

# Ecological site R028AY136UT

## Desert Sandy Loam (Four-Wing Saltbush)

Last updated: 5/02/2025  
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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): 028A–Ancient Lake Bonneville

MLRA 28A occurs in Utah (82%), Nevada (16%), and Idaho (2%). It encompasses approximately 36,775 square miles (95,246 square kilometers). A large area west and southwest of Great Salt Lake is a salty playa. This area is the farthest eastern extent of the Great Basin Section of the Basin and Range Province of the Intermontane Plateaus. It is an area of nearly level basins between widely separated mountain ranges trending north to south. The basins are bordered by long, gently sloping alluvial fans. The mountains are uplifted fault blocks with steep side slopes. Most of the valleys are closed basins containing sinks or playa lakes. Elevation ranges from 3,950 to 6,560 feet (1,204 to 2000 meters) in the basins and from 6,560 to 11,150 feet (1996 to 3398 meters) in the mountains. Much of the MLRA has alluvial valley fill and playa lakebed deposits at the surface from pluvial Lake Bonneville, which dominated this MLRA 13,000 years ago. A level line of remnant lake terraces on some mountain slopes indicates the former extent of this glacial lake. The Great Salt Lake is what remains of the pluvial lake. Mountains in the interior of this MLRA consist of tilted blocks of marine sediments from Cambrian to Mississippian age with scattered outcrops of Tertiary continental sediments and volcanic rocks. The average annual precipitation is 5 to 12 inches (13 to 30 cm) in the valleys and ranges up to 49 inches (124 cm) in the mountains. Most of the rainfall in the southern LRU occurs as high-intensity, convective thunderstorms during the growing season (April through September). The driest period is from midsummer to early autumn in the northern LRU. Precipitation in winter typically occurs as snow. The average annual temperature is 39 to 53 °F (4 to 12 °C). The freeze-free period averages 165 days and ranges from 110 to 215 days, decreasing in length with increasing elevation. The dominant soil orders in this MLRA are Aridisols, Entisols, and Mollisols. Soils are dominantly in the mesic or frigid soil temperature regime, aridic or xeric soil moisture regime, and mixed mineralogy. They generally are well drained, loamy or loamy-skeletal, and very deep.

### LRU notes

The Basin and Range South LRU has mountain ranges that are about 40 percent sedimentary/metasedimentary (limestone/quartzite dominant) and about 40 percent Tertiary volcanics. The basin floors are generally higher in the southern LRU than in the north LRU between 4,900 and 6,100 feet (1493 to 1859 meters) in elevation. The Basin and Range South LRU also exhibits patterns of summers with a greater relative amount of precipitation in July and August coming from convective storms (ustic trending pattern). Pinyon and juniper ecological sites have a great percentage of pinyon pine (*Pinus edulis* or *monophylla*) than Utah juniper (*Juniperus osteosperma*), with pinyon pine up to 50 percent of the tree composition in the semidesert zones and more than 50 percent in upland zones. Warm season grasses, such as James' galleta (*Pleuraphis jamesii*) or blue grama (*Bouteloua gracilis*), are present within the plant community, and can make up a large portion of the subdominant grass composition. Bristlecone pine (*Pinus longaeva*) and cliffrose (*Purshia* sp.) are also present and dominant on some ecological sites in the southern LRU, while they are sparse or absent in the northern LRU.

### Classification relationships

MLRA 28A, LRU E, southern desert ecological zone

### Ecological site concept

This site is typically dominated by four-wing saltbush in reference condition. It is typically found on 2 to 8 percent slopes on lake terraces, alluvial fans and fan terraces with sandy loam textures.

