

Ecological site R028AB232UT

Semidesert Shallow Hardpan (Utah Juniper) South

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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 percent), Nevada (16 percent), and Idaho (2 percent). 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. The soils are generally 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

MRLA: 28A Great Salt Lake Area LRU: A, Basin and Range South Ecological Zone: Semidesert Ecological Site: Semidesert Shallow Hardpan (Utah Juniper) EPA Ecoregions: North American Deserts Cold Deserts Central Basin and Range Woodland- and Shrub-Covered Low Mountains

Ecological site concept

The Semidesert Shallow Hardpan (Utah Juniper) South site occurs on hills and fan remnants. The soils are shallow over silica and carbonate hardpans. The dominant vegetation is Utah juniper and Indian ricegrass.

Associated sites

R028AY226UT	Semidesert Sandy Loam (Wyoming Big Sagebrush) Adjacent to R028AA232UT in lower lying areas.
R028AY230UT	Semidesert Shallow Hardpan (Black Sagebrush) North This site occurs adjacent to R028AB232UT and on the same landform. This site should be dominated by black sagebrush with a small component of Utah juniper.
R028AF214UT	Semidesert Gravelly Loam (Wyoming Big Sagebrush) South This site will be adjacent down slope from R028AB232UT and will be located in deeper soils.

Similar sites

R028AY232UT	Semidesert Shallow Hardpan (Utah Juniper) North This site occurs in the Basin and Range North LRU. This site does not receive regular summer precipitation and does not have a large presence of warm season species.
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Table 1. Dominant plant species

Tree	(1) <i>Juniperus osteosperma</i>
Shrub	Not specified
Herbaceous	Not specified

Physiographic features

The Semidesert Shallow Hardpan (Utah Juniper) South site occurs on hills and fan remnants between 5,500 and 6,200 feet. Slopes are typically between 2 and 25 percent. There is no flooding or ponding on this site.

Table 2. Representative physiographic features

Landforms	(1) Hill (2) Fan remnant
Flooding frequency	None
Ponding frequency	None
Elevation	1,680 – 1,890 m
Slope	0 – 30 %

Climatic features

The climate is semi-arid and characterized by cold snowy winters and warm summers that receive rain from thunderstorms. The average annual precipitation is 8 to 12 inches. Approximately 70 percent comes as rain from March through October. This site often receives summer precipitation from convective thunderstorms July through October.

Climate summary tables are derived from PRISM climate model.

Table 3 Representative climatic features

Frost-free period (average)	
Freeze-free period (average)	
Precipitation total (average)	360 mm

Influencing water features

Soil features

The characteristic soils are 10 to 20 inches deep over silica and carbonate hardpans that are generally fragmented. They formed in alluvium and colluvium derived mainly from mixed parent materials. The surface horizon is medium or moderately coarse textures, and are generally calcareous throughout. About 16 to 22 percent of the soil surface is covered by rock fragments. The volume of rock fragments in the soil profile is 8 to 25 percent. Permeability is moderately slow to moderate. The available water capacity is 2 to 3 inches.

This site occurs across the proposed LRU boundary. All soil components are currently correlated to R028AY232UT. The following soil components are proposed to be evaluated to re-correlate to R028AB232UT:

UT634: Chuska (349), Denmark (364), Minu (421), Plegomir (450)

UT646: Chuska (I349), Plegomir (I450)

Table 4. Representative soil features

Parent material	(1) Alluvium – limestone, sandstone, and shale
Surface texture	(1) Gravelly loam (2) Sandy loam
Drainage class	Well drained
Permeability class	Moderately slow to moderate
Soil depth	30 – 50 cm
Surface fragment cover <=3"	20 %
Surface fragment cover >3"	Not specified

Available water capacity (0-101.6cm)	3.81 – 7.62 cm
Calcium carbonate equivalent (0-101.6cm)	0 – 10 %
Electrical conductivity (0-101.6cm)	Not specified
Sodium adsorption ratio (0-101.6cm)	Not specified
Soil reaction (1:1 water) (0-101.6cm)	7.4 – 8.4
Subsurface fragment volume <=3" (Depth not specified)	10 – 30 %
Subsurface fragment volume >3" (Depth not specified)	Not specified

Ecological dynamics

As ecological condition deteriorates due to overgrazing, Indian ricegrass (*Achnatherum hymenoides*), needle and thread (*Hesperostipa comata*), and bluebunch wheatgrass (*Pseudoroegneria spicata*) decrease, while low rabbitbrush (*Chrysothamnus viscidiflorus*), black sagebrush (*Artemisia nova*), snakeweed (*Gutierrezia sarothrae*), and juniper (*Juniperus osteosperma*) increase.

