

Ecological site R028AY104UT

Desert Alkali Bench (Bud Sagebrush)

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 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, ecological zone desert.

Ecological site concept

This site occurs predominantly in the northern part of 28A. It is dominated by bud sagebrush in reference condition. It is typically found on alluvial fans and fan terraces on coarser textured soils.

Associated sites

R028AY124UT	Desert Loam (Shadscale) This site will occur on finer textured soils and is dominated by shadscale.
R028AY138UT	Desert Shallow Loam (Shadscale) This site occurs on shallow soils.
R028AY230UT	Semidesert Shallow Hardpan (Black Sagebrush) North This site occur on shallow soils.
R028AY134UT	Desert Sand (Four-Wing Saltbush) This site occurs on deep sandy soils.
R028AY119UT	Desert Flat (Shadscale) This site will occur on finer textured soils and is dominated by shadscale.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) <i>Picrothamnus desertorum</i> (2) <i>Atriplex confertifolia</i>
Herbaceous	Not specified

Physiographic features

This site occurs on benches, gently sloping outwash fans, old lake terraces, lake plains, beach bars, and plateaus. It is typically found between 4300 to 5800 feet at 2 to 8 percent slopes.

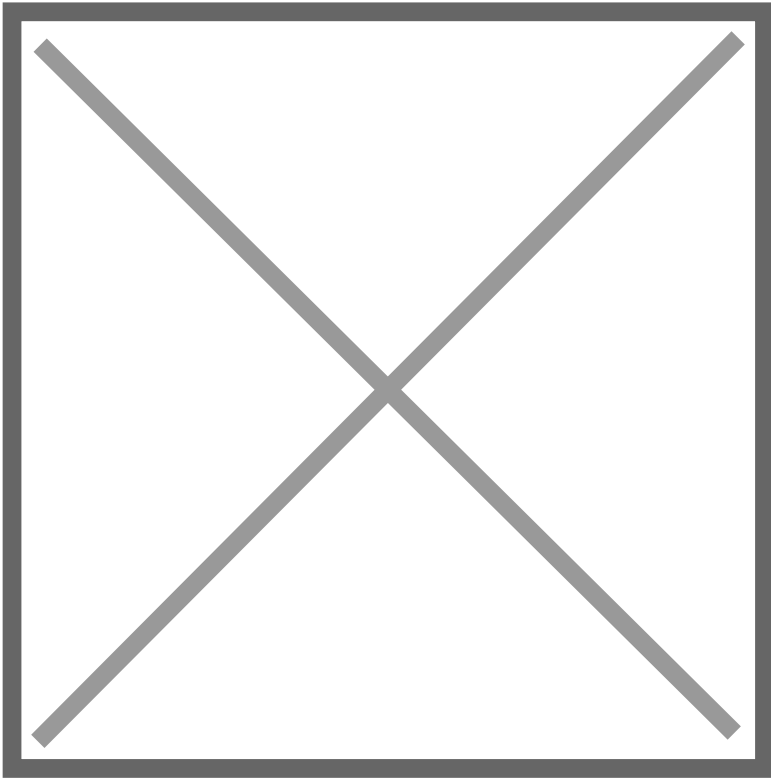


Figure 1.

Table 2. Representative physiographic features

Landforms	(1) Alluvial fan (2) Fan remnant (3) Terrace
Flooding frequency	None
Ponding frequency	None
Elevation	1,310 – 1,770 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.

Mean Annual Air Temperature: 45-50
Mean Annual Soil Temperature: 52-54

Table 3 Representative climatic features

Frost-free period (average)	80 days
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Freeze-free period (average)	120 days
Precipitation total (average)	310 mm

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

Influencing water features

Water erosion hazard is slight.

Soil features

Characteristic soils in this site are over 60 inches deep and well or somewhat excessively drained.

They formed in alluvium and colluvium and lacustrine materials derived mainly from mixed by the wave action of ancient Lake Bonneville or by running water in streams or sheetflood. The surface horizon is gravelly loam to very gravelly sandy loam textures and 13 inches thick. About 60 percent of the soil surface is covered by rock fragments. These soils are moderately calcareous to very strongly calcareous, strongly alkaline or very strongly alkaline and slightly saline to strongly saline in some part of the profile. These soils are affected by sodium. Permeability is moderate to moderately rapid. Available water capacity is reduced by salinity and ranges from 2 to 5 inches. Runoff is slow, and the hazard of water erosion is slight.

