Ecological site R027XY023NV
DUNES 4-8 P.Z.

Last updated: 6/03/2024
Accessed: 11/21/2024

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 4-8 P.Z. site occurs on partially stabilized sand dunes and sand sheets. Slopes range from 0 to 30 percent, but slope gradients of 0 to 15 percent are typical. Elevations are 3800 to about 5500 feet. The soils are very deep, excessively drained and formed in eolian sands. Surface and subsurface soils are coarse textured.

Associated sites

R027XY012NV	**SODIC SANDS** SAVE4 dominant shrub; does not occur on dune landform

Similar sites

R027XY060NV	**SANDY 3-5 P.Z.** LYSH major shrub; TETRA3 spp. minor shrub, if present
R027XY053NV	**DUNES 8-10 P.Z.** TETRA3 spp. minor shrub; ATCA2 dominant shrub
R027XY016NV	**SODIC DUNES** SAVE4 dominant shrub
R027XY009NV	**SANDY 5-8 P.Z.** ATCA2 dominant shrub; TETRA3 spp. minor shrub, if present

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Tetradymia tetrameres* (2) *Atriplex canescens*
Herbaceous	(1) *Achnatherum hymenoides*

Physiographic features

The Dunes 4-8 P.Z. site occurs on partially stabilized sand dunes and sand sheets. Slopes range from 0 to 30 percent, but slope gradients of 0 to 15 percent are typical. Elevations are 3800 to about 5500 feet.

Table 2. Representative physiographic features

Landforms	(1) Dune (2) Sand sheet
Runoff class	Negligible to very low
Elevation	1,158–1,676 m

Slope	0–30%
Water table depth	183 cm
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 4 to 8 inches. Mean annual air temperature is 50 to 54 degrees F. The average growing season is about 100 to 140 days.

Table 3. Representative climatic features

Frost-free period (average)	140 days
Freeze-free period (average)	
Precipitation total (average)	203 mm

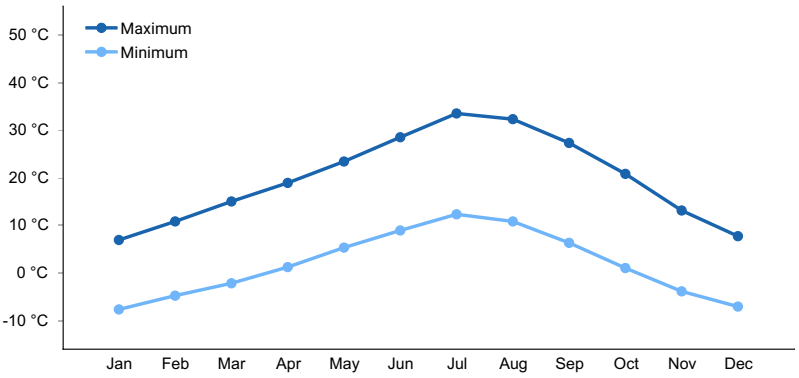


Figure 1. Monthly average minimum and maximum temperature

Influencing water features

There are no influencing water features associated with this site.

Soil features

The soils associated with this site are very deep, excessively drained and formed in eolian sands. Surface and subsurface soils are coarse textured. Available water capacity is low. Permeability is very rapid and surface runoff is very low. Potential for sheet and rill erosion is slight. Wind erosion hazard is high. Soil stability values should be 1 to 4 on the sandy soil textures found on this site. The soil series that is associated with this site is Isolde.

Table 4. Representative soil features

Parent material	(1) Eolian deposits (2) Eolian sands
Surface texture	(1) Fine sand (2) Sand
Family particle size	(1) Sandy
Drainage class	Excessively drained
Permeability class	Very rapid
Soil depth	183 cm
Surface fragment cover <=3"	0%

