USDA Natural Resources
Conservation Service

Ecological site R030XB043NV
CLAYPAN 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.

Ecological site concept

This site occurs on fan remnants and fan piedmonts. Slopes range from 0 to 15 percent, but slope gradients of 2 to 8 percent are most typical. Elevations are 2400 to 4500 feet. The soils have an argillic horizon shallow to the surface acting as an Aquitard.

This site is under the group concept of R030XB188CA.

Associated sites

R030XB034NV	**SANDY PLAIN 5-7 P.Z.**
R030XB039NV	**LIMY FAN 5-7 P.Z.**

Similar sites

R030XB034NV	**SANDY PLAIN 5-7 P.Z.** More productive site
R030XB039NV	**LIMY FAN 5-7 P.Z.** More productive site
R030XB004NV	**SANDY 5-7 P.Z.** MUPO2 rare to absent
R030XB121NV	**SANDY PLAIN 3-5 P.Z.** MUPO2 absent
R030XB075NV	**GRAVELLY FAN 5-7 P.Z.** MESP2 codominant shrub
R030XB044NV	**COBBLY CLAYPAN 5-7 P.Z.** More productive site

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Larrea tridentata*
Herbaceous	(1) *Pleuraphis rigida* (2) *Muhlenbergia porteri*

Physiographic features

This site occurs on fan remnants and fan piedmonts. Slopes range from 0 to 15 percent, but slope gradients of 2 to 8 percent are most typical. Elevations are 2400 to 4500 feet.

Table 2. Representative physiographic features

Landforms	(1) Fan remnant (2) Fan piedmont
Flooding duration	Very brief (4 to 48 hours) to brief (2 to 7 days)
Flooding frequency	Very rare to rare
Ponding frequency	None
Elevation	2,400–4,500 ft
Slope	0–15%
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 60 degrees F. The average growing season is about 190 to 270 days.

Table 3. Representative climatic features

Frost-free period (average)	270 days
Freeze-free period (average)	
Precipitation total (average)	7 in

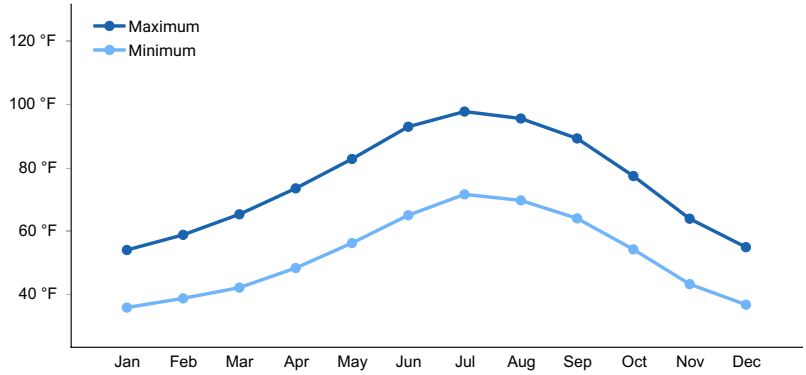


Figure 1. Monthly average minimum and maximum temperature

Influencing water features

There are no influencing water features associated with this site.

Soil features

The soils associated with this site are deep to very deep and well drained. The soils have moderately slow to moderately rapid permeability. Available water holding capacity is low to moderate and runoff is low. The soils have an argillic horizon shallow to the surface. The soil series associated with this site include Aymate, Lanip, and Tenwell.

Table 4. Representative soil features

Surface texture	(1) Very gravelly loamy coarse sand (2) Gravelly sandy loam (3) Extremely gravelly sandy loam

Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Moderately slow to moderately rapid
Soil depth	20–72 in
Surface fragment cover <=3"	5–50%
Surface fragment cover >3"	0–30%
Available water capacity (0-40in)	1.8–5.4 in
Calcium carbonate equivalent (0-40in)	0–15%
Electrical conductivity (0-40in)	0–4 mmhos/cm
Sodium adsorption ratio (0-40in)	0–12
Soil reaction (1:1 water) (0-40in)	7.4–9
Subsurface fragment volume <=3" (Depth not specified)	8–62%
Subsurface fragment volume >3" (Depth not specified)	0–32%

Ecological dynamics

Potential natural vegetation is dominanted by perennial grasses. This site is geographically located in the bottom or on fan toes, positively contributing to the run-in moisture. The argillic and calcic horizons found in the soil lead to increased water holding capacity, making this site more productive than the surrounding areas. Half of the annual precipitation comes in the summer, increasing production and the presence of warm season grasses. The dominant grasses on this ecological site are large bunchgrasses which provide valuable organic matter. Litter and old shoots are incorporated into the soil increasing the organic matter and therefore the nutrient availability compared to other desert soils. Run-in moisture is positively influenced by the abundance of vegetation on the landscape, providing more places for infiltration. Elevated levels of soil organic matter and infiltration help make this site more resilient, than the surrounding area, following a disturbance.

