USDA Natural Resources Conservation Service

# Ecological site R026XY039NV
# CLAYPAN 14+ P.Z.

Last updated: 4/10/2024
Accessed: 05/13/2025

## 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): 026X–Carson Basin and Mountains

The area lies within western Nevada and eastern California, with about 69 percent being within Nevada, and 31 percent being within California. Almost all this area is in the Great Basin Section of the Basin and Range Province of the Intermontane Plateaus. Isolated north-south trending mountain ranges are separated by aggraded desert plains. The mountains are uplifted fault blocks with steep side slopes. Most of the valleys are drained by three major rivers flowing east across this MLRA. A narrow strip along the western border of the area is in the Sierra Nevada Section of the Cascade-Sierra Mountains Province of the Pacific Mountain System. The Sierra Nevada Mountains are primarily a large fault block that has been uplifted with a dominant tilt to the west. This structure leaves an impressive wall of mountains directly west of this area. This helps create a rain shadow affect to MLRA 26. Parts of this eastern face, but mostly just the foothills, mark the western boundary of this area. Elevations range from about 3,806 feet (1,160 meters) on the west shore of Pyramid Lake to 11,653 feet (3,552 meters) on the summit of Mount Patterson in the Sweetwater Mountains.

Valley areas are dominantly composed of Quaternary alluvial deposits with Quaternary playa or alluvial flat deposits often occupying the lowest valley bottoms in the internally drained valleys, and river deposited alluvium being dominant in externally drained valleys. Hills and mountains are dominantly Tertiary andesitic flows, breccias, ash flow tuffs, rhyolite tuffs or granodioritic rocks. Quaternary basalt flows are present in lesser amounts, and Jurassic and Triassic limestone and shale, and Precambrian limestone and dolomite are also present in very limited amounts. Also of limited extent are glacial till deposits along the east flank of the Sierra Nevada Mountains, the result of alpine glaciation.

The average annual precipitation in this area is 5 to 36 inches (125 to 915 millimeters), increasing with elevation. Most of the rainfall occurs as high-intensity, convective storms in spring and autumn. Precipitation is mostly snow in winter. Summers are dry. The average annual temperature is 37 to 54 degrees F (3 to 12 degrees C). The freeze-free period averages 115 days and ranges from 40 to 195 days, decreasing in length with elevation.

The dominant soil orders in this MLRA are Aridisols and Mollisols. The soils in the area dominantly have a mesic soil temperature regime, an aridic or xeric soil moisture regime, and mixed or smectitic mineralogy. They generally are well drained, are clayey or loamy and commonly skeletal, and are very shallow to moderately deep.

This area supports shrub-grass vegetation characterized by big sagebrush. Low sagebrush and Lahontan sagebrush occur on some soils. Antelope bitterbrush, squirreltail, desert needlegrass, Thurber needlegrass, and Indian ricegrass are important associated plants. Green ephedra, Sandberg bluegrass, Anderson peachbrush, and several forb species also are common. Juniper-pinyon woodland is typical on mountain slopes. Jeffrey pine, lodgepole pine, white fir, and manzanita grow on the highest mountain slopes. Shadscale is the typical plant in the drier parts of the area. Sedges, rushes, and moisture-loving grasses grow on the wettest parts of the wet flood plains and terraces. Basin wildrye, alkali sacaton, saltgrass, buffaloberry, black greasewood, and rubber rabbitbrush grow on the drier sites that have a high concentration of salts.

Some of the major wildlife species in this area are mule deer, coyote, beaver, muskrat, jackrabbit, cottontail, raptors, pheasant, chukar, blue grouse, mountain quail, and mourning dove. The species of fish in the area include trout and catfish. The Lahontan cutthroat trout in the Truckee River is a threatened and endangered species.

## LRU notes

The Sierra Influenced Ranges LRU is characterized by wooded great basin mountains with climatic and biotic affinities to the Sierra Nevada mountain range. The Sierra Influences Ranges LRU receives greater precipitation that the mountain ranges of central NV. Amount of precipitation varies in relation to the local strength of the Sierra NV rain shadow, characterized by pinyon and juniper trees. The White, Sweetwater, Pine Nut, Wassuk, and Virginia ranges of Nevada support varying amounts of Sierra Nevada flora, such as ponderosa pine. Elevations range from 1610 to 2420 meters and slopes range from 5 to 49 percent, with a median value of 22 percent. Frost free days (FFD) ranges from 92 to 163.

