USDA Natural Resources Conservation Service

# Ecological site R027XY053NV
# DUNES 8-10 P.Z.

Last updated: 6/03/2024
Accessed: 07/17/2024

## 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 Dunes 8-10 P.Z. site occurs on sand dunes situated within mountain valleys. Slopes range from 8 to over 30. Elevations are 4800 to about 6500 feet. The soils are very deep and somewhat excessively drained. These soils have formed in aeolian and lacustrine sands. Surface soils are single-grained.

## Associated sites

| | |
|---|---|
| R027XY024NV | **SODIC TERRACE**<br>Found on the associated sodic terraces. |
| R027XY041NV | **DEEP SODIC FAN**<br>Found on the associated sodic fans. |

## Similar sites

| | |
|---|---|
| R027XY023NV | **DUNES 4-8 P.Z.**<br>Site found in a lower precipitation zone. |

**Table 1. Dominant plant species**

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

## Physiographic features

The Dunes 8-10 P.Z. site occurs on sand dunes situated within mountain valleys. Slopes range from 8 to over 30. Elevations are 4800 to about 6500 feet.

**Table 2. Representative physiographic features**

| | |
|---|---|
| Landforms | (1) Dune |
| Runoff class | Very low |
| Elevation | 4,800–6,800 ft |
| Slope | 8–30% |
| Water table depth | 72 in |
| Aspect | Aspect is not a significant factor |

## Climatic features

The climate associated with this site is arid, characterized by cool, moist winters and hot, dry summers. Average annual precipitation is 8 to 10 inches. Mean annual air temperature is 45 to 53 degrees F. The average growing season is about 90 to 140 days.

**Table 3. Representative climatic features**

| | |
|---|---|
| Frost-free period (average) | 140 days |
| Freeze-free period (average) | |
| Precipitation total (average) | 10 in |

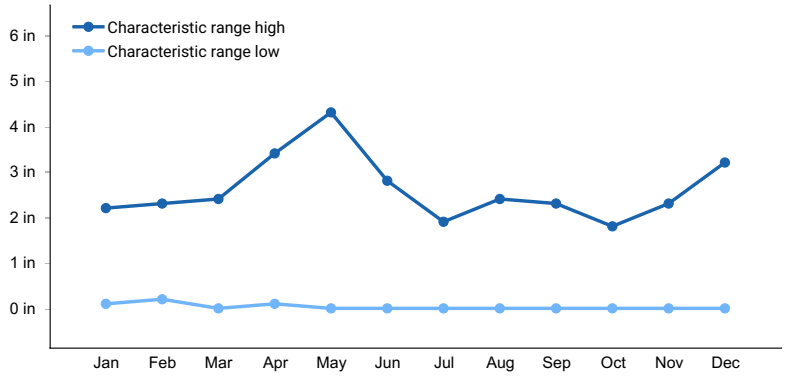



**Figure 1. Monthly precipitation range**

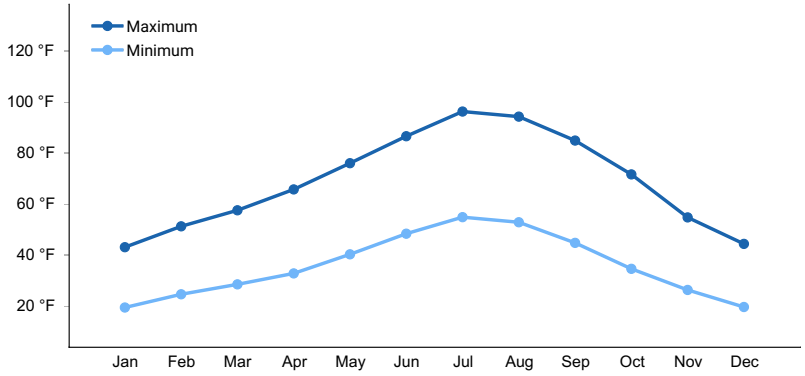



**Figure 2. Monthly average minimum and maximum temperature**

## Influencing water features

There are no water features associated with this site.

## Soil features

The soils of this site are very deep and somewhat excessively drained. These soils have formed in aeolian sands. Surface soils are single-grained. Surface and subsurface soils are coarse textured. Available water capacity is low. Permeability is rapid and surface runoff is very low. Potential for sheet and rill erosion is slight but potential for wind erosion is high. The soil series correlated to this site includes Toll, a mixed, mesic Xeric Torripsamment.

