USDA Natural Resources
Conservation Service

Ecological site R030XB075NV
GRAVELLY FAN 5-7 P.Z.

Last updated: 3/11/2025
Accessed: 05/12/2025

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.

Ecological site concept

This site occurs on fan skirts of upper piedmont slopes, fan remnants, and inset fans. Slopes range from 0 to 15 percent, but slope gradients of 2 to 4 percent are typical. Elevations are 2000 to 4500 feet.

This site falls under the group concept of R030XB221CA.

Associated sites

R030XB034NV	**SANDY PLAIN 5-7 P.Z.**
R030XB075NV	**GRAVELLY FAN 5-7 P.Z.**

Similar sites

R030XB074NV	**COBBLY LOAM 5-7 P.Z.** Less productive site.
R030XB004NV	**SANDY 5-7 P.Z.** ACHY codominant grass; KRLA2 major shrub.
R030XB043NV	**CLAYPAN 5-7 P.Z.** MESP2 rare to absent.
R030XB121NV	**SANDY PLAIN 3-5 P.Z.** More productive site; on broad alluvial plains; MESP2 rare to absent.
R030XB039NV	**LIMY FAN 5-7 P.Z.** More productive site; MESP2 rare to absent.
R030XB034NV	**SANDY PLAIN 5-7 P.Z.** More productive site.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Ambrosia dumosa* (2) *Menodora spinescens*
Herbaceous	(1) *Pleuraphis rigida*

Physiographic features

This site occurs on fan skirts of upper piedmont slopes, fan remnants, and inset fans. Slopes range from 0 to 15 percent, but slope gradients of 2 to 4 percent are typical. Elevations are 2000 to 4500 feet.

Table 2. Representative physiographic features

Landforms	(1) Fan remnant (2) Fan skirt (3) Inset fan
Flooding frequency	None
Ponding frequency	None
Elevation	2,000–4,500 ft
Slope	0–15%
Water table depth	0 in
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 190 to 210 days.

Table 3. Representative climatic features

Frost-free period (average)	210 days
Freeze-free period (average)	
Precipitation total (average)	7 in

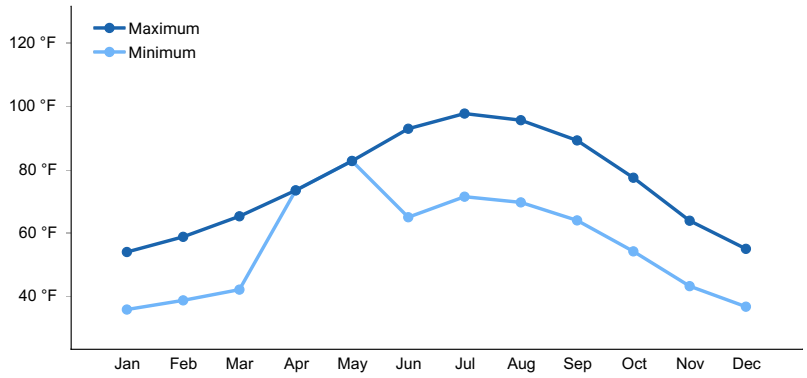


Figure 1. Monthly average minimum and maximum temperature

Influencing water features

This site receives run-in moisture from adjacent landscapes.

Soil features

The soils are deep to very deep and well drained to somewhat excessively drained. The soils are formed in alluvium or colluvium typically from limestone. The soils typically have a calcic horizon. They are moderately coarse textured and have high volumes of gravels throughout the soil profile. Surface cover of gravel-sized rock fragments is typically more than 45 percent. Water intake rates are moderately slow to moderately rapid and runoff is low to high. Although available water capacity is very low to moderate, these soils receive run-in moisture from higher landscapes. The soil series associated with this site include; Lanip, a fine-loamy, mixed, superactive, thermic Typic Calciargids; Nickel, a loamy-skeletal, mixed, superactive, thermic Typic Haplocalcids; Upperline, a loamy-skeletal, carbonatic, thermic, Typic Haplocalcid; and Weiser, a loamy-skeletal, carbonatic, thermic, Typic Haplocalcid.

