USDA Natural Resources
Conservation Service

# Ecological site R028AY139UT
# Desert Silt Loam (Winterfat)

Accessed: 05/14/2025

## 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.

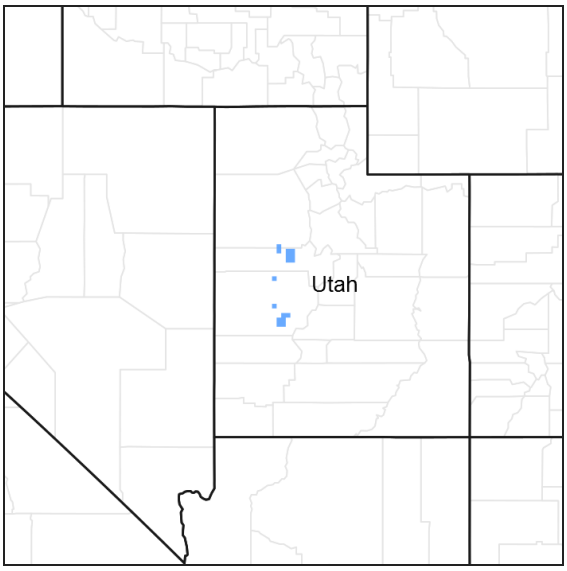


**Figure 1. Mapped extent**

Areas shown in blue indicate the maximum mapped extent of this ecological site. Other ecological sites likely occur within the highlighted areas. It is also possible for this ecological site to occur outside of highlighted areas if detailed soil survey has not been completed or recently updated.

## MLRA notes

Major Land Resource Area (MLRA): 028A–Ancient Lake Bonneville

This site occurs in MLRA 28A, LRU A, the northern part of MLRA 28A. This LRU has a mesic soil temperature regime and a typic aridic soil moisture regime. Typically most precipitation occurs in the winter with some precipitation in the summer with convective thundstorms. Mean annual precipitation is between 4 to 8 inches. The south desert ecological zone typically has no big sagebrush (Artemisia tridentate spp.), but typically is dominated by shadscale (Atriplex confertifolia), winterfat (Krascheninnikovia lanata), saltbushes (Atriplex spp), Indian ricegrass (Achnatherum hymenoides), and bottlebrush squirreltail (Elymus elymoides). Unlike the northern LRUs, there is typically galleta (Pleuraphis jamesii) grass present in the community.

## Classification relationships

MLRA 28A, LRU E, southern desert ecological zone

## Ecological site concept

This site is dominated by winterfat in reference condition. It is found relatively flat alluvial flats, alluvial fans and valley floors on fine texture soils.

## Associated sites

| | |
|---|---|
| R028AY124UT | **Desert Loam (Shadscale)** |

## Similar sites

| | |
|---|---|
| R028AY140UT | **Desert Silt Flat (Winterfat)** |
| R028AY040UT | **Silt Flat (Winterfat)**<br>This site is the same |
| R028AY030NV | **SILTY 8-10 P.Z.**<br>Similar site with winterfat dominance. |

**Table 1. Dominant plant species**

| | |
|---|---|
| Tree | Not specified |
| Shrub | (1) *Krascheninnikovia lanata*<br>(2) *Atriplex confertifolia* |
| Herbaceous | Not specified |

## Physiographic features

This site occurs on alluvial flats, alluvial fans, valley floors and deltas. It is found on very gentle to flat slopes between 0 and 2 percent. It is found at elevations between 4300 to 5800 feet. There is no ponding or flooding on this site.

**Table 2. Representative physiographic features**

| | |
|---|---|
| Landforms | (1) Alluvial flat<br>(2) Alluvial fan<br>(3) Valley floor |
| Flooding frequency | None |
| Ponding frequency | None |
| Elevation | 1,311–1,768 m |
| Slope | 0–2% |

## Climatic features

The climate is cold and snowy in the winter and warm and dry in the summer. The average annual precipitation is 5 to 8 inches. Approximately 70 percent comes as rain from March through October. On the average, June through September are the driest months and March through May are the wettest months.

