USDA Natural Resources
Conservation Service

Ecological site R030XB210AZ
Limestone Hills 6-9" p.z.

Last updated: 10/21/2024
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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.

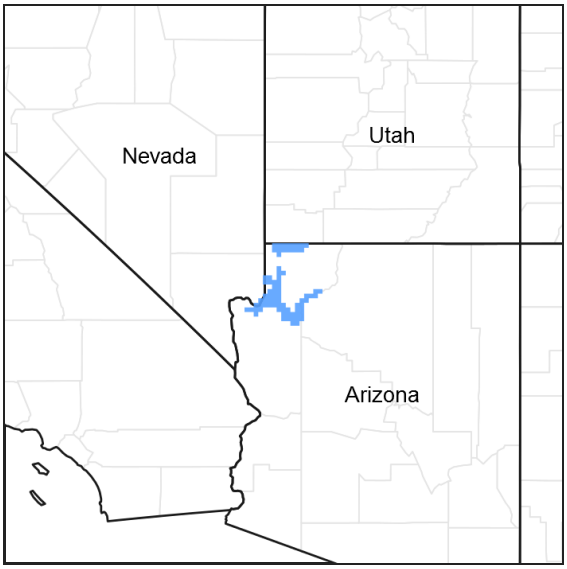


Figure 1. Mapped extent

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): 030X–Mojave Basin and Range

This unit occurs within the Basin and Range Province and is characterized by broad basins, valleys, and old lakebeds. Widely spaced mountains trending north to south occur throughout the area. Isolated, short mountain ranges are separated by an aggraded desert plain. The mountains are fault blocks that have been tilted up. Long alluvial fans coalesce with dry lakebeds between some of the ranges.

LRU notes

AZ LRU 30-2 – Middle Mohave Desert

Elevations range from 1500 to 3200 feet and precipitation averages 6 to 9 inches per year. Vegetation includes creosotebush, white bursage, yucca, prickly pear and cholla species, Mormon tea, flattop buckwheat, ratany, winterfat, bush muhly, threeawns, and big galleta. The soil temperature regime is thermic and the soil moisture regime is typic aridic.

Ecological site concept

This ecological site is located on steeply sloping uplands (slopes 15%-65%). Soils are very shallow to shallow over

limestone.

Associated sites

R030XB205AZ	**Sandy Loam Upland 6-10" p.z. Limy Subsurface, Gravelly**
R030XB208AZ	**Gypsum Hills 6-9" p.z.**
R030XB214AZ	**Limy Upland 6-9" p.z.**
R030XB222AZ	**Gypsum Hills 6-9" p.z. Alkaline**

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Ephedra nevadensis* (2) *Encelia frutescens*
Herbaceous	(1) *Pleuraphis rigida* (2) *Muhlenbergia porteri*

Physiographic features

This site occurs in an upland position as hills and escarpments associated with rock outcrops. Geologic formations associated with the site include Callville limestone, Kaibab Limestone, Coconino sandstone and Supi formation. Slopes range from 35 to 70 percent.

Table 2. Representative physiographic features

Landforms	(1) Escarpment (2) Hill
Flooding frequency	None
Ponding frequency	None
Elevation	1,600–3,500 ft
Slope	35–70%
Aspect	Aspect is not a significant factor

Climatic features

The climate is arid and warm. Annual precipitation ranges from 6 to 9 inches. About 65 percent of the rainfall comes from October through May as gentle rain from Pacific storms which may last for a couple of days. The rest of the rainfall comes during the summer monsoon season from July through September as spotty, brief, intense thunderstorms. Snow rarely falls, and only remains on the ground a few hours at most. Annual air temperature ranges from 59 to 70 degrees F. The average frost-free period ranges from 156 to 259 days.

Table 3. Representative climatic features

Frost-free period (average)	259 days
Freeze-free period (average)	290 days
Precipitation total (average)	9 in

Influencing water features

Soil features

The soil of this ecological site is very shallow to shallow. The surface texture is extremely gravelly loam. The subsurface texture is extremely gravelly loam. The parent material is colluvium from sedimentary formations. The available water holding capacity is very low due to the shallow nature of the soil. The hazard of erosion by water is very severe and by wind is slight. The soil is calcareous throughout the profile.

A typical soil profile is a follows:

0 to 1 inch - extremely gravelly loam
1 to 7 inches - extremely gravelly loam
7 inches - limestone bedrock

Soil map units correlated to this ecological site include 623034, Hindu soil, Shivwits Area SSA.

