USDA Natural Resources
Conservation Service

Ecological site R030XC037NV
SHALLOW LOAM 9-11 P.Z.

Last updated: 2/25/2025
Accessed: 05/20/2025

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 fan remnants. Slopes range from 2 to 30 percent, but slope gradients of 4 to 15 percent are most typical. Elevations range from 4000 to 6500 feet.

The soils associated with site are shallow and formed in alluvium derived from limestone. The soils are well drained and available water holding capacity is low. Rooting depth is limited by a petrocalcic horizon at 14 to 20 inches. A calcic horizon occurs at 4 to 10 inches.

This site is part of group concept R030XC034NV

Associated sites

R030XB137NV	**GRAVELLY WASH 5-7 P.Z.** Gravelly Wash 5-7
R030XB142NV	**SHALLOW LOAM 7-9 P.Z.** Shallow Loam 7-9
R030XC032NV	**UPLAND WASH** Upland Wash

Similar sites

R030XC007NV	**SHALLOW GRAVELLY LOAM 7-9 P.Z.** Less productive site; lacks ELEL5 and MUPO2.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Coleogyne ramosissima* (2) *Atriplex canescens*
Herbaceous	(1) *Achnatherum speciosum* (2) *Achnatherum hymenoides*

Physiographic features

This site occurs on fan remnants. Slopes range from 2 to 30 percent, but slope gradients of 4 to 15 percent are most typical. Elevations range from 4000 to 6500 feet.

Table 2. Representative physiographic features

Landforms	(1) Fan remnant
Flooding frequency	None
Ponding frequency	None
Elevation	1,219–1,981 m
Slope	2–30%

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 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)	279 mm

