USDA Natural Resources
Conservation Service

Ecological site R030XB025CA
Sodic Flat

Last updated: 2/18/2025
Accessed: 05/10/2025

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 saline or sodic soils of alluvial flats, flood-plain steps or fan skirts over a playa floor. There is no water table within 30 feet of the soil surface at this site.

This is a group concept and provisional STM that also covers R030XY025NV, R030XY162CA, R030XY157CA, R030XY158CA.

Associated sites

R030XB028NV	**VALLEY WASH**
R030XY040NV	**SODIC TERRACE**
R030XY046NV	**OUTWASH PLAIN**

Similar sites

R030XY046NV	**OUTWASH PLAIN** ATPO dominant shrub
R030XY040NV	**SODIC TERRACE** more productive site; LYCIU codominant shrub
R030XY025NV	**SODIC FLAT** The same ecological site.

Table 1. Dominant plant species

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

Physiographic features

This site occurs on fan skirts over playa floors, alluvial flats, and flood-plain playas. Slopes range from 0 to 4 percent, but slope gradients of 0 to 2 percent are most typical. Elevations are 800 to about 5000 feet.

Table 2. Representative physiographic features

Landforms	(1) Alluvial flat

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 3 to about 7 inches. Mean annual air temperature is 55 to 76 degrees F. The average growing season is about 140 to 360 days.

Table 3. Representative climatic features

Frost-free period (average)	360 days
Freeze-free period (average)	

Precipitation total (average)	7 in

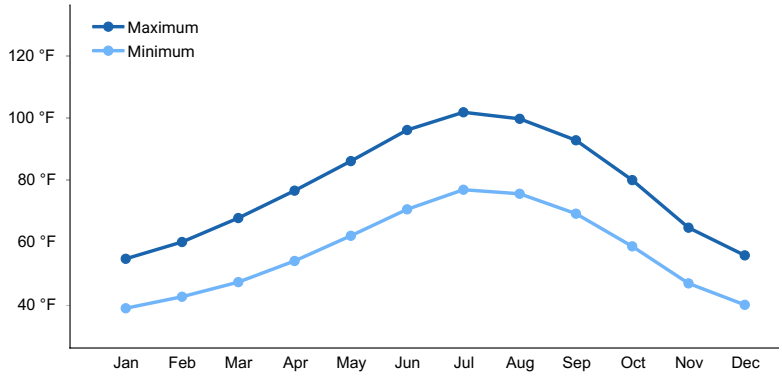


Figure 1. Monthly average minimum and maximum temperature

Influencing water features

There are no influencing water features associated with this site.

Soil features

The soils associated with this site are deep alluvium from mixed sources. Surface is very high in salts. Textures vary from loams to clays. A high water table is present. Drainage is very poor. The surface will crust. The soils have low water holding capacity. Potential for sheet and rill erosion is slight to moderate.

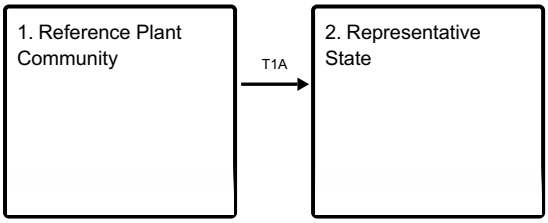
Ecological dynamics

As ecological condition deteriorates, shadscale, desertholly, and cresotebush increase. Species likely to invade this site are mesquite and annuals.

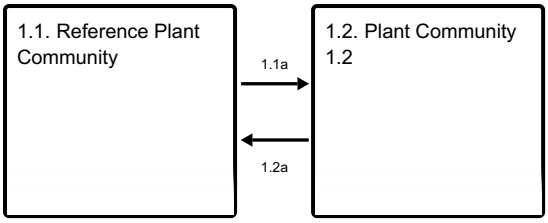
Fire Ecology:
The mean fire return interval for shadscale-greasewood communities ranges from 35 to 100 years. Shadscale communities are usually unaffected by fire because of low fuel loads, although a year of exceptionally heavy winter rains can generate fuels by producing a heavy stand of annual forbs and grasses. Increased presence of non-native annual grasses, such as cheatgrass, can alter fire regimes in shadscale communities by increasing fire frequency under wet to near-normal summer moisture conditions. When fire does occur, the effect on the ecosystem may be extreme. Shadscale is fire intolerant and it does not readily recover from fire, except for establishment through seed. Fall prescribed burning killed 100% of shadscale on study plots in a basin big sagebrush community. Spring burning left a few surviving shadscale plants but greatly reduced shadscale density and frequency.

State and transition model

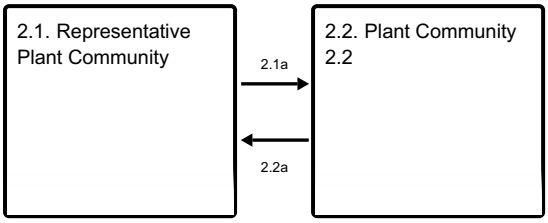
Ecosystem states



State 1 submodel, plant communities



State 2 submodel, plant communities



State 1
Reference Plant Community

Community 1.1
Reference Plant Community

The reference plant community is dominated by shadscale, desertholly and seepweed. Potential vegetative composition is about 5% grasses, 5% forbs, and 90% shrubs. Approximate ground cover (basal and crown) is less than 5 percent.

