USDA Natural Resources
Conservation Service

Ecological site R030XB030NV
SHALLOW LIMESTONE SLOPE 5-7 P.Z.

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General information

Provisional. A provisional ecological site description has undergone quality control and quality assurance review. It contains a working state and transition model and enough information to identify the ecological site.

MLRA notes

Major Land Resource Area (MLRA): 030X–Mojave Basin and Range

The Mojave Desert Major Land Resource Area (MLRA 30) is found in southern California, southern Nevada, the extreme southwest corner of Utah and northwestern Arizona within the Basin and Range Province of the Intermontane Plateaus. The Mojave Desert is a transitional area between hot deserts and cold deserts where close proximity of these desert types exert enough influence on each other to distinguish these desert types from the hot and cold deserts beyond the Mojave. Kottek et. al 2006 defines hot deserts as areas where mean annual air temperatures are above 64 F (18 C) and cold deserts as areas where mean annual air temperatures are below 64 F (18 C). Steep elevation gradients within the Mojave create islands of low elevation hot desert areas surrounded by islands of high elevation cold desert areas.

The Mojave Desert receives less than 10 inches of mean annual precipitation. Mojave Desert low elevation areas are often hyper-arid while high elevation cold deserts are often semi-arid with the majority of the Mojave being an arid climate. Hyper-arid areas receive less than 4 inches of mean annual precipitation and semi-arid areas receive more than 8 inches of precipitation (Salem 1989). The western Mojave receives very little precipitation during the summer months while the eastern Mojave experiences some summer monsoonal activity.

In summary, the Mojave is a land of extremes. Elevation gradients contribute to extremely hot and dry summers and cold moist winters where temperature highs and lows can fluctuate greatly between day and night, from day to day and from winter to summer. Precipitation falls more consistently at higher elevations while lower elevations can experience long intervals without any precipitation. Lower elevations also experience a low frequency of precipitation events so that the majority of annual precipitation may come in only a couple precipitation events during the whole year. Hot desert areas influence cold desert areas by increasing the extreme highs and shortening the length of below freezing events. Cold desert areas influence hot desert areas by increasing the extreme lows and increasing the length of below freezing events. Average precipitation and temperature values contribute little understanding to the extremes which govern wildland plant communities across the Mojave.

Arid Eastern Mojave Land Resource Unit (XB)

LRU notes

The Mojave Desert is currently divided into 4 Land Resource Units (LRUs). This ecological site is within the Arid Eastern Mojave LRU where precipitation is bi-modal, occurring during the winter months and summer months. The Arid Eastern Mojave LRU is designated by the 'XB' symbol within the ecological site ID. This LRU is found across the eastern half of California, much of the mid-elevations of Nevada, the southernmost portions of western Utah, and the mid-elevations of northwestern Arizona. This LRU is essentially equivalent to the Eastern Mojave Basins and Eastern Mojave Low Ranges and Arid Footslopes of EPA Level IV Ecoregions

Elevations range from 1650 to 4000 feet and precipitation is between 4 to 8 inches per year. This LRU is distinguished from the Arid Western Mojave (XA) by the summer precipitation, falling between July and September, which tends to support more warm season plant species. The 'XB' LRU is generally east of the Mojave River and the 117 W meridian (Hereford et. al 2004). Vegetation includes creosote bush, burrobush, Nevada jointfir, ratany, Mojave yucca, Joshua tree, cacti, big galleta grass and several other warm season grasses. At the upper portions of the LRU, plant production and diversity are greater and blackbrush is a common dominant shrub.

Ecological site concept

This site occurs on hills and mountain slopes below 3800 feet where cobbles, stones and boulders over 3 inches wide, in addition to rock outcrop, cover more than 15 percent of the soil surface. Soils formed in colluvium or residuum from sedimentary or non-foliated metamorphic parent material.

This site is part of group concept R030XB086CA.

Associated sites

R030XB001NV	**LIMY HILL 5-7 P.Z.**
R030XB017NV	**LIMY HILL 3-5 P.Z.**

R030XB029NV	**SHALLOW GRAVELLY LOAM 5-7 P.Z.**

Similar sites

R030XB057NV	**SHALLOW GRANITIC LOAM 5-7 P.Z.** More productive site; soils derived from granitic parent material.
R030XB014NV	**SHALLOW GRAVELLY LOAM 7-9 P.Z.** BOER major grass.
R030XB056NV	**SHALLOW GRANITIC SLOPE 5-7 P.Z.** Soils derived from granitic parent material.
R030XB029NV	**SHALLOW GRAVELLY LOAM 5-7 P.Z.** More productive site.
R030XB123NV	**LIMESTONE SLOPE 5-7 P.Z.** Conceptually the same ecological site.
R030XB015NV	**SHALLOW GRAVELLY SLOPE 7-9 P.Z.** BOER major grass.

