USDA Natural Resources Conservation Service

# Ecological site R027XY008NV
# DROUGHTY LOAM 8-10 P.Z.

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## 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
Accumulation of salts, tuffa deposits, eolian sediments with soluble salts influence most of the soils in this MLRA.

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

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

Droughty Loam 8-10 P.Z. occurs on fan remnants and upper fan remnants on all exposures. Slopes range from 0 to 30 percent, but slope gradients of 4 to 15 percent are most typical. Elevations are 4000 to 7200 feet. Soils are very deep and well drained. Surface soils are medium to moderately coarse textured and some soils are modified with high volumes of rock fragments through the profile.

## Associated sites

| | |
|---|---|
| R027XY007NV | **LOAMY SLOPE 8-10 P.Z.**<br>Found on associated hillslopes with greater production and vigor. |

## Similar sites

| | |
|---|---|
| R027XY029NV | **GRAVELLY FAN 8-10 P.Z.**<br>LECI4 codominant grass |
| R027XY091NV | **LOAMY FAN 10-12 P.Z.**<br>LECI4 dominant grass |
| R027XY007NV | **LOAMY SLOPE 8-10 P.Z.**<br>ARTRW8 dominant shrub; ACTH7 dominant grass |
| R027XY067NV | **GRANITIC LOAM 8-10 P.Z.**<br>ACSP12 dominant grass |
| R027XY045NV | **SANDY 8-10 P.Z.**<br>ACHY dominant grass; GRSP and ATCA2 important shrubs, not codominant |

**Table 1. Dominant plant species**

| | |
|---|---|
| Tree | Not specified |
| Shrub | (1) *Artemisia tridentata ssp. wyomingensis*<br>(2) *Grayia spinosa* |
| Herbaceous | (1) *Achnatherum hymenoides* |

## Physiographic features

This site occurs on fan remnants and upper fan remnants on all exposures. Slopes range from 0 to 30 percent, but slope gradients of 2 to 15 percent are most typical. Elevations are 4000 to 7200 feet.

**Table 2. Representative physiographic features**

| | |
|---|---|
| Landforms | (1) Fan remnant |
| Runoff class | High to very high |

| | |
|---|---|
| Flooding frequency | None |
| Ponding frequency | None |
| Elevation | 1,219–2,195 m |
| Slope | 2–15% |
| Water table depth | 183 cm |
| Aspect | Aspect is not a significant factor |

**Table 3. Representative physiographic features (actual ranges)**

| | |
|---|---|
| Runoff class | Not specified |
| Flooding frequency | Not specified |
| Ponding frequency | Not specified |
| Elevation | Not specified |
| Slope | 0–30% |
| Water table depth | Not specified |

## Climatic features

The climate associated with this site is semiarid, characterized by cold, moist winters and hot, dry summers. Average annual precipitation is (7) 8 to 10 inches. Mean annual temperatures are 45 to 55 degrees F. The average growing season is about 80 to 130 days. There are no climate stations available.

**Table 4. Representative climatic features**

| | |
|---|---|
| Frost-free period (average) | 130 days |
| Freeze-free period (average) | |
| Precipitation total (average) | 254 mm |

