USDA Natural Resources
Conservation Service

Ecological site R030XB107NV
COARSE GRAVELLY LOAM 5-7 P.Z.

Last updated: 3/10/2025
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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 hills, fan remnants, and on inset fans. Slope ranges from 2 to 50 percent, but slopes of 2 to 15 are most typical. Elevations are 2700 to 4800 feet. The soils have a calcic or petrocalcic and/or an argillic horizon which act as an aquitard.

This site is under the group provisional concept of site R030XB188CA.

Associated sites

R030XB039NV	**LIMY FAN 5-7 P.Z.**
R030XB075NV	**GRAVELLY FAN 5-7 P.Z.**
R030XB102NV	**GRAVELLY LOAM 5-7 P.Z.**

Similar sites

R030XB014NV	**SHALLOW GRAVELLY LOAM 7-9 P.Z.** Less productive site.
R030XB057NV	**SHALLOW GRANITIC LOAM 5-7 P.Z.** Soils derived from granitic parent materials.
R030XB015NV	**SHALLOW GRAVELLY SLOPE 7-9 P.Z.** Less productive site.

Table 1. Dominant plant species

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

Physiographic features

This site occurs on hills, fan remnants, and on inset fans. Slope ranges from 2 to 50 percent, but slopes of 2 to 15 are most typical. Elevations are 2700 to 4800 feet.

Table 2. Representative physiographic features

Landforms	(1) Hill (2) Fan remnant (3) Inset fan

Flooding frequency	None
Ponding frequency	None
Elevation	2,700–4,800 ft
Slope	2–15%
Water table depth	0 in
Aspect	Aspect is not a significant factor

Climatic features

The climate of the Mojave Desert has extreme fluctuations of daily temperatures, strong seasonal winds, and clear skies. The climate is arid and is characterized with cool, moist winters and hot, dry summers. Most of the rainfall falls between November and April. Summer convection storms from July to September may contribute up to 25 percent of the annual precipitation. Average annual precipitation is 7 to 9 inches. Mean annual air temperature is 57 to 69 degrees F. The average growing season is about 170 to 300 days.

Table 3. Representative climatic features

Frost-free period (average)	300 days
Freeze-free period (average)	
Precipitation total (average)	9 in

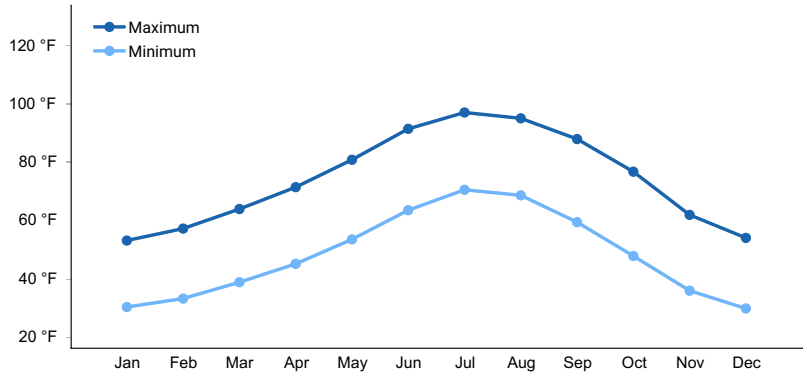


Figure 1. Monthly average minimum and maximum temperature

Influencing water features

There are no influencing water features associated with this site.

Soil features

The soils associated with this site are moderately deep and well drained. Surface soils are medium to moderately coarse textured. The soils have a calcic or petrocalcic and/or an argillic horizon. Water intake rates are moderate slow to moderately rapid. Runoff is low to very high. Surface cover of 30 to 45 percent gravels and 5 percent or less cobbles provides a stabilizing effect on surface erosion conditions. The soil associated with this site are classified as Typic Calciargids.