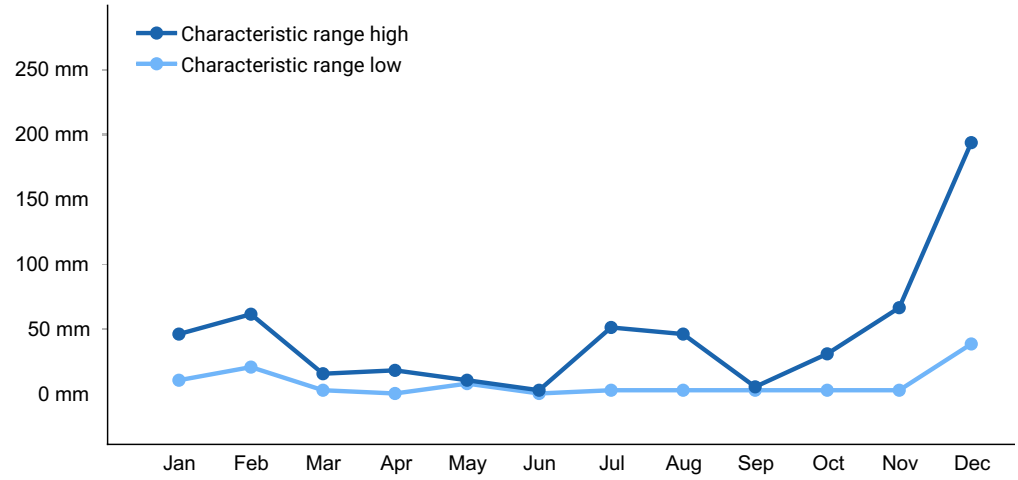


Figure 1. Monthly precipitation range

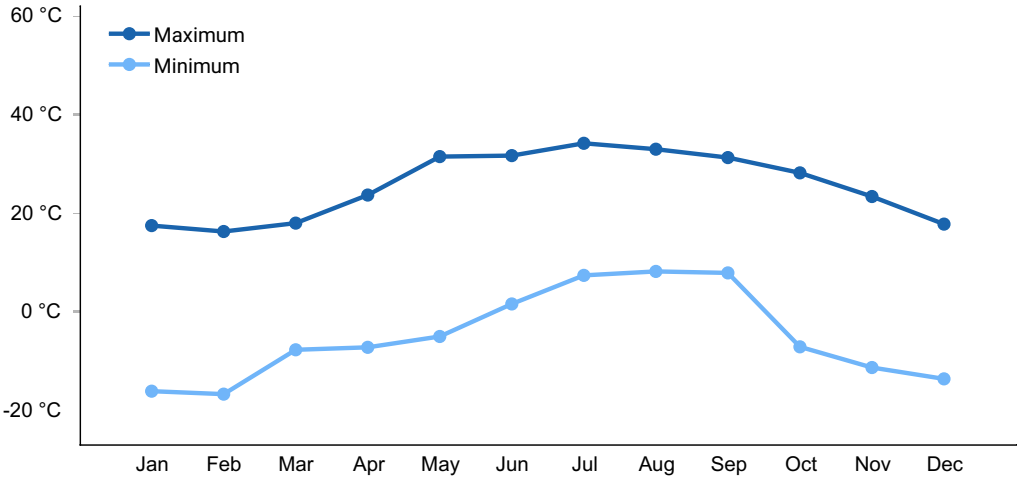


Figure 2. Monthly average minimum and maximum temperature

Influencing water features

There are no influencing water features associated with this site.

Soil features

The soils associated with site are shallow and formed in alluvium derived from limestone. The soils are well drained and available water holding capacity is low. Rooting depth is limited by a petrocalcic horizon at 14 to 20 inches. A calcic horizon occurs at 4 to 10 inches. Runoff is very high and permeability is moderate. Soils series correlated to this ecological site include Purob, a loamy-skeletal, carbonatic, mesic, shallow Calcic Petrocalcids.

Table 4. Representative soil features

Parent material	(1) Alluvium–limestone
Surface texture	(1) Gravelly fine sandy loam (2) Extremely gravelly loam

Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Moderate
Soil depth	36–51 cm
Surface fragment cover <=3"	30–60%
Surface fragment cover >3"	1–5%
Available water capacity (0-101.6cm)	2.36–4.37 cm
Calcium carbonate equivalent (0-101.6cm)	15–80%
Electrical conductivity (0-101.6cm)	0–1 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0–5
Soil reaction (1:1 water) (0-101.6cm)	8.2–8.4
Subsurface fragment volume <=3" (Depth not specified)	40–55%
Subsurface fragment volume >3" (Depth not specified)	2–10%

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).

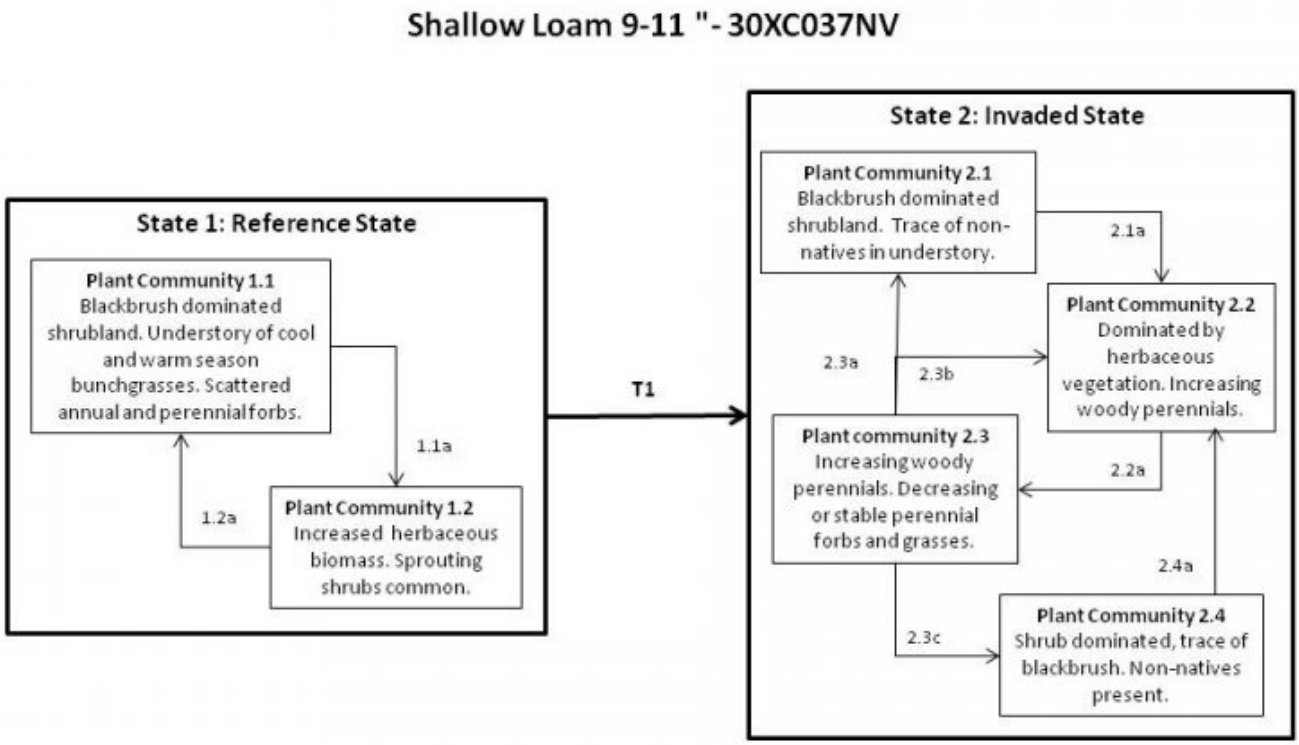
On undisturbed sites, blackbrush dominates the landscape and species diversity is generally low. Undisturbed blackbrush communities are fairly resistant to invasion by non-natives (Brooks and Matchett 2003). Mature blackbrush plants are well adapted to persist under less than optimal conditions, and individuals' may live as long as 400 years (Pendleton and Meyer 2004).

