USDA Natural Resources
Conservation Service

Ecological site R030XC038NV
SHALLOW GRAVELLY SLOPE 9-11 P.Z.

Last updated: 2/25/2025
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 primarily on south-facing mountain sideslopes. Slopes range from 15 to 75 percent, but slopes of 30 to 50 percent are most typical. Elevations range from 5500 to 6400 feet. The soils associated with this site are shallow to unweathered bedrock. They are well drained and derived from limestone and dolomite.

This site is part of group concept R030XC036NV.

Associated sites

R030XC040NV	**STEEP NORTH SLOPE 9-11 P.Z.**
R030XC032NV	**UPLAND WASH**
R030XC036NV	**STEEP GRAVELLY SLOPE 9-11 P.Z.**

Similar sites

R030XC034NV	**SHALLOW GRAVELLY LOAM 9-11 P.Z.** Higher elevation, blackbrush co-dominant with ARTRV.
R030XC037NV	**SHALLOW LOAM 9-11 P.Z.** More productive, blackbrush co-dominant with ATCA2.
R030XC036NV	**STEEP GRAVELLY SLOPE 9-11 P.Z.** FAPA important shrub; less productive.

Table 1. Dominant plant species

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

Physiographic features

This site occurs primarily on south-facing mountain sideslopes. Slopes range from 15 to 75 percent, but slopes of 30 to 50 percent are most typical. Elevations range from 5500 to 6400 feet.

Table 2. Representative physiographic features

Landforms	(1) Mountain slope
Flooding frequency	None

Ponding frequency	None
Elevation	5,500–6,400 ft
Slope	15–75%
Aspect	S

Climatic features

The climate is semiarid with cold, moist winters and warm, intermittently moist summers. Precipitation is greatest in the winter, with a lesser secondary peak in the summer typical of the Mojave Desert transitional to the Great Basin. Average annual precipitation is 7 to 11 inches. Mean annual air temperature is 52 to 58 degrees F. The average growing season is about 150 to 180 days.

Table 3. Representative climatic features

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

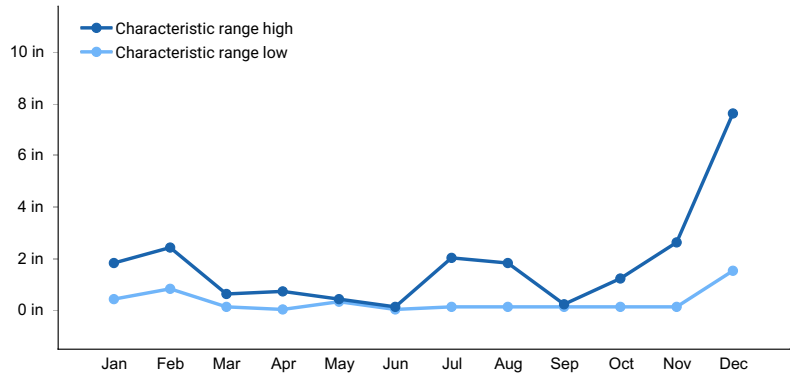


Figure 1. Monthly precipitation range

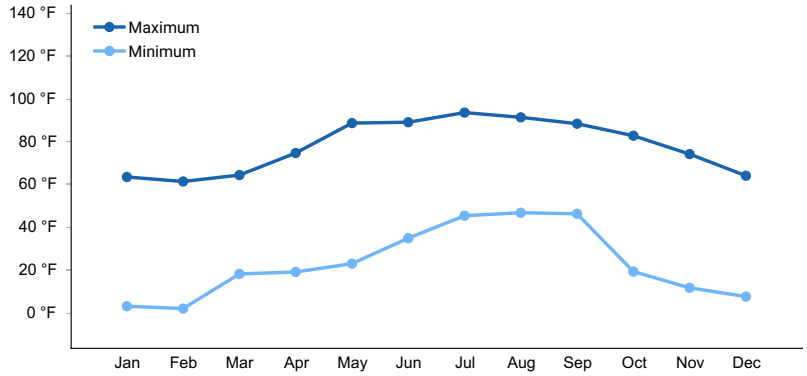


Figure 2. Monthly average minimum and maximum temperature

Influencing water features

There are no influencing water features associated with this site.