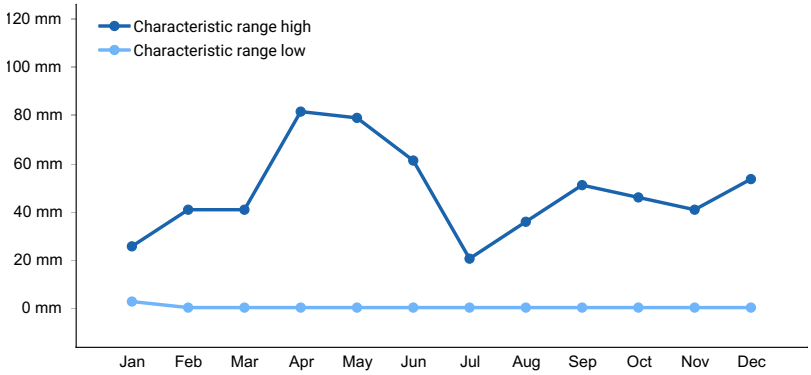



**Figure 1. Monthly precipitation range**

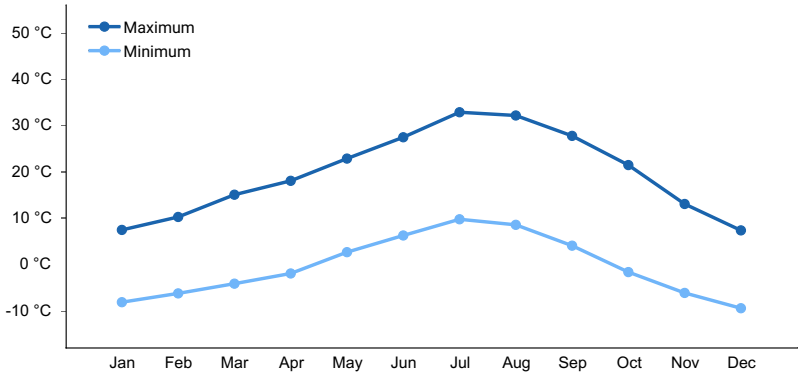



**Figure 2. Monthly average minimum and maximum temperature**

## Influencing water features

There are no influencing water features associated with this site.

## Soil features

Soils are very deep and well drained. Surface soils are medium to moderately coarse textured. The available water capacity is low to moderate and some soils are modified with high volumes of rock fragments through the soil profile. Soils having a high percentage of rock fragments on the surface are less subject to soil erosion losses. Runoff is very low to very high and the potential for sheet and rill erosion is moderate. Soil stability values should be 3 to 6 on most soil textures found on this site. Areas of this site occurring on soils that have a physical crust will probably have stability values less than 3. The soils that are associated with this site are Allor, Bombadil, Buffaran, Chill, Deadyon, Newpass, Pineval, Pokergap, Rebel, Shawave, Slipback, and Yody. The representative soil series is Pineval.

**Table 5. Representative soil features**

| | |
|---|---|
| Parent material | (1) Alluvium<br>(2) Alluvium–granite |
| Surface texture | (1) Gravelly loam<br>(2) Gravelly sandy loam<br>(3) Loam |
| Family particle size | (1) Loamy |
| Drainage class | Well drained |
| Permeability class | Slow to moderately rapid |
| Soil depth | 183 cm |
| Surface fragment cover <=3" | 0–35% |
| Surface fragment cover >3" | 1–12% |
| Available water capacity (0-101.6cm) | 1.78–14.48 cm |
| Calcium carbonate equivalent (0-101.6cm) | 0% |
| Electrical conductivity (0-101.6cm) | 0–8 mmhos/cm |
| Sodium adsorption ratio (0-101.6cm) | 0–45 |
| Soil reaction (1:1 water) (0-101.6cm) | 6.6–9 |
| Subsurface fragment volume <=3" (Depth not specified) | 5–44% |

| | |
|---|---|
| Subsurface fragment volume >3" (Depth not specified) | 2–20% |

**Table 6. Representative soil features (actual values)**

| | |
|---|---|
| Drainage class | Not specified |
| Permeability class | Not specified |
| Soil depth | 15–183 cm |
| Surface fragment cover <=3" | Not specified |
| Surface fragment cover >3" | Not specified |
| Available water capacity (0-101.6cm) | Not specified |
| Calcium carbonate equivalent (0-101.6cm) | Not specified |
| Electrical conductivity (0-101.6cm) | Not specified |
| Sodium adsorption ratio (0-101.6cm) | Not specified |
| Soil reaction (1:1 water) (0-101.6cm) | Not specified |
| Subsurface fragment volume <=3" (Depth not specified) | Not specified |
| Subsurface fragment volume >3" (Depth not specified) | Not specified |