## Ecological site concept

This site occurs on mountain summits and plateaus on all exposures. Slopes range from 4 to 50 percent. Elevations are over 7,800 feet. The soils is moderately deep granitic bedrock. The surface soil texture is very gravelly fine sandy loam, very cobbly loam, or extremely gravelly coarse sandy loam.

## Associated sites

| | |
|---|---|
| R026XY028NV | **MOUNTAIN RIDGE** |
| R026XY038NV | **LOAMY SLOPE 14+ P.Z.** |
| R026XY052NV | **SHALLOW LOAM 16+ P.Z.** |
| R026XY056NV | **SOUTH SLOPE 16+ P.Z.** |
| R026XY058NV | **ALPINE RIDGE** |

## Similar sites

| | |
|---|---|
| R026XY028NV | **MOUNTAIN RIDGE**<br>ACPI2 dominant grass; less productive site |
| R026XY090NV | **SCABLAND 10-14 P.Z.**<br>POSE dominant grass; less productive site |
| R026XY058NV | **ALPINE RIDGE**<br>Higher elevations; POA and KOMA dominant grasses; ARAR8 rare to mostly absent |
| R026XY023NV | **CLAYPAN 10-12 P.Z.**<br>ACTH7 dominant grass; lower elevations |

**Table 1. Dominant plant species**

| | |
|---|---|
| Tree | Not specified |
| Shrub | (1) *Artemisia arbuscula* |
| Herbaceous | (1) *Achnatherum lettermanii*<br>(2) *Poa* |

## Physiographic features

This site occurs on mountain summits and platueas on all exposures. Slopes range from 4 to 50 percent. Elevations are over 7,800.

**Table 2. Representative physiographic features**

| | |
|---|---|
| Landforms | (1) Mountain slope<br>(2) Plateau |

| | |
|---|---|
| Elevation | 2,377–3,353 m |
| Slope | 4–50% |
| Ponding depth | 0 cm |
| Aspect | Aspect is not a significant factor |

## Climatic features

The climate associated with this site is subhumid with cool, dry summers and cold, wet winters. Average annual precipitation is 14 to over 20 inches. Mean annual air temperature is 39 to 52 degrees F. The average growing season is about 50 to 130 days. Climate data used to support this section were derived from PRISM and is not specifically tied to any dominant climate station.

Nevada’s climate is predominantly arid, with large daily ranges of temperature, infrequent severe storms, heavy snowfall in the higher mountains, and great location variations with elevation. Three basic geographical factors largely influence Nevada’s climate: continentality, latitude, and elevation. Continentality is the most important factor. The strong continental effect is expressed in the form of both dryness and large temperature variations. Nevada lies on the eastern, lee side of the Sierra Nevada Range, a massive mountain barrier that markedly influences the climate of the State. The prevailing winds are from the west, and as the warm moist air from the Pacific Ocean ascend the western slopes of the Sierra Range, the air cools, condensation occurs and most of the moisture falls as precipitation. As the air descends the eastern slope, it is warmed by compression, and very little precipitation occurs. The effects of this mountain barrier are felt not only in the West but throughout the state, with the result that the lowlands of Nevada are largely desert or steppes. The temperature regime is also affected by the blocking of the inland-moving maritime air. Nevada sheltered from maritime winds, has a continental climate with well-developed seasons and the terrain responds quickly to changes in solar heating.

Nevada lies within the mid-latitude belt of prevailing westerly winds which occur most of the year. These winds bring frequent changes in weather during the late fall, winter and spring months, when most of the precipitation occurs. To the south of the mid-latitude westerlies, lies a zone of high pressure in subtropical latitudes, with a center over the Pacific Ocean. In the summer, this high-pressure belt shifts northward over the latitudes of Nevada, blocking storms from the ocean. The resulting weather is mostly clear and dry during the summer and early fall, with scattered thundershowers. The eastern portion of the state receives significant summer thunderstorms generated from monsoonal moisture pushed up from the Gulf of California, known as the North American monsoon. The monsoon system peaks in August and by October the monsoon high over the Western U.S. begins to weaken and the precipitation retreats southward towards the tropics (NOAA 2004).

