USDA Natural Resources Conservation Service

Ecological site R029XY081NV
SHALLOW CALCAREOUS HILL 10-14 P.Z.

Last updated: 2/20/2025
Accessed: 05/10/2025

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.

MLRA notes

Major Land Resource Area (MLRA): 029X–Southern Nevada Basin and Range

The Southern Nevada Basin and Range MLRA (29) represents the transition from the Mojave Desert to the Great Basin. It is cooler and wetter than the Mojave. It is warmer and typically receives more summer precipitation than the Great Basin. This area is in Nevada (73 percent), California (25 percent), and Utah (2 percent). It makes up about 26,295 square miles (68,140 square kilometers). Numerous national forests occur in the area, including the San Bernardino, Angeles, Sequoia, Inyo, Humboldt-Toiyabe, and Dixie National Forests. Portions of Death Valley National Monument, the Nuclear Regulatory Commission's Nevada Test Site, the Hawthorne Ammunition Depot, and the Nellis Air Force Range in Nevada and the China Lake Naval Weapons Center in California also are in this MLRA. The northeast part of the Paiute Indian Reservation and the southern third of the Walker River Indian Reservation are in the part of this MLRA in Nevada, and the Lone Pine, Fort Independence, and Big Pine Indian Reservations are in the part in California.
Physiography:
The entire area is in the Great Basin Section of the Basin and Range Province of the Intermontane Plateaus. The area of broad, nearly level, aggraded desert basins and valleys between a series of mountain ranges trending north to south. The basins are bordered by sloping fans and pluvial lake terraces. The mountains are uplifted fault blocks with steep side slopes and not well dissected due to limited annual precipitation. Most of the valleys in this MLRA are closed basins or bolsons containing sinks or playa lakes.
Geology:
The mountains are dominated by Pliocene and Miocene andesite and basalt rocks, Paleozoic and Precambrian carbonate rocks prominent in some areas. Scattered outcrops of older Tertiary intrusives and very young tuffaceous sediments (Pliocene and Miocene) are in the western and eastern thirds of this MLRA. The valleys consist mostly of alluvial fill and playa deposits at the lowest elevations in the closed basins.
Climate:
The average annual precipitation is 3 to 12 inches (75 to 305 millimeters) in most of this area. It may be as high as 29 inches (735 millimeters), on the higher mountain slopes. Most of the rainfall occurs as high-intensity, convective thunderstorms during the growing season. Summers are dry, but sporadic storms are common in July and August.
Water Resources:
Water resources are scarce. Ground water and surface water sources are limited. Streams are small and intermittent. Quality of surface water in naturally degraded as streams cross area of valley fill effected by dissolved salts. Irrigation water may raise the levels of dissolved salts and suspended sediments causing contamination.
Soils:
Dominant soil orders include Entisols and Aridisols.

Ecological site concept

The Shallow Calcareous Hill 10-14 P.Z. site is on summits and sideslopes of hills, mountains, fan remnants, and rock pediments on all aspects. Slopes range from 4 to 75 percent, but slope gradients of 15 to 50 are typical. Elevations are 4,400 to about 8,800 feet. The soils are very shallow to shallow to bedrock or duripan and well drained.