The available water capacity is 1.2 to 3.8 inches. Natural geologic erosions in potential is approximately 0.5 tons/acre/year.

This site is correlated in the following surveys (Survey name, component, mapunit)

UT601: Cliffdown (15, 18)

UT602: Cliffdown (CRP)

UT611: Cliffdown (27), Izamatch (28)

UT617: Dera (18), Goshute (26, 28, 29, 30), Swasey (78)

UT632: Goshute (GO), Swasey (SWC, UFC), Uffens (PU, UE, UFC, UH2, YUC), Yenrab (YeC, YUC)

Table 4. Representative soil features

Parent material	(1) Alluvium – limestone and sandstone
Surface texture	(1) Gravelly loam (2) Very gravelly sandy loam (3) Gravelly silt loam
Drainage class	Somewhat excessively drained to well drained
Permeability class	Slow to moderately rapid
Soil depth	150 cm
Surface fragment cover <=3"	0 – 40 %
Surface fragment cover >3"	0 – 10 %

Available water capacity (0-101.6cm)	3.05 – 9.65 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 – 30
Soil reaction (1:1 water) (0-101.6cm)	7.9 – 10
Subsurface fragment volume <=3" (Depth not specified)	0 – 40 %
Subsurface fragment volume >3" (Depth not specified)	Not specified

Ecological dynamics

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

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

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

This site is similar in soils and vegetation composition to 028AY016NV. The STM developed by Nevada (Stringham et al. 2015) is used for the Utah ESD.

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 (%)
Shrub/Vine					
0	Primary Shrubs			143-171	
	bud sagebrush	PIDE4	<i>Picrothamnus desertorum</i>	112-127	–
	shadscale saltbush	ATCO	<i>Atriplex confertifolia</i>	15-28	–

	green molly	BAAM4	<i>Bassia americana</i>	9	–
	Nevada jointfir	EPNE	<i>Ephedra nevadensis</i>	9	–
3	Secondary Shrubs			9-15	
	spiny hopsage	GRSP	<i>Grayia spinosa</i>	3-9	–
	broom snakeweed	GUSA2	<i>Gutierrezia sarothrae</i>	3-9	–
	winterfat	KRLA2	<i>Krascheninnikovia lanata</i>	3-9	–
	shortspine horsebrush	TESP2	<i>Tetradymia spinosa</i>	3-9	–
Grass/Grasslike					
0	Primary Grasses			59-143	
	Indian ricegrass	ACHY	<i>Achnatherum hymenoides</i>	43-56	–
	squirreltail	ELEL5	<i>Elymus elymoides</i>	43-56	–
	James' galleta	PLJA	<i>Pleuraphis jamesii</i>	43-56	–
1	Secondary Grasses			15-28	
	King's eyelashgrass	BLKI	<i>Blepharidachne kingii</i>	3-9	–
	Sandberg bluegrass	POSE	<i>Poa secunda</i>	3-9	–
	alkali sacaton	SPAI	<i>Sporobolus airoides</i>	3-9	–
	sand dropseed	SPCR	<i>Sporobolus cryptandrus</i>	3-9	–
Forb					
0	Primary Forbs			9-15	
	scarlet globemallow	SPCO	<i>Sphaeralcea coccinea</i>	9-15	–
2	Secondary Forbs			15-28	
	Holboell's rockcress	ARHO2	<i>Arabis holboellii</i>	3-9	–
	western tansymustard	DEPI	<i>Descurainia pinnata</i>	3-9	–
	shaggy fleabane	ERPU2	<i>Erigeron pumilus</i>	3-9	–
	whitestem blazingstar	MEAL6	<i>Mentzelia albicaulis</i>	3-9	–

Table 6. Community 1.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 7. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 8. Community 2.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 9. Community 2.3 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 10. Community 3.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 11. Community 4.1 plant community composition

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

--Threatened and Endangered Species-- This section will be populated as more information becomes available. --Wildlife Interpretation-- This ecological site, in its reference state, produced large amounts of nutritious forage that was utilized by native herbivores including deer and antelope who lived here along their associated predators. Although much of this site is presently different from the reference

state, it is still very important as wildlife habitat. Other wildlife commonly observed using this site include rabbit, coyote, badger, fox, and various waterfowl species. --Grazing Interpretations-- This site provides good spring, fall, and winter grazing conditions for domestic livestock due to its accessibility and its supply of nutritious forage. When this site is stressed, cheatgrass, Russian thistle and halogeton are likely to invade.

