USDA Natural Resources
Conservation Service

Ecological site R027XY061NV
SHALLOW CALCAREOUS SLOPE 8-10 P.Z.

Last updated: 6/03/2024
Accessed: 10/20/2024

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 Shallow Calcareous Slope 8-10 P.Z. site occurs on mountain and hill sideslopes on all aspects but is most commonly found on southerly aspects. Slope gradients of 30 to 75 percent are typical. Elevations are 5000 to 6500 feet. The soils are very shallow and shallow and well drained. The soils typically have high volumes of coarse fragments through the soil profile.

Associated sites

R027XY031NV	**SHALLOW CALCAREOUS LOAM 8-10 P.Z.** ACHY dominant grass; occurs on slopes <30%

Similar sites

R027XY032NV	**SHALLOW CALCAREOUS LOAM 10-12 P.Z.** ACTH7 dominant grass; more productive site
R027XY079NV	**GRAVELLY CLAYPAN 8-10 P.Z.** ARARL3 dominant shrub; ACTH7 dominant grass
R027XY020NV	**SHALLOW CLAYPAN 8-10 P.Z.** ARARL3 dominant shrub

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Artemisia nova*
Herbaceous	(1) *Achnatherum speciosum*

Physiographic features

The Shallow Calcareous Slope 8-10 P.Z. site occurs on mountain and hill sideslopes on all aspects but is most commonly found on southerly aspects. Slope gradients of 30 to 75 percent are typical. Elevations are 5000 to 6500 feet.

Table 2. Representative physiographic features

Landforms	(1) Mountain slope (2) Hill
Runoff class	Very high
Elevation	1,524–1,981 m

Slope	30–75%
Water table depth	183 cm
Aspect	Aspect is not a significant factor

Climatic features

The climate associated with this site is semiarid, characterized by cool, moist winters and warm, dry summers. Average annual precipitation is 8 to 10(12) inches. Mean annual air temperature is 45 to 55 degrees F. The average growing season is about 110 to 140 days.

Table 3. Representative climatic features

Frost-free period (average)	140 days
Freeze-free period (average)	
Precipitation total (average)	254 mm

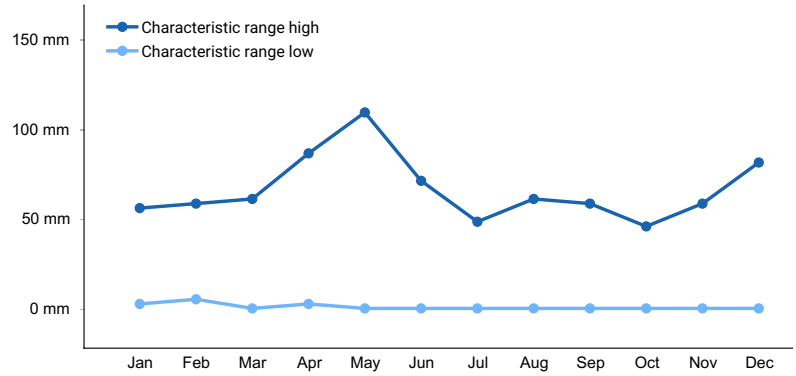


Figure 1. Monthly precipitation range

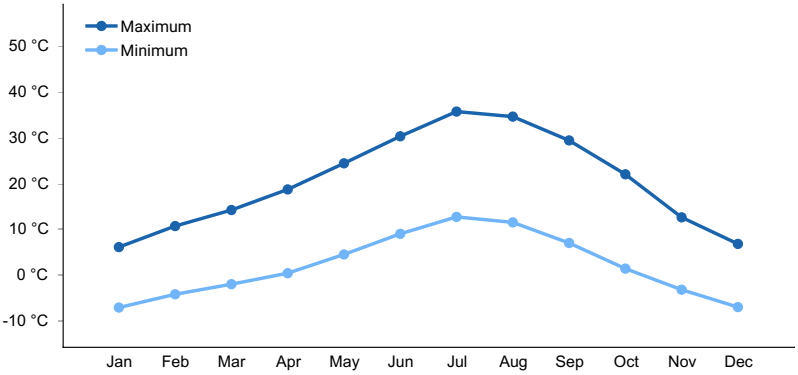


Figure 2. Monthly average minimum and maximum temperature

Influencing water features

There are no influencing water features associated with this site.