Soil features

The soils associated with this site are shallow to unweathered bedrock. They are well drained and derived from limestone and dolomite. These soils have very high runoff, moderate permeability and low available water holding capacity. The soils of this site are characterized by an aridic moisture regime that borders on ustic. The soils are usually dry, but are moist in some part during the winter months and days following summer convection storms. The soil temperature regime is mesic. Soil series associated with site include Boxspring, classified as a loamy-skeletal,

carbonatic, mesic Lithic Ustic Torriorthents.

Table 4. Representative soil features

Parent material	(1) Alluvium–limestone (2) Residuum–dolomite
Surface texture	(1) Gravelly loam (2) Very gravelly sandy loam (3) Gravelly fine sandy loam
Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Moderate
Soil depth	14–20 in
Surface fragment cover <=3"	30–50%
Surface fragment cover >3"	1–15%
Available water capacity (0-40in)	0.66–1.32 in
Calcium carbonate equivalent (0-40in)	30–60%
Electrical conductivity (0-40in)	0–2 mmhos/cm
Sodium adsorption ratio (0-40in)	0–5
Soil reaction (1:1 water) (0-40in)	8.2–8.6
Subsurface fragment volume <=3" (Depth not specified)	40–50%
Subsurface fragment volume >3" (Depth not specified)	5–20%

Ecological dynamics

Blackbrush communities are most prevalent in the transitional zone between the Mojave Desert and Great Basin. Blackbrush is a paleoendemic species as originally postulated by Stebbins and Major (1965). Blackbrush is a transitional species that occupies a boundary that has shifted in recent geologic time. Analysis of packrat middens suggests a 50–100m downward movement of the blackbrush zone along elevational gradients in the Mojave Desert(Cole and Webb, 1985; Hunter and McAuliffe, 1994).

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).

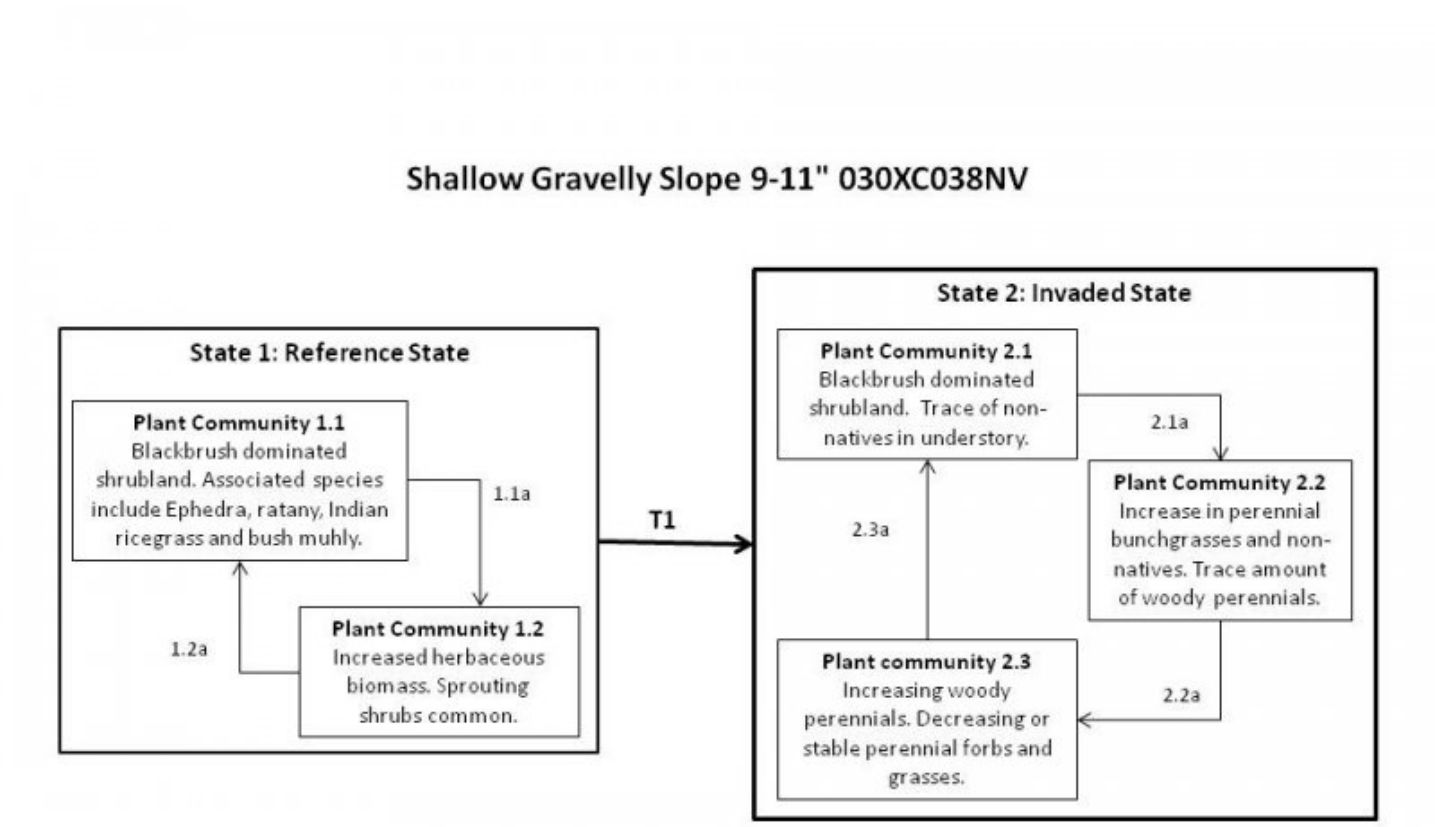
On undisturbed sites, blackbrush dominates the landscape and species diversity is generally low. Undisturbed blackbrush communities are fairly resistant to invasion by non-natives (Brooks and Matchett 2003). Mature blackbrush plants are well adapted to persist under less than optimal conditions, and 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. There is frequently 100 percent mortality of mature blackbrush following fire (Brooks and Matchett 2003).