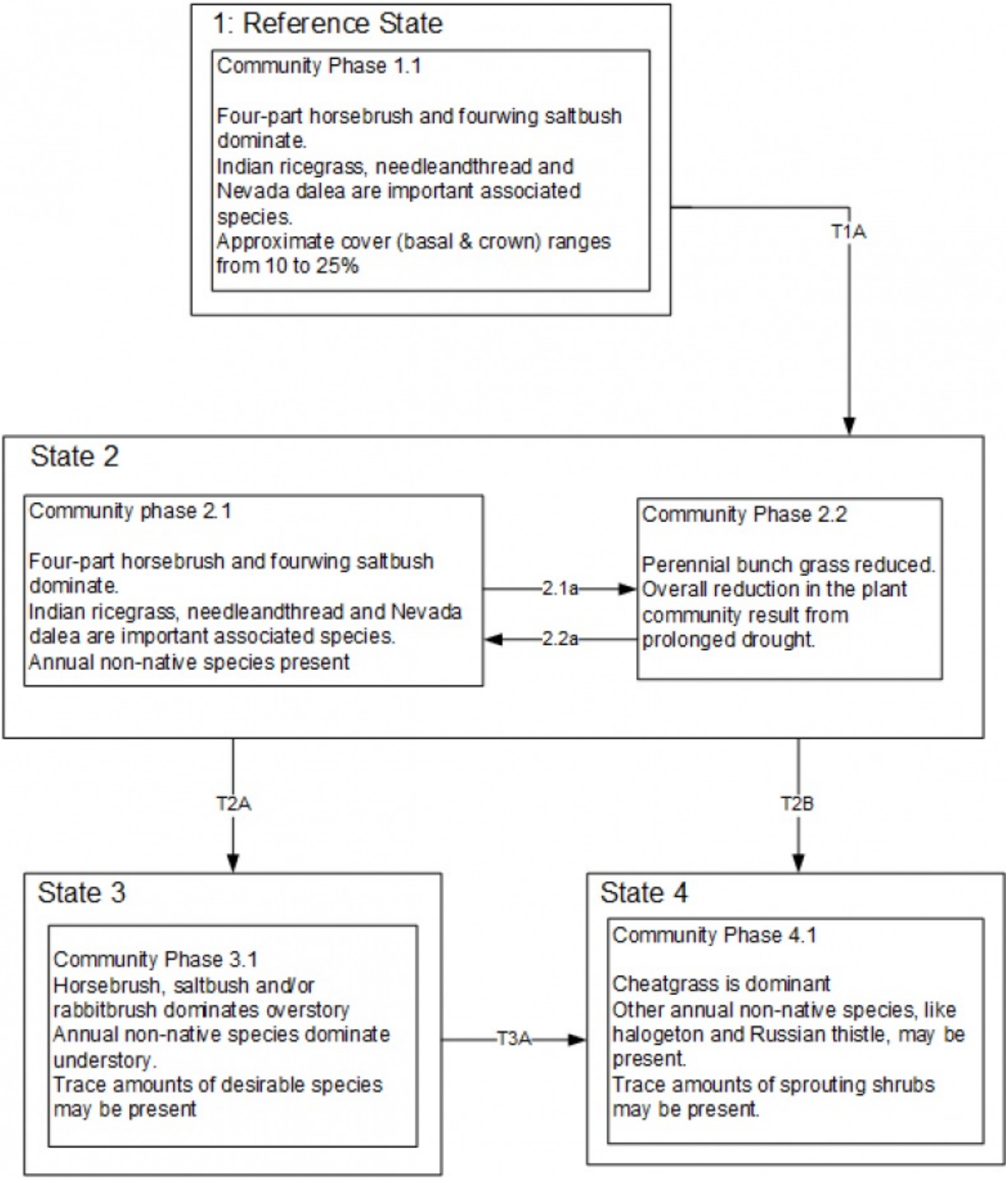
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	7.62–7.87 cm
Calcium carbonate equivalent (0-101.6cm)	0%
Electrical conductivity (0-101.6cm)	0–8 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0–12
Soil reaction (1:1 water) (0-101.6cm)	6.6–8.4
Subsurface fragment volume <=3" (Depth not specified)	0%
Subsurface fragment volume >3" (Depth not specified)	0%

Ecological dynamics

With disturbance that removes the vegetative cover, the sandy soils become unstable. As the sand shifts and moves, horsebrush and dalea will increase as fourwing saltbush, needleandthread and Indian ricegrass decrease. In areas where a relatively shallow (less than 30 to 40 feet) ground water table occurs, black greasewood is frequently associated with this plant community. Species likely to invade this site are Douglas' rabbitbrush, horsebrush, snakeweed, and annuals such as cheatgrass, halogeton, mustards, kochia, bassia and Russian thistle.