**Table 3. Representative climatic features**

| | |
|---|---|
| Frost-free period (characteristic range) | |
| Freeze-free period (characteristic range) | |
| Precipitation total (characteristic range) | 356-508 mm |
| Frost-free period (average) | 90 days |
| Freeze-free period (average) | |
| Precipitation total (average) | 406 mm |

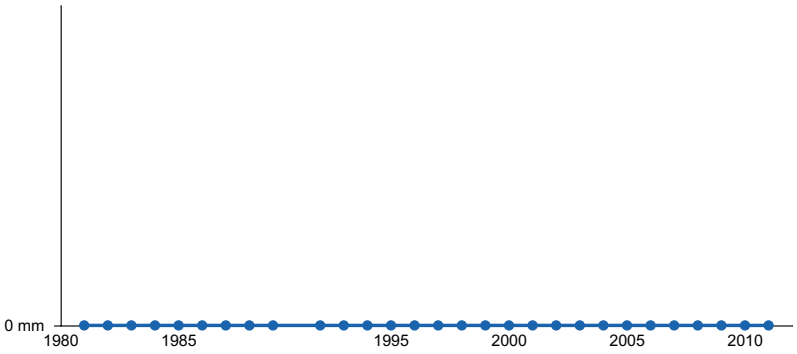



**Figure 1. Annual precipitation pattern**

## Influencing water features

There are no influencing water features associated with this site.

## Soil features

The soils associated with this site are moderately deep to very deep with heavy textured, skeletal subsoils. The clay subsoils (argillic horizon) restrict most roots and available moisture to the surface layer. Parent material is derived from colluvium and residuum from granitic rock sources. The soils have argillic horizons and mollic epipedons. The soil moisture regime is xeric and the soil temperature regime is frigid and cryic. Soil series associated with this site include Devils, Granmount, Rockabin, and Tagum.

A representative soil series is Granmount, a clayey-skeletal, mixed, superactive Xeric Argicryolls. A mollic epipedon occurs from the soil surface to 25 cm and an argillic horizon occurs from 25 to 157 cm.

**Table 4. Representative soil features**

| | |
|---|---|
| Parent material | (1) Residuum–granite<br>(2) Colluvium–granite |
| Surface texture | (1) Extremely gravelly coarse sandy loam<br>(2) Very gravelly fine sandy loam<br>(3) Very cobbly loam |
| Family particle size | (1) Clayey-skeletal<br>(2) Loamy-skeletal |
| Drainage class | Well drained |
| Permeability class | Slow to moderately rapid |
| Soil depth | 51–99 cm |
| Surface fragment cover <=3" | 16–60% |
| Surface fragment cover >3" | 0–22% |
| Available water capacity (0-101.6cm) | 2.03–8.89 cm |
| Calcium carbonate equivalent (0-101.6cm) | 0% |
| Electrical conductivity (0-101.6cm) | 0–2 mmhos/cm |
| Sodium adsorption ratio (0-101.6cm) | 0 |
| Soil reaction (1:1 water) (0-101.6cm) | 6.1–7.8 |

| | |
|---|---|
| Subsurface fragment volume <=3" (Depth not specified) | 15–56% |
| Subsurface fragment volume >3" (Depth not specified) | 0–21% |

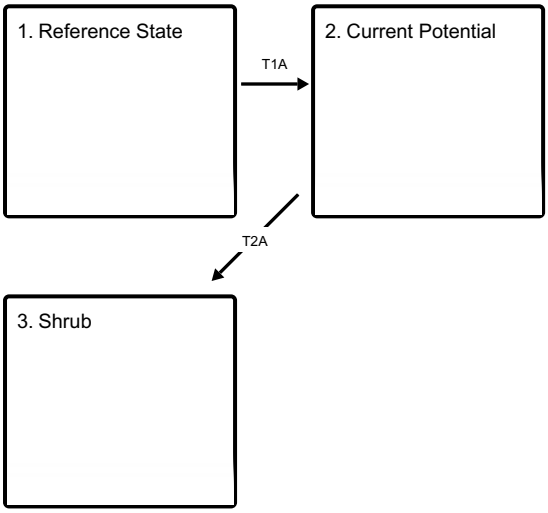
## Ecological dynamics

As ecological condition declines, low sagebrush and Douglas' rabbitbrush will increase.