Fire Ecology:

Blackbrush stands are considered to be one of the most flammable native plant assemblages in the Mojave Desert.

Fire will start and spread easily due to the close spacing nature and resinous foliage of blackbrush. During periods with high winds, low relative humidity and low fuel moisture blackbrush will experience stand replacing fires. The short-lived seed of blackbrush is readily destroyed by fire and it may take upwards of 60 years for blackbrush to achieve pre-fire conditions. There is frequently 100 percent mortality of mature blackbrush following fire (Brooks and Matchett 2003) and reestablishment occurs solely from seed. 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. Underground regenerative structures of Ephedra commonly survive when aboveground vegetation is consumed by fire. However, severe fires may kill shallowly buried regenerative structures. 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. Purple threeawn is readily harmed by fire because its rootcrown is close to or above the soil surface. Purple threeawn is generally reduced by fire for several growing seasons. Purple threeawn recovers from fire by tillering and also establishes from seed after fire. It is a seedbanking species with seeds stored below ground, where they are insulated from heat damage by fire.
Post-fire plant communities vary, depending on use history and species present prior to the fire. Post fire sprouting shrub species such as yucca, Stansbury cliffrose and ephedra increase along with perennial grasses. Species that readily reestablish from seed such as shadscale and snakeweed also increase. Generally, non-natives increase and native species decrease post fire (Brooks and Matchett 2003). The effects of fire on blackbrush appear to be long term.
This ecological site is currently described by a two state model, which includes the reference state and the invaded state. This site also has the potential to be invaded by pinyon and juniper trees, however, a tree state has not been indentified at this time. If in the future a tree state is indentified on the landscape, this model will be revised to reflect findings.

State and transition model



State 1
Reference State

The reference state is representative of the natural range of variability under pristine conditions. It is dominated by the long-lived evergreen shrub, blackbrush with an understory of cool and warm season perennial grasses. Plant community phase changes are primarily driven by fire, long-term drought and insect attack. Historically, blackbrush associations were long-lived stable communities that rarely experienced fire due to low fuel loading. Reproduction and recruitment are episodic, based on favorable climatic conditions.

