USDA Natural Resources
Conservation Service

# Ecological site R027XY027NV
# BARREN GRAVELLY SLOPE 4-8 P.Z.

Last updated: 6/03/2024
Accessed: 09/27/2024

## 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): 027X–Fallon-Lovelock Area

Physiography
Found in the Great Basin Section of the Basin and Range Province of the Intermontane Plateaus this area is characterized by isolated uplifted fault block mountain ranges trending north to south that are separated by broad, hydrologically closed basins. The entire area occurs in the rain-shadow of the Sierra Nevada mountains and is influenced by Pleistocene Lake Lahontan which reached its most recent high stand about 12,000 years ago. There is substantial evidence suggesting the western Great Basin has been the site of pluvial-interpluvial cycles for at least the past two million years.
The mountains and valleys are dissected by the Humboldt, Truckee, Carson, and Walker Rivers and their tributaries, all of which terminate within MLRA 27. Extensive playas can be found throughout this area and are the result of drying of ancient Lake Lahontan. Elevation generally ranges from 3,300 to 5,900 feet (1,005 to 1,800 meters) in valleys, but on some mountain peaks it is more than 7,870 feet (2,400 meters).

Geology
Landforms and soils of this MLRA have been heavily influenced by fluctuating lake level over the last 40,000 years. There is a level line evident on the higher slopes marking the former extent of glacial Lake Lahontan. Almost half of this area has surface deposits of alluvial valley fill influenced by lacustrine sediment. The rest has andesite and basalt rocks of different ages. Mesozoic and Tertiary intrusives are concentrated along the western border of the area, and Lower Volcanic Rocks (17 to 43 million years old) are common on the eastern side of the area. Also, some scattered outcrops of Mesozoic sedimentary and volcanic rocks and tuffaceous sedimentary rocks are in the mountains within the interior of this MLRA.

Climate
The average annual precipitation is 5 to 10 inches (125 to 255 millimeters) in most of the area but is as much as 19 inches (485 millimeters) on high mountain slopes. Most of the rainfall occurs as high-intensity, convective thunderstorms during the growing season. The amount of precipitation is very low from summer to midautumn. The precipitation in winter occurs mainly as snow. The average annual temperature is 43 to 54 degrees F (6 to 12 degrees C). The freeze-free period averages 155 days and ranges from 110 to 195 days, decreasing in length with elevation.

Water
The amount of precipitation is very low, and water for irrigation is obtained principally from diversions on the four large rivers in the area and from water stored in the Lahontan, Rye Patch, and Weber Reservoirs. Pyramid Lake and Walker Lakes are terminal lakes for the Truckee and Walker Rivers, respectively. Much of the annual flow of both rivers is diverted for irrigation, causing lake levels to fall and levels of dissolved salts to increase causing problems for the native Lahontan cutthroat trout.

Soils
The dominant soil orders are Aridisols and Entisols. The soils in the area are predominantly a mesic temperature

regime, aridic moisture regime, and have a mixed mineralogy. They are generally well drained, loamy or sandy, commonly skeletal, and shallow to very deep. Accumulation of salts, tufa deposits, and eolian sediments with soluble salts over lacustrine deposits influence most of the soils in the basin landforms of this MLRA. Soils on bedrock-controlled landforms are typically comprised of volcanic or tuffaceous sedimentary colluvium over residuum.

Biological Resources
This area supports extensive areas of salt-desert shrub vegetation. Shadscale and Bailey's greasewood are widespread, occurring both individually and together. Grasses are generally sparse, although Indian ricegrass is prominent, especially on the sandy soils. Fourwing saltbush, winterfat, spiny hopsage, wolfberry, ephedra, dalea, and bud sagebrush are common shrubs. Basin wildrye, creeping wildrye, alkali sacaton, saltgrass, black greasewood, rubber rabbitbrush, and big saltbush are important plants on saline bottom lands and terraces. A few marsh areas support cattail, bulrushes, sedges, and rushes. Big sagebrush, along with scattered Utah juniper and singleleaf pinyon, is associated with Thurber needlegrass, desert needlegrass, Sandberg bluegrass, and squirreltail on the higher elevation piedmont slopes and mountains.