Associated sites

F029XY071NV	**Shallow Rocky Loam 10-12" P.Z** This site is on shallow soils on mountains and hills at greater than 15 percent slopes. The dominant vegetation is typically Utah juniper (Juniperus osteosperma), black sagebrush (Artemisia nova), and Indian ricegrass (Achnatherum hymenoides).
R029XY008NV	**SHALLOW CALCAREOUS LOAM 8-12 P.Z.** This site is on fan remnants, inset fans, and mountains on all exposures. Slopes range from 0 to 75 percent, but slope gradients of 4 to 30 percent are most typical. Elevations are 4,200 to 8,000 feet. The soils associated with this site are very shallow to very deep or they have a restrictive layer within the main rooting depth. These soils are moderately to strongly calcareous and soil reaction increases with soil depth. The soils are often modified with high amounts of gravels, cobbles or stones on the surface.
R029XY014NV	**SHALLOW CALCAREOUS SLOPE 8-12 P.Z.** This site is on summits and backslopes of hills, mountains, fan remnants, and rock pediments. Slopes range from 2 to over 75 percent, but slope gradients of 15 to 50 percent are typical. Elevations are 4,300 to about 8,800 feet. The soils on this site are calcareous or carbonatic and have a shallow effective rooting zone with depth to a hardpan or bedrock ranging from 5 to 20 inches. The soils have high amounts of gravels throughout the soil profile. The soil surface typically has a cover of 75 percent or more rock fragments.
R029XY015NV	**SHALLOW CALCAREOUS HILL 8-10 P.Z.** This site is on summits and backslopes of mountains and low hills. Slopes range from 2 to over 50 percent, but slope gradients of 8 to 50 percent are typical. Elevations are 4,600 to about 7,000 feet. The soils are very shallow and have been derived from volcanic sources. These soils are calcareous with slight to violent effervescence in all parts.
R029XY049NV	**SANDY LOAM 8-12 P.Z.** This site is on inset fans, fan remnants, and alluvial fans on all exposures. Slopes range from 0 to 30 percent, but slope gradients of 2 to 15 percent are most typical. Elevations are 4,300 to about 7,800 feet. The soils are very deep, well to somewhat excessively well drained, and typically formed in mixed alluvium. Soil surface textures are moderately coarse and there are high amounts of gravels on the surface.

Similar sites

R029XY014NV	**SHALLOW CALCAREOUS SLOPE 8-12 P.Z.** PUST and JUOS minor species, if present.
R029XY015NV	**SHALLOW CALCAREOUS HILL 8-10 P.Z.** Less productive site; PUST dominant understory species.
R029XY045NV	**STONY CALCAREOUS SLOPE 8-12 P.Z.** More productive site.
R029XY008NV	**SHALLOW CALCAREOUS LOAM 8-12 P.Z.** More productive site.

Table 1. Dominant plant species

Tree	(1) *Juniperus osteosperma*
Shrub	(1) *Artemisia nova*
Herbaceous	(1) *Achnatherum hymenoides*

Physiographic features

The Shallow Calcareous Hill 10-14 P.Z. site is on summits and sideslopes of hills, mountains, fan remnants, and rock pediments on all aspects. Slopes range from 4 to 75 percent, but slope gradients of 15 to 50 are typical. Elevations are 4,400 to about 8,800 feet.

Table 2. Representative physiographic features

Landforms	(1) Mountain slope (2) Hill (3) Pediment (4) Fan remnant
Runoff class	Very high
Flooding frequency	None
Ponding frequency	None
Elevation	4,400–8,800 ft
Slope	4–75%
Water table depth	72 in
Aspect	Aspect is not a significant factor

Climatic features

The climate is semi-arid with cool, moist winters and generally hot, dry summers. Average annual precipitation is 8 to about (12) 14 inches. Mean annual air temperature is 45 to 54 degrees F. The average growing season is about 80 to 130 days. No climate stations are available.

Table 3. Representative climatic features

Frost-free period (average)	130 days
Freeze-free period (average)	
Precipitation total (average)	14 in