Community 1.1
Reference Plant Community

Figure 3. representative photo

The reference plant community is dominated by blackbrush. Stansbury cliffrose, ephedra and desert needlegrass are important species associated with this site. Potential vegetative composition is about 20 percent grasses, 10 percent forbs and 70 percent shrubs and less than 1 percent trees. Approximate ground cover (basal and crown) is about 30 to 45 percent. This plant community can persist under undisturbed conditions for extended periods of time.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Shrub/Vine	209	347	485
Grass/Grasslike	60	100	140
Forb	30	50	70
Tree	1	3	5
Total	**300**	**500**	**700**

Community 1.2
Plant Community 1.2

This plant community is characterized by an early-seral, post-disturbance community phase and is initially heavily dominated by herbaceous biomass. Sprouting shrubs quickly recover and provide a favorable environment for the establishment of other shrubs seedlings. Fast-moving, low-intensity fires result in the incomplete removal of blackbrush allowing for direct reestablishment through on site seed. This plant community is ‘at-risk’ of invasion by non-native annuals, such as red brome and cheatgrass. Non-natives take advantage of the increased availability of critical resources following a disturbance. Composition of the post-fire plant community may vary depending on season of burn. Early summer fires cause higher rates of mortality in desert needlegrass.

Pathway 1.1a
Community 1.1 to 1.2

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

Pathway 1.2a
Community 1.2 to 1.1

Absence from disturbance and natural regeneration over time. Recovery of blackbrush to pre-fire conditions may take greater than 60 years.

State 2
Invaded State

The invaded state is characterized by the presence of non-natives in the understory. A biotic threshold has been crossed, with the introduction of non-natives that cannot be easily removed from the system and have the potential to significantly alter disturbance regimes from their historic range of variation. These non-native annuals, such as red brome and cheatgrass, are highly flammable and promote wildfires where fires historically have been infrequent. Following a disturbance this state relies on the availability of an offsite seed source.

Community 2.1
Invaded Plant Community 2.1

Compositionally this plant community is similar to the reference plant community with the presence of non-native species in the understory. Ecological processes are not compromised at this time, but ecological resilience is reduced by the presence of non-natives. This site will respond differently following a disturbance, when compared to the reference plant community. Management focused on protecting native perennial vegetation is important for maintaining blackbrush dominated plant communities.

Community 2.2
Invaded Plant Community 2.2

This plant community is representative of an early-seral, post-disturbance plant community and is initially heavily dominated by herbaceous vegetation. Sprouting shrubs recover quickly and provide favorable microsites for the establishment of shrub seedlings. Fast-moving, low-intensity fires result in the incomplete removal of blackbrush allowing for direct reestablishment. Following a disturbance reestablishment of blackbrush relies on the availability of a nearby seed source. Recovery of blackbrush to pre-fire conditions can take more than 60 years. It is also possible that very old stands of blackbrush established hundreds to thousands of years ago and may not be able to recover under the current climatic conditions.

Community 2.3
Invaded Plant Community 2.3

This plant community is characterized by recovering native woody perennials. Sprouting species such as Ephedra, Yucca, Fallugia and Purshia recover quickly. Gutierrezia and other species that readily establish from seed post disturbance are also common. Non-natives are present in the understory. Wildfire has long term effects on blackbrush communities. Recovery of blackbrush is highly dependent on intensity of the fire. Abundance of non-native biomass varies annually depending on weather; droughty conditions favor native perennials and decrease abundance of non-natives.

Pathway 2.1a
Community 2.1 to 2.2

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

Pathway 2.2a
Community 2.2 to 2.3

Absence from disturbance and natural regeneration over time.

Pathway 2.3a
Community 2.3 to 2.1

Absence from disturbance and natural regeneration over time. Sufficient time for blackbrush to reestablish on a site may take >60 years.

