Ecological site R030XB052NV
RUBBLY OUTWASH

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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 site is found on inset fans between 3600 feet and 4300 feet.

This is a group concept and provisional STM that also covers sites: R030XB159CA, R030XB108NV, R030XB137NV, R030XB157CA, R030XB163CA.

Associated sites

R030XB001NV	**LIMY HILL 5-7 P.Z.**
R030XB005NV	**Arid Active Alluvial Fans**
R030XB074NV	**COBBLY LOAM 5-7 P.Z.**

Similar sites

R030XB159CA	**Broad Gravelly Wash** Conceptually the same ecological site.
R030XB028NV	**VALLEY WASH** Baccharis major shrub; less shrub diversity

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Senna armata*
Herbaceous	(1) *Pleuraphis rigida*

Physiographic features

This site occurs on the upper portion of inset fans of upper erosional fan remnants. Slope gradients of 2 to 8 percent are most typical. Elevations are 2500 to 4500 feet.

Table 2. Representative physiographic features

Landforms	(1) Inset fan
Flooding duration	Very brief (4 to 48 hours)
Flooding frequency	Rare to occasional
Ponding frequency	None
Elevation	762–1,372 m
Slope	2–8%
Aspect	Aspect is not a significant factor

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 56 to 65 degrees F. The average growing season is about 180 to 340 days.

Table 3. Representative climatic features

Frost-free period (average)	340 days
Freeze-free period (average)	

Precipitation total (average)	178 mm

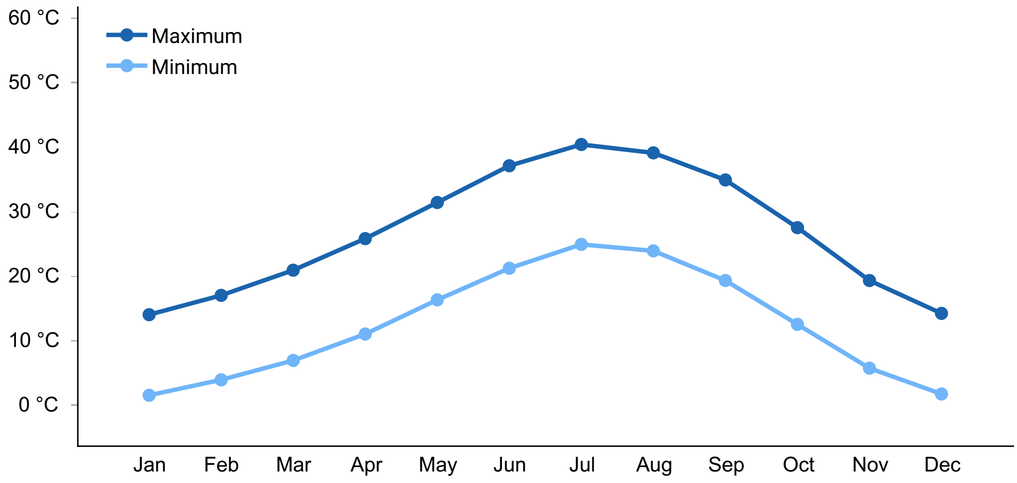


Figure 1. Monthly average minimum and maximum temperature

Influencing water features

This site is subject to occasional flooding.

Soil features

The soils associated with this site are very deep and are formed in alluvium from mixed sources. There are very high amounts (greater than 60 percent surface cover) of boulders, stones or cobbles at the surface. Soil textures are fine sand to moderately coarse sands. The soils are excessively drained and water intake rates are moderately rapid to rapid. Available water capacity is very low. The soil series associated with this site includes: Arizo.

Table 4. Representative soil features

Surface texture	(1) Extremely gravelly sandy loam (2) Gravelly loamy sand (3) Gravelly fine sand
Family particle size	(1) Sandy
Drainage class	Excessively drained
Permeability class	Moderately rapid to rapid
Soil depth	183–213 cm
Surface fragment cover <=3"	23–60%
Surface fragment cover >3"	4–25%
Available water capacity (0-101.6cm)	4.83–5.08 cm

Calcium carbonate equivalent (0-101.6cm)	0–10%
Electrical conductivity (0-101.6cm)	0–2 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0–13
Soil reaction (1:1 water) (0-101.6cm)	7.4–9
Subsurface fragment volume <=3" (Depth not specified)	23–68%
Subsurface fragment volume >3" (Depth not specified)	0–25%

Ecological dynamics

This site is quite variable and diverse in floristic composition reflecting a relatively infrequent, yet intense, flooding pattern. Ephemeral streams are unique in that they lack permanent flow although they perform the same critical hydrologic functions as perennial streams; they move water, sediment, nutrients and debris through the stream network and provide connectivity within the watershed. These systems experience extreme and rapid variations in flood magnitudes as a response to heavy rain events. The fundamental difference between ephemeral and perennial streams is that ephemeral stream channels have sizeable transmission losses when they flow. Ephemeral streams are also characterized by wider channels, low sinuosity, and flat bed topography. The sparseness of vegetation along the stream banks contributes to channel widening tendencies. (Levick et al 2008).