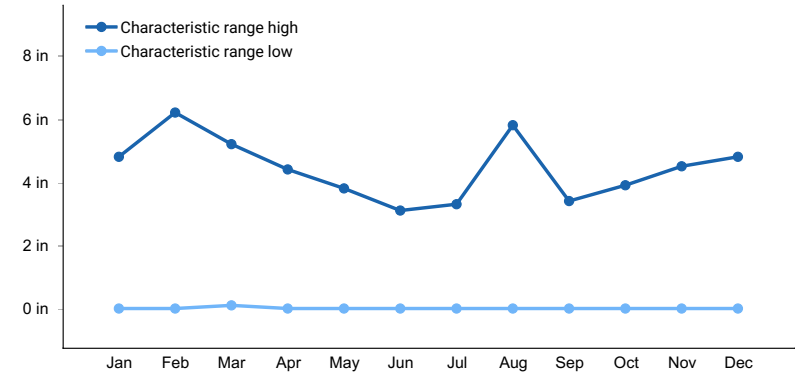


Figure 1. Monthly precipitation range

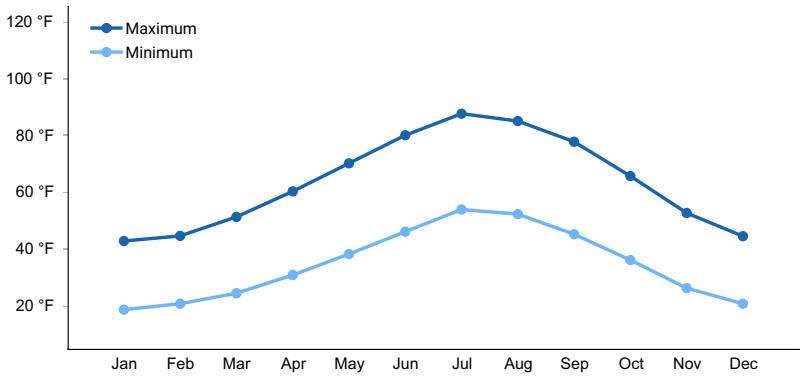


Figure 2. Monthly average minimum and maximum temperature

Influencing water features

There are no influencing water features associated with this site.

Soil features

The soils are very shallow to shallow to bedrock or duripan and well drained. The available water holding capacity is very low and the depth to weathered bedrock is typically less than 14 inches. These soils are neutral to very strongly alkaline. Soil series associated with this site include: Amtoft, Beelem, Checkett, Chubard, Jarab, Kyler, Littleailie, Majorsplace, Radol, Tert, and Ursine.

Table 4. Representative soil features

Parent material	(1) Colluvium–tuff (2) Residuum–tuff (3) Alluvium
Surface texture	(1) Very gravelly sandy loam (2) Cobbly sandy loam (3) Very cobbly loam (4) Very gravelly loam
Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Slow to moderately rapid
Soil depth	4–20 in
Surface fragment cover <=3"	9–88%
Surface fragment cover >3"	3–30%
Available water capacity (0-40in)	0.2–1.9 in
Calcium carbonate equivalent (0-40in)	0–80%
Electrical conductivity (0-40in)	0–8 mmhos/cm
Sodium adsorption ratio (0-40in)	0–12
Soil reaction (1:1 water) (0-40in)	6.6–9.6
Subsurface fragment volume <=3" (Depth not specified)	4–56%
Subsurface fragment volume >3" (Depth not specified)	0–36%

Ecological dynamics

Where management results in abusive grazing use by cattle or feral horses, herbaceous species decrease as black sagebrush and rabbitbrush increase. With excessive use by sheep, black sagebrush and palatable forbs decrease as rabbitbrush increases. Rabbitbrush, snakeweed, and cheatgrass are often dominant after fire, particularly where fire occurs on this site in lower ecological condition. Species likely to invade this site are annuals such as cheatgrass.

Utah juniper occurs throughout the site and typically provides less than 12 percent total canopy cover. Utah juniper is not shade tolerant. It is a climax species in harsh areas where stands are open and regeneration can occur without competition for light. Across the West, junipers have expanded their historical range in the years since European settlement, especially into sagebrush-grass communities below areas of traditional pinyon-juniper. Overgrazing, fire suppression, and climatic change have been identified as potential causes of juniper invasion. In the absence of fire or other disturbances, trees eventually dominate the site and crowd out herbaceous and shrub species.