**Table 4. Representative soil features**

| | |
|---|---|
| Parent material | (1) Eolian sands |
| Surface texture | (1) Sand |
| Family particle size | (1) Sandy |

| | |
|---|---|
| Drainage class | Somewhat excessively drained |
| Permeability class | Rapid |
| Soil depth | 78–84 in |
| Surface fragment cover <=3" | 0% |
| Surface fragment cover >3" | 0% |
| Available water capacity (0-40in) | 1–3 in |
| Calcium carbonate equivalent (0-40in) | 0% |
| Electrical conductivity (0-40in) | 0 mmhos/cm |
| Sodium adsorption ratio (0-40in) | 0 |
| Soil reaction (1:1 water) (0-40in) | 6.2–6.7 |
| Subsurface fragment volume <=3" (Depth not specified) | 0–5% |
| Subsurface fragment volume >3" (Depth not specified) | 0% |

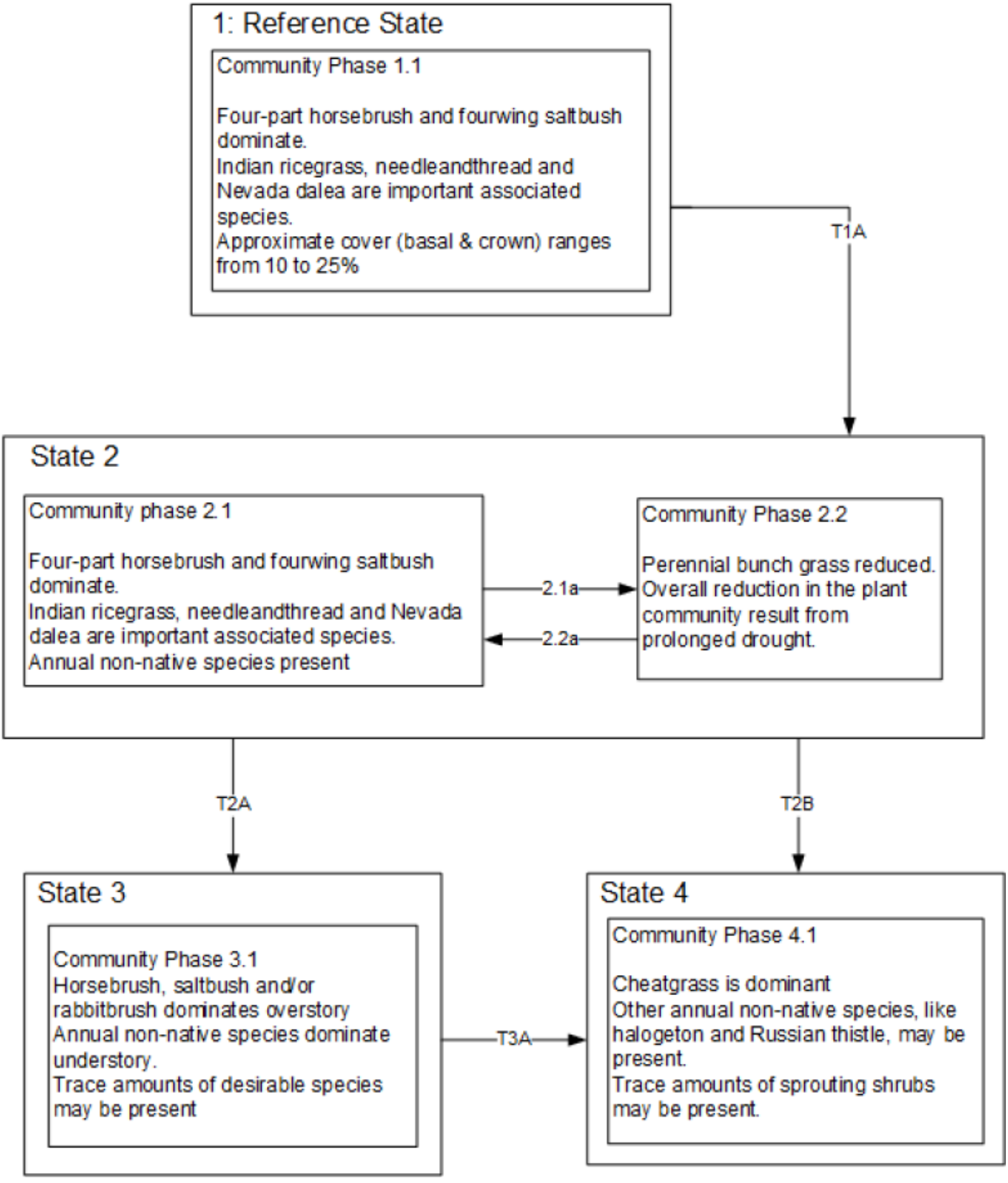
## Ecological dynamics

With disturbance that removes the vegetative cover, the sandy soils become unstable. As the sands shift and move, horsebrush and dalea will increase as fourwing saltbush and Indian ricegrass decrease. Following wildfire, fire tolerant shrubs such as Nevada ephedra and horsebrush may dominate the plant community. Species likely to invade this site are annuals such as cheatgrass and Russian thistle.

Fire Ecology:
Sustained surface fire top-kills or kills fourwing saltbush, depending upon ecotype. Fourwing saltbush is fire-resistant compared to most associated shrubs. The salt scurf layer on leaves inhibits burning. Ether extractives in leaves and stems promote shrub flammability. Fourwing saltbush may sprout after top-kill. Some ecotypes fail to sprout, or show only a weak sprouting response. Generally, fourwing saltbush is poorly adapted to frequent fire.

Indian ricegrass reestablishes on burned sites through seed dispersed from adjacent unburned areas. Indian ricegrass plants are generally killed by fire. Rapid post fire responses such as these suggest that Indian ricegrass may also sprout from tillers.

## State and transition model




The Reference State 1.0 is a representative of the natural range of variability under pristine conditions. The Reference State has two general community phases: a shrub-grass dominant phase and a shrub dominant phase. State dynamics are maintained by interactions between climatic patterns and disturbance regimes. Negative feedbacks enhance ecosystem resilience and contribute to the stability of the state. These include the presence of all structural and functional groups, low fine fuel loads, and retention of organic matter and nutrients. 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. Wet years will increase grass production, while drought years will reduce production.

Community phase 1.1