Table 4. Representative soil features

Parent material	(1) Alluvium–dolomite
Surface texture	(1) Loamy fine sand (2) Very gravelly fine sandy loam (3) Gravelly fine sandy loam
Family particle size	(1) Loamy

Drainage class	Well drained
Permeability class	Moderately slow to moderately rapid
Soil depth	20–40 in
Surface fragment cover <=3"	35–65%
Surface fragment cover >3"	5–30%
Available water capacity (0-40in)	1.2–2.7 in
Calcium carbonate equivalent (0-40in)	15–30%
Electrical conductivity (0-40in)	0–4 mmhos/cm
Sodium adsorption ratio (0-40in)	0–12
Soil reaction (1:1 water) (0-40in)	7.6–8.4
Subsurface fragment volume <=3" (Depth not specified)	7–59%
Subsurface fragment volume >3" (Depth not specified)	2–30%

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). The plant communities of this site are dynamic in response to changes in disturbance regimes and weather patterns. 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). Reproduction and recruitment are episodic, based on favorable environmental conditions (Pendleton and Meyer 2004). Very old stands of blackbrush may have established hundreds to thousands of years ago under very different climatic conditions and will take a considerable amount of time to recover following disturbances.

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).

Plant community phases of this ecological site have a significant amount of perennial bunchgrasses. Desert grasses are intensive exploiters; which means they extract a large portion of their moisture from shallow soil horizons (Burgess 1995). Intensive exploiters are very effective competitors for limited soil moisture and tend to be very resilient. The topographic position of this ecological site results in increased run-on moisture contributing to the increased annual production. Big galleta, a warm season grass, is the dominant grass on this ecological site. Warm season grasses have higher light and temperature requirements to begin photosynthesis, therefore grow most actively during the summer. Big galleta generally undergoes two major growth periods, coinciding with the bimodal rainfall pattern (Matthews 2000). Big galleta typically flowers from February through June in the Mojave Desert and is the most drought tolerant of the Pleuraphis species. Its shallow root system extends radially from the base of the plant, maximizing the area covered by the roots (Matthews 2000).

