Ecological site R030XC008NV
SHALLOW LIMESTONE SLOPE 7-9 P.Z.

Last updated: 2/25/2025
Accessed: 05/11/2025

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 mountain summits and sideslopes on all exposures. Slopes ranges from 15 to over 75 percent, but slope gradients of 15 to 50 percent are typical. Elevations are 5000 to 7500 feet. The soils associated with this site are shallow to limestone bedrock. These soils have formed in residuum and colluvium from limestone.

Similar sites

R029XY013NV	**SHALLOW GRAVELLY LOAM 5-8 P.Z.** ACHY dominant grass
R029XY077NV	**SHALLOW GRAVELLY LOAM 8-10 P.Z.** ACSP12 dominant grass; ACAR14 absent; soils not derived from limestone
R030XB029NV	**SHALLOW GRAVELLY LOAM 5-7 P.Z.** PLRI3 dominant grass
R030XB136NV	**SHALLOW LIMESTONE 7-9 P.Z.** MOUT major shrub
R030XB076NV	**SHALLOW GRAVELLY SLOPE 6-8 P.Z.** LATR2 and PLRI3 present
R030XB030NV	**SHALLOW LIMESTONE SLOPE 5-7 P.Z.** LATR2 and PLRI3 present; less productive site; less shrub diversity
R030XA094NV	**SHALLOW GRAVELLY LOAM 5-7 P.Z.** LATR2 and AMDU2 present
R029XY019NV	**SHALLOW GRAVELLY SLOPE 8-10 P.Z.** ACHY-ACSP12 codominant grasses; ACAR14 absent

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Coleogyne ramosissima*
Herbaceous	(1) *Achnatherum aridum* (2) *Achnatherum speciosum*

Physiographic features

This site occurs on mountain summits and sideslopes on all exposures. Slopes ranges from 15 to over 75 percent, but slope gradients of 15 to 50 percent are typical. Elevations are 5000 to 7500 feet.

Table 2. Representative physiographic features

Landforms	(1) Mountain (2) Mountain slope
Elevation	5,000–7,500 ft
Slope	15–75%
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 7 to 11 inches. Mean annual air temperature is 51 to 56 degrees F. The average growing season is about 130 to 180 days.

Table 3. Representative climatic features

Frost-free period (average)	180 days
Freeze-free period (average)	
Precipitation total (average)	11 in

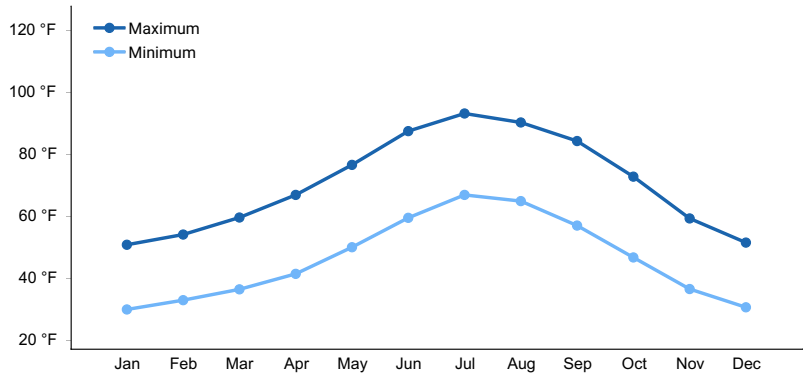


Figure 1. Monthly average minimum and maximum temperature

Influencing water features

There are no influencing water features associated with this site.

Soil features

The soils associated with this site are shallow to limestone bedrock. These soils have formed in residuum and colluvium from limestone. Soils are well drained with very high runoff. Potential for sheet and rill erosion is slight to moderate. Permeability is moderate. Available water capacity is low to very low. The soils are usually dry. They are moist in some parts for short periods during winter and early spring and for 10 to 20 days cumulative between July and October following convection storms. The soils have a typic-aridic moisture regime. The soil series associated with this site is Potosi.

