USDA Natural Resources
Conservation Service

Ecological site R028AB236UT
Semidesert Shallow Loam (Black sagebrush) South

Last updated: 6/12/2025
Accessed: 02/09/2026

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 Shallow Loam (Black sagebrush) South site can be found on hills, hillsides, mountainsides and hillslopes between 4,400 and 7,000 feet typically on slopes steeper than 15 percent and up to 50 percent. The soil is shallow to bedrock (10 to 20 inches deep) with a very cobbly loam surface texture and 20 to about 60 percent volume of rock fragments in the subsurface. It is similar to other shallow loam ecological sites, however this site in reference condition does not have a tree canopy of Utah juniper. This site is also similar to the Semidesert Very Steep Shallow Loam, black sagebrush sites, except that it is found at less steep slopes (10 to 45 percent opposed to 30 to 75 percent slopes). The northern analogue to this site is R028AY236UT, the northern site has not been found to have Utah juniper encroachment and has a small component of warm season grasses in the community, except near the LRU border. No soils have been correlated to this site. Soils correlated to R028AY236UT will need to be field checked and then recorrelated to the correct site.

Similar sites

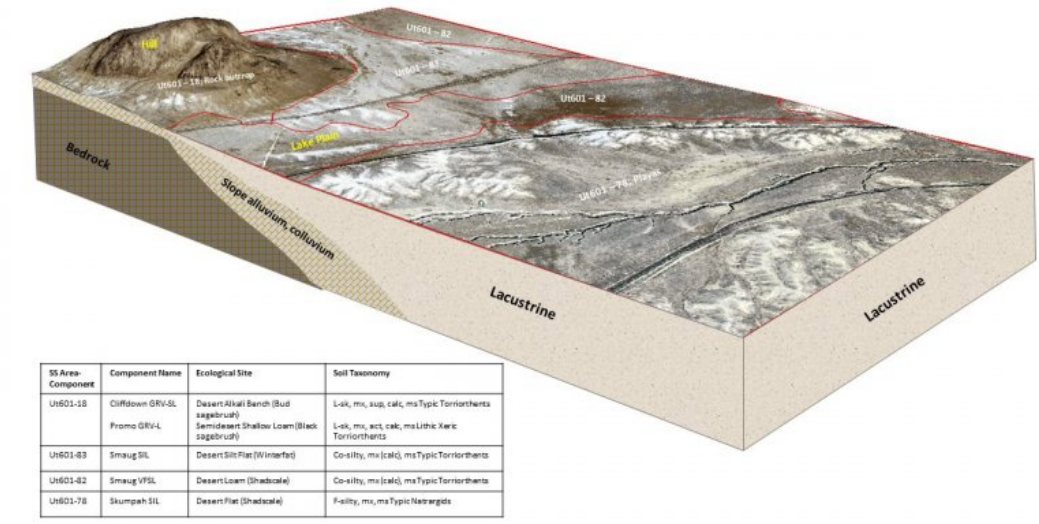
R028AY236UT	**Semidesert Shallow Loam (Black Sagebrush) North** This is the similar site found in the Basin and Range North LRU. It few, if any, warm season grasses in the plant community. It is also not influenced as much by summer thunderstorms.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Artemisia nova*
Herbaceous	(1) *Pseudoroegneria spicata*

Physiographic features

Semidesert Shallow Loam, black sagebrush (*Artemisia nova*) site can be found on hills, hillsides, mountainsides and hillslopes. Elevations are between 4400 and 7000 feet, typically on slopes steeper than 15 percent and up to 50 percent.



SS Area-Component	Component Name	Ecological Site	Soil Taxonomy
Ut601-18	Cliffdown GRV-SL Promo GRV-L	Desert Alkali Bench (Bud sagebrush) Semidesert Shallow Loam (Black sagebrush)	L-sk, mx, sup, calc, ms Typic Torriorthents L-sk, mx, act, calc, ms Lithic Xeric Torriorthents
Ut601-83	Smaug SIL	Desert Silt Flat (Winterfat)	Co-silty, mx (calc), ms Typic Torriorthents
Ut601-82	Smaug VFSL	Desert Loam (Shadscale)	Co-silty, mx (calc), ms Typic Torriorthents
Ut601-78	Skumpah SIL	Desert Flat (Shadscale)	F-silty, mx, ms Typic Natrargids

Figure 1.

Table 2. Representative physiographic features

Landforms	(1) Hill (2) Hillside or mountainside (3) Hillslope
Elevation	1,463–1,981 m
Slope	15–50%

Climatic features

The climate of this site is dry subhumid and semiarid. It is characterized by cold, snowy winters and warm summers that are influenced by summer thunderstorms. The average annual precipitation is 12 inches. March, April and May are typically the wettest months. The most reliable sources of moisture for plant growth are the snow that accumulates over the winter and spring rains. Summer thunderstorms are intermittent and sporadic in nature, however, this site receives enough precipitation from summer thunderstorms to increase warm season grasses in the plant community.

Table 3. Representative climatic features

Frost-free period (characteristic range)	96 days
Freeze-free period (characteristic range)	