Mean Annual Air Temperature: 45-50
Mean Annual Soil Temperature: 54-58

**Table 3. Representative climatic features**

| | |
|---|---|
| Frost-free period (average) | 119 days |
| Freeze-free period (average) | 148 days |
| Precipitation total (average) | 229 mm |

## Climate stations used

- (1) DESERET [USC00422101], Delta, UT

## Influencing water features

## Soil features

The characteristic soils in this site are deep and well drained. They formed in alluvium and residuum derived mainly from lacustrine parent materials. The surface horizon is silt loam and very fine sandy loam textures and 4 inches thick. Rock fragments are not found in or on this soil.

Soils are strongly to very strongly alkaline. They are also strongly calcareous.

The water supplying capacity is 3 to 6 inches. Natural geologic erosion in potential is approximately 0.2 tons/acre/year.

**Table 4. Representative soil features**

| | |
|---|---|
| Parent material | (1) Alluvium–limestone and sandstone |
| Surface texture | (1) Very fine sandy loam<br>(2) Loam<br>(3) Silty clay loam |
| Drainage class | Well drained |
| Permeability class | Moderate to moderately rapid |
| Soil depth | 152 cm |
| Surface fragment cover <=3" | 0–8% |
| Surface fragment cover >3" | 0% |
| Available water capacity (0-101.6cm) | 2.03–17.02 cm |
| Calcium carbonate equivalent (0-101.6cm) | 10–50% |
| Electrical conductivity (0-101.6cm) | 0–32 mmhos/cm |
| Sodium adsorption ratio (0-101.6cm) | 0–70 |
| Soil reaction (1:1 water) (0-101.6cm) | 7.9–9 |
| Subsurface fragment volume <=3" (Depth not specified) | 0–28% |
| Subsurface fragment volume >3" (Depth not specified) | 0% |

## Ecological dynamics

As ecological condition deteriorates due to overgrazing, Indian ricegrass and squirreltail decrease while horsebrush, rabbitbrush, snakeweed, and shadscale increase.

When the potential natural plant community is burned, Indian ricegrass and shadscale decrease while rabbitbrush and horsebrush increase.

Cheatgrass, halogeton, and other annual forbs are most likely to invade this site.

This site is the same as R028AY140UT, R028AY040UT and similar to 028BY013NV, 028AY030NV, and 028AY002NV (Stringham et al. 2015). STMs were developed by Nevada for the 028BY013NV site and they are used in this ESD (Stringham et al. 2015).

