USDA Natural Resources
Conservation Service

Ecological site R030XB013CA
Loamy

Last updated: 2/18/2025
Accessed: 05/21/2025

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.

MLRA notes

Major Land Resource Area (MLRA): 030X–Mojave Basin and Range

The Mojave Desert Major Land Resource Area (MLRA 30) is found in southern California, southern Nevada, the extreme southwest corner of Utah and northwestern Arizona within the Basin and Range Province of the Intermontane Plateaus. The Mojave Desert is a transitional area between hot deserts and cold deserts where close proximity of these desert types exert enough influence on each other to distinguish these desert types from the hot and cold deserts beyond the Mojave. Kottek et. al 2006 defines hot deserts as areas where mean annual air temperatures are above 64 F (18 C) and cold deserts as areas where mean annual air temperatures are below 64 F (18 C). Steep elevation gradients within the Mojave create islands of low elevation hot desert areas surrounded by islands of high elevation cold desert areas.

The Mojave Desert receives less than 10 inches of mean annual precipitation. Mojave Desert low elevation areas are often hyper-arid while high elevation cold deserts are often semi-arid with the majority of the Mojave being an arid climate. Hyper-arid areas receive less than 4 inches of mean annual precipitation and semi-arid areas receive more than 8 inches of precipitation (Salem 1989). The western Mojave receives very little precipitation during the summer months while the eastern Mojave experiences some summer monsoonal activity.

In summary, the Mojave is a land of extremes. Elevation gradients contribute to extremely hot and dry summers and cold moist winters where temperature highs and lows can fluctuate greatly between day and night, from day to day and from winter to summer. Precipitation falls more consistently at higher elevations while lower elevations can experience long intervals without any precipitation. Lower elevations also experience a low

frequency of precipitation events so that the majority of annual precipitation may come in only a couple precipitation events during the whole year. Hot desert areas influence cold desert areas by increasing the extreme highs and shortening the length of below freezing events. Cold desert areas influence hot desert areas by increasing the extreme lows and increasing the length of below freezing events. Average precipitation and temperature values contribute little understanding to the extremes which govern wildland plant communities across the Mojave.

Arid Eastern Mojave Land Resource Unit (XB)

LRU notes

The Mojave Desert is currently divided into 4 Land Resource Units (LRUs). This ecological site is within the Arid Eastern Mojave LRU where precipitation is bi-modal, occurring during the winter months and summer months. The Arid Eastern Mojave LRU is designated by the 'XB' symbol within the ecological site ID. This LRU is found across the eastern half of California, much of the mid-elevations of Nevada, the southernmost portions of western Utah, and the mid-elevations of northwestern Arizona. This LRU is essentially equivalent to the Eastern Mojave Basins and Eastern Mojave Low Ranges and Arid Footslopes of EPA Level IV Ecoregions

Elevations range from 1650 to 4000 feet and precipitation is between 4 to 8 inches per year. This LRU is distinguished from the Arid Western Mojave (XA) by the summer precipitation, falling between July and September, which tends to support more warm season plant species. The 'XB' LRU is generally east of the Mojave River and the 117 W meridian (Hereford et. al 2004). Vegetation includes creosote bush, burrobush, Nevada jointfir, ratany, Mojave yucca, Joshua tree, cacti, big galleta grass and several other warm season grasses. At the upper portions of the LRU, plant production and diversity are greater and blackbrush is a common dominant shrub.

Ecological site concept

This site occurs on buried fan remnants, non-buried fan remnants, fan aprons and other active alluvial fan landforms above 4000 feet elevation on moderately deep or deeper soils without a diagnostic subsurface horizon.

This is a group concept and provisional STM that also covers R030XA061NV.

Similar sites

R030XA002NV	**LIMESTONE HILL 5-7 P.Z.** Soils from limestone PM; LYAN minor spp., if present

R030XA061NV	**LOAMY 5-7 P.Z.** Essentially the same ecological site concept as R030XB013CA.
R030XA044NV	**LOAMY HILL 5-7 P.Z.** LATR2 minor shrub, if present; MESP2 major shrub
R030XA056NV	**LOAMY HILL 3-5 P.Z.** LYAN & Ephedra minor spp
R030XA059NV	**GRAVELLY HILL 5-7 P.Z.** ATCO-LATR2 codominant; LYAN & MESP2 minor shrubs, if present
R030XY049NV	**BREAKS 3-7 P.Z.** PROSO major plant spp
R030XA068NV	**CALCAREOUS HILL 5-7 P.Z.** MESP2 codominant shrub
R030XA066NV	**CALCAREOUS LOAM 5-7 P.Z.** AMDU2-ATCO codominant

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Atriplex confertifolia* (2) *Larrea tridentata*
Herbaceous	(1) *Achnatherum hymenoides*

Physiographic features

This site occurs on inset fans, fan remnants, and fan skirts. Slopes range from 2 to over 15 percent. Elevations are 3800 to about 5300 feet.