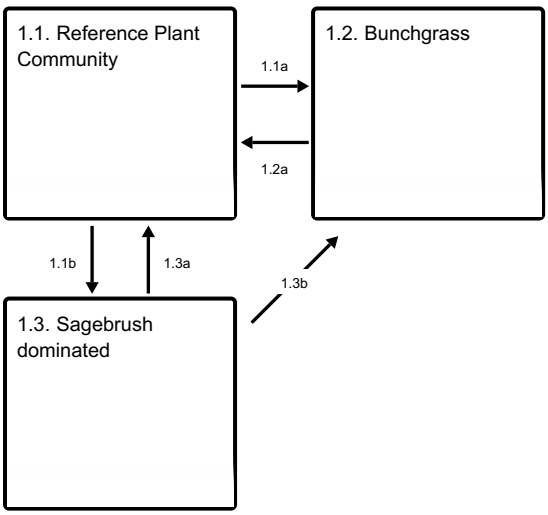
Fire Ecology:
Prior to 1897, mean fire return intervals for low sagebrush communities have been estimated to be from 35 to over 100 years. Fire most often occurs during wet years with high forage production. Low sagebrush is very susceptible to fire damage. Low sagebrush is usually killed by fire and does not re-sprout. The recovery in burned areas is usually via small, light, wind-dispersed seed for all low sagebrush subspecies. Partially injured low sagebrush may re-grow from living branches, but sprouting does not occur.
Little specific information is available on adaptations of Letterman's needlegrass to fire. It is morphologically similar to Columbia needlegrass, which is only slightly to moderately damaged by fire. Season of burn affects the plant's ability to survive a fire. Post fire regeneration is through seeding and tillering.
Prairie junegrass is reported as showing little or no damage to moderate damage from fire. The small stature of prairie junegrass and coarse textured foliage aid in protection of these meristimatic tissue areas. Possessing coarsely textured foliage and a small clump size also limits the potential for fire damage.

## State and transition model

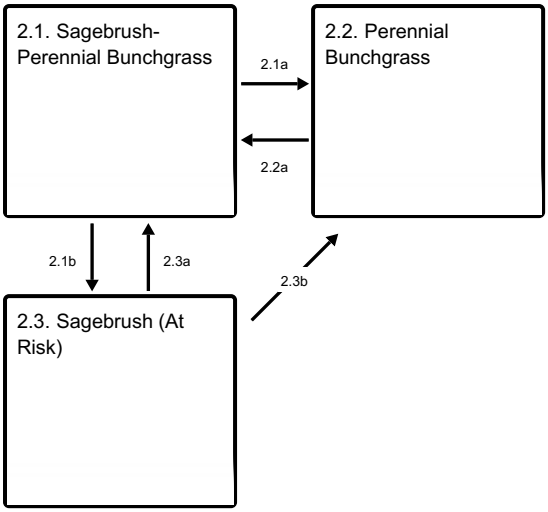
**Ecosystem states**



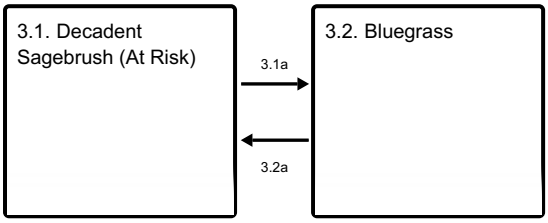

**State 1 submodel, plant communities**



**State 2 submodel, plant communities**




**State 3 submodel, plant communities**




## State 1
## Reference State

The Reference State 1.0 is a representative of the natural range of variability under pristine conditions. The reference state has three general community phases: a shrub-grass dominant phase, a perennial 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. Plant community phase changes are primarily driven by fire, periodic drought and/or insect or disease attack.

## Community 1.1
## Reference Plant Community

The reference plant community is dominated by low sagebrush, Letterman's needlegrass, bluegrasses and prairie junegrass. Potential vegetative composition is about 50% grasses, 15% forbs, and 35% shrubs. Approximate ground cover (basal and crown) is 15 to 30 percent.

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

| Plant Type | Low (Kg/Hectare) | Representative Value (Kg/Hectare) | High (Kg/Hectare) |
|---|---|---|---|
| Grass/Grasslike | 84 | 168 | 280 |
| Shrub/Vine | 59 | 118 | 196 |
| Forb | 25 | 50 | 84 |
| **Total** | **168** | **336** | **560** |

## Community 1.2
## Bunchgrass

This community phase is characteristic of a post-disturbance, early to mid-seral community where annual non-native species are present. Sagebrush is present in trace amounts; perennial bunchgrasses and forbs dominate the

site. Depending on fire severity, patches of intact sagebrush may remain. Rabbitbrush may be sprouting or dominant in the community. Perennial forbs may be a significant component for a number of years following fire.