Hydrological functions

The soils are in hydrologic group B. The hydrologic curve number is 61 when the vegetation is in good condition.

Recreational uses

Resources that have special aesthetic and lanscape value are wildflowers. Some recreation uses of this sight 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	Box Elder West Soil Survey – Terrace Mountain Pigeon Mountain Lyon Mountain Warm Springs Soil Survey Pit - No. 6-4 Pit No. 23-1 Location Ferguson Desert

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.

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Date	01/05/2009

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 following significant storm or snow melt events. The appearance of rills may be more apparent on steeper slopes or where run-on from adjacent upland sites or exposed bedrock concentrate flows. Any rill development will be short (< 3') and widely spaced (6' – 8'). Evidence of rills will disappear in the months following major weather events. Potential rill development may be masked by large concentrations (70% - 80% or greater) of coarse fragments on the soil surface.

- 2. Presence of water flow patterns:** Evidence of water flow is not apparent in the reference community except slight flow activity may be observed following significant weather events. Surface coarse fragments and biological soil crusts typically protect surface soils from accelerated erosion in the reference state. Any flow patterns present are normally <10 feet long, follow natural contours, and are typically spaced 15 to 20 feet apart. There are no exposed roots around perennial grass clumps and surface coarse fragments show little sign of movement or redistribution.

- 3. Number and height of erosional pedestals or terracettes:** Pedestals or terracettes caused by accelerated water erosion are not evident in the reference community. 1 – 3 inches of elevational mounding in James galleta clumps, Bud sage canopies and cryptogamic crusts are 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 5% - 15% in the reference community. Ground cover (the inverse of bare ground) typically includes: coarse fragments – 50% to 70%; plant canopy – 10% to 20%; litter – 10% to 15%, and biological soil crusts – 2% to 5%. Bud sage is deciduous and may appear to increase bare ground percentages following leaf drop.

- 5. Number of gullies and erosion associated with gullies:** Developed gully channels are a normal component of desert environments. Gullies will typically have stable, partially vegetated sides and bottoms with no evidence of recent 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:** Very minor evidence of wind generated soil movement may be present in reference communities. Slight depositional mounding in perennial grass clumps, Bud sage canopies and biological soil crusts 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") 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 3 to 4. Surface textures are typically sandy loams containing 50 to 75% coarse fragments. Where surface soil is lost, increased clay and silt percentages are common 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 3 or 4 inches deep and structure varies from thin to thick platy. The A-horizon color varies from 10YR 6/2 to 10YR 7/2. It 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 presence of rhizomatous grasses such as James galleta or Alkali sacaton combined with healthy perennial bunchgrass and Bud sage 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. Coarse fragments can increase as a percentage of total cover sealing the soil surface and slowing infiltration.
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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 mostly very deep, but a few may have bedrock at 25 – 30 inches. Increases in clay or silt content in subsoil layers should not be mistaken for compaction.
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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: Non-sprouting shrubs (e.g. Bud sage and Shadscale) 40 – 60%, >> warm season perennial grasses (e.g. James galleta, Alkali sacaton, dropseeds) 10 – 20%, > cool season grasses (e.g. Bottlebrush squirreltail and Indian ricegrass) 5 – 10%.
- Sub-dominant: Sub-dominant: Mixed shrubs (e.g. Nevada jointfir and Winterfat) 1-5% > Cool season grasses (e.g. Sandberg and Nevada bluegrasses) 1-3%.
- Other: Others: Shrubs (e.g. Shortspine horsebrush and Spiny hopsage) 1-3%, perennial forbs (e.g. Scarlet globemallow and Holboell rockcress) 3-5%, biological soil crusts (e.g. lichens, mosses, cyanobacteria).
- Additional: Moss and lichen communities will normally be found under plant canopies while the cyanobacteria will be found throughout the site.
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13. Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence): Reference community populations should remain relatively stable during average or above average precipitation years. During extreme drought years Bud sage may die and cool season perennial grasses may appear stressed with little production. Broom snakeweed may temporarily increase in percent composition during years with favorable growing conditions for this plant.
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14. **Average percent litter cover (%) and depth (in):** Litter cover ranges from 10 to 15% with a spike when Bud Sage drops its leaves. Depth varies from ¼ - 1/2 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):** 150 – 250 pounds on a typical 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: Broom snakeweed, Redstem storksbill and Halogeton are likely to increase in or 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. During drought years new seedlings may be missing and principle shrubs may experience early and prolonged leaf drop.
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