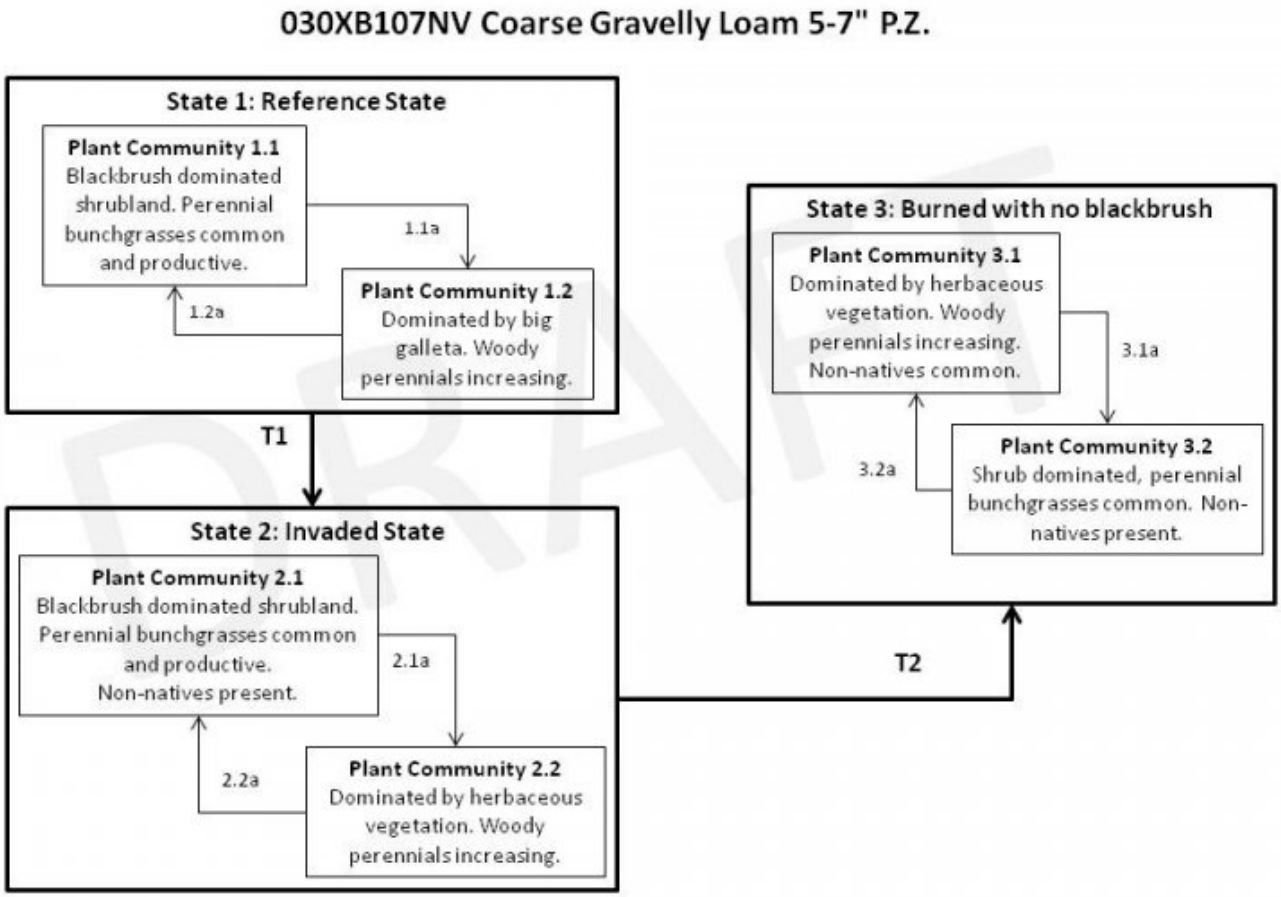
Long-term surface disturbance or reoccurring wildfire will reduce native plant cover, density and species diversity. As ecological condition deteriorates big galleta and perennial forbs decrease, short-lived perennials initially

increase. Blackbrush may also decrease. Non-native annual grasses and forbs may increase as native perennials are lost.

Fire Ecology:
Blackbrush communities are characterized by a flammable shrub architecture allowing fire to easily spread, thus these communities 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 reestablish. 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 vegetation response 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).
Big galleta commonly sprouts from the root crown following low severity fire. Damage from fire varies; depending on whether big galleta is dry when burned. Indian ricegrass can be killed by fire, depending on the seasonality of the burn. It easily reestablishes through seed dispersed from adjacent unburned areas. Desert needlegrass is a facultative seral species and is often one of the first perennials to appear following a disturbance. It is highly susceptible to top kill by fire due to the persistent leaf bases. The root crown will resprout following low to moderate intensity fires.
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. Dramatic changes have occurred in the middle elevation shrublands dominated by blackbrush, where most fires have occurred in recent times. This zone is more susceptible than other areas of the Mojave Desert to increased fire size related to the flush of non-native annual grasses following years of high rainfall (Brooks and Matchett 2006). A non-native annual grassland state would develop with frequent reoccurring fire causing the plant community to cross an irreversible threshold.

The blackbrush ecotone experiences long-term species composition changes post wildfire. Non-native annual species like red brome and cheatgrass benefit from the reduced competition for moisture and nutrients from native woody species and readily establish. The rapid life cycles and efficient use of sunlight exhibited by annuals allows them to achieve great reproductive success on previously burned sites. Additional biomass provided by non-native annuals, leads to an accumulation of flammable fuels and a shorter fire return interval. This process contributes to the loss of blackbrush shrublands. Researchers have shown that species diversity is greater in burned, than unburned blackbrush communities (Engel and Abella 2011). This process leads to long-term changes in desert plant communities, because dominant late-successional species reduced by disturbance are often nurse plants for other species (Engel and Abella 2011).