## Ecological site concept

The Barren Gravelly Slope 4-8 P.Z. site occurs on hills, mountains, and pediments. Slope ranges from 2 to 75 percent, but Slope gradients of 30 to 50 percent are most typical. Elevations are 3900 to 7000 feet. The soils are very shallow to shallow and well to excessively well drained. There are high amounts of gravel and cobbles on the soil surface. Surface and subsurface textures are moderately coarse and very gravelly.

## Associated sites

| | |
|---|---|
| R027XY017NV | **SOUTH SLOPE 4-8 P.Z.**<br>ACSP12 dominant grass. |

## Similar sites

| | |
|---|---|
| R027XY018NV | **GRAVELLY LOAM 4-8 P.Z.**<br>ARSP5 major shrub; more productive site. |
| R027XY015NV | **STONY LOAM 4-8 P.Z.**<br>More productive site; SABA14 codominant shrub. |
| R027XY019NV | **STONY SLOPE 4-8 P.Z.**<br>SABA14 codominant shrub. |
| R027XY013NV | **LOAMY 4-8 P.Z.**<br>Slopes typically <15% not on hill landform. More productive site. |
| R027XY037NV | **LOAMY SLOPE 5-8 P.Z.**<br>More productive site. |

**Table 1. Dominant plant species**

| | |
|---|---|
| Tree | Not specified |
| Shrub | (1) *Atriplex confertifolia* |
| Herbaceous | (1) *Achnatherum hymenoides* |

## Physiographic features

The Barren Gravelly Slope 4-8 P.Z. site occurs on hills, mountains, and pediments. Slope ranges from 2 to 75 percent, but Slope gradients of 30 to 50 percent are most typical. Elevations are 3900 to 7000 feet.

**Table 2. Representative physiographic features**

| | |
|---|---|
| Landforms | (1) Hill<br>(2) Mountain<br>(3) Pediment |
| Runoff class | Low to very high |
| Elevation | 1,189–2,134 m |
| Slope | 2–75% |
| Water table depth | 183 cm |
| Aspect | Aspect is not a significant factor |

## Climatic features

The climate on this site is arid, characterized by cool, moist winters, and hot, dry summers. Average annual precipitation is 4 to 8 inches. Mean annual air temperature is 46 to 55 degrees F. The average growing season is about 80 to 150 days.

**Table 3. Representative climatic features**

| | |
|---|---|
| Frost-free period (average) | 150 days |
| Freeze-free period (average) | |
| Precipitation total (average) | 203 mm |

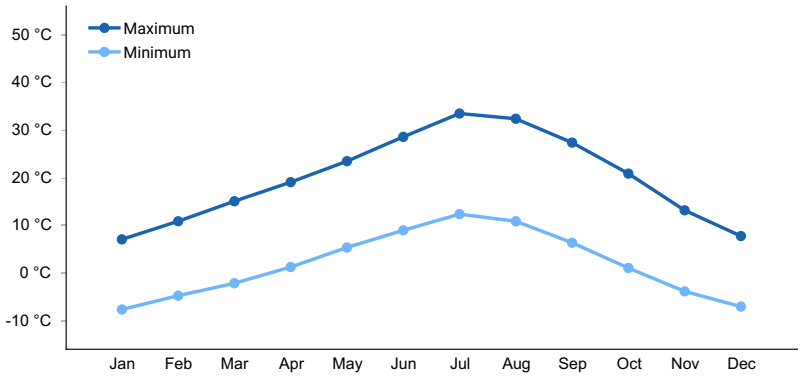



**Figure 1. Monthly average minimum and maximum temperature**

## Influencing water features

There are no influencing water features associated with this site.