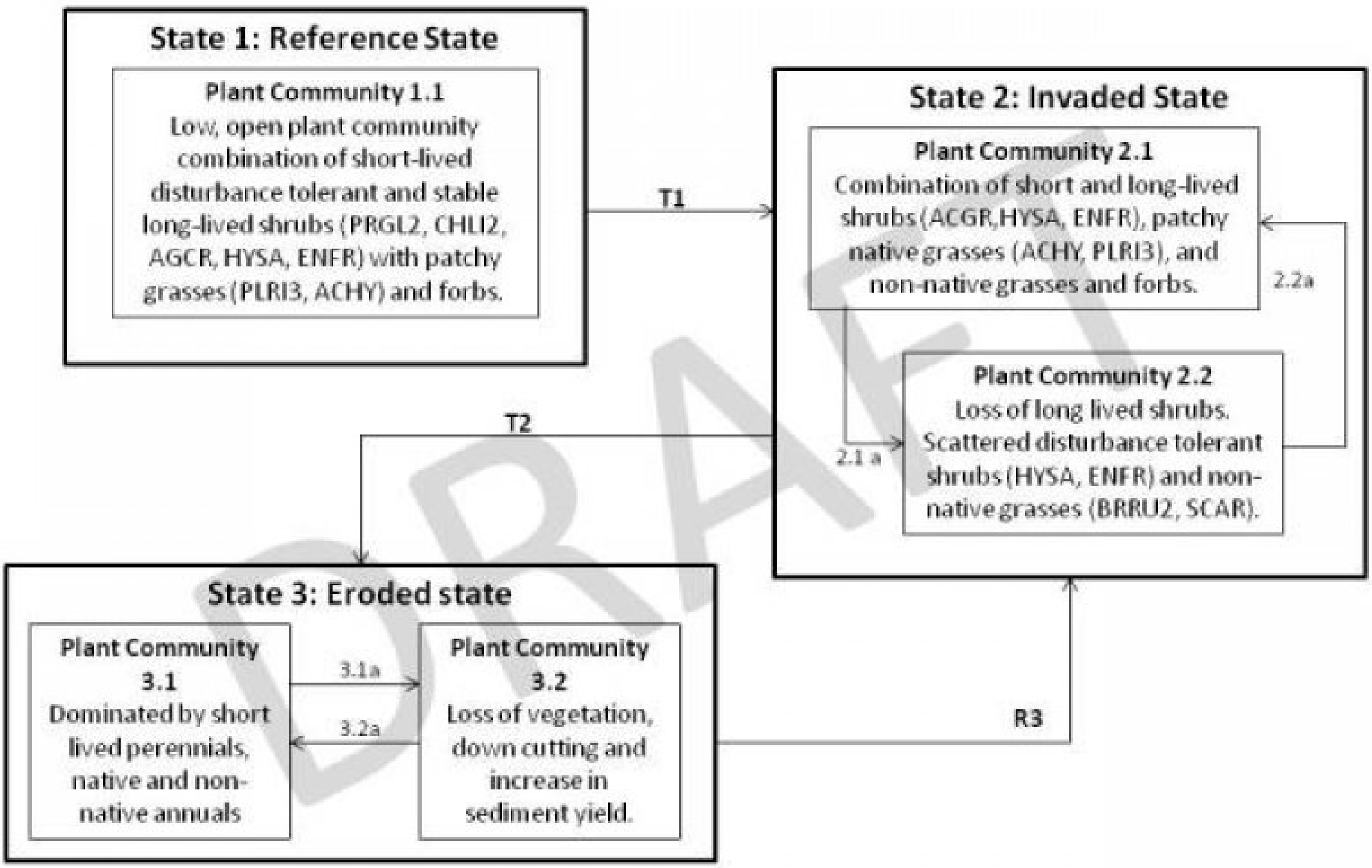
Along the desert washes, vegetation composition and structure overlap considerably with those of the surrounding desert uplands. An example of this is creosotebush and white bursage commonly occur in the washes and adjoining uplands. As water availability increases, the vegetation becomes increasingly distinct from the upland vegetation with respect of physiognomy and species composition. Canopy cover increases and mesoriparian and hydroriparian species increase in abundance (Levick et al 2008). The four wash ecological sites are characterized as having intermediate water availability and support more drought-tolerant shrubs.