Soil features

The soils of this site are very shallow and shallow and well drained. These soils typically have high volumes of coarse fragments through the soil profile. Rock fragments in the profile occupy plant growing space and reduce the potential soil moisture holding capacity. The available water capacity is very low. Runoff is rapid and the potential for sheet and rill erosion is to high. The soil temperature regime is aridic bordering on xeric and the soil moisture regime is mesic. Soil serie correlated to this site includes Puett.

Table 4. Representative soil features

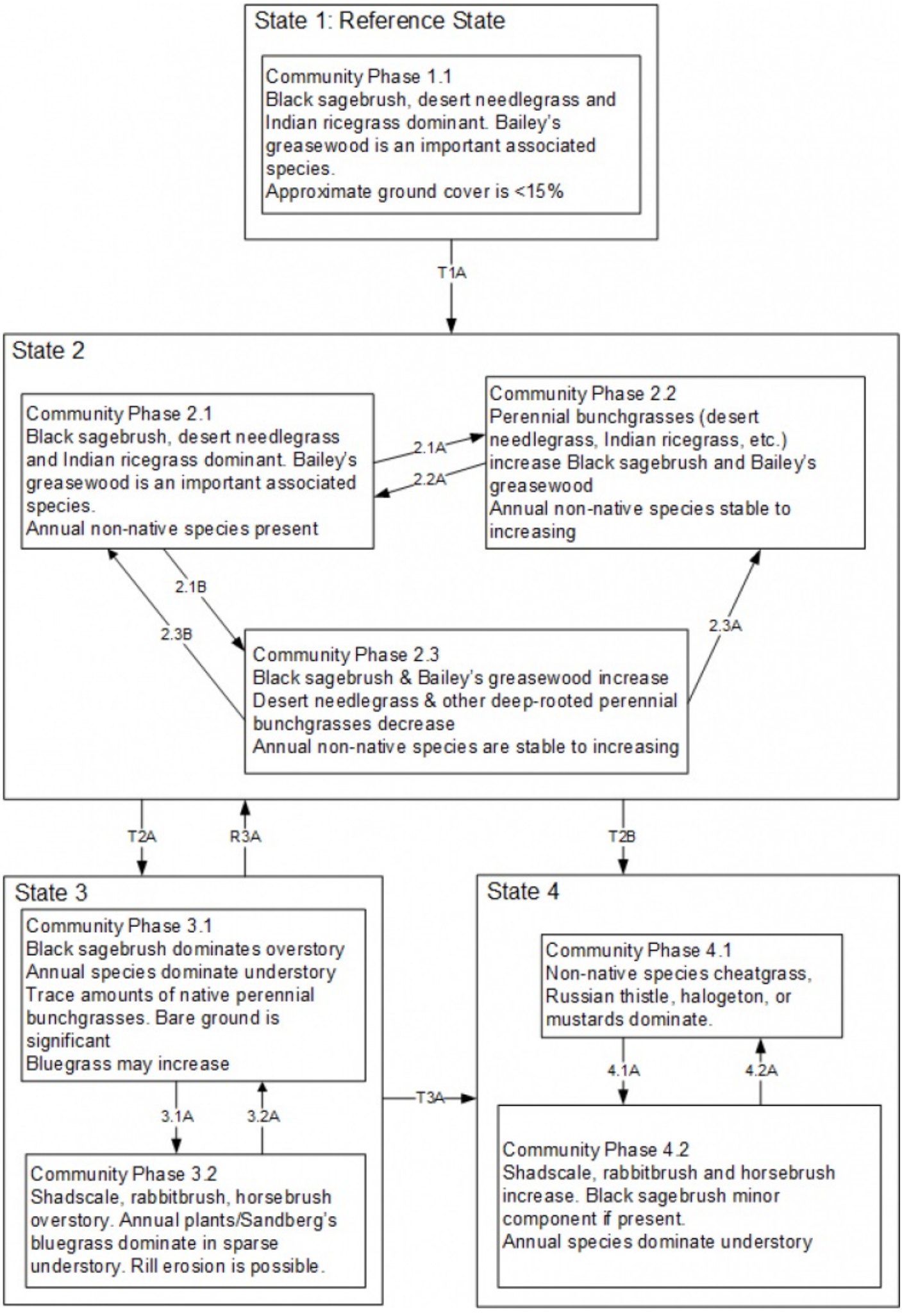
Parent material	(1) Residuum–welded tuff (2) Colluvium–tuff
Surface texture	(1) Very gravelly sandy loam
Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Moderately rapid
Soil depth	10–36 cm
Surface fragment cover <=3"	35–45%
Surface fragment cover >3"	10–30%
Available water capacity (0-101.6cm)	1.27–3.81 cm
Calcium carbonate equivalent (0-101.6cm)	1–5%
Electrical conductivity (0-101.6cm)	0 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0
Soil reaction (1:1 water) (0-101.6cm)	7.9–8.2
Subsurface fragment volume <=3" (Depth not specified)	25–50%
Subsurface fragment volume >3" (Depth not specified)	5–10%

