Ecological site R028AY124UT
Desert Loam (Shadscale)

Last updated: 5/02/2025
Accessed: 08/29/2026

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 North LRU exhibits dry summer with stronger xeric patterns than the Basin and Range South LRU. Ranges in the north LRU are about 50 percent Paleozoic sedimentary/metasedimentary (limestone/quartzite dominant) and about 10 percent Tertiary volcanics. The basin floors are between 4,200 and 5,100 feet (1280 to 1554 meters) in elevation. Pinyon and juniper sites have a greater percentage of Utah juniper (Juniperus osteosperma) in the plant community than pinyon pine (Pinus edulis or monophylla). The Basin and Range North have few semidesert ecological sites with Utah juniper. Cool season grasses, such as bluebunch wheatgrass (Pseudoroegneria spicata), are dominant in the plant community, while warm season grasses are largely absent or a small component of the plant community.

Classification relationships

MLRA 28A, LRU A, northern desert ecological zone

Ecological site concept

This site is dominated by shadscale in reference condition. It is typically found on the low slopes of lake terraces, fan remnants, alluvial fans, and lake plains.

Associated sites

R028AY001UT	**Alkali Bottom (Alkali Sacaton)** This site will occur in the bottom areas adjacent to the Desert Loam site.
R028AY104UT	**Desert Alkali Bench (Bud Sagebrush)** This site occurs on benches above the Desert Loa (shadscale) site and is dominated by bud sagebrush.
R028AY140UT	**Desert Silt Flat (Winterfat)** This site has been combined with R028AY139UT.
R028AY130UT	**Desert Salt Flat (Sickle Saltbush)** This site occurs in association, but is dominated by sickle saltbush.
R028AY138UT	**Desert Shallow Loam (Shadscale)** This site occurs on shallow soils.
R028AB110UT	**Desert Alkali Sand (Fourwing Saltbush)** This site is found in the southern LRU on coarser textured soils and is dominated by four-wing saltbush.
R028AY110UT	**Desert Alkali Sand (Fourwing Saltbush)** This site is found in the northern LRU on coarser textured soils and is dominated by four-wing saltbush.
R028AB112UT	**Desert Alkali Sandy Loam (Shadscale)** This site occurs in the southern LRU on coarser textured soil.
R028AB119UT	**Desert Flat (Shadscale)** This site is found in the southern LRU and will occur on finer textured soils and will be on nearly level slopes and is dominated by shadscale.
R028AB122UT	**Desert Gravelly Sandy Loam (Indian Ricegrass)** This site is found in the southern LRU and occurs on gravelly sand loam soils and is dominated by Indian ricegrass.
R028AY106UT	**Desert Alkali Clay Loam (Alkali Sacaton)** This site also occurs on finer textured soils but is dominated by alkali sacaton.

R028AY119UT	**Desert Flat (Shadscale)** This site occurs in the northern LRU on finer textured soils and will be on nearly level slopes and is dominated by shadscale.
R028AY122UT	**Desert Gravelly Sandy Loam (Indian Ricegrass)** This site is found in the northern LRU and occurs on gravelly sand loam soils and is dominated by Indian ricegrass.
R028AY139UT	**Desert Silt Loam (Winterfat)** This site occurs on siltier soils and is dominated by winterfat.

Similar sites

R028AY119UT	**Desert Flat (Shadscale)** This site occurs in the northern LRU on finer textured soils and will be on nearly level slopes and is dominated by shadscale.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Atriplex confertifolia*
Herbaceous	Not specified

Physiographic features

This site occurs on gently sloping lake terraces, fan remnants, alluvial fans and lake plains. It can be found between 4300 to 6000 feet. There is no flooding or ponding that occurs on this site.