## Soil features

The soils associated with this site are very shallow to shallow and well to excessively well drained. There are high amounts of gravel and cobbles on the soil surface. Surface and subsurface textures are moderately coarse and very gravelly. Available water capacity is low to moderate and runoff is high to very high. The erosion potential is slight to moderate due to high amount of rock fragments on soil surface. Soil stability values should be 2 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. Soils having thin surface sand sheet will have lower stability values. The soil series associated with this site inlcude: Barnmot, Bedwyr, Celeton, Daick, Envol, Osobb, Rednik, Roic, Singatse, Sojur, Vium, and Weena.

**Table 4. Representative soil features**

| | |
|---|---|
| Surface texture | (1) Very stony sandy loam<br>(2) Very cobbly fine sandy loam<br>(3) Very gravelly loam |

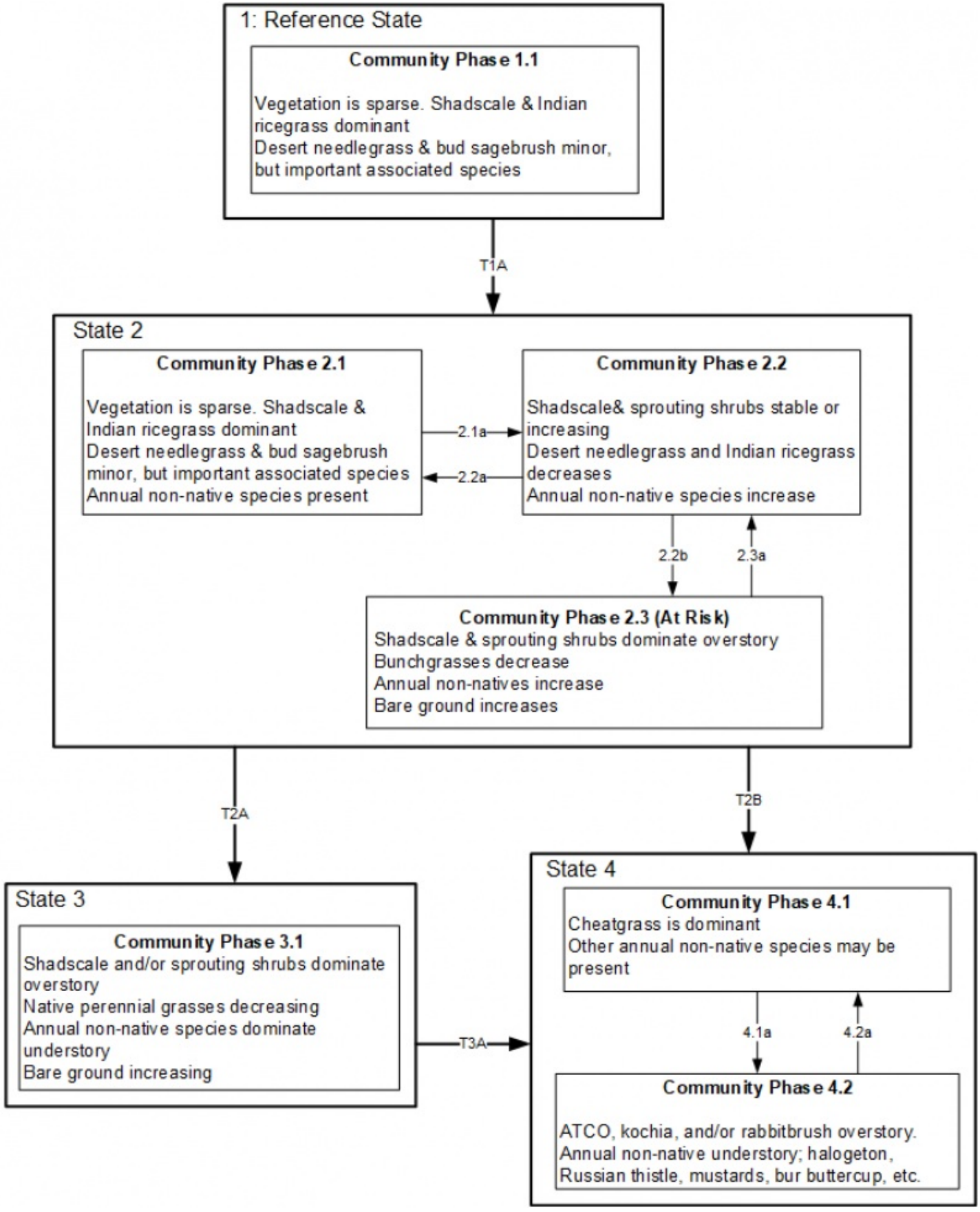
| | |
|---|---|
| Family particle size | (1) Loamy |
| Drainage class | Well drained to somewhat excessively drained |
| Permeability class | Very slow to moderately rapid |
| Soil depth | 10–51 cm |
| Surface fragment cover <=3" | 15–73% |
| Surface fragment cover >3" | 1–40% |
| Available water capacity (0-101.6cm) | 10.92–13.97 cm |
| Calcium carbonate equivalent (0-101.6cm) | 0–10% |
| Electrical conductivity (0-101.6cm) | 0–8 mmhos/cm |
| Sodium adsorption ratio (0-101.6cm) | 0–30 |
| Soil reaction (1:1 water) (0-101.6cm) | 6.6–9.6 |
| Subsurface fragment volume <=3" (Depth not specified) | 9–54% |
| Subsurface fragment volume >3" (Depth not specified) | 0–40% |