Table 4. Representative soil features

Parent material	(1) Alluvium–limestone and sandstone
Surface texture	(1) Gravelly fine sandy loam (2) Very gravelly sandy loam (3) Extremely gravelly fine sandy loam
Family particle size	(1) Loamy
Drainage class	Well drained to somewhat excessively drained
Permeability class	Moderately slow to moderately rapid
Soil depth	30–84 in
Surface fragment cover <=3"	16–40%
Surface fragment cover >3"	2–38%
Available water capacity (0-40in)	1.9–5.4 in
Calcium carbonate equivalent (0-40in)	40–60%
Electrical conductivity (0-40in)	0–4 mmhos/cm
Sodium adsorption ratio (0-40in)	1–12
Soil reaction (1:1 water) (0-40in)	7.9–9
Subsurface fragment volume <=3" (Depth not specified)	17–47%
Subsurface fragment volume >3" (Depth not specified)	2–36%

Ecological dynamics

The plant communities of this site are dynamic in response to changes in disturbance regimes and weather patterns. Community phase changes are primarily driven by periodic wildfire and long term drought. The reference plant community has a mixture of cool and warm season grasses, due to the combination of the summer and winter precipitation. Desert grasses are intensive exploiters, which extract a large proportion of their moisture from shallow soil horizons (Burgess 1995). Intensive exploiters are very effective competitors for limited moisture and tend to be very resilient.

The topographic position of this site results in increased run-in moisture from the surrounding landscape, increasing the abundance of warm season perennial bunchgrasses. Primary production in this system is largely constrained by drought. High temperatures and small rainfall events allow nutrients to accumulate during extended dry periods when plant and microbial growth is restricted. When precipitation events do occur, they trigger a pulse of biological activities including plant growth and nutrient uptake (Collins et al 2008). The resource pulses influence plant community structure through annual growth and seedling recruitment.

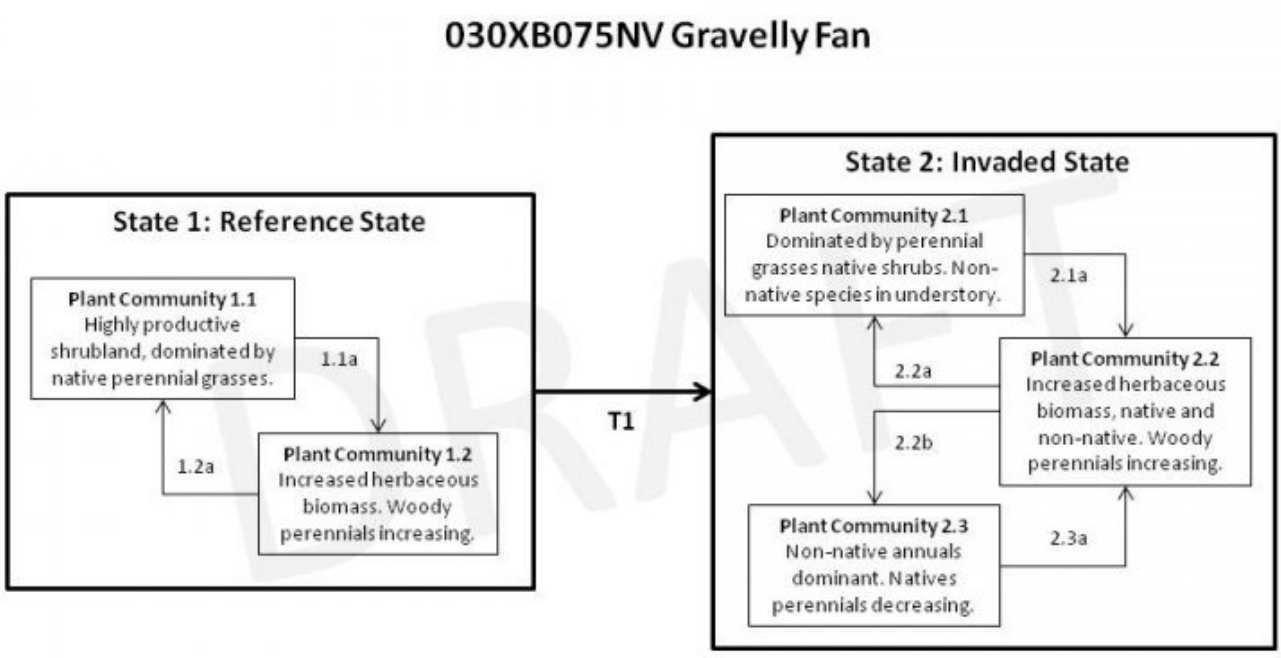
The site is dominated by big galleta, a warm season grass. Warm season grasses have higher light and temperature requirements to begin photosynthesis, therefore grow most actively during the summer. Big galleta generally undergoes two major growth periods, coinciding with the bimodal rainfall pattern (Matthews 2000). Big galleta typically flowers from February through June in the Mojave Desert and is the most drought tolerant of the Pleuraphis species. Its shallow root system extends radially from the base of the plant, maximizing area covered by the roots (Matthews 2000).

