USDA Natural Resources Conservation Service

Ecological site R030XB086CA
Gravelly Pediment

Last updated: 3/10/2025
Accessed: 05/12/2025

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 is found on hill, mountain and plateau landforms such as pediments, mesas and tableland where slope is less than 15 percent slope. Cobbles, stones and boulders over 3 inches wide and rock outcrop cover less than 15 percent of the soil surface. Soils formed in colluvium and residuum from sedimentary rock and have a shallow depth class.

This is a group concept and provisional STM that also covers R030XB126NV, R030XB030NV, R030XB131NV.

Associated sites

R030XB005NV	**Arid Active Alluvial Fans**
R030XB074NV	**COBBLY LOAM 5-7 P.Z.**

Similar sites

R030XB117NV	**GYPSIC SAND 3-5 P.Z.** ATCO rare to absent; ATCA2 and PEPA13 important shrubs
R030XB115NV	**GYPSIC SODIC LOAM 3-5 P.Z.** ENAR an important forb; PEPA13 an important shrub
R030XB109NV	**GYPSIC BARREN 3-5 P.Z.** ATCO may occur but a minor spp.; less productive site
R030XB106NV	**GRAVELLY SLOPE 5-7 P.Z.** PLRI3 dominant plant; more productive site
R030XB126NV	**GRAVELLY PEDIMENT 5-7 P.Z.** This is the same ecological site which was copied here to avoid identification duplication in the event the
R030XB002NV	**LOAMY HILL 5-7 P.Z.** PSFR rare to absent; ARSP5 may occur; less productive site
R030XB003NV	**GYPSIC LOAM 5-7 P.Z.** LEFR2 codominant shrub; ATCO rare to absent
R030XB131NV	**CALCAREOUS PEDIMENT 3-5 P.Z.** AMDU2-ATCO codominant; ENAR codominant
R030XB026NV	**GYPSIC LOAM 3-5 P.Z.** ATHY codominant shrub; much less productive site
R030XB010NV	**LOAMY SLOPE 5-7 P.Z.** ACSP12 dominant plant; PSFR minor shrub
R030XB127NV	**SHALLOW SANDSTONE SLOPE 3-5 P.Z.** ATCO dominant plant
R030XB125NV	**CHANNERY HILL 3-5 P.Z.** ATCO-ATCO codominant; PSFR minor shrub
R030XB124NV	**SHALLOW HILL 3-5 P.Z.** ATCO absent to rare

Table 1. Dominant plant species

Tree	Not specified

Shrub	(1) *Psorothamnus fremontii* (2) *Ambrosia dumosa*
Herbaceous	Not specified

Physiographic features

The soils of this site are on hills and rock pediments. Slopes range from 4 to 30 percent, but slope gradients of 8 to 15 are most typical. Elevations are 2,000 to 2,500 feet.

Table 2. Representative physiographic features

Landforms	(1) Hill (2) Pediment
Elevation	2,000–2,500 ft
Slope	4–30%

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. The climate is hot and arid with warm moist winters and hot, dry summers. The mean annual precipitation is about 5 to 7 inches. The mean annual air temperature is about 64 to 69 degrees F. The frost free season is 240 to 300 days.

Table 3. Representative climatic features

Frost-free period (average)	300 days
Freeze-free period (average)	
Precipitation total (average)	7 in

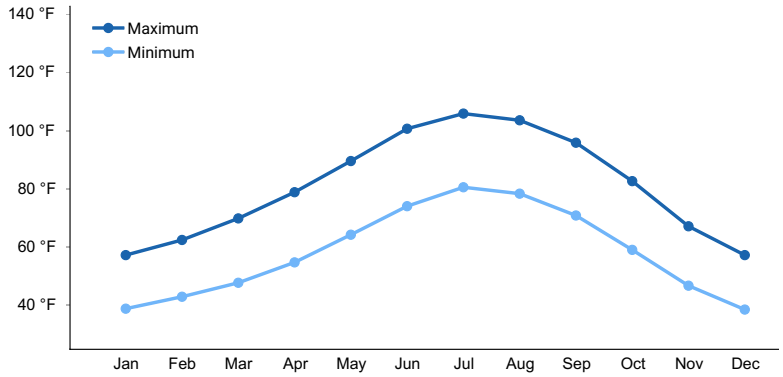


Figure 1. Monthly average minimum and maximum temperature

Influencing water features

There are no influencing water features associated with this site.

Soil features

The soil associated with this site are shallow to weathered bedrock and have formed in colluvium and residuum from Triassic sedimentary rocks such as claystone, siltstone, conglomerate and calcareous sandstone. These sites are well drained and have slow permeability. Available water holding capacity is very low and runoff is high.

Table 4. Representative soil features

Drainage class	Well drained

Permeability class	Slow

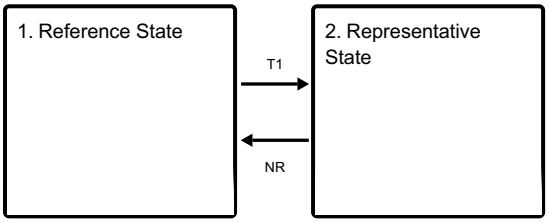
Ecological dynamics

As ecological condition deteriorates, big galleta and other perennial grasses decrease and interspaces between shrubs increase. In a deteriorated condition, annual grasses and forbs will probably invade this site.