Table 4. Representative soil features

Parent material	(1) Residuum–limestone
Surface texture	(1) Very gravelly loam (2) Extremely gravelly loam
Family particle size	(1) Loamy
Drainage class	Well drained

Permeability class	Moderate
Soil depth	8–14 in
Surface fragment cover <=3"	65–75%
Surface fragment cover >3"	3–8%
Available water capacity (0-40in)	0.5–0.6 in
Calcium carbonate equivalent (0-40in)	15–60%
Electrical conductivity (0-40in)	0–2 mmhos/cm
Sodium adsorption ratio (0-40in)	0–5
Soil reaction (1:1 water) (0-40in)	7.9–8.4
Subsurface fragment volume <=3" (Depth not specified)	41–68%
Subsurface fragment volume >3" (Depth not specified)	3–8%

Ecological dynamics

The potential native plant community is dominated by blackbrush, an intricately branched deciduous shrub, and cool season perennial bunchgrasses. Blackbrush communities are most prevalent in the transitional zone between the Mojave Desert and Great Basin and are commonly associated with creosotebush.

Blackbrush is a long-lived and generally considered a climax species. It is a non-sprouter; regeneration depends on wind pollinated seed and heavy winter precipitation, and is therefore slow to re-colonize burned areas (Anderson 2001). Blackbrush recruitment is episodic, like many shrubs in arid systems, when conditions are favorable large seed crops are produced and the rest of the time is characterized by minimal seed output (Pendleton and Meyer 2004). Blackbrush seeds are frequently cached away by rodents, until conditions are conducive for germination. Typically, germination occurs during the winter and early spring, given the proper moisture conditions and cool soil temperatures (Pendleton 2008). Seeds require cold stratification before germination and the survival of seedlings following germination is dependent on the availability of spring time moisture (Pendleton 2008).

On undisturbed sites, blackbrush dominates the landscape and species diversity is generally low. Undisturbed blackbrush communities are fairly resistant to invasion by non-natives (Brooks and Matchett 2003). Mature blackbrush plants are well adapted to persist under less than optimal conditions, and individuals' may live as long as 400 years (Pendleton and Meyer 2004). Communities are characterized by a flammable shrub architecture allowing fire to easily spread, thus these communities experience stand replacing fire regimes. The short-lived seed of blackbrush is readily destroyed by fire and it may take upwards of 60 years for blackbrush to reestablish. There is frequently 100 percent mortality of blackbrush following fire (Brooks and Matchett 2003).

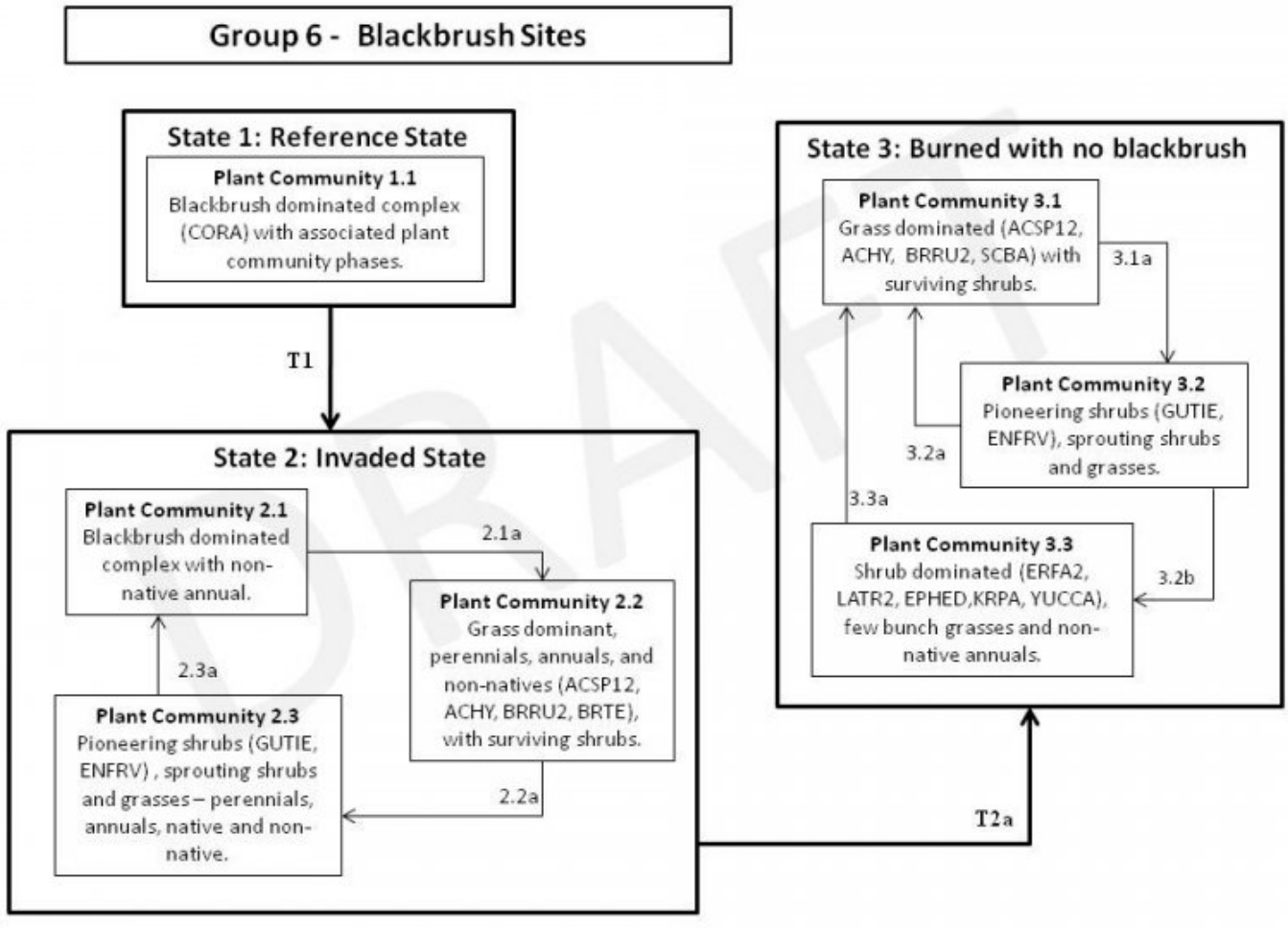
Under pristine condidtions low amounts of fine fuels in interspaces probably limited fire spread in blackbrush communities to only extreme fire conditions, during which high winds, low relative humidity, and low fuel moisture led to high intensity stand-replacing fires. Historical fire return intervals appear to have been on the order of centuries, allowing late seral blackbrush stands to reestablish. Blackbrush stands are substantially decreased or eliminated by fire; fire usually kills blackbrush seeds and mature shrubs. Blackbrush is susceptible to fire and slow to reestablish; it is generally removed from the site for 25 to 30 years. Fires in spiny hopsage sites generally occur in late summer when plants are dormant, and sprouting generally does not occur until the following spring. 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. Fourwing saltbush is most common under regimes of infrequent fire and moderate browsing. Fire top-kills or kills fourwing saltbush, depending upon ecotype. Fourwing saltbush may sprout after top-kill. Fire effects on Stansbury cliffrose are variable. Fire may kill or severely damage plants. Late-season fire also increases