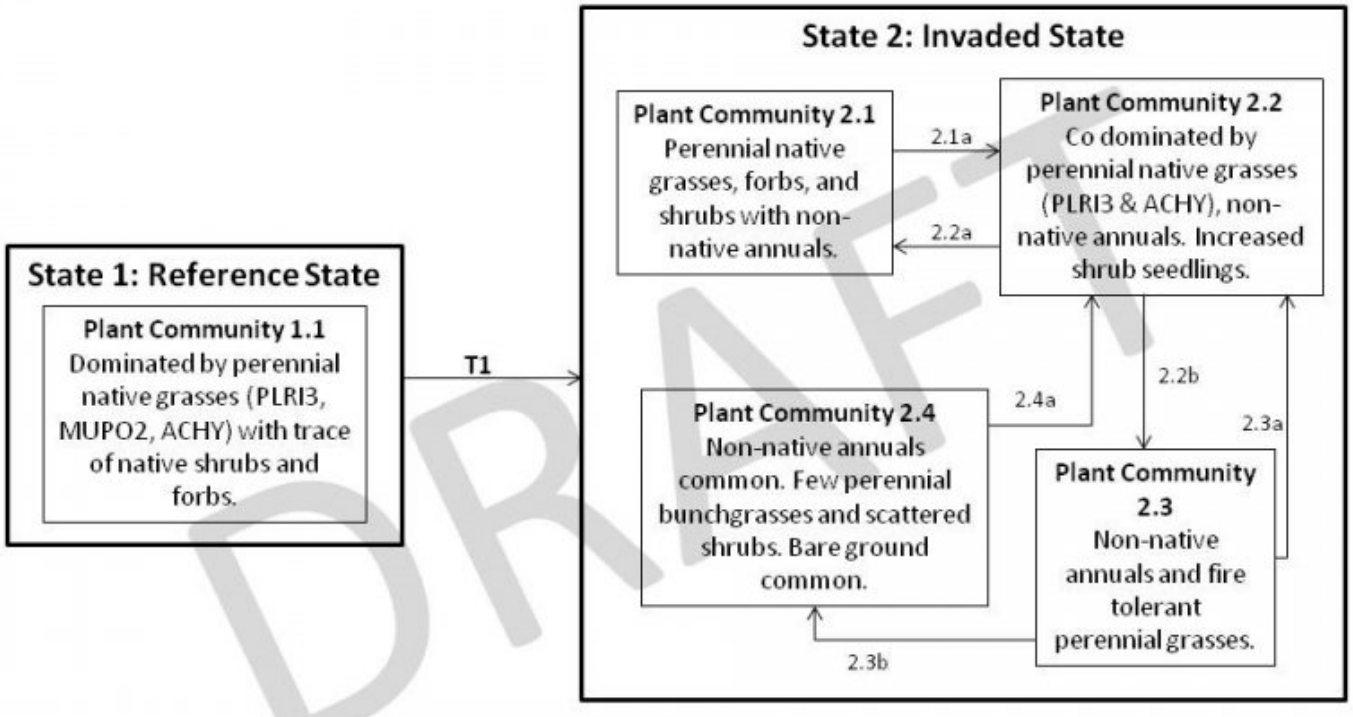
Grasses and shrubs of this ecological site are considered to be palatable to wildlife making it valuable habitat. Perennial grass species found on this ecological site include a combination of cool and warm season species. Big galleta, Indian ricegrass, desert needlegrass (*Achnatherum speciosum*), fluffgrass (*Dasyochloa pulchella*), and threeawn (Aristida spp.) are the most common. The relative species diversity of this site makes it more resilient. Species richness contributes to overall increased ecological stability. The ecological functions of different species overlap, so that even if a species is removed, ecological function will persist due to the compensation by other species with similar function (Peterson et al. 1998).

