USDA Natural Resources
Conservation Service

Ecological site R028AY312UT
Upland Sand (Indian Ricegrass)

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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 (1,280 to 1,554 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.

Ecological site concept

The Upland Sand (Indian Ricegrass) site is found on lake terraces, terrace escarpments, and alluvial fans. Slopes are typically between 6 and 40 percent. Average annual precipitation is 16 inches, and ranges from 10 to 23 inches. The soil surface texture is typically sandy loam or loam and is gravelly with a gravelly subsoil. The dominant species are perennial bunch grasses. This site was only mapped in one survey and was not developed or used after the 1970s. Further evaluation of each mapunit is needed to develop the site concept.

Associated sites

R028AY306UT	**Upland Gravelly Loam (Bonneville Big Sagebrush)** This site occurs on adjacent landforms but has a finer textured soil and has rock fragments in the soil.
R028AY307UT	**Upland Gravelly Loam (Wyoming Big Sagebrush)** This site occurs on adjacent landforms but has a finer textured soil and has rock fragments in the soil.
R028AY309UT	**Upland Loam (Wyoming Big Sagebrush)** This site occurs lower on the landscape and has finer textured soil and less rock fragments.
R028AY310UT	**Upland Loam (Bonneville Big Sagebrush) North** This site occurs lower on the landscape and has finer textured soil and less rock fragments.
R028AY334UT	**Upland Stony Loam (Wyoming Big Sagebrush)** This site occurs adjacent or downslope from the site.

R028AY338UT	**Upland Stony Loam (Pinyon-Utah Juniper)** This site occurs adjacent or upslope from the site.

Similar sites

R028AY306UT	**Upland Gravelly Loam (Bonneville Big Sagebrush)** This site occurs on adjacent landforms but has a finer textured soil and has rock fragments in the soil.
R028AY307UT	**Upland Gravelly Loam (Wyoming Big Sagebrush)** This site occurs on adjacent landforms but has a finer textured soil and has rock fragments in the soil.
R028AY309UT	**Upland Loam (Wyoming Big Sagebrush)** This site is typically located lower in elevation. This site will have less rock fragments.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Artemisia tridentata*
Herbaceous	(1) *Achnatherum hymenoides*

Physiographic features

The Upland Sand (Indian Ricegrass) site is found on lake terraces, terrace escarpments, and alluvial fans. Slopes are typically 6 to 40 percent, but can go up to 70 percent. Elevation is typically between 4,220 and 5,100 feet (1,286 to 1,554 meters).

Table 2. Representative physiographic features

Landforms	(1) Lake terrace (2) Escarpment (3) Alluvial fan
Flooding frequency	None
Ponding frequency	None
Elevation	1,286–1,554 m
Slope	6–40%
Aspect	Aspect is not a significant factor

Climatic features

The climate is characterized by warm, dry summers, cold, snowy winters and moist springs. October through May is the wettest part of the year and July to September is the

driest. The effective moisture for plant growth is the 55 percent that falls during the plant dormant period, which wets the soil deeply in the spring and early summer. Warm season moisture is less effective for plant growth on this site because summer storms are short and undependable.