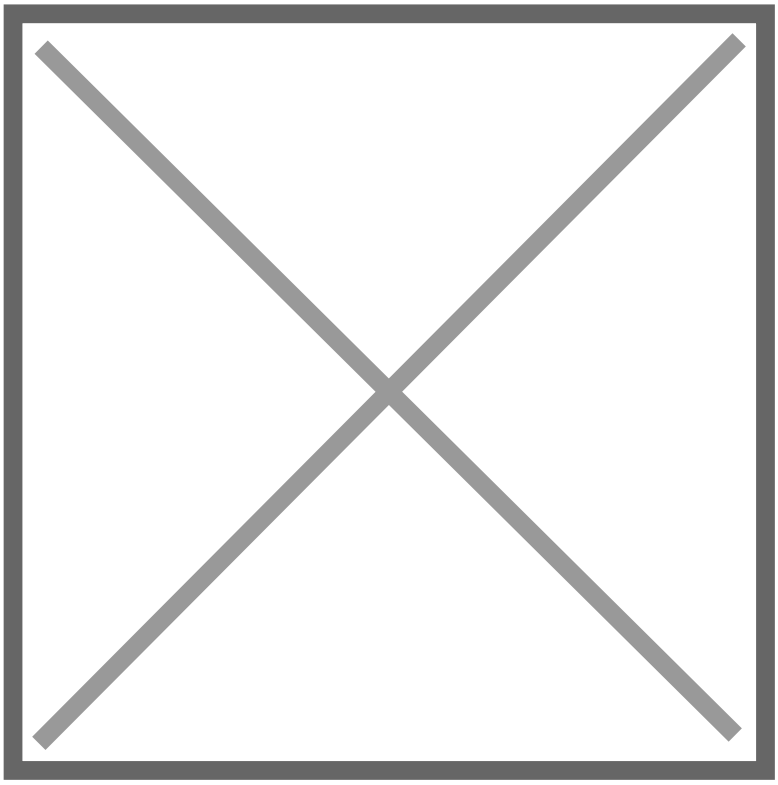

Figure 1.

Table 2. Representative physiographic features

Landforms	(1) Lake terrace (2) Fan remnant (3) Alluvial fan
Flooding frequency	None
Ponding frequency	None
Elevation	1,310 – 1,830 m
Slope	0 – 10 %

Climatic features

The climate is cold and snowy in the winter and warm and dry in the summer. The average 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: 50-54

Table 3 Representative climatic features

Frost-free period (average)	80 days

Freeze-free period (average)	120 days
Precipitation total (average)	310 mm

- (1) GROUSE CREEK [USC00423486], Grouse Creek, UT

Influencing water features

No flooding or ponding occur on this site.

Soil features

Characteristic soils in this site are over 60 inches deep and well drained. They formed in alluvium and lacustrine sediments derived mainly from limestone and basalt parent materials. The surface horizon is fine sandy loam textures and 3 inches thick. About 0-10 percent of the soil surface is covered by rock fragments. The volume of rock fragments in the soil profile is 0 to 15 percent.

These soils are moderately through strongly calcareous. Rock fragments range from 0 to 15 percent throughout the profile and may occur on the surface ad "desert pavement." the subsoil and underlying materials are slightly to strongly saline. Reaction is moderately to very strongly alkaline. Available water capacity is 2 to 6 inches.

Natural geologic erosion in potential is approximately 1.0 tons/acre/year.

This site is correlated to the following soil components (soil survey area, soil component, mapunit):
UT601: Declo (25, 26, 27), Hiko Springs (40), Smaug (82)
UT611: Timpie (66), Tooele (69)
UT617: Avalon (4), Mazuma (44), Robozo (4), Swingler (54, 79, 80), Yuba (92)
UT618: Puddle (122), Thiokol (112)
UT640: Penoyer (KPE, PGB, PHD)

Table 4. Representative soil features

Parent material	(1) Estuarine deposits – limestone (2) Lacustrine deposits – quartzite
Surface texture	(1) Fine sandy loam (2) Silt loam (3) Very fine sandy loam
Drainage class	Well drained
Permeability class	Slow to moderately rapid
Soil depth	150 cm
Surface fragment cover <=3"	0 – 10 %