Table 2. Representative physiographic features

Landforms	(1) Inset fan (2) Fan remnant (3) Fan skirt
Flooding duration	Very brief (4 to 48 hours)
Flooding frequency	Rare
Ponding frequency	None
Elevation	1,158–1,615 m
Slope	2–15%
Aspect	Aspect is not a significant factor

Climatic features

The climate is hot and arid, with mild winters and very hot summers. Precipitation is greatest in the winter with a lesser secondary peak in summer, typical of the Mojave Desert. Average annual precipitation is 5 to 7 inches. Mean annual air temperature is 56 to 64 degrees F. The average growing season is about 150 to 230 days.

Table 3. Representative climatic features

Frost-free period (average)	230 days
Freeze-free period (average)	
Precipitation total (average)	178 mm

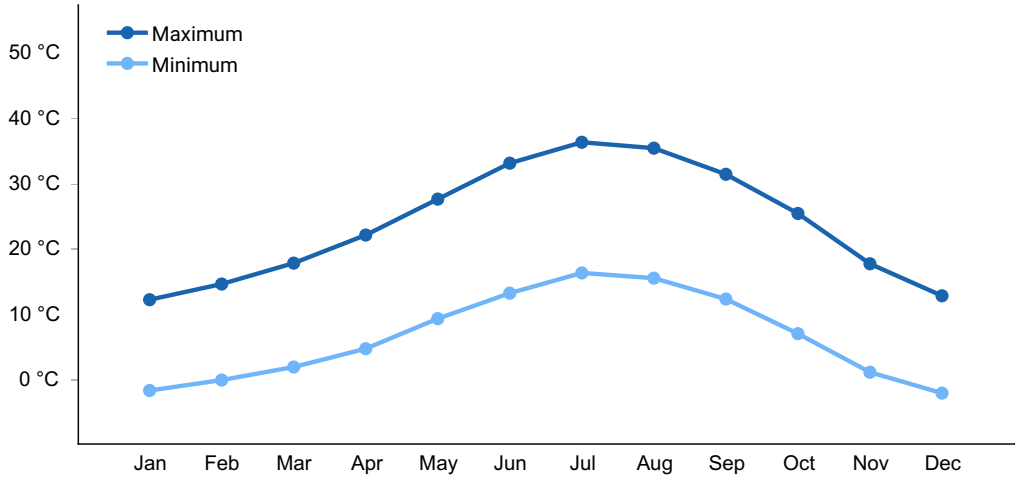


Figure 1. Monthly average minimum and maximum temperature

Influencing water features

There are no influencing water features associated with this site.

Soil features

The soils associated with this site are moderately deep to very deep and well to excessively drained. These soils have formed in alluvium from mixed parent material. High amounts of rock fragments may occur at the soil surface. Runoff is negligible to high, available water capacity is very low, and water intake rates are moderately slow to moderately rapid. The soil series associated with this site include: Avizo, Orwash, Scottcas, Skelon, and Yermo.

Table 4. Representative soil features

Surface texture	(1) Very gravelly sandy loam (2) Very gravelly fine sandy loam (3) Very gravelly loam
Family particle size	(1) Loamy

Drainage class	Well drained to excessively drained
Permeability class	Moderately slow to moderately rapid
Soil depth	51–213 cm
Surface fragment cover <=3"	24–53%
Surface fragment cover >3"	2–25%
Available water capacity (0-101.6cm)	3.56–7.11 cm
Calcium carbonate equivalent (0-101.6cm)	0–20%
Electrical conductivity (0-101.6cm)	0–8 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0–12
Soil reaction (1:1 water) (0-101.6cm)	7.9–9.6
Subsurface fragment volume <=3" (Depth not specified)	20–71%
Subsurface fragment volume >3" (Depth not specified)	2–14%