## Ecological dynamics

As ecological conditions deteriorates due to surface disturbance such as erosion, horsebrush, burrobrush, and Douglas rabbitbrush increase as shadscale and perennial grasses decrease. Species likely to invade this site are cheatgrass, Douglas' rabbitbrush, snakeweed, burrobrush, horsebrush, halogeton, Russian thistle and annual mustards.

Fire Ecology:
The mean fire return interval for shadscale-greasewood communities range from 35 to 100 years. Increased presence of non-native annual grasses, such as cheatgrass, can alter fire regimes by increasing fire frequency under wet to near-normal summer moisture conditions. When fire does occur, the effect on the ecosystem may be extreme. Shadscale is generally killed by fire. Shadscale is fire intolerant and it does not readily recover from fire, except for establishment through seed. Budsage is killed by fire. Budsage communities rarely burn due to insufficient fire loads. Indian ricegrass reestablishes on burned sites through seed dispersed from adjacent unburned areas. Indian ricegrass plants are generally killed by fire. Needlegrasses are damaged by burning due to the dense plant material that can burn slowly and long, charring to the growing points. Late summer and early fall fires are the least harmful.

## State and transition model




Reference State 1.0:
State dynamics are maintained by interactions between climatic patterns and disturbance regimes. Negative feedbacks enhance ecosystem resilience and contribute to the overall stability. These include the presence of all structural and functional groups, low fine fuel loads, and retention of organic matter and nutrients. Under natural condition this site is very stable, with little variation in plant community composition. Plant community changes would be reflected in production response to long term drought or herbivory.

Community Phase 1.1:
This community is dominated by shadscale and Indian ricegrass. Desert needlegrass and bud sagebrush are important, but minor components within this community. Community phase changes are primarily a function of chronic drought. Drought favors shrubs over perennial bunchgrasses. However, long-term drought will result in an overall decline in plant community production, regardless of

functional group. Extreme growing season wet periods may also reduce the shadscale component. Fire is very infrequent to non-existent.

T1A: Transition from Reference State 1.0 to Current Potential State 2.0:
Trigger: This transition is caused by the introduction of non-native annual plants, such as halogeton, mustards and cheatgrass.
Slow variables: Over time the annual non-native species will increase within the community.
Threshold: Any amount of introduced non-native species causes an immediate decrease in the resilience of the site. Annual non-native species cannot be easily removed from the system and have the potential to significantly alter disturbance regimes from their historic range of variation.