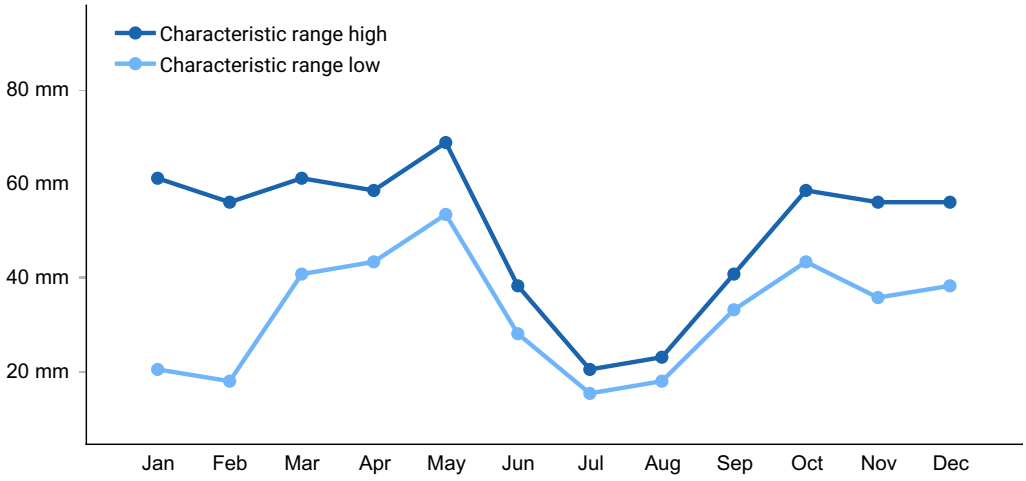


Figure 1. Monthly precipitation range

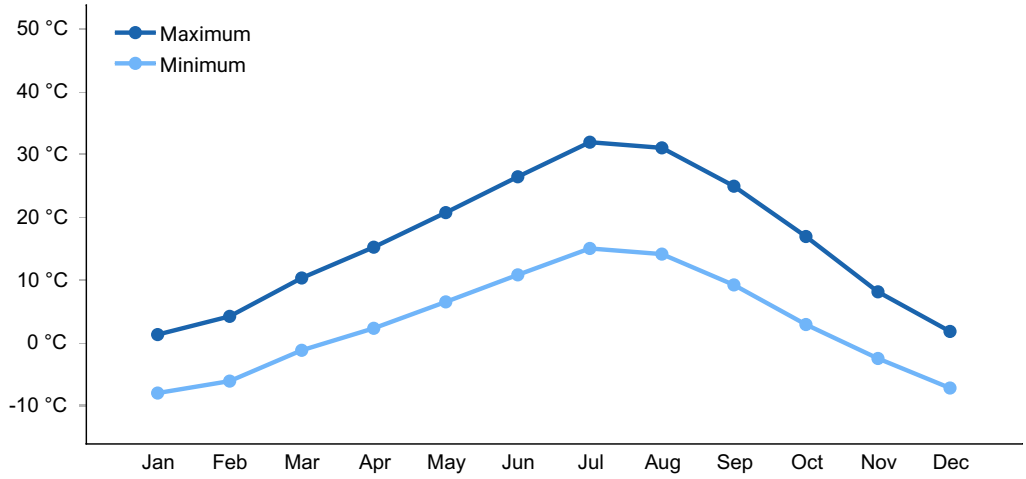


Figure 2. Monthly average minimum and maximum temperature

Influencing water features

Soil features

The soils are deep and somewhat excessively drained. They are formed in alluvium and/or beach deposits derived from limestone, sandstone, and quartzite. Surface texture is typically gravelly loam to gravelly sandy loam. The subsoil is typically gravelly sandy loam to very gravelly sand or very cobbly sand. The content of coarse fragments ranges from 0 to 60 percent. The soils in this site absorb water quite rapidly. Permeability is moderate to rapid and available water-holding capacity ranges from 2 to 4 inches of water in the upper 40 inches of soil. The soil moisture regime is xeric and the soil temperature regime is mesic.

Soil Survey Area: Soil Components (Map Units in parentheses);

Box Elder County, Eastern Part (UT602): Blue Star variant (BhD, BLG), Eccles variant (ElB), Sheeprock (SoD, SpF3), Wasatch (WcC, WcE), Wasatch variant (WdG, WeE)

Table 3. Representative soil features

Parent material	(1) Alluvium–limestone and sandstone (2) Lacustrine deposits–quartzite
Surface texture	(1) Gravelly loam (2) Gravelly sandy loam
Drainage class	Somewhat excessively drained to excessively drained
Permeability class	Moderate to rapid
Soil depth	152 cm
Surface fragment cover <=3"	0–30%
Surface fragment cover >3"	0–21%
Available water capacity (Depth not specified)	4.06–9.4 cm
Calcium carbonate equivalent (Depth not specified)	0–3%
Electrical conductivity (Depth not specified)	0–2 mmhos/cm
Soil reaction (1:1 water) (Depth not specified)	6.6–9
Subsurface fragment volume <=3" (Depth not specified)	0–60%
Subsurface fragment volume >3" (Depth not specified)	0–41%