## Ecological dynamics

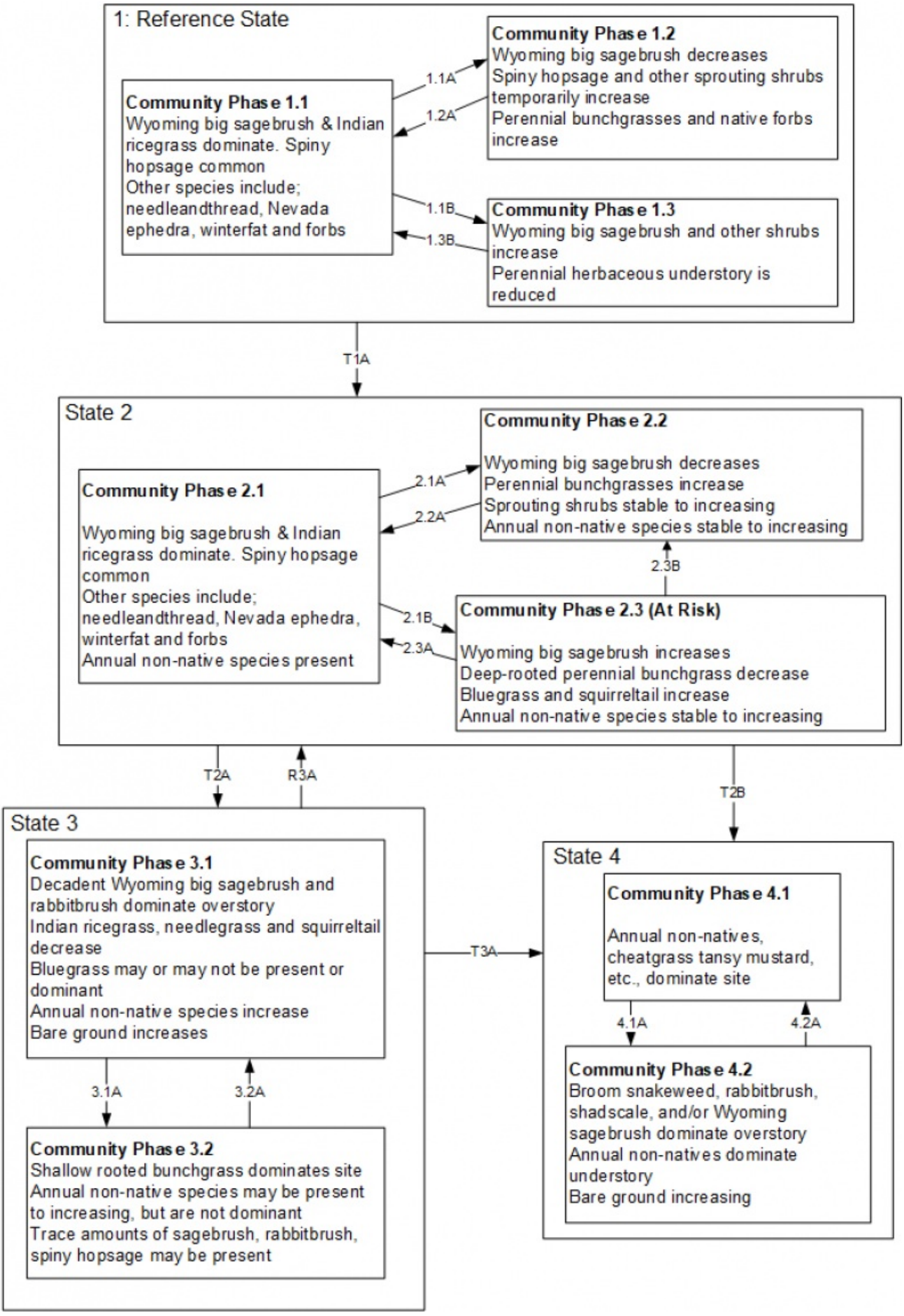
Where management results in abusive grazing use by livestock or feral horses, Wyoming big sagebrush, spiny hopsage, and rabbitbrush increase in density, as Indian ricegrass declines in the understory. Where site degradation has been fire-induced, shadscale, spiny hopsage, horsebrush, and rabbitbrush often dominate the site. Repeated burning of the plant community at intervals less than 10 to 15 years results in complete site dominance by annuals (primarily cheatgrass and tansy mustard). Species likely to invade this site are cheatgrass, Douglas' rabbitbrush, snakeweed, halogeton, Russian thistle, bassia, annual mustards and knapweed.

Fire Ecology:
The fire return interval for Wyoming big sagebrush communities range from is 10 to 70 years. Fire is the principal means of renewal for decadent stands of Wyoming big sagebrush. Wyoming big sagebrush establishes after fire from a seedbank; from seed produced by remnant plants that escaped fire; and from plants adjacent to the burn that seed in. Fires in Wyoming big sagebrush communities are usually not continuous, and remnant plants are the principal means of postfire reproduction.
Spiny hopsage is considered to be somewhat fire tolerant and often survives fires that kill sagebrush. Mature spiny hopsage generally sprout after being burned. Spiny hopsage is reported to be least susceptible to fire during summer dormancy. 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. Winterfat is either killed or top-killed by fire, depending on fire severity. Severe fire can kill the perennating buds located several inches above the ground surface and thus kills the plant. In addition, severe fire usually destroys seed on the plant. Low-severity fire scorches or only partially consumes the aboveground portions of winterfat and thus does not cause high mortality.

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. Bottlebrush squirreltail's small size, coarse stems, and sparse leafy material aid in its tolerance of fire.