As a result of decreased flow rates in the downstream direction, more silts and fines are deposited in the channel, which can be advantageous to biotic communities. Many of the species (white burrobush, desert rabbitbrush, baccharis, sweetbush) occurring on these sites are generally considered to be increasers or pioneers in the presence of disturbance (Abella 2010). These species produce prolific numbers of wind-dispersed seeds and are more abundant in ephemeral streams with intense flood scour (Levick et al 2008). Rainfall and flood flow events can trigger a pulse of germination of annual and perennial forbs from a diverse soil seed bank. Some species, such as catclaw acacia, desert willow, purple sage (*Salvia dorrii*), and bladdersage (*Salazaria mexicana*) have resprouting capabilities; an adaptation to withstand flooding flows. Catclaw acacia also has nitrogen fixing bacteria associated with its roots, which can be an important influence on local nitrogen availability. The increased availability of nutrients on these sites compared to the surrounding area increases the likelihood of encountering invasive species, like saltcedar (Tamarix spp.). Saltcedar is successful in arid environments due to its ability to tolerate unpredictable periods of moisture. Perturbation of these systems by natural or anthropogenic causes can result in the development of continuous incised channels.

Flooding is a natural disturbance within these ecological sites due to their location on the landscape. Floods help to redistribute nutrients across the landscape, as well as, encouraging resprouting and seedling establishment. Seedling establishment and canopy expansion is greater for plants growing in the drainageways than the surrounding area. However, these plants are less tolerant of extended dry periods because they are adapted to increased soil moisture (Hamerlynk and McAuliffe 2008). Very large rainfall events rarely occur but have the potential to remove existing vegetation and deposit new sediment, initiating secondary succession.

Wildfire is infrequent and patchy in this system. However, years with increased annual precipitation result in increased production from annuals and increase the chances of wildfire. Post fire creosotebush, baccharis and other fire intolerant shrubs decrease. Fire tolerant species such as bursage, burrowbrush, ephedra, desert willow and acacia are able to sprout from the root crown and may increase following wildfire. Fire also favors an increase by perennial native grasses.Bursage species are easily top-killed but can resprout following fire. Mojave buckwheat is vulnerable to hot fires. Resprout success is low and most regeneration is from seeds. Frequent fires deplete the seed bank, making populations vulnerable to extinction. Fires are infrequent in communities where white burrobrush occurs because of low productivity and discontinuous fuels; nevertheless, fire is a natural component of these communities. White burrobrush establishes after fire via off-site seeds and sprouting. Because it seeds prolifically, white burrobrush can quickly colonize burned sites. Purple sage has a high tolerance to fire and will resprout following fire. Damage to big galleta from fire varies. 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. Desert needlegrass has persistent dead leaf bases, which make it susceptible to burning. Fire removes the accumulation; a rapid, cool fire will not burn deep into the root crown. Most perennial grasses have root crowns that can survive wildfire.

State and transition model



State 1
Reference State

This state represents the natural range of variability under pristine conditions. Plant community phase changes are maintained by occasional flooding in response to heavy rainfall events, periodic drought and insect attack. Fire is rare in this system, but can have long term impacts on plant community composition. Timing of disturbances combined with weather events determines plant community dynamics.

Community 1.1
Reference Plant Community

The reference plant community is dominated by desertsenna. Hollyleaf bursage and Mojave buckwheat are other important species associated with this site. Potential vegetative composition is about 15% grasses, 5% annual and perennial forbs and 80% shrubs. Approximate ground cover (basal and crown) is less than 15 percent.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Shrub/Vine	179	269	448
Grass/Grasslike	34	50	84
Forb	11	17	28
Total	**224**	**336**	**560**

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. 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 species that have the potential to alter disturbance regimes significantly from their natural or historic range of disturbances. In addition to non-native annual grasses like Mediterranean grass and red brome, this site is also susceptible to invasion by saltcedar.

Community 2.1
Plant Community Phase 2.1

This plant community is compositionally similar to the Reference State with a trace of non-natives in the understory. Ecological processes remain unchanged at this time. However, ecologic resilience is reduced by the presence of non-natives.

Community 2.2
Plant Community Phase 2.2

This plant community is characterized as “at-risk”. The decrease in long-lived perennial shrubs has reduced the stability of the site, leaving it vulnerable to increased erosion. Natural ecosystem processes are disrupted sediment and nutrients are increasingly redistributed downstream.

Pathway 2.1a
Community 2.1 to 2.2

Increased disturbance from OHV use or other impacts removes long-lived shrubs and favors short-lived species and non-native annuals.

Pathway 2.2a
Community 2.2 to 2.1

With time and removal of disturbance long-lived perennial species return and ecosystem is restored.

State 3
Eroded State

The Eroded State is characterized by increased channel erosion. An abiotic threshold has been crossed, triggered by chronic disturbance or even a discrete event such as an intense rainfall event, leading to sediment transport and the loss of perennial vegetation.