Table 4. Representative soil features

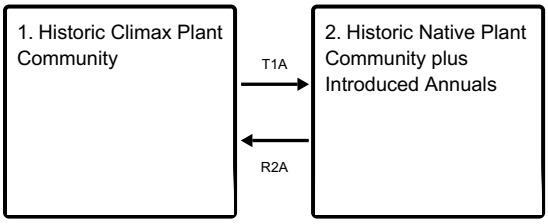
Surface texture	(1) Extremely gravelly loam
Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Moderate to moderately rapid
Soil depth	5–20 in
Surface fragment cover <=3"	35–65%
Surface fragment cover >3"	0–20%
Available water capacity (0-40in)	0.3–0.5 in
Calcium carbonate equivalent (0-40in)	15–35%
Electrical conductivity (0-40in)	0–2 mmhos/cm
Soil reaction (1:1 water) (0-40in)	7.9–8.4
Subsurface fragment volume <=3" (Depth not specified)	35–65%
Subsurface fragment volume >3" (Depth not specified)	0–20%

Ecological dynamics

Limestone Hills, 6"-9" p.z., is a mixed shrubland. Scattered perennial grasses and forbs are well-distributed across the site. Annual forbs and grasses flourish following rainfall. Natural disturbances are rare. Following introduction of non-native annuals (forbs and/or grasses), seasonal herbaceous production increases following wet winters. Assorted half-shrubs are widely scattered.

State and transition model

Ecosystem states



State 1 submodel, plant communities

1.1. Historic Climax Plant Community

State 2 submodel, plant communities

2.1. Non-native Annuals

State 1
Historic Climax Plant Community

Community 1.1
Historic Climax Plant Community

The dominant aspect of this ecological site is a desert shrub-grassland. No one species dominates the aspect, although the cacti species, Utah agave, and Fremont dalea are very visible when in flower. With disturbance plants that will increase are snakeweed and plants that will invade are red brome. The site's total annual production by weight (air-dried) is comprised of: grasses and grasslike plants 20 to 30 percent, forbs 5 to 15 percent, shrubs 60 to 70 percent and trees 0 to 3 percent.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Shrub/Vine	70	145	237
Grass/Grasslike	24	55	102
Forb	6	20	51
Tree	0	5	10
Total	**100**	**225**	**400**

Table 6. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	0-2%
Grass/grasslike foliar cover	0-1%
Forb foliar cover	0-1%
Non-vascular plants	0%
Biological crusts	0%
Litter	0%
Surface fragments >0.25" and <=3"	0%
Surface fragments >3"	0%
Bedrock	0%
Water	0%
Bare ground	0%

Table 7. Canopy structure (% cover)

Height Above Ground (Ft)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.5	–	–	–	0-2%
>0.5 <= 1	–	–	1-3%	–
>1 <= 2	–	–	–	–
>2 <= 4.5	–	8-12%	–	–
>4.5 <= 13	–	–	–	–
>13 <= 40	–	–	–	–
>40 <= 80	–	–	–	–
>80 <= 120	–	–	–	–
>120	–	–	–	–

Figure 5. Plant community growth curve (percent production by month). AZ3022, 30.2 6-9" p.z. upland sites. Growth begins in the late winter, most growth occurs in the spring..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	2	19	33	18	7	7	11	3	0	0	0

Figure 6. Plant community growth curve (percent production by month). AZ3038, 35.5 6-9" p.z. Nevada Mormon tea. Growth occurs mostly in the spring and early summer using stored winter moisture..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	15	25	20	15	15	10	0	0	0	0

Figure 7. Plant community growth curve (percent production by month). AZ3070, 30.23 6-9" p.z. big galleta. 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	10	15	5	0	10	45	15	0	0	0

Figure 8. Plant community growth curve (percent production by month). AZ3075, 30.23 6-9" p.z. white ratany. Most growth occurs in the spring, some growth occurs in the summer. Flowers in the spring..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	5	20	35	5	10	15	10	0	0	0

Figure 9. Plant community growth curve (percent production by month). AZ3077, 30.23 6-9" p.z. bush muhly. Growth begins in the spring, most growth occurs during the summer rainy season, green most of the year..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	5	5	5	5	15	40	20	5	0	0

State 2
Historic Native Plant Community plus Introduced Annuals

Community 2.1
Non-native Annuals

This plant community resembles the historic native plant community, but exotic annuals have been introduced. Non-native species include red brome, Mediterranean grass (Schismus spp.), and filaree. The flourish of non-native

annuals that occurs following rainfalls may preclude native annuals.

Transition T1A
State 1 to 2

Introduction of non-native forb and grass seed.

Restoration pathway R2A
State 2 to 1

None known.

