USDA Natural Resources
Conservation Service

Ecological site R030XB073NV
VOLCANIC SLOPE 5-7 P.Z.

Last updated: 3/11/2025
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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

West of the Virgin and Colorado Rivers, this ecological site is found on northerly slopes of hills and mountains slopes between 2800 and 3525 feet elevation; otherwise all aspects up to 3800 feet. Soils formed in colluvium and residuum from extrusive igneous rock where rock fragments over 10 inches diameter cover less than 15 percent of the soil surface.

Associated sites

R030XB028NV	**VALLEY WASH**
R030XB044NV	**COBBLY CLAYPAN 5-7 P.Z.**

Similar sites

R030XB202AZ	**Basalt Hills 6-9" p.z.** Conceptually the same ecological site.
R030XB095NV	**SHALLOW VOLCANIC HILL 5-7 P.Z.** ERFAP dominant shrub
R030XA029CA	**Shallow Limy 5-7** Conceptually the same ecological site.
R030XB203AZ	**Basalt Slopes 6-9" p.z.** Conceptually the same ecological site.
R030XB071NV	**VOLCANIC SLOPE 7-9 P.Z.** ERFAP dominant shrub; more productive site
R030XB070NV	**VOLCANIC HILL 5-7 P.Z.** ERFAP-AMDU2 codominant; less productive site
R030XB008NV	**SHALLOW GRANITIC HILL 5-7 P.Z.** ACSP12 dominant grass; less productive site
R030XB072NV	**STONY SLOPE 5-7 P.Z.** AMDU2 codominant shrub; less productive site

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Ambrosia dumosa* (2) *Krameria erecta*
Herbaceous	(1) *Pleuraphis rigida*

Physiographic features

This site occurs on hill sideslopes on all exposures. Slopes range from 4 to over 50 percent, but slope gradients of 15 to 30 percent are typical. Elevations are 2500 to 3500 feet.

Table 2. Representative physiographic features

Landforms	(1) Hill
Elevation	2,500–3,500 ft
Slope	4–50%

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 5 to 7 inches. Mean annual air temperature is 57 to 63 degrees F. The average growing season is about 180 to 240 days.

Table 3. Representative climatic features

Frost-free period (average)	240 days
Freeze-free period (average)	
Precipitation total (average)	7 in

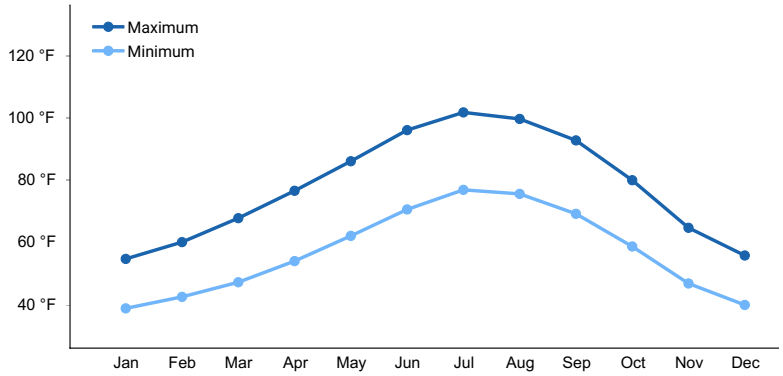


Figure 1. Monthly average minimum and maximum temperature

Influencing water features

There are no influencing water features associated with this site.

Soil features

The soil associated with this site are shallow and derived from volcanic parent materials. Water intake rates are moderate, available water capacity is low, runoff is medium to rapid and the soils are well drained.

