Ecological site R030XB045CA
Lake Plain

Last updated: 2/24/2025
Accessed: 08/20/2026

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 lake plains below 3600 feet elevation but where headwaters are predominantly from elevations above 3600 feet. A water table is within 30 feet of the soil surface but soils do not have aquic conditions. This is a group concept and provisional STM that also covers the following ecological sites:R030XA011NV, R030XA064NV R030XY009NV, R030XY040NV, R030XY045NV, R030XY161CA, R030XY163CA, R030XY165CA, R030XY216CA

Associated sites

R030XB114NV	**SODIC LOAM 3-5 P.Z.** Occurs on adjacent dry lake plain areas.
R030XY160CA	**Gypsic Terrace 5-7" p.z.** Occurs on adjacent lake terraces with high gypsum soils.
R030XY163CA	**Loamy Lakeplain 5-7" p.z.** Occurs on adjacent hummock areas.

Similar sites

R030XY161CA	**Gypsic Lake 5-7" p.z.** Conceptually the same ecological site.
R030XY163CA	**Loamy Lakeplain 5-7" p.z.** Conceptually the same ecological site.
R030XY165CA	**Alluvial Flat** Conceptually the same ecological site.
R030XY216CA	**ATCO-ATCA2 lake plain** Conceptually the same ecological site.
R030XY013NV	**SHALLOW SILTY** This site has higher shrub diversity and is lower producing.
R030XY009NV	**SILT BOTTOM** Conceptually the same ecological site.
R030XY040NV	**SODIC TERRACE** Conceptually the same ecological site.
R030XA011NV	**SILTY TERRACE 5-7 P.Z.** Conceptually the same ecological site.

R030XY045NV	**DUNES 3-7 P.Z.** Conceptually the same ecological site.

Table 1. Dominant plant species

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

Physiographic features

This site occurs on dry lake plains and lake terraces.

Table 2. Representative physiographic features

Landforms	(1) Lake plain (2) Lake terrace
Flooding duration	Extremely brief (0.1 to 4 hours) to very brief (4 to 48 hours)
Flooding frequency	Very rare to rare
Ponding duration	Very brief (4 to 48 hours) to brief (2 to 7 days)
Ponding frequency	Rare to occasional
Elevation	460 – 910 m
Slope	0 %
Ponding depth	0 cm
Water table depth	200 cm
Aspect	Aspect is not a significant factor

Climatic features

The Mojave Desert experiences clear, dry conditions for a majority of the year. Winter temperatures are mild, summer temperatures are hot, and seasonal and diurnal temperature fluctuations are large. Monthly minimum temperature averages range from 30 to 80 degrees F

(-1 to 27 degrees C). Monthly maximum temperature averages range from 60 to 110 degrees F (16 to 43 degrees C) (CSU 2002).

Average annual rainfall is between 2 and 8 inches (50 to 205 millimeters) (USDA 2006). Snowfall is more common at elevations above 4000 feet (1220 meters), but it may not occur every year (WRCC 2002b). The Mojave Desert receives precipitation from two sources. Precipitation falls primarily in the winter as a result of storms originating in the northern Pacific Ocean. The Sierra Nevada and Transverse Ranges create a rain shadow effect, causing little precipitation to reach the Mojave Desert. Sporadic rainfall occurs during the summer as a result of convection storms formed when moisture from the Gulf of Mexico or Gulf of California moves into the region. Summer rainfall is more common and has a greater influence on soil moisture in the eastern Mojave Desert.

Windy conditions are also common in the Mojave Desert, particularly in the west and central Mojave Desert. Spring is typically the windiest season, with winds averaging 10-15 miles per hour (WRCC 2002a). Winds in excess of 25 miles per hour and gusts in excess of 50 miles per hour are not uncommon (CSU 2002).

In the BLM Grazing Allotments Soil Survey (Northeast Part of Mojave Desert Area, CA (CA805)), most areas receive approximately 5 to 7 inches of precipitation annually (WRCC 2002b). At elevations above 4000 feet (1370 meters), average annual precipitation in the form of rain may reach 8 inches or more, and average annual snowfall may reach up to 10 inches (WRCC 2002b).

The data from the following climate stations were used to describe the climate in the BLM Grazing Allotments Soil Survey (station number in parentheses):
Pahrump, NV (265890)
Mountain Pass, CA (045890)
Searchlight, NV (267369)
Red Rock Canyon State Park, NV (266691)

"Maximum monthly precipitation" represents average monthly precipitation at Pahrump, NV.

Table 3 Representative climatic features

Frost-free period (average)	240 days
Freeze-free period (average)	280 days
Precipitation total (average)	180 mm

Influencing water features

Soil features

Soils for this site are very deep, coarse-loamy soils derived from lacustrine deposits high in calcium. The entire basin of Mesquite Lake is affected by the limestone mountains surrounding the lakebed. Permeability is moderate to moderately rapid, and soils are moderately well to well drained. All surface and subsurface fragments are from gypsum crystals. These soils classify as Typic Calcigypsids. The playa and adjacent lake terraces act as sinks for calcium salts, i.e. calcium carbonate and gypsum (a calcium sulfate). Available water capacity is low to moderate.