Fire Ecology:
Blackbrush stands are considered to be one of the most flammable native plant assemblages in the Mojave Desert and fire will start and spread easily due to the dense, close spacing nature and resinous foliage of blackbrush. Blackbrush is killed by fire, is slow to reestablish, and may take 60 or more years 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 top-kills or kills fourwing saltbush, depending upon ecotype. Fourwing saltbush probably establishes primarily from seed after fire, with some populations also regenerating vegetatively. Nevada ephedra generally sprouts after fire damages aboveground vegetation. Underground regenerative structures commonly survive when aboveground vegetation is consumed by fire, however, severe fires may kill shallowly buried regenerative structures. Winterfat is either killed or top-killed by fire, depending on fire severity. Severe fire can kill the perennating buds located several inches above the ground surface and thus kills the plant. In addition, severe fire usually destroys seed on the plant. Low-severity fire scorches or only partially consumes the aboveground portions of winterfat and thus does not cause high mortality. Fire generally consumes the aboveground shrub layer of banana yucca. Mortality rates of banana yucca after fire likely depend on water stress and severity of damage sustained by the plant. Live plant material is often damaged by adjacent dead plant material that burns at higher temperatures. The ability of banana yucca to sprout from rhizomes and basal stem buds below the surface likely increases its chances of survival in ecosystems prone to fire. This feature allows it to dominate some desert plant communities after fire. Joshua tree sprouts from the root crown and/or rhizomes following fire. If the fire reaches the root crown the plant will die. Many Joshua trees are killed by fire. Spanish dagger is top-killed by fire. Spanish dagger sprouts following fire. Post-fire sprouting is described as vigorous. Vegetative regeneration predominates following fire; seedlings are rarely observed. 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. Indian ricegrass can be killed by fire, depending on severity and season of burn. Indian ricegrass reestablishes on burned sites through seed dispersed from adjacent unburned areas.

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 saltbush 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.

State and transition model



State 1
Reference State

The reference state is representative of the natural range for variability under pristine conditions. Historically, blackbrush associations were long-lived stable communities that rarely experienced fire. Plant community phase changes are primarily driven by long term drought. Wildfire is infrequent and patchy due to low fuel loading. Reproduction and recruitment of blackbrush is episodic, based on favorable climatic 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.

Community 1.1
Reference Plant Community

Figure 3. representative photo

The reference plant community is dominated by blackbrush and desert needlegrass. Important associated species include Indian ricegrass, fourwing saltbush, Nevada ephdra, winterfat and Yucca. Native annuals are abundant in wet years. Potential vegetative composition is about 15 percent grasses, 10 percent annuals and perennial forbs and 75 percent shrubs. Approximate ground cover (basal and crown) is 30 to 40 percent. This plant community phase can persist under undisturbed conditions for an extended period of time.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Shrub/Vine	504	630	757
Grass/Grasslike	101	127	151
Forb	67	84	101
Total	**672**	**841**	**1009**

Community 1.2
Plant Community 1.2

This plant community is characteristic of a post-disturbance plant community and initially is heavily dominated by herbaceous vegetation. Sprouting shrubs quickly recover following disturbance and provide a favorable environment for the establishment of other shrub seedlings. This plant community is ‘at-risk’ of invasion by non-native annuals, such as red brome. Invasion by non-natives will cause this plant community to cross a biotic threshold into state 2. Composition of post-fire plant community may vary depending on season of burn. Spring or early summer fires may result in increased cover of Indian ricegrass. Early summer fires result in higher rates of mortality in desert needlegrass.