Ecological dynamics

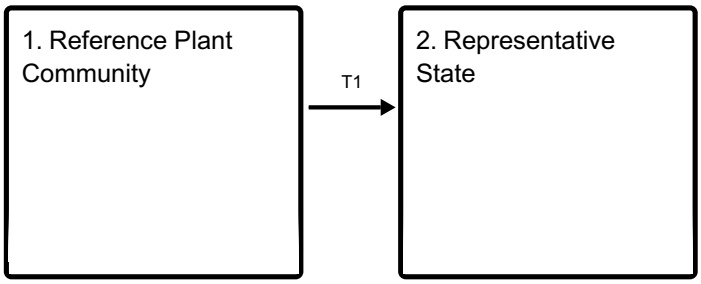
As ecological condition declines, cresotebush, wolfberry, and burrobrush increase. Following mechanical disturbance or wildfire, introduced annual grasses and forbs readily invade or increase on this site.

Fire Ecology:
Shadscale communities are usually unaffected by fire because of low fuel loads, although a year of exceptionally heavy winter rains can generate fuels by producing a heavy stand of annual forbs and grasses. The mean fire return interval for shadscale communities range from 35 to 100 years. Increased presence of non-native annual grasses, such as cheatgrass, can alter fire regimes by increasing fire frequency under wet to near-normal summer moisture conditions. Most fires in the Mojave desert are infrequent and of low severity because production of annual and perennial herbs seldom provides a fuel load capable of sustaining fire. Fires in creosotebush scrub were an infrequent event in pre-settlement desert habitats, because fine fuels from winter annual plants were probably sparse, only occurring in large amounts during exceptionally wet winters. Fire kills many creosotebush. Creosotebush is poorly adapted to fire because of its limited sprouting ability. Creosotebush survives some fires that burn patchily or are of low severity. Fire typically destroys aboveground parts of Anderson wolfberry, but the degree of damage to the plant depends on fire severity. Budsage is killed by fire. Desert needlegrass has

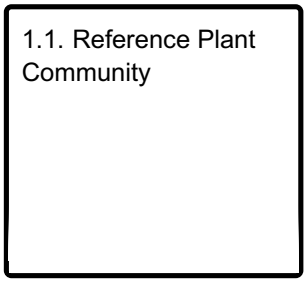
persistent dead leaf bases, which make it susceptible to burning. Fire removes the accumulation; a rapid, cool fire will not burn deep into the root crown and surviving tufts will resprout. Indian ricegrass can be killed by fire, depending on severity and season of burn. Indian ricegrass reestablishes on burned sites through seed dispersed from adjacent unburned areas.

State and transition model

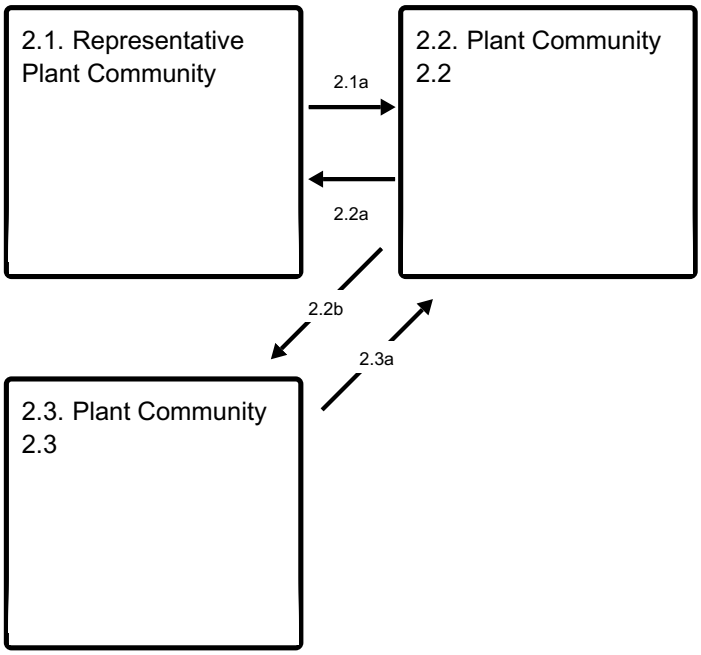
Ecosystem states



State 1 submodel, plant communities



State 2 submodel, plant communities



State 1
Reference Plant Community

The reference state is representative of the natural range of variability under pristine conditions. The plant community is shrub dominated with a minor component of perennial

grasses. Plant community dynamics are primarily driven by long-term drought, insect outbreaks, and infrequent wildfire. Historically, this state experienced an extended fire return interval due to low fuel loading, which resulted in long-lived stable shadscale plant communities.