Soil survey area - Map unit symbol - Component
CA805 - 4765 - Typic Calcigypsids

Table 4. Representative soil features

Surface texture	(1) Gypsiferous sandy loam
Family particle size	(1) Loamy
Drainage class	Moderately well drained to well drained

Permeability class	Moderate to moderately rapid
Soil depth	150 – 200 cm
Surface fragment cover <=3"	30 – 60 %
Surface fragment cover >3"	Not specified
Available water capacity (0-101.6cm)	5.08 – 15.24 cm
Calcium carbonate equivalent (0-101.6cm)	10 – 20 %
Electrical conductivity (0-101.6cm)	0 – 10 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	Not specified
Soil reaction (1:1 water) (0-101.6cm)	7.8 – 8.4
Subsurface fragment volume <=3" (Depth not specified)	50 – 90 %
Subsurface fragment volume >3" (Depth not specified)	Not specified

Ecological dynamics

The dominant species on this ecological site is shadscale (Atriplex confertifolia). Shadscale often occurs in nearly pure stands (Stubbendieck et al. 2003), and is not known to have specific edaphic requirements (Simonin 2001). It occurs on both gypsum and non-gypsum substrates (Meyer 1986), and also on saline and alkaline soils (Hodgkinson 1987).

Gypsum is thought to affect plant growth more as a physical restriction rather than a chemical one, particularly at the seedling stage (Meyer 1986).The large amount of gypsum crystals on this ecosite make it difficult for many species to establish. A wide range of tolerance to different growing conditions (Simonin 2001) and its ability to root where large gypsum crystals are present (Groff 1997) may have facilitated growth of shadscale in this ecosite.

The dominance of shadscale on this ecosite may be related to its position in the landscape. Shadscale is thought to be less drought tolerant than other commonly associated species (Simonin 2001). This ecosite is at a low point in the landscape, and water drains to this position. Coupled with shadscale's tolerance of the edaphic conditions at this location, this may encourage shadscale growth over that of other minor species on this ecological site.

The position of this site also makes it highly dynamic with flash flooding and sediment deposition capable of initiating secondary succession. Sediment deposition at this site also creates conditions where minor species may increase in abundance or other species not typical at this site may become established. Natural and anthropogenic disturbance is likely to increase fourwing saltbush abundance at this site. On the proposed nuclear waste site at Yucca Mountain, Nevada, fourwing saltbush occurs in both early-successional creosotebush disturbed by heavy equipment and undisturbed creosotebush associations. In blackbrush communities on Yucca Mountain, it occurs on disturbed sites but is nearly absent from undisturbed sites (Gabbert et. al 1995).

Biological soil crusts—slow-growing complexes of fungi, lichen, moss, and cyanobacteria—may contribute up to 35% of the cover on this ecosite. They indicate site stability and recover slowly following disturbance (Belnap and Lange 2001). They moderate several processes that occur in the desert such as water and wind erosion (Belnap and others 2001). They act like a living mulch and slow evaporative water loss. They also affect soil fertility by increasing the available nitrogen in the soil. By occupying spaces between shrubs, biological soil crusts limit the establishment of invasive species that change disturbance regimes. The presence of biological soil crusts on this ecosite suggest that disturbance on this ecosite historically was not severe.

Wildfire has historically been rare in desert ecosystems due to low and widely spaced fuels. Red brome (Bromus rubens) and Mediterranean grass (Schismus arabicus) are present in small amounts on this ecosite. The high surface cover of gypsum crystals likely prevents rapid spread of these opportunistic species. However, the destruction of gypsum crystals by recreational vehicles, mining, or other disturbances will create bare soil surfaces in which these species may readily establish. Higher biomass production during years of high rainfall may create a more continuous, easily ignitable fuel source. Over time, sufficient biomass may build up and increase the risk that a fire will carry through the ecosite. Tamarisk (Tamarix ramosissima) is also present on this ecosite.

State and transition model

Additional community tables

Table 5. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
Shrub/Vine					
1	**Perennial Shrubs**			109-325	
	shadscale saltbush	ATCO	*Atriplex confertifolia*	98-291	–
	fourwing saltbush	ATCA2	*Atriplex canescens*	3-10	–
	Mojave seablite	SUMO	*Suaeda moquinii*	3-10	–
	iodinebush	ALOC2	*Allenrolfea occidentalis*	2-7	–
	honey mesquite	PRGL2	*Prosopis glandulosa*	1-3	–
	desert princesplume	STPI	*Stanleya pinnata*	1-3	–
Forb					
2	**annual forbs**			3-11	
	Forb, annual	2FA	*Forb, annual*	3-11	–

Table 6. Community 2.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)

Table 7. Community 2.3 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)

Table 8. Community 2.4 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)

Table 9. Community 3.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)

Table 10. Community 3.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)

Table 11. Community 3.3 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)

Animal community

Shadscale is an important forage species for both wildlife (Howard 2003) and livestock (Sampson and Jesperson 1963). Animals feed on the foliage and fruit, particularly during the winter when other forage is scarce. Uncontrolled grazing may reduce cover, but spine-like branches limit utilization.