Transition T1
State 1 to 2

Introduction of non-native species due to a combination of factors including: 1) surface disturbance, 2) changes in the kinds of animals and their grazing patterns, 3) drought and/or 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**			35–75	
	desert needlegrass	ACSP12	*Achnatherum speciosum*	25–50	–
	purple threeawn	ARPU9	*Aristida purpurea*	10–25	–
2	**Secondary Perennial Grasses**			0–25	
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	1–15	–
	blue grama	BOGR2	*Bouteloua gracilis*	1–15	–
	low woollygrass	DAPU7	*Dasyochloa pulchella*	1–15	–
	squirreltail	ELEL5	*Elymus elymoides*	1–15	–
	bush muhly	MUPO2	*Muhlenbergia porteri*	1–15	–
	James' galleta	PLJA	*Pleuraphis jamesii*	1–15	–
3	**Annual Grasses**			0–10	
	sixweeks fescue	VUOC	*Vulpia octoflora*	0–10	–
Forb					
4	**Perennial Forbs**			10–50	
	rockcress	ARABI2	*Arabis*	1–10	–
	desert marigold	BAMU	*Baileya multiradiata*	1–10	–
	suncup	CAMIS	*Camissonia*	1–10	–
	castilla	CASTI	*Castilla*	1–10	–
	desert trumpet	ERIN4	*Eriogonum inflatum*	1–10	–
	Lewis flax	LILE3	*Linum lewisii*	1–10	–
	beardtongue	PENST	*Penstemon*	1–10	–
	desert globemallow	SPAM2	*Sphaeralcea ambigua*	1–10	–
5	**Annual Forbs**			1–25	
	bristly fiddleneck	AMTE3	*Amsinckia tessellata*	1–10	–
	cryptantha	CRYPT	*Cryptantha*	1–10	–
Shrub/Vine					
6	**Primary Shrubs**			260–375	
	blackbrush	CORA	*Coleogyne ramosissima*	225–275	–
	Stansbury cliffrose	PUST	*Purshia stansburiana*	25–75	–
	Nevada jointfir	EPNE	*Ephedra nevadensis*	5–15	–

	mormon tea	EPVI	*Ephedra viridis*	5–15	–
7	**Secondary Shrubs**			25–75	
	Utah agave	AGUT	*Agave utahensis*	5–15	–
	Bigelow sage	ARBI3	*Artemisia bigelovii*	5–15	–
	desert ceanothus	CEGR	*Ceanothus greggii*	5–15	–
	green rabbitbrush	ERTE18	*Ericameria teretifolia*	5–15	–
	Apache plume	FAPA	*Fallugia paradoxa*	5–15	–
	spiny greasebush	GLSP	*Glossopetalon spinescens*	5–15	–
	spiny hopsage	GRSP	*Grayia spinosa*	5–15	–
	threadleaf snakeweed	GUMI	*Gutierrezia microcephala*	5–15	–
	turpentinebroom	THMO	*Thamnosma montana*	5–15	–
	banana yucca	YUBA	*Yucca baccata*	5–15	–
	Joshua tree	YUBR	*Yucca brevifolia*	5–15	–
	pricklypear	OPUNT	*Opuntia*	1–7	–
	Wiggins' cholla	CYEC3	*Cylindropuntia echinocarpa*	1–7	–
	hedgehog cactus	ECHIN3	*Echinocereus*	1–7	–
Tree					
8	**Trees**			1–4	
	Utah juniper	JUOS	*Juniperus osteosperma*	1–2	–
	singleleaf pinyon	PIMO	*Pinus monophylla*	1–2	–

Animal community

Livestock Interpretations:
This site has limited value for livestock grazing, due to steep slopes. Grazing management should be keyed to dominant grasses and palatable shrub production. Attentive grazing management is required due to steep slopes and erosive soil surface condition. Blackbrush is not preferred as forage by domestic livestock, but does provide some forage during the spring, summer and fall. Stansbury cliffrose is an important browse species for livestock, especially in the winter. Ephedra is important winter range browse for domestic cattle, sheep and goats. Young desert needlegrass is palatable to all classes of livestock. Mature herbage is moderately grazed by horses and cattle, but rarely grazed by sheep. In most regions, forage value of purple threeawn is only poor to fair. The long awns irritate and cause abscesses in the mouths and nostrils of grazing animals. Livestock generally avoid purple threeawn for most of the year when other forage is available. In areas where purple threeawn is abundant, livestock may make moderate use of it in spring before awns develop and in fall and winter after seeds shatter.

