USDA Natural Resources Conservation Service

Ecological site R027XY093NV
STONY TERRACE 4-8 P.Z.

Last updated: 6/03/2024
Accessed: 05/12/2025

General information

Provisional. A provisional ecological site description has undergone quality control and quality assurance review. It contains a working state and transition model and enough information to identify the ecological site.

MLRA notes

Major Land Resource Area (MLRA): 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 Stony Terrace 4-8 P.Z. site occurs on lake terraces associated with Lake Lahontan and other Pleistocene lakes. Slopes range from 4 to 15 percent. Elevations are 4100 to 4400 feet. The soils are very shallow to very deep and well drained. The soil surface is extremely cobbly. The site is moist for short periods in winter and early spring and dry in late spring through early fall.

Associated sites

R027XY018NV	**GRAVELLY LOAM 4-8 P.Z.** Found on associated fan remnants, alluvial fans, fan skirts, and lake terraces

Similar sites

R027XY015NV	**STONY LOAM 4-8 P.Z.** SAVEB-ATCO dominant shrubs
R027XY017NV	**SOUTH SLOPE 4-8 P.Z.** ATCO dominant shrub.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Ephedra nevadensis*
Herbaceous	(1) *Achnatherum speciosum*

Physiographic features

The Stony Terrace 4-8 P.Z. site occurs on lake terraces associated with Lake Lahontan and other Pleistocene lakes. Slopes range from 4 to 15 percent. Elevations are 4100 to 4400 feet.

Table 2. Representative physiographic features

Landforms	(1) Lake terrace
Runoff class	Negligible to high
Elevation	4,100–4,400 ft
Slope	4–15%
Water table depth	72 in
Aspect	Aspect is not a significant factor

Climatic features

The climate is arid with cool, moist winters and hot, dry summers. Average annual precipitation is 4 to 6 (8) inches. Mean annual air temperature is 52 to 54 degrees F. The average growing season is about 120 to 140 days.

Table 3. Representative climatic features

Frost-free period (average)	140 days
Freeze-free period (average)	
Precipitation total (average)	8 in

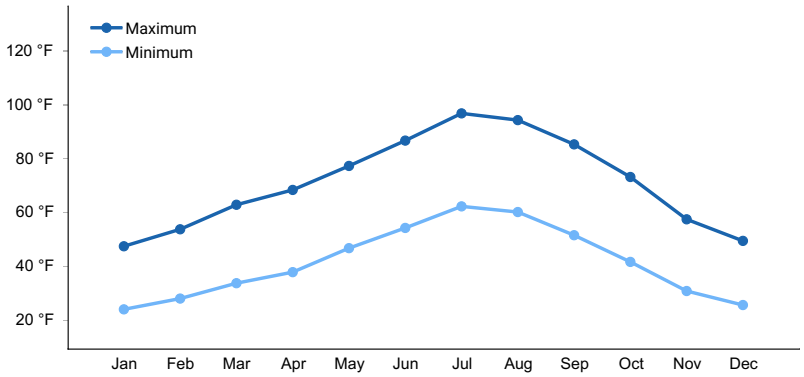


Figure 1. Monthly average minimum and maximum temperature

Influencing water features

There are no influencing water features associated with this site.

Soil features

The soils associated with this site are very shallow and well drained. The soils are formed in lacustrine deposits derived from mixed rocks and tufa deposits. The soil surface is extremely cobbly. Available water capacity is very low. The soils are moist for short periods in winter and early spring and dry in late spring through early fall. The moisture regime is typic aridic and the temperature regime is mesic. Runoff is high and permeability is rapid in the upper part of the profile and very slow in the lower part.
Soils correlated to this ecological site include Jacaranda and Inmo.

Table 4. Representative soil features

Parent material	(1) Alluvium–granite (2) Alluvium–tufa (3) Alluvium
Surface texture	(1) Extremely cobbly loamy sand
Family particle size	(1) Sandy
Drainage class	Well drained
Permeability class	Rapid
Soil depth	3–10 in
Surface fragment cover <=3"	30–35%
Surface fragment cover >3"	50–55%
Available water capacity (0-40in)	0.1–0.2 in
Calcium carbonate equivalent (0-40in)	1–5%

Electrical conductivity (0-40in)	1–5 mmhos/cm
Sodium adsorption ratio (0-40in)	1–5
Soil reaction (1:1 water) (0-40in)	8.4–9
Subsurface fragment volume <=3" (Depth not specified)	30–35%
Subsurface fragment volume >3" (Depth not specified)	30–35%

Ecological dynamics

Nevada ephedra is drought tolerant and requires approximately 5 inches of annual precipitation. Nevada ephedra occurs in both recently disturbed (6-12 years post-disturbance) and undisturbed desert communities. It reproduces both vegetatively and by seed.
Nevada ephedra leafs out in early to late spring and in September after summer rains. It forms buds in early spring, and cones open from March through May, though lack of available soil moisture may inhibit cone production. Seed matures in early summer. Nevada ephedra is physiologically inactive during hot summer months.