Fire Ecology:
Historically, dunes had infrequent fires, but with invasion of non-native annuals fire frequency increased. Fires in the desert shrub ecosystems in which spiny horsebrush occurs were historically infrequent and stand replacing. Four-part horsebrush is most common on dry sites with sparse vegetation cover, and fires are rare on four-part horsebrush-dominated sites due to sparse fuels. Four-part horsebrush sprouts from seed, the root crown and rhizomes after fire. Fire top-kills or kills fourwing saltbush, depending upon ecotype. Fourwing saltbush may sprout after top-kill. Communities in which Nevada dalea occur rarely burn, thus Nevada dalea has little adaptations to fire and is killed.
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. Needleandthread grass is top-killed by fire. It may be killed if the aboveground stems are completely consumed. Needleandthread grass is classified as slightly to severely damaged by fire. Needleandthread grass sprouts from the caudex following fire, if heat has not been sufficient to kill underground parts. Recovery usually takes 2 to 10 years.

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 dominated by four-part horsebrush, fourwing saltbush, and Indian ricegrass. Potential vegetative composition is about 25% grasses, 5% forbs and 70% shrubs. Approximate ground cover (basal and crown) is 10 to 25 percent. are ground is approximately 70%, surface rock fragments are typically absent, shrub canopy is 25%, basal area for perennial herbaceous plants <2%. Dead branches within individual shrubs are common and standing dead shrub canopy material may be as much as 40% of total woody canopy. Some of the mature bunchgrasses (approximately 25%) commonly have dead centers. Between plant interspaces litter is approximately 5% cover and the depth of litter is approximately one-fourth inch.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Shrub/Vine	235	392	549
Grass/Grasslike	84	140	196
Forb	17	28	39
Total	**336**	**560**	**784**

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**			112–224	
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	84–140	–
	needle and thread	HECO26	*Hesperostipa comata*	28–84	–
2	**Secondary Perennial Grasses**			11–45	
	squirreltail	ELEL5	*Elymus elymoides*	3–17	–
	thickspike wheatgrass	ELLAL	*Elymus lanceolatus ssp. lanceolatus*	3–17	–
	basin wildrye	LECI4	*Leymus cinereus*	3–17	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	3–17	–
Forb					
3	**Perennial**			11–45	
	basin wildrye	LECI4	*Leymus cinereus*	3–17	–
	evening primrose	OENOT	*Oenothera*	3–17	–
	beardtongue	PENST	*Penstemon*	3–17	–
	globemallow	SPHAE	*Sphaeralcea*	3–17	–
	princesplume	STANL	*Stanleya*	3–17	–
4	**Annual**			0–17	
	thickspike wheatgrass	ELLAL	*Elymus lanceolatus ssp. lanceolatus*	3–17	–
Shrub/Vine					
5	**Primary Perennial Shrubs**			263–437	
	fourpart horsebrush	TETE4	*Tetradymia tetrameres*	168–252	–
	fourwing saltbush	ATCA2	*Atriplex canescens*	84–140	–
	Nevada dalea	PSPO	*Psorothamnus polydenius*	11–45	–
	evening primrose	OENOT	*Oenothera*	3–17	–
	beardtongue	PENST	*Penstemon*	3–17	–
	globemallow	SPHAE	*Sphaeralcea*	3–17	–
	princesplume	STANL	*Stanleya*	3–17	–
6	**Secondary Perennial Shrubs**			28–84	
	big sagebrush	ARTR2	*Artemisia tridentata*	3–17	–
	shadscale saltbush	ATCO	*Atriplex confertifolia*	3–17	–
	rubber rabbitbrush	ERNAN5	*Ericameria nauseosa ssp. nauseosa var. nauseosa*	3–17	–
	spiny hopsage	GRSP	*Grayia spinosa*	3–17	–
	winterfat	KRLA2	*Krascheninnikovia lanata*	3–17	–
	greasewood	SAVE4	*Sarcobatus vermiculatus*	3–17	–
	littleleaf horsebrush	TEGL	*Tetradymia glabrata*	3–17	–
	shortspine horsebrush	TESP2	*Tetradymia spinosa*	3–17	–