When the potential natural plant community is burned, juniper, Indian ricegrass, needle and thread, and bluebunch wheatgrass decrease while low rabbitbrush, Sandberg bluegrass (*Poa secunda*), and James' galleta grass (*Pleuraphis jamesii*) increase.

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

Analyzing previously collected data and new field data will be needed to further develop vegetation dynamics.

State and transition model

Figure 5. STM R028AB232UT

Additional community tables

Table 5. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
Tree					
0	Tree			50-76	

	purple threeawn	ARPU9	<i>Aristida purpurea</i>	6-16	—
	James' galleta	PLJA	<i>Pleuraphis jamesii</i>	0-16	—
	Sandberg bluegrass	POSE	<i>Poa secunda</i>	6-16	—
	sand dropseed	SPCR	<i>Sporobolus cryptandrus</i>	6-16	—
Shrub/Vine					
0	Primary Shrubs			157-252	
	littleleaf pussytoes	ANMI3	<i>Antennaria microphylla</i>	26-50	—
	freckled milkvetch	ASLE8	<i>Astragalus lentiginosus</i>	26-50	—
	Hooker's balsamroot	BAHO	<i>Balsamorhiza hookeri</i>	26-50	—
	thickstem wild cabbage	CACR11	<i>Caulanthus crassicaulis</i>	26-50	—
	roundspike cryptantha	CRHU2	<i>Cryptantha humilis</i>	26-50	—
	cushion buckwheat	EROV	<i>Eriogonum ovalifolium</i>	26-50	—
	ballhead ipomopsis	IPCOC3	<i>Ipomopsis congesta ssp. congesta</i>	26-50	—
	Gray's biscuitroot	LOGR	<i>Lomatium grayi</i>	26-50	—
	longleaf phlox	PHLO2	<i>Phlox longifolia</i>	26-50	—
	gooseberryleaf globemallow	SPGR2	<i>Sphaeralcea grossulariifolia</i>	26-50	—
	Pacific aster	SYCHC	<i>Symphyotrichum chilense</i> var. <i>chilense</i>	26-50	—
3	Secondary Shrubs			6-10	
Grass/Grasslike					
0	Primary Grasses			192-278	
	pygmy sagebrush	ARPY2	<i>Artemisia pygmaea</i>	6-10	—
	Wyoming big sagebrush	ARTRW8	<i>Artemisia tridentata ssp. wyomingensis</i>	6-10	—
	shadscale saltbush	ATCO	<i>Atriplex confertifolia</i>	6-10	—
	slender buckwheat	ERMI4	<i>Eriogonum microthecum</i>	6-10	—
	broom snakeweed	GUSA2	<i>Gutierrezia sarothrae</i>	6-10	—
	plains pricklypear	OPPO	<i>Opuntia polyacantha</i>	6-10	—
	bud sagebrush	PIDE4	<i>Picrothamnus desertorum</i>	6-10	—
	Mexican cliffrose	PUME	<i>Purshia mexicana</i>	6-10	—
1	Secondary Grasses			16-26	
Forb					
2	Forbs			26-50	

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 1.3 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 8. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 9. Community 2.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 10. Community 2.3 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 11. Community 3.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 12. Community 3.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 13. Community 4.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 14. Community 4.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 15. Community 5.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 16. Community 5.2 plant community composition

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

The Semidesert Shallow Hardpan (Utah Juniper) South site is suited for cattle and sheep grazing during spring, fall, and winter. Wildlife using this site include rabbit, coyote, fox, badger, pronghorn antelope, mule deer, and dove. 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 C and D with runoff curves ranging from 74 to 86 and 80 to 89 respectively, depending on hydrologic condition.

Recreational uses

Resources that have special aesthetic and landscape values are wildflowers. Some recreation uses of this site are hiking, picnicking, and hunting.

Wood products

Potential wood products are fuel and posts.

Other information

Threatened and endangered species include plants and animals.

Type locality

Location 1: Box Elder County, UT	
Township/Range/Section	T12N R15W S33
General legal description	SW ¼, SE ¼, Section 33, Township 12N, Range 15W. Fifteen Miles Southwest of Park valley

Contributors

Approval

Kendra Moseley, 6/12/2025

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	02/09/2010
Approved by	
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

- 1. Number and extent of rills:** No rills present. Very minor rill development may occur in sparsely vegetated areas. If rills are present, they should be widely spaced and not connected. Rill development may increase following large storm events, but should begin to heal during the following growing season. Frost heaving will accelerate recovery. Rill development may increase when run inflow enters site from adjacent sites that produce large amounts of runoff (i.e. steeper sites, slickrock, rock outcrop). Site is essentially level and rills do not form.

