

Ecological site R028AY258UT

Semidesert Very Shallow Loam (Littleleaf Mountain Mahogany)

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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.

Ecological site concept

The Semidesert Very Shallow Loam (Littleleaf Mountain Mahogany) site is found on ridges, hillsides, and mountainsides between 4,800 and 6,500 feet in elevation. It is typically found on steep slopes between 15 and 40 percent. Soils are very shallow to bedrock with a very gravelly sandy loam surface texture that were formed from colluvium or slope alluvium over residuum derived from limestone. The dominant plant on this site is littleleaf mountain mahogany (*Cercocarpus intricatus*) with perennial bunchgrasses and shrubs in the understory. This site has been predominantly found in the southern portion of the Great Salt Lake Area MLRA (28A), in the Basin and Range South LRU.

Associated sites

R028AY252UT	Semidesert Stony Loam (Black Sagebrush) This site occurs downslope of this ecological site.
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Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) <i>Cercocarpus intricatus</i>
Herbaceous	Not specified

Physiographic features

The Semidesert Very Shallow Loam (Littleleaf Mountain Mahogany) site occurs on ridges, hillsides, and mountainsides at elevations between 4,800 and 6,500 feet. Slopes are typically between 15 and 40 percent.

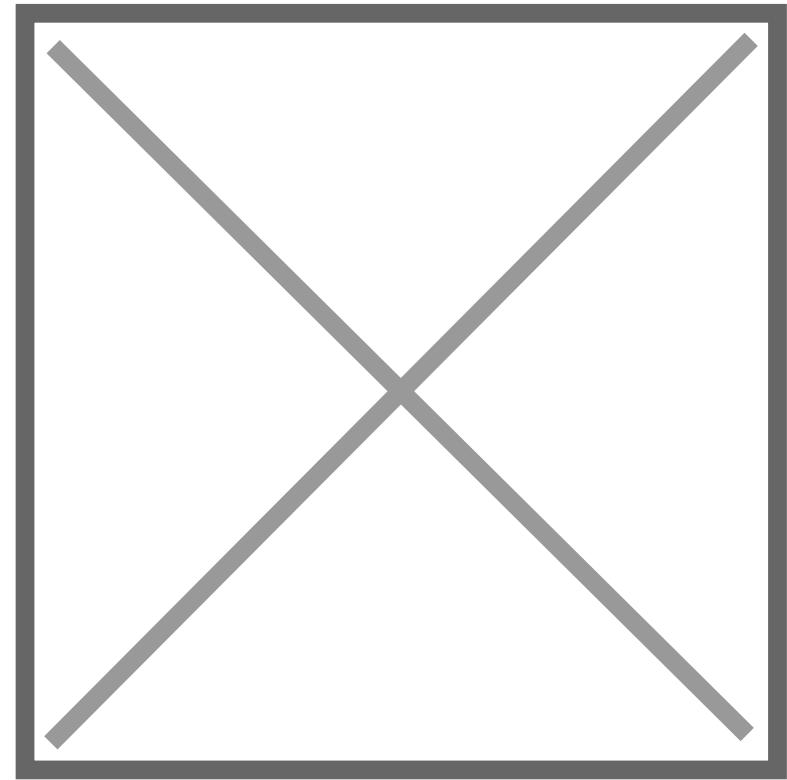


Figure 1.

Table 2. Representative physiographic features

Landforms	(1) Ridge (2) Hillside (3) Mountainside
Elevation	1,460 – 1,980 m

Slope	20 – 40 %
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Climatic features

The climate is semi-arid and characterized by cold snowy winters and warm dry summers. The average annual precipitation is 8 to 12 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. There are no climate stations within a reasonable distance to this site, a PRISM climate model was used for the data tables below.

Table 3 Representative climatic features

Frost-free period (average)	
Freeze-free period (average)	
Precipitation total (average)	330 mm

Influencing water features

Soil features

Soils are shallow over bedrock and well drained. The soils mainly formed in colluvium and/or slope alluvium derived from limestone parent material. Surface texture is very gravelly sandy loam with more than 30 percent rock fragments on the soil surface and subsurface. Soils also contain more than 40 percent calcium carbonate in the soil profile.

Table 4. Representative soil features

Parent material	(1) Colluvium – limestone (2) Slope alluvium – limestone
Surface texture	(1) Very gravelly sandy loam
Drainage class	Well drained
Permeability class	Moderate
Depth to restrictive layer	10 – 30 cm
Soil depth	10 – 30 cm
Surface fragment cover <=3"	30 %
Surface fragment cover >3"	Not specified

Available water capacity (Depth not specified)	1.27 – 2.03 cm
Calcium carbonate equivalent (Depth not specified)	20 – 40 %
Electrical conductivity (Depth not specified)	Not specified
Sodium adsorption ratio (Depth not specified)	Not specified
Soil reaction (1:1 water) (Depth not specified)	7.9 – 8.4
Subsurface fragment volume <=3" (Depth not specified)	30 %
Subsurface fragment volume >3" (Depth not specified)	10 – 30 %

Ecological dynamics

This ecological site is dominated by littleleaf mountain mahogany, deep rooted perennial bunchgrasses and shrubs. Littleleaf mountain mahogany is short statured (1 to 2 meters), intricately branched and with short evergreen leaves (Welsh et al. 1993). It grows in predominately limestone slopes within pinyon-juniper communities (Welsh et al. 1993). Littleleaf mountain mahogany may hybridize with curl-leaf mountain mahogany (*Cercocarpus ledifolius*) when the two occur together (Welsh et al. 1993). It is typically found in southern Utah, however it can be found in northern Utah. There is limited information on the ecology of littleleaf mountain mahogany in the eastern Great Basin. Black sagebrush (*Artemisia nova*) and Indian ricegrass (*Achantherum hymenoides*) are the dominant understory species.