Ecological dynamics

As ecological condition declines, bottlebrush squirreltail increases in the understory as black sagebrush increases and becomes the dominant plant Cheatgrass, Russian thistle, and halogeton are species most likely to invade this site. Following wildfire, shadscale and spiny hopsage (with rabbitbush, horsebrush, and snakeweed) often replace black sagebrush.

Fire Ecology:
Black sagebrush communities generally lack enough fine fuels to carry a fire. In addition to low fine fuel loading, wide shrub spacing makes fire infrequent or difficult to prescribe in black sagebrush types.
Black sagebrush is highly susceptible to fire-caused mortality; plants are readily killed by all fire intensities. Following burning, reestablishment occurs through off-site sources.
Desert needlegrass has persistent dead leaf bases, which make it susceptible to burning. Fire removes the accumulation; a rapid, cool fire will not burn deep into the root crown. Most perennial grasses have root crowns that can survive wildfire.

State and transition model


State 1: Reference State
Community Phase 1.1
Black sagebrush, desert needlegrass and Indian ricegrass dominant. Bailey's greasewood is an important associated species.
Approximate ground cover is <15%
T1A
State 2
Community Phase 2.1
Black sagebrush, desert needlegrass and Indian ricegrass dominant. Bailey's greasewood is an important associated species.
Annual non-native species present
2.1A
2.2A
Community Phase 2.2
Perennial bunchgrasses (desert needlegrass, Indian ricegrass, etc.) increase Black sagebrush and Bailey's greasewood
Annual non-native species stable to increasing
2.1B
2.3B
2.3A
Community Phase 2.3
Black sagebrush & Bailey's greasewood increase
Desert needlegrass & other deep-rooted perennial bunchgrasses decrease
Annual non-native species are stable to increasing
T2A
R3A
T2B
State 3
Community Phase 3.1
Black sagebrush dominates overstory
Annual species dominate understory
Trace amounts of native perennial bunchgrasses. Bare ground is significant
Bluegrass may increase
3.1A
3.2A
Community Phase 3.2
Shadscale, rabbitbrush, horsebrush overstory. Annual plants/Sandberg's bluegrass dominate in sparse understory. Rill erosion is possible.
T3A
State 4
Community Phase 4.1
Non-native species cheatgrass, Russian thistle, halogeton, or mustards dominate.
4.1A
4.2A
Community Phase 4.2
Shadscale, rabbitbrush and horsebrush increase. Black sagebrush minor component if present.
Annual species dominate understory

Reference State 1.0: The Reference State is a representative of the natural range of variability under pristine conditions. 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. Plant community phase changes are primarily driven by fire, periodic drought and/or insect or disease attack.

Community Phase 1.1:
This community is dominated by black sagebrush in the overstory with desert needlegrass and Indian ricegrass dominant in the understory.

T1A: Transition from Reference State 1.0 to Current Potential State 2.0
Trigger: Introduction of non-native annual species.
Slow variables: Over time the annual non-native plants 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 in this state, but the resiliency of the state has been reduced by the presence of invasive species. These non-native species can be highly flammable, and promote fire where historically fire had been infrequent. 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. 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 phase is compositionally similar to Community Phase 1.1 with the presence of non-native species in trace amounts. This community is dominated by black sagebrush and desert needlegrass.
CPP 2.1a: A low severity fire would decrease the overstory of sagebrush and allow the understory perennial grasses to increase. Fires are typically low severity resulting in a mosaic pattern due to low fuel loads. Annual non-native species are likely to increase after fire. Brush treatments with minimal soil disturbance may also reduce the sagebrush overstory and allow an increase in perennial grasses.
CPP 2.1b: Time, absence of disturbance, chronic drought, inappropriate grazing management or combinations of these would allow the sagebrush overstory to increase and dominate the site. Inappropriate grazing management reduces the perennial bunchgrass understory; conversely Sandberg bluegrass may increase in the understory.