The fine fuels from annuals and perennial grasses facilitate the ignition and spread of wildfires. The relatively high yield of annual biomass makes this site susceptible to high intensity wildfire. Native annual plants usually break down rapidly during the summer and do not create a long-lived fuelbed. Fine fuels from non-native annual grasses currently represent the most important fuelbed component. 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. Fire top-kills bush muhly. A nonrhizomatous species, bush muhly regenerates following fire from soil-stored seed. Burning causes at least short-term decline of bush muhly. Recovery time is thought to vary considerably and is probably dependent on postfire weather and competition. When ungrazed, bush muhly's dense growth may contribute to fire spread. It may be most susceptible to fire damage when growing beneath shrubs because of increased fuels and higher temperatures as shrubs burn. 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.

Creosotebush is poorly adapted to fire because of its limited sprouting ability. Creosotebush survives some fires that burn patchily or are of low severity. Winterfat is either killed or top-killed by fire, depending on fire severity. Severe fire can kill the perennating buds located several inches above the ground surface and thus kills the plant. In addition, severe fire usually destroys seed on the plant. Low-severity fire scorches or only partially consumes the aboveground portions of winterfat and thus does not cause high mortality. Spiny hopsage is considered to be somewhat fire tolerant and often survives fires that kill sagebrush. Mature spiny hopsage generally sprout after being burned. Spiny hopsage is reported to be least susceptible to fire during summer dormancy. There is little mention of fire in relation to white bursage in the literature. Fire generally kills white bursage. Nevada ephedra generally sprouts after fire damages aboveground vegetation. Underground regenerative structures commonly survive when aboveground vegetation is consumed by fire. However, severe fires may kill shallowly buried regenerative structures. Range ratany is top-killed by fire. Range ratany resprouts from the root crown after fire.

Following low intensity wildfire the perennial grasses on this ecological site may increase in abundance, while shrubs will be temporally absent from the plant community. In the occurrence of repeated large scale fires, perennial grasses and shrubs will decrease in abundance and non-native annuals will increase. Even under a shorter fire return interval the perennial bunchgrass of this community are able to persist in small quantities, preventing conversion to annual grassland. The ability of these species to reproduce by tiller and seeds, allows them to persist in the presence of increased fire or prolonged drought .This ecological site is also susceptible to anthropogenic disturbances resulting in soil compaction. This negatively affects reproduction and vigor of native plant species, reduces infiltration and soil stability.

State and transition model



State 1

Reference State

This state represents the natural range of variability under pristine conditions. Community phase changes are driven by natural disturbances such as periodic drought, wildfire and insect attack. This site experiences light to moderate grazing by wildlife. Timing of disturbances combined with weather events determines plant community dynamics.

Community 1.1
Reference Plant Community

The reference plant community is dominated by creosotebush and big galleta. Bush muhly, Indian ricegrass, spiny hopsage, Nevada ephedra, winterfat, and rayless goldenhead are other important species associated with this site. Potential vegetative composition is about 60% grasses, 10% annual and perennial forbs, and 30% shrubs and trees. 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	270	420	600
Shrub/Vine	135	210	300
Forb	45	70	100
Total	**450**	**700**	**1000**

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. The presence of non-natives has the potential to alter disturbance regimes significantly from their natural or historic range of disturbances.

Community 2.1
Plant Community Phase 2.1

This plant community is compositionally similar to the reference community with a trace of non-native annuals in the understory. Ecological processes have not changed at this time.

Community 2.2
Plant Community Phase 2.2

This plant community is characterized by an increase of non-native annual biomass. Non-native species take advantage of increased light and nutrient resources post fire. Perennial bunchgrasses sprout from the root crown post fire. Recruitment of early successional species increases dramatically from seed provided by an offsite source.

Community 2.3
Plant Community Phase 2.3

This plant community is dominated by non-native annuals. Minor amount of perennial bunchgrasses and shrubs remain in the plant community. Loss of perennial vegetation leads to altered ecological processes including increased erosion and changes in the nutrient cycling dynamics.

Community 2.4

Plant Community Phase 2.4

This plant community is characterized by heavy anthropogenic disturbance. Native grasses and shrubs have reduced vigor and are experiencing little to no recruitment. Non-native species persist even under an increased disturbance regime. Increase in amount of bare ground, site is susceptible to erosion.