the risk of mortality. Stansbury cliffrose is a weak sprouter that is generally killed by severe fire. Needlegrasses are damaged by burning due to the dense plant material that can burn slowly and long, charring to the growing points. Late summer and early fall fires are the least harmful. 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. Muttongrass is unharmed to slightly harmed by light-severity fall fire. Muttongrass appears to be harmed by and slow to recover from severe fire.

Plant succession varies wildly following fire and blackbrush communities can be replaced by undesirable species, like redstem filaree, snakeweed (Gutierrezia spp), and Bromus spp. (Anderson 2001). The response of woody vegetation post-fire largely depends on site history, species present prior to the fire, as well as, fire severity and frequency. Common plant species include those that are known to sprout, be fire resistant, or are prolific seed producers. Mojave buckwheat, creosotebush, Ephedra spp., Encelia spp., and white bursage are all found on burned blackbrush sites. However, it is uncommon to see blackbrush recruitment under the current climatic conditions, especially at the lower extent of its elevational range. The traits that allow established blackbrush communities to persist for centuries, even after environmental conditions have changed are now precluding seedling establishment under the current climatic regime (Pendleton and Meyer 2004).

Under current environmental conditions in the Mojave Desert it is common to see disturbed blackbrush sites dominated by the semi-erect, evergreen, Mojave buckwheat. Eriogonum species are frequently pioneering species following natural disturbance (Meyer 2008). Following severe fires resprout success of Mojave buckwheat is limited. Most regeneration is from seeds (Montalvo 2010). The seedbank of Mojave buckwheat will not persist under a frequent fire regime. Under an unnaturally high fire frequency herbaceous communities are favored over woody dominated plant communities, which cause habitat degradation.

State and transition model



State 1
Reference State

This state represents the natural range of variability under pristine conditions. The reference state is dominated by long-lived evergreen shrub communities with an understory of cool and warm season perennial bunchgrasses. Plant community phase changes are primarily driven by fire, long-term drought and insect attack. Historically, fire is rare in this system, but does impact long-term plant community dynamics.

