

Ecological site R047XA316UT

Upland Shallow Loam (black 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): 047X–Wasatch and Uinta Mountains

MLRA 47 occurs in Utah (86 percent), Wyoming (8 percent), Colorado (4 percent), and Idaho (2 percent). It encompasses approximately 23,825 square miles (61,740 square kilometers). The northern half of this area is in the Middle Rocky Mountains Province of the Rocky Mountain System. Parts of the western edge of this MLRA are in the Great Basin Section of the Basin and Range Province of the Intermontane Plateaus. The MLRA includes the Wasatch Mountains, which trend north and south. The steeply sloping, precipitous Wasatch Mountains have narrow crests and deep valleys. Active faulting and erosion are a dominant force in controlling the geomorphology of the area. The mountains in this area are primarily fault blocks that have been tilted up. Alluvial fans at the base of the mountains are recharge zones for the basin fill aquifers. An ancient shoreline of historic Bonneville Lake is evident on the footslopes along the western edge of the area. Rocks exposed in the mountains are mostly Mesozoic and Paleozoic sediments. The average precipitation is from 12 to 16 inches in the valleys and can range up to 73 inches in the mountains. Peak precipitation occurs in the winter months. The average annual temperature is 30 to 50 degrees F (-1 to 15 C). The freeze-free period averages 140 days and ranges from 60 to 220 days, generally decreasing in length with elevation. The dominant soil orders in this MLRA are Entisols, Inceptisols, and Mollisols. The lower elevations are dominated by a frigid temperature regime, while the higher elevations experience cryic temperature regimes. The soil moisture regime is typically xeric. The minerology is generally mixed and the soils are very shallow to very deep, generally well drained, and loamy or loamy –skeletal.

LRU notes

This LRU includes the Wasatch Mountains which tend to run north and south. These steeply sloping, precipitous mountains have narrow crests and deep valleys. They are primarily fault blocks that have been tilted up. The alluvial fans located at the base of these mountains are important recharge zones for valley aquifers.

Ecological site concept

This site occurs on foothills, mountain slopes and hills at elevations between 6,500 and 8,500 feet. This site typically has a restrictive bedrock layer around 20 inches below the soil surface. The dominant aspect of this ecological site in reference condition is black sagebrush with a diverse perennial forb community and perennial bunchgrasses.

Associated sites

R047XA332UT	Upland Stony Loam (black sagebrush) This site is found in association with the upland shallow loam site in soils that are stony and deeper than 20 inches.
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Similar sites

R047XA301UT	Upland Clay Loam (early sagebrush) This site is dominated by early sagebrush and the surface texture is a clay loam.
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Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) <i>Artemisia nova</i>
Herbaceous	(1) <i>Pseudoroegneria spicata</i>

Physiographic features

This site occurs on foothills, mountain slopes and hills at elevations between 5,100 and 7,500 feet. Slopes mostly range from 10 to 50 percent, but may vary from 2 to 70 percent. Flooding and ponding do not occur on this site, and it does not have a water table.

Table 2. Representative physiographic features

Landforms	(1) Mountain slope (2) Ridge (3) Hill
Flooding frequency	None
Ponding frequency	None
Elevation	1,550 – 2,290 m
Slope	10 – 50 %
Aspect	Aspect is not a significant factor

Table 3. Representative physiographic features (actual ranges)

Flooding frequency	Not specified
Ponding frequency	Not specified
Elevation	Not specified
Slope	0 – 70 %

Climatic features

The climate of this site is characterized by cold, snowy winters and hot dry summers. The average annual precipitation is between 12 and 16 inches, but in some cases can reach as high as 20 inches. Winter snowpack adds moisture to the soil as it melts in the spring. However, much of the spring moisture is unavailable to plants by mid-June and reduced precipitation causes many herbaceous species

to go dormant by early July. June, July and August are commonly the driest months. Plant growth usually begins from March 15th to April 15th and grasses and forbs usually mature from June 15th to July 1st due to soil moisture deficiencies and hot temperatures. The optimal growing period is from early May to early June. Shrubs usually grow throughout July and August but at a much reduced rate and continue into October. Grasses usually green up again in late August through October in areas that are influenced by the summer monsoonal rains.

Table 4 Representative climatic features

Frost-free period (characteristic range)	80 days
Freeze-free period (characteristic range)	120 days
Precipitation total (characteristic range)	360 mm
Frost-free period (actual range)	80 days
Freeze-free period (actual range)	120 days
Precipitation total (actual range)	360 mm
Frost-free period (average)	80 days
Freeze-free period (average)	120 days
Precipitation total (average)	360 mm

- (1) LAKETOWN [USC00424856], Laketown, UT

Influencing water features

Due to its landscape position, this site is not typically influenced by streams or wetlands.

Soil features

The soils of this site are shallow to bedrock and formed in colluvium, slope alluvium and residuum derived from limestone or conglomerate rock. Bedrock is typically 10-20 inches below the soil surface. Surface textures are occasionally loams, but are often gravelly or cobbly with greater than 35 percent rock fragments by volume. These soils are somewhat excessively drained with moderate or moderately rapid permeability. Available water-holding capacity is restricted by the shallow nature of the soil, and ranges from 1.0 to 2.1 inches of water throughout the profile. These soils can be non-calcareous to very calcareous and have neutral to alkaline pH. The soil moisture regime is xeric and the soil temperature regime can be mesic or frigid.