Hydrological functions

This ecological site occurs in low positions in the landscape, and water from adjacent areas will drain toward this area.

Recreational uses

Off-highway vehicle use occurs on this ecosite, the impacts of which may be severe. Cover of shadscale may be reduced by vehicle trampling. Gypsum crystals will likely be destroyed. The gypsum crystals on this site protect the surface soil structure, so destruction of this natural barrier will loosen the surface soil. The biological crusts that protect the soil surface are also fragile, easily damaged, and very slow to recover following a disturbance. Destruction of either soil surface stabilizer will likely lead to greater potential for wind erosion on this site.

Other products

Gypsum mining is planned for soils within this ecosite. Mining will destroy large areas of this site. There will be increased wind erosion from this area as the soil surface will be loose and large areas of soil will be exposed.

Inventory data references

Species composition of this ecosite was estimated in Spring and Fall 2005 using 3 Range Inventory Worksheets (NV-ECS-1) . Productivity was sampled on 29 June 2005 using one double-weight sampling transect (SCS Range 417) at the type locality.

Other references

Belnap, J., J.H. Kaltenecker, R. Rosentreter, J. Williams, S. Leonard, D. Eldridge. 2001. Biological Soil Crusts: Ecology and Management. Technical Reference 1730-2. U.S. Department of the Interior, Bureau of Land Management and U.S. Geological Survey. Available: http://www.blm.gov/nstc/library/pdf/CrustManual.pdf. Accessed 5 October 2006.

Belnap, J. and O.L. Lange. 2001. Structure and functioning of biological soil crusts: a synthesis. In: Ecological Studies, Vol. 150. Belnap, J. and O.L. Lange (eds.). 2001. Biological Soil Crusts: Structure, Function, and Management. Springer-Verlag Berlin Heidelberg. pp. 471-479.

Belnap, J. 2003. The world at your feet: desert biological soil crusts. Frontiers in Ecology and the Environment 1,181–9.

California State University (CSU) Desert Studies Center. 2002. Desert Climate. CSU Desert Studies Center, Soda Springs, CA. Online. http://biology.fullerton.edu/facilities/dsc/zz_climate.html. Accessed 28 November 2006.

Doria, J. R. C., & Aldon, E. F. 1993. Fourwing saltbush seedling survival using saline irrigation. Arid Land Research and Management, 7(3), 243-251.

Gabbert, W. D., Schultz, B. W., Angerer, J. P., & Ostler, W. K. 1996. Plant succession on disturbed sites in four plant associations in the northern Mojave Desert. In Proceedings: Wildland Shrub and Arid Land Restoration Symposium (pp. 183-188).

Groff, Dale. 1997. Characteristics of gypsum soils in arid landscapes. Hortus West 8(1):10-52.

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.

Li, F. R., Kang, L. F., Zhang, H., Zhao, L. Y., Shirato, Y., & Taniyama, I. (2005). Changes in intensity of wind erosion at different stages of degradation development in grasslands of Inner Mongolia, China. Journal of Arid Environments, 62(4), 567-585.

Meyer, S.E. 1986. The ecology of gypsophile endemism in the Eastern Mojave Desert. Ecology 67(5):1303-1313.

Rundel, P.W. and A.C. Gibson. 1996. Ecological communities and processes in a Mojave Desert ecosystem: Rock Valley, Nevada. Cambridge University Press, New York. 369pp.

Sampson, A.W. and B.S. Jesperson. 1963. California range brushlands and browse plants. Publication 4010. Division of Agriculture and Natural Resources, University of California.

Simonin, Kevin A. 2001. Atriplex confertifolia. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: http://www.fs.fed.us/database/feis/ [2006, November 15].

Stubbendieck, James, Stephan L. Hatch, and L. M. Landholt. 2003. North American Wildland Plants. A Field Guide. University of Nebraska Press, Lincoln, Nebraska. xiv + 501 pp.

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

United States Department of Agriculture (USDA), Natural Resources Conservation Service. 2006. Land Resource Regions and Major Land Resource Areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296.

Western Regional Climate Center (WRCC). 2002a. Average wind speeds by state (1992-2002). Desert Research Institute, Reno, NV. Online. http://www.wrcc.dri.edu/htmlfiles/westwind.final.html. Accessed 28 November 2006.

Western Regional Climate Center (WRCC). 2002b. Western U.S. Climate Historical Summaries [Online]. Desert Research Institute, Reno, NV. Online. http://www.wrcc.dri.edu/Climsum.html. Accessed 28 November 2006.

Contributors

Heath M. McAllister, Steven R. Perkins, Allison Tokunaga
Dustin Detweiler

Approval

Sarah Quistberg, 2/24/2025

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	08/20/2026
Approved by	
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:

---

13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):**

---

14. **Average percent litter cover (%) and depth (in):**

---

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):**

---

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:**

---

17. **Perennial plant reproductive capability:**