This plant community is dominated by four-part horsebrush and fourwing saltbush with understory of Indian ricegrass. Needleandthread and Nevada dalea are present in minor amounts.

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, Russian thistle 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 is similar to the Reference State with in the presence of non-native species. Ecological function has not changed, however the resiliency of the state has been reduced by the presence of invasive weeds. 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 Russian thistle. 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.

CPP 2.1a Prolonged drought conditions cause overall decrease the perennial bunchgrasses in the understory. Inappropriate growing season grazing favors unpalatable shrubs over bunchgrasses, winterfat and bud sagebrush.

Community phase 2.2:
This community phase is the result of the prolonged drought conditions. Perennial bunchgrass are decline first. Further decline and possible mortality is experienced in the shrub component with continued drought. Inappropriate growing season grazing will favor dominance by four-part horsebrush and fourwing saltbush. Fire is infrequent and patchy, but may occur in a mosaic pattern. Continued drought and/or excessive grazing puts this community phase at-risk of crossing a ecological threshold into a alternative stable state.

CPP 2.2a:
Release from drought and/or grazing management that facilitates an increase in perennial grasses and desirable shrubs.

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. An unusually wet spring 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.

Shrubs state 3.0: This state is characterized by four-part horsebrush, fourwing saltbush and/or rabbitbrush overstory. 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, nutrient capture, nutrient cycling and soil organic matter are temporally and spatially redistributed. Bare ground has increased.

Community phase 3.1: This community phase is characterized by decadent overstory of horsebrush and saltbush. Rabbitbrush, greasewood and other shrubs may be a significant component of the plant community. Deep-rooted perennial bunchgrass may be present in trace amounts or absent from the community. Annual non-native species increase. Bare ground is significant.

T3A: Transition from Shrub State 3.0 to Annual State 4.0:
Trigger: Repeated fire and/or soil disturbing treatments such as drill seeding and plowing.
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 of fires. Changes in plant community composition and spatial variability of vegetation due to the loss of perennial bunchgrasses and sagebrush truncate energy capture spatially and temporally thus impacting nutrient cycling and distribution.

