USDA Natural Resources
Conservation Service

Ecological site R030XB112NV
STONY LIMESTONE SLOPE 5-7 P.Z.

Last updated: 2/26/2025
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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 ecological site is found on hill and mountain landforms below 3000 feet elevation. Due to warmer and drier climatic conditions west of the Colorado and Virgin Rivers, this site is found on northerly aspects west of these rivers. East of the Colorado and Virgin Rivers, this site is found on all aspects. Soils are derived from colluvium and residuum from limestone with very shallow to shallow depths. Rock fragments larger than 3 inches diameter cover less than 15 percent of the soil surface.

Associated sites

R030XB111NV	**GRAVELLY LIMESTONE SLOPE 5-7 P.Z.**

Similar sites

R030XB105NV	**BOULDERY LIMESTONE SLOPE 5-7 P.Z.** KRLA2-MOUT codominant shrubs
R030XB106NV	**GRAVELLY SLOPE 5-7 P.Z.** ATCO codominant shrub
R030XB123NV	**LIMESTONE SLOPE 5-7 P.Z.** PLRI3 dominant plant; MOUT minor spp., if present
R030XB111NV	**GRAVELLY LIMESTONE SLOPE 5-7 P.Z.** KRLA2-MOUT codominant shrubs; less productive site

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Ambrosia dumosa* (2) *Lycium*
Herbaceous	Not specified

Physiographic features

This site occurs on steep, northerly sideslopes of mountains. Slopes range from 15 to 50 percent. Elevations are 1800 to 3000 feet.

Table 2. Representative physiographic features

Landforms	(1) Mountain slope
Elevation	1,800–3,000 ft
Slope	15–50%

Climatic features

The climate of the Mojave Desert has extreme fluctuations of daily temperatures, strong seasonal winds, and clear skies. The climate is arid and is characterized with cool, moist winters and hot, dry summers. Most of the rainfall falls between November and April. Summer convection storms from July to September may contribute up to 25 percent of the annual precipitation. Average annual precipitation is 5 to 7 inches. Mean annual air temperature is 66 to 68 degrees F. The average growing season is about 240 to 300 days.

Table 3. Representative climatic features

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

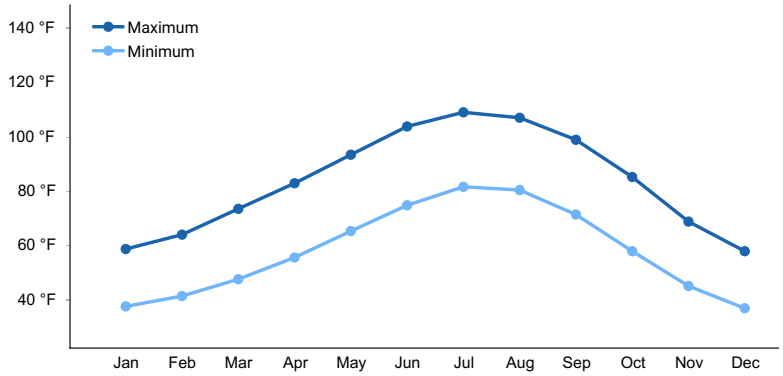


Figure 1. Monthly average minimum and maximum temperature

Influencing water features

There are no influencing water features associated with this site.

Soil features

The soil associated with this site are very shallow to shallow over limestone bedrock. The soil profile has more 35 percent rock fragments (by volume) and the soils are highly calcareous. These soils have high amounts of cobbles and stones on the surface. Water intake rates are moderately rapid and available water capacity is very low. Runoff is very high and the soils are well drained. Soil series associated with this site include Helkitchen.

Table 4. Representative soil features

Parent material	(1) Colluvium–limestone
Surface texture	(1) Extremely stony fine sandy loam
Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Moderately rapid
Soil depth	7–14 in
Surface fragment cover <=3"	30–40%
Surface fragment cover >3"	30–35%
Available water capacity (0-40in)	0.5–0.6 in
Calcium carbonate equivalent (0-40in)	20–80%
Electrical conductivity (0-40in)	2–4 mmhos/cm
Sodium adsorption ratio (0-40in)	0–2
Soil reaction (1:1 water) (0-40in)	7.9–8.4
Subsurface fragment volume <=3" (Depth not specified)	43–59%

Subsurface fragment volume >3" (Depth not specified)	5–35%

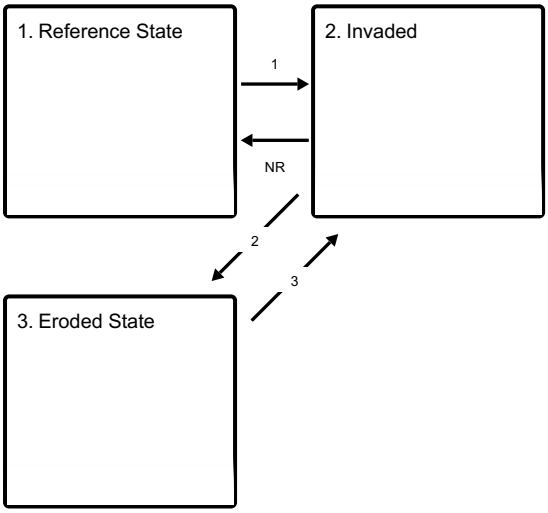
Ecological dynamics

This plant community is found on very steep limestone mountain sideslopes where the soils are very shallow and unstable. Following wildfire, snakeweed, desertrue, and ephedra greatly increase. Species likely to invade this site are annual forbs and grasses.