Pathway 1.1a
Community 1.1 to 1.2

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

Pathway 1.2a
Community 1.2 to 1.1

Absence from disturbance and natural regeneration over time. Regeneration of blackbrush is dependent on nearby seed source and favorable climatic conditions. Recovery of blackbrush to pre-fire conditions can take greater than 60 years.

State 2
Invaded State

The invaded state is characterized by the presence of non-native species. A biotic threshold is crossed, with the introduction of non-natives that are difficult to remove from the system and have the potential to alter disturbance regimes significantly from their natural range of variability. Introduced annuals such as red brome have invaded the reference plant community. These non-natives annuals are highly flammable and promote wildfires where fires historically have been infrequent.

Community 2.1
Invaded Plant Community 2.1

Figure 5. Invaded Plant Community with a trace of red brome

This plant community is compositionally similar to the reference plant community with a trace of non-natives in the understory. Primary ecological processes have not been compromised at this time, however ecological resilience is reduced by the presence of non-natives. This plant community will respond differently following a disturbance, when

compared to the reference plant community. Management focused on reducing anthropogenic impacts and other disturbances is important for maintaining the health of perennial native species.

Community 2.2
Invaded Plant Community 2.2

This plant community is characteristic of a post-disturbance plant community. Initially this community phase is heavily dominated by herbaceous vegetation, which may or may not be non-native. Sprouting shrubs quickly recover and provide favorable sites for the establishment of shrubs seedlings. Fast-moving, low-intensity fires result in the incomplete removal of blackbrush allowing for direct reestablishment through on site seed. Abundance of non-native biomass varies annually depending on the weather. Post-fire plant communities may vary in response to the season and intensity of burn.

Community 2.3
Invaded Plant Communtiy 2.3

This plant community is characteristic of a mid-seral plant community phase. Woody perennials are increasing, once established sprouting shrubs provide favorable micro-sites for the establishment of additional native perennials. Atriplex and other species that readily establish from seed post disturbance are common. Non-natives are present in the understory. Wildfire has long term effects on blackbrush communities. Natural regeneration post-fire may result in dominance by winterfat and fourwing saltbush, with a trace of blackbrush. 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.

Community 2.4
Invaded Plant Community 2.4

This plant community is dominated by shrubs that were present in smaller quantities in the reference plant community, such as ephedra, winterfat or fourwing saltbush. Natural succession post fire may result in dominance by a variety of shrubs depending on weather conditions and disturbance regimes. Blackbrush is present in trace amounts and non-natives are present in the understory. Blackbrush establishes solely from seed and is characterized by a pulse recruitment dependent on periods of ideal climatic conditions. This plant community is representative of conditions where blackbrush has been unable to regain dominance due to changes in climatic patterns, disturbance regimes or both.

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. Recovery of blackbrush to pre-disturbance conditions may take a significant amount of time (>60years).

Pathway 2.3b
Community 2.3 to 2.2

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

Pathway 2.3c
Community 2.3 to 2.4

Absence from disturbance and natural regeneration over time.

Pathway 2.4a
Community 2.4 to 2.2

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

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 (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Primary Perennial Grasses**			85–168	
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	43–84	–
	desert needlegrass	ACSP12	*Achnatherum speciosum*	43–84	–