State and transition model



State 1
Reference State

The reference state is representative of the natural range variability under pristine conditions. The reference state is dominated by long-lived evergreen shrubs and deep rooted perennial bunchgrasses. Plant community phase changes are primarily driven by long-term drought, periodic wildfire, disease and insect attack. This plant community is distinctive in the amounts of annual biomass it is capable of producing. Environmental factors including soil texture, topographic position and season of precipitation contribute to increased annual production.

Community 1.1
Reference Plant Community

Figure 2. Reference Plant Community

The plant community is dominated by blackbrush and big galleta. Potential vegetative composition is about 45 percent grasses, 5 percent annual and perennial forbs and 50 percent shrubs. Approximate ground cover (basal and crown) is 20 to 35 percent.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Shrub/Vine	300	400	500
Grass/Grasslike	270	360	450
Forb	30	40	50
Total	**600**	**800**	**1000**

Community 1.2
Plant Community 1.2

This plant community is characteristic of a post-disturbance plant community. Initially, it is heavily dominated by herbaceous vegetation. Sprouting shrubs, such as yucca, spiny hopsage and ephedra, 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 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 and cheatgrass 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
Invaded Plant Communtiy 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 non-invaded plant communities. Management focused on protecting intact blackbrush communities is important to ensure seed sources are available for regeneration in the future.

Community 2.2
Invaded Plant Community 2.2

This plant community is characteristic of a post-disturbance plant community. Initially, it is heavily dominated by herbaceous biomass, which may or may not be non-native annuals. Sprouting shrubs recover quickly and provide favorable sites for the establishment of other shrubs. Further disturbance may result in reduced cover of blackbrush and other natives and increased cover of non-native annuals. 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 fuel loading and reducing anthropogenic impacts to protect soil and ecological resources.

Pathway 2.1a
Community 2.1 to 2.2

Prolonged drought, wildfire, disease or insect attack.

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. Blackbrush requires specific climatic conditions for germination and survival. 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 tolerant 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, white bursage and fourwing saltbush. 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

Wildfire or other disturbance removes woody vegetation and promotes growth of 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.

Transition T2a
State 2 to 3

Large scale, high intensity wildfire in combination with insufficient climatic conditions for germination and establishment of blackbrush.

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**			336–464	
	big galleta	PLRI3	*Pleuraphis rigida*	320–400	–
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	16–64	–
2	**Secondary Perennial Grasses**			16–64	
	desert needlegrass	ACSP12	*Achnatherum speciosum*	4–24	–
	threeawn	ARIST	*Aristida*	4–24	–
	low woollygrass	DAPU7	*Dasyochloa pulchella*	4–24	–
	bush muhly	MUPO2	*Muhlenbergia porteri*	4–24	–
3	**Annual Grasses**			1–24	
	sixweeks grama	BOBA2	*Bouteloua barbata*	4–24	–
Forb					
4	**Perennial Forbs**			16–64	
	desert globemallow	SPAM2	*Sphaeralcea ambigua*	4–24	–
5	**Annual Forbs**			1–40	
	sixweeks grama	BOBA2	*Bouteloua barbata*	4–24	–
Shrub/Vine					
6	**Primary shrubs**			281–400	
	blackbrush	CORA	*Coleogyne ramosissima*	280–360	–
	winterfat	KRLA2	*Krascheninnikovia lanata*	1–40	–
7	**Secondary shrubs**			40–160	
	burrobush	AMDU2	*Ambrosia dumosa*	8–24	–
	fourwing saltbush	ATCA2	*Atriplex canescens*	8–24	–
	Virgin River brittlebush	ENVI	*Encelia virginensis*	8–24	–
	Nevada jointfir	EPNE	*Ephedra nevadensis*	8–24	–
	spiny hopsage	GRSP	*Grayia spinosa*	8–24	–
	creosote bush	LATR2	*Larrea tridentata*	8–24	–
	water jacket	LYAN	*Lycium andersonii*	8–24	–
	spiny menodora	MESP2	*Menodora spinescens*	8–24	–
	Joshua tree	YUBR	*Yucca brevifolia*	8–24	–
	Mojave yucca	YUSC2	*Yucca schidigera*	8–24	–