Community 1.1
Reference Plant Community

The reference plant community is dominated by shadscale and creosotebush. Anderson's wolfberry, Ephedra ssp., and bud sagebrush are other important plants associated with this site. Potential vegetative composition is about 15% grasses, 10% annual and perennial forbs, and 75% shrubs. Approximate ground cover (basal and crown) is 3 to 8 percent.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Shrub/Vine	64	127	252
Grass/Grasslike	12	25	50
Forb	8	17	34
Total	**84**	**169**	**336**

State 2
Representative State

The Representative State is characterized by the presence of non-native annuals in the understory. Plant communities in this state function very similarly to the reference state, however, ecological resilience may be reduced by the presence of the non-natives. Introduced annuals such as red brome, Mediterranean grass and redstem filaree have invaded the reference plant community and have become a component of the herbaceous cover. These non-native annuals are highly flammable and promote wildfires where fires historically have been infrequent. Mature shadscale persists after this invasion by non-native annuals, however shrubs seedling and desirable grasses suffer reduced vigor and limited reproductive capability due to increased competition from non-natives.

Community 2.1
Representative Plant Community

This plant community is similar to the reference plant community with a trace of non-natives in the understory. Ecological function has been not compromised at this time. Ecological resilience is reduced by the presence of non-native species and this plant community phase will respond differently following a disturbance when compared to non-invaded plant communities.

Community 2.2
Plant Community 2.2

This plant community is characteristic of a post-disturbance plant community. It is initially dominated by herbaceous vegetation, woody perennials are increasing. Short lived and pioneering shrubs provide favorable microsites for the establishment of long lived shrub seedlings.

Community 2.3
Plant Community 2.3

This plant community is characterized by a short disturbance return interval. Non-native annuals take advantage of the increased availability of resources. This plant community is identified as “at risk”. The loss of vegetative cover has reduced the ecological resistance and resilience. Management should be focused on limiting disturbances and protecting remnants of mature vegetation to ensure a seed source is available in the future.

Pathway 2.1a
Community 2.1 to 2.2

Frequent and repeated surface disturbances, wildfire, disease, insect attack, or any other type of incomplete vegetation removal.

Pathway 2.2a
Community 2.2 to 2.1

Absence from disturbance and natural regeneration over time.

Pathway 2.2b
Community 2.2 to 2.3

Frequent and repeated surface disturbances, wildfire, disease, insect attack, or any type of vegetation removal.

Pathway 2.3a
Community 2.3 to 2.2

Absence from disturbance and natural regeneration over time.

Transition T1
State 1 to 2

Introduction of non-native species due to a combination of factors including; surface disturbance, changes in the kinds of animals and their grazing patterns, drought, changes

in fire history or any other type of vegetation removal.

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	**Primary Perennial Grasses**			6–22	
	desert needlegrass	ACSP12	*Achnatherum speciosum*	3–13	–
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	2–9	–
2	**Secondary Perennial Grasses**			1–9	
	low woollygrass	DAPU7	*Dasyochloa pulchella*	1–6	–
	squirreltail	ELEL5	*Elymus elymoides*	1–6	–
Forb					
3	**Perennial forbs**			3–17	
4	**Annual forbs**			1–9	
Shrub/Vine					
5	**Primary shrubs**			34–119	
	shadscale saltbush	ATCO	*Atriplex confertifolia*	9–43	–
	creosote bush	LATR2	*Larrea tridentata*	9–26	–
	water jacket	LYAN	*Lycium andersonii*	9–17	–
	jointfir	EPHED	*Ephedra*	3–17	–
6	**Secondary shrubs**			9–34	
	Shockley's goldenhead	ACSH	*Acamptopappus shockleyi*	2–9	–
	burrobush	AMDU2	*Ambrosia dumosa*	2–9	–
	spiny hopsage	GRSP	*Grayia spinosa*	2–9	–
	winterfat	KRLA2	*Krascheninnikovia lanata*	2–9	–
	spiny menodora	MESP2	*Menodora spinescens*	2–9	–