Current Potential State 2.0: This state is similar to the Reference State 1.0. Ecological function has not changed, however the resiliency of the state has been reduced by the presence of non-native annuals. Non-natives may increase in abundance but will not become dominant within this State. These non-natives can be highly flammable and can promote fire where historically fire had been infrequent. Negative feedbacks enhance ecosystem resilience and contribute to the stability of the state. These feedbacks include the presence of all structural and functional groups, low fine fuel loads, and retention of organic matter and nutrients. Positive feedbacks decrease ecosystem resilience and stability of the state. These include the non-natives' high seed output, persistent seed bank, rapid growth rate, ability to cross pollinate, and adaptations for seed dispersal.

Community Phase 2.1:
This community is compositionally similar to the reference plant community with a trace of annual non-natives, primarily cheatgrass, halogeton and/or tansy mustard. Non-native species may also include seeded perennials and parasitic plants like dodder. Ecological resilience is reduced by the presence of non-native species. Community phase changes are primarily a function of chronic drought or extreme wet periods. Fire is infrequent and patchy due to low fuel loads.
Community Phase Pathway 2.1a: Inappropriate growing season grazing favors unpalatable shrubs over bunchgrasses and bud sagebrush. Long term drought will also decrease the perennial bunchgrasses in the understory.

Community Phase 2.2: Shadscale dominates overstory while rabbitbrush and/or other sprouting shrubs may become sub-dominate. Bud sagebrush may become minor component with excessive spring grazing. Sandberg bluegrass may dominate the understory whereas Indian ricegrass becomes a minor component. Bare ground interspaces increase in size and connectivity. Annual non-native weeds such as bur buttercup and halogeton increase. Prolonged drought may lead to an overall decline in the plant community. Wet periods may decrease the shadscale component. If present.
Community Phase Pathway 2.2a: Release from drought and/or grazing management that facilitates an increase in perennial grasses and bud sagebrush.
Community Phase Pathway 2.2b: Long term drought and/or inappropriate grazing management will significantly reduce perennial grasses and bud sagebrush in favor of shadscale and rabbitbrush.

Community Phase 2.3 (At-risk):
Shadscale and rabbitbrush dominates the overstory and perennial bunchgrasses and bud sagebrush are reduced, either from competition with shrubs, inappropriate grazing, chronic drought or a combination. Annual non-native species may be stable or increasing due to a lack of competition with perennial bunchgrasses. Bare ground may be significant. This community is at risk of crossing a threshold to either State 3.0 (shrub) or State 4.0 (annual).
Community Phase Pathway 2.3a: Release from drought and/or inappropriate grazing allows for bud sagebrush and perennial grasses to increase. Extreme growing season wet period may reduce shadscale.

T2A: Transition from Current Potential State 2.0 to Shrub State 3.0:
Trigger: Inappropriate grazing management and/or prolonged drought will decrease or eliminate deep rooted perennial bunchgrasses and favor shrub growth and establishment.
Slow variables: Long term decrease in grass density and reduced native species (shrub and grass) recruitment rates. Increased reproduction of non-native invasive species.
Threshold: Loss of deep-rooted perennial bunchgrasses changes nutrient cycling, nutrient redistribution, and reduces soil organic matter.

T2B: Transition from Current Potential State 2.0 to Annual State 4.0:
Trigger: Fire and/or soil disturbing treatments such as drill seeding and plowing (failed seeding attempt). Increased spring moisture may facilitate the increased germination and production of cheatgrass leading to its dominance within the community.
Slow variables: Increased production and cover of non-native annual species.
Threshold: Loss of deep-rooted perennial bunchgrasses and shrubs truncates, spatially and temporally, nutrient capture and cycling within the community. Increased, continuous fine fuels from annual non-native plants modify the fire regime by changing intensity, size and spatial variability of fires.

