USDA Natural Resources Conservation Service

Ecological site R030XC042NV
GRAVELLY LOAM 9-11 P.Z.

Last updated: 2/25/2025
Accessed: 05/21/2025

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 inset fans. Slopes range from 4 to 15 percent. Elevations range from 5000 to 6500 feet. The soils associated with this site are deep to very deep, well drained soils that formed in alluvium derived from limestone.

This site is part of group concept R030XC041NV.

Associated sites

R030XC007NV	**SHALLOW GRAVELLY LOAM 7-9 P.Z.**
R030XC032NV	**UPLAND WASH**

Similar sites

R030XC037NV	**SHALLOW LOAM 9-11 P.Z.** Shallow Loam 9-11

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Coleogyne ramosissima*
Herbaceous	(1) *Muhlenbergia porteri*

Physiographic features

This site occurs on inset fans. Slopes range from 4 to 15 percent. Elevations range from

5000 to 6500 feet.

Table 2. Representative physiographic features

Landforms	(1) Inset fan
Flooding duration	Extremely brief (0.1 to 4 hours) to very brief (4 to 48 hours)
Flooding frequency	Rare to occasional
Elevation	1,524–1,981 m
Slope	4–45%
Aspect	Aspect is not a significant factor

Climatic features

The climate is arid with warm, dry summers and cool, moist winters. Precipitation is greatest in the winter with a lesser secondary peak in the summer, typical of Mojave Desert transition 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 130 to 180 days.

Table 3. Representative climatic features

Frost-free period (average)	180 days
Freeze-free period (average)	
Precipitation total (average)	279 mm