## State and transition model

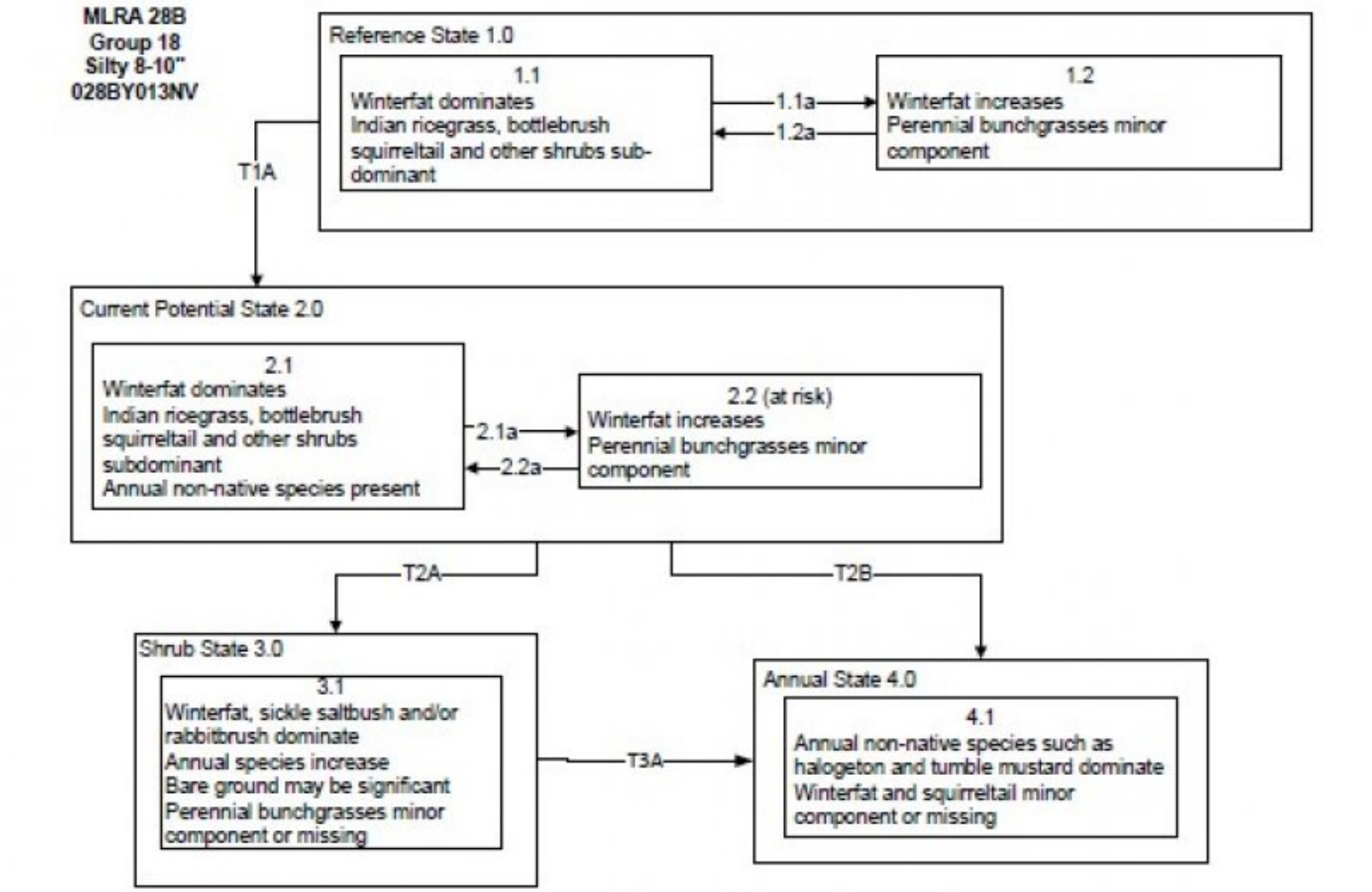


**Figure 6. R028AE139UT STM**

Reference State 1.0 Community Phase Pathways
1.1a: Drought and/or excessive herbivory favors as decrease in perennial bunchgrasses. Fire was infrequent but would be patchy due to low fuel loads.
1.2a: Time and lack of disturbance and/or release from drought

Transition T1A: Introduction of non-native species such as cheatgrass and halogeton.

Current Potential State 2.0 Community Phase Pathways
2.1a: Drought and/or inappropriate grazing management
2.2a: Time and lack of disturbance and/or release from drought

Transition T2A: Inappropriate grazing management in the presence of non-native species (3.1)

Transition T2B: Catastrophic fire and/or multiple fires, inappropriate grazing management and/or soil disturbing treatments (4.1)

Transition T3A: Catastrophic fire and/or multiple fires, inappropriate grazing management and/or soil disturbing treatments (4.1)

**Figure 7. R028AE139UT STM Legend**

## State 1
## Reference State

The Reference State 1.0 is a representative of the natural range of variability under pristine conditions. This state has two community phases, one co-dominated by shrubs and grass, and the other dominated by shrubs. State dynamics are maintained by interactions between climatic patterns and disturbance regimes. Negative feedbacks enhance ecosystem resilience and contribute to the stability of the state. These include the presence of all structural and functional groups, low fine fuel loads, and retention of organic matter and nutrients. This site is very stable, with

little variation in plant community composition. Plant community changes would be reflected in production in response to drought or abusive grazing. Wet years will increase grass production, while drought years will reduce production. Shrub production will also increase during wet years; however, recruitment of winterfat is episodic.

## Community 1.1
## Winterfat, Indian ricegrass

This community is dominated by winterfat and Indian ricegrass. Bottlebrush squirreltail and bud sage are also important species on this site. Community phase changes are primarily a function of chronic drought. Fire is infrequent and patchy due to low fuel loads.