Long-term drought greatly influences plant community dynamics. Drought induced canopy die-back and mortality, is common during periods of below average precipitation, especially among juveniles (Hamerlynck and McAuliffe 2008). Mortality and canopy die-back is more extensive among drought-deciduous species, which frequently have larges leaves, greater stomatal conductance and higher transpiration rates. Under water-limited conditions the xylem structure of these plants are more prone to cavitation (Hamerlynck and McAuliffe 2008). During drought the drought-deciduous white bursage will experience increased mortality and overall canopy die-back in the plant community.

Vegetation plays an important role in reducing the erodibilty of the soil surface. Incorrect management actions may result in reduced vegetative cover and increased soil erosion. Long-term surface disturbance or reoccurring wildfire will reduce native plant cover, plant density, and species diversity of this site. As ecological condition deteriorates big galleta and perennial forbs decrease, short-lived perennials initially increase. Non-native annual grasses and forbs may invade as native perennial vegetation is lost.

Fire Ecology:
Fires in the Mojave Desert are infrequent and of low severity because production of herbaceous biomass seldom provides a fuel load capable of sustaining fire. Fire generally kills white bursage. Spiny menodora often survives fire because its foliage does not readily burn. 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. Range ratany is top-killed by fire. Range ratany resprouts from the root crown after fire.
Big galleta is top-killed by fire but is able to sprout from rhizomes. 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. Bush muhly regenerates from soil-stored seed following fire. Success depends on soil moisture and competition pressure. Burning causes at least short-term decline of bush muhly. 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 and surviving tufts will resprout. Indian ricegrass can be killed by fire, depending on severity and season of burn. Indian ricegrass reestablishes on burned sites through seed dispersed from adjacent unburned areas. Currently this ecological site is described by a two state model because additional states have not been identified on the landscape. If additional stable states are identified in the future, this model will be revised to reflect such findings.

State and transition model



State 1
Reference State

The reference state is representative of the natural range of variability under pristine conditions. Plant community phase changes are primarily driven by long-term drought, wildfire, disease and insect attack. Plant communities of the reference state are stable and long lived, both creosotebush and white bursage persist in the plant community even though their relative percentages may change over time. Plant communities 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 big galleta, spiny menodora and white bursage. Desert needlegrass, Indian ricegrass, range ratany, and creosotebush are important species associated with this site. Spiny menodora and bush muhly are most prevalent at the upper elevations of this site's occurrence. Potential vegetative composition is about 55 percent grasses, 5 percent perennial and annual forbs and 40 percent 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)
Grass/Grasslike	220	330	440
Shrub/Vine	160	240	320
Forb	20	30	40
Total	**400**	**600**	**800**

Community 1.2
Plant Community 1.2

This plant community is characteristic of a post-disturbance plant community. Initially herbaceous biomass increases. Sprouting shrubs quickly recover and provide favorable sites for the establishment of other shrubs. This plant community is considered to be ‘at-risk’ of invasion by non-native annuals. Non-natives take advantage of the increased availability of critical resources following a disturbance. Prolonged drought results in shrub canopy die-back and temporarily reduces annual production.

Pathway 1.1a
Community 1.1 to 1.2

Wildfire, prolonged drought, disease and/or insect attack.

Pathway 1.2a
Community 1.2 to 1.1

Absence from disturbance and natural regeneration over time.

State 2
Invaded State

The invaded state is characterized by the presence of non-native species. Introduced annuals such as red brome and redstem filaree have invaded the reference plant community and have become a dominant component of the herbaceous cover. A biotic threshold is crossed, with the introduction of non-native annuals that are difficult to remove from the system and will alter disturbance regimes significantly from their natural or historic range of disturbances. These non-native annuals are highly flammable and promote wildfires where fires historically have been infrequent.