### Associated sites

|                    |                                                                                                                                 |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------|
| <b>R028AY119UT</b> | <b>Desert Flat (Shadscale)</b><br><br>This site will occur on finer textured soils and is dominated by shadscale.               |
| <b>R028AY226UT</b> | <b>Semidesert Sandy Loam (Wyoming Big Sagebrush)</b><br><br>This site will occur upslope and be dominated by Wyoming sagebrush. |

### Similar sites

|                    |                                                                                           |
|--------------------|-------------------------------------------------------------------------------------------|
| <b>R028AY011NV</b> | <b>SODIC DUNE</b><br><br>Similar site in Nevada.                                          |
| <b>R028AY134UT</b> | <b>Desert Sand (Four-Wing Saltbush)</b><br><br>This site also occurs on deep sandy soils. |

Table 1. Dominant plant species

|            |                               |
|------------|-------------------------------|
| Tree       | Not specified                 |
| Shrub      | (1) <i>Atriplex canescens</i> |
| Herbaceous | Not specified                 |

### Physiographic features

This site occurs on gently sloping fans and plains.

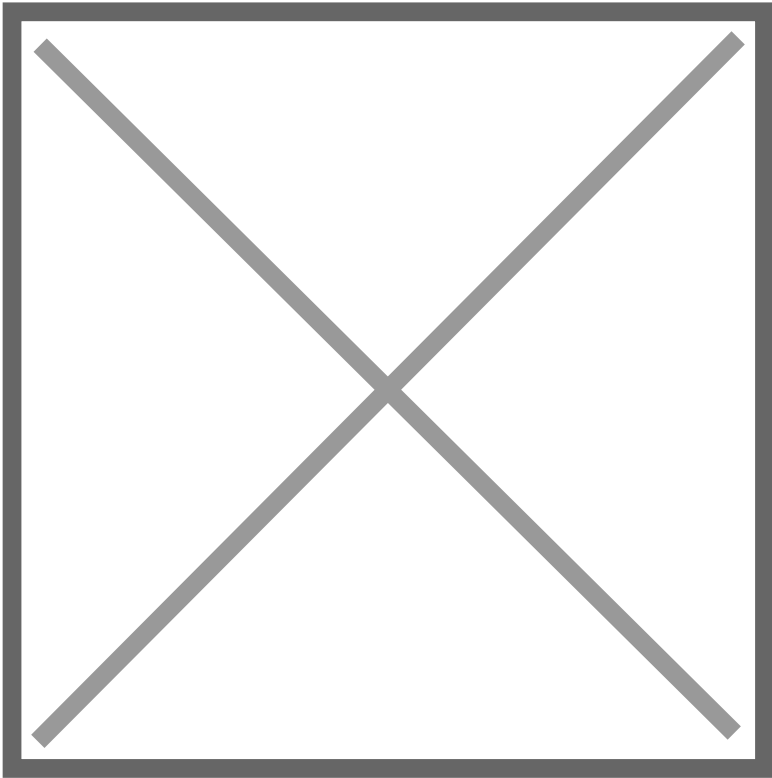


Figure 1.

Table 2. Representative physiographic features

|           |                      |
|-----------|----------------------|
| Landforms | (1) Fan<br>(2) Plain |
| Elevation | 1,460 – 1,590 m      |
| Slope     | 0 – 10 %             |

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.

Climate tables derived from PRISM model.

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

Table 3 Representative climatic features

|                               |          |
|-------------------------------|----------|
| Frost-free period (average)   |          |
| Freeze-free period (average)  | 130 days |
| Precipitation total (average) | 180 mm   |

## Influencing water features

### Soil features

Characteristic soils in this site are 60 inches deep or deeper and well drained.

They formed in alluvium derived mainly from mixed parent materials. The surface horizon is loamy sand or fine sandy loam textures and 4 inches thick. Rock fragments are not found in or on this soil.

The subsoil or substratum is sandy loams or loams. Some soils will have carbonate accumulations in the substratum and are calcareous throughout the profile. Other soils will have some silica cementation in the substratum. The available water holding capacity is 4 to 6 inches.