2	**Secondary Perennial Grasses**			17–43	
	purple threeawn	ARPU9	*Aristida purpurea*	3–17	–
	blue grama	BOGR2	*Bouteloua gracilis*	3–17	–
	squirreltail	ELEL5	*Elymus elymoides*	3–17	–
	bush muhly	MUPO2	*Muhlenbergia porteri*	3–17	–
	mesa dropseed	SPFL2	*Sporobolus flexuosus*	3–17	–
Forb					
3	**Perennial Forbs**			17–84	
	desert marigold	BAMU	*Baileya multiradiata*	3–17	–
	desert trumpet	ERIN4	*Eriogonum inflatum*	3–17	–
	desert globemallow	SPAM2	*Sphaeralcea ambigua*	3–17	–
4	**Annual Forbs**			17–67	
Shrub/Vine					
5	**Primary Shrubs**			429–698	
	blackbrush	CORA	*Coleogyne ramosissima*	336–420	–
	fourwing saltbush	ATCA2	*Atriplex canescens*	43–126	–
	Nevada jointfir	EPNE	*Ephedra nevadensis*	17–43	–
	winterfat	KRLA2	*Krascheninnikovia lanata*	17–43	–
	banana yucca	YUBA	*Yucca baccata*	6–22	–
	Joshua tree	YUBR	*Yucca brevifolia*	6–22	–
	Mojave yucca	YUSC2	*Yucca schidigera*	6–22	–
6	**Secondary Shrubs**			43–84	
	rayless goldenhead	ACSP	*Acamptopappus sphaerocephalus*	8–26	–
	Torrey's jointfir	EPTO	*Ephedra torreyana*	8–26	–
	threadleaf snakeweed	GUMI	*Gutierrezia microcephala*	8–26	–
	desert pepperweed	LEFR2	*Lepidium fremontii*	8–26	–
	water jacket	LYAN	*Lycium andersonii*	8–26	–
	spiny menodora	MESP2	*Menodora spinescens*	8–26	–
	Fremont's dalea	PSFR	*Psorothamnus fremontii*	8–26	–
	desert bitterbrush	PUGL2	*Purshia glandulosa*	8–26	–
	longspine horsebrush	TEAX	*Tetradymia axillaris*	8–26	–

	longspine horsebrush	TEAX	*Tetradymia axillaris*	8–20	
	turpentinebroom	THMO	*Thamnosma montana*	8–26	–
	beavertail pricklypear	OPBA2	*Opuntia basilaris*	1–8	–
	grizzlybear pricklypear	OPPOE	*Opuntia polyacantha var. erinacea*	1–8	–
	Wiggins' cholla	CYEC3	*Cylindropuntia echinocarpa*	1–8	–
	Whipple cholla	CYWH	*Cylindropuntia whipplei*	1–8	–
	Engelmann's hedgehog cactus	ECEN	*Echinocereus engelmannii*	1–8	–

Animal community

Livestock Interpretations:
This site is suitable for livestock grazing. Grazing management should be keyed to dominant grasses and palatable shrub production. Blackbrush is not preferred as forage by domestic livestock, but does provide some forage during the spring, summer and fall. Fourwing saltbush is one of the most palatable shrubs in the West. Its protein, fat, and carbohydrate levels are comparable to alfalfa. It provides nutritious forage for all classes of livestock. Palatability is rated as good for domestic sheep and domestic goats; fair for cattle; fair to good for horses in winter, poor for horses in other seasons. Nevada ephedra is important winter range browse for domestic cattle, sheep and goats. Winterfat is an important forage plant for livestock, especially during winter when forage is scarce. Abusive grazing practices have reduced or eliminated winterfat on some areas even though it is fairly resistant to browsing. Effects depend on severity and season of grazing. Banana yucca provides browse to a variety of livestock. Joshua tree use by livestock is limited to the consumption of accessible blossoms and fruits and utilization of shade. Palatability of Joshua tree is poor for cattle, domestic sheep, and horses. Spanish dagger is rarely utilized by livestock, evidence of cattle browsing is a sign of poor range condition. Young desert needlegrass is palatable to all classes of livestock. Mature herbage is moderately grazed by horses and cattle, but rarely grazed by sheep. 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.

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. Fourwing saltbush provides valuable habitat and

year-round browse for wildlife. Fourwing saltbush also provides browse and shelter for small mammals. Additionally, the browse provides a source of water for black-tailed jackrabbits in arid environments. Granivorous birds consume the fruits. Wild ungulates, rodent and lagomorphs readily consume all aboveground portions of the plant. Palatability is rated good for deer, elk, pronghorn and bighorn sheep. Mule deer, bighorn sheep, and pronghorn browse Nevada ephedra, especially in spring and late summer when new growth is available. Winterfat is an important forage plant for wildlife, especially during winter when forage is scarce. Winterfat seeds are eaten by rodents and are a staple food for black-tailed jackrabbits. Mule deer and pronghorn antelope browse winterfat. Winterfat is used for cover by rodents. It is potential nesting cover for upland game birds, especially when grasses grow up through its crown. Deer often use banana yucca as a food source searching out new leaves that sprout after fire and eating from the plant at a higher frequency than when it is not burned. Banana yucca is consumed by elk in the pinyon-juniper woodlands. Bighorn sheep browse on the leaves and fruit of banana yucca, and various parts of the plant are also utilized by small rodents, birds, and insects. Joshua tree provides important habitat and food for small mammals, birds, reptiles, insects, and spiders. Use by deer, however, is limited to the consumption of accessible blossoms and fruits and utilization of shade. Palatability of Joshua tree is poor for pronghorn, elk, mule deer, and small mammals. Spanish dagger is important to a variety of desert wildlife species. Small mammals, birds, and reptiles utilize Spanish dagger for food, nest materials, nesting sites, and habitat. 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. Indian ricegrass is eaten by pronghorn in moderate amounts whenever available. A number of heteromyid rodents inhabiting desert rangelands show preference for seed of Indian ricegrass. Indian ricegrass is an important component of jackrabbit diets in spring and summer. Indian ricegrass seed provides food for many species of birds. Doves, for example, eat large amounts of shattered Indian ricegrass seed lying on the ground.