Shrub State 3.0: This state is characterized by shadscale, bud sagebrush or a sprouting shrub overstory with very little to no understory. The site has crossed a biotic threshold and site processes are being controlled by shrubs. Shrub cover exceeds the site concept and may be decadent, reflecting stand maturity and lack of seedling establishment due to competition with mature plants. The shrub overstory dominates site resources such that soil, water and nutrients are temporally and spatially redistributed. Bare ground has increased.

Community Phase 3.1:
Decadent shadscale and bud sagebrush dominate the overstory. Rabbitbrush and/or other sprouting shrubs may be a significant component or dominant shrub. Deep-rooted perennial bunchgrasses may be present in trace amounts or absent from the community. Annual nonnative species increase.
T3A: Transition from Shrub State 3.0 to Annual State 4.0:
Trigger: Fire and/or soil disturbing treatments.
Slow variables: Increased production and cover of non-native annual species.
Threshold: Increased, continuous fine fuels modify the fire regime by changing intensity, size and spatial variability. Changes in plant

community composition and spatial variability of vegetation, due to the loss of perennial bunchgrasses, truncate energy capture spatially and temporally thus impacting nutrient cycling and distribution.

Annual State 4.0: This state consists of two general community phases; one dominated by annual forbs and the other dominated by annual grass. Shadscale/rabbitbrush may with the present with the annual understory. In this state, a biotic threshold has been crossed and state dynamics are driven by the dominance and persistence of non-native annuals which is perpetuated by a shortened fire return interval. The herbaceous understory is dominated by annual non-native species such as cheatgrass and halogeton. Bare ground may be abundant.

Community Phase 4.1:
This plant community phase is dominated by non-native annual grasses. This community phase is at-risk of increased erosion and soil loss or redistribution and reoccurring fire driven by fine fuels. Prescribed grazing may be used to reduce fuel loading and the cheatgrass seedbank. However, caution should be exercised; inappropriate grazing management resulting in the complete defoliation of the site will lead to a more degraded state.

Community Phase Pathway 4.1a: Seeding of shrub species may result in an increase in shadscale, forage kochia and other species on this site (probability of success is very low)
Community Phase 4.2:
This community is dominated by shadscale and/or rabbitbrush with annual non-native species dominating the understory. Forage kochia and other seeded species may be present in the community. This site is at risk of increased erosion and soil loss and an increase risk of fire due to the fine fuel loads.
CPP 4.2a: fire or herbicide treatment targeting non-native forbs

## State 1
## Reference Plant Community

### Community 1.1
### Reference Plant Community

The reference plant community is characterized by a open canopy of shrubs and perennial grasses. The plant community is dominated by shadscale and Indian ricegrass. Potential vegetative composition is about 25% grasses, 5% forbs, and 70% shrubs. Approximate ground cover (basal and crown) is less than 7%. Bare ground is <25%, surface cover of rock fragments are variable but often more than 70%, shrub canopy is 3 to 7%, foliar cover for perennial herbaceous plants <3%. Dead branches within individual shrubs are common and standing dead shrub canopy material may be as much as 35% of total woody canopy. Some of the mature bunchgrasses (approximately 25%) commonly have dead centers. There are trace amounts of herbaceous litter in plant interspaces.

**Table 5. Annual production by plant type**

| Plant Type | Low (Kg/Hectare) | Representative Value (Kg/Hectare) | High (Kg/Hectare) |
|---|---|---|---|
| Shrub/Vine | 39 | 78 | 157 |
| Grass/Grasslike | 13 | 28 | 56 |
| Forb | 3 | 6 | 11 |
| **Total** | **55** | **112** | **224** |

