USDA Natural Resources
Conservation Service

Ecological site R030XC043NV
SHALLOW CALCAREOUS SLOPE 9-11 P.Z.

Last updated: 2/25/2025
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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 north facing sideslopes of fan remnants. Slope gradients of 30 to 50 percent are most typical. Elevations range from 5000 to 5500 feet. The soils associated with this site are shallow to a cemented pan, well drained, and formed in alluvium from limestone.

This is a group concept and provisional STM that also covers the following ecological sites: R030XC044NV, R030XC237CA, R030XC023NV

Associated sites

R030XC032NV	**UPLAND WASH** Upland Wash
R030XC044NV	**ERODED SOUTH SLOPE 9-11 P.Z.** Eroded South Slope 9-11
R030XC045NV	**SHALLOW NORTH SLOPE 9-11 P.Z.** Shallow North Slope 9-11

Similar sites

R030XC041NV	**GRAVELLY FAN APRON 9-11 P.Z.** Gravelly Loam 9-11
R030XC044NV	**ERODED SOUTH SLOPE 9-11 P.Z.** Eroded South Slope 9-11
R030XC038NV	**SHALLOW GRAVELLY SLOPE 9-11 P.Z.** Shallow Gravelly Slope 9-11
R030XC042NV	**GRAVELLY LOAM 9-11 P.Z.** Gravelly Fan Apron 9-11

Table 1. Dominant plant species

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

Physiographic features

This site occurs on north facing sideslopes of fan remnants. Slope gradients of 30 to 50 percent are most typical. Elevations range from 5000 to 5500 feet.

Table 2. Representative physiographic features

Landforms	(1) Fan remnant
Flooding frequency	None
Ponding frequency	None
Elevation	5,000–5,500 ft
Slope	30–50%
Aspect	N

Climatic features

The climate is semiarid with cool, 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 frost free season is 130 to 180 days.

Table 3. Representative climatic features

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

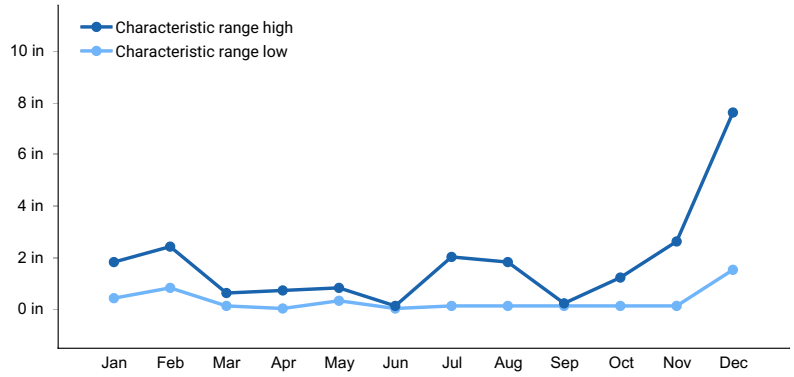


Figure 1. Monthly precipitation range

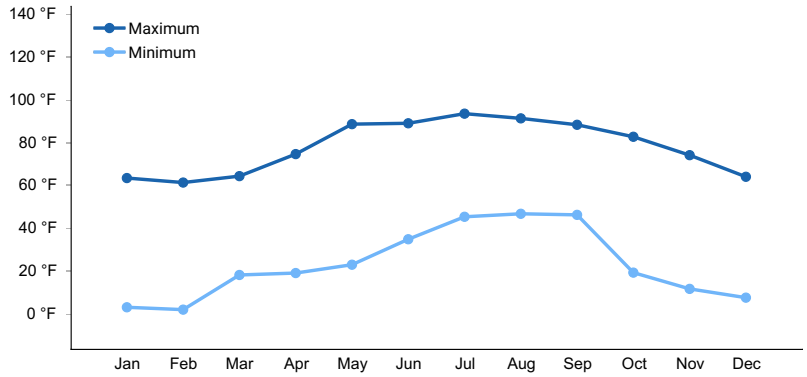


Figure 2. Monthly average minimum and maximum temperature

Influencing water features

There are no influencing water features associated with this site.