Soil surveys correlated to this site:

Rich County, Utah: Highams (RBD, RBE), Solak (SHF)

Cache Valley Area: Richmond (RCG2, RDG2, REG2, RFG2, RGG2)

Table 5. Representative soil features

Parent material	(1) Colluvium – calcareous conglomerate (2) Alluvium – limestone (3) Residuum – limestone
Surface texture	(1) Gravelly loam (2) Very cobbly loam (3) Loam
Family particle size	(1) Loamy-skeletal
Drainage class	Well drained to somewhat excessively drained
Permeability class	Moderate to moderately rapid
Depth to restrictive layer	30 – 50 cm
Soil depth	30 – 50 cm
Surface fragment cover <=3"	20 %
Surface fragment cover >3"	0 – 30 %
Available water capacity (0-101.6cm)	2.54 – 5.33 cm
Calcium carbonate equivalent (0-101.6cm)	10 – 60 %
Electrical conductivity (0-101.6cm)	Not specified
Sodium adsorption ratio (0-101.6cm)	0 – 10

Soil reaction (1:1 water) (0-101.6cm)	6.6 – 8.4
Subsurface fragment volume <=3" (0-101.6cm)	20 – 50 %
Subsurface fragment volume >3" (0-101.6cm)	10 – 20 %

Table 6. Representative soil features (actual values)

Drainage class	Not specified
Permeability class	Not specified
Depth to restrictive layer	Not specified
Soil depth	Not specified
Surface fragment cover <=3"	10 – 20 %
Surface fragment cover >3"	0 – 30 %
Available water capacity (0-101.6cm)	Not specified
Calcium carbonate equivalent (0-101.6cm)	Not specified
Electrical conductivity (0-101.6cm)	Not specified
Sodium adsorption ratio (0-101.6cm)	Not specified

Soil reaction (1:1 water) (0-101.6cm)	Not specified
Subsurface fragment volume <=3" (0-101.6cm)	Not specified
Subsurface fragment volume >3" (0-101.6cm)	Not specified

Ecological dynamics

It is impossible to determine in any quantitative detail the historic climax plant community (HCPC) for this ecological site because of the lack of direct historical documentation preceding all human influence. In some areas, the earliest reports of dominant plants include the cadastral survey conducted by the General Land Office, which began in the late 19th century for this area (Galatowitsch 1990). However, up to the 1870s the Shoshone Indians, prevalent in northern Utah and neighboring states, grazed horses and set fires to alter the vegetation for their needs (Parson 1996). In the 1860s, Europeans brought cattle and horses to the area, grazing large numbers of them on unfenced parcels year-long (Parson 1996). Itinerant and local sheep flocks followed, largely replacing cattle as the browse component increased.

Below is a State and Transition Model diagram to illustrate the “phases” (common plant communities), and “states” (aggregations of those plant communities) that can occur on the site. Differences between phases and states depend primarily upon observations of a range of disturbance histories in areas where this ESD is represented. These situations include grazing gradients to water sources, fence-line contrasts, patches with differing dates of fire, herbicide treatment, tillage, etc. Reference State 1 illustrates the common plant communities that probably existed just prior to European settlement.

The major successional pathways within states, (“community pathways”) are indicated by arrows between phases. “Transitions” are indicated by arrows between states. The drivers of these changes are indicated in codes decipherable by referring to the legend at the bottom of the page and by reading the detailed narratives that follow the diagram. The transition between Reference State 1 and State 2 is considered irreversible because of the naturalization of exotic species of both flora and fauna, possible extinction of native species, and climate change. There may have also been accelerated soil erosion.

When available, monitoring data (of various types) were employed to validate more subjective inferences made in this diagram. See the complete files in the office of the State Range Conservationist for more detail.

State and transition model

Additional community tables

Table 7. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
Grass/Grasslike					
0	Dominant Grasses			785-1009	
	bluebunch wheatgrass	PSSP6	<i>Pseudoroegneria spicata</i>	785-1121	–
	Sandberg bluegrass	POSE	<i>Poa secunda</i>	224-448	–
0	Sub-Dominant Grass			112-336	
	Grass, perennial	2GP	<i>Grass, perennial</i>	56-112	–
	thickspike wheatgrass	ELLA3	<i>Elymus lanceolatus</i>	56-112	–
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	56-112	–
	squirreltail	ELEL5	<i>Elymus elymoides</i>	34-78	–
	sedge	CAREX	<i>Carex</i>	34-78	–
	Indian ricegrass	ACHY	<i>Achnatherum hymenoides</i>	28-56	–
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	28-56	–
	spike fescue	LEKI2	<i>Leucopoa kingii</i>	11-22	–
	needle and thread	HECO26	<i>Hesperostipa comata</i>	11-22	–