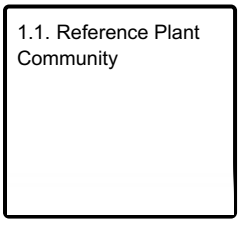
Fire Ecology:
Fires in the Mojave Desert are infrequent and of low severity because production of annual and perennial herbs seldom provides a fuel load capable of sustaining fire. Fire generally kills white bursage. Range ratany is top-killed by fire. Range ratany resprouts from the root crown after fire. Nevada ephedra is top-killed by fire and generally sprouts after fire damages aboveground vegetation and may increase in plant cover. Green ephedra generally sprouts vigorously from the roots or woody root crown after fire and rapidly produces aboveground biomass from surviving meristematic tissue. It is capable of reestablishing disturbed areas through seed. Green ephedra has been found in plant communities with a wide range of fire return intervals, and has been found in ecosystems following large, stand replacing fires as well as small, patchy, erratic fires. Green ephedra establishes early after fire but with relatively low occurrence compared to mid- and late successional stages. 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

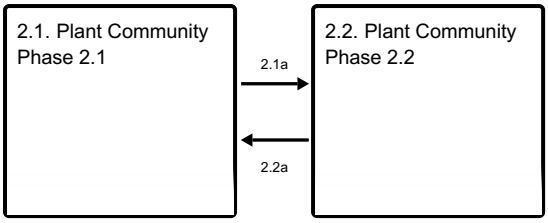
Ecosystem states



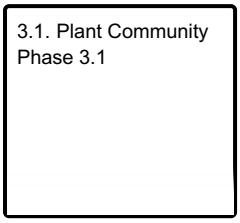
State 1 submodel, plant communities



State 2 submodel, plant communities



State 3 submodel, plant communities



State 1
Reference State

The Reference State is characterized by a long-lived stable plant community. Total ground cover is approximately 10-20%, dominated by shrubs.

Community 1.1
Reference Plant Community

The reference plant community is dominated by white bursage, wolfberry and ephedra. Potential vegetative composition is about 5% grasses, 5% annual and perennial forbs, and 90% shrubs. Approximate ground cover (basal and crown) is 10 to 20 percent.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Shrub/Vine	270	405	540
Grass/Grasslike	15	23	30
Forb	15	22	30
Total	**300**	**450**	**600**

State 2
Invaded

Introduced annuals such as red brome, schismus and redstem stork's bill have invaded the reference plant community and have become a dominant component of the herbaceous cover. This invasion of non-natives is attributed to a combination of factors including: 1) surface disturbances, 2) changes in the kinds of animals and their grazing patterns, 3) drought, and 4) changes in fire history. These non-natives annuals are highly flammable and promote wildfires where fires historically have been infrequent. AMDU and LYAN would persist after this invasion by non-native annuals, but the other shrubs and desirable grasses would either be unsuccessful in competing with the non-natives or removed from the system. The threshold that is crossed, is the introduction of non-native annuals that cannot be removed from the system and will alter disturbance regimes significantly from their natural or historic range of disturbances.

Community 2.1
Plant Community Phase 2.1

This plant community is compositionally similar to the Reference State with non-natives in the understory. At this time ecological processes have not been affected by the presence of non-natives.

Community 2.2
Plant Community Phase 2.2

This plant community is characterized by the dominance of non-native annuals. Native shrubs will persist through the invasion but will experience reduced vigor and decreased recruitment. This plant community is identified as “at-risk”. The decreased native perennial vegetation and dominance by non-native annuals reduces the soil stability and leaves the site vulnerable to erosion from wind and water.

Pathway 2.1a
Community 2.1 to 2.2

Localized disturbance will change the relative abundance of native shrubs and non-native annuals.

Pathway 2.2a
Community 2.2 to 2.1

With time and the absence of disturbance native shrubs begin to reestablish from seed provided by an offsite source.

State 3
Eroded State

The Eroded State is characterized by increased erosion and the presence of rills and gullies.

Community 3.1
Plant Community Phase 3.1

Perennial vegetation has been lost soil and soil nutrients are being relocated down slope. All ecological processes have been significantly altered including the hydrologic and nutrient cycle.

Transition 1
State 1 to 2

Introduction of non-native species due to anthropogenic impacts including OHV use, dry land farming, grazing, linear corridors, mining, military operations, and settlements.

Restoration pathway NR
State 2 to 1

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

Transition 2
State 2 to 3

Large scale disturbances remove native perennial vegetation. Increasing the amount of bare ground, leading to higher levels water erosion, decrease soil infiltration rates, and loosening of the soil surface causing channeling.

Restoration pathway 3
State 3 to 2

Restoration pathway. Possible restoration techniques, to stabilize the site and reestablish native perennials, include flattening and terracing hill slopes, closing roads, vertical, horizontal and rock mulching, as well as, planting container stock.

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**			9–45	
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	2–14	–
	desert needlegrass	ACSP12	*Achnatherum speciosum*	2–14	–
	threeawn	ARIST	*Aristida*	2–14	–
2	**Annual Grasses**			1–14	
Forb					
3	**Perennial Forbs**			9–36	
4	**Annual Forbs**			1–23	
Shrub/Vine					
5	**Primary Shrubs**			198–451	
	burrobush	AMDU2	*Ambrosia dumosa*	135–225	–
	desert-thorn	LYCIU	*Lycium*	45–90	–
	creosote bush	LATR2	*Larrea tridentata*	9–23	–
	Nevada jointfir	EPNE	*Ephedra nevadensis*	5–23	–
	Utah mortonia	MOUT	*Mortonia utahensis*	9–23	–
	mormon tea	EPVI	*Ephedra viridis*	4–22	–
6	**Secondary Shrubs**			23–68	
	catclaw acacia	ACGR	*Acacia greggii*	5–14	–
	blackbrush	CORA	*Coleogyne ramosissima*	5–14	–
	California barrel cactus	FECY	*Ferocactus cylindraceus*	5–14	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	5–14	–
	spiny menodora	MESP2	*Menodora spinescens*	5–14	–
	turpentinebroom	THMO	*Thamnosma montana*	5–14	–

Animal community

Livestock Interpretations:
This site has limited value for livestock grazing, due to the low forage production, steep slopes and stony surfaces. 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. 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. Nevada ephedra is important winter range browse for domestic cattle, sheep and goats. Nevada ephedra is usually grazed heavily and seems to be perfectly safe for grazing livestock since it induces neither toxicity in ewes or cows, nor congenital deformities in lambs. Green ephedra is an important browse species for big game and domestic livestock. It is heavily browsed by livestock and big game on winter range but only moderately or lightly browsed during other seasons. Green ephedra stems and twigs are nearly all within reach of grazing animals, and can serve as winter forage because they extend above the snow. 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. 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. Mule deer, bighorn sheep, and pronghorn browse Nevada ephedra, especially in spring and late summer when new growth is available. Mountain quail eat Ephedra seeds. Green ephedra is also of importance to small mammals; the stem parts and sizeable seeds are favored by many small mammals. Creosotebush is unpalatable to most browsing wildlife.

Hydrological functions

Water intake rates are moderately rapid. Runoff is very high.

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 hiking and has potential for upland and big game hunting.

Other products

White bursage is a host for sandfood, a parasitic plant. Sandfood was a valuable food supply for Native Americans. The Papago Indians used an infusion of the 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. Some Native American tribes steeped the twigs and drank the tea as a general beverage. 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 and serves as a nurse plant for creosotebush. 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. Nevada and Green ephedra are valuable shrubs for restoring western rangeland communities and can be used to rehabilitate disturbed lands. They also has value for reducing soil erosion on both clay and sandy soils. They establish readily through direct seeding, transplants, and stem cuttings.

Type locality

Location 1: Clark County, NV	
Latitude	36° 7′ 40″
Longitude	114° 3′ 33″
General legal description	About 1.5 miles northeast of Devils Cove. Lake Mead National Recreation Area, Clark County, Nevada. W Longitude 114º03'33" N Latitude 36º07'40"

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).

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Contributors

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Approval

Sarah Quistberg, 2/26/2025

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	07/15/2010
Approved by	Sarah Quistberg
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** Rills are none to rare. Rock fragments armor the surface.

2. **Presence of water flow patterns:** Water flow patterns are none to rare. Rock fragments armor the surface.

3. **Number and height of erosional pedestals or terracettes:** Pedestals are none to rare.

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Bare Ground to 10-20%.

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

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

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

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** Soil stability values should be 1 to 4 on most soil textures found on this site. (To be field tested.)

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Surface structure is typically moderate thin platy. Soil surface colors are light and soils are typified by an ochric epipedon. Organic matter of the surface 2 to 3 inches is less than 1 percent.

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Sparse shrub canopy and associated litter break raindrop impact.

11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):** None

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: Mojave Desert shrubs

    Sub-dominant: perennial forbs > deep-rooted, cool-season, grasses > annual forbs > deep-rooted, warm-season, grasses > annual grasses

    Other:

    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 25% of total woody canopy; mature bunchgrasses commonly (±25%) have dead centers.

14. **Average percent litter cover (%) and depth (in):** Between plant interspaces (<5%) and depth (±¼-inch).

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** For normal or average growing season ± 450lbs/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:** Invaders on this site include red brome, filaree, and Mediterranean grass.

17. **Perennial plant reproductive capability:** All functional groups should reproduce in above average growing season years.