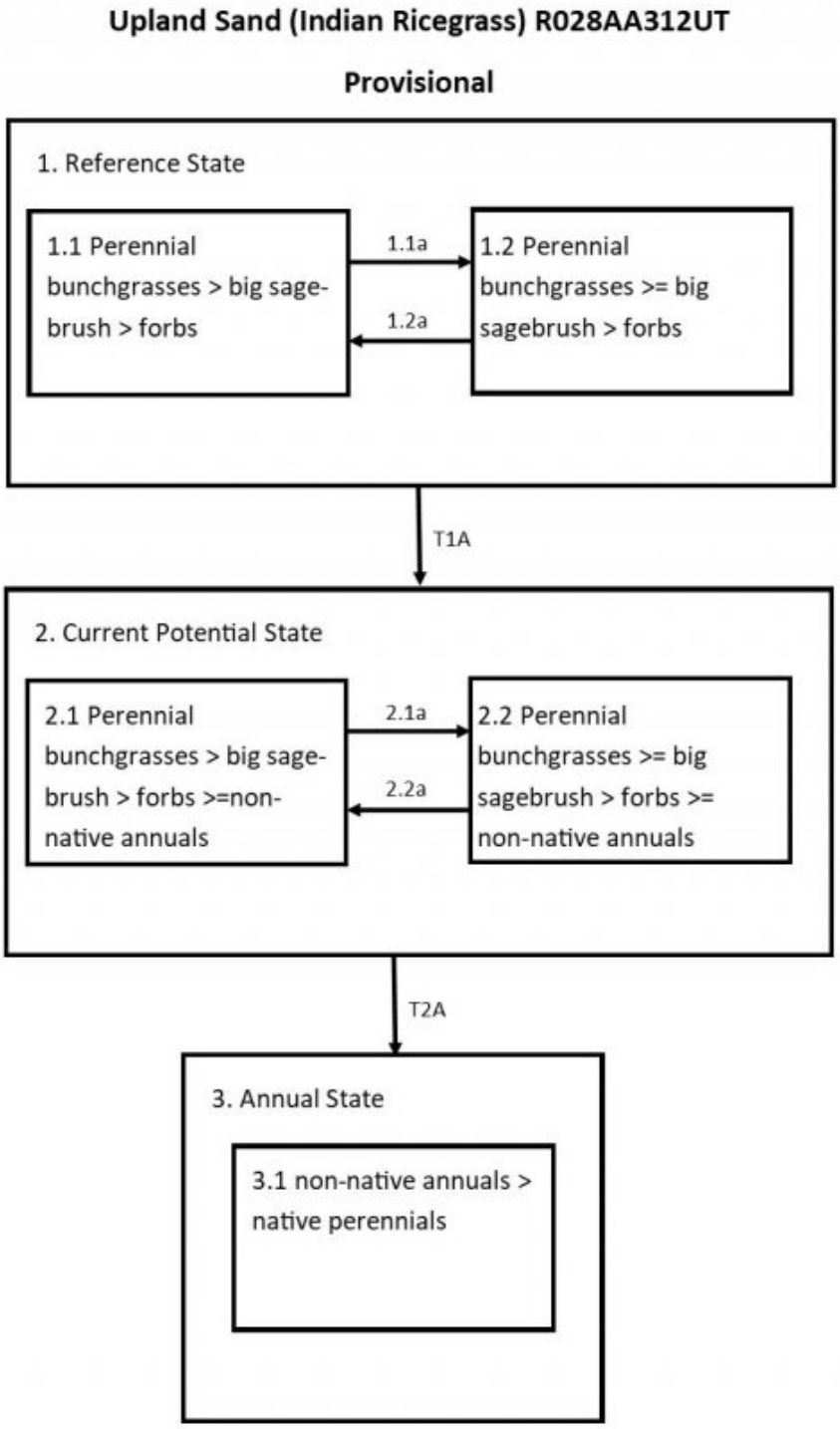
Ecological dynamics

These plant communities may not represent every possibility, but they are the most prevalent and repeatable plant communities. As more data is collected, some of these plant communities may be revised or removed and new ones may be added. None of these plant communities should necessarily be thought of as the “desired plant community”. According to the USDA NRCS National Range and Pasture Handbook, the desired plant community will be determined by the decision makers and will meet minimum quality criteria established by the NRCS. The main purpose for including any description of a plant community here is to capture the current knowledge and experience at the time of this revision.

This ecological site is dominated by perennial deep rooted cool season bunchgrasses. Big sagebrush (*Artemisia tridentata*) is the dominant shrub . The perennial bunchgrasses that are dominant are Indian ricegrass (*Achnatherum hymenoides*) and sand dropseed (*Sporobolus cryptandrus*). These species generally have somewhat shallower root systems than the shrubs, but root densities are often as high as or higher than those of shrubs in the upper 0.5 m but taper off more rapidly than shrubs. General differences in root depth distributions between grasses and shrubs result in resource partitioning in these shrub/grass systems. This site is currently dominated by non-native species in some locations. This ecological site lacks sufficient information to fully describe the plant community or identify the specific subspecies of big sagebrush. Further field investigations are needed.

Three possible alternative stable states have been identified for this ecological site. The Reference State contains two community phases, grass dominated, and a grass/shrub dominated phase. The primary drivers in this state are fire and drought. The Current Potential State is like the Reference State; however, non-native species have been introduced in the system which alters the resilience and resistance of the state. The Annual State occurs after large fires or multiple fires that promote annual invasive species dominance over native shrubs and grasses. Specific community phases and transitions will be described in the narratives below.