Community 2.1
Invaded Plant Community 2.1

Compositionally this plant community is similar to the reference plant community with non-native species in the understory. Ecological function is not compromised at this time, however ecological resilience is reduced by the presence of non-natives. This plant community will respond differently following a disturbance, when compared to a non-invaded plant communities. Management focused on reducing anthropogenic impacts and protecting native vegetation is important to ensure seed is available for regeneration in the future

Community 2.2
Invaded Plant Community 2.2

This plant community is characteristic of a post-disturbance plant community. It is initially heavily dominated by herbaceous biomass, which may or not be dominated by non-native annual grasses. Non-native species take advantage of increased light and nutrient resources post-fire. Perennial bunchgrasses sprout from the root crown post-fire. This plant community is ‘at-risk’ of frequent wildfire, due to increased fuel loading from native and non-native grasses.

Community 2.3
Invaded Plant Community 2.3

This plant community is heavily dominated by non-native annuals. Native perennials are decreasing. Loss of deep-rooted perennial vegetation results in reduced infiltration and increased runoff during precipitation events. Native perennials suffer from increased competition for light, water and nutrients. This plant community is ‘at-risk’ of frequent and reoccurring disturbances, such as wildfire, and a total loss of native perennials. Management should focus of fuels management and reducing disturbances to protect remaining native vegetation.

Pathway 2.1a
Community 2.1 to 2.2

Wildfire, prolonged drought, disease and/or insect attack.

Pathway 2.2a
Community 2.2 to 2.1

Absence from disturbance and natural regeneration over time.

Pathway 2.2b
Community 2.2 to 2.3

Reoccurring wildfire.

Pathway 2.3a
Community 2.3 to 2.2

Absence from disturbance and natural regeneration over time.

Transition T1
State 1 to 2

Introduction of non-native species due 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.

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**			294–450	
	big galleta	PLRI3	*Pleuraphis rigida*	240–300	–
	bush muhly	MUPO2	*Muhlenbergia porteri*	30–90	–
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	12–30	–
	desert needlegrass	ACSP12	*Achnatherum speciosum*	12–30	–
2	**Secondary Perennial Grasses**			12–48	
	threeawn	ARIST	*Aristida*	3–18	–
	low woollygrass	DAPU7	*Dasyochloa pulchella*	3–18	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	3–18	–
3	**Annual Grasses**			1–30	
Forb					
4	**Perennial forbs**			12–30	
	desert globemallow	SPAM2	*Sphaeralcea ambigua*	3–12	–
	low woollygrass	DAPU7	*Dasyochloa pulchella*	0–5	–
5	**Annual forbs**			1–30	
Shrub/Vine					
6	**Primary shrubs**			114–300	
	burrobush	AMDU2	*Ambrosia dumosa*	60–150	–
	spiny menodora	MESP2	*Menodora spinescens*	30–90	–
	creosote bush	LATR2	*Larrea tridentata*	12–30	–
	desert globemallow	SPAM2	*Sphaeralcea ambigua*	0–5	–
7	**Secondary shrubs**			12–60	
	catclaw acacia	ACGR	*Acacia greggii*	3–18	–
	Nevada jointfir	EPNE	*Ephedra nevadensis*	3–18	–
	Eastern Mojave buckwheat	ERFAP	*Eriogonum fasciculatum var. polifolium*	3–18	–
	spiny hopsage	GRSP	*Grayia spinosa*	3–18	–
	burrobrush	HYSA	*Hymenoclea salsola*	3–18	–
	winterfat	KRLA2	*Krascheninnikovia lanata*	3–18	–
	water jacket	LYAN	*Lycium andersonii*	3–18	–
	turpentinebroom	THMO	*Thamnosma montana*	3–18	–
	Mojave yucca	YUSC2	*Yucca schidigera*	3–18	–

Animal community

Livestock Interpretations:
This site is suitable for spring grazing by sheep and cattle where water is available. 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. Bush muhly is readily eaten by livestock throughout the year when available; however, it is usually not abundant enough to provide much forage. It is grazed heavily in winter when other species become scarce. Because of its branching habit, it is extremely susceptible to heavy grazing. Bush muhly is damaged when continuously grazed to a stubble height of less than 4 inches (10 cm). Desert needlegrass produces considerable basal foliage and is good forage while young. Young desert needlegrass is palatable to all classes of livestock. Mature herbage is moderately grazed by horses and cattle but rarely grazed by sheep. Indian ricegrass is highly

palatable to all classes of livestock in both green and cured condition. It supplies a source of green feed before most other native grasses have produced much new growth. 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. Cattle will graze the stems of spiny menodora in the spring before the stems become woody and spiny. Spiny menodora has lower palatability than the other shrubs but is consumed during early spring before spines mature. Creosotebush is unpalatable to livestock. Consumption of creosotebush may be fatal to sheep. 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.

