USDA Natural Resources
Conservation Service

Ecological site R030XA002CA
Calcareous Fan 5-7

Last updated: 10/21/2024
Accessed: 05/13/2025

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 Western Mojave Land Resource Unit (XA)

LRU notes

The Mojave Desert is currently divided into 4 Land Resource Units (LRUs). This ecological site is within the arid portions of the Mojave where precipitation primarily occurs during the winter months (Hereford et. al 2004). The lack of summer precipitation as well as cooler temperatures allows cool season species to occupy sites at lower elevations than they do in the Eastern Mojave. For example, sandberg bluegrass, winterfat and spiny hopsage are common at lower elevations in the Western Mojave than they are in the Eastern Mojave. Warm season species like big galleta rarely occur in the Western Mojave. The Arid Western Mojave LRU is designated by the 'XA' symbol within the ecological site ID and is roughly equivalent to Western Mojave Basins and Western Mojave Low Ranges and Arid Footslopes of EPA Level IV Ecoregions.

Elevations range from 1650 to 4300 feet and precipitation is between 4 to 8 inches per year. The Arid Western Mojave LRU is distinguished from the Arid Eastern Mojave (XB) by the lack of summer precipitation which excludes many warm season plant species from occurring in this LRU. Vegetation includes creosote bush, rabbitbrush, shadscale saltbush, spiny hopsage, winterfat, Nevada jointfir, and Joshua tree. At the upper elevations of the LRU, plant production and diversity are greater and blackbrush is a common dominant shrub. The Arid Western Mojave LRU generally lacks the diversity of yucca, cacti and warm season species found in the Arid Eastern Mojave.

Ecological site concept

The Calcareous Fan ecological site is found on eroded fan remnants within the upper fan piedmont between 3800 feet (1150 m) and 4500 feet (1375 m) elevation. Soils are moderately deep or deeper and form in mixed alluvium from limestone, dolomite and shale.

The central concept for this ecological site is found in Benton-Owens Valley Area Parts of Inyo and Mono Counties, California (SSA CA802) within the map unit, Yermo stony-Yermo complex, 5 to 15 percent slopes (MU Sym 378).

This is a group concept and provisional STM that also covers R030XA175CA.

Similar sites

R030XA006CA	**Granitic Loam 5-7" p.z.** Granitic Loam [AMDU2-GRSP co-dominant shrubs; more productive]

Table 1. Dominant plant species

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

Physiographic features

This site occurs on fan terraces. Elevations are 3750 to 5000 feet. Slopes range from 5 to 15 percent and are generally greater than 8 percent slope.

Table 2. Representative physiographic features

Landforms	(1) Alluvial fan
Flooding frequency	Very rare
Elevation	1,128–1,524 m
Slope	5–15%
Aspect	Aspect is not a significant factor

Climatic features

The climate on this site is characterized by mild cool winters (30 to 60 degrees F) and hot dry summers (70 to 100 degrees F). The average annual precipitation ranges from 4 to 6 inches, with most falling as rain from November to March.

The average frost-free period is 190 to 225 days.

Table 3. Representative climatic features

Frost-free period (average)	225 days

Freeze-free period (average)	
Precipitation total (average)	152 mm

Influencing water features

Soil features

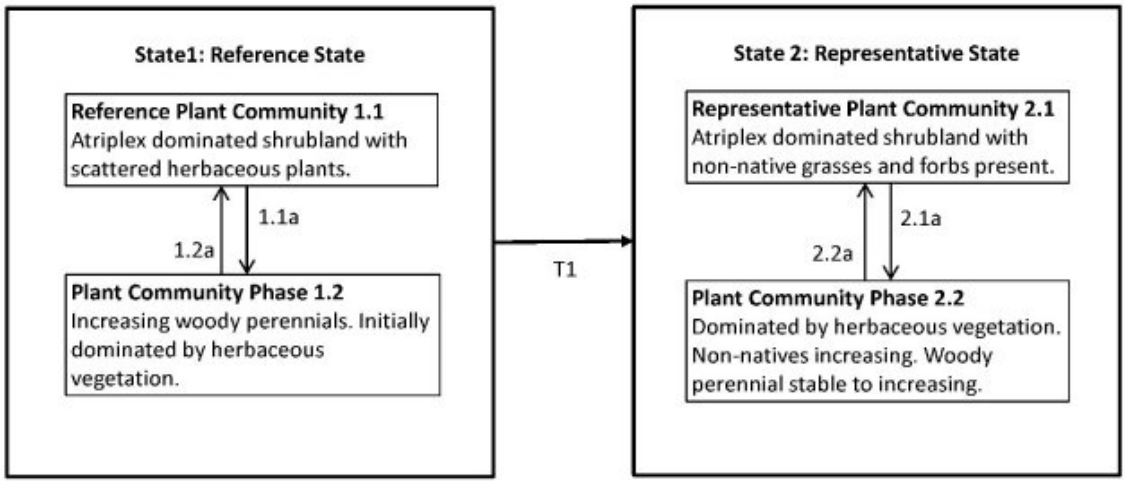
The soils that characterize this site are very deep and well-drained on eroded fan remnants. They are formed in alluvium predominantly from sedimentary sources. Surface textures are gravelly sandy loams and gravelly loamy sands. Available water capacity is low to medium and the hazard of water erosion is slight. Wind erosion hazard is slight. Effective rooting depth is 60 inches or more. Water tables are greater than 60 inches.