Postfire regeneration occurs from surviving root crowns and from on- and off-site seed sources. Frequency of disturbance greatly influences postfire response of bottlebrush squirreltail. Undisturbed plants within a 6 to 9 year age class generally contain large amounts of dead material, increasing bottlebrush squirreltail's susceptibility to fire. Sandberg bluegrass is generally unharmed by fire. It produces little litter, and its small bunch size and sparse litter reduces the amount of heat transferred to perennating buds in the soil. Its rapid maturation in the spring also reduces fire damage, since it is dormant when most fires occur.

## State and transition model


1: Reference State
Community Phase 1.1
Wyoming big sagebrush & Indian ricegrass dominate. Spiny hopsage common
Other species include; needleandthread, Nevada ephedra, winterfat and forbs
1.1A
1.2A
Community Phase 1.2
Wyoming big sagebrush decreases
Spiny hopsage and other sprouting shrubs temporarily increase
Perennial bunchgrasses and native forbs increase
1.1B
1.3B
Community Phase 1.3
Wyoming big sagebrush and other shrubs increase
Perennial herbaceous understory is reduced
T1A
State 2
Community Phase 2.1
Wyoming big sagebrush & Indian ricegrass dominate. Spiny hopsage common
Other species include; needleandthread, Nevada ephedra, winterfat and forbs
Annual non-native species present
2.1A
2.2A
Community Phase 2.2
Wyoming big sagebrush decreases
Perennial bunchgrasses increase
Sprouting shrubs stable to increasing
Annual non-native species stable to increasing
2.3B
2.1B
2.3A
Community Phase 2.3 (At Risk)
Wyoming big sagebrush increases
Deep-rooted perennial bunchgrass decrease
Bluegrass and squirreltail increase
Annual non-native species stable to increasing
T2A
R3A
T2B
State 3
Community Phase 3.1
Decadent Wyoming big sagebrush and rabbitbrush dominate overstory
Indian ricegrass, needlegrass and squirreltail decrease
Bluegrass may or may not be present or dominant
Annual non-native species increase
Bare ground increases
3.1A
3.2A
Community Phase 3.2
Shallow rooted bunchgrass dominates site
Annual non-native species may be present to increasing, but are not dominant
Trace amounts of sagebrush, rabbitbrush, spiny hopsage may be present
T3A
State 4
Community Phase 4.1
Annual non-natives, cheatgrass tansy mustard, etc., dominate site
4.1A
4.2A
Community Phase 4.2
Broom snakeweed, rabbitbrush, shadscale, and/or Wyoming sagebrush dominate overstory
Annual non-natives dominate understory
Bare ground increasing

Reference State 1.0: The Reference State 1.0 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:
Wyoming big sagebrush and Indian ricegrass dominate the site. Needleandthread, spiny hopsage, Nevada ephedra and winterfat are also common. Forbs are present but not abundant. This site is tolerant of dry conditions, but prolonged drought will result in an overall decline, with possible mortality, in the plant community.
Community Phase Pathway 1.1a: Fire would decrease or eliminate the overstory of sagebrush and allow the perennial bunchgrasses to dominate the site. Under natural conditions fires are typically small and patchy due to low fuel loads. A fire following an unusually wet spring or a change in management may be more severe and reduce sagebrush cover to trace amounts. A severe infestation of Aroga moth could also reduce large areas of sagebrush canopy cover, giving a competitive advantage to the perennial grasses and forbs.
Community Phase Pathway 1.1b: Time and lack of disturbance such as fire allows for sagebrush to increase and become decadent. Long-term drought, herbivory, or combinations of these would cause a decline in perennial bunchgrasses and fine fuels and lead to a reduced fire frequency allowing big sagebrush to dominate the site.

Community Phase 1.2: This community phase is characteristic of a post-disturbance, early seral community phase. Indian ricegrass and other perennial grasses dominate. Depending on fire severity or intensity of Aroga moth infestation, patches of intact sagebrush may remain.
Community Phase Pathway 1.2a: Absence of disturbance over time coupled with natural regeneration allows sagebrush to increase. Patches of mature sagebrush required for a seed source are important for recovery to community phase 1.1.

Community Phase 1.3:
Wyoming big sagebrush increases in the absence of disturbance. Decadent sagebrush dominates the overstory and the deep-rooted perennial bunchgrasses in the understory are reduced either from competition with shrubs and/or from herbivory.
Community Phase 1.3a: Fire would decrease or eliminate the overstory of sagebrush and allow the perennial bunchgrasses to dominate the site. Fires would typically be low severity resulting in a mosaic pattern due to low fine 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. A severe infestation of Aroga moth could also cause a large decrease in sagebrush within the community, giving a competitive advantage to the perennial grasses and forbs.
Community Phase Pathway 1.3b: A low severity patchy fire, Aroga moth or combination would reduce the sagebrush overstory and create a sagebrush/grass mosaic with sagebrush and perennial bunchgrasses co-dominant.