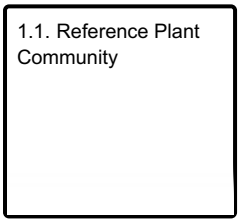
Fire ecology:
Fires in the Mojave desert are infrequent and of low severity because production of annual and perennial herbs seldom provides a fuel load capable of sustaining fire. Fire generally kills white bursage. However, most white bursage plants burned because their canopies contained numerous small branches in proximity to herbaceous fuels. 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. Range ratany is top-killed by fire. Range ratany resprouts from the root crown after 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.

State and transition model

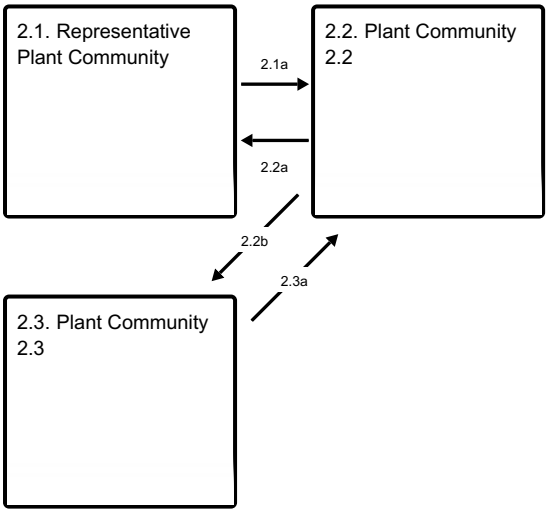
Ecosystem states



State 1 submodel, plant communities



State 2 submodel, plant communities



State 1
Reference State

The reference state is representative of the natural range of variability under pristine conditions. Community phase changes are primarily driven by natural disturbances such as long-term drought and insect attack. Wildfire is infrequent and patchy due to low fuel loading and widely spaced shrubs. Timing of disturbance combined with weather events determines plant community dynamics.

Community 1.1
Reference Plant Community

The reference plant community is dominated by Fremont dalea, white bursage, and shadscale. Potential vegetative composition is about 5% grasses, 10% annual and perennial forbs, and 85% shrubs. Approximate ground cover (basal and crown) is 10 to 15 percent.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Shrub/Vine	170	340	510
Forb	20	40	60
Grass/Grasslike	10	20	30
Total	**200**	**400**	**600**

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 shrubs persists after this invasion by non-native annuals, however shrub seedlings 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. Non-natives can alter disturbance regimes significantly from their natural or historic range and change ecological processes therefore creating an unlikely scenario to restore the site back to reference.

Restoration pathway NR
State 2 to 1

No Recovery (NR) - Non-native annuals species have become naturalized in these systems creating an unlikely scenario to restore the site back to reference.

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**			1–20	
	low woollygrass	DAPU7	*Dasyochloa pulchella*	2–12	–
	big galleta	PLRI3	*Pleuraphis rigida*	2–12	–
2	**Annual Grasses**			1–20	
Forb					
3	**Perennial forbs**			1–20	
	desert globemallow	SPAM2	*Sphaeralcea ambigua*	2–12	–
4	**Annual forbs**			1–20	
	desert trumpet	ERIN4	*Eriogonum inflatum*	2–12	–
Shrub/Vine					
5	**Primary shrubs**			248–452	
	Fremont's dalea	PSFR	*Psorothamnus fremontii*	80–120	–
	burrobush	AMDU2	*Ambrosia dumosa*	60–100	–
	shadscale saltbush	ATCO	*Atriplex confertifolia*	60–100	–
	woody crinklemat	TICA3	*Tiquilia canescens*	20–40	–
	creosote bush	LATR2	*Larrea tridentata*	8–32	–
6	**Secondary shrubs**			20–80	
	Fremont's chaffbush	AMFR2	*Amphipappus fremontii*	4–20	–
	hedgehog cactus	ECHIN3	*Echinocereus*	4–20	–
	brittlebush	ENFA	*Encelia farinosa*	4–20	–
	Nevada jointfir	EPNE	*Ephedra nevadensis*	4–20	–
	California barrel cactus	FECY	*Ferocactus cylindraceus*	4–20	–
	beavertail pricklypear	OPBA2	*Opuntia basilaris*	4–20	–

Animal community

Livestock Interpretations:
This site has limited value for livestock grazing, due to the low forage production, steep slopes and stony surface. White bursage is of intermediate forage value. It is fair to good forage for horses and fair to poor for cattle and sheep. However, because there is often little other forage where white bursage grows, it is often highly valuable to browsing animals and is sensitive to browsing. 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. Range ratany is an important forage species for all classes of livestock. Palatability of range ratany is rated fair to good for cattle and sheep. Creosotebush is unpalatable to livestock. Consumption of creosotebush may be fatal to sheep.

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:
White bursage is an important browse species for wildlife. 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. Range ratany is an important forage species for deer. Mule deer browse range ratany year-long with seasonal peaks. Mule deer peak use is from February to April and from August

to October. Creosotebush is unpalatable to most browsing wildlife.

Hydrological functions

These sites are well drained and have slow permeability. Available water holding capacity is very low and runoff is high.

Other products

White bursage is a host for sandfood, a parasitic plant. Sandfood was a valuable food supply for Native Americans. Seeds of shadscale were used by Native Americans for bread and mush. The Papago Indians used an infusion of range ratany twigs externally for treating sore eyes and internally for dysentery. The roots provided them with a red dye for wool and other materials. The dye was also used as an ink. 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.

Other information

White bursage may be used to revegetate disturbed sites in southwestern deserts. 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.

Other references

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

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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).

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Contributors

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Approval

Kendra Moseley, 3/10/2025

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	05/12/2025
Approved by	Sarah Quistberg
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:

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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:**