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

| Plant Type | Low (Kg/Hectare) | Representative Value (Kg/Hectare) | High (Kg/Hectare) |
|---|---|---|---|
| Shrub/Vine | 101 | 252 | 336 |
| Grass/Grasslike | 39 | 59 | 196 |
| Forb | 6 | 9 | 28 |
| **Total** | **146** | **320** | **560** |

**Table 6. Ground cover**

| | |
|---|---|
| Tree foliar cover | 0% |
| Shrub/vine/liana foliar cover | 15-35% |
| Grass/grasslike foliar cover | 10-20% |
| Forb foliar cover | 2-5% |
| Non-vascular plants | 0% |
| Biological crusts | 0% |
| Litter | 0% |
| Surface fragments >0.25" and <=3" | 0% |
| Surface fragments >3" | 0% |
| Bedrock | 0% |
| Water | 0% |
| Bare ground | 0% |

**Table 7. Canopy structure (% cover)**

| Height Above Ground (M) | Tree | Shrub/Vine | Grass/ Grasslike | Forb |
|---|---|---|---|---|
| <0.15 | – | – | – | – |
| >0.15 <= 0.3 | – | – | – | 1-10% |
| >0.3 <= 0.6 | – | 30-40% | 15-25% | – |
| >0.6 <= 1.4 | – | – | – | – |
| >1.4 <= 4 | – | – | – | – |
| >4 <= 12 | – | – | – | – |
| >12 <= 24 | – | – | – | – |
| >24 <= 37 | – | – | – | – |
| >37 | – | – | – | – |

**Figure 9. Plant community growth curve (percent production by month). UT1391, PNC. Excellent Condition.**

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 5 | 25 | 50 | 10 | 0 | 0 | 5 | 5 | 0 | 0 |

### Community 1.2
### Winterfat

Drought will favor shrubs over perennial bunchgrasses. However, long-term drought will result in an overall decline in the plant community, regardless of functional group.

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

Long term drought and/or herbivory. Fires would also decrease vegetation on these sites but would be infrequent and patchy due to low fuel loads.

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

Time, lack of disturbance and recovery from drought would allow the vegetation to increase and bare ground would eventually decrease.

### State 2
### Current Potential State

This state is similar to the Reference State 1.0. This state has the same two general community phases. 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 2.1
### Winterfat, Indian ricegrass, annual non-natives

This community is dominated by winterfat and Indian ricegrass. Bottlebrush squirreltail and bud sage are also important species on this site. Community phase changes are primarily a function of chronic drought. Fire is infrequent and patchy due to low fuel loads. Non-native annual species are present.

### Community 2.2
### Winterfat, annual non-natives

This community is dominated by winterfat. The perennial grass component is significantly reduced. This community phase is at-risk to move to state 3 or state 4.

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

Long term drought will favor shrubs over perennial bunchgrasses. However, long-term drought will result in an overall decline in the plant community, regardless of functional group. Inappropriate grazing will favor unpalatable shrubs such as shadscale, and cause a decline in winterfat and budsage.

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

Release from long term drought and/or growing season grazing pressure allows recovery of bunchgrasses, winterfat, and bud sagebrush.

### State 3
### Shrub State

This state consists of one community phase. This site has crossed a biotic threshold and site processes are being controlled by shrubs. Bare ground has increased.

### Community 3.1
### Winterfat, sickle saltbush, rabbitbrush, annual non-natives

Perennial bunchgrasses, like Indian ricegrass are reduced and the site is dominated by winterfat. Rabbitbrush and shadscale may be significant components or dominant shrubs. Annual nonnative species increase. Bare ground has increased.

### State 4
### Annual State

This state consists of one community phase. This community is characterized by the dominance of annual non-native species such as halogeton and cheatgrass. Rabbitbrush, shadscale, sickle saltbush and other sprouting shrubs may dominate the overstory.

### Community 4.1
### Annual non-natives

This community is dominated by annual non-native species. Trace amounts of winterfat and other shrubs may be present, but are not contributing to site function. Bare ground may be abundant, especially during low precipitation years. Soil erosion, soil temperature and wind are driving factors in site function.

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

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

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

Trigger: Inappropriate, long-term grazing of perennial bunchgrasses during the growing season and/or long term drought will favor shrubs and initiate a transition to Community phase 3.1. 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.

### Transition T2B
### State 2 to 4

Trigger: Severe fire/ multiple fires, long term inappropriate grazing and/or soil disturbing treatments such as plowing. 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.

### Transition T3A
### State 3 to 4

Trigger: Severe fire/ multiple fires, long term inappropriate grazing, and/or soil disturbing treatments such as plowing. Slow variables: Increased production and cover of non-native annual species. Threshold: Increased, continuous fine fuels modify the fire regime by changing intensity, size and spatial variability of fires. Changes in plant community composition and spatial variability of vegetation due to the loss of perennial bunchgrasses and sagebrush truncate energy capture spatially and temporally thus impacting nutrient cycling and distribution.