Surface fragment cover >3"	Not specified
Available water capacity (0-101.6cm)	3.81 – 17.02 cm
Calcium carbonate equivalent (0-101.6cm)	0 – 40 %
Electrical conductivity (0-101.6cm)	0 – 20 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0 – 10
Soil reaction (1:1 water) (0-101.6cm)	7.9 – 10
Subsurface fragment volume <=3" (Depth not specified)	0 – 10 %
Subsurface fragment volume >3" (Depth not specified)	Not specified

Ecological dynamics

The plant communities and ecological dynamics associated with this site are presented in a State and Transition Model (STM) diagram and are described in more detail in the narratives that follow. These plant communities may not represent every possibility, but are probably the most prevalent and recurring plant communities. As more monitoring data are collected, some phases or states may be revised, removed, and/or new ones added. None of these plant communities should necessarily be thought of as “Desired Plant Communities.” The descriptions of plant communities in this document represent the current knowledge and experience at the time of this revision.

STMs are used to illustrate how a reference community (i.e. vegetation prior to Euro-American settlement but long after the arrival of Native Americans) and associated soil-vegetation relationships evolve when subjected to different environmental conditions and drivers of change (e.g. climate, land use, natural disturbances). The STM consists of the historic “Reference State” and potential “alternative states.” Each state may have one or more community “phases” to represent how system dynamics fluctuate within the “limits” of the state (Briske et al. 2008). The ecological resilience (i.e. stability) of a state can be maintained when negative feedbacks exist. Conversely, when system dynamics are disturbed enough through positive feedbacks, whether natural or human-caused, new conditions and processes may develop, resetting the trajectory of the site to an alternative stable state. Transitions between states occur when ecological “thresholds” are crossed. The ability to return to the prior state and reverse the transition would not occur without active restoration practices (i.e. “restoration pathways”). The drivers of change between phases and states are labeled in the diagram as codes (see legend beneath the diagram).

STMs provide a more mechanistic view of the ecological site, which land managers can use to distinguish current conditions from “desired” conditions, and to assess state vulnerability relative to ecological thresholds. Increased awareness of how soil-vegetation

patterns and processes vary over space and time promotes greater opportunities to focus adaptive management and restoration efforts.

As ecological condition deteriorates due to overgrazing, Indian ricegrass, squirreltail, bud sagebrush, and winterfat decrease while shadscale and rabbitbrush increase.

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

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

State and transition model

Figure 6. R028AA124UT STM

Figure 7. R028AA124UT STM Legend

Additional community tables

Table 5. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
Shrub/Vine					
0	**Primary Shrubs**			140-224	
	shadscale saltbush	ATCO	*Atriplex confertifolia*	84-112	–
	winterfat	KRLA2	*Krascheninnikovia lanata*	28-56	–
	bud sagebrush	PIDE4	*Picrothamnus desertorum*	28-56	–
3	**Secondary Shrubs**			17-28	
	black sagebrush	ARNO4	*Artemisia nova*	6-17	–
	fourwing saltbush	ATCA2	*Atriplex canescens*	6-17	–
	green molly	BAAM4	*Bassia americana*	6-17	–
	yellow rabbitbrush	CHVI8	*Chrysothamnus viscidiflorus*	6-17	–
	Nevada jointfir	EPNE	*Ephedra nevadensis*	6-17	–
	Nuttall's horsebrush	TENU2	*Tetradymia nuttallii*	6-17	–
Grass/Grasslike					
0	**Primary Grasses**			185-252	
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	112-140	–
	squirreltail	ELEL5	*Elymus elymoides*	56-84	–
	James' galleta	PLJA	*Pleuraphis jamesii*	17-28	–
1	**Secondary Grasses**			17-28	
	blue grama	BOGR2	*Bouteloua gracilis*	6-17	–
	needle and thread	HECO26	*Hesperostipa comata*	6-17	–
	western wheatgrass	PASM	*Pascopyrum smithii*	6-17	–
	Sandberg bluegrass	POSE	*Poa secunda*	6-17	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	6-17	–
Forb					
2	**Forbs**			56-84	
	Torrey's milkvetch	ASCA9	*Astragalus calycosus*	17-28	–
	cushion buckwheat	EROV	*Eriogonum ovalifolium*	17-28	–
	shaggy fleabane	ERPU2	*Erigeron pumilus*	17-28	–
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	17-28	–