Table 4. Representative soil features

Drainage class	Well drained

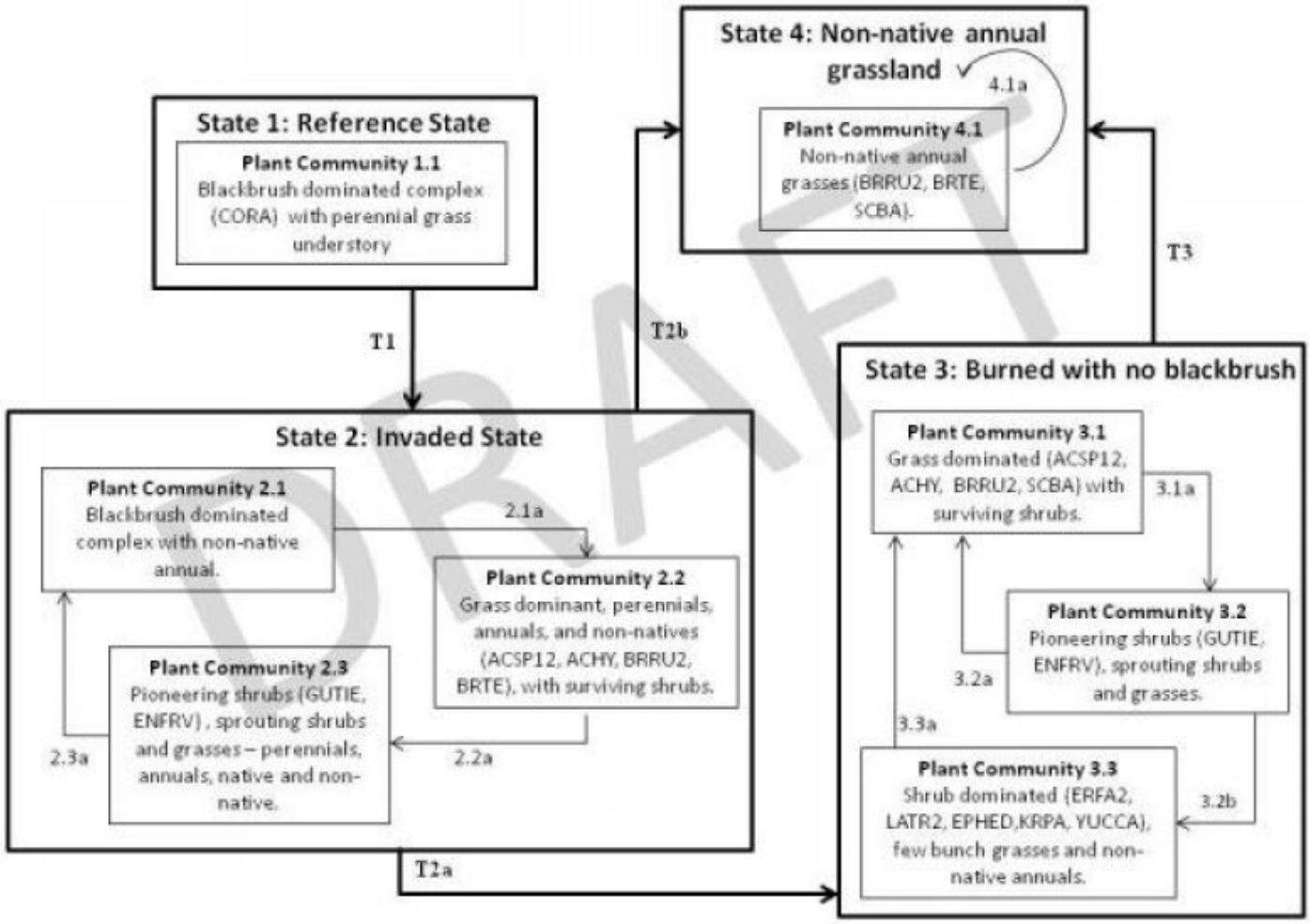
Ecological dynamics

As ecological condition deteriorates, creosotebush increases. Following wildfire, Mojave buckwheat and introduced (exotic) annual grasses and forbs greatly increase and will often dominate this site.

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. However, most white bursage plants burned because their canopies contained numerous small branches in proximity to herbaceous fuels. Range ratany is top-killed by fire. Range ratany resprouts from the root crown after fire. Following fire, Virgin River encelia depends on off-site seed rather than on-site sprouts for regeneration. 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. Nevada ephedra is top-killed by fire. Underground regenerative structures commonly survive when aboveground vegetation is consumed by fire. Nevada ephedra generally sprouts after fire damages aboveground vegetation and may increase in plant cover. California ephedra will often survive fire

because their foliage does not readily burn. Fire most likely top-kills big galleta. Big galleta sprouts from rhizomes following fire. Damage to big galleta from fire varies, depending on whether big galleta is dormant when burned. If big galleta is dry, damage may be severe. However, when plants are green, fire will tend to be less severe and damage may be minimal, with big galleta recovering quickly.

State and transition model



State 1
Reference State

The Reference State is characterized by a blackbrush dominated community with a perennial grass understory. Historically, blackbrush associations were long-lived stable communities that rarely experienced fire.

Community 1.1
Reference Plant Community

The reference plant community is dominated by white bursage, range ratany, and Virgin River encelia. Creosotebush is an important shrub on this site. Potential vegetative composition is about 15% grasses, 15% annual and perennial forbs and 70% shrubs. Approximate ground cover (basal and crown) is 5 to 15 percent.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Shrub/Vine	140	245	350
Grass/Grasslike	30	53	75
Forb	30	52	75
Total	**200**	**350**	**500**

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. ERFAP and AMDU 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

Compositionally this plant community is similar to the Reference State with the presence of non-native species in the understory.