The water supplying capacity is 3 to 5 inches. Natural geologic erosion in potential is approximately 0.1 tons/acre/year

This site is correlated to the following soil components (soil survey area, component, mapunit):

UT617: Mazuma (41, 54)

Table 4. Representative soil features

|                                             |                         |
|---------------------------------------------|-------------------------|
| Surface texture                             | (1) Gravelly sandy loam |
| Family particle size                        | (1) Sandy               |
| Drainage class                              | Well drained            |
| Permeability class                          | Moderately rapid        |
| Soil depth                                  | 150 cm                  |
| Surface fragment cover <=3"                 | 0 – 20 %                |
| Surface fragment cover >3"                  | Not specified           |
| Available water capacity<br>(0-101.6cm)     | 7.37 – 9.91 cm          |
| Calcium carbonate equivalent<br>(0-101.6cm) | 10 – 20 %               |
| Electrical conductivity<br>(0-101.6cm)      | 0 – 20 mmhos/cm         |

|                                                          |               |
|----------------------------------------------------------|---------------|
| Sodium adsorption ratio<br>(0-101.6cm)                   | 0 – 70        |
| Soil reaction (1:1 water)<br>(0-101.6cm)                 | 7.9 – 10      |
| Subsurface fragment volume <=3"<br>(Depth not specified) | 0 – 20 %      |
| Subsurface fragment volume >3"<br>(Depth not specified)  | Not specified |

## Ecological dynamics

As ecological condition deteriorates due to overgrazing, Indian ricegrass, needleandthread, and fourwing saltbush decrease while rabbitbrush and threeawn increase.

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

Annual forbs and annual grasses are most likely to invade this site.

This site is similar to Nevada's 028AY011NV ecological site and the STM developed for 011NV is used below (Stringham et al. 2015).

## State and transition model

### Additional community tables

Table 5. Community 1.1 plant community composition

| Group                  | Common Name              | Symbol | Scientific Name                                                         | Annual Production () | Foliar Cover (%) |
|------------------------|--------------------------|--------|-------------------------------------------------------------------------|----------------------|------------------|
| <b>Shrub/Vine</b>      |                          |        |                                                                         |                      |                  |
| 0                      | <b>Primary Shrubs</b>    |        |                                                                         | 235-370              |                  |
|                        | fourwing saltbush        | ATCA2  | <i>Atriplex canescens</i>                                               | 135-202              | –                |
|                        | Nevada jointfir          | EPNE   | <i>Ephedra nevadensis</i>                                               | 67-101               | –                |
|                        | winterfat                | KRLA2  | <i>Krascheninnikovia lanata</i>                                         | 34-67                | –                |
| 3                      | <b>Secondary Shrubs</b>  |        |                                                                         | 20-34                |                  |
|                        | yellow rabbitbrush       | CHVIS5 | <i>Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus</i> | 7-20                 | –                |
|                        | granite prickly phlox    | LIPU11 | <i>Linanthus pungens</i>                                                | 7-20                 | –                |
|                        | bud sagebrush            | PIDE4  | <i>Picrothamnus desertorum</i>                                          | 7-20                 | –                |
| <b>Grass/Grasslike</b> |                          |        |                                                                         |                      |                  |
| 0                      | <b>Primary Grasses</b>   |        |                                                                         | 155-202              |                  |
|                        | Indian ricegrass         | ACHY   | <i>Achnatherum hymenoides</i>                                           | 135-168              | –                |
|                        | sand dropseed            | SPCR   | <i>Sporobolus cryptandrus</i>                                           | 20-34                | –                |
| 1                      | <b>Secondary Grasses</b> |        |                                                                         | 20-34                |                  |
|                        | blue grama               | BOGR2  | <i>Bouteloua gracilis</i>                                               | 7-20                 | –                |
|                        | squirreltail             | ELEL5  | <i>Elymus elymoides</i>                                                 | 7-20                 | –                |
|                        | needle and thread        | HECO26 | <i>Hesperostipa comata</i>                                              | 7-20                 | –                |