### Community 1.3
### Sagebrush dominated

This community is at risk of crossing a threshold to another state. 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. Bluegrasses may increase and become dominant. 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.

### Pathway 1.1a
### Community 1.1 to 1.2

Fire reduces the shrub overstory and allows for perennial bunchgrasses to dominate the site. Fires are typically low severity resulting in a mosaic pattern due to low fuel loads. A fire following an unusually wet spring or a change in management favoring an increase in fine fuels may be more severe and reduce sagebrush cover to trace amounts.

### Pathway 1.1b
### Community 1.1 to 1.3

Long-term drought, herbivory, or combinations of these will cause a decline in perennial bunchgrasses and fine fuels leading to a reduced fire frequency and allowing sagebrush to dominate the site.

### Pathway 1.2a
### Community 1.2 to 1.1

Time and lack of disturbance and/or grazing management that favors the establishment and growth of sagebrush allows the shrub component to recover. The establishment of low sagebrush can take many years.

### Pathway 1.3a
### Community 1.3 to 1.1

A change in grazing management that reduces shrubs will allow for the perennial bunchgrasses in the understory to increase. Heavy late-fall or winter grazing may cause mechanical damage and subsequent death to sagebrush, facilitating an increase in the herbaceous understory. Low sagebrush are palatable shrub species and can decrease with increased grazing pressure. Brush treatments with minimal soil disturbance will also decrease sagebrush and release the perennial understory. A low severity fire would decrease the overstory of sagebrush and allow for the understory perennial grasses to increase. Due to low fuel loads in this state, fires will likely be small, creating a mosaic pattern.

### Pathway 1.3b
### Community 1.3 to 1.2

Fire eliminates/reduces the overstory of sagebrush and allows for the understory perennial grasses to increase. Fires may be high severity in this community phase due to the dominance of sagebrush resulting in removal of overstory shrub community. Annual non-native species respond well to fire and may increase post burn.

## State 2
## Current Potential

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. This state has the same three general community phases. 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 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 2.1
### Sagebrush-Perennial Bunchgrass

This community phase is similar to the Reference State Community Phase 1.1, with the presence of non-native species in trace amounts. Sagebrush, pine needlegrass and prairie junegrass dominate the site. A diversity of forbs and other shrubs and grasses make up smaller components of this site.

### Community 2.2
### Perennial Bunchgrass

This community phase is characteristic of a post-disturbance, early to mid-seral community where annual non-native species are present. Sagebrush is present in trace amounts; perennial bunchgrasses and forbs dominate the site. Depending on fire severity, patches of intact sagebrush may remain. Rabbitbrush may be sprouting or dominant in the community. Perennial forbs may be a significant component for a number of years following fire. Annual non-native species are stable or increasing within the community.

### Community 2.3
### Sagebrush (At Risk)

This community is at risk of crossing a threshold to another state. 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. Bluegrasses may increase and become dominant. 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.

### Pathway 2.1a
### Community 2.1 to 2.2

Fire reduces the shrub overstory and allows for perennial bunchgrasses and perennial forbs to dominate the site. Fires are typically low severity resulting in a mosaic pattern due to low fuel loads. A fire following an unusually wet spring or a change in management favoring an increase in fine fuels may be more severe and reduce sagebrush cover to trace amounts. Annual non-native species are likely to increase after fire.

### Pathway 2.1b
### Community 2.1 to 2.3

Time and lack of disturbance allows for sagebrush to increase and become decadent. Long-term drought reduces fine fuels and leads to a reduced fire frequency, allowing sagebrush to dominate the site. Inappropriate grazing management reduces the perennial bunchgrass understory; conversely bluegrasses may increase in the understory depending on grazing management.

### Pathway 2.2a
### Community 2.2 to 2.1

Time and lack of disturbance and/or grazing management that favors the establishment and growth of sagebrush allows the shrub component to recover. The establishment of low sagebrush can take many years.