Table 1. Dominant plant species

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

Physiographic features

This site occurs on hills and upper fan piedmonts on all exposures. Slopes range from 4 to 75 percent, but slope gradients of 15 to 50 percent are most typical. Elevations are 3000 to 5000 feet.

Table 2. Representative physiographic features

Landforms	(1) Fan piedmont (2) Hill
Flooding frequency	None
Ponding frequency	None
Elevation	914–1,524 m
Slope	4–75%
Water table depth	0 cm
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 57 to 67 degrees F. The average growing season is about 180 to 210 days.

Table 3. Representative climatic features

Frost-free period (average)	210 days
Freeze-free period (average)	
Precipitation total (average)	178 mm

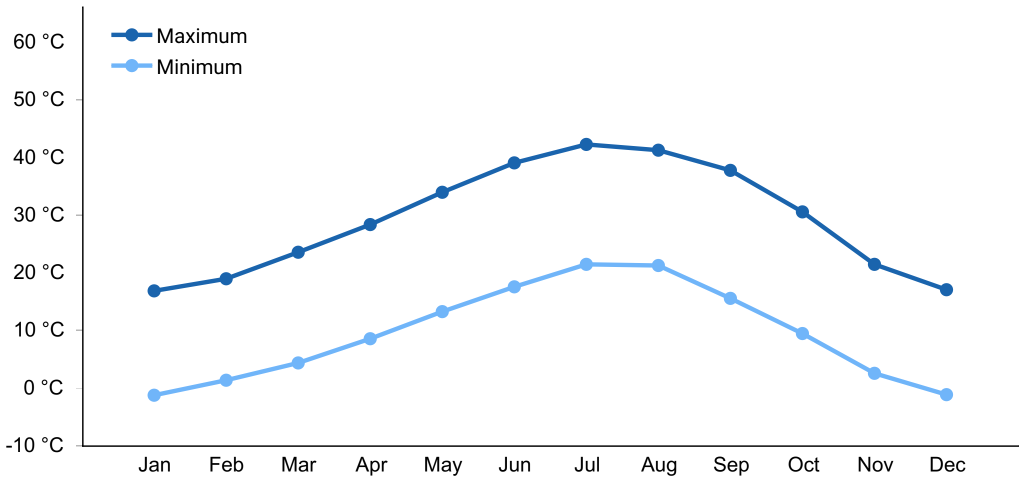


Figure 1. Monthly average minimum and maximum temperature

Influencing water features

There are no influencing water features associated with this site.

Soil features

The soils are very shallow and shallow to limestone bedrock and have formed in residuum or colluvium from dolomite and limestone parent material. The soil surface is typically covered by 35 to 60 percent rock fragments. These soils are well drained with very high runoff. Permeability is moderately rapid and available water capacity is low to very low. An ochric epipedon occurs from 0 to 3 inches and a calcic horizon occurs from 3 to 13 inches. The soils series associated with this site includes Zeheme, a loamy-skeletal, carbonatic, thermic Lithic Haplocalcid.

Table 4. Representative soil features

Parent material	(1) Residuum–dolomite (2) Colluvium–limestone
Surface texture	(1) Extremely gravelly fine sandy loam (2) Very gravelly sandy loam (3) Very gravelly fine sandy loam
Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Moderately rapid
Soil depth	33–58 cm
Surface fragment cover <=3"	11–42%
Surface fragment cover >3"	12–29%
Available water capacity (0-101.6cm)	1.52–3.05 cm
Calcium carbonate equivalent (0-101.6cm)	40–60%
Electrical conductivity (0-101.6cm)	0–2 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0–5
Soil reaction (1:1 water) (0-101.6cm)	7.9–8.4
Subsurface fragment volume <=3" (Depth not specified)	34–43%
Subsurface fragment volume >3" (Depth not specified)	8–9%

Ecological dynamics

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 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 50–100-m downward movement of the blackbrush zone along elevational gradients in the Mojave (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).