Community Phase 2.2: This community phase is characteristic of a post-disturbance, early seral community where annual non-native species are present. Sagebrush is present in trace amounts; perennial bunchgrasses dominate the site. Depending on fire severity patches of intact sagebrush may remain. Rabbitbrush or other sprouting shrubs may be increasing. Annual non-native species are stable or increasing within the community. Annual non-native species generally respond well after fire and may be stable or increasing within the community.
CPP 2.2a: Absence of disturbance over time and/or grazing management that favors the establishment and growth of sagebrush allows the shrub component to recover. The establishment of black sagebrush can take many years.
Community Phase 2.3 (At Risk):
Black sagebrush dominates the overstory and perennial bunchgrasses in the understory are reduced, either from competition with shrubs or from inappropriate grazing, or from both. Rabbitbrush may be a significant component. Sandberg bluegrass may increase and become codominant with deep rooted bunchgrasses. Annual non-native species may be stable or increasing due to lack of competition with perennial bunchgrasses. This site is susceptible to further degradation from grazing, drought, and fire. This community is at risk of crossing a threshold to either Shrub State 3.0 (grazing or fire) or Annual State 4.0 (fire).
CPP 2.3a: Fire will decrease or eliminate the overstory of sagebrush and allow the perennial bunchgrasses to dominate the site. Fires may be high intensity due to the dominance of sagebrush in this phase, resulting in removal of the overstory shrub community. Annual non-native species respond well to fire and may increase post-burn resulting in a transition to the Annual State.

CPP 2.3b: Brush treatments with minimal soil disturbance decrease sagebrush and release the perennial understory. Annual non-native species are present and may increase. A low severity fire would decrease the overstory of sagebrush and allow the understory perennial grasses to increase. Due to low fuel loads in this State, fires will likely be small creating a mosaic pattern. Heavy late-fall/winter grazing may cause mechanical damage to sagebrush promoting the perennial bunchgrass understory.

T2A: Transition from Current Potential State 2.0 to Shrub State 3.0
Trigger: Inappropriate grazing will decrease or eliminate deep rooted perennial bunchgrasses, increase Sandberg bluegrass and favor shrub growth and establishment. Soil disturbing brush treatments and/or inappropriate sheep grazing will reduce sagebrush and potentially increase sprouting shrubs and Sandberg bluegrass.
Slow variables: Long term decrease in deep-rooted perennial grass density and/or black sagebrush.

T2B: Transition from Current Potential State 2.0 to Annual State 4.0
Trigger: Catastrophic or repeated fire or soil surface disturbance.
Slow variables: Increased production and cover of non-native annual species.
Threshold: Loss of deep-rooted perennial bunchgrasses and shrubs changes energy and nutrient capture and cycling both spatially and temporally within the community. Increased, continuous fine fuels modify the fire regime by changing intensity, size and spatial variability of fires.

Shrub State 3.0: This state is characterized by an overstory of black sagebrush and/or other shrubs (shadscale, rabbitbrush, horsebrush, greasewood) with a Sandberg bluegrass understory. The site has crossed a biotic threshold and site processes are being controlled by shrubs. Bare ground has increased and pedestalling of grasses may be excessive.
Community Phase 3.1:
Black sagebrush dominates overstory while Sandberg bluegrass dominates the understory. Deep-rooted perennial bunchgrasses have significantly declined. Annual non-native species may be present. Bare ground and soil redistribution may be increasing. The community phase may be at risk of transitioning into an Annual State.
CPP 3.1a: Fire reduces black sagebrush to trace amounts and allows for sprouting shrubs such as rabbitbrush or spiny hopsage to dominate. Shadscale may also establish/become dominate post-fire. Inappropriate or excessive sheep grazing could also reduce cover of sagebrush and allow shadscale or sprouting shrubs to dominate the community. Brush treatments with minimal soil disturbance would facilitate sprouting shrubs and Sandberg bluegrass.
Community Phase 3.2 (At Risk):
Shadscale and/or rabbitbrush dominate the overstory. Broom snakeweed may be present to increasing. Annual non-native species may be increasing and bare ground is significant. This site is at risk for an increase in invasive annual weeds.

T3B: Transition from Shrub State 3.0 to Annual State 4.0
Trigger: Fire or treatments that disturb the soil and existing plant community (ex: failed restoration attempts).
Slow variables: Increased seed production and cover of annual non-native 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 and impact the nutrient cycling and distribution.