This site is a stable ecological site. Fire is the main disturbance but it is relatively rare and low severity. Most fires are minor spot burns which may create a moosaic in the plant community. Cheatgrass (*Bromus tectorum*) is known to be present in this site but does not dominate the understory.

This site is similar to the Limestone Hill (R028AY029NV) ecological site developed for Nevada in the same MLRA (Stringham et al. 2015). The state and transition model for the Limestone Hill was used to develop the STM for this site.

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 (%)
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Shrub/Vine					
0	Primary Shrubs			206-314	
	littleleaf mountain mahogany	CEIN7	<i>Cercocarpus intricatus</i>	135-202	—
	black sagebrush	ARNO4	<i>Artemisia nova</i>	45-67	—
	shadscale saltbush	ATCO	<i>Atriplex confertifolia</i>	13-22	—
	yellow rabbitbrush	CHVI8	<i>Chrysothamnus viscidiflorus</i>	13-22	—
3	Secondary Shrubs			13-22	
Grass/Grasslike					
0	Primary Grasses			72-126	
	Indian ricegrass	ACHY	<i>Achnatherum hymenoides</i>	45-67	—
	bluebunch wheatgrass	PSSP6	<i>Pseudoroegneria spicata</i>	22-45	—
	Sandberg bluegrass	POSE	<i>Poa secunda</i>	4-13	—
1	Secondary Grasses			13-22	
	pine needlegrass	ACPI2	<i>Achnatherum pinetorum</i>	4-13	—
	squirreltail	ELEL5	<i>Elymus elymoides</i>	4-13	—
	needle and thread	HECO26	<i>Hesperostipa comata</i>	4-13	—
Forb					
2	Forbs			22-45	
	Holboell's rockcress	ARHO2	<i>Arabis holboellii</i>	4-13	—
	cushion buckwheat	EROV	<i>Eriogonum ovalifolium</i>	4-13	—
	rock goldenrod	PEPU7	<i>Petradoria pumila</i>	4-13	—
	spiny phlox	PHHO	<i>Phlox hoodii</i>	4-13	—
Tree					
4	Trees			4-13	
	Utah juniper	JUOS	<i>Juniperus osteosperma</i>	4-13	

Table 6. Community 2.1 plant community composition

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

This site is suited for grazing by cattle and sheep during fall, winter, and spring. 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 hydrological group D with runoff curves ranging from 65 to 75 depending on hydrologic condition.

Recreational uses

Resources that have special aesthetic and landscape values are the geologic slick rock with scattered shrubs and trees. Some recreation 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: Millard County, UT	
General legal description	2 Miles South of Cedar Pass Reservoir in Western Millard County, Utah

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.

Welsh, S. L., N. D. Atwood, S. Goodrich, and L. C. Higgins. 1993. A Utah flora (p. 894). Provo, Utah: Brigham Young University.

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

Indicators

1. **Number and extent of rills:** Some rills present. 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 other sites that produce large amounts of runoff (i.e. steeper sites, slickrock, rock outcrop).

2. **Presence of water flow patterns:** Water flow patterns are common. Some are long (15-20'). They are generally very widely spaced (about 20-30' apart). Flow patterns occur in low places associated with microtopography commonly occurring on this site.

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):** 25-45% 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. On steep slopes (>30%), litter will move downhill to next obstruction.

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 (Amtoft Family, Very Shallow, soil survey area: 617, West Millard - Juab Area), the only soil correlated with this site. Soil surface horizon is typically 8 inches deep. Structure is typically weak medium subangular blocky. Color is typically pale brown (10YR 6/3), brown (10YR 4/3) moist. An ochric horizon extends to a depth of 8 inches. An ochric horizon typically extends to a depth of 2

to 10 inches. The ochric horizon is a surface horizon lacking fine stratification and which is either light colored, or thin, or has an low organic carbon content, or is massive and (very) hard when dry. The A horizon would be expected to be more strongly developed under plant canopies. It is important if you are sampling to observe the A horizon under plant canopies as well as the interspaces.

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Bunchgrasses and shrubs equally important for increasing infiltration and reducing runoff. Litter plays a role in increasing infiltration and decreasing runoff. Plants provide microhabitat for seedlings, catch litter and soil, and slow raindrops and runoff. Vascular plants and/or 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. Interspaces between plants and any well-developed biological soil crusts (where present) may serve as water flow patterns during episodic runoff events, with natural erosion expected in severe storms. When perennial grasses decrease, reducing ground cover and increasing bare ground, runoff is expected to increase and any associated infiltration reduced. Shrubs catch snow, slow wind evaporation, and provide microhabitat for seedling establishment.
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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. Lithic contact (the boundary with hard bedrock) may occur at about 17 inches. 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.
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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: littleleaf mountain mahogany

Sub-dominant: Indian ricegrass > black sagebrush > bluebunch wheatgrass

Other: other shrubs > other grasses > trees

Additional:

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 30-40% 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):** 375#/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.

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: Cheatgrass and annual weeds
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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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