Additional community tables

Table 8. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1				2–11	
	bush muhly	MUPO2	*Muhlenbergia porteri*	2–11	–
2				4–14	
	big galleta	PLRI3	*Pleuraphis rigida*	4–14	–
3				2–14	
	threeawn	ARIST	*Aristida*	2–14	–
4				0–11	
	slim tridens	TRMU	*Tridens muticus*	0–11	–
5				0–9	
	low woollygrass	DAPU7	*Dasyochloa pulchella*	0–9	–
6				0–4	
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	0–4	–
7				0–11	
	Grass, perennial	2GP	*Grass, perennial*	0–11	–
	desert needlegrass	ACSP12	*Achnatherum speciosum*	0–11	–
	common wolfstail	LYPH	*Lycurus phleoides*	0–11	–
8				0–2	
	Grass, annual	2GA	*Grass, annual*	0–2	–
	sixweeks grama	BOBA2	*Bouteloua barbata*	0–2	–
Forb					
9				0–7	
	desert globemallow	SPAM2	*Sphaeralcea ambigua*	0–7	–
10				0–9	
	desert trumpet	ERIN4	*Eriogonum inflatum*	0–9	–
11				2–18	
	Forb, perennial	2FP	*Forb, perennial*	2–9	–
	desert marigold	BAMU	*Baileya multiradiata*	2–9	–
	lettuce	LACTU	*Lactuca*	2–9	–
	beardtongue	PENST	*Penstemon*	2–9	–
	phlox	PHLOX	*Phlox*	2–9	–

	phlox	PHLOX	*Phlox*	2–9	
12				2–22	
	Forb, annual	2FA	*Forb, annual*	2–11	–
	buckwheat	ERIOG	*Eriogonum*	2–11	–
	spurge	EUPHO	*Euphorbia*	2–11	–
	blazingstar	MENTZ	*Mentzelia*	2–11	–
	phacelia	PHACE	*Phacelia*	2–11	–
Shrub/Vine					
13				11–22	
	Nevada jointfir	EPNE	*Ephedra nevadensis*	11–22	–
14				4–11	
	button brittlebush	ENFR	*Encelia frutescens*	4–11	–
16				7–11	
	littleleaf ratany	KRER	*Krameria erecta*	0–11	–
	white ratany	KRGR	*Krameria grayi*	0–11	–
17				0–11	
	Fremont's dalea	PSFRF	*Psorothamnus fremontii var. fremontii*	0–11	–
18				2–7	
	starry bedstraw	GASTE2	*Galium stellatum ssp. eremicum*	2–7	–
19				10–20	
	pricklypear	OPUNT	*Opuntia*	10–20	–
20				0–11	
	creosote bush	LATR2	*Larrea tridentata*	0–11	–
21				0–11	
	burrobush	AMDU2	*Ambrosia dumosa*	0–11	–
22				0–11	
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	0–11	–
23				0–22	
	blackbrush	CORA	*Coleogyne ramosissima*	0–22	–
24				34–79	
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–11	–
	rayless goldenhead	ACSP	*Acamptopappus sphaerocephalus*	0–11	–
	Utah agave	AGUT	*Agave utahensis*	0–11	–
	Wright's beebrush	ALWR	*Aloysia wrightii*	0–11	–
	fourwing saltbush	ATCA2	*Atriplex canescens*	0–11	–
	brickellbush	BRICK	*Brickellia*	0–11	–
	spiny hopsage	GRSP	*Grayia spinosa*	0–11	–
	burrobrush	HYSA	*Hymenoclea salsola*	0–11	–
	winterfat	KRLA2	*Krascheninnikovia lanata*	0–11	–
	water jacket	LYAN	*Lycium andersonii*	0–11	–
	Utah mortonia	MOUT	*Mortonia utahensis*	0–11	–
	desert almond	PRFA	*Prunus fasciculata*	0–11	–
	whitestem paperflower	PSCO2	*Psilostrophe cooperi*	0–11	–
	Stansbury cliffrose	PUST	*Purshia stansburiana*	0–11	–

	Stansbury cliffrose	PUST	*Purshia stansburiana*	0–11	
	Mexican bladdersage	SAME	*Salazaria mexicana*	0–11	–
	turpentinebroom	THMO	*Thamnosma montana*	0–11	–
	American threefold	TRCA8	*Trixis californica*	0–11	–
Tree					
15				2–7	
	Eastern Mojave buckwheat	ERFA2	*Eriogonum fasciculatum*	2–7	–
25				0–7	
	Joshua tree	YUBR	*Yucca brevifolia*	0–7	–

Contributors

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Stephen Cassady

Approval

Kendra Moseley, 10/21/2024

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	05/10/2025
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:**

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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:**