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 weeds, such as cheatgrass, mustards, bur buttercup and halogeton.
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, however the resiliency of the state has been reduced by the presence of non-natives. 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: Wyoming big sagebrush and Indian ricegrass dominate the site. Needleandthread, spiny

hopsage and squirreltail may be significant components while Sandberg bluegrass and forbs make up smaller percentages by weight of the understory. Non-native annual species are present.
Community Phase Pathway 2.1a: 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. A severe infestation of Aroga moth could also cause a large decrease in sagebrush cover, reducing competition with perennial grasses and forbs. Annual non-native species are likely to increase after fire.
Community Phase Pathway 2.1b: Natural regeneration over time and lack of disturbance such as fire allows for sagebrush to increase and become decadent. Chronic drought reduces fine fuels and leads to a reduced fire frequency allowing Wyoming big sagebrush to dominate the site. Inappropriate grazing management reduces the perennial bunchgrass understory; conversely Sandberg bluegrass may increase in the understory depending on grazing management. Excessive sheep grazing favors Sandberg bluegrass; however, where cattle and/or horses are the dominant grazers, cheatgrass often increases.

Community Phase 2.2: This community phase is characteristic of a post-disturbance, early seral community phase. Thurber's needlegrass and other perennial grasses dominate. Wyoming big sagebrush is present in trace amounts. Depending on fire severity or intensity of Aroga moth infestations, patches of intact sagebrush may remain. Rabbitbrush & spiny hopsage may be sprouting. Forbs may increase post-fire but will likely return to pre-burn levels within a few years. Annual non-native species generally respond well after fire and may be stable or increasing within the community.
Community Phase Pathway 2.2a: Natural regeneration over 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 Wyoming big sagebrush can take many years and is dependent on multiple years of favorable weather conditions.

Community Phase 2.3 (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 management, or from both. Rabbitbrush may be a significant component. Sandberg bluegrass may increase and become co-dominate with deep rooted bunchgrasses. Annual non-natives species may be stable or increasing due to lack of competition with perennial bunchgrasses. This site is susceptible to further degradation from excessive grazing, prolonged drought, and/or fire.

Community Phase Pathway 2.3a: A change in grazing management that decreases shrubs would allow the perennial bunchgrasses in the understory to increase. Heavy late-fall/winter grazing may cause mechanical damage and subsequent death to sagebrush, facilitating an increase in the herbaceous understory. An infestation of Aroga moth or a low severity fire would reduce some sagebrush overstory and allow perennial grasses to increase in the community. Brush management with minimal soil disturbance would also decrease sagebrush and release the perennial understory. Annual non-native species are present and may increase in the community.
Community Phase Pathway 2.3b: Fire would decrease or eliminate the overstory of sagebrush and allow the perennial bunchgrasses to dominate the site. Fires would typically be small and patchy due to low fuel loads. A fire following an unusually wet spring or a change in management may be more severe and reduce sagebrush cover to trace amounts. A severe infestation of Aroga moth could also cause a large decrease in sagebrush within the community, giving a competitive advantage to the perennial grasses and forbs.

T2A: Transition from Current Potential State 2.0 to Shrub State 3.0
Trigger: Inappropriate, long-term grazing of perennial bunchgrasses during the growing season favors an increase in sagebrush.
Slow variables: Long term decrease in deep-rooted perennial grass density.
Threshold: Loss of deep-rooted perennial bunchgrasses changes spatial and temporal nutrient cycling and nutrient redistribution, and reduces soil organic matter.
T2B: Transition from Current Potential State 2.0 to Annual State 4.0
Trigger: To Community Phase 4.1: Severe fire and/or soil disturbing treatments. To Community Phase 4.2: Inappropriate grazing management that favors shrubs in the presence of non-native species.
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 is a product of many years of heavy grazing during time periods harmful to perennial bunchgrasses. Sandberg bluegrass may increase with a reduction in deep rooted perennial bunchgrass competition and may become the dominate grass or the herbaceous understory may be completely eliminated. Sagebrush dominates the overstory and spiny hopsage, Nevada ephedra and/or 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 dominates site resources such that soil water, nutrient capture, nutrient cycling and soil organic matter are temporally and spatially redistributed. Bare ground may be significant with soil redistribution occurring between interspace and canopy locations.