Animal community

Livestock Interpretations:
This site has value for livestock grazing. 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. 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. Winterfat is an important forage plant for livestock. Winterfat palatability is rated as good for sheep, good to fair for horses, and fair for cattle. Abusive grazing practices have reduced or eliminated winterfat on some areas even though it is fairly resistant to browsing. Grazing season has more influence on winterfat than grazing intensity. Early winter grazing may actually be beneficial.

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. Winterfat is an important forage plant for wildlife. Animals that browse winterfat include mule deer, Rocky Mountain elk, desert bighorn sheep, and pronghorn. Indian ricegrass is eaten by pronghorn in moderate amounts whenever available. In Nevada it is consumed by desert bighorns. A number of heteromyid rodents inhabiting desert rangelands show preference for seed of Indian ricegrass. Indian ricegrass is an important component of jackrabbit diets in spring and summer. In Nevada, Indian ricegrass may even dominate jackrabbit diets during the spring through early summer months. Indian ricegrass seed provides food for many species of birds. Doves, for example, eat large amounts of shattered Indian ricegrass seed lying on the ground.

Hydrological functions

Runoff is low to very high. Permeability is moderately slow to moderately rapid. Rills and waterflow patterns are none to rare. Shrub canopy and associated litter provide protection from raindrop impact. Perennial bunchgrasses aid in infiltration and reduce runoff.

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

Indian ricegrass was traditionally eaten by some Native Americans. The Paiutes used seed as a reserve food source.

Other information

Big galleta's clumped growth form stabilizes blowing sand.

Inventory data references

NV-ECS-1: 4 records

Type locality

Location 1: Lincoln County, NV	
Township/Range/Section	T9S R65E S5
UTM zone	N
UTM northing	4118909
UTM easting	701079
Latitude	37° 11′ 42″
Longitude	114° 44′ 4″
General legal description	West-side of Kane Springs Wash, Lincoln County, Nevada. N Latitude 37 degrees 11 minutes 42 seconds. W Longitude 114 degrees 44 minutes 04 seconds.
Location 2: Clark County, NV	
Township/Range/Section	T22 S R58 E S28
UTM zone	N
UTM northing	3985710
UTM easting	636801

Latitude	36° 0′ 22″
Longitude	115° 28′ 55″
General legal description	Five to six miles west of Mountain Springs summit along the north side of Highway 160, Clark County, Nevada.

Other references

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Contributors

BLS/GKB

Approval

Kendra Moseley, 3/10/2025

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	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.

2. **Presence of water flow patterns:** Water flow patterns are none to rare.

3. **Number and height of erosional pedestals or terracettes:** Pedestals are rare. Occurrence is usually limited to areas of 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 15-25%; surface cover of rock fragments to 70%; shrub canopy to 10%.

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.

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 3 in interspaces and 3 to 6 under canopy 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 weak very thick to moderate, thin platy. 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 litter break raindrop impact. Perennial bunchgrasses increase infiltration and reduce runoff.

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 or argillic horizons should not be mistaken for compaction.

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 >

    Sub-dominant: deciduous shrubs > warm-season, perennial bunchgrasses >> cool-season, perennial bunchgrasses > perennial forbs > annual forbs > annual grasses

    Other: 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 25% of total woody canopy; some of the mature bunchgrasses (<10%) have dead centers.

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14. **Average percent litter cover (%) and depth (in):** Between plant interspaces up to 20-30%.

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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 ± 800 lbs/ac. Favorable years 1000+ lbs/ac and unfavorable years <600 lbs/ac.

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

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