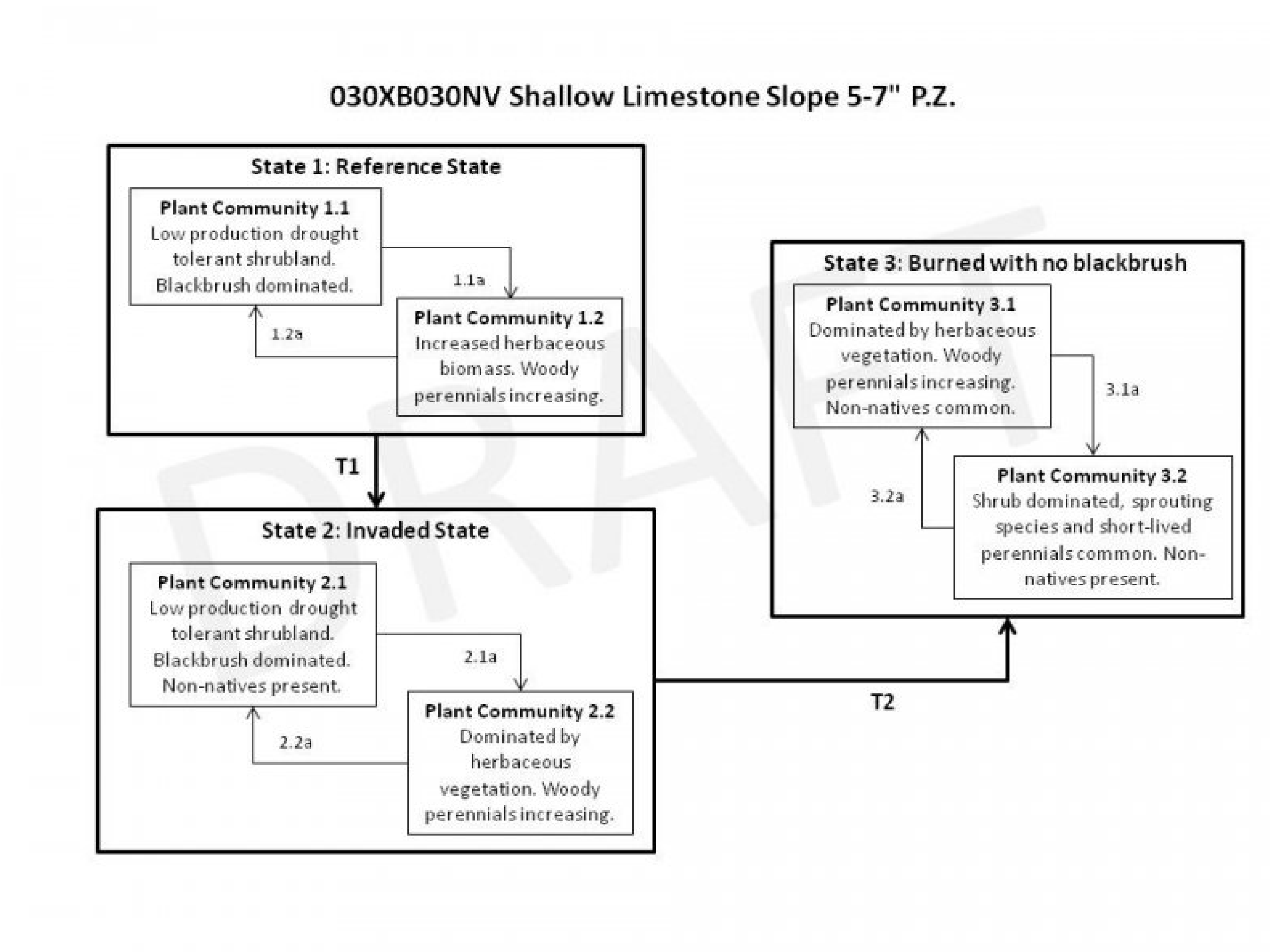
On undisturbed sites, blackbrush dominates the landscape and species diversity is generally low. Undisturbed blackbrush communities are fairly resistant to invasion by non-natives (Brooks and Matchett 2003). Mature blackbrush plants are well adapted to persist under less than optimal conditions, and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

Fire Ecology:
Fire return intervals for blackbrush communities range from 35 to 100 years. Blackbrush communities burn under conditions of high temperature, high wind velocity, and low relative humidity. The presence of red brome and cheatgrass in stands of blackbrush may result in more frequent fire frequencies than would occur without the bromes. Fires in blackbrush communities were an infrequent event in pre-settlement desert habitats, because fine fuels from winter annual plants were probably sparse, only occurring in large amounts during exceptionally wet winters. Plant succession varies widely 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, are fire resistant, and/or 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).