State and transition model



State 1
Reference State

The Reference State includes the plant communities that were best adapted to the unique combination of factors associated with this ecological site prior to European settlement. It was in a natural dynamic equilibrium with the historic biotic, abiotic, climatic factors on its ecological site in North America at the time of European immigration and settlement. This dominant aspect of the plant community is Indian ricegrass and sand dropseed. The community is made up of 75% grasses, 10% forbs, and 15% shrubs by dry weight.

Characteristics and indicators. This state will only contain native species in the plant community.

Community 1.1
Perennial bunchgrasses, big sagebrush, forbs

This community is represented with 75 percent grasses, 10 percent forbs and 15 percent shrubs. The dominant grass is Indian ricegrass and the dominant forb visually is globemallow (Sphaeralcea spp.)

Community 1.2
Big sagebush, perennial grasses, other native shrubs, forbs

This community occurs when there is a period of time when big sagebrush increases in dominance. This causes the grasses and forbs to be suppressed.

Pathway 1.1a
Community 1.1 to 1.2

Time without catastrophic event. This was probably dependent on a specific chain of climatic events.

Pathway 1.2a
Community 1.2 to 1.1

Fires that normally occur mid-summer. A fire that is hot enough and fast enough moving to kill the sagebrush and stimulate the perennial cool season grasses. Insects, prolonged drought and/or pathogens that kill or reduce the shrub overstory. Fire is the most effective.

State 2
Current Potential State

The Current Potential State (CPS) includes the biotic communities that would become established on the ecological site if all successional sequences were completed without interferences by humans under the present environmental conditions. Natural disturbances are inherent in its development. The CPS may include acclimatized, naturalized or invasive nonnative species. There is no known way to effectively remove

these plants from the site once they have become established. The level of occurrence of these plants in the CPS is such that careful management can prevent their domination of the site. This site is irreversibly changed and has not been shown to return to the Reference State. Plant communities within the CPS may be managed and used for various purposes without significant alteration in plant community composition or production. It includes all the plant communities that exist in the Refernce State with the inclusion of species that are non-native to this ESD.

Characteristics and indicators. This state is similar to the Reference State however it will have non-native species in the plant community.

Community 2.1
Perennial cool season grass, big sagebrush, forbs, other native shrubs, non-native species

This community is represented with 75 percent grasses, 10 percent forbs and 15 percent shrubs. This community will have notable amounts of non-native species.

Community 2.2
Perennial cool season grasses, big sagebrush, and forbs

This community occurs when big sagebrush increases to where it is suppressing the understory. This community will have notable amounts of non-native species.

Pathway 2.1a
Community 2.1 to 2.2

Time without catastrophic event. This was probably dependent on a specific chain of climatic events

Pathway 2.2a
Community 2.2 to 2.1

Fire that is hot and fast enough moving that kills the sagebrush and stimulates the perennial cool season grasses. Insects, prolonged drought and/or pathogens that kill and/or reduce the dominant shrub overstory can also cause this community pathway. However, fire is the most effective disturbance.

State 3
Rubber rabbitbrush/Invasive annuals State (Annual State)

The Rubber rabbitbrush/Invasive annuals State (Annual State) occurs when the site is overgrazed for an extended time, has been cultivated and abandoned, or experienced repeated fires. This state may also occur with the combination of drought and over grazing or drought and fire with either no seeding following the fire or a failed seeding. The

dominant aspect of the plant community is cheatgrass brome, rubber rabbitbrush, and three-awn.

Characteristics and indicators. This state is dominated by annual grasses and shrubs other than big sagebrush.

Community 3.1
Invasive annuals, rubber rabbitbrush, native perennials

This plant community occurs when the site is overgrazed for a prolonged period. Drought, fire, mechanical disturbance, and other like disturbances will speed up the process.

Transition T1a
State 1 to 2

Introduction of non-native species into the ecosystem.

Transition T2a
State 2 to 3

Prolonged drought and/or prolonged overgrazing. Most often it is a combination of the two conditions that brings this condition into existence. Continued overgrazing and increase of the fire frequency over time (3 to 5-year fire frequency interval).

Additional community tables

Inventory data references

The Upland Sand (Indian Ricegrass) site was only documented in the Box Elder County, Utah Eastern Part Survey (UT602). No other documentation has been found and the survey write up along with NASIS soils information was used to develop the current provisional ecological site.

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	03/27/2026
Approved by	Kendra Moseley
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:**

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2. **Presence of water flow patterns:**

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3. **Number and height of erosional pedestals or terracettes:**

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

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5. **Number of gullies and erosion associated with gullies:**

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

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

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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):**

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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:

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17. **Perennial plant reproductive capability:**