Table 4. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Shrub/Vine	45	90	270
Grass/Grasslike	3	5	15
Forb	2	5	15
Total	**50**	**100**	**300**

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, disease, prolonged drought, insect attack or any other type of incomplete vegetation 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 species in the understory. A biotic threshold is crossed with the introduction of non-natives that are difficult to remove from the system and have they potential to significantly alter disturbance regimes from their historic range of variation. Non-native annuals will persist once introduced into the plant community, due to their annual growth form, abundant seed production and long term seed viability. Non-native annuals such as red brome and cheatgrass are potential invaders on this ecological site. These non-native annuals are highly flammable and promote wildfires where fires historically have been infrequent.

Community 2.1
Representative Plant Community

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 may promote wildfires where fires historically have been infrequent.

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 T1A
State 1 to 2

Invaded non-natives

Additional community tables

Table 5. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	**Primary Perennial Grasses**			1–8	
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	1–5	–
	saltgrass	DISP	*Distichlis spicata*	1–5	–
	alkali sacaton	SPAI	*Sporobolus airoides*	1–5	–
Forb					
2	**Perennial**			1–8	
	marsh elder	IVA	*Iva*	1–3	–
	niterwort	NITRO	*Nitrophila*	1–3	–
3	**Annual**			1–3	
Shrub/Vine					
4	**Primary Shrubs**			57–103	
	shadscale saltbush	ATCO	*Atriplex confertifolia*	45–60	–
	desertholly	ATHY	*Atriplex hymenelytra*	10–35	–
	seepweed	SUAED	*Suaeda*	2–8	–
5	**Secondary Shrubs**			10–25	
	iodinebush	ALOC2	*Allenrolfea occidentalis*	1–5	–
	burrobush	AMDU2	*Ambrosia dumosa*	1–5	–
	fourwing saltbush	ATCA2	*Atriplex canescens*	1–5	–
	cattle saltbush	ATPO	*Atriplex polycarpa*	1–5	–
	Torrey's saltbush	ATTO	*Atriplex torreyi*	1–5	–
	burrobrush	HYSA	*Hymenoclea salsola*	1–5	–
	alkali goldenbush	ISAC2	*Isocoma acradenia*	1–5	–
	creosote bush	LATR2	*Larrea tridentata*	1–5	–
	desert-thorn	LYCIU	*Lycium*	1–5	–

Animal community

Livestock Interpretations:
This site has limited value for livestock grazing due to low forage. Shadscale is a valuable browse species, providing a source of palatable, nutritious forage for a wide variety of livestock. Shadscale provides good browse for domestic sheep. Shadscale leaves and seeds are an important component of domestic sheep and cattle winter diets.

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 particularly during spring and summer before the hardening of spiny twigs. It supplies browse, seed, and cover for birds, small mammals, rabbits, deer, and pronghorn antelope.

Recreational uses

Aesthetic value is derived from the diverse floral and faunal composition and the colorful flowering of wild flowers and shrubs during the spring and early summer. This site offers rewarding opportunities to photographers and for nature study. This site is used for camping and hiking and has potential for upland and big game hunting.

Other products

Seeds of shadscale were used by Native Americans for bread and mush.

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

HA
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)	P NOVAK-ECHENIQUE
Contact for lead author	State Rangeland Management Specialist
Date	07/20/2012
Approved by	Kendra Moseley
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** None

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2. **Presence of water flow patterns:** Waterflow patterns are rare to common depending on site location relative to major inflow areas. Waterflow patterns are typically short, ending in depressional areas where water ponds.

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3. **Number and height of erosional pedestals or terracettes:** None

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4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Bare Ground up to 80%

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5. **Number of gullies and erosion associated with gullies:** None

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6. **Extent of wind scoured, blowouts and/or depositional areas:** None

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7. **Amount of litter movement (describe size and distance expected to travel):** Fine litter (foliage of grasses and annual & perennial forbs) expected to move distance of slope length during periods of intense summer convection storms. Persistent litter (large woody material) will remain in place except during large rainfall events.

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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):** Soil stability values will range from 1 to 4. (To be field tested.)

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Structure of soil surface will be moderate to strong medium platy. The soil surface will crust. Soil surface colors are white or pale browns and soils are typified by a natric horizon near the surface. Organic matter is less than 1.0 percent.

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** The soils have slow permeability and brief ponding may occur during the winter months. The surface layer will also crust resulting in poor infiltration. Sparse shrub canopy and associated litter provide little protection from raindrop impact. Runoff is slow to moderately rapid.

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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):** Compacted layers are none. Subsoil natric or argillic horizons are normal for this site and are not to be interpreted as compaction.

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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: salt-desert shrubs

    Sub-dominant: deep-rooted, warm season, perennial bunchgrasses > deep-rooted perennial forbs > cool season perennial bunchgrasses > fibrous, shallow-rooted, cool season, perennial and annual forbs

    Other: rhizomatous grasses

    Additional:

13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** Dead branches within individual shrubs common and standing dead shrub canopy material may be as much as 30% of total woody canopy

14. **Average percent litter cover (%) and depth (in):** Between plant interspaces and under shrubs up to 5% and depth < ¼ in.

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** For normal or average growing season (March thru May) ± 100 lbs/ac; Favorable years 300 lbs/ac and unfavorable years <50 lbs/ac.

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:** Potential invaders include: red brome, Mediterranean grass, redstem filaree, annual mustards, Russian thistle.

17. **Perennial plant reproductive capability:** All functional groups should reproduce in average (or normal) and above average growing season years. Little growth or reproduction occurs in drought years.