Annual state 4.0: This state has crossed a biotic threshold and ecological dynamics are driven by the dominance and persistence of non-native annual species. Non-native annuals provide a continuous cover of fine fuels, perpetuating 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 community phase is dominated by non-native annual species. This plant community 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.

## State 1
## Reference Plant Community

### Community 1.1
### Reference Plant Community

The reference plant community is characterized by an open canopy of shrubs and perennial grasses. The plant community is dominated by fourwing saltbush, Nevada ephedra, and Indian ricegrass. Potential vegetative composition is about 40% grasses, 10% forbs and 50% shrubs. Approximate ground cover (basal and crown) is 5 to 15 percent.

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

| Plant Type | Low (Lb/Acre) | Representative Value (Lb/Acre) | High (Lb/Acre) |
|---|---|---|---|
| Shrub/Vine | 150 | 250 | 300 |
| Grass/Grasslike | 120 | 200 | 240 |
| Forb | 30 | 50 | 60 |
| **Total** | **300** | **500** | **600** |

## 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** | | | 125–200 | |
| | Indian ricegrass | ACHY | *Achnatherum hymenoides* | 100–150 | – |
| | needle and thread | HECO26 | *Hesperostipa comata* | 25–50 | – |
| 2 | **Secondary Perennial Grasses** | | | 10–40 | |
| | squirreltail | ELEL5 | *Elymus elymoides* | 3–15 | – |
| | thickspike wheatgrass | ELLAL | *Elymus lanceolatus ssp. lanceolatus* | 3–15 | – |
| | basin wildrye | LECI4 | *Leymus cinereus* | 3–15 | – |
| | sand dropseed | SPCR | *Sporobolus cryptandrus* | 3–15 | – |
| **Forb** | | | | | |
| 3 | **Perennial Forbs** | | | 25–75 | |
| | evening primrose | OENOT | *Oenothera* | 3–15 | – |
| | beardtongue | PENST | *Penstemon* | 3–15 | – |
| | globemallow | SPHAE | *Sphaeralcea* | 3–15 | – |
| | princesplume | STANL | *Stanleya* | 3–15 | – |
| | basin wildrye | LECI4 | *Leymus cinereus* | 3–10 | – |
| 4 | **Annual Forbs** | | | 0–15 | |
| | thickspike wheatgrass | ELLAL | *Elymus lanceolatus ssp. lanceolatus* | 2–10 | – |
| **Shrub/Vine** | | | | | |
| 5 | **Primary Shrubs** | | | 135–240 | |
| | fourwing saltbush | ATCA2 | *Atriplex canescens* | 100–150 | – |
| | Nevada dalea | PSPO | *Psorothamnus polydenius* | 25–50 | – |
| | big sagebrush | ARTR2 | *Artemisia tridentata* | 10–40 | – |
| | evening primrose | OENOT | *Oenothera* | 4–10 | – |
| | beardtongue | PENST | *Penstemon* | 4–10 | – |
| | globemallow | SPHAE | *Sphaeralcea* | 4–10 | – |
| | princesplume | STANL | *Stanleya* | 4–10 | – |
| 6 | **Secondary Shrubs** | | | 25–100 | |
| | shadscale saltbush | ATCO | *Atriplex confertifolia* | 3–15 | – |
| | rubber rabbitbrush | ERNA10 | *Ericameria nauseosa* | 3–15 | – |
| | spiny hopsage | GRSP | *Grayia spinosa* | 3–15 | – |
| | winterfat | KRLA2 | *Krascheninnikovia lanata* | 3–15 | – |
| | littleleaf horsebrush | TEGL | *Tetradymia glabrata* | 3–15 | – |
| | shortspine horsebrush | TESP2 | *Tetradymia spinosa* | 3–15 | – |
| | fourpart horsebrush | TETE4 | *Tetradymia tetrameres* | 3–15 | – |
| | Forb, annual | 2FA | *Forb, annual* | 0–7 | – |

## Animal community

Livestock Interpretations:
This site is suitable for cattle and sheep grazing. Fourwing saltbush is one of the most palatable shrubs in the West. Its protein, fat, and carbohydrate levels are comparable to alfalfa. It provides nutritious forage for all classes of livestock. Palatability is rated as good for domestic sheep, and domestic goats; fair for cattle; fair to good for horses in winter, and poor for horses in other seasons.