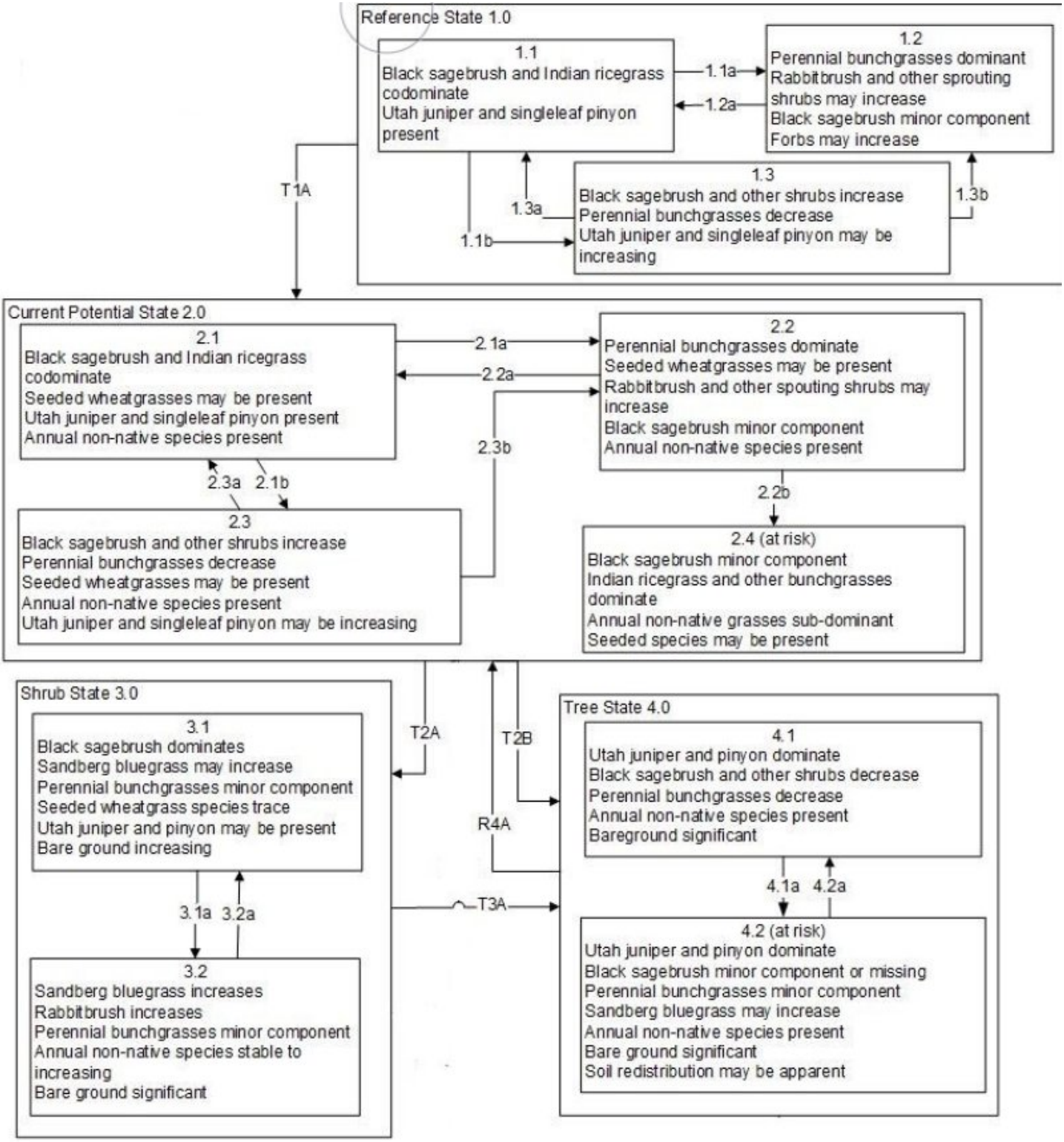
Fire Ecology:
Fire return intervals for black sagebrush communities range from 35 to over 100 years. Black sagebrush communities generally lack enough fine fuels to carry a fire. In addition to low fine fuel loading, wide shrub spacing makes fire infrequent or difficult to prescribe in black sagebrush types. Black sagebrush is highly susceptible to fire-caused mortality; plants are readily killed by all fire intensities. Following burning, reestablishment occurs through off-site sources.