Hydrological functions

Runoff is very high. Permeability is moderate.

Recreational uses

Aesthetic value is derived from the diverse floral and faunal composition and the colorful flowering of wild flowers and shrubs during the spring and early summer. This site offers rewarding opportunities to photographers and for nature study. This site is used for camping and hiking and has potential for upland and big game hunting.

Other products

Fourwing saltbush is traditionally important to Native Americans. They ground the seeds for flour. The leaves, placed on coals, impart a salty flavor to corn and other roasted food. Top-growth produces a yellow dye. Young leaves and shoots were used to dye wool and

other materials. The roots and flowers were ground to soothe insect bites. Native Americans used Nevada ephedra as a tea to treat stomach and kidney ailments. Indian ricegrass was traditionally eaten by some Native Americans. The Paiutes used the seed as a reserve food source.

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. Fourwing saltbush is widely used in rangeland and riparian improvement and reclamation projects, including burned area recovery. It is probably the most widely used shrub for restoration of winter ranges and mined land reclamation. Nevada ephedra is useful for erosion control, and seedlings have been successfully planted onto reclaimed strip mines. Winterfat adapts well to most site conditions, and its extensive root system stabilizes soil. However, winterfat is intolerant of flooding, excess water, and acidic soils.

Type locality

Location 1: Clark County, NV	
Township/Range/Section	T16S R61E S29
UTM zone	N
UTM northing	4042848
UTM easting	664508
Latitude	36° 31′ 0″
Longitude	115° 9′ 45″
General legal description	Section 29, T16S, R61E, Sheep Peak NV 7.5 minute topographic quadrangle. Approximately 1 mile from the mouth of Peek-a-boo Canyon, near the Yucca Forest area in Desert National Wildlife Refuge. Latitude/Longitude 36.5169°N, 115.1628°W

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Contributors

E. Hourihan

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)	E. Hourihan/P.Novak-Echenique
Contact for lead author	State Rangeland Management Specialist
Date	11/15/2011
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. A few rills can be expected on steeper slopes in areas subjected to summer convection storms or rapid spring snowmelt.

2. **Presence of water flow patterns:** Water flow patterns are none to rare but can be expected in areas subjected to summer convection storms or rapid snowmelt.

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 15-25% depending on amount of 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.

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.

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Surface structure is typically thin to medium platy. Soil surface colors are pale browns and soils are typified by an ochric epipedon. Organic matter of the surface 2 to 3 inches is typically 1 to 1.5 percent dropping off quickly below.

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Perennial herbaceous plants

(especially deep-rooted bunchgrasses [i.e., desert needlegrass & Indian ricegrass] slow runoff and increase infiltration. Shrub canopy and associated litter break raindrop impact and provide opportunity for snow catch and accumulation on site.

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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 or petrocalcic horizons are 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: Reference Plant Community: Evergreen shrubs (blackbrush, ephedra)

    Sub-dominant: > deciduous shrubs (four-wing saltbush, winterfat) > deep-rooted, cool season, perennial bunchgrasses > deep-rooted perennial forbs > fibrous, shallow-rooted, cool season, annual and perennial forbs.

    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 35% of total woody canopy; some of the mature bunchgrasses (<20%) have dead centers.

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14. **Average percent litter cover (%) and depth (in):** Between plant interspaces and under canopy 20-30% and litter depth is ± ¼ inch.

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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 (through May) ± 750, Favorable years 900 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 include red brome, cheatgrass and red-stem filaree.

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

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