Table 6. Community 1.2 plant community composition

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

Table 7. Community 2.1 plant community composition

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

Table 8. Community 2.2 plant community composition

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

Table 9. Community 2.3 plant community composition

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

Table 10. Community 2.4 plant community composition

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

Table 11. Community 2.5 plant community composition

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

Table 12. Community 3.1 plant community composition

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

Table 13. Community 4.1 plant community composition

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

Table 14. Community 5.1 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

The soils are in hydrologic groups B and C with runoff curves ranging from 61 and 74 to 86 respectively depending of hydrologic condition.

Recreational uses

Resources that have special aesthetic and landscaping value are wildflowers. Some recreational uses of this site are hiking and hunting.

Wood products

None

Other information

Threatened and endangered species include plants and animals.

Type locality

Location 1: Box Elder County, UT

General legal description	Type Location: 25 Miles South of Park Valley, Box Elder County, Utah Benchlands Immediately South of Bovine Point and Bordering Red Dome

Contributors

DJS
Lisa Langs Stoner
David J. Somorville

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)	Shane A. Green (NRCS), V. Keith Wadman (NRCS Ret.)
Contact for lead author	shane.green@ut.usda.gov
Date	05/24/2005
Approved by	
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills: Minor rill development will be evident in reference communities on this site. Development will be more pronounced 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. Small rill development will be moderately short (< 6') and somewhat widely spaced (10' – 15'). Evidence of rills will decrease in the months following major weather events as they heal.**

---

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.**

---

3. **Number and height of erosional pedestals or terracettes:** **Very slight evidence of pedestals or terracettes caused by accelerated water erosion may be evident in the reference community. 1–2 inches of depositional mounding under Shadscale canopies is normal and may not be water erosion caused.**

---

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** **Bare ground ranges from 40% - 50% in the reference community. Ground cover (the inverse of bare ground) typically includes: coarse fragments – 0 - 10%; plant canopy – 20% to 30%; litter – 10% to 20%, and cryptogamic crusts – 2% to 5%.**

---

5. **Number of gullies and erosion associated with gullies:** **Very few. Some 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. Wind caused blowouts are not present. Slight depositional mounding in perennial grass bunches and under Shadscale canopies is a normal characteristic of this site.**

---

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.**

---

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 loams or sandy loams containing < 10% rock fragments.**

---

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** **Soil surface is 1 - 4 inches deep and structure varies from thin or medium platy to fine granular. The A-horizon color varies from 10YR 7/3 to 10YR 6/2. Soils have an Ochric epipedon that extends 3 – 14 inches into the soil profile. The A horizon is normally deeper and better developed under plant canopies.Where surface soil is lost, increased clay and silt percentages are common in the remaining soil material.**

---

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** **The presence of healthy perennial bunchgrasses 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.**

---

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. Some soils have an argillic horizon (clay accumulation) in subsoil layers could be mistaken for compaction.

---

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: Non-sprouting shrubs (e.g. Shadscale and Bud sage) 20 – 30%, > tall cool season grasses (e.g. Bottlebrush squirreltail and Indian ricegrass) 20 – 40%.

    Sub-dominant: Sub-dominant: Sprouting shrubs (e.g. Winterfat and Nevada jointfir) 10- 15% > Rhizomatous grasses (e.g. Galleta and Western wheatgrass) 3 - 5%.

    Other: Others: Shrubs (e.g. Low rabbitbrush and Greenmolly) 1-3%, perennial forbs (e.g. Scarlet globemallow and Cushion 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.

---

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 80% of the shadscale may die. There may be partial mortality of individual bunchgrasses and other shrubs during severe drought.

---

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

---

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 450 – 500 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.