Ecological dynamics

Overgrazing this site would cause a decrease in the grass species and an increase in the more unpalatable shrubs species, such as creosotebush and white bursage.

Fire is very infrequent at this site.

State and transition model



State 1
Reference State

The reference state is representative of the natural range of variability under pristine conditions. Plant communities are dynamic in response to changes in disturbance regimes and weather patterns. Plant community phase changes are primarily driven by long-term drought. Historically, fire had little impact in this system due to low fuel loading and widely spaced vegetation.

Community 1.1
Reference Plant Community

The plant community is dominated by creosotebush, shadscale, and white bursage. Potential vegetation composition is about 70% shrubs, 20% grasses, and 10% forbs. The following table lists the major plant species and percentages by weight, air dry, of the total plant community that each contributes in an average production year.

Table 4. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Shrub/Vine	78	157	235
Grass/Grasslike	22	45	67
Forb	11	22	34
Total	**111**	**224**	**336**

Table 5. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	7-14%
Grass/grasslike foliar cover	2-4%
Forb foliar cover	1-2%
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%

Community 1.2
Plant Community 1.2

This plant community is characteristic of an early seral, post- disturbance plant community. Initially, this plant community phase is heavily dominated by herbaceous vegetation. Perennial grasses provide favorable sites for the establishment of shrub seedlings. This plant community is considered at risk of invasion by non-native annuals. Non-natives take advantage of increased availability of critical resources following a fire or other disturbance.

Pathway 1.1a
Community 1.1 to 1.2

Wildfire, prolonged drought, disease, insect attack or any other type of shrub removal.

Pathway 1.2a
Community 1.2 to 1.1

Absence from disturbance and natural regeneration over time.

State 2
Representative State

The Representative State is characterized by the presence of non-native annuals in the understory. Ecological resilience of the site is reduced by the presence of non-natives. A biotic threshold is crossed, with the introduction of non-native annuals that are difficult to remove from the system and have the potential to alter disturbance regimes significantly from their natural or historic range of disturbances. Introduced annuals such as red brome and redstem stork's bill have invaded the reference plant community and have become a dominant component of the herbaceous cover. These non-natives annuals are highly flammable and promote wildfires where fires historically have been infrequent.

Community 2.1
Representative Plant Community

Plant community composition is similar to the reference plant community with the trace of non-natives in the understory. Ecological processes have not been compromised at this time, but ecological resilience is reduced by the presence of non-natives. This plant community will respond differently following a disturbance, when compared to the reference plant community. Non-natives likely to invade this site include red brome and Mediterranean grass. Increased fine fuels provided by non-native annuals can drastically change the natural fire return interval.

Community 2.2
Plant Community 2.2

This plant community is characteristic of an early seral, post-disturbance plant community and may or may not be dominated by non-native annuals. Perennial native bunchgrasses recover quickly and provide favorable sites for the establishment of shrub seedlings. Disturbance may result in increased bare ground, increasing the risk of soil erosion. This plant community is considered at-risk, due to the increased fuel loading from herbaceous biomass. Management should be focused on minimizing the threat of wildfire and reducing anthropogenic impacts to protect soil and ecological resources.

Pathway 2.1a
Community 2.1 to 2.2

Surface disturbance or fire removes mature shrubs and favors an increase of herbaceous vegetation, native and non-native.

Pathway 2.2a
Community 2.2 to 2.1

Recovery of woody perennials and absence from disturbance.

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, or changes in fire history.

Additional community tables

Animal community

This site has low wildlife habitat potential, but there is occasional winter use by mule deer.

Livestock Grazing:
This site is primarily used for spring grazing, especially during favorable pre¬cipitation years when forage is

abundant.

General Guide to Initial Stocking Rate:
making specific recommendations, an on site evaluation must be made.

POUNDS/ACRE
air dry AUM/AC AC/AUM
Normal Years 200 20-25

Hydrological functions

Runoff is medium. The erosion hazard is slight.

Soil Series: Yermo
Hydrologic Group: B
Hydrologic Conditions and Runoff Curves: Good 63; Fair 66; Poor 76

Recreational uses

This site is located on City of Los Angeles, Department of Water and Power (LADWP) and Bureau of Land Management (BLM) properties, and is open to public use.

Type locality

Location 1: Inyo County, CA	
Township/Range/Section	T14S R36E S15
General legal description	SW 1/4 Section 15, T14S, R36E Seven miles north of Lone Pine, Inyo Co., CA

Other references

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.

Laity, J. 2003. Aeolian destabilization along the Mojave River, Mojave Desert, California: linkages among fluvial, groundwater, and aeolian systems. Physical Geography, 24(3), 196-221.

Peterson, F.F. 1981. Landforms of the Basin and Range Province defined for soil survey.

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

Contributors

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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	05/13/2025
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:**

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):**

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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:**