Community Phase 3.1:
Wyoming big sagebrush dominates overstory and spiny hopsage and/or rabbitbrush may be a significant component. Deep-rooted perennial bunchgrasses may be present in trace amounts or absent from the community. Sandberg bluegrass may dominate the understory. Annual nonnative species are present and may be co-dominant. Bare ground is significant.
Community Phase Pathway 3.1a: 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 Sandberg bluegrass to dominate the site.
Community Phase 3.2
Bluegrass dominates the site; annual non-native species may be present but are not dominant. Trace amounts of sagebrush may be present. Sprouting shrubs such as spiny hopsage, Nevada ephedra, Anderson's peachbrush or rabbitbrush may be dominant.
Community Phase Pathway 3.2a: Time and lack of disturbance and/or grazing management that favors the establishment and growth of sagebrush allows the shrub component to recover. The re-establishment of Wyoming big sagebrush can take many years.

T3A: Transition from Shrub State 3.0 to Annual State 4.0
Trigger: Severe/repeated fire and/or soil disturbing treatments. Possible soil disturbing treatments include attempted restoration with drought tolerant perennials, such as crested wheatgrass. Restoration attempts causing soil disturbance will likely initiate a transition to an annual state. Probability of success very low. Inappropriate grazing management in the presence of annual non-native species.
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.

R3A: Restoration from Shrub State 3.0 to Current Potential State 2.0
Brush management with minimal soil disturbance, coupled with seeding of deep rooted perennial native bunchgrasses. Probability of success very low.

Annual State 4.0:
This community is characterized by the dominance of annual non-native species such as cheatgrass and tansy mustard in the understory. Sprouting shrubs such as rabbitbrush, shadscale, broom snakeweed and spiny hopsage may dominate the overstory.
Community Phase 4.1
Annual non-native plants such as cheatgrass or tansy mustard dominate the site. Rabbitbrush may or may not be present.
Community Phase Pathway 4.1a: Time and lack of fire allows for the sagebrush to establish. Probability of sagebrush establishment is extremely low.
Community Phase 4.2: Sprouting shrubs such as spiny hopsage and Rabbitbrush dominate overstory. Shadscale may be present or increasing. Wyoming big sagebrush may be a minor component. Annual non-native species dominate understory. Trace amounts of desirable bunchgrasses may be present. Bare ground is significant.
Community Phase Pathway 4.2a: Fire removes sagebrush and allows for annual non-native species to dominate the site.

**State 1**
**Reference Plant Community**

## Community 1.1
## Reference Plant Community

The reference plant community is dominated by Wyoming big sagebrush, spiny hopsage, and Indian ricegrass. Potential vegetative composition is about 40% grasses, 5% forbs and 55% shrubs. Approximate ground cover (basal and crown) is 20 to 30 percent. Bare ground is approximately 50%, surface rock fragments are approximately 35%, shrub canopy 15 to 25% and basal area for perennial herbaceous plants is approximately 5%. Dead branches within individual shrubs are common and standing dead shrub canopy material may be as much as 25% of total woody canopy. Some of the mature bunchgrasses (to 20%) have dead centers. Within plant interspaces litter is approximately 20% cover and the depth of litter is less than one-half inch.

**Table 7. Annual production by plant type**

| Plant Type | Low (Kg/Hectare) | Representative Value (Kg/Hectare) | High (Kg/Hectare) |
|---|---|---|---|
| Shrub/Vine | 185 | 308 | 432 |
| Grass/Grasslike | 135 | 224 | 314 |
| Forb | 17 | 28 | 39 |
| **Total** | **337** | **560** | **785** |