## 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** | | | 13–39 | |
| | Indian ricegrass | ACHY | *Achnatherum hymenoides* | 11–28 | – |
| | desert needlegrass | ACSP12 | *Achnatherum speciosum* | 2–11 | – |
| 2 | **Secondary Perennial Grasses** | | | 2–9 | |
| | King's eyelashgrass | BLKI | *Blepharidachne kingii* | 1–3 | – |
| | squirreltail | ELEL5 | *Elymus elymoides* | 1–3 | – |
| | James' galleta | PLJA | *Pleuraphis jamesii* | 1–3 | – |
| **Forb** | | | | | |
| 3 | **Perennial** | | | 2–11 | |
| | buckwheat | ERIOG | *Eriogonum* | 1–4 | – |
| | globemallow | SPHAE | *Sphaeralcea* | 1–4 | – |
| | King's eyelashgrass | BLKI | *Blepharidachne kingii* | 1–3 | – |
| **Shrub/Vine** | | | | | |
| 4 | **Primary Perennial Shrubs** | | | 58–82 | |
| | shadscale saltbush | ATCO | *Atriplex confertifolia* | 56–73 | – |
| | bud sagebrush | PIDE4 | *Picrothamnus desertorum* | 2–9 | – |
| | buckwheat | ERIOG | *Eriogonum* | 0–4 | – |
| | globemallow | SPHAE | *Sphaeralcea* | 0–4 | – |
| | Forb, perennial | 2FP | *Forb, perennial* | 0–2 | – |
| 5 | **Secondary Perennial Shrubs** | | | 6–17 | |
| | yellow rabbitbrush | CHVI8 | *Chrysothamnus viscidiflorus* | 1–3 | – |
| | Nevada jointfir | EPNE | *Ephedra nevadensis* | 1–3 | – |
| | spiny hopsage | GRSP | *Grayia spinosa* | 1–3 | – |
| | burrobrush | HYMEN3 | *Hymenoclea* | 1–3 | – |
| | winterfat | KRLA2 | *Krascheninnikovia lanata* | 1–3 | – |
| | Shockley's desert-thorn | LYSH | *Lycium shockleyi* | 1–3 | – |
| | littleleaf horsebrush | TEGL | *Tetradymia glabrata* | 1–3 | – |

## Animal community

Livestock Interpretations:
This site is marginally suitable for cattle and sheep grazing due to low forage production and steep slopes. Grazing management should be keyed to indian ricegrass and desert needlegrass production. 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.
Desert needlegrass provides a palatable and nutritious feed for livestock and wildlife during the spring and early summer. Shadscale is a valuable and palatable browse species for livestock. Shadscale provides good browse for domestic sheep and goats. Shadscale leaves and seeds are an important component of domestic sheep and cattle winter diets. The spiny branches are unsuitable for cattle. Seeds are the most palatable part of shadscale. Budsage is palatable and nutritious forage for domestic sheep in the winter and spring although it is known to cause mouth sores in lambs. Budsage can be poisonous or fatal to calves when eaten in quantity. Budsage, while desired by cattle in spring, is poisonous to cattle when consumed alone.

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:
Shadscale is a valuable browse species, providing a source of palatable, nutritious forage for a wide variety of wildlife particularly during spring and summer before the hardening of spiny twigs. It supplies browse, seed, and cover for birds, small mammals, rabbits, deer, and pronghorn antelope.
Budsage is palatable, nutritious forage for upland game birds, small game and big game in winter. Budsage is rated as "regularly, frequently, or moderately taken" by mule deer in Nevada in winter and is utilized by bighorn sheep in summer, but the importance of budsage in the diet of bighorns is not known. Bud sage comprises 18 – 35% of a Pronghorn's diet during the spring where it is available. Chukar will utilize the leaves and seeds of bud sage. Budsage is highly susceptible to effects of browsing. It decreases under browsing due to year-long palatability of its buds and is particularly susceptible to browsing in the spring when it is physiologically most active. ndian ricegrass is eaten by pronghorn in "moderate" amounts whenever available. In Nevada it is consumed by desert bighorns. A number of heteromyid rodents inhabiting desert rangelands show preference for seed of Indian ricegrass. Indian ricegrass is an important component of jackrabbit diets in spring and summer. In Nevada, Indian ricegrass may even dominate jackrabbit diets during the spring through early summer months. Indian ricegrass seed provides food for many species of birds. Doves, for example, eat large amounts of shattered Indian ricegrass seed lying on the ground. Desert needlegrass is palatable to wildlife and is grazed during the spring.