- 2. Presence of water flow patterns:** Water flow patterns will be short (2-5'), narrow (<1'), and meandering; interrupted by plants and exposed rocks. Slight to no evidence of erosion or deposition associated with flow patterns.

3. **Number and height of erosional pedestals or terracettes:** Plants may have small pedestals (1-3") where they are adjacent to water flow patterns, but without exposed roots. Terracettes should be few and stable. Terracettes should be small (1-3") and show little sign of active erosion. Some plants may appear to have a pedestal but rather than be formed by erosion, the only place litter accumulates and soil collects is at plant bases forming the appearance of a pedestal. Well-developed biological crusts may appear pedestalled, but are actually a characteristic of the crust formation. Some plants may appear to have a pedestal but rather than be formed by erosion, the only place litter accumulates and soil collects is at plant bases forming the appearance of a pedestal.

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** 20-40% bare ground (soil with no protection from raindrop impact). Herbaceous communities are most likely to have lower values. As species composition by shrubs increases, bare ground is likely to increase. Poorly developed biological soil crust that is susceptible to raindrop splash erosion should be recorded as bare ground. Very few if any bare spaces of greater than 1 square foot.

5. **Number of gullies and erosion associated with gullies:** No gullies present.

6. **Extent of wind scoured, blowouts and/or depositional areas:** Very minor evidence of active wind generated soil movement is present in reference communities. Wind scoured (blowouts) and depositional areas are rarely present. Slight depositional mounding at plant bases. Slight deposition may occur in perennial bunchgrasses, under winterfat canopy, and within biological soil crusts. Wind scour or deposition areas are associated with fire activity. Very small areas (less than 4 square feet) may be present.

7. **Amount of litter movement (describe size and distance expected to travel):** Most litter resides in place with some redistribution caused by water and wind movement. Very minor litter removal may occur in flow patterns and rills with deposition occurring at points of obstruction. The majority of litter accumulates at the base of plants. Some leaves, stems, and small twigs may accumulate in soil depressions adjacent to plants. Woody stems are not likely to move.

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 an erosion rating of 5 or 6 under plant canopies and a rating of 4 to 5 in the interspaces with an average rating of 5 using the soil stability kit test.

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** This description is based on the modal soil (Plegomir, Very Shallow, soil survey area: 611, Tooele). This site has 2 correlated soils, resulting in variation of each of these attributes. Unless working on a location with the modal soil, it is critical to supplement this description with the soil-specific information from the published soil survey. Soil surface horizon is typically 5 inches deep. Structure is typically fine and medium granular. Color is typically brown (10YR 5/3), dark brown (10YR 3/3) moist.

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Vascular plants and any well-developed biological soil crusts (where present) will break raindrop impact and splash erosion. Spatial distribution of vascular plants and interspaces between well-developed biological soil crusts (where present) provide detention storage and surface roughness that slows runoff allowing time for infiltration. Crowns of trees and accumulating litter at base of trees appear to create a micro-topography that may enhance development of water flow patterns below the drip line of the canopy. Significant increases in pinyon-juniper canopy reduces understory vegetation and increases runoff.

11. Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site): None. Naturally occurring soil horizons may be harder than the surface because of an accumulation of calcium carbonate and should not be considered as compaction layers. A duripan (indurated layer of illuvial silica and lime) may be present at a depth of about 13".
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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: black sagebrush

Sub-dominant: Indian ricegrass, bluebunch wheatgrass

Other: other shrubs > other grasses > forbs

Additional: In the northern portion of the MLRA cool-season perennial grasses (Indian ricegrass, needle and thread) dominate. In the southernmost portion of the MLRA warm-season perennial grasses (galleta, sand dropseed) dominate. The two groups share dominance in the middle portion of the MLRA.

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. Some bunchgrass and shrub mortality may occur during severe droughts, particularly on the shallower and coarser soils associated with this site.
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14. Average percent litter cover (%) and depth (in): Litter cover includes litter under plants. Most litter will be fine litter. Depth should be 1-2 leaf thickness in the interspaces and up to 1/2" under canopies. Litter cover may increase to 15-25% following years with favorable growing conditions. Excess litter may accumulate in absence of disturbance. Vegetative production may be reduced if litter cover exceeds 40%.
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15. Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production): 420#/acre. Even the most stable communities exhibit a range of production values. Production will vary between communities and across the MRLA. Refer to the community descriptions in the ESD. Production will differ across the MLRA due to the naturally occurring variability in weather, soils, and aspect. The biological processes on this site are complex; therefore, representative values are presented in a land management context.
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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: Annual grasses and annual forbs
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17. Perennial plant reproductive capability: Reproduction restricted by effective precipitation, rock cover, soil depth, and generally harsh growing conditions; all to be expected for site. Site provides harsh environment for seedling establishment.
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