Annual State 4.0: This state is characterized by the dominance of annual nonnative species such as cheatgrass, tansy mustard, halogeton and/or Russian thistle. Sagebrush, horsebrush and/or rabbitbrush may be present, but are not contributing to ecological function. Annual species are controlling ecological site function including nutrient and water resources.
Community Phase 4.1:
Annual non-native species characterize this community phase. This phase may also have seeded species present if resulting from a failed seeding attempt.
Community Phase Pathway 4.1a: Time, natural regeneration and lack of disturbance. Occurrence of this pathway is unlikely.
Community Phase 4.2: Rabbitbrush, horsebrush, spiny hopsage and/or shadscale. Trace amounts of black sagebrush in the overstory with annual non-native species, likely cheatgrass, dominating the understory. Trace amounts of desirable bunchgrasses may be present.
Community Phase Pathway 4.2a: Fire removed shrubs & allows annual non-native species to dominate site

State 1
Reference State

Community 1.1
Reference Plant Community

The reference plant community is dominated by black sagebrush, desert needlegrass, and Indian ricegrass. Potential vegetative composition is about 50% grasses, 5% forbs and 45% shrubs. Approximate ground cover (basal and crown) is less than 15 percent.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	56	140	224
Shrub/Vine	50	127	202
Forb	6	13	28
Total	**112**	**280**	**454**

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**			99–141	
	desert needlegrass	ACSP12	*Achnatherum speciosum*	71–99	–
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	28–43	–
2	**Secondary Perennial Grasses**			6–22	
	squirreltail	ELEL5	*Elymus elymoides*	1–8	–
	needle and thread	HECO26	*Hesperostipa comata*	1–8	–
	James' galleta	PLJA	*Pleuraphis jamesii*	1–8	–
	Sandberg bluegrass	POSE	*Poa secunda*	1–8	–
Forb					
3	**Perennial Forbs**			6–22	
	milkvetch	ASTRA	*Astragalus*	1–8	–
	buckwheat	ERIOG	*Eriogonum*	1–8	–
	globemallow	SPHAE	*Sphaeralcea*	1–8	–
	princesplume	STANL	*Stanleya*	1–8	–
Shrub/Vine					
4	**Primary Shrubs**			90–140	
	black sagebrush	ARNO4	*Artemisia nova*	84–112	–
5	**Secondary Shrubs**			15–43	
	shadscale saltbush	ATCO	*Atriplex confertifolia*	1–8	–
	yellow rabbitbrush	CHVI8	*Chrysothamnus viscidiflorus*	1–8	–
	Nevada jointfir	EPNE	*Ephedra nevadensis*	1–8	–
	spiny hopsage	GRSP	*Grayia spinosa*	1–8	–
	winterfat	KRLA2	*Krascheninnikovia lanata*	1–8	–
	littleleaf horsebrush	TEGL	*Tetradymia glabrata*	1–8	–

Animal community

Livestock Interpretations:
This site is suitable for livestock grazing. Grazing management should be keyed to perennial grass and palatable shrub production. Young desert needlegrass is palatable to all classes of livestock. Mature herbage is moderately grazed by horses and cattle, but rarely grazed by sheep.
In winter, at lower elevations, black sagebrush is heavily utilized by domestic sheep.

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:
Black sagebrush is a significant browse species within the Intermountain region. It is especially important on low elevation winter ranges in the southern Great Basin, where extended snow free periods allow animal’s access to plants throughout most of the winter. In these areas it is heavily utilized by pronghorn and mule deer.
Young desert needlegrass is palatable to many species of wildlife. Desert needlegrass produces considerable basal foliage and is good forage while young. Desert bighorn sheep graze desert needlegrass.

Hydrological functions

Runoff is high.

Recreational uses

Aesthetic value is derived from the diverse floral and faunal composition and the colorful flowering of wild flowers and shrubs during the spring and early summer. This site offers rewarding opportunities to photographers and for nature study. This site is used for camping and hiking and has potential for upland and big game hunting.

Other information

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

Inventory data references

NASIS soil component data.

Type locality

Location 1: Mineral County, NV	
Township/Range/Section	T9N R34E S26
General legal description	North of Luning, about 7 miles northwest of NvHwy 23 (Skidue turnoff), Gabbs valley Range, Mineral County, Nevada. This site also occurs in Churchill, Lyon, Pershing and Storey 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)	
Contact for lead author	
Date	10/20/2024
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:**

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

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

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

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

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

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

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:

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

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

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

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:**

17. **Perennial plant reproductive capability:**