|             |                            |        |                                     |       |   |
|-------------|----------------------------|--------|-------------------------------------|-------|---|
|             | James' galleta             | PLJA   | <i>Pleuraphis jamesii</i>           | 7-20  | – |
| <b>Forb</b> |                            |        |                                     |       |   |
| 0           | <b>Primary Forbs</b>       |        |                                     | 20-34 |   |
|             | gooseberryleaf globemallow | SPGR2  | <i>Sphaeralcea grossulariifolia</i> | 20-34 | – |
| 2           | <b>Secondary Forbs</b>     |        |                                     | 20-34 |   |
|             | Utah milkvetch             | ASUT   | <i>Astragalus utahensis</i>         | 7-20  | – |
|             | roundspike cryptantha      | CRHU2  | <i>Cryptantha humilis</i>           | 7-20  | – |
|             | Shockley's buckwheat       | ERSH   | <i>Eriogonum shockleyi</i>          | 7-20  | – |
|             | tufted evening primrose    | OECA10 | <i>Oenothera caespitosa</i>         | 7-20  | – |
|             | slimflower scurfpea        | PSTE5  | <i>Psoralidium tenuiflorum</i>      | 7-20  | – |
|             | Mojave woodyaster          | XYTO2  | <i>Xylorhiza tortifolia</i>         | 7-20  | – |

Table 6. Community 1.2 plant community composition

| Group | Common Name | Symbol | Scientific Name | Annual Production () | Foliar Cover (%) |
|-------|-------------|--------|-----------------|----------------------|------------------|
|-------|-------------|--------|-----------------|----------------------|------------------|

Table 7. Community 1.3 plant community composition

| Group | Common Name | Symbol | Scientific Name | Annual Production () | Foliar Cover (%) |
|-------|-------------|--------|-----------------|----------------------|------------------|
|-------|-------------|--------|-----------------|----------------------|------------------|

Table 8. Community 2.1 plant community composition

| Group | Common Name | Symbol | Scientific Name | Annual Production () | Foliar Cover (%) |
|-------|-------------|--------|-----------------|----------------------|------------------|
|-------|-------------|--------|-----------------|----------------------|------------------|

Table 9. Community 2.2 plant community composition

| Group | Common Name | Symbol | Scientific Name | Annual Production () | Foliar Cover (%) |
|-------|-------------|--------|-----------------|----------------------|------------------|
|-------|-------------|--------|-----------------|----------------------|------------------|

Table 10. Community 2.3 plant community composition

| Group | Common Name | Symbol | Scientific Name | Annual Production () | Foliar Cover (%) |
|-------|-------------|--------|-----------------|----------------------|------------------|
|-------|-------------|--------|-----------------|----------------------|------------------|

Table 11. Community 3.1 plant community composition

| Group | Common Name | Symbol | Scientific Name | Annual Production () | Foliar Cover (%) |
|-------|-------------|--------|-----------------|----------------------|------------------|
|-------|-------------|--------|-----------------|----------------------|------------------|

Table 12. Community 3.2 plant community composition

| Group | Common Name | Symbol | Scientific Name | Annual Production () | Foliar Cover (%) |
|-------|-------------|--------|-----------------|----------------------|------------------|
|-------|-------------|--------|-----------------|----------------------|------------------|

Animal community

This site is suited for sheep and cattle grazing during winter and spring. Wildlife using this site include rabbit, coyote, fox, pronghorn antelope, and mule deer (seasonal). 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

Soils are in hydrologic groups B and C with runoff curves ranging from 61 to 79 and 74 to 76 respectively depending on hydrologic condition.

Recreational uses

Some recreational uses of this site are hiking and hunting.

Wood products

None

Other information

Threatened and endangered species include plants and animals.