Utah juniper is usually killed by fire, especially when trees are small. However, Utah juniper habitat types rarely have sufficient fine fuels to produce severe or continuous fires. Vegetative recovery following a fire in a mature juniper site may be slow, since the pre-fire herbaceous cover is often sparse.

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.

The reference plant community is dominated by a sparse overstory (less than 15 percent canopy cover) of Utah juniper. The understory is dominated by black sagebrush, Stansbury's cliffrose, ephedra, and Indian ricegrass. Potential vegetative composition is about 35 percent grasses, 5 percent forbs, 50 percent shrubs, and 10 percent trees.

State and transition model


Reference State 1.0
1.1
Black sagebrush and Indian ricegrass codominate
Utah juniper and singleleaf pinyon present
1.1a
1.2a
1.2
Perennial bunchgrasses dominant
Rabbitbrush and other sprouting shrubs may increase
Black sagebrush minor component
Forbs may increase
1.3
Black sagebrush and other shrubs increase
Perennial bunchgrasses decrease
Utah juniper and singleleaf pinyon may be increasing
1.3a
1.1b
1.3b
T1A
Current Potential State 2.0
2.1
Black sagebrush and Indian ricegrass codominate
Seeded wheatgrasses may be present
Utah juniper and singleleaf pinyon present
Annual non-native species present
2.1a
2.2a
2.2
Perennial bunchgrasses dominate
Seeded wheatgrasses may be present
Rabbitbrush and other spouting shrubs may increase
Black sagebrush minor component
Annual non-native species present
2.3b
2.3a
2.1b
2.2b
2.3
Black sagebrush and other shrubs increase
Perennial bunchgrasses decrease
Seeded wheatgrasses may be present
Annual non-native species present
Utah juniper and singleleaf pinyon may be increasing
2.4 (at risk)
Black sagebrush minor component
Indian ricegrass and other bunchgrasses dominate
Annual non-native grasses sub-dominant
Seeded species may be present
Shrub State 3.0
3.1
Black sagebrush dominates
Sandberg bluegrass may increase
Perennial bunchgrasses minor component
Seeded wheatgrass species trace
Utah juniper and pinyon may be present
Bare ground increasing
3.1a
3.2a
3.2
Sandberg bluegrass increases
Rabbitbrush increases
Perennial bunchgrasses minor component
Annual non-native species stable to increasing
Bare ground significant
T2A
T2B
R4A
T3A
Tree State 4.0
4.1
Utah juniper and pinyon dominate
Black sagebrush and other shrubs decrease
Perennial bunchgrasses decrease
Annual non-native species present
Bareground significant
4.1a
4.2a
4.2 (at risk)
Utah juniper and pinyon dominate
Black sagebrush minor component or missing
Perennial bunchgrasses minor component
Sandberg bluegrass may increase
Annual non-native species present
Bare ground significant
Soil redistribution may be apparent

MLRA 28B
Shallow Calcareous Hill 10-14"
028BY059NV

Reference State 1.0 Community Phase Pathways
1.1a: Low severity fire creates grass/sagebrush mosaic; high severity fire significantly reduces sagebrush cover and leads to early/mid-seral community, dominated by grasses and forbs.
1.1b: Time and lack of disturbance such as fire or long-term drought. Excessive herbivory would also reduce perennial understory.
1.2a: Time and lack of disturbance allows for shrub regeneration.
1.3a: Low severity fire resulting in a mosaic pattern, fall/winter herbivory may cause mechanical damage to shrubs and reduce shrub density.
1.3b: High severity fire significantly reduces sagebrush cover and leads to early/mid-seral community, dominated by grasses and forbs

Transition T1A: Introduction of non-native species such as bulbous bluegrass, cheatgrass and thistles.

Current Potential State 2.0 Community Phase Pathways
2.1a: Low severity fire creates grass/sagebrush mosaic; high severity fire significantly reduces sagebrush cover and leads to early/mid-seral community dominated by grasses and forbs; non-native annual species present.
2.1b: Time and lack of disturbance such fire or long-term drought. Inappropriate grazing management may also reduce perennial understory.
2.2a: Time and lack of disturbance allows for shrub regeneration.
2.3a: Low severity fire resulting in a mosaic pattern. Brush management with minimal soil disturbance; late-fall/winter grazing causing mechanical damage to sagebrush.
2.3b: High severity fire significantly reduces sagebrush cover and leads to early/mid-seral community dominated by grasses and forbs; non-native annual species present.