Community 1.1
Reference Plant Community

The reference plant community is dominated by blackbrush. Other important species of this site are spiny hopsage, Mormon needlegrass, and desert needlegrass. Potential vegetative composition is about 25% grasses, 5% forbs and 70% shrubs. Approximate ground cover (basal and crown) is 15 to 25 percent.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Shrub/Vine	210	315	420
Grass/Grasslike	75	113	150
Forb	15	22	30
Total	**300**	**450**	**600**

State 2
Invaded

The Invaded State is characterized by a blackbrush community with non-native annuals in the understory. A biotic threshold has been crossed, with the introduction of non-natives that cannot be removed from the system. The presence of non-natives has reduced the ecological resilience of the site. Following a disturbance this state relies on the availability of an offsite seed source. These non-natives have the potential to significantly alter disturbance regimes from their historic range. 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. CORA would persist after invasion by non-native annuals, but other shrubs and desirable grasses may be unsuccessful in competing with the non-natives.

Community 2.1
Plant Community 2.1

This plant community is compositionally similar to the Reference Plant Community with the presence of non-native species in the understory. Primary ecological processes have not been compromised at this time.

Community 2.2
Plant Community 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, causing the site to cross a biotic threshold.

Community 2.3
Plant Community 2.3

This plant community is characterized by regenerating shrubs. Pioneering woody species with high seed production

are the first to return. Once large shrubs are established they provide micro-sites favoring the establishment of additional native perennials.

Pathway 2.1a
Community 2.1 to 2.2

Anthropogenic disturbance or fire 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 those 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 the site. An abiotic and/or biotic threshold has been crossed, due to insufficient climatic conditions and/or lack of an available seed source, respectively. In the absence of ideal conditions blackbrush will not return to the site. Shrubs with high growth rates and high reproductive capacities persist after invasion by non-native annuals. However, other shrubs, such as blackbrush, are unsuccessful competitors in the disturbance regime created by the non-natives and can be removed from the system.

Community 3.1
Plant Community 3.1

This plant community 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 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 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 3.1
Community 3.1 to 3.2

Time without disturbance, sprouting shrubs begin to reappear and pioneering shrubs germinate and establish from

an offsite seed source.

Pathway 3.2a
Community 3.2 to 3.1

Small scale fire or 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.

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**			63–171	
	Mormon needlegrass	ACAR14	*Achnatherum aridum*	45–90	–
	desert needlegrass	ACSP12	*Achnatherum speciosum*	9–45	–
	muttongrass	POFE	*Poa fendleriana*	9–36	–
2	**Secondary Perennial Grasses**			1–22	
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	2–9	–
	threeawn	ARIST	*Aristida*	2–9	–
Forb					
3	**Perennial Forbs**			1–22	
	globemallow	SPHAE	*Sphaeralcea*	2–9	–
	princesplume	STANL	*Stanleya*	2–9	–
4	**Annual Forbs**			1–22	
Shrub/Vine					
5	**Primary Shrubs**			220–374	
	blackbrush	CORA	*Coleogyne ramosissima*	180–225	–
	spiny hopsage	GRSP	*Grayia spinosa*	22–68	–
	fourwing saltbush	ATCA2	*Atriplex canescens*	9–45	–
	Stansbury cliffrose	PUST	*Purshia stansburiana*	9–36	–
6	**Secondary Shrubs**			23–45	
	Utah agave	AGUT	*Agave utahensis*	5–9	–
	Bigelow sage	ARBI3	*Artemisia bigelovii*	5–9	–
	Nevada jointfir	EPNE	*Ephedra nevadensis*	5–9	–
	mormon tea	EPVI	*Ephedra viridis*	5–9	–
	Heermann's buckwheat	ERHE	*Eriogonum heermannii*	5–9	–
	water jacket	LYAN	*Lycium andersonii*	5–9	–
	spiny menodora	MESP2	*Menodora spinescens*	5–9	–
	Mojave yucca	YUSC2	*Yucca schidigera*	5–9	–
Tree					
7	**Trees**			4–18	
	Utah juniper	JUOS	*Juniperus osteosperma*	2–9	–
	singleleaf pinyon	PIMO	*Pinus monophylla*	2–9	–