Community 2.2
Plant Community Phase 2.2

This plant community is characterized by increased annual, perennial, native and non-native grasses. Few surviving shrubs will remain on the site. This plant community is identified as “at-risk”. Continued heavy disturbance or repeated fire will exclude native vegetation and change the ecological dynamics of the site.

Community 2.3
Plant Community Phase 2.3

Shrubs have begun to regenerate. Woody species with high seed production and early establishment will be the first to return. Once large shrubs are established and begin to produce shade it will favor the establishment of additional native perennials.

Pathway 2.1a
Community 2.1 to 2.2

Anthropogenic disturbance removes shrubs and favors an increase of herbaceous vegetation and non-native species.

Pathway 2.2a
Community 2.2 to 2.3

Changes in management remove disturbance and allow woody species to regenerate. Post disturbance colonization by woody species will be limited to thoes with high growth rates, high reproductive ability and relatively short life spans (GUTIE, ENFAV, ERFA). Blackbrush will begin to reestablish provided favorable climatic conditions and available seed source.

Pathway 2.3a
Community 2.3 to 2.1

Many years with NO fire, minimal disturbance, the presence of a blackbrush seed source, ideal climatic conditions and multiple recruitment pulses blackbrush seedlings will establish and recruit into the stand.

State 3
Burned With No Blackbrush

This state is characterized by the inability of blackbrush to return to site following a fire, due to insufficient climatic conditions and the lack of an available seed source. In the absence of ideal conditions blackbrush will not return to the site. Species will consist of fire tolerant shrubs with high growth rates and high reproductive capacities.

Community 3.1
Plant Community Phase 3.1

Is characterized by dominance of grasses; annual, perennial, native and non-native. Few surviving shrubs remain on the site. Non-native annuals provide a significant amount of herbaceous biomass.

Community 3.2
Plant Community Phase 3.2

This plant community is dominated by pioneering woody species tolerant of post fire conditions. Scattered shrubs consist of those with the ability to sprout from the root crown following fire. Perennial bunchgrasses and non-native annuals are common and wide spread.

Community 3.3
Plant Community Phase 3.3

This plant community is dominated by a variety of shrubs that were present in smaller quantities in the Reference State. Blackbrush continues to be excluded from this site due to the lack of seed source and ideal conditions required for recruitment and establishment.

Pathway 3.1a
Community 3.1 to 3.2

Time without disturbance pioneering shrubs germinate and establish from an offsite seed source and sprouting shrubs begin to reappear.

Pathway 3.2a
Community 3.2 to 3.1

Small scale fire of other localized disturbances remove patches of woody vegetation and encourage growth of perennial bunchgrasses and non-native annuals.

Pathway 3.2b
Community 3.2 to 3.3

Removal of disturbance and the absence of fire favors establishment of long-live native perennial vegetation.

Pathway 3.3a
Community 3.3 to 3.1

Large disturbance, like fire, removes woody vegetation and promotes growth of non-native annuals.

State 4

Non-Native Annual Grassland

This state is characterized by a frequent fire return interval.

Community 4.1
Plant Community Phase 4.1

Frequent repeated fires exclude native vegetation, especially woody species and favor a monoculture of non-native annuals. This phase is a reoccurring cycle.

Transition 1
State 1 to 2

Introduction of non-natives due to anthropogenic disturbances, including OHV use, dry land farming, grazing, linear corridors, mining, military training operations, and settlements.

Transition 2a
State 2 to 3

Large scale high intensity fire in combination with insufficient climatic conditions for germination and establishment of blackbrush.

Transition 2b
State 2 to 4

Large scale repeated fire excludes native perennials and creates non-native annual grassland.

Transition 3
State 3 to 4

Large scale repeated fire excludes native perennials and creates non-native annual grassland.