Indian ricegrass has good forage value for domestic sheep, cattle, and horses. It can be important cattle forage in winter, particularly in salt desert communities. Indian ricegrass is often used most heavily in 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. Consequently, Indian ricegrass is often heavily grazed before animals leave winter ranges.

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:
Fourwing saltbush provides valuable habitat and year-round browse for wildlife. Fourwing saltbush also provides browse and shelter for small mammals. Additionally, the browse provides a source of water for black-tailed jackrabbits in arid environments. Granivorous birds, including scaled and other quail species, grouse, and gray partridge, consume the fruits. Wild ungulates, rodents, and lagomorphs readily consume all aboveground portions of the plant. Palatability is rated good for deer, pronghorn, and bighorn sheep.
Indian ricegrass is eaten by pronghorn in moderate amounts whenever available and in Nevada it is consumed by desert bighorn sheep.

## Hydrological functions

Runoff is very low and permeability is rapid.

## Other products

Fourwing saltbush is traditionally important to Native Americans. They ground the seeds for flour. The leaves, placed on coals, impart a salty flavor to corn and other roasted food. Top-growth produces a yellow dye. Young leaves and shoots were used to dye wool and other materials. Branch ashes were added to blue corn dough to make green bread. The roots and flowers were ground to soothe insect bites.

Indian ricegrass seeds make a gluten-free, nutritious flour with a potentially good market. Indian ricegrass was traditionally eaten by some Native American people. The Paiutes used seed as a reserve food source. The large-seeded panicle is often used in dry floral arrangements.

## Other information

Fourwing saltbush is widely used in rangeland and riparian improvement and reclamation projects, including burned area recovery. It is probably the most widely used shrub for restoration of winter ranges and mined land reclamation. Fourwing saltbush is drought and cold resistant, palatable, relatively easy to establish with artificial regeneration, and establishes on harsh (and even toxic) sites. Fourwing saltbush is adaptable on sites with declining water tables, brackish groundwater, or saline soils. The deep roots help stabilize erodible soils. It can facilitate establishment of native shrubs, such as sagebrush, that are more resistant to artificial regeneration.

Indian ricegrass is well-suited for surface erosion control and desert revegetation although it is not highly effective in controlling sand movement. Certain native ecotypes exhibit desirable characteristics such as drought and salinity tolerance, low seed dormancy, and good nutritional qualities. However, Indian ricegrass can be difficult to establish. Indian ricegrass can be useful in the reclamation of many arid and semiarid areas in the western United States. Typical sites include those in which vegetation has been removed due to surface mining, construction activity, brush control, heavy grazing, or fire. Indian ricegrass can be used for revegetating degraded rangelands in areas of low precipitation and has naturally revegetated overgrazed ranges.

## Inventory data references

NASIS soil component data.

## Type locality

| Location 1: Churchill County, NV | |
|---|---|
| Township/Range/Section | T18 R32 S4 |
| General legal description | About 1 mile north and ½ mile west of northern-most water tank along Mountain Well Canyon, Sage Flat area, Stillwater Range, 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 Plants Databse (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) | |
| Contact for lead author | |
| Date | 07/17/2024 |
| Approved by | Kendra Moseley |
| Approval date | |
| Composition (Indicators 10 and 12) based on | Annual Production |

## Indicators

1. **Number and extent of rills:**

2. **Presence of water flow patterns:**

3. **Number and height of erosional pedestals or terracettes:**

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

5. **Number of gullies and erosion associated with gullies:**

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6. **Extent of wind scoured, blowouts and/or depositional areas:**

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7. **Amount of litter movement (describe size and distance expected to travel):**

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8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):**

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):**

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

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11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):**

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12. **Functional/Structural Groups (list in order of descending dominance by above-ground annual-production or live foliar cover using symbols: >>, >, = to indicate much greater than, greater than, and equal to):**

    Dominant:

    Sub-dominant:

    Other:

    Additional:

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):**

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14. **Average percent litter cover (%) and depth ( in):**

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-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:**

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17. **Perennial plant reproductive capability:**

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