i>Ambrosia dumosa</i>	15-30	-
	white ratany	KRGR	<i>Krameria grayi</i>	5-15	-
	brittlebush	ENFA	<i>Encelia farinosa</i>	0-5	-
9	Miscellaneous Shrubs			15-30	
	yellow paloverde	PAMI5	<i>Parkinsonia microphylla</i>	0-5	-
	desert ironwood	OLTE	<i>Olneya tesota</i>	0-3	-
	ocotillo	FOSP2	<i>Fouquieria splendens</i>	0-2	-
	desert lavender	HYEM	<i>Hyptis emoryi</i>	0-1	-
	sangre de cristo	JACA2	<i>Jatropha cardiophylla</i>	0-1	-
	crown of thorns	KOSP	<i>Koeberlinia spinosa</i>	0-1	-
	water jacket	LYAN	<i>Lycium andersonii</i>	0-1	-

	Arizona desert-thorn	LYEX	<i>Lycium exsertum</i>	0–1	–
	desert wolfberry	LYMA	<i>Lycium macrodon</i>	0–1	–
	whitethorn acacia	ACCO2	<i>Acacia constricta</i>	0–1	–
	catclaw acacia	ACGR	<i>Acacia greggii</i>	0–1	–
	rayless goldenhead	ACSP	<i>Acamptopappus sphaerocephalus</i>	0–1	–
	Coulter's brickellbush	BRCO	<i>Brickellia coulteri</i>	0–1	–
	button brittlebush	ENFR	<i>Encelia frutescens</i>	0–1	–
	Nevada jointfir	EPNE	<i>Ephedra nevadensis</i>	0–1	–
	velvet mesquite	PRVE	<i>Prosopis velutina</i>	0–1	–
	whitestem paperflower	PSCO2	<i>Psilostrophe cooperi</i>	0–1	–
	dwarf saltwort	SABI	<i>Salicornia bigelovii</i>	0–1	–
	Mexican bladdersage	SAME	<i>Salazaria mexicana</i>	0–1	–
	jojoba	SICH	<i>Simmondsia chinensis</i>	0–1	–
	woody crinklemat	TICAC	<i>Tiquilia canescens var. canescens</i>	0–1	–
	American threefold	TRCA8	<i>Trixis californica</i>	0–1	–
	Parish's goldeneye	VIPA14	<i>Viguiera parishii</i>	0–1	–
	desert zinnia	ZIAC	<i>Zinnia acerosa</i>	0–1	–
	lotebush	ZIOB	<i>Ziziphus obtusifolia</i>	0–1	–
10	Cacti			15–30	
	senita cactus	PASC14	<i>Pachycereus schottii</i>	0–2	–
	organpipe cactus	STTH3	<i>Stenocereus thurberi</i>	0–2	–
	beavertail pricklypear	OPBA2	<i>Opuntia basilaris</i>	0–1	–
	Engelmann's hedgehog cactus	ECEN	<i>Echinocereus engelmannii</i>	0–1	–
	Leconte's barrel cactus	FECYL	<i>Ferocactus cylindraceus var. lecontei</i>	0–1	–
	candy barrelcactus	FEWI	<i>Ferocactus wislizeni</i>	0–1	–
	common fishhook cactus	MATE4	<i>Mammillaria tetrancistra</i>	0–1	–

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	10/22/2019
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:**