Soil features

The soils associated with this site are shallow to a cemented pan, well drained, and formed in alluvium from limestone. Runoff is very high and permeability is moderate above the cemented pan. Soils are dry for much of the year, moist in later winter and early spring, and intermittently following summer convection storms. These soils are characterized by an ochric epipedon, a calcic horizon from 2 to 11 inches, and a petrocalcic horizon from 11 to 14 inches. Soil series correlated to this ecological site include Goodwater, classified as a loamy-skeletal, carbonatic, mesic, shallow, Calcic Petrocalcids.

Table 4. Representative soil features

Parent material	(1) Alluvium–limestone
Surface texture	(1) Very gravelly sandy loam
Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Moderate
Soil depth	11–14 in
Surface fragment cover <=3"	80–90%
Surface fragment cover >3"	0–5%
Available water capacity (0-40in)	0.36–0.96 in
Calcium carbonate equivalent (0-40in)	40–55%
Electrical conductivity (0-40in)	0 mmhos/cm
Sodium adsorption ratio (0-40in)	0
Soil reaction (1:1 water) (0-40in)	7.9–8.4
Subsurface fragment volume <=3" (Depth not specified)	50–60%
Subsurface fragment volume >3" (Depth not specified)	1–8%

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 (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:

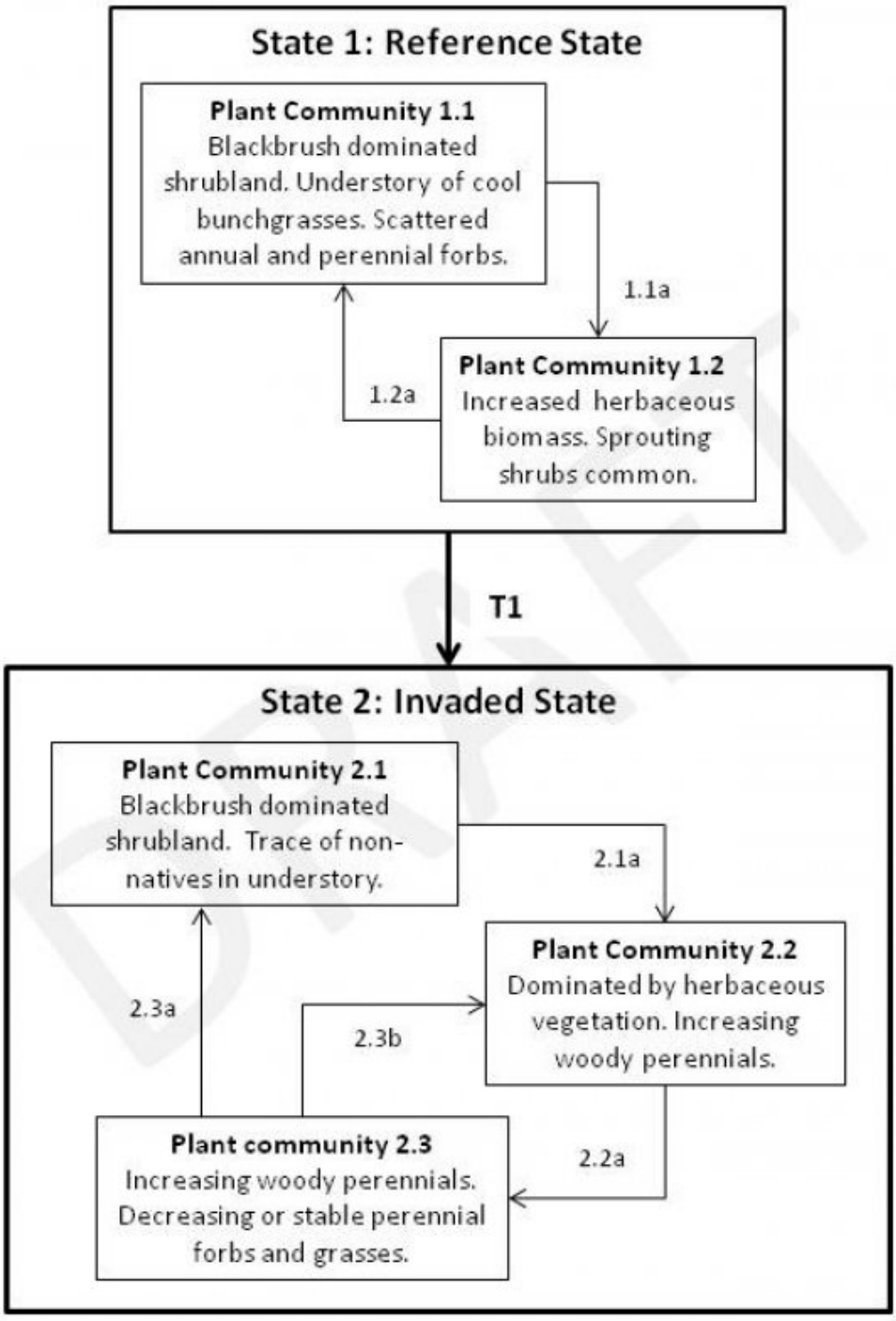
Blackbrush stands are considered to be one of the most flammable native plant assemblages in the Mojave Desert.