Pathway 2.1a
Community 2.1 to 2.2

Fire reduces woody vegetation and favors an increase of herbaceous biomass, native and non-native.

Pathway 2.2a
Community 2.2 to 2.1

With time and exclusion of fire, native woody species mature. Non-native annuals persist through recovery.

Pathway 2.2b
Community 2.2 to 2.3

Frequent repeated fire removes native perennials from the site and favors non-native annuals.

Pathway 2.3a
Community 2.3 to 2.2

Exclusion of fire and time allows resilient native species to regenerate.

Pathway 2.3b
Community 2.3 to 2.4

Increased anthropogenic impacts will decrease native vegetation and increase bare ground.

Pathway 2.4a
Community 2.4 to 2.2

Removal of disturbance increases vigor and reproduction of native species.

Transition 1
State 1 to 2

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	**Primary Perennial Grasses**			189–385	
	big galleta	PLRI3	*Pleuraphis rigida*	140–245	–
	bush muhly	MUPO2	*Muhlenbergia porteri*	35–105	–
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	14–35	–
2	**Secondary Perennial Grasses**			14–70	
	desert needlegrass	ACSP12	*Achnatherum speciosum*	4–21	–
	squirreltail	ELEL5	*Elymus elymoides*	4–21	–
Forb					
3	**Perennial Forbs**			14–56	
	desert marigold	BAMU	*Baileya multiradiata*	4–21	–
	globemallow	SPHAE	*Sphaeralcea*	4–21	–
4	**Annual Forbs**			1–56	
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	14–35	–
	desert needlegrass	ACSP12	*Achnatherum speciosum*	4–21	–
	squirreltail	ELEL5	*Elymus elymoides*	4–21	–
Shrub/Vine					
5	**Primary Shrubs**			92–308	
	creosote bush	LATR2	*Larrea tridentata*	35–70	–
	burrobush	AMDU2	*Ambrosia dumosa*	1–56	–
	spiny hopsage	GRSP	*Grayia spinosa*	14–56	–
	winterfat	KRLA2	*Krascheninnikovia lanata*	14–56	–
	Nevada jointfir	EPNE	*Ephedra nevadensis*	14–35	–
	desert marigold	BAMU	*Baileya multiradiata*	4–21	–
	globemallow	SPHAE	*Sphaeralcea*	4–21	–
6	**Secondary Shrubs**			35–70	
	rayless goldenhead	ACSP	*Acamptopappus sphaerocephalus*	7–21	–
	blackbrush	CORA	*Coleogyne ramosissima*	7–21	–
	Eastern Mojave buckwheat	ERFAP	*Eriogonum fasciculatum var. polifolium*	7–21	–
	water jacket	LYAN	*Lycium andersonii*	7–21	–
	Joshua tree	YUBR	*Yucca brevifolia*	7–21	–
	Mojave yucca	YUSC2	*Yucca schidigera*	7–21	–

Animal community

Livestock Interpretations:
This site is suited to livestock grazing. Grazing management should be keyed to perennial grass production. When actively growing, galleta provides good to excellent forage for cattle and horses and fair forage for domestic sheep. Although not preferred, all classes of livestock may use galleta when it is dry. Domestic sheep show greater use in winter than summer months and typically feed upon central portions of galleta tufts, leaving coarser growth around the edges. Galleta may prove somewhat coarse to domestic sheep. 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).