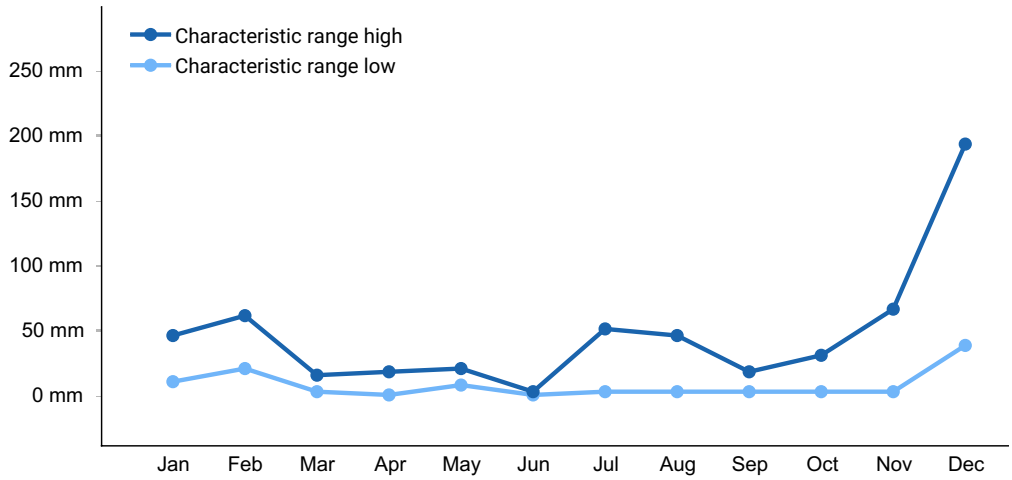


Figure 1. Monthly precipitation range

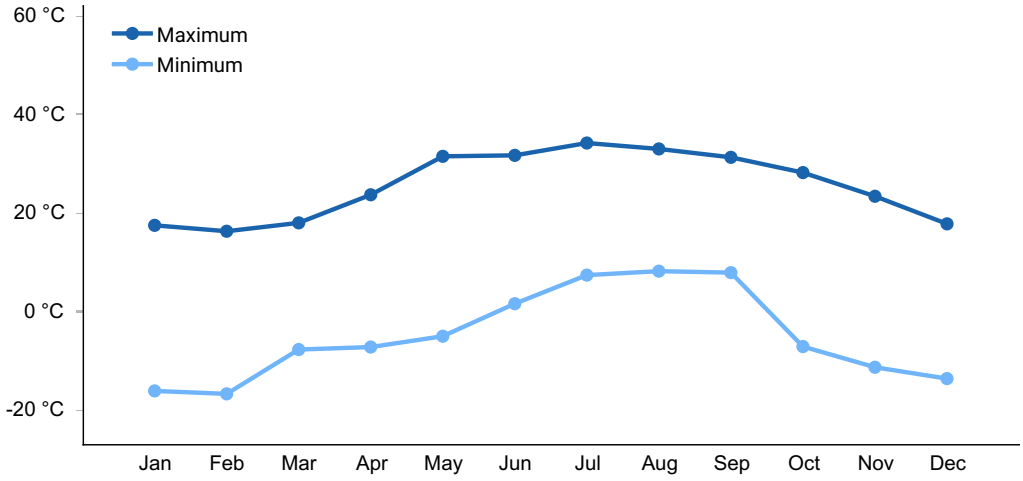


Figure 2. Monthly average minimum and maximum temperature

Influencing water features

There are no influencing water features associated with this site.

Soil features

The soils associated with this site are deep to very deep, well drained soils that formed in alluvium derived from limestone. The soil profile is characterized by 50 to 75 percent rock fragments, mainly gravel with some cobbles and stones. Available water capacity is low and runoff is low. This site receives additional run-in moisture which provides additional soil moisture for increased annual biomass. The soil moisture regime is typic-aridic. Soil series correlated to this ecological site include Quijinump, classified as a loamy-skeletal, carbonatic, mesic, Typic Torriorthents.

Table 4. Representative soil features

Parent material	(1) Alluvium–limestone
Surface texture	(1) Very gravelly fine sandy loam
Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Slow
Soil depth	183 cm
Surface fragment cover <=3"	60–70%
Surface fragment cover >3"	2–5%
Available water capacity (0-101.6cm)	4.6–12.09 cm
Calcium carbonate equivalent (0-101.6cm)	30–40%

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)	35–65%
Subsurface fragment volume >3" (Depth not specified)	5–10%

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 50–100-m 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).

This ecological site receives run-in moisture from the surrounding area positively influencing available soil moisture, thereby increasing annual biomass production.