## Hydrological functions

Runoff is high to very high. A few rills can be expected on steeper slopes in areas subjected to summer convection storms or rapid spring snowmelt. Water flow patterns may commonly occur in areas subjected to summer convection storms and are short and stable. High amount of surface rock fragments limit development of extensive flow patterns. Pedestals are rare with occurrence typically limited to area within water flow patterns. Frost heaving of shallow rooted plants should not be considered as normal condition. Gullies are rare on this site. Fine litter (foliage from grasses and annual and perennial forbs) are 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. Sparse shrub canopy and associated litter break raindrop impact. Medium to fine textured surface soils have moderate to slow infiltration and medium runoff.

## Recreational uses

This site offers opportunities for photography and nature study. This site has potential for off-road vehicle use and hiking.

## Other products

Indian ricegrass was traditionally eaten by some Native Americans. The Paiutes used seed as a reserve food source. Seeds of shadscale were used by Native Americans of Arizona, Utah and Nevada for bread and mush.

## Inventory data references

NV-ECS-1: 17 records

## Type locality

| Location 1: Churchill County, NV | |
|---|---|
| Township/Range/Section | T17 N R35 E S24 |
| General legal description | About 2 miles north of Middlegate, low elevation mountain sideslopes, Clan Alpine Mountains, Churchill County, Nevada. This site also occurs in Lyon, Mineral, Pershing, Storey and Washoe counties, Nevada. |

## Other references

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

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

## Contributors

DK/GD

## Approval

Kendra Moseley, 6/03/2024

## 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 | 06/20/2006 |
| Approved by | Kendra Moseley |
| Approval date | |
| Composition (Indicators 10 and 12) based on | Annual Production |

## Indicators

1. **Number and extent of rills:** A few rills can be expected particularly in areas subjected to summer convection storms or rapid spring snowmelt.

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2. **Presence of water flow patterns:** Water flow patterns may commonly occur in areas subjected to summer convection storms. Flow patterns are short and stable. High amount of surface rock fragments limit development of extensive flow patterns.

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3. **Number and height of erosional pedestals or terracettes:** Pedestals are rare with occurrence typically limited to area within water flow patterns. Frost heaving of shallow rooted plants should not be considered as a normal condition.

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4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Bare Ground <25%; surface cover of rock fragments variable but often more than 70%; shrub canopy 3 to 7%; foliar cover for perennial herbaceous plants <3%.

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5. **Number of gullies and erosion associated with gullies:** Gullies are rare on this site.

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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.

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 2 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. Soils having thin surface sand sheet will have lower stability values. (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 fine to medium platy or prismatic. Soil surface colors are light and the soils are typified by an ochric epipedon. Organic carbon of the surface 2 to 3 inches is less than to 1 percent.

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Sparse shrub canopy and associated litter break raindrop impact. Medium to fine textured surface soils have moderate to slow infiltration and medium runoff.

11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):** Compacted layers are 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: Low-statured salt desert shrubs (shadscale & bud sagebrush). (By above ground production)

    Sub-dominant: Deep-rooted, cool season, perennial bunchgrasses > associated shrubs > shallow-rooted, cool season, perennial grasses > deep-rooted, cool season, perennial forbs = fibrous, shallow-rooted, cool season, annual and perennial forbs. (By above ground production)

    Other:

    Additional:

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

14. **Average percent litter cover (%) and depth ( in):** Trace amounts of herbaceous litter in plant interspaces.

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** For normal or average growing season (February thru April [May]) ± 100 lbs/ac; Spring moisture significantly affects total production.

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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:** Cheatgrass, snakeweed, horsebrush, halogeton, Russian thistle, and annual mustards are invaders on this site. Douglas' rabbitbrush, burrobrush, and galleta are inceasers on this site.

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17. **Perennial plant reproductive capability:** All functional groups should reproduce in above average growing season years.

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