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. Elk will graze the stems of spiny menodora in the spring before the stems become woody and spiny. Creosotebush is unpalatable to most browsing 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.

The palatability of bush muhly for wildlife species is rated fair to poor. Desert bighorn sheep and feral horses and burros will graze desert needlegrass. Indian ricegrass is eaten by pronghorn in moderate amounts whenever available. In Nevada it is consumed by desert bighorns. A number of heteromyid rodents inhabiting desert rangelands show preference for seed of Indian ricegrass. Indian ricegrass is an important component of jackrabbit diets in spring and summer. In Nevada, Indian ricegrass may even dominate jackrabbit diets during the spring through early summer months. Indian ricegrass seed provides food for many species of birds. Doves, for example, eat large amounts of shattered Indian ricegrass seed lying on the ground.

Hydrological functions

Water intake rates are moderately slow to moderately rapid and runoff is low to high. Although available water capacity is very low to moderate, these soils receive run-in moisture from higher landscapes.

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 products

Indian ricegrass was traditionally eaten by some Native Americans. The Paiutes used seed as a reserve food source. White bursage is a host for sandfood, a parasitic plant. Sandfood was a valuable food supply for Native Americans. 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. 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.

Other information

Big galleta's clumped growth form stabilizes blowing sand. Desert needlegrass may be used for groundcover in areas of light disturbance, but it is susceptible to excessive trampling. White bursage may be used to revegetate disturbed sites in southwestern deserts. Creosotebush may be used to rehabilitate disturbed environments 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.

Inventory data references

NV-ECS-1: 2 records
NRCS-RANGE-417: 1 record

Type locality

Location 1: Clark County, NV	
Township/Range/Section	T26 S R63 E S24
General legal description	Upper piedmonts east side of Eldorado Valley, Clark County, Nevada.

Other references

Burgess, T.L. 1995. Desert Grassland, Mixed Shrub Savanna, Shrub Steppe, or Semidesert Scrub? Pp. 31-67 in M.P. McClaran and T.R. Van Devender (eds.), the Desert Grassland. University of Arizona Press, Tucson Arizona.
Collins, S.L., R.L. Sinsabaugh, C. Crenshaw, L. Green, A. Porras-Alfaro, M. Stursova and L.H. Zeglin. 2008. Pulse dynamics and microbial processes in aridland ecosystems. J. of Ecology. 96: 413-420.
Fire Effects Information System (Online; http://www.fs.fed.us/database/feis/). Hamerlynck, E.P. and J.R. McAuliffe. 2008. Soil-dependent canopy die-back and plant mortality in two Mojave Desert shrubs. J. of Arid Environments. 72:1793-1802.
Matthews, Robin F. 2000. Pleuraphis rigida. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: http://www.fs.fed.us/database/feis/
USDA-NRCS Plant database (Online; http://plants.usda.gov/).

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)	P Novak-Echenique
Contact for lead author	State Rangeland Management Specialist
Date	04/27/2010
Approved by	Kendra Moseley
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 none to rare. Rock fragments armor the surface.

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

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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 to 10-20%.

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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 storms. Persistent litter (large woody material) will remain in place except during large rainfall events.

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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. (To be field tested.)

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Surface structure is typically strong very thick platy to strong 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 typically less than 1 percent. (lab characterization data)

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Perennial herbaceous plants (especially deep-rooted bunchgrasses [i.e., Indian ricegrass and big galleta] slow runoff and increase infiltration. Shrub canopy and associated litter break raindrop impact.

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11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):** None. Subsoil calcic or argillic horizon should not be mistaken for compaction.

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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: deep-rooted, warm season, perennial bunchgrasses >> Mojave desert shrubs

    Sub-dominant: deep-rooted, cool season, perennial bunchgrasses > perennial forbs > 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; some of the mature bunchgrasses (<20%) have dead centers.

14. **Average percent litter cover (%) and depth (in):** Between plant interspaces and under canopy 20-30% and depth of litter is ±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 ±600 lbs/ac. Favorable years 800+ lb/ac and unfavorable years 400 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 Mediterranean grass, red brome, and redstem filaree.

17. **Perennial plant reproductive capability:** All functional groups should reproduce in average (or normal) and above average growing season years. Little growth or reproduction occurs during below average years.