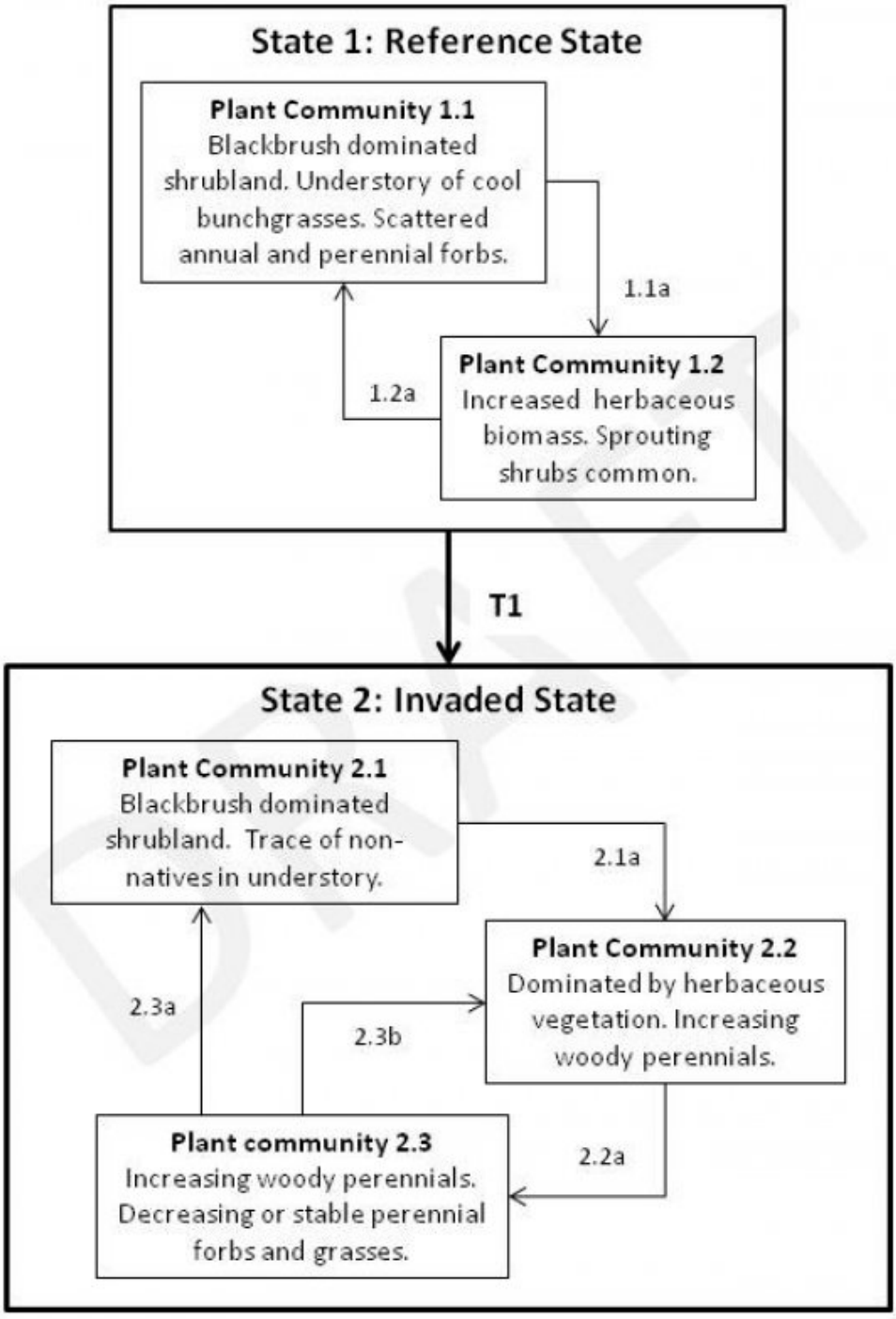
Blackbrush is extremely flammable and in years with increased precipitation and herbaceous biomass, these systems experience stand replacing fires. Post-fire plant communities vary widely, depending on use history and which species were present before the fire. Post-fire, species capable of sprouting from the root crown and those that readily establish from seed will likely become dominant.

Fire Ecology: Blackbrush communities historic fire return intervals appear to have been on the order of centuries, allowing late seral blackbrush stands to reestablish. Low amounts of fine fuels in interspaces probably limited fire spread to only extreme fire conditions, during which high winds, low relative humidity, and low fuel moisture led to high intensity stand-replacing crown fires. The fuel complex in blackbrush appears to be more conducive to burning now than in the past. Non-native annual grasses currently occur in most blackbrush communities resulting in large stand-replacing fires. Blackbrush is considered to be one of the most flammable native plant assemblages in the Mojave Desert. Fire will start and spread easily due to the dense branching, resinous foliage and close spacing of blackbrush. Blackbrush is slow to recover and may take 60 or more years to reach pre-fire conditions. Spiny menodora often survives fire because its foliage does not readily burn. 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. Fire effects on fourwing saltbush vary with intensity of the fire. It is generally killed by more intense fires. 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. Fire top-kills bush muhly and causing a temporary decline in cover. Blue grama is tolerant of fire if burned when dormant, but experiences damage if burned during the growing season, especially during drought. 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.