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. Ephedra is top killed by fire, but commonly sprouts vigorously from the root crown following fire. Damage to big galleta from fire varies. If big galleta is dry, damage may be severe. However, when plants are green, fire will tend to be less severe and damage may be minimal, with big galleta recovering quickly. Desert needlegrass has persistent dead leaf bases, which make it susceptible to burning. When a rapid, cool fire occurs it will not burn deep into the root crown. Most needlegrasses especially young plants are very susceptible to fire damage. Surviving tufts of desert needlegrass probably will sprout.

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

The reference state represents the natural range of variability under pristine conditions. This 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 ephedra, big galleta and desert needlegrass. Potential vegetative composition is about 10 percent grasses, 5 percent annual and perennial forbs and 85 percent shrubs. Approximate ground cover (basal and crown) is 10 to 15 percent.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Shrub/Vine	143	191	286
Grass/Grasslike	17	22	34
Forb	8	11	17
Total	**168**	**224**	**337**

Community 1.2
Plant Community 1.2

This plant community is characteristic of a post disturbance plant community. Herbaceous biomass initially increases. Sprouting shrubs, including ephedra and range ratany, quickly recover and provide favorable sites for the germination and establishment of other shrub seedlings. Post disturbance plant community composition varies depending on season of disturbance. This plant community is at-risk of invasion by non-natives. Non-native species take advantage of increased availability of critical resources following a disturbance.

Pathway 1.1a
Community 1.1 to 1.2

Prolonged drought, wildfire, 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 in the understory. Introduced annuals such as red brome, cheatgrass 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 have the potential to alter disturbance regimes significantly from their natural or historic range of variation. These non-native annuals are highly flammable and promote wildfires where fires historically have been infrequent.

Community 2.1
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 have not been compromised at this time, however, ecological resilience is reduced by the presence of non-natives. This plant community may respond differently following a disturbance, when compared to the reference plant community. Management focused on protecting intact blackbrush communities is important to ensure seed sources are available for regeneration in the future.

Community 2.2
Plant Community 2.2

This plant community is characteristic of a post-disturbance plant community. Herbaceous biomass initially increases, which may or may not be dominated by non-native annuals. Sprouting shrubs recover quickly and provide favorable sites for the establishment of other shrubs. Further disturbance may result in increased bare ground and increased soil erosion. This plant community is considered at-risk, due to the increased fuel loading from non-native annuals. Management should be focused on managing non-native species and reducing anthropogenic impacts to protect soil and ecological resources.

Pathway 2.2a
Community 2.2 to 2.1

Absence from disturbance and natural regeneration over time. 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 following wildfire or other disturbance. A biotic threshold has been crossed due to insufficient climatic conditions, the lack of an available seed source or both which prevent the reestablishment of blackbrush in the plant community. Plant community phases consist of fire tolerant shrubs with high growth rates and high reproductive capacities, that were present in smaller quantities in the reference plant community.

Community 3.1
Plant Community 3.1

This plant community is characteristic of a post disturbance plant community. Initially this community phase is heavily dominated by herbaceous biomass, which may or may not be non-native. Sprouting shrubs recover quickly and provide a favorable environment for the establishment of other shrubs. Blackbrush is absent from the plant community. This plant community phase is at-risk of wildfire due to increased fuel loading from herbaceous vegetation and short lived perennials.

Community 3.2
Plant Community 3.2

This plant community is dominated by a variety of shrubs that were present in smaller quantities in the reference plant community, such as Mojave buckwheat, range ratany, encelia and snakeweed. Blackbrush continues to be excluded from this site due to the lack of available seed source and the climatic conditions required for recruitment and establishment.

Pathway 3.1a
Community 3.1 to 3.2

Absence from disturbance and natural regeneration over time.

Pathway 3.2a
Community 3.2 to 3.1

Small scale fire of other localized disturbances remove patches of woody vegetation and encourage growth of perennial bunchgrasses and non-native annuals.

Transition T1
State 1 to 2

Introduction of non-native species due 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.

Transition T2
State 2 to 3

Wildfire, insect attack or other disturbance resulting in the removal of blackbrush, in combination with insufficient climatic conditions for germination and establishment of blackbrush. Blackbrush requires specific climatic conditions for germination and survival.