Desert needlegrass is a stress-tolerant ruderal and reproduces both vegetatively and by seed. Indian ricegrass typically reproduces by seed. In disturbed areas, desert needlegrass and Indian ricegrass seedlings may be the first perennials to appear.

These deep-rooted native perennial grasses and shrubs optimize infiltration and runoff.

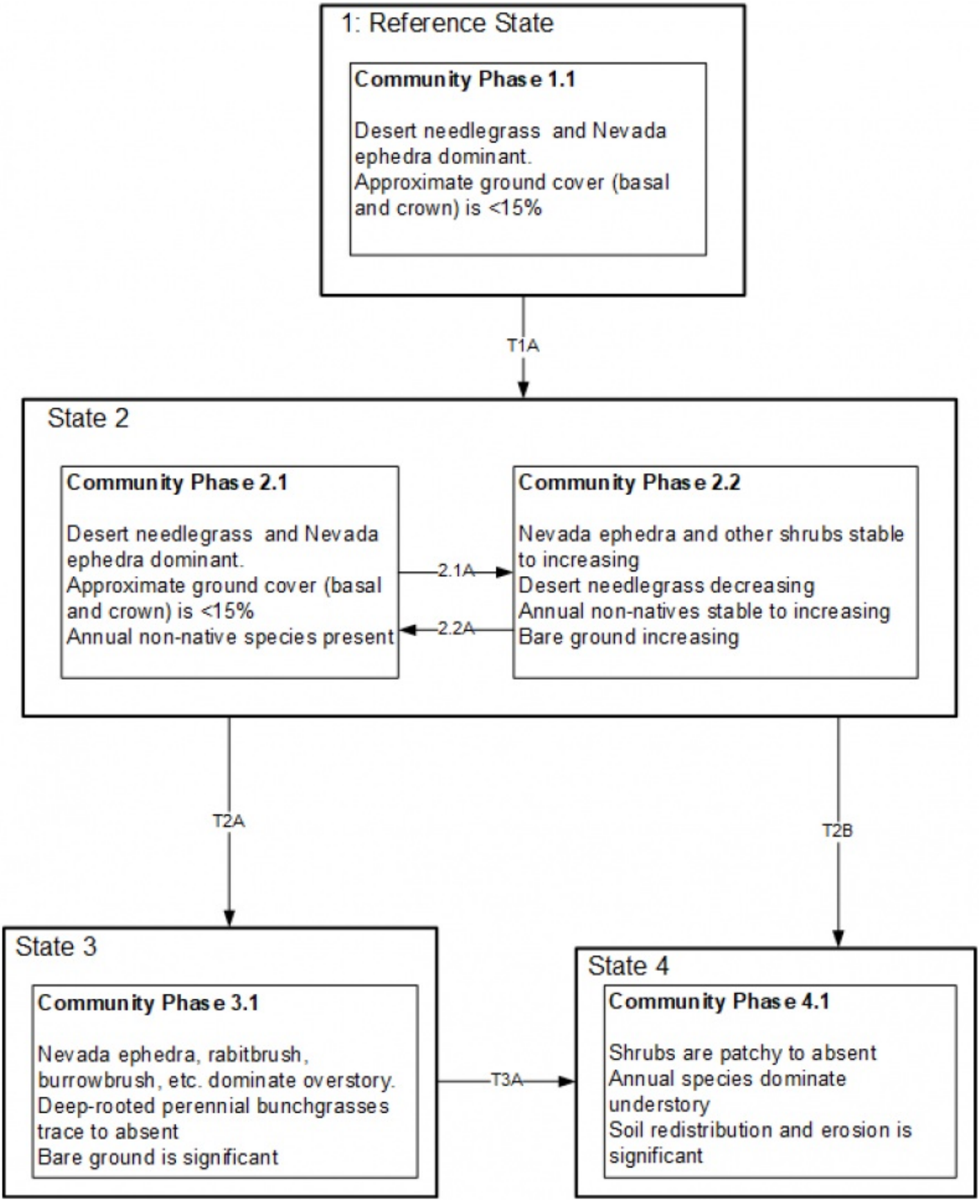
Fire Ecology: Most plant communities in which Nevada ephedra commonly occurs historically experienced stand-replacement fire regimes. Desert shrub types and desert grassland communities had fire intervals of 35 to <100 years. Fires may not carry on some Nevada ephedra sites due to insufficient fuels. After wildfire, cheatgrass can dominate the plant community. The species most likely to invade this site are cheatgrass and Russian thistle.

Nevada ephedra generally sprouts after fire damages aboveground vegetation. Underground regenerative structures commonly survive when aboveground vegetation is consumed by fire. However, severe fires may kill shallowly buried regenerative structures.

Desert needlegrass has persistent dead leaf bases, which make it susceptible to burning. Fire removes the accumulation and a rapid, cool fire will not burn deep into the root crown.

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.

State and transition model



Reference State: 1.0

State 1.0 is representative of the natural range of variability under pristine conditions. The site is dominated by deep-rooted cool season, perennial bunchgrasses and drought tolerant shrubs with high root to shoot ratios. 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 are primarily driven by drought. Wet years will increase grass production, while drought years will reduce production. Shrub production will also increase during wet years; however, extreme growing season wet periods has been shown to cause shadscale death. Fire is rare and not a important driver in this community.

Community Phase 1.1:
Community phase 1.1 is stable and long-lived. It is dominated by desert needlegrass. Associated shrubs include spiny hopsage, littleleaf horsebrush, Nevada ephedra and Anderson's wolfberry. 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 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 State Community Phase 1.1 with the presence of non-native species in trace amounts. It is dominated by desert needlegrass. Associated shrubs include spiny hopsage, littleleaf horsebrush, Nevada ephedra and Anderson's wolfberry. 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: Long-term drought and/or excessive growing season grazing favor shrubs over perennial bunchgrass.

Community Phase 2.2:
Desert needlegrass and other perennial grasses decrease, shrubs are increasing. Bare ground increases along with non-native annuals. Prolonged drought may lead to an overall decline in the plant community. Prolonged wet periods will decrease the shadscale component.
Community Phase Pathway 2.2a: Release from drought and/or appropriate grazing management that facilitates an increase in perennial grasses and desirable shrub species.

T2A: Transition from Current Potential State 2.0 to Shrub State 3.0:
Trigger: Long-term inappropriate grazing and/or long-term drought will decrease or eliminate deep rooted perennial bunchgrasses and favor shrub growth and establishment.
Slow variables: Long term decrease in deep-rooted perennial grass density.
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.

Shrub State 3.0: This state has one community phase that is characterized by shrubs 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, nutrient capture, nutrient cycling and soil organic matter are temporally and spatially redistributed. Bare ground has increased.
Community Phase 3.1:
Decadent shrubs, spiny hopsage, littleleaf horsebrush, Nevada ephedra and/or Anderson's wolfberry, dominate the overstory. Rabbitbrush and/or other sprouting shrubs may be a significant component. Deep-rooted perennial bunchgrasses may be present in trace amounts or absent from the community. Annual nonnative species increase. Bare ground is significant.

T3A: Transition from Shrub State 3.0 to Annual State 4.0:
Trigger: Fire and/or soil disturbing treatments such as drill seeding and plowing. 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: 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

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

Annual State 4.0: In this state, a biotic threshold has been crossed and state dynamics are driven by the dominance and persistence of the annual plant community 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. Resiliency has declined and further degradation from fire facilitates a cheatgrass and sprouting shrub plant community. The fire return interval has shortened due to the dominance of cheatgrass in the understory and is a driver in site dynamics.

Community Phase 4.1:
This community is dominated by annual non-native species. Sprouting shrubs maybe be present in patches but are not contributing to site function. Annual non-native species dominated the understory. Bare ground may be abundant, especially during low precipitation years. Soil erosion from wind and soil temperature are driving factors in site function.

State 1
Reference Plant Community

Community 1.1
Reference Plant Community

The reference plant community is dominated by Nevada ephedra and desert needlegrass. Potential vegetative composition is about 45 percent grasses, 10 percent forbs, and 45 percent shrubs. Approximate ground cover (basal and crown) is less than 15 percent.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	45	90	158
Shrub/Vine	45	90	157
Forb	10	20	35
Total	**100**	**200**	**350**

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**			74–100	
	desert needlegrass	ACSP12	*Achnatherum speciosum*	70–90	–
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	4–10	–
2	**Secondary Perennial Grasses**			1–10	
	squirreltail	ELEL5	*Elymus elymoides*	1–4	–
	needle and thread	HECO26	*Hesperostipa comata*	1–4	–
	Sandberg bluegrass	POSE	*Poa secunda*	1–4	–
Forb					
3	**Perennial**			4–16	
	globemallow	SPHAE	*Sphaeralcea*	1–4	–
4	**Annual**			1–20	
Shrub/Vine					
5	**Primary Shrubs**			60–80	
	Nevada jointfir	EPNE	*Ephedra nevadensis*	60–80	–
6	**Secondary Shrubs**			10–30	
	rabbitbrush	CHRYS9	*Chrysothamnus*	2–6	–
	spiny hopsage	GRSP	*Grayia spinosa*	2–6	–
	burrobrush	HYSA	*Hymenoclea salsola*	2–6	–
	desert pepperweed	LEFR2	*Lepidium fremontii*	2–6	–
	Nevada dalea	PSPO	*Psorothamnus polydenius*	1–6	–
	littleleaf horsebrush	TEGL	*Tetradymia glabrata*	2–6	–

Animal community

Livestock Interpretations:
This site is suitable for livestock grazing. Nevada ephedra is important winter browse for domestic cattle, sheep and goats. Desert needlegrass produces considerable basal foliage and is good forage while young. Young desert needlegrass is palatable to all classes of livestock. Mature herbage is moderately grazed by horses and cattle but rarely grazed by sheep. 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.

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:
Mule deer, bighorn sheep, and pronghorn browse Nevada ephedra, especially in spring and late summer when new growth is available. The seeds are a valuable food source for small mammals, small nongame birds and upland game birds.
Nevada ephedra also provides good cover for small mammals; fair cover for pronghorn, small nongame birds, and upland game birds; and poor cover for game animals and waterfowl.

Hydrological functions

Runoff is high. Permeability is rapid in the upper part of the profile and very slow in the lower part.

Other products

Native Americans used Nevada ephedra as a tea to treat stomach and kidney ailments.
Indian ricegrass was traditionally eaten by some Native Americans. The Paiutes used seed as a reserve food source.

Other information

Nevada ephedra is useful for erosion control, and seedlings have been successfully planted onto reclaimed strip mines. Atrazine may be effective in controlling Nevada ephedra, though some plants can survive through crown sprouting. Irrigation may increase control by atrazine.
Desert needlegrass seeds are easily germinated and have potential for commercial use. Desert needlegrass may be used for groundcover in areas of light disturbance, but it is susceptible to excessive trampling.

Inventory data references

NASIS soil component data.

Type locality

Location 1: Mineral County, NV	
Township/Range/Section	T11N R29E S6
Latitude	38° 50′ 29″
Longitude	118° 46′ 41″
General legal description	Northwest of Walker Lake on the Walker River Indian Reservation, Mineral County, Nevada. This site also occurs in Pershing County, 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

P Novak-Echenique

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)	P.Novak-Echenique
Contact for lead author	State Rangeland Management Specialist
Date	01/20/2008
Approved by	Kendra Moseley

Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** Rills are none.

2. **Presence of water flow patterns:** Water flow patterns are rare. Flow patterns short and stable.

3. **Number and height of erosional pedestals or terracettes:** Pedestals are rare with occurrence typically limited to areas within water flow patterns.

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Bare Ground 10-15%

5. **Number of gullies and erosion associated with gullies:** None

6. **Extent of wind scoured, blowouts and/or depositional areas:** None

7. **Amount of litter movement (describe size and distance expected to travel):** Fine litter (foliage from grasses and annual & perennial forbs) expected to move 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 1 to 3 on most 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 soils are typified by an ochric epipedon. Organic carbon of the surface 2 to 3 inches is less than 1 percent.

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Perennial grass and shrub canopies and associated litter break raindrop impact. Loamy sand surface textures have rapid permeability and high surface 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 present.

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: Desert shrubs (Nevada ephedra, spiny hopsage, Anderson wolfberry, etc.) >> deep-rooted, cool season, bunchgrasses

    Sub-dominant: Rhizomatous shallow-rooted, perennial bunchgrasses = associated, tall-statured, shrubs > deep-rooted, perennial forbs = fibrous, shallow-rooted, perennial forbs = annual forbs.

    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 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):** Between plant interspaces (<5%) and depth (±¼-inch)

---

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]) ± 200lbs/ac; Spring moisture significantly affects total 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:** Douglas rabbitbrush, horsebrush, and burrobrush are increasers on this site. Russian thistle, annual mustards, and cheatgrass are invaders on this site.

---

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

---