## Other references

Stringham, T.K., P. Novak-Echenique, P. Blackburn, C. Coombs, D. Snyder, and A. Wartgow. 2015. Final Report 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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## Approval

Jamin Johanson, 5/02/2025

## 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 Ret.), Shane A. Green (NRCS) |
| Contact for lead author                     | shane.green@ut.usda.gov                            |
| Date                                        | 01/12/2009                                         |
| Approved by                                 |                                                    |
| Approval date                               |                                                    |
| Composition (Indicators 10 and 12) based on | Annual Production                                  |

## Indicators

- 1. Number and extent of rills:** Minor rill development may be evident in the reference community only following significant storm or snow melt events. The presence of rills may be more evident where run-on from adjacent upland sites or exposed bedrock concentrate flows. Any rill development will be short (< 5') and spaced 6' – 8'. Evidence of rills will decrease in the months following major weather events due to coarse textured surface soils.
-

2. **Presence of water flow patterns:** Evidence of water flow is not evident in the reference community except slight flow activity may be observed following significant weather events. Any flow patterns present are normally <15 feet long, follow natural contours, and are typically spaced 15 to 20 feet apart. Healthy vascular plant communities and biological soil crusts reduce runoff and improve infiltration on this site.
- 
3. **Number and height of erosional pedestals or terracettes:** Pedestals or terracettes caused by accelerated water erosion are not typically evident in the reference community. 1 – 2 inches of depositional mounding in perennial grass clumps and Four-wing saltbush canopies is normal. There are no exposed roots around perennial grass bunches and little evidence of soil or litter accumulating behind obstructions.
- 
4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Bare ground ranges from 20% - 40% in the reference community. Ground cover (the inverse of bare ground) typically includes: coarse fragments – 5% to 15%; plant canopy – 20% to 30%; litter – 20% to 30%, and cryptogamic crusts – 2% to 5%.
- 
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.
- 
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 around Indian ricegrass and Sand dropseed bunches is a normal characteristic of this site. Slight coppice mounding under Four-wing canopies is normal. Evidence of increased soil saltation may be present during severe drought periods or wind storms.
- 
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") may move (1' – 2') in the direction of prevailing winds or down slope if being transported by water. Little accumulation is observed behind obstructions. Larger woody litter (> 1/4") is found under or near shrubs.
- 
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 sandy loams containing 10% to 15% coarse fragments.
- 
9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Soil surface is 3 - 4 inches deep and structure varies from granular to weak thick platy. The A-horizon color varies from 5YR 6/8 to 10YR 6/3. Soils have an Ochric epipedon that extends 4 – 10 inches into the soil profile. The A horizon is normally deeper and better developed under plant canopies.
- 
10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** The presence of rhizomatous grasses combined with healthy perennial bunchgrasses and Four-wing saltbush 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. Increases in clay or silt content in subsoil layers could be mistaken for compaction in some soils.
- 

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: Sprouting shrubs (e.g. Four-wing saltbush and Winterfat) 20 – 40%, > cool season grasses (e.g. Indian ricegrass and Bottlebrush squirreltail) 20 – 25%.

Sub-dominant: Sub-dominant: Sprouting shrubs (e.g. Nevada jointfir and Low rabbitbrush) 10 – 15%, > warm season grasses (e.g. Galleta) 2 – 5%, > Short Cool season grasses (e.g. Sandberg and Nevada bluegrasses) 1-3%.

Other: Others: Shrubs (e.g. Bud sage 1-3%), perennial forbs (e.g. Gooseberryleaf globemallow and wild buckwheat) 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. There may be partial (<30%) mortality of individual bunchgrasses and other shrubs during severe drought.
- 

14. Average percent litter cover (%) and depth ( in): Litter cover ranges from 20 to 30% with a spike when shrubs drop their leaves. Depth varies from ¾ to 1/2 inch with depth increasing near plant canopies.
- 

15. Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production): 500 - 600 pounds on an average year.
- 

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: Broom snakeweed, Russian thistle, Redstem storksbill, annual bromes and Halogeton are likely to increase in or invade this site.
- 

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