## Additional community tables

**Table 8. Community 1.1 plant community composition**

| Group | Common Name | Symbol | Scientific Name | Annual Production (Kg/Hectare) | Foliar Cover (%) |
|---|---|---|---|---|---|
| **Grass/Grasslike** | | | | | |
| 1 | **Primary Perennial Grasses** | | | 163–342 | |
| | needle and thread | HECO26 | *Hesperostipa comata* | 28–84 | – |
| | Indian ricegrass | ACHY | *Achnatherum hymenoides* | 28–84 | – |
| | squirreltail | ELEL5 | *Elymus elymoides* | 11–45 | – |
| | Sandberg bluegrass | POSE | *Poa secunda* | 11–45 | – |
| 2 | **Secondary Perennial Grasses** | | | 11–45 | |
| | desert needlegrass | ACSP12 | *Achnatherum speciosum* | 3–17 | – |
| | Thurber's needlegrass | ACTH7 | *Achnatherum thurberianum* | 3–17 | – |
| | Webber needlegrass | ACWE3 | *Achnatherum webberi* | 3–17 | – |
| | buckwheat | ERIOG | *Eriogonum* | 3–17 | – |
| | phlox | PHLOX | *Phlox* | 3–17 | – |
| | globemallow | SPHAE | *Sphaeralcea* | 3–17 | – |
| **Forb** | | | | | |
| 3 | **Perennial** | | | 11–45 | |
| | Wyoming big sagebrush | ARTRW8 | *Artemisia tridentata ssp. wyomingensis* | 112–168 | – |
| | Nevada jointfir | EPNE | *Ephedra nevadensis* | 11–28 | – |
| | buckwheat | ERIOG | *Eriogonum* | 3–11 | – |
| | phlox | PHLOX | *Phlox* | 3–11 | – |
| | globemallow | SPHAE | *Sphaeralcea* | 3–11 | – |
| **Shrub/Vine** | | | | | |
| 4 | **Primary Perennial Shrubs** | | | 191–364 | |
| | spiny hopsage | GRSP | *Grayia spinosa* | 56–140 | – |
| | winterfat | KRLA2 | *Krascheninnikovia lanata* | 11–28 | – |
| | Nevada jointfir | EPNE | *Ephedra nevadensis* | 11–28 | – |
| 5 | **Secondary Perennial Shrubs** | | | 11–56 | |
| | fourwing saltbush | ATCA2 | *Atriplex canescens* | 3–17 | – |
| | shadscale saltbush | ATCO | *Atriplex confertifolia* | 3–17 | – |
| | yellow rabbitbrush | CHVI8 | *Chrysothamnus viscidiflorus* | 3–17 | – |
| | bud sagebrush | PIDE4 | *Picrothamnus desertorum* | 3–17 | – |
| | desert peach | PRAN2 | *Prunus andersonii* | 3–17 | – |

## Animal community

Livestock Interpretations:
This site is suited for livestock grazing. Grazing management should be keyed to indian ricegrass, needleandthread, bottlebrush squirreltail, and bluegrass production. 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. 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. Bottlebrush squirreltail is very palatable winter forage for domestic sheep of Intermountain ranges. Domestic sheep relish the green foliage. Overall, bottlebrush squirreltail is considered moderately palatable to livestock. Bluegrass is a widespread forage grass. It is one of the earliest grasses in the spring and is sought by domestic livestock and several wildlife species. Sandberg bluegrass is a palatable species, but its production is closely tied to weather

conditions. It produces little forage in drought years, making it a less dependable food source than other perennial bunchgrasses. Livestock browse Wyoming big sagebrush, but may use it only lightly when palatable herbaceous species are available. Spiny hopsage provides a palatable and nutritious food source for livestock, particularly during late winter through spring. Domestic sheep browse the succulent new growth of spiny hopsage in late winter and early spring. Nevada ephedra is important winter range browse for domestic cattle, sheep and goats. Winterfat is an important forage plant for livestock, especially during winter when forage is scarce. Abusive grazing practices have reduced or eliminated winterfat on some areas even though it is fairly resistant to browsing. Effects depend on severity and season of grazing.

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:
Wyoming big sagebrush is preferred browse for wild ungulates, and Wyoming big sagebrush communities are important winter ranges for big game. Pronghorn usually browse Wyoming big sagebrush heavily. Wyoming big sagebrush communities are critical habitat for the birds. Spiny hopsage provides a palatable and nutritious food source for big game animals. Spiny hopsage is used as forage to at least some extent by domestic goats, deer, pronghorn, and rabbits. Mule deer, bighorn sheep, and pronghorn browse Nevada ephedra, especially in spring and late summer when new growth is available. Winterfat is an important forage plant for Wildlife, especially during winter when forage is scarce. Winterfat seeds are eaten by rodents. Winterfat is a staple food for black-tailed jackrabbit. Mule deer and pronghorn antelope browse winterfat. Winterfat is used for cover by rodents. It is potential nesting cover for upland game birds, especially when grasses grow up through its crown. A number of heteromyid rodents inhabiting desert rangelands show preference for seed of Indian ricegrass. Indian ricegrass is an important component of jackrabbit diets in spring and summer. In Nevada, Indian ricegrass may even dominate jackrabbit diets during the spring through early summer months. Indian ricegrass seed provides food for many species of birds. Doves, for example, eat large amounts of shattered Indian ricegrass seed lying on the ground. Needleandthread is moderately important spring forage for mule deer, but use declines considerably as more preferred forages become available.