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 shrubs production. Blackbrush areas are economically important for winter grazing by domestic livestock, especially sheep. Blackbrush is considered poor forage during the spring, summer, and fall for domestic cattle, horses, and domestic sheep. Spiny hopsage as being browsed by livestock in the fall, winter, and spring. Spiny hopsage is used as forage to at least some extent by domestic sheep and goats. The large quantities of seeds produced are valuable for fattening domestic sheep. Spiny hopsage readily establishes and increases on overgrazed and denuded ranges. Fourwing saltbush is one of the most palatable shrubs in the West. It provides nutritious forage for all classes of livestock. Fourwing saltbush is adapted to browsing, and may show compensatory growth after stem removal. Old crown wood can produce vigorous sprouts after new growth is browsed; however, plants decline when subjected to overuse. Stansbury cliffrose is an important browse species for

livestock, especially in the winter. Mormon needlegrass is preferred by horses year round, desired by cattle and sheep in the spring. Young desert needlegrass is palatable to all classes of livestock. Mature herbage is moderately grazed by horses and cattle, but rarely grazed by sheep. Muttongrass is excellent forage for domestic livestock especially in the early spring. Muttongrass begins growth in late winter and early spring, which makes it available before many other forage plants.

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:
Blackbrush areas are economically important for winter grazing primarily for several wildlife species. Mule deer and bighorn sheep generally use the blackbrush vegetation type in winter. Spiny hopsage provides a palatable and nutritious food source for big game, particularly during late winter through spring. Fourwing saltbush provides valuable habitat and year-round browse for wildlife. Stansbury cliffrose is an important browse species for mule deer, pronghorn, game birds, and songbirds. Wild ungulates use it heavily in winter. Mule deer and Pronghorn antelope prefer to graze on Mormon needlegrass during the spring, however it is undesirable during the winter. 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. Deer and elk make heavy use of muttongrass, especially in early spring when other green forage is scarce. Depending upon availability of other nutritious forage, deer may use muttongrass in all seasons. Muttongrass cures well and is an important fall and winter deer food in some areas.

Hydrological functions

Runoff is very high. Permeability is moderate.

Other information

Blackbrush contributes to desert fertility by 1) protecting the soil against wind erosion through retarding the movement of soil and increasing the accumulation of fine soil particles around its base; 2) protecting understory vegetation from the effects of high temperatures, thereby helping to retain surface nitrogen and adding organic matter to the soil; and 3) serving as a nitrogen reservoir through the storage of nitrogen in roots, leaves, and stems. Desert needlegrass seeds are easily germinated and have potential for commercial use. Desert needlegrass may be used for groundcover in areas of light disturbance, but it is susceptible to excessive trampling.

Type locality

Location 1: Clark County, NV	
Township/Range/Section	T24S R58E S20
General legal description	About 3½ miles west of Goodsprings, Spring Mountains, Clark County, Nevada.

Other references

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Rosaceae) seed germination response. J. of Arid Environments. 59: 229-243.

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

Contributors

TJ WOLFE

Approval

Sarah Quistberg, 2/25/2025

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	07/15/2010
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.

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2. **Presence of water flow patterns:** Water flow patterns are rare but can be expected in areas recently subjected to summer convection storms, usually on steeper slopes.

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3. **Number and height of erosional pedestals or terracettes:** Pedestals are rare. Occurrence is usually limited to areas of 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 15-25%; surface cover of rock fragments is 65 to 75%; shrub canopy to 20%; foliar cover of perennial herbaceous plants ± 5%.

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5. **Number of gullies and erosion associated with gullies:** None

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6. **Extent of wind scoured, blowouts and/or depositional areas:** None

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 1 to 4 on most soil textures found on this site. (To be field tested.)

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Surface structure is typically moderate fine to medium subangular blocky. Soil surface colors are light and soils are typified by an ochric epipedon. Organic matter of the surface horizon is typically less than 1 percent dropping off quickly below. Organic matter content can be more or less depending on micro-topography.

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Shrub canopy and associated bunchgrasses break raindrop impact and provide some opportunity for snow catch on this site.

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 not typical. Subsoil calcic horizons are not to be interpreted as compacted.

12. **Functional/Structural Groups (list in order of descending dominance by above-ground annual-production or live foliar cover using symbols: >>, >, = to indicate much greater than, greater than, and equal to):**

    Dominant: Mojave Desert shrubs

    Sub-dominant: deep-rooted, cool-season, bunchgrasses > warm-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; some of the mature bunchgrasses (<10%) have dead centers.

14. **Average percent litter cover (%) and depth (in):** Between plant interspaces up to 5%.

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** For normal or average growing season ± 450 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:** Red brome, red-stem filaree and Mediterranean grass are potential invaders on this site.

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