## Additional community tables

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

| Group | Common Name | Symbol | Scientific Name | Annual Production (Kg/Hectare) | Foliar Cover (%) |
|---|---|---|---|---|---|
| **Shrub/Vine** | | | | | |
| 0 | **Primary Shrubs** | | | 179–269 | |
| | winterfat | KRLA2 | *Krascheninnikovia lanata* | 90–135 | – |
| | bud sagebrush | PIDE4 | *Picrothamnus desertorum* | 45–67 | – |
| | shadscale saltbush | ATCO | *Atriplex confertifolia* | 45–67 | – |
| 3 | **Secondary Shrubs** | | | 13–22 | |
| | fourwing saltbush | ATCA2 | *Atriplex canescens* | 4–13 | – |
| | yellow rabbitbrush | CHVI8 | *Chrysothamnus viscidiflorus* | 4–13 | – |
| | Nevada jointfir | EPNE | *Ephedra nevadensis* | 4–13 | – |
| | broom snakeweed | GUSA2 | *Gutierrezia sarothrae* | 4–13 | – |
| | shortspine horsebrush | TESP2 | *Tetradymia spinosa* | 4–13 | – |
| **Grass/Grasslike** | | | | | |
| 0 | **Primary Grasses** | | | 103–188 | |
| | Indian ricegrass | ACHY | *Achnatherum hymenoides* | 45–90 | – |
| | squirreltail | ELEL5 | *Elymus elymoides* | 45–67 | – |
| | James' galleta | PLJA | *Pleuraphis jamesii* | 9–22 | – |
| | sand dropseed | SPCR | *Sporobolus cryptandrus* | 4–9 | – |
| 1 | **Secondary Grasses** | | | 13–22 | |
| **Forb** | | | | | |
| 0 | **Primary Forbs** | | | 27–45 | |
| | scarlet globemallow | SPCO | *Sphaeralcea coccinea* | 13–22 | – |
| | Utah milkvetch | ASUT | *Astragalus utahensis* | 9–13 | – |
| | showy Townsend daisy | TOFL5 | *Townsendia florifer* | 4–9 | – |
| 2 | **Secondary Forbs** | | | 13–22 | |

## Animal community

This site is suited for sheep and cattle grazing during fall, winter, and spring.

Wildlife using this site include rabbit, coyote, fox, and pronghorn antelope.

This is a short list of the more common species found. Many other species are present as well and migratory birds are present at times.

## Hydrological functions

The soils are in hydrologic group B with runoff curves ranging from 61 to 79 depending on hydrologic condition.

## Recreational uses

Resources that have special aesthetic and landscape value are indian ricegrass, scarlet globemallow, and winterfat. Some recreation uses of this site are hiking and picnicing.

## Wood products

None

## Other information

Threatened and endangered species include plants and animals.

## Type locality

| Location 1: Millard County, UT | |
|---|---|
| Township/Range/Section | T23S R7W S17 |
| General legal description | Fourteen Miles West of Kanosh, Utah; SE ¼ of the NE ¼, Section 17, Township 23S, Range 7W |

## Other references

Stringham, T.K., P. Novak-Echenique, P. Blackburn, C. Coombs, D. Snyder, and A. Wartgow. 2015. FinalReport for USDA Ecological Site Description State-and-Transition Models, Major Land Resource Area 28A and 28B Nevada. University of Nevada Reno, Nevada Agricultural Experiment Station Research Report 2015-01. p. 1524.

## Contributors

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## 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) | V. Keith Wadman (NRCS retired), Shane A. Green (NRCS) |
| Contact for lead author | shane.green@ut.usda.gov |
| Date | 02/03/2009 |
| Approved by | Shane A. Green |
| Approval date | |
| Composition (Indicators 10 and 12) based on | Annual Production |

## Indicators

1. **Number and extent of rills:** Very minor rill development may be evident in reference communities on this site following

significant storm or snow melt events. The presence of rills may also be more apparent where run-on from adjacent upland sites or exposed bedrock concentrate flows. Rill development will be moderately short (< 6') and spaced 8' – 10'.