Additional community tables

Table 6. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Primary Perennial Grasses**			4–29	
	desert needlegrass	ACSP12	*Achnatherum speciosum*	2–18	–
	big galleta	PLRI3	*Pleuraphis rigida*	2–11	–
2	**Secondary Perennial Grasses**			1–11	
	Mormon needlegrass	ACAR14	*Achnatherum aridum*	1–4	–
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	1–4	–
	threeawn	ARIST	*Aristida*	1–4	–
	bush muhly	MUPO2	*Muhlenbergia porteri*	1–4	–
	slim tridens	TRMU	*Tridens muticus*	1–4	–
3	**Annual Grasses**			1–11	
Forb					
4	**Perennial Forbs**			4–18	
	desert globemallow	SPAM2	*Sphaeralcea ambigua*	1–4	–
	threeawn	ARIST	*Aristida*	0–2	–
	bush muhly	MUPO2	*Muhlenbergia porteri*	0–2	–
5	**Annual Forbs**			1–18	
Shrub/Vine					
6	**Primary Shrubs**			141–179	
	blackbrush	CORA	*Coleogyne ramosissima*	135–157	–
	jointfir	EPHED	*Ephedra*	2–11	–
	creosote bush	LATR2	*Larrea tridentata*	4–11	–
	desert globemallow	SPAM2	*Sphaeralcea ambigua*	0–6	–
7	**Secondary Shrubs**			11–34	
	Virgin River	ENVI	*Encelia virginensis*	2–7	–

	brittlebush				
	Eastern Mojave buckwheat	ERFAP	*Eriogonum fasciculatum var. polifolium*	2–7	–
	snakeweed	GUTIE	*Gutierrezia*	2–7	–
	winterfat	KRLA2	*Krascheninnikovia lanata*	2–7	–
	water jacket	LYAN	*Lycium andersonii*	2–7	–
	spiny menodora	MESP2	*Menodora spinescens*	2–7	–

Animal community

Livestock Interpretations:
This site has limited value for livestock grazing, due to the low forage production. Grazing management should be keyed to perennial grasses or palatable shrub production. Blackbrush is not preferred as forage by domestic livestock, but does provide some forage during the spring, summer and fall. 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. Young desert needlegrass is palatable to all classes of livestock. Mature herbage is moderately grazed by horses and cattle, but rarely grazed by sheep. 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. 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. 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. 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. In southern Nevada, big galleta is heavily utilized by bighorn sheep and in some blackbrush communities it is referred to as preferred habitat. Mule deer utilize trace amounts of big galleta.

Hydrological functions

Potential for sheet and rill erosion is slight to moderate. Runoff is very high. Permeability is moderately rapid. Rills and waterflow patterns are none to rare. Shrub canopy and associated litter provide some protection from raindrop impact.

Recreational uses

Aesthetic value is derived from the diverse floral and faunal composition and the colorful flowering of wildflowers 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

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.

Other information

Blackbrush contributes to desert fertility by protecting the soil against wind erosion through retarding the movement of soil and increasing the accumulation of fine soil particles around its base. Blackbrush also protects under story vegetation from the effects of high temperatures, thereby helping to retain surface nitrogen and adding organic matter to the soil. Blackbrush also serves as a nitrogen reservoir through the storage of nitrogen in roots, leaves, and stems. 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. Big galleta's clumped growth form stabilizes blowing sand.

Inventory data references

NV-ECS-1: 2 records

Type locality

Location 1: Lincoln County, NV	
Township/Range/Section	T10 S. R69 E. S32
General legal description	Toquop Gap area of East Mormon Mountains, Lincoln County, Nevada. This site also occurs in Clark County, Nevada.

Other references

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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. A few can be expected on steeper slopes recently subjected to summer convection storms.

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

3. **Number and height of erosional pedestals or terracettes:** Pedestals are rare. Occurrence is usually limited to areas of waterflow patterns.

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Bare Ground 15-25%

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 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 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 typically weak thin platy structure. Soil surface colors are light and soils are typified by an ochric epipedon. Organic matter of the surface horizon is typically <1 percent dropping off quickly below. Organic matter content can be more or less depending on micro-topography.

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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 provide some protection from 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):** Compacted layers are none. Subsoil calcic horizons are not to be interpreted as compacted.

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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)

    Sub-dominant: deciduous shrubs > 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):** Under shrubs and between plant interspaces up to 15%.

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** For normal or average growing season ± 200 lbs/ac. Favorable production 300 lbs/ac and unfavorable production 150 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, annual mustards, and Mediterranean grass are potential invaders on this site.

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 drought years.