Animal community

Livestock Interpretations:
This site has limited value for livestock grazing, due to the low forage production. Desert needlegrass produces considerable basal foliage and is good forage while young. Young desert needlegrass is palatable to all classes of livestock. Mature herbage is moderately grazed by horses and cattle but rarely grazed by sheep. Indian ricegrass is highly palatable to all classes of livestock in both green and cured condition. It supplies a source of green feed before most other native grasses have produced much new growth. Shadscale provides good browse for domestic sheep and goats. Shadscale leaves and seeds are an important component of domestic sheep and cattle winter diets. Shadscale tends to be browse tolerant. Heavy grazing during the winter and/or spring reduces shadscale. Die-off can also occur during extended periods of high precipitation. Shadscale is tolerant of early spring light-intensity browsing. Creosotebush is unpalatable to livestock. Consumption of creosotebush may be fatal to sheep. Anderson wolfberry is sometimes used as forage by livestock and feral burros. Budsage can be poisonous or fatal to calves when eaten in quantity. Cattle and horses seldom utilize budsage, possibly because of its aromatic oil content.

Stocking rates vary over time depending upon season of use, climate variations, site, and previous and current management goals. A safe starting stocking rate is an estimated stocking rate that is fine tuned by the client by adaptive management through the year and from year to year.

Wildlife Interpretations:
Shadscale is a valuable browse species providing a source of palatable, nutritious forage for a wide variety of wildlife. The fruits and leaves are a food source for deer, desert bighorn sheep and pronghorn antelope. Creosotebush is unpalatable to most browsing wildlife. Budsage is rated as "regularly, frequently, or moderately taken" by mule deer in Nevada in winter and is utilized by bighorn sheep in summer. Black-tailed jackrabbits and small rodents generally eat only leaves, small branches, and twigs of budsage. Desert bighorn sheep and feral horses and burros will graze desert needlegrass. Indian ricegrass is eaten by pronghorn in "moderate" amounts whenever available. In Nevada it is consumed by desert bighorns. A number of heteromyid rodents inhabiting desert rangelands show preference for seed of Indian ricegrass. Indian ricegrass is an important component of jackrabbit diets in spring and summer. In Nevada, Indian ricegrass may even dominate jackrabbit diets during the spring through early summer months. Indian ricegrass seed provides food for many species of birds. Doves, for example, eat large amounts of shattered Indian ricegrass seed lying on the ground.

Hydrological functions

Runoff is negligible to high. Permeability is moderately slow to moderately rapid.

Other products

Indian ricegrass was traditionally eaten by some Native Americans. The Paiutes used seed as a reserve food source. Seeds of shadscale were used by Native Americans for bread and mush. Creosotebush has been highly valued for its medicinal properties by Native Americans. It has been used to treat at least 14 illnesses. Twigs and leaves may be boiled as tea, steamed, pounded into a powder, pressed into a poultice, or heated into an infusion. Native Americans used the fleshy berries of Anderson wolfberry either fresh or boiled and then dried them for later use.

Other information

Desert needlegrass may be used for groundcover in areas of light disturbance, but it is susceptible to excessive trampling. Once established, creosotebush may improve sites for annuals that grow under its canopy by trapping fine soil, organic matter, and symbiont propagules. It may also increase water infiltration and storage. Anderson wolfberry is also used as an ornamental valued chiefly for its showy red berries.

Type locality

Location 1: Nye County, NV	
Township/Range/Section	T9S R45E S29
General legal description	Sarcobatus Flat area, Nye County, Nevada.
Location 2: Nye County, NV	
Township/Range/Section	T9S R45E S30
General legal description	Sarcobatus Flat area, Nye County, Nevada.

Other references

Fire Effects Information System (Online; http://www.fs.fed.us/database/feis/plants/).

Hereford, R., R.H. Webb and C. I. Longpre. 2004. Precipitation history of the Mojave Desert region, 1893-2001 (No. 117-03).

Kottek, M., Grieser, J., Beck, C., Rudolf, B., & Rubel, F. (2006). World map of the Köppen-Geiger climate classification updated. Meteorologische Zeitschrift, 15(3), 259-263.

Salem, B. B. (1989). Arid zone forestry: a guide for field technicians (No. 20). Food and Agriculture Organization (FAO).

USDA-NRCS Plants Database (Online; http://www.plants.usda.gov).

Contributors

Dustin Detweiler

Approval

Kendra Moseley, 2/18/2025

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	05/21/2025
Approved by	Kendra Moseley
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

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

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

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

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

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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):

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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:**