	Idaho fescue	FEID	<i>Festuca idahoensis</i>	11-22	–
	Grass, annual	2GA	<i>Grass, annual</i>	11-22	–
Forb					
0	Dominant Forbs			56-112	
	arrowleaf balsamroot	BASA3	<i>Balsamorhiza sagittata</i>	56-112	–
0	Sub-Dominant Forbs			56-112	
	lupine	LUPIN	<i>Lupinus</i>	34-78	–
	Forb, perennial	2FP	<i>Forb, perennial</i>	34-78	–
	phlox	PHLOX	<i>Phlox</i>	34-78	–
	pussytoes	ANTEN	<i>Antennaria</i>	11-22	–
	western stoneseed	LIRU4	<i>Lithospermum ruderae</i>	11-22	–
	tapertip hawksbeard	CRAC2	<i>Crepis acuminata</i>	11-22	–
	Tolmie's owl's-clover	ORTO	<i>Orthocarpus tolmiei</i>	11-22	–
	pea	LATHY	<i>Lathyrus</i>	11-22	–
	Forb, annual	2FA	<i>Forb, annual</i>	11-22	–
	milkvetch	ASTRA	<i>Astragalus</i>	11-22	–
	buckwheat	ERIOG	<i>Eriogonum</i>	11-22	–
	foothill deathcamas	ZIPA2	<i>Zigadenus paniculatus</i>	11-22	–
Shrub/Vine					
0	Dominant Shrubs			336-673	
	black sagebrush	ARNO4	<i>Artemisia nova</i>	392-504	–
	big sagebrush	ARTR2	<i>Artemisia tridentata</i>	56-392	–
0	Sub-Dominant Shrubs			56-112	
	antelope bitterbrush	PUTR2	<i>Purshia tridentata</i>	56-112	–
	Shrub (>.5m)	2SHRUB	<i>Shrub (>.5m)</i>	0-112	–
	yellow rabbitbrush	CHVI8	<i>Chrysothamnus viscidiflorus</i>	34-67	–
	littleleaf horsebrush	TEGL	<i>Tetradymia glabrata</i>	11-22	–

Table 8. Community 1.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 9. Community 1.3 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 10. Community 1.4 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 11. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 12. Community 2.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 13. Community 2.3 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 14. Community 2.4 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 15. Community 3.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 16. Community 3.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 17. Community 4.1 plant community composition

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

This site is used by cattle and sheep during late spring, summer and fall. This site has high value for rangeland, but low values for woodland and wetland. Wildlife species that can be found on this site are sage grouse, antelope, mule deer, and elk.

Recreational uses

This site has fair to good aesthetic appeal and is valued for open space. In good condition it has a relatively large number of forbs and a few shrubs which bloom in the spring and early summer. It has very little value for screening because of the low growing nature of the plants and is not valued for camping and picnicking. Hiking, horseback riding, and wildlife viewing are potential recreational activities. Snowmobiling is a possible winter recreation activity, but this may conflict with large population of wintering mule deer, antelope and sage grouse.

Wood products

None.

Inventory data references

Galatowitsch, S. M. 1990. Using the original land survey notes to reconstruct pre-settlement landscapes in the American West. Great Basin Naturalist 50:181-191. Keywords: [Western U.S., conservation, history, human impact] Parson, R. E. 1996. A History of Rich County. Utah State Historical Society, County Commission, Rich County, Utah. Keywords: [Rich County, Utah, Historic land use, European settlements] USDA-NRCS. 2003. National Range and Pasture Handbook. in USDA, editor, USDA-Natural Resources Conservation Service-Grazing Lands Technology Institute. Keywords: [Western US, Federal guidelines, Range pasture management] West, N. E. 2000. Synecology and disturbance regimes of sagebrush steppe ecosystems. Pages 15-26 in Entwistle, P.G., A.M. DeBolt, J.H. Kaltenecker and K. Steenhof (compilers) Sagebrush Steppe Ecosystems Symposium Proceedings. Bureau of Land Management, Boise State University, Boise, Idaho, Publication No. BLM/ID/PT-0011001+1150. Keywords: [Intermountain West, Sagebrush Steppe, plant ecology, management] UDWR, Utah Big Game Range Trend Studies. 2007. Available at: <https://dwrapps.utah.gov/rangetrend/rtstart> Western Regional Climate Center, Western U.S. Climate Historical Summaries. Available at: <https://wrcc.dri.edu/summary/Climsmut.html> USDA-NRCS Official Soil Series Descriptions. Available at: <https://soilseries.sc.egov.usda.gov/osdname.aspx>

Contributors

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Approval

Kendra Moseley, 2/05/2025

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)	
Contact for lead author	
Date	09/04/2026
Approved by	
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. Number and extent of rills:

2. Presence of water flow patterns:

3. Number and height of erosional pedestals or terracettes:

4. Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):

5. Number of gullies and erosion associated with gullies:

6. Extent of wind scoured, blowouts and/or depositional areas:

7. Amount of litter movement (describe size and distance expected to travel):

8. Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):

9. Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):

10. Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:

11. Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):

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:

Sub-dominant:

Other:

Additional:

13. Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):

14. Average percent litter cover (%) and depth (in):

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

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:

17. Perennial plant reproductive capability:
