

Ecological site R028AY226UT

Semidesert Sandy Loam (Wyoming Big Sagebrush)

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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 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 Great Salt Lake Area LRU: Basin and Range North Ecological Zone: Semidesert Ecological Site Semidesert Sandy Loam (Wyoming Big Sagebrush) EPA Ecoregion: North American Deserts Cold Deserts Central Basin and Range Shadscale-Dominated Saline Basins, Sagebrush Basins and Slopes, Woodland- and Shrub-Covered Low Mountains

Ecological site concept

The Semidesert Sandy Loam (Wyoming Big Sagebrush) site occurs on alluvial fans, lake plains and lake terraces. The soil is typically deep and the surface horizon is loamy sand with few rock fragments. This site is typically dominated by Wyoming sagebrush (*Artemisia tridentata* subsp. *wyomingensis*) and Indian ricegrass (*Achnatherum hymenoides*). As ecological condition deteriorates due to overgrazing, Indian ricegrass, needle and thread (*Hesperostipa comata*), fourwing saltbush (*Atriplex canescens*), and winterfat (*Krascheninnikovia lanata*) decrease, while Wyoming big sagebrush, rabbitbrush (*Chrysothamnus viscidiflorus*), and broom snakeweed (*Gutierrezia sarothrae*) increase. When the potential natural plant community is burned, Wyoming big sagebrush, Indian ricegrass, and

needle and thread decrease while rabbitbrush increases.

Associated sites

R028AA222UT	Semidesert Sand (Four-Wing Saltbush) This site occurs on coarser textured sandy soils.
R028AY232UT	Semidesert Shallow Hardpan (Utah Juniper) North This site occurs on hills and fan remnants on shallow soil. It is dominated by Utah Juniper.
R028AY227UT	Semidesert Gravelly Sandy Loam (Black Sagebrush) North This site occurs adjacent to the Sandy Loam site, typically on soils with calcium carbonate accumulation/cementation about 20 inches below the soil surface.

Similar sites

R028AB224UT	Semidesert Sandy Loam (Winterfat) This site is located on lake terraces that have a coarser textured soil. It is dominated by winterfat. This site occurs in the Basin and Range South LRU.
R028AB226UT	Semidesert Sandy Loam (Wyoming Big Sagebrush) This site occurs in the southern Basin and Range LRU and will have more influence from summer convective storms and will have a component of warm season grasses in the community.
R028AY224UT	Semidesert Sandy Loam (Winterfat) This site is located on lake terraces that have a coarser textured soil. It is dominated by winterfat.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) <i>Artemisia tridentata subsp. wyomingensis</i>
Herbaceous	Not specified

Physiographic features

The Semidesert Sandy Loam (Wyoming Big Sagebrush) site occurs on alluvial fans, lake plains, and lake terraces. It occurs between 4490 and 5740 feet at low slopes (between 0 and 5 percent). There is no flooding or ponding on this site.

Table 2. Representative physiographic features

Landforms	(1) Alluvial fan (2) Lake plain (3) Lake terrace
Flooding frequency	None
Ponding frequency	None
Elevation	1,370 – 1,750 m
Slope	0 – 10 %
Aspect	Aspect is not a significant factor

Climatic features

The climate is semi-arid and characterized by cold snowy winters and warm dry summers. The average annual precipitation is 13 to 17 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.

Table 3 Representative climatic features

Frost-free period (characteristic range)	90-110 days
Freeze-free period (characteristic range)	110-160 days
Precipitation total (characteristic range)	330-430 mm
Frost-free period (actual range)	80-110 days
Freeze-free period (actual range)	100-160 days
Precipitation total (actual range)	330-430 mm
Frost-free period (average)	100 days
Freeze-free period (average)	140 days
Precipitation total (average)	360 mm

- (1) FAIRFIELD [USC00422696], Cedar Valley, UT
- (2) ELBERTA [USC00422418], Cedar Valley, UT
- (3) LITTLE SAHARA REC AREA [USC00425138], Eureka, UT
- (4) OAK CITY [USC00426357], Delta, UT
- (5) FILLMORE [USC00422828], Fillmore, UT
- (6) KANOSH [USC00424527], Fillmore, UT

Influencing water features

Soil features

The soils formed in alluvium and sandy beach materials derived mainly from sedimentary, basic intermediate igneous and granitic parent materials. The surface horizon is loamy sand textures and 4 inches thick. About 5 percent of the soil surface is covered by rock fragments. The volume of rock fragments in the soil profile is 0 to 19 percent.

Table 4. Representative soil features

Parent material	(1) Alluvium – limestone and sandstone (2) Lacustrine deposits – quartzite
Surface texture	(1) Fine sandy loam (2) Very fine sandy loam (3) Sandy loam
Family particle size	(1) Sandy
Drainage class	Well drained
Permeability class	Moderate 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)	9.4 – 18.54 cm
Calcium carbonate equivalent (0-101.6cm)	0 – 40 %

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 – 10
Subsurface fragment volume <=3" (Depth not specified)	0 – 20 %
Subsurface fragment volume >3" (Depth not specified)	Not specified

Ecological dynamics

As ecological condition deteriorates due to overgrazing, Indian ricegrass, needle and thread, fourwing saltbush, and winterfat decrease, while Wyoming big sagebrush, low rabbitbrush and broom snakeweed increase.

When the potential natural plant community is burned, Wyoming big sagebrush, Indian ricegrass, and needle and thread decrease while low rabbitbrush increases.

Cheatgrass and annual forbs are most likely to invade this site.

More data needs to be collected and analyzed to refine site dynamics.

State and transition model

Figure 7. STM R028AA226UT

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			141-275	
	winterfat	KRLA2	<i>Krascheninnikovia lanata</i>	39-78	–
	Wyoming big sagebrush	ARTRW8	<i>Artemisia tridentata ssp. wyomingensis</i>	39-78	–
	fourwing saltbush	ATCA2	<i>Atriplex canescens</i>	39-78	–
	yellow rabbitbrush	CHVI8	<i>Chrysothamnus viscidiflorus</i>	24-39	–
3	Secondary Shrubs			39-78	
	shadscale saltbush	ATCO	<i>Atriplex confertifolia</i>	8-24	–
	Nevada jointfir	EPNE	<i>Ephedra nevadensis</i>	8-24	–
	cushion buckwheat	EROV	<i>Eriogonum ovalifolium</i>	8-24	–
	spiny hopsage	GRSP	<i>Grayia spinosa</i>	8-24	–

	broom snakeweed	GUSA2	Gutierrezia sarothrae	8-24	–
	plains pricklypear	OPPO	Opuntia polyacantha	8-24	–
	Nuttall's horsebrush	TENU2	Tetradymia nuttallii	8-24	–
Grass/Grasslike					
0	Primary Grasses			306-471	
	Indian ricegrass	ACHY	Achnatherum hymenoides	157-235	–
	needle and thread	HECO26	Hesperostipa comata	78-118	–
	western wheatgrass	PASM	Pascopyrum smithii	24-39	–
	James' galleta	PLJA	Pleuraphis jamesii	24-39	–
	squirreltail	ELEL5	Elymus elymoides	24-39	–
1	Secondary Grasses			24-39	
	purple threeawn	ARPU9	Aristida purpurea	8-24	–
	sandhill muhly	MUPU2	Muhlenbergia pungens	8-24	–
Forb					
2	Forbs			39-78	
	Holboell's rockcress	ARHO2	Arabis holboellii	8-24	–
	Utah milkvetch	ASUT	Astragalus utahensis	8-24	–
	two-lobed larkspur	DENU2	Delphinium nuttallianum	8-24	–
	longleaf phlox	PHLO2	Phlox longifolia	8-24	–
	thorn skeletonweed	PLSP7	Pleiacanthus spinosus	8-24	–
	scarlet globemallow	SPCO	Sphaeralcea coccinea	8-24	–
	Pacific aster	SYCHC	Symphyotrichum chilense var. chilense	8-24	–

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 Sandy Loam (Wyoming Big Sagebrush) 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 hydrologic group B with runoff curves ranging from 61 to 79 depending on hydrologic condition.

Recreational uses

Resources that have special aesthetic and landscape values are wildflowers. Some recreation uses of this site are hiking and horseback riding.

Wood products

None

Other information

Threatened and endangered species include plants and animals.

Type locality

Location 1: Box Elder County, UT	
Township/Range/Section	T6N R18W S17
General legal description	Box Elder County, Utah, Pilot Mountains, East Foot Slopes SW ¼ SW ¼ Section 17, Township 6N, Range 18W

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	02/08/2010
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):** 30-50% 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.
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5. **Number of gullies and erosion associated with gullies:** No gullies present.
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6. **Extent of wind scoured, blowouts and/or depositional areas:** Very minor evidence of active wind-generated soil movement. Wind scoured (blowouts) and depositional areas are rarely present. If present they have muted features and are mostly stabilized with vegetation and/or biological crust. Gravel or desert pavement protects the site from wind scour.
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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.
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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):** Soil surface is moderately stable (average soil stability score of 3.5 -5).
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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 (Okrist LS Thick Surface, soil survey area: 601, West Box Elder). This site has 7 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 8 inches deep. Structure is typically weak medium platy. Color is typically yellowish brown (10YR 5/4), dark brown (10YR 4/3) moist.
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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. 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. Durinodic features (weakly cemented to indurated nodules with a diameter of 1 cm or more) may be present at 19 to 30".
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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: Indian ricegrass > needle and thread

Sub-dominant: Wyoming big sagebrush, fourwing saltbush, winterfat

Other: The perennial grass/non-sprouting shrub functioning group is expected on this site.

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. Functional/structural groups may appropriately contain non-native species if their ecological function is the same as the native species in the reference state (e.g. crested wheatgrass and Russian wildrye may substitute for mid stature cool season perennial native bunchgrasses.). Biological soil crust is variable in its expression on this site and is measured as a component of ground cover. 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. Some mortality of bunchgrass and other shrubs may occur during very severe (long-term) droughts. There may be partial mortality of individual bunchgrasses and shrubs during less severe drought. Long-lived species dominate site. Open spaces from disturbance are quickly filled by new plants through seedlings and reproductive reproduction (tillering).
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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): 675#/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: Cheatgrass and annual forbs
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17. **Perennial plant reproductive capability:** All perennial plants should have the ability to reproduce sexually or asexually, except in drought years. Density of plants indicates that plants reproduce at level sufficient to fill available resource. Within capability of site there are no restrictions on seed or vegetative reproductive capacity.
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