## Hydrological functions

Rills and water flow patterns are rare on this site. A few can be expected on steeper slopes in areas subjected to summer convection storms or rapid snowmelt. Pedestals are rare. Occurrence is usually limited to areas of water flow patterns. Frost heaving of shallow rooted plants should not be considered a normal condition. Gullies are rare in areas of this site that occur on stable landforms. Where this site occurs on inset fans, gullies and head cuts associated with ephemeral channel entrenchment may be common. Gullies and head cuts should be healing or stable. Fine litter (foliage from grasses and annual and perennial forbs) are expected to move the 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. Perennial herbaceous plants (especially deep-rooted bunchgrasses [i.e. Thurber’s needlegrass and Indian ricegrass] slow runoff and increase infiltration. Shrub canopy and associated litter break raindrop impact and provide opportunity for snow catch and accumulation on site.

## Recreational uses

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

## Other products

Native Americans made tea from big sagebrush leaves. They used the tea as a tonic, an antiseptic, for treating colds, diarrhea, and sore eyes and as a rinse to ward off ticks. Big sagebrush seeds were eaten raw or made into meal. Some Native American peoples traditionally ground parched seeds of spiny hopsage to make pinole flour. Indian ricegrass was traditionally eaten by some Native American peoples. The Paiutes used seed as a reserve food source.

## Other information

Wyoming big sagebrush is used for stabilizing slopes and gullies and for restoring degraded wildlife habitat, rangelands, mine spoils and other disturbed sites. It is particularly recommended on dry upland sites where other shrubs are difficult to establish. Spiny hopsage has moderate potential for erosion control and low to high potential for long-term revegetation projects. It can improve forage, control wind erosion, and increase soil stability on gentle to moderate slopes. Spiny hopsage is suitable for highway plantings on dry sites in Nevada. Winterfat adapts well to most site conditions, and its extensive root system stabilizes soil. However, winterfat is intolerant of flooding, excess water, and acidic soils. 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. Bottlebrush squirreltail is tolerant of disturbance and is a suitable species for revegetation.

## Inventory data references

NASIS soil data used for abiotic ranges.

## Type locality

| Location 1: Churchill County, NV | |
|---|---|
| Township/Range/Section | T19N R37E S18 |
| General legal description | Florence Canyon area, Edwards Creek Valley, 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

GED/GKB

## 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 are rare but can be expected on steeper slopes in areas subjected to summer convection storms or rapid snowmelt.

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3. **Number and height of erosional pedestals or terracettes:** Pedestals are rare. Occurrence is usually limited to areas of water flow patterns. Frost heaving of shallow rooted plants should not be considered a "normal" condition.

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4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Bare Ground ± 50%; surface rock fragments ± 35%; shrub canopy 15 to 25%; basal area for perennial herbaceous plants ± 5%.

---

5. **Number of gullies and erosion associated with gullies:** Gullies are rare in areas of this site that occur on stable landforms. Where this site occurs on inset fans, gullies and head cuts associated with ephemeral channel entrenchment may be common. Gullies and head cuts should be healing or stable.

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

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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 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.

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8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** Soil stability values should be 3 to 6 on most soil textures found on this site. Areas of this site occurring on soils that have a physical crust will probably have stability values less than 3. (To be field tested.)

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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 massive. 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.

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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 [i.e., Thurber"""""s needlegrass and Indian ricegrass] slow runoff and increase infiltration. Shrub canopy and associated litter break raindrop impact and provide opportunity for snow catch and accumulation on site.

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11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):** Compacted layers are not typical. Platy or massive sub-surface horizons, subsoil calcic, argillic horizons or hardpans shallow to the surface are not to be interpreted as compacted layers.

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: Deep-rooted, cool season, perennial bunchgrasses >> Wyoming big sagebrush & spiny hopsage. (By above ground production)

    Sub-dominant: Associated shrubs > shallow-rooted, cool season, perennial bunchgrasses = deep-rooted, cool season, perennial forbs = fibrous, shallow-rooted, cool season, perennial and annual forbs. (By above ground prodcution)

    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 are common and standing dead shrub canopy material may be as much as 25% of total woody canopy; some of the mature bunchgrasses (to 20%) have dead centers.

14. **Average percent litter cover (%) and depth ( in):** Within plant interspaces (± 20%) and depth of litter is <½ inch

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** For normal or average growing season (end of May) ± 500 lbs/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:** Cheatgrass, snakeweed, halogeton, Russian thistle, bassia, annual mustards, and knapweeds are invaders on this site. Douglas' rabbitbrush is an increaser on this site.

17. **Perennial plant reproductive capability:** All functional groups should reproduce in average (or normal) and above average growing season years.