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	**Primary Perennial Grasses**			7–28	
	big galleta	PLRI3	*Pleuraphis rigida*	7–28	–
2	**Secondary Perennial Grasses**			7–28	
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	2–11	–
	threeawn	ARIST	*Aristida*	2–11	–
	low woollygrass	DAPU7	*Dasyochloa pulchella*	2–11	–
	bush muhly	MUPO2	*Muhlenbergia porteri*	2–11	–
3	**Annual Grasses**			1–17	
Forb					
4	**Primary Perennial forbs**			4–17	
	desert globemallow	SPAM2	*Sphaeralcea ambigua*	4–17	–
5	**Perennial forbs**			1–28	
6	**Annual forbs**			1–35	
Shrub/Vine					
7	**Primary shrubs**			126–302	
	burrobush	AMDU2	*Ambrosia dumosa*	53–88	–
	Virgin River brittlebush	ENVI	*Encelia virginensis*	17–53	–
	Parish's goldeneye	VIPA14	*Viguiera parishii*	7–35	–
	creosote bush	LATR2	*Larrea tridentata*	7–28	–
	California jointfir	EPCA2	*Ephedra californica*	3–14	–
	Nevada jointfir	EPNE	*Ephedra nevadensis*	4–14	–
8	**Secondary shrubs**			17–53	
	catclaw acacia	ACGR	*Acacia greggii*	4–18	–
	sweetbush	BEJU	*Bebbia juncea*	4–18	–
	spearleaf brickellbush	BRAT	*Brickellia atractyloides*	4–18	–
	Eastern Mojave buckwheat	ERFAP	*Eriogonum fasciculatum var. polifolium*	4–18	–
	California barrel cactus	FECY	*Ferocactus cylindraceus*	4–18	–
	Fremont's dalea	PSFR	*Psorothamnus fremontii*	4–18	–
	Mojave woodyaster	XYTO2	*Xylorhiza tortifolia*	4–18	–
	Mojave yucca	YUSC2	*Yucca schidigera*	4–18	–

Animal community

Livestock Interpretations:
This site has limited value for livestock grazing, due to the low forage production, steep slopes and stony surfaces. Big galleta is considered a valuable forage plant for cattle and domestic sheep. Its coarse, rigid culms make it relatively resistant to heavy grazing and trampling. 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. Encelia has no forage value for domestic livestock. Triangle goldeneye has limited browse value, when other forage is scarce, but otherwise are practically worthless as forage except that livestock will frequently pick off the flowering and fruiting heads, after frost, and nibble the leaves. Creosotebush is unpalatable to livestock.

Consumption of creosotebush may be fatal to 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. California ephedra is important winter range browse for domestic cattle, sheep and goats.

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. Virgin River encelia is important to the desert tortoise as a source of succulent forage in periods of low moisture. Encelia is a browse species of desert mule deer and desert bighorn Sheep. Triangle goldeneye has limited browse value, when other forage is scarce, but otherwise are practically worthless as forage. Creosotebush is unpalatable to most browsing wildlife. 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. Mule deer, bighorn sheep, and pronghorn browse California ephedra, especially in spring and late summer when new growth is available.

Hydrological functions

Water intake rates are moderate, available water capacity is low, runoff is medium to rapid and the soils are well drained.

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 range ratany 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. 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. Some Native American tribes steeped the twigs of Nevada ephedra and drank the tea as a general beverage.

Other information

Big galleta's clumped growth form stabilizes blowing sand. White bursage may be used to revegetate disturbed sites in southwestern deserts. 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	
General legal description	Highland Range, Clark County, Nevada.

Other references

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Contributors

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Approval

Kendra Moseley, 3/11/2025

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)	GK BRACKLEY
Contact for lead author	State Rangeland Management Specialist
Date	05/02/2013
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. Typically found in areas recently subject to intense summer rainfall and on steeper slopes.

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2. **Presence of water flow patterns:** Water flow patterns none to rare, particularly in areas recently subject to intense summer rainfall and on steeper slopes. These are short (<1 m) and not connected.

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3. **Number and height of erosional pedestals or terracettes:** Pedestals are none to rare with occurrence typically limitec to areas within water flow patterns.

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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 30% depending on amount of surface rock fragments.

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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

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 3 to 6 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 fine to medium platy or subangular blocky. Soil surface colors are pale browns and soils are typified by an ochric epipedon. Organic matter of the surface 2 to 3 inches is less than to 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. Medium to fine textured surface soils have moderate to slow infiltration and medium to rapid runoff.

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. Platy or massive sub-surface horizons, subsoil calcic horizons or hardpans shallow to the surface are not to be interpreted as compacted layers.

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: deep-rooted, warm-season, grasses (big galleta) > deep-rooted, cool-season, grasses (Indian ricegrass) > perennial forbs = annual forbs > shallow-rooted perennial 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 35% 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 (February thru April [May]) ± 350lbs/ac. Favorable years ±500 lbs/ac and unfavorable years ±200 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 cheatgrass, redstem filaree, annual mustards and Mediterranean grass.

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