Transition T2A: Inappropriate grazing management (3.1). Fire or brush treatment; may be coupled with inappropriate grazing management (3.2).
Transition T2B: Time and lack of disturbance allows for maturation of trees, may be coupled with inappropriate grazing management (4.1).

Shrub State 3.0 Community Phase Pathways
3.1a: Fire or brush management (i.e. mowing) with minimal soil disturbance.
3.2a: Time and lack of disturbance.

Transition T3A: Time and lack of disturbance allows for tree maturation; may be coupled with inappropriate grazing management (4.1).

Tree State 4.0 Community Phase Pathways
4.1a: Time and lack of disturbance allows maturation of tree community.
4.2a: Tree management with minimal soil disturbance such as mastication will reduce tree cover.

Restoration R4A: Tree removal with minimal soil disturbance and seeding of desired species.

Animal community

Livestock Interpretations:
This site is suited to livestock grazing. Grazing management should be keyed to Indian ricegrass production. Utah juniper is used on a rare occasions by livestock for cover and food. In winter, at lower elevations, black sagebrush is heavily utilized by domestic sheep. Black sagebrush may be lethal to sheep if it comprises the bulk of the diet for even a short time. Decreases in black sagebrush indicate a downward trend in grazing condition.
Indian ricegrass has good forage value for domestic sheep, cattle and horses. It can be important cattle forage in winter. Indian ricegrass is often used most heavily in the late winter, when succulent and nutritious new green leaves are produced. It supplies a source of green feed before most other native grasses have produced much new growth. Nevada ephedra is important winter range browse for domestic cattle, sheep and goats. Green ephedra is heavily browsed by livestock on winter range but only moderately or lightly browsed during other seasons.
Stansbury cliffrose is an important browse species for livestock, especially in the winter.

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:
Utah juniper is used by many birds and animals for cover and food. Juniper "berries," or berry-cones, are eaten by jackrabbits, and coyotes. Many bird species depend on juniper berry-cones for fall and winter food. The foliage is grazed by mule deer when other foliage is scarce and during periods of deep snow. In winter at lower elevations black sagebrush is heavily utilized by pronghorn and mule deer. Indian ricegrass is eaten by pronghorn, desert bighorns, elk, and mule deer in "moderate" amounts whenever available. A number of heteromyid rodents inhabiting desert rangelands show preference for seed of Indian ricegrass. It is considered an important component of jackrabbit diets in spring and summer. Indian ricegrass seed provides food for many species of birds. Nevada ephedra is important winter range browse for domestic cattle, sheep and goats. Green ephedra is an important browse species for big game animals. Green ephedra is heavily used by wildlife on winter ranges. Stansbury cliffrose is an important browse species for mule deer, pronghorn, game birds, and songbirds. Wild ungulates use it heavily in winter.

Hydrological functions

Rills and water flow patterns are few to common. Occurrence of rills and water flow patterns are more frequent on steeper slopes and as canopy cover increases. Pedestals are rare to few. Occurrence is usually limited to areas of water flow patterns. Frost heaving of shallow rooted plants should not be considered an indicator of soil erosion. Fine litter (foliage from grasses and annual and perennial forbs) is expected to move the 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. Mat of accumulating needle litter under mature trees is very stable and shows no obvious movement. Perennial herbaceous plants (especially deep-rooted bunchgrasses [i.e., Indian ricegrass]) slow runoff and increase infiltration. Trees and understory shrubs break raindrop impact and provide opportunity for snow catch and accumulation on 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 to photographers and for nature study. This site is used for camping and hiking and has potential for upland and big game hunting.

Wood products

Utah juniper has long been used for construction, fence posts, firewood, pencils, Christmas trees, and other purposes. Utah juniper wood is highly decay resistant.