Community 3.1
Plant Community Phase 3.1

This plant community is dominated by short-lived perennial shrubs and non-natives, characteristic of a short disturbance return interval. The ability of this site to dissipate energy during large flow event is severely reduced contributing to ecological damage downstream.

Community 3.2
Plant Community Phase 3.2

This plant community is characterized by a loss of stability, increased erosion, and channel incision. Ecological processes have been altered including connectivity within the watershed, ground water recharge and habitat quality.

Pathway 3.1a
Community 3.1 to 3.2

Large scale disturbance removes remaining perennial shrubs.

Pathway 3.2a
Community 3.2 to 3.1

With time and the exclusion of disturbance some perennial plants return to the system increasing stability.

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.

Transition 2
State 2 to 3

Large scale disturbance on a short return interval remove stabilizing vegetation and lead to increased erosion.

Restoration pathway 3
State 3 to 2

Restoration pathway. Ecological processes can be restored to the site, but non-natives remain. Possible restoration techniques include stabilizing the site by reestablishing native perennials and the use of artificial rip-rap to dissipate energy and reestablish the flood plain.

Additional community tables

Table 6. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Primary Perennial Grasses**			27–84	
	big galleta	PLRI3	*Pleuraphis rigida*	17–50	–
	desert needlegrass	ACSP12	*Achnatherum speciosum*	7–17	–
2	**Secondary Perennial Grasses**			2–6	
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	2–7	–
	bush muhly	MUPO2	*Muhlenbergia porteri*	2–7	–
3	**Annual Grasses**			1–10	
Forb					
4	**Perennial Forbs**			7–27	
5	**Annual Forbs**			1–17	
Shrub/Vine					
6	**Primary Shrubs**			233–400	
	desertsenna	SEAR8	*Senna armata*	101–151	–
	woolly fruit bur ragweed	AMER	*Ambrosia eriocentra*	50–84	–
	Eastern Mojave buckwheat	ERFAP	*Eriogonum fasciculatum var. polifolium*	50–84	–
	burrobrush	HYSA	*Hymenoclea salsola*	22–45	–
7	**Secondary Shrubs**			34–67	
	catclaw acacia	ACGR	*Acacia greggii*	3–10	–
	burrobush	AMDU2	*Ambrosia dumosa*	3–10	–
	sweetbush	BEJU	*Bebbia juncea*	3–10	–
	Nevada jointfir	EPNE	*Ephedra nevadensis*	3–10	–
	creosote bush	LATR2	*Larrea tridentata*	3–10	–
	desert almond	PRFA	*Prunus fasciculata*	3–10	–
	Fremont's dalea	PSFR	*Psorothamnus fremontii*	3–10	–
	Mexican bladdersage	SAME	*Salazaria mexicana*	3–10	–
	Mojave yucca	YUSC2	*Yucca schidigera*	3–10	–

Animal community

Livestock Interpretations:
This site has limited value for livestock grazing, due to the low forage production. Grazing management should be keyed to perennial grasses or palatable shrub production. 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. Young desert needlegrass is palatable to all classes of livestock. Mature herbage is moderately grazed by horses and cattle, but rarely grazed by sheep. Fluffgrass is a poor forage grass for livestock. Hollyleaf bursage has low forage value for livestock. Mojave buckwheat has a browse rating of fair to poor for cattle. Purple sage has low to medium platability for livestock.
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:
In southern Nevada, big galleta is heavily utilized by bighorn sheep and in some blackbrush communities it is referred to as preferred habitat. Mule deer utilize trace amounts of big galleta. Young desert needlegrass is palatable to many species of wildlife. Desert needlegrass produces considerable basal foliage and is good forage while young. Desert bighorn sheep graze desert needlegrass. Fluffgrass is a poor forage grass for wildlife. Hollyleaf bursage has low forage value for wildlife. Purple sage has low to medium platability for wildlife.

Hydrological functions

Runoff is low. Permeability is moderately rapid to rapid.

Recreational uses

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

Other information

Big galleta's clumped growth form stabilizes blowing sand.

Other references

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Contributors

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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	04/08/2010
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.

2. **Presence of water flow patterns:** Water flow patterns few to common.

3. **Number and height of erosional pedestals or terracettes:** Pedestals are rare with occurrence typically limited to areas within water flow patterns.

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Bare Ground to 20%; surface rock fragments to 85%; shrub canopy to 15%; basal area for perennial herbaceous plants (Trace).

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 2 to 4 on most soil textures found on this site. Areas of this site occurring on soils that have a physical crust will probably have stability values less than 3. (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 weak coarse 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 0.5 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: Reference Plant Community: Mojave Desert shrubs

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

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 ±300lbs/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 annual grasses and forbs, such as red brome, Mediterranean grass, and filaree.

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