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. Many animals bed in or under creosotebush. Domestic sheep dig shallow beds under creosotebush because it provides the only shade in the desert scrub community. Creosotebush is unpalatable to livestock. Consumption of creosotebush may be fatal to sheep. Winterfat is an important forage plant for livestock, especially during winter when forage is scarce. Abusive grazing practices have reduced or eliminated winterfat on some areas even though it is fairly resistant to browsing. Effects depend on severity and season of grazing. Spiny hopsage provides a palatable and nutritious food source for livestock, particularly during late winter through spring. Domestic sheep browse the succulent new growth of spiny hopsage in late winter and early spring. White bursage is an important browse species. Browsing pressure on white bursage is particularly heavy during years of low precipitation, when production of winter annuals is low. 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. Nevada ephedra is important winter range browse for domestic cattle, sheep and goats. 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:
Galleta provides moderately palatable forage when actively growing and relatively unpalatable forage during dormant periods. Galleta provides poor cover for most wildlife species. The palatability of bush muhly for wildlife species is rated fair to poor. Indian ricegrass is eaten by pronghorn in moderate amounts whenever available. 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. 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. Many small mammals browse creosotebush or consume its seeds. Desert reptiles and amphibians use creosotebush as a food source and perch site and hibernate or estivate in burrows under creosotebush, avoiding predators and excessive daytime temperatures. Winterfat is an important forage plant for wildlife, especially during winter when forage is scarce. Winterfat seeds are eaten by rodents and are a staple food for black-tailed jackrabbits. Mule deer and pronghorn antelope browse winterfat. Winterfat is used for cover by rodents. It is potential nesting cover for upland game birds, especially when grasses grow up through its crown. Spiny hopsage provides a palatable and nutritious food source for big game animals. Spiny hopsage is used as forage to at least some extent by domestic goats, deer, pronghorn, and rabbits. White bursage is an important browse species for wildlife. Mule deer, bighorn sheep, and pronghorn browse Nevada ephedra, especially in spring and late summer when new growth is available. 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.

Hydrological functions

Runoff is low and permeability is moderately slow to moderately 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 products

Indian ricegrass was traditionally eaten by some Native Americans. The Paiutes used the seed as a reserve food source. Creosotebush has been highly valued for its medicinal properties by desert peoples. 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 peoples traditionally ground parched seeds of spiny hopsage to make pinole flour. White bursage is a host for sandfood, a parasitic plant with a sweet, succulent, subterranean flowerstalk. Sandfood was a valuable food supply for Native Americans. Native Americans used Nevada ephedra as a tea to treat stomach and kidney ailments.

Other information

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. Winterfat adapts well to most site conditions, and its extensive root system stabilizes soil. However, winterfat is intolerant of flooding, excess water, and acidic soils. Spiny hopsage has moderate potential for erosion control and low to high potential for long-term revegetation projects. It can improve forage, control wind erosion, and increase soil stability on gentle to moderate slopes. Spiny hopsage is suitable for highway plantings on dry sites in Nevada. White bursage may be used to revegetate disturbed sites in southwestern deserts. Nevada ephedra is useful for erosion control, and seedlings have been successfully planted onto reclaimed strip mines. Atrazine may be effective in controlling Nevada ephedra, though some plants can survive through crown sprouting. Irrigation may increase control by atrazine.

Type locality

Location 1: Clark County, NV	
Township/Range/Section	T28S R63E S11
General legal description	About 4 miles north of Searchlight, along US Highway 95, Clark County, Nevada.
Location 2: Lincoln County, NV	
Township/Range/Section	T10S R68E S10
General legal description	Tule Desert, Lincoln County, Nevada.

Other references

Fire Effects Information System (Online; http://www.fs.fed.us/database/feis/plants/).

Peterson, G. C., R. Allen, and C.S. Holling. 1998. Ecological Resilience, Biodiversity, and Scale. Ecosystems 1:6-18.

USDA-NRCS Plants Database (Online; http://www.plants.usda.gov).

Contributors

GKB

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	04/19/2010
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 soil surface.

2. **Presence of water flow patterns:** Water flow patterns none to rare in areas recently subject to intense summer rainfall and on steeper slopes.

3. **Number and height of erosional pedestals or terracettes:** Pedestals are none to 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 10-20%; surface rock fragments to 80%; shrub canopy to 10%; basal area for perennial herbaceous plants (5%).

5. **Number of gullies and erosion associated with gullies:** Gullies are 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 moderate thin to weak thick platy or singled grained. Soil surface colors are light and soils are typified by an ochric epipedon. Organic matter of the surface 2 to 3 inches is less than 1 percent.

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

11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):** None. Platy or massive sub-surface horizons, subsoil argillic horizons or duripans 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: Deep-rooted, warm-season, bunchgrasses (big galleta) >> Mojave Desert shrubs

    Sub-dominant: deep-rooted, cool-season, bunchgrasses > perennial forbs > annual 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 25% of total woody canopy; mature bunchgrasses commonly (±25%) have dead centers.

14. **Average percent litter cover (%) and depth (in):** Between plant interspaces 5-10% 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 ±700lbs/ac.

16. **Potential invasive (including noxious) species (native and non-native). List species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicators, we are describing what is NOT expected in the reference state for the ecological site:** Invaders on this site include red brome, filaree, and Mediterranean grass.

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