Post-fire plant communities vary, depending on use history and species present prior to the fire. Post fire sprouting shrub species such as yucca, spiny menodora and ephedra increase. Species that readily reestablish from seed such as 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

Gravelly Loam 9-11" 030XC042NV



State 1

Reference State

The reference state is representative of the natural range of 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

The reference plant community is dominated by blackbrush. Spiny menodora, Nevada ephedra, bush muhly and blue grama are other important species associated with this site. This plant community is stable and long-lived and is able to persist for extended periods of time under undisturbed conditions. Potential vegetative composition by weight is about 20 percent grasses, 10 percent annual and perennial forbs and 70 percent shrubs. Approximate ground cover (basal and crown) is 30 to 45 percent.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Shrub/Vine	392	510	628
Grass/Grasslike	112	146	179
Forb	56	73	90
Total	**560**	**729**	**897**

Community 1.2
Plant Community 1.2

This plant community is characteristic of an early-seral, post-disturbance plant community and is initially dominated by herbaceous vegetation. Sprouting shrubs quickly recover following disturbance and provide favorable environment for the establishment of other shrub seedlings. Fast moving, low intensity fires result in the incomplete removal of blackbrush allowing for direct reestablishment. This plant community is ‘at-risk’ of invasion by non-native annuals, like red brome and Mediterranean grass. 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. Wildfire generally results in the decline of bush muhly, recovery is dependent on weather conditions and competition. Summer fires reduce cover of blue grama.

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 >60 years.

State 2
Invaded State

The invaded state is characterized by the presence of non-native species. Ecological processes are not compromised at this time, however the presence of non-natives has reduced the ecological resilience of the site, causing it to respond differently following a disurbance. 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 range of variability. These non-natives are highly flammable and promote wildfires where fires historically have been infrequent. This invasion of non-natives is attributed to a combination of factors including: 1) surface disturbances, 2) changes in the kinds of animals and their grazing patterns, 3) drought, and 4) changes in fire history.

Community 2.1
Invaded Plant Community 2.1

Figure 4. trace of non-natives

This plant community is compositionally similar to the reference plant community with a trace of non-natives in the understory. Dominant shrubs persist through invasion, however native forbs and grasses may decrease due to increased competition. Management focused on reducing anthropogenic impacts and other disturbances is important for maintaining the health 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. Sprouting shrubs, such as Ephedra, spiny menodora and yucca, quickly recover and provide favorable sites of the establishment of the shrubs seedlings. Fast moving, low intensity fires result in the incomplete removal of blackbrush allowing for direct reestablishment. Abundance of non-native biomass varies annually depending on the weather. Post-fire plant communities may vary in response to the season of burn.

Community 2.3
Invaded Plant Community 2.3

This plant community is characteristic of a mid-seral plant community. Woody perennials are increasing and non-natives are present. Atriplex and other species that readily establish from seed post disturbance are common. Wildfire has long term effects on blackbrush communities. Abundance of non-native biomass varies annually depending on weather, droughty conditions favor native perennials and decrease abundance of non-natives. Species composition of this plant community may vary greatly depending on the species present prior to the disturbance.

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.

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 Grases**			50–109	
	bush muhly	MUPO2	*Muhlenbergia porteri*	36–73	–
	blue grama	BOGR2	*Bouteloua gracilis*	15–36	–
2	**Secondary Perennial Grasses**			36–73	
	desert needlegrass	ACSP12	*Achnatherum speciosum*	1–22	–
	purple threeawn	ARPU9	*Aristida purpurea*	1–22	–
	low woollygrass	DAPU7	*Dasyochloa pulchella*	1–22	–
	Sandberg bluegrass	POSE	*Poa secunda*	1–22	–
Forb					
3	**Perennial Forbs**			36–73	
	desert marigold	BAMU	*Baileya multiradiata*	1–15	–
	desert trumpet	ERIN4	*Eriogonum inflatum*	1–15	–
	desert globemallow	SPAM2	*Sphaeralcea ambigua*	1–15	–
4	**Annual Forbs**			2–36	
	narrowstem cryptantha	CRGR3	*Cryptantha gracilis*	1–15	–
	Fremont's phacelia	PHFR2	*Phacelia fremontii*	1–15	–
Shrub/Vine					

5	**Primary Shrubs**			443–713	
	blackbrush	CORA	*Coleogyne ramosissima*	254–364	–
	spiny menodora	MESP2	*Menodora spinescens*	109–182	–
	fourwing saltbush	ATCA2	*Atriplex canescens*	36–73	–
	Nevada jointfir	EPNE	*Ephedra nevadensis*	29–58	–
	banana yucca	YUBA	*Yucca baccata*	7–18	–
	Joshua tree	YUBR	*Yucca brevifolia*	7–18	–
6	**Secondary Shrubs**			36–109	
	sweetbush	BEJU	*Bebbia juncea*	1–22	–
	Heermann's buckwheat	ERHE	*Eriogonum heermannii*	1–22	–
	Apache plume	FAPA	*Fallugia paradoxa*	1–22	–
	spiny hopsage	GRSP	*Grayia spinosa*	1–22	–
	littleleaf ratany	KRER	*Krameria erecta*	1–22	–
	desert pepperweed	LEFR2	*Lepidium fremontii*	1–22	–
	water jacket	LYAN	*Lycium andersonii*	1–22	–
	Fremont's dalea	PSFR	*Psorothamnus fremontii*	1–22	–
	Stansbury cliffrose	PUST	*Purshia stansburiana*	1–22	–
	turpentinebroom	THMO	*Thamnosma montana*	1–22	–
	Wiggins' cholla	CYEC3	*Cylindropuntia echinocarpa*	1–11	–
	Engelmann's hedgehog cactus	ECEN	*Echinocereus engelmannii*	1–11	–
	cottontop cactus	ECPO2	*Echinocactus polycephalus*	1–11	–

Animal community

Livestock interpretations:
This site has limited value for livestock grazing, due to low forage production and distance from adequate water resources. Grazing management should be keyed to dominant perennial grasses and palatable shrubs. Bush muhly is readily eaten by livestock throughout the year when available. However, it is generally not abundant enough to provide much forage. It is extremely susceptible to heavy grazing due to its highly

branched growth form. Bush muhly experiences its high rate of use in the winter months when other species become scarce. Blue grama is highly palatable to all classes of livestock year around. Dominant shrubs provide additional grazing resource on this ecological site. Blackbrush is economically important forage in the winter especially for domestic sheep. It is considered poor forage during the spring, summer and fall for domestic cattle, horses and sheep. Spiny menodora does not provide valuable foraging resource due to its spiny nature and absence of obvious leaves. Nevada ephedra is also important winter forage for domestic cattle, sheep and goats. It is generally heavily grazed without inducing toxicity in ewes or cows. Fourwing saltbush is highly palatable to most domestic livestock. It is especially important in the winter, at which time it is high in carotene and averages about four percent digestible protein. Yucca species can provide browse for domestic livestock. However, palatability is generally considered to be low and consumption is limited to accessible blooms and fruits. Signs of heavy browsing by domestic livestock should be considered an indication of poor range condition. Stocking rates vary over time depending upon season of use, climate variation, 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:

A variety of wildlife species find valuable foraging and habitat resources on this ecological site. The palatability of bush muhly is considered fair to poor for most wildlife species. Blue grama is occasionally used by pronghorn antelope, mule deer and bighorn sheep. Blackbrush provides an important winter browsing resource for several species of wildlife, including mule deer and bighorn sheep. Spiny menodora does not provide a valuable foraging resource due to its spiny nature and absence of obvious leaves. Nevada ephedra is browsed by mule deer, bighorn sheep and pronghorn in the spring to late summer when new growth is available. Fourwing saltbush is important to a variety of wildlife species. Deer browse it year around, bighorn sheep, antelope and elk primarily use it during the winter months. Fourwing saltbush provides excellent cover for upland birds, rabbits, songbirds and small mammals. Mule deer often seek out new growth on banana yucca, especially as it sprouts after fire. Bighorn sheep browse leaves and fruit of banana yucca. Multiple parts of the plant are also used by small mammals, birds and insects. Joshua tree provides important habitat and food for small mammals, birds, insects and reptiles. Utilization by large wildlife is limited by the height of blossoms and fruit. Palatability is poor for pronghorn, mule deer and small mammals.

Hydrological functions

The soils associated with this site are characterized by medium runoff and slow 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 for photography and nature study. This site is used for camping and hiking and has potential for upland and big game hunting.

Other products

Native Americans made a tea from fresh roots or leaves of fourwing saltbush and drank it as a remedy for stomach pain, bad coughs or used it as a laxative. Roots were also ground and used to relieve toothaches. Soapy lather made from the leaves was applied to itching and rashes from chickenpox, measles, or even bug bites. Leaves were used as a snuff for nasal problems. The smoke from leaves was used to revive someone who was injured, weak, or feeling faint. Hispanics use the plant to treat cold and flu symptoms. Banana yucca was used by Native Americans as a food source. Fruits were consumed raw before fully ripening. Cakes were also made by pit roasting the fruits, grinding them into a paste, and drying the resulting material. Fermented banana yucca has been used for beverages, its juices used as a preservative, its seeds dried and ground into a meal and the central leaves were incorporated into soups and meat dishes.

Other information

Blue grama is tolerant of drought, salinity, moderate alkalinity and capable of forming mats. Therefore, it is a desirable species for revegetating disturbed sites and controlling erosion. Fourwing saltbush is extensively for rangeland seedings, mine land reclamation, and other disturbed sites.

Type locality

Location 1: Clark County, NV	
Township/Range/Section	T13S R60E S25
UTM zone	N
UTM northing	4070725
UTM easting	660933
Latitude	36° 46′ 7″
Longitude	115° 11′ 48″
General legal description	Approximately 37 kilometers north and 15 kilometers east of Corn Creek, Nevada at the south end of Desert Valley; Approximately 10 kilometers north-northeast of Quijinump Canyon; Desert National Wildlife Refuge

Other references

Anderson, Michelle D. 2001. Coleogyne ramosissima. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research

Station, Fire Sciences Laboratory (Producer). Available: http://www.fs.fed.us/database/feis/ [2011, August 16].
Brooks, M.L. and J.R. Matchett. 2003. Plant community patterns in unburned and burned blackbrush (Coleogyne ramosissima Torr.) shrublands in the Mojave Desert. Western North American Naturalist. 63.3: 283-298.
Cole, K.L., and Webb, R.H. 1985. Late Holocene vegetation changes in Greenwater Valley, Mojave Desert, California, Quaternary Research. 23. 2: 227-235.
Hunter, K.L. and J.R. McAuliffe. 1994. Elevational Shifts of Coleogyne ramosissima in the Mojave Desert during the Little Ice Age. Quaternary Research. 42. 2: 216-221.
Pendleton, B.K. and S.E. Meyer. 2004. Habitat-correlated variation in blackbrush (Coleogyne ramosissima: Rosaceae) seed germination response. J. of Arid Environments. 59: 229-243.
Pendleton, B.K. 2008. Coleogyne ramosissima Torr. Available: http://www.nsl.fs.fed.us.wpsm/index.html

Fire Effects Information System (Online; http://fs.fed.us/database/feis/plants/).

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

Contributors

E.Hourihan
PN-E

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)	
Contact for lead author	State Range Management Specialist
Date	08/16/2011
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 in areas recently subjected to summer convection storms.

---

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

---

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 10-15% depending on amount of surface cover 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 catastrophic events.

---

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** Soil stability values should be 3 to 6 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):** A horizon thickness is 2 inches. Surface structure is typically moderate, medium subangular blocky. Soil surface colors are pale brown and soils are typified by an ochric epipedon. Organic matter of the surface 2 to 4 inches is typically <1.0 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 and provide opportunity for snow catch and accumulation on this site. Deep-rooted perennial bunchgrasses slow runoff and increase infiltration.

---

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.

---

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 shrub (blackbrush)

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

    Other: succulents

    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):** Litter mostly concentrated under shrubs.

Total litter cover between and under plants 25-35%

---

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** For normal or average growing season ± 650 lbs/ac, below average 500 lbs/ac; above-average 800 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:** Cheatgrass and red brome are invaders on this site.

---

17. **Perennial plant reproductive capability:** All functional groups should reproduce in average (or normal) and above average growing season years. Less reproduction, although rarely none, will occur in below average precipitation years.