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2. **Presence of water flow patterns:** Evidence of stable overland water flow is apparent in the reference community; increased flow activity may be observed immediately following significant weather events. Flow patterns are normally <20 feet long, follow natural contours, and are typically spaced 10 to 15 feet apart.

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3. **Number and height of erosional pedestals or terracettes:** Slight evidence of pedestals or terracettes caused by accelerated water erosion may be evident in the reference community. 1 – 2 inches of elevational mounding under Winterfat and Shadscale canopies and within biological soil crusts is normal and may not be water erosion caused. There are no exposed roots around perennial grass bunches.

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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 ranges from 50% - 60% in the reference community. Ground cover (the inverse of bare ground) typically includes: coarse fragments – < 1%; plant canopy – 20% to 30%; litter – 10% to 20%, and biological soil crusts – 2% to 5%.

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5. **Number of gullies and erosion associated with gullies:** Developed gully channels are a normal component of desert environments. Gullies associated with reference areas will typically have stable, partially vegetated sides and bottoms with no evidence of head-cutting. Some evidence of disturbance may be evident following significant weather events or when gullies convey runoff from higher elevation rocky or naturally eroding areas.

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6. **Extent of wind scoured, blowouts and/or depositional areas:** Some minor evidence of wind generated soil movement is present in reference communities. Slight depositional mounding in perennial grass bunches, under Winterfat and Shadscale canopies and within biological soil crusts is a normal characteristic of this site.

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7. **Amount of litter movement (describe size and distance expected to travel):** Most litter resides in place within or under plant canopies. Some movement of the finest material (< 1/8" or less) may move (1' – 2') in the direction of prevailing winds or down slope if being transported by water. Little accumulation is observed behind obstructions.

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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):** This site should have a soil stability rating of 4 to 5. Surface textures are typically silt loams containing very few coarse fragments. Where surface soil is lost, a slight increased silt percentage may occur in the remaining soil material.

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Soil surface is 4 inches deep and structure is moderately thick platy. The A-horizon color is 10YR 6/3. Soils have an Ochric epipedon that extends 7 inches into the soil profile. The A horizon is normally deeper and better developed under plant canopies.

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial**

**distribution on infiltration and runoff:** The presents of healthy perennial bunchgrasses, Winterfat and Shadscale in the reference community provides for the best infiltration and least runoff from storm events and snow melt. As perennial vegetation decreases and bare ground increases, runoff increases and soil loss is accelerated.

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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):** None. Soils are deep to very deep.

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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: Dominant: A mix of sprouting and non-sprouting shrubs (e.g. Winterfat and Shadscale) 30 – 45%, > cool season grasses (e.g. Indian ricegrass and Bottlebrush squirreltail) 30 – 45%.

    Sub-dominant: Sub-dominant: Non- sprouting shrubs (e.g. Bud sage and Nevada jointfir) 15 - 20% > Cool and warm season grasses (e.g. James galleta and Sand dropseed) 5 - 8%.

    Other: Others: Shrubs (e.g. Low rabbitbrush and Four-wing saltbush) 1-3%, perennial forbs (e.g. Scarlet globemallow and Utah milkvetch) 3-5%, biological crusts (e.g. lichens, mosses, cyanobacteria) trace%.

    Additional: Moss and lichen communities will normally be found under plant canopies while the cyanobacteria will be found throughout the site. Functional/structural groups may appropriately contain non-native species if their ecological function is the same as the native species in the reference state. Perennial and annual forbs can be expected to vary widely in their expression in the plant community based upon departures from average growing conditions.

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** During years with average to above-average precipitation, there should be very little recent mortality or decadence apparent in either the shrubs or grasses. During severe (multi-year) drought or insect infestations up to 20% of the winterfat may die. There may be partial mortality of individual bunchgrasses and other shrubs during severe drought.

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14. **Average percent litter cover (%) and depth ( in):** Litter cover ranges from 10 to 20% with a spike when Bud Sage drops its leaves. Depth varies from ½ - ¾ inch with depth increasing near plant canopies.

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 350 – 400 pounds on an average year.

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16. **Potential invasive (including noxious) species (native and non-native). List species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicators, we are describing what is NOT expected in the reference state for the ecological site:** Russian thistle, annual bromes and Halogeton are likely to invade this site.

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17. **Perennial plant reproductive capability:** All perennial plant species have the ability to reproduce in most years except drought years.

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