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 is a valuable browse species for bighorn sheep. It may also comprise up to 25% of the mule deer winter diet. Blackbrush provides cover for upland game birds, nongame birds and small mammals. Stansbury cliffrose is an important browse species for mule deer, pronghorn, game birds, and songbirds. Wild ungulates use it heavily in winter. Mule deer, bighorn sheep, and pronghorn browse ephedra, especially in spring and late summer when new growth is available. 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. Wildlife species tend to avoid purple threeawn for most of the year when other forage is available.

Hydrological functions

The soils associated with this site are characterized by very high runoff and moderate permeability.

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 hiking and has potential for upland and big game hunting.

Other products

Triterpenoids extracted from Stansbury cliffrose have been shown to have inhibitory effects on HIV and Epstein-Barr virus. Native Americans used the inner bark for making clothing and ropes, and the branches for making arrows. Native Americans used ephedra as a tea to treat stomach and kidney ailments.

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. Stansbury cliffrose is recommended for wildlife, roadside, construction, and mine spoils plantings; and for restoring pinyon-juniper woodland, mountain brushland, basin big sagebrush grassland, black sagebrush, and black greasewood communities. It can be established on disturbed seedbeds by broadcast seeding, drill seeding, or transplanting. Fall or winter seeding is recommended. Ephedra is listed as a successful shrub for restoring western rangeland communities and can be used to rehabilitate disturbed lands. It also has value for reducing soil erosion on both clay and sandy soils. Ephedra establishes readily through direct seeding, transplants, and stem cuttings.

Type locality

Location 1: Clark County, NV	
Township/Range/Section	T17S R61E S15
UTM zone	N
UTM northing	4037914
UTM easting	666736
Latitude	36° 28′ 19″
Longitude	115° 8′ 20″
General legal description	Section 15, T17S. R61E. MDBM. Located near Quail Spring in the Desert National Wildlife Refuge. Approximately 2.5 miles from the mouth of Peek-a-boo Canyon, between the Sheep Range and the Las Vegas Range, west northwest of U.S. Highway 93.

Other references

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Contributors

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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.

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Contact for lead author	State Rangeland Management Specialist
Date	11/16/2011
Approved by	Sarah Quistberg
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** A few rills can be expected, particularly on steeper slopes in areas subjected to summer convection storms or rapid spring snowmelt.

2. **Presence of water flow patterns:** Water flow patterns may commonly occur in areas subjected to summer convection storms. Flow patterns are short and stable. High amount of surface rock fragments limit development of extensive flow patterns.

3. **Number and height of erosional pedestals or terracettes:** None

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Bare Ground 10-20% depending on amount of surface rock fragments

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 large 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 3 to 6 on most soil textures found on this site. (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 weak thin platy parting to moderately fine subangular blocky. Soil surface colors are browns and soils are typified by an ochric epipedon. Organic matter of the surface 2 to 3 inches is 1 to 1.5 percent.

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Shrub canopy, perennial bunchgrasses and associated litter break raindrop impact, slow runoff and increase infiltration.

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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):** Compacted layers are none. Massive or subangular block structure is not to be interpreted as compacted layers.

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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: Evergreen shrubs (blackbrush, ephedra)

    Sub-dominant: associated deciduous shrubs > deep-rooted perennial cool-season bunchgrasses>warm season perennial grasses>deep-rooted, cool season, perennial forbs>fibrous, shallow-rooted, cool season, annual and perennial forbs

    Other: evergreen trees, succulents

    Additional:

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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 30% of total woody canopy; mature bunchgrasses commonly (<20%) have dead centers.

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14. **Average percent litter cover (%) and depth (in):** Between interspaces and under canopy 25-35% and depth 0.25 inches.

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** For normal or average growing season (February thru April [May]) ± 500 lbs/ac; Favorable 700 lbs/ac and unfavorable 300 lbs/ac

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

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