Fire will start and spread easily due to the close spacing nature and resinous foliage of blackbrush. During periods with high winds, low relative humidity and low fuel moisture blackbrush will experience stand replacing fires. The short-lived seed of blackbrush is readily destroyed by fire and it may take upwards of 60 years for blackbrush to achieve pre-fire conditions. There is frequently 100 percent mortality of mature blackbrush following fire (Brooks and Matchett 2003) and reestablishment occurs solely from seed. Shadscale is generally killed by fire. Nevada ephedra is top-killed by fire. Underground regenerative structures commonly survive when aboveground vegetation is consumed by fire. Nevada ephedra generally sprouts after fire damages aboveground vegetation and may increase in plant cover. 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. Invasive species likely to invade this site following wildfire include red brome.

Post-fire plant communities vary, depending on use history and species present prior to the fire. Post fire sprouting shrub species such as yucca, Stansbury cliffrose and ephedra increase along with perennial grasses. Species that readily reestablish from seed such as shadscale and snakeweed also increase. Generally, non-natives increase and native species decrease post fire (Brooks and Matchett 2003). The effects of fire on blackbrush appear to be long term, it is killed by fire and is slow to reestablish.

State and transition model

Shallow Calcareous Slope 9-11" 030XC043NV



State 1
Reference State

The reference state is representative of the natural range for variability under natural 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 characteristic of a late-seral healthly condition and is dominated by blackbrush and Indian ricegrass. Important associated species include ephedra, shadscale saltbush and spiny menodora. Native annuals are abundant in wet years. Plant community phase changes are primarily driven by prolonged drought, insect attack, disease and infrequent wildfire. Potential vegetative composition by weight is about 10 percent grasses, 10 percent annual and perennial forbs and 80 percent shrubs. Approximate ground cover (basal and crown) is 15 to 25 percent.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Shrub/Vine	160	240	360
Grass/Grasslike	20	30	45
Forb	20	30	45
Total	**200**	**300**	**450**

Community 1.2
Plant Community 1.2

This plant community is characterized by a 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 from on-site seed. 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. Spring or early summer fires may result in increased cover of Indian ricegrass. Purple threeawn typically responds favorably to disturbance, increasing in cover.

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 black brush 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. 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 annuals are highly flammable and promote wildfires where fires historically have been infrequent.

Community 2.1
Invaded Plant Community 1

Figure 4. 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. 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

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 and Yucca, quickly recover and provide favorable sites of the establishment of the shrubs seedlings. 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 3

This plant community is characteristic of a mid-seral plant community with non-natives in the understory. Once sprouting shrubs establish they provide favorable micro-sites for the establishment of additional native perennials. Wildfire has long term effects on blackbrush communities. Natural regeneration post-fire may result in dominance by spiny menodora, Ephedra and shadscale saltbush, with a trace of blackbrush. Recovery of blackbrush is highly dependent on intensity of the fire. Fast moving, low intensity fires result in incomplete removal of blackbrush, which allows for direct reestablishment. Abundance of non-native biomass varies annually depending on weather, droughty conditions favor native perennials and decrease abundance of non-natives.

Pathway 2.1a
Community 2.1 to 2.2

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

Pathway 2.2a
Community 2.2 to 2.3

Absence from disturbance and natural regeneration over time.

Pathway 2.3a
Community 2.3 to 2.1

Absence from disturbance and natural regeneration over time. 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 (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	**Primary Perennial Grasses**			15–30	
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	15–30	–
2	**Secondary Perennial Grasses**			6–24	
	Mormon needlegrass	ACAR14	*Achnatherum aridum*	1–6	–
	purple threeawn	ARPU9	*Aristida purpurea*	1–6	–
	blue grama	BOGR2	*Bouteloua gracilis*	1–6	–
	low woollygrass	DAPU7	*Dasyochloa pulchella*	1–6	–
	squirreltail	ELEL5	*Elymus elymoides*	1–6	–
	needle and thread	HECO26	*Hesperostipa comata*	1–6	–
	bush muhly	MUPO2	*Muhlenbergia porteri*	1–6	–
	James' galleta	PLJA	*Pleuraphis jamesii*	1–6	–
Forb					
3	**Perennial**			15–30	
	King's sandwort	ARKI	*Arenaria kingii*	1–6	–
	desert marigold	BAMU	*Baileya multiradiata*	1–6	–
	desert trumpet	ERIN4	*Eriogonum inflatum*	1–6	–
	desert frasera	FRAL5	*Frasera albomarginata*	1–6	–
	Cooper's rubberweed	HYCO2	*Hymenoxys cooperi*	1–6	–
	desert globemallow	SPAM2	*Sphaeralcea ambigua*	1–6	–
	desert princesplume	STPI	*Stanleya pinnata*	1–6	–
4	**Annual**			1–15	
	fetid marigold	DYPA	*Dyssodia papposa*	1–6	–
Shrub/Vine					
5	**Primary Shrubs**			192–255	
	blackbrush	CORA	*Coleogyne ramosissima*	165–195	–
	shadscale saltbush	ATCO	*Atriplex confertifolia*	15–30	–
	Nevada jointfir	EPNE	*Ephedra nevadensis*	6–15	–
	spiny menodora	MESP2	*Menodora spinescens*	6–15	–

6	**Secondary Shrubs**			15–30	
	Bigelow sage	ARBI3	*Artemisia bigelovii*	1–9	–
	winterfat	KRLA2	*Krascheninnikovia lanata*	1–9	–
	desert pepperweed	LEFR2	*Lepidium fremontii*	1–9	–
	water jacket	LYAN	*Lycium andersonii*	1–9	–
	turpentinebroom	THMO	*Thamnosma montana*	1–9	–
	Mojave woodyaster	XYTO2	*Xylorhiza tortifolia*	1–9	–
	banana yucca	YUBA	*Yucca baccata*	1–9	–
	Joshua tree	YUBR	*Yucca brevifolia*	1–9	–
	Torrey's jointfir	EPTO	*Ephedra torreyana*	1–9	–
	foxtail cactus	ESCOB	*Escobaria*	1–3	–
	beavertail pricklypear	OPBA2	*Opuntia basilaris*	1–3	–
	Wiggins' cholla	CYEC3	*Cylindropuntia echinocarpa*	1–3	–
	Engelmann's hedgehog cactus	ECEN	*Echinocereus engelmannii*	1–3	–

Animal community

Livestock interpretations: This site has limited value for livestock grazing, due to low forage production, steep slopes and distance from adequate water resources. Grazing management should be keyed to dominant perennial grasses and palatable shrubs. Indian ricegrass benefits from moderate grazing use in winter and early spring. Inappropriate season of grazing may sharply reduce vigor of decrease overall cover. Indian ricegrass is high palatable to all classes of livestock in both the green and cured condition. Blackbrush is an 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. Shadscale is an important source of browse for domestic sheep and goats. Domestic sheep and cattle heavily use shadscale leaves and seeds throughout the winter. The spinescense of shadscale limits use to 15 to 20 percent. Nevada ephedra is also highly important winter forage for domestic cattle, sheep and goats. It is generally heavily grazed without inducing toxicity in ewes or cows. Spiny menodora is characterized by very low palatability, but domestic livestock will use it early in the spring before spines mature. 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. Indian ricegrass is eaten by pronghorn when available. It is also the preferred seed of a variety of rodents and small mammals. Indian ricegrass makes up a significant portion of jackrabbit diets in the spring and summer. It also provides seed for many species of birds. Blackbrush provides an important winter browsing resource for several species of wildlife, including mule deer and bighorn sheep. Shadscale provides good browse for mule deer during winter, spring and fall. Bighorn sheep occasionally browse on shadscale and it primarily used by pronghorn antelope in the winter. Nevada ephedra is browsed by mule deer, bighorn sheep and pronghorn in the spring to late summer when new growth is available. Wildlife species do not prefer spiny menodora but will browse it early in spring before spines mature. Mule deer often seek out new growth on banana yucca, especially as it sprouts after fire. Banana yucca flower stalks are highly digestible and provide an important source of phosphorus. Bighorn sheep browse leave 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.

Hydrological functions

Runoff is very high and permeability is moderate. Shrubs and perennial grasses aid in infiltration and reduce runoff. Shrubs also aid in snow capture on this site.

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 hiking and has potential for upland and big game hunting.

Other products

The highly nutritious seed of Indian ricegrass was one of the staple foods of American Indians. The seeds of shadscale were an important food source for Native Americans; generally it was made into bread or mush. Ephedra was traditionally used a beverage and medicine. Native Americans made tea from the slender twigs and inner bark by boiling them. The beverage was used as tonic and blood purifier. However, ephedra is considered toxic and should be used with caution.
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

Indian ricegrass is well adapted to stabilization of disturbed sandy soils and is especially valuable for controlling wind erosion. It is well suited for reclamation projects in areas receiving 8 to 14 inches annual precipitation.

Type locality

Location 1: Clark County, NV	
Township/Range/Section	T13S R60E S33
UTM zone	N
UTM northing	4069158
UTM easting	655353
Latitude	36° 45′ 19″
Longitude	115° 15′ 34″
General legal description	Approximately 1.5 miles from the mouth of Yellowjacket Canyon, south of Dead Horse Ridge, west of Sheep Range in the Desert National Wildlife Refuge. Clark Co., NV

Other references

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

Contributors

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Approval

Sarah Quistberg, 2/25/2025

Rangeland health reference sheet

Interpreting Indicators of Rangeland Health is a qualitative assessment protocol used to determine ecosystem condition based on benchmark characteristics described in the Reference Sheet. A suite of 17 (or more) indicators are typically considered in an assessment. The ecological site(s) representative of an assessment location must be known prior to applying the protocol and must be verified based on soils and climate. Current plant community cannot be used to identify the ecological site.

Author(s)/participant(s)	P.Novak-Echenique/E.Hourihan
Contact for lead author	State Rangeland Management Specialist
Date	11/17/2011
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:** A few water flow patterns can be expected in areas recently subjected to summer convection storms or rapid snowmelt, particularly on steeper slopes. If waterflow patterns are evident, they are typically short in length (<3 ft) and not connected.

3. **Number and height of erosional pedestals or terracettes:** A few pedestals may occur in waterflow patterns.

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Bare Ground <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. (To be field tested.)

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Surface structure is moderate, medium subangular blocky. Soil surface colors are browns and soils are typified by an ochric epipedon. Organic matter of the surface 2 to 3 inches is typically 1 to 1.5 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:** Deep-rooted bunchgrasses (i.e., Indian ricegrass & James galleta) slow runoff and increase infiltration. Although low statured, shrub canopy and associated litter break raindrop impact and provide some opportunity for snow catch on site.

11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):** Compacted layers are none. Massive sub-surface horizons or calcic horizons are not to be interpreted as compacted.

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 >> deep-rooted, cool season, perennial bunchgrasses > deep-rooted, cool season, perennial forbs > shallow-rooted cool season perennial grasses > warm season perennial grasses > fibrous, shallow-rooted, cool season, perennial and annual forbs

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

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

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** For normal or average growing season (through mid-June) ± 300 lbs/ac; favorable years 450+ lbs/ac and unfavorable years ± 200 lbs/ac

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