Animal community

Livestock Interpretations:
This site is suited for livestock grazing. Grazing management should be keyed to Indian ricegrass and needleandthread. Indian ricegrass has hood 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 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. Needleandthread provides highly palatable forage, especially in the spring before fruits have developed. Needlegrasses are grazed in the fall only if the fruits are softened by rain. Horsebrushes are unpalatable except early in the spring, when browsers may consume young shoots and buds. However browse palatability is rated poor. 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, poor for horses in other seasons. Nevada dalea is of little importance to livestock due to its low palatability.

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:
Horsebrushes are unpalatable except early in the spring, when browsers may consume young shoots and buds. However browse palatability is rated poor. Its cover is rated fair for large and small species. It is considered critical cover habitat in sparsely covered desert ranges. 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 quail, grouse and gray partridge, consume the fruits. Wild ungulates, rodent and lagomorphis readily consume all aboveground portions of the plant. Palatability is rated good for deer, pronghorn and bighorn sheep. Nevada dalea has low palatability to many wildlife species. Indian ricegrass is an important forage species for several wildlife species. Needleandthread is moderately important spring forage for mule deer, but use declines considerably as more preferred forages become available.

Hydrological functions

Rills are rare on this site. A few can be expected on steeper slopes in areas subjected to summer convection storms or rapid spring snowmelt. Water flow patterns are none to rare. Pedestals are common with occurrence due to wind scouring. Gullies are rare. Fine litter (foliage from grasses and annual and perennial forbs) are expected to move unsheltered distance during heavy wind. Persistent litter (large woody material) will remain in place except during intense summer convections. Shrub canopy and associated litter break raindrop impact and provide opportunity for snow catch.

Recreational uses

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

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. The roots and flowers were ground to soothe insect bites.
Indian ricegrass was traditionally eaten by some Native American peoples. The Paiutes used seed as a reserve food source.

Other information

Horsebrushes provide critically needed ground cover and erosion protection on dry sites that are otherwise often sparsely vegetated. 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. Indian ricegrass is well-suited for surface erosion control and desert revegetation although it is not highly effective in controlling sand movement. Needleandthread grass is useful for stabilizing eroded or degraded sites.

Inventory data references

NASIS soil component data.

Type locality

Location 1: Churchill County, NV	
Township/Range/Section	T16N R30E S30
General legal description	South of Fallon, Bass Flat area, 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/plants/).

USDA-NRCS Plants Database (Online; http://www.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:** Rills are rare. A few can be expected on steeper slopes in areas subjected to summer convection storms or rapid spring snowmelt.

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2. **Presence of water flow patterns:** Water flow patterns none to rare.

3. **Number and height of erosional pedestals or terracettes:** Pedestals are common with occurrence due to wind scouring.

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Bare Ground ± 70%; surface rock fragments typically absent; shrub canopy ±25%; basal area for perennial herbaceous plants <2%.

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

6. **Extent of wind scoured, blowouts and/or depositional areas:** Slight to moderate wind scouring.

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 unsheltered distance during heavy wind. Persistent litter (large woody material) will remain in place except during intense summer storms.

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 1 to 4 on the sandy 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 typically single grain. Soil surface colors are light and the 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:** Shrub canopy and associated litter break raindrop impact and provide opportunity for snow catch.

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

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

    Dominant: Reference Plant Community: Tall shrubs (horsebrush & fourwing saltbush) >> deep-rooted, cool season, perennial bunchgrasses. (By above ground production)

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

Other:

Additional:

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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 40% of total woody canopy; some of the mature bunchgrasses (±25%) have dead centers.

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14. **Average percent litter cover (%) and depth (in):** Between plant interspaces (± 5%) and depth of litter is ± ¼ inch.

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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 May) ± 500 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, halogeton, Russian thistle, annual mustards and annual kochia are invaders on this site. Rubber rabbitbrush and horsebrush are increasers 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.