Other products

The berries of Utah juniper were eaten by Native Americans.
Indian ricegrass was traditionally eaten by some Native American peoples. The Paiutes used seed as a reserve food source.

Other information

Juniper litter has an allelopathic effect on some understory species, especially Sandberg bluegrass, and blue grama This effect is particularly evident on heavy, poorly drained clay soils. Broadcasting grass seeds over litter appeared to lower the allelopathic effects.

Black sagebrush is an excellent species to establish on sites where management objectives include restoration or improvement of domestic sheep, pronghorn, or mule deer winter range.

Indian ricegrass is well-suited for surface erosion control and desert revegetation although it is not highly effective in controlling sand movement.

Inventory data references

NASIS soil component data.

Type locality

Location 1: Nye County, NV	
Township/Range/Section	T2S R54E S7
General legal description	Quinn Canyon Range north of Queen City Summit, Nye County, Nevada. This site also occurs in Lincoln County, Nevada.

Other references

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

United States Department of Agriculture, Natural Resources Conservation Service. 2022. Land resource regions and major land resource areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture, Agriculture Handbook 296.

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

Contributors

GED

Approval

Kendra Moseley, 2/20/2025

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)	GK BRACKLEY
Contact for lead author	State Rangeland Management Specialist
Date	02/21/2007
Approved by	Kendra Moseley
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** Rills are few to common. Occurrence of rills more frequent on steeper slopes and as canopy cover increases.

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2. **Presence of water flow patterns:** Water flow patterns are few to common with occurrence increasing as canopy cover increases.

3. **Number and height of erosional pedestals or terracettes:** Pedestals are rare to few. Occurrence is usually limited to areas of water flow patterns. Frost heaving of shallow rooted plants should not be considered an indicator of soil erosion.

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Bare Ground ± 45%; surface rock fragments ±35%; tree canopy to 15%; shrub canopy ±15%; foliar cover for perennial herbaceous plants ± 10%. Needle litter forms a mat 2 to 4 inches thick under the drip line of mature trees.

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) is expected to move the 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. Mat of accumulating needle litter under mature trees is very stable and shows no obvious movement.

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 4 on most soil textures found on this site. Areas of this site occurring on soils that have a physical crust will probably have stability values less than 3. (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 thin to thick platy or massive. Soil surface colors are light and soils are typified by an ochric epipedon. Organic carbon 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:** Perennial herbaceous plants (especially deep-rooted bunchgrasses [i.e., Indian ricegrass]) slow runoff and increase infiltration. Trees and understory shrubs break raindrop impact and provide opportunity for snow catch and accumulation 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 not typical. Platy or massive sub-surface horizons, subsoil argillic horizons or hardpans shallow to the surface are not to be interpreted as compacted layers.

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: Utah juniper >> understory shrubs (black sagebrush & cliffrose) = deep-rooted,

cool season, perennial bunchgrasses Indian ricegrass & desert needlegrass)

Sub-dominant: deep-rooted, cool season, perennial forbs = shallow-rooted, cool season, perennial grasses = fibrous, shallow-rooted, cool season, perennial forbs = annual forbs.

Other:

Additional:

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** Overstory trees have little mortality. Dead branches within understory shrubs are common and standing dead shrub canopy material may be as much as 35% of total shrub canopy; mature bunchgrasses (<25%) may have dead centers.

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14. **Average percent litter cover (%) and depth (in):** Herbaceous, or non-persistent, litter within tree canopy interspaces (± 5%) and litter depth is ± ¼ inch. Needle litter forms a mat 2 to 4 inches thick under the drip line of mature trees. Large, persistent, litter from trees (limbs, etc.) variable to 5%.

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** For understory vegetation to 4½ feet and normal or average growing season (through May) = ± 325 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:** Galleta (aggressive increaser plant following wildfire) and Douglas rabbitbrush are increasers on this site. Snakeweed, Russian thistle, annual mustards, and Cheatgrass are invaders on this site.

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