### Pathway 2.3a
### Community 2.3 to 2.1

A change in grazing management that reduces shrubs will allow for the perennial bunchgrasses in the understory to increase. Heavy late-fall or winter grazing may cause mechanical damage and subsequent death to sagebrush, facilitating an increase in the herbaceous understory. Low sagebrush are palatable shrub species and can decrease

with increased grazing pressure. Brush treatments with minimal soil disturbance will also decrease sagebrush and release the perennial understory. A low severity fire would decrease the overstory of sagebrush and allow for the understory perennial grasses to increase. Due to low fuel loads in this state, fires will likely be small, creating a mosaic pattern. Annual non-native species are present and may increase in the community.

### Pathway 2.3b
### Community 2.3 to 2.2

Fire eliminates/reduces the overstory of sagebrush and allows for the understory perennial grasses to increase. Fires may be high severity in this community phase due to the dominance of sagebrush resulting in removal of overstory shrub community. Annual non-native species respond well to fire and may increase post burn.

## State 3
## Shrub

This state has 2 community phases, a shrub dominated phase and a bluegrass/annual grass dominated phase. This state is a product of many years of heavy grazing during time periods harmful to perennial bunchgrasses. Bluegrasses will increase with a reduction in deep-rooted perennial bunchgrass competition and become the dominant grass. Sagebrush dominates the overstory and rabbitbrush may be a significant component. Sagebrush cover exceeds site concept and may be decadent, reflecting stand maturity and lack of seedling establishment due to competition with mature plants. The shrub overstory and bluegrass understory dominate site resources such that soil water, nutrient capture, nutrient cycling and soil organic matter are temporally and spatially redistributed.

### Community 3.1
### Decadent Sagebrush (At Risk)

Decadent sagebrush dominates the overstory with perennial forbs dominant in the understory. Rabbitbrush may be a significant component. Deep-rooted perennial bunchgrasses may be present in trace amounts or absent from the community. Bluegrasses and annual non-native species increase. Bare ground is significant.

### Community 3.2
### Bluegrass

Bluegrass dominates the site; annual non-native species may be present but are not dominant. Trace amounts of sagebrush or rabbitbrush may be present.

### Pathway 3.1a
### Community 3.1 to 3.2

Fire, heavy fall grazing causing mechanical damage to shrubs, and/or brush treatments with minimal soil disturbance, will greatly reduce the overstory shrubs to trace amounts and allow for bluegrasses to dominate the site.

### Pathway 3.2a
### Community 3.2 to 3.1

Time and lack of disturbance and/or grazing management that favors the establishment and growth of sagebrush allows the shrub component to recover. The establishment of low sagebrush can take many years.

### Transition T1A
### State 1 to 2

Trigger: This transition is caused by the introduction of non-native annual plants. 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.

### Transition T2A
### State 2 to 3

Trigger: To Community Phase 3.1: Inappropriate grazing will decrease or eliminate deep-rooted perennial bunchgrasses, increase bluegrasses and favor shrub growth and establishment. To Community Phase 3.2: Severe fire in Community Phase 2.3 will remove sagebrush overstory, decrease perennial bunchgrasses and enhance bluegrasses. Annual non-native species will increase. 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.

## 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** | | | 98–244 | |
| | Letterman's needlegrass | ACLE9 | *Achnatherum lettermanii* | 50–101 | – |
| | prairie Junegrass | KOMA | *Koeleria macrantha* | 17–50 | – |
| | pine needlegrass | ACPI2 | *Achnatherum pinetorum* | 7–27 | – |
| | muttongrass | POFE | *Poa fendleriana* | 9–26 | – |
| | Cusick's bluegrass | POCU3 | *Poa cusickii* | 8–25 | – |
| | Webber needlegrass | ACWE3 | *Achnatherum webberi* | 7–17 | – |
| 2 | **Secondary Perennial Grasses** | | | 7–27 | |
| | Thurber's needlegrass | ACTH7 | *Achnatherum thurberianum* | 2–7 | – |
| | squirreltail | ELEL5 | *Elymus elymoides* | 2–7 | – |
| | needle and thread | HECO26 | *Hesperostipa comata* | 2–7 | – |
| | spike fescue | LEKI2 | *Leucopoa kingii* | 2–7 | – |
| | Sandberg bluegrass | POSE | *Poa secunda* | 2–7 | – |
| **Forb** | | | | | |
| 3 | **Perennial** | | | 17–50 | |
| | aster | ASTER | *Aster* | 2–7 | – |
| | Hooker's balsamroot | BAHO | *Balsamorhiza hookeri* | 2–7 | – |
| | desertparsley | LOMAT | *Lomatium* | 2–7 | – |
| | lupine | LUPIN | *Lupinus* | 2–7 | – |
| **Shrub/Vine** | | | | | |
| 4 | **Primary Shrubs** | | | 87–168 | |
| | little sagebrush | ARAR8 | *Artemisia arbuscula* | 67–118 | – |
| | mormon tea | EPVI | *Ephedra viridis* | 7–17 | – |
| | slender buckwheat | ERMI4 | *Eriogonum microthecum* | 7–17 | – |
| | antelope bitterbrush | PUTR2 | *Purshia tridentata* | 7–17 | – |
| 5 | **Secondary Shrubs** | | | 7–27 | |
| | yellow rabbitbrush | CHVI8 | *Chrysothamnus viscidiflorus* | 3–7 | – |
| | wax currant | RICE | *Ribes cereum* | 3–7 | – |
| | snowberry | SYMPH | *Symphoricarpos* | 3–7 | – |

## Animal community

Livestock Interpretations:
This site is suited for livestock grazing. Grazing management should be keyed to perennial grass and palatable shrub production. Low sagebrush is considered a valuable browse plant for livestock during the spring, fall, and winter months. Letterman's needlegrass, bluegrass, and prairie Junegrass provide valuable forage for domestic livestock.

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 utilize and sometimes prefer low sagebrush, particularly in winter and early spring. Letterman's needlegrass provides valuable forage for many species of wildlife. Letterman's needlegrass is consumed by mule deer. Letterman's needlegrass provides some cover for small birds and mammals.

## Hydrological functions

Runoff is high to very high. Permeability is slow to moderately rapid.

## 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 has potential for upland and big game hunting.

## Other information

Low sagebrush can be successfully transplanted or seeded in restoration.

## Type locality

| Location 1: Mineral County, NV | |
|---|---|
| Township/Range/Section | T7N R28E S1 |
| General legal description | About 10 miles west southwest of Hawthorne, Wassuk Range, Hawthorne Army Depot, Mineral County, Nevada. This site also occurs in Douglas, Lyon, 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://plants.usda.gov/).

## Contributors

HB/DK/FR

## Approval

Kendra Moseley, 4/10/2024

## 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 | 07/12/2012 |
| 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 to rare. A few rills can be expected on steeper slopes in areas subjected to summer convection storms or rapid spring snowmelt.

2. **Presence of water flow patterns:** Waterflow patterns are none to rare but can be expected in areas recently subjected to summer convection storms or rapid snowmelt, usually on steeper slopes.

3. **Number and height of erosional pedestals or terracettes:** Pedestals are none to rare. Occurrence is usually limited to areas of waterflow patterns. Frost heaving of shallow rooted plants should not be considered a "normal" condition.

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Bare Ground ± 40% depending on the amount of surface cover of rock fragments.

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 large rainfall 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 3 to 6 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 thin to thick platy or subangular blocky. Soil surface colors are grayish browns and soils are typified by a mollic epipedon. Organic matter of the surface 2 to 4 inches is typically 1.25 to 3 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:** Perennial herbaceous plants (especially deep-rooted bunchgrasses [needlegrasses] slow runoff and increase infiltration. Shrub canopy and associated litter break raindrop impact. Snow catch and accumulation is limited on the wind-swept summits and sideslopes.

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 none. Subsoil argillic horizons are not to be interpreted as compacted.

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: Deep-rooted, cool season, perennial bunchgrasses

    Sub-dominant: low shrubs (low sagebrush)>deep-rooted, cool season, perennial forbs> associated shrubs > shallow-rooted, cool season, perennial bunchgrasses>fibrous, shallow-rooted, cool season, perennial and 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 25% of total woody canopy; some of the mature bunchgrasses (<10%) have dead centers.

14. **Average percent litter cover (%) and depth ( in):** Reference Plant Community: Under shrubs and between plant interspaces (20-35%) and litter depth is < 1/4 inch.

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** For normal or average growing season (through mid-June) ± 300 lbs/ac; Favorable years ± 500 lbs/ac and unfavorable years ± 150 lbs/ac.

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:** Potential invaders include snakeweed, cheatgrass, and annual mustards.

17. **Perennial plant reproductive capability:** All functional groups should reproduce in average (or normal) and above average growing season years. Reduced growth and reproduction occur during extended or extreme drought periods.