USDA Natural Resources Conservation Service

Ecological site R030XB092NV
DESERT PATINA

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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 occurs on all types of alluvial fans covered in non-fragmented desert pavement below 3600 feet elevation.

This is a group concept and provisional STM that also covers the following ecological sites: R030XG024CA, R030XF030CA, and R030XY092NV.

Associated sites

R030XB001NV	**LIMY HILL 5-7 P.Z.**
R030XB005NV	**Arid Active Alluvial Fans**
R030XB017NV	**LIMY HILL 3-5 P.Z.**
R030XB019NV	**Eroded Fan Remnant Pavette 4-6 P.Z.**

Similar sites

R030XY092NV	**DESERT PATINA** This is the same ecological site. R030XG024CA and R030XF030CA are also conceptually equivalent.
R030XB019NV	**Eroded Fan Remnant Pavette 4-6 P.Z.** Desert pavement, if present, not continuous across shrub interspace; AMDU2 important shrub; more productive site
R030XB005NV	**Arid Active Alluvial Fans** AMDU2-LATR2 codominant; more productive site
R030XB084NV	**ERODED SLOPE** Not a stable plant community; vegetation constantly shifting with sloughing of surface soil/gravels
R030XB017NV	**LIMY HILL 3-5 P.Z.** More productive site; AMDU2 important shrub
R030XB078NV	**BARREN HILL 3-5 P.Z.** Occurs on hill landform: slopes >8%
R030XB001NV	**LIMY HILL 5-7 P.Z.** More productive site; AMDU2 dominant shrub

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Larrea tridentata*
Herbaceous	Not specified

Physiographic features

This site occurs on summits of fan remnants. Slopes gradients of 2 to 15 percent but slopes of 2 to 8 percent are most typical. Elevations are 800 to about 3600 feet.

Table 2. Representative physiographic features

Landforms	(1) Fan remnant
Elevation	800–4,700 ft

Slope	2–15%

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 3 to 7 inches. Mean annual air temperature is 57 to 75 degrees F. The average growing season is about 180 to 360 days.

Table 3. Representative climatic features

Frost-free period (average)	360 days
Freeze-free period (average)	
Precipitation total (average)	7 in

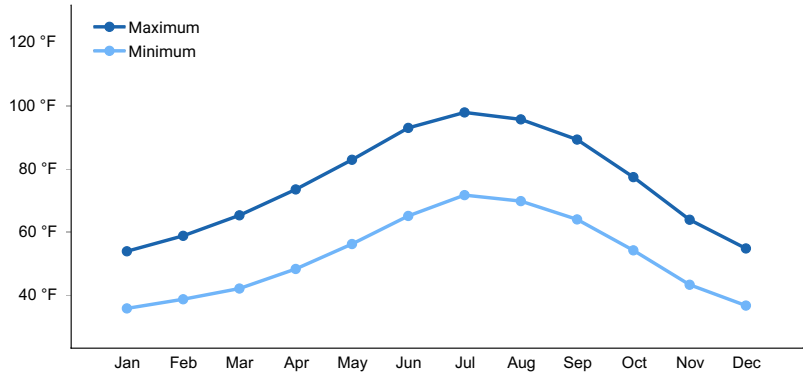


Figure 1. Monthly average minimum and maximum temperature

Influencing water features

There are no influencing water features associated with this site.

Soil features

The soil associated with this site are very deep and derived from mixed sources. A continuous desert pavement of at least 80 percent gravels covers the soil surface. Surface rock fragments are coated with a shiny patina (desert varnish) on the exposed surfaces. The rock fragments tend to be imbedded, leaving a smooth soil surface. The soils are well drained to excessively drained, available water capacity is very low and runoff is very low to low. Soil series associated with this site include Gypwash, Heleweiser, Oldspan and Varwash. The soils typically are loamy-skeletal and have an ochric epipedon and a calcic horizon.

Table 4. Representative soil features

Surface texture	(1) Gravelly fine sandy loam (2) Extremely gravelly fine sandy loam (3) Extremely gravelly loam
Family particle size	(1) Loamy
Drainage class	Well drained to excessively drained
Permeability class	Moderate to moderately rapid
Soil depth	72–84 in
Surface fragment cover <=3"	50–95%
Surface fragment cover >3"	0–10%

Available water capacity (0-40in)	1.8–3.9 in
Calcium carbonate equivalent (0-40in)	10–60%
Electrical conductivity (0-40in)	0–4 mmhos/cm
Sodium adsorption ratio (0-40in)	0–5
Soil reaction (1:1 water) (0-40in)	7.9–9
Subsurface fragment volume <=3" (Depth not specified)	8–70%
Subsurface fragment volume >3" (Depth not specified)	0–15%

Ecological dynamics

This is a very stable plant community so long as the desert pavement is not disturbed. This is a very low producing site with very restricted plant diversity. Annual forbs account for most of the variability in production. Introduced annual forbs and grasses may invade this site.

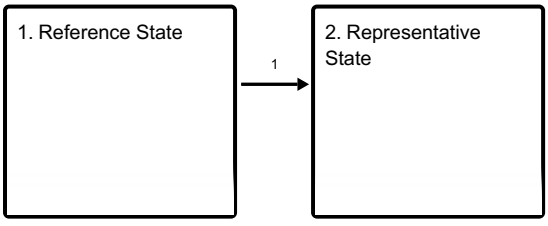
Most fires in the Mojave Desert are infrequent and of low severity because production of annual and perennial herbs seldom provides a fuel load capable of sustaining fire. Fires in creosotebush scrub were an infrequent event in pre-settlement desert habitats, because fine fuels from winter annual plants 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 patchy or are of low severity. Range ratany is a drought tolerant perennial. It is generally considered to be a climax species in desert communities. It is a valuable browse plant, however under heavy grazing pressure it will decrease. The intricately branched round shape of range ratany provides valuable shelter for small mammals and birds. Range ratany generally reproduces sexually from seed, but has also been known to sprout post fire (Griffith 1991).

Desert pavement formed as a function of eolian erosion and deposition, therefore the site is not vulnerable to wind erosion if surface clasts are intact. If disturbed, the fine grained materials of the vesicular horizon will be released into the air potentially causing ecological and health problems (Yonovitz and Drohan 2009). Anthropogenic disturbances disrupt the pavement surface and increase erosion. However, studies have shown that soil functions related to pore morphology are not significantly affected by disturbance. Characteristics of the vesicular horizon, including the non-connected nature of the pores and its effect on restricting infiltration are able to rapidly recover to pre-disturbance conditions (Yonovits and Droham 2009). The implications of this are that the increased availability of nitrogen will not facilitate increase vegetative growth because infiltration will continue to be impeded even following disturbance.

Well-developed desert pavements can require thousands of years to form (Graham et al. 2008). Even at maturity, pavement surfaces are characterized by a dynamic stability. Stone mobility is an important aspect of pavement longevity. Disturbances can also be repaired by this process if not too extensive (Haff and Werner 1996). Natural mechanisms influencing stone mobility include animal movement and running water.

State and transition model

Ecosystem states



State 1 submodel, plant communities

1.1. Reference Plant Community

State 2 submodel, plant communities

2.1. Plant Community Phase 2.1

State 1
Reference State

This state is representative of the natural range of variability under pristine conditions. Plant community phase changes are primarily driven by long-term drought. Insect attack and wildfire are infrequent, but have long-term impacts on the plant community. The plant communities of this site are dynamic in response to changes in disturbance regimes and weather patterns.

Community 1.1
Reference Plant Community

The reference plant community is dominated by creosotebush. Potential native vegetative composition is about 5% perennial and annual forbs and 95% shrubs. Approximate ground cover (basal and crown) is less than 4 percent.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Shrub/Vine	23	71	143
Grass/Grasslike	1	2	4
Forb	1	2	3
Total	**25**	**75**	**150**

State 2
Representative State

The Invaded State is characterized by the presence of non-native annuals in the understory. A biotic threshold has been crossed, with the introduction of non-native annuals that cannot be removed from the system. Ecological resiliency has been reduced by the presence of non-native annual species and a reduction in the cover of desert pavement. Non-native species have the potential to alter disturbance regimes significantly from their natural or historic range of variability. 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.

Community 2.1
Plant Community Phase 2.1

This community is compositionally similar to the Reference Plant Community, with the presence of non-native

annuals and reduced surface gravels. Following small scale disturbances desert pavements are able to heal due to the mobility of surface clasts. This plant community is identified as “at-risk”. If surface disturbance is not discontinued the site will be highly susceptible to erosion.

Transition 1
State 1 to 2

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

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**			1–4	
	low woollygrass	DAPU7	*Dasyochloa pulchella*	0–4	–
Forb					
2	**Perennial forbs**			1–4	
	desert globemallow	SPAM2	*Sphaeralcea ambigua*	0–2	–
3	**Annual forbs**			1–19	
	pincushion flower	CHFR	*Chaenactis fremontii*	0–2	–
	devil's spineflower	CHRI	*Chorizanthe rigida*	0–2	–
	desert trumpet	ERIN4	*Eriogonum inflatum*	0–2	–
	California poppy	ESCHS	*Eschscholzia*	0–2	–
	velvet turtleback	PSRA	*Psathyrotes ramosissima*	0–2	–
	yellowdome	TRIN2	*Trichoptilium incisum*	0–2	–
Shrub/Vine					
4	**Primary shrubs**			55–68	
	creosote bush	LATR2	*Larrea tridentata*	55–68	–
5	**Secondary shrubs**			1–8	
	burrobush	AMDU2	*Ambrosia dumosa*	1–8	–
	brittlebush	ENFA	*Encelia farinosa*	1–8	–
	white ratany	KRGR	*Krameria grayi*	1–8	–
	Fremont's dalea	PSFR	*Psorothamnus fremontii*	1–8	–
	Mojave yucca	YUSC2	*Yucca schidigera*	1–8	–

Animal community

Livestock Interpretations:
This site has limited value for livestock grazing, due to the very low forage production. 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:
Creosotebush is unpalatable to most browsing wildlife.

Hydrological functions

Runoff is very low to low and permeability is moderate to moderately rapid.

Other products

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

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.

Type locality

Location 1: Clark County, NV	
Township/Range/Section	T27S R65E S25
UTM zone	N
UTM northing	3938071
UTM easting	710939
General legal description	Approximately 14 miles northeast of Searchlight and 2 miles southeast of Opal Mountain on the west side of the Colorado River, Clark County, Nevada. This site also occurs in southern Lincoln and southern Nye Counties.

Other references

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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	05/12/2010
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. Rock fragments armor the soil surface.

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2. **Presence of water flow patterns:** None

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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 <20%; surface rock fragments up to 95%; shrub canopy < 5%.

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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 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 large rainfall 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 strong very thick to moderate medium platy. Soil surface colors are light and 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 provide some protection from raindrop impact.

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 argillic horizons should not be interpreted as compacted.

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: tall shrubs

    Sub-dominant: annual forbs > associated shrubs > warm-season, perennial bunchgrass = perennial forbs

    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 30% of total woody canopy; mature bunchgrasses commonly (<20%) have dead centers.

14. **Average percent litter cover (%) and depth (in):** Between plant interspaces trace to 5%, 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 ± 75 lbs/ac. Favorable years ± 150 lbs/ac and unfavorable years ± 25 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 on this site include red brome, redstem filaree, and Mediterranean grass.

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17. **Perennial plant reproductive capability:** All functional groups should reproduce in average and above average growing season years. Little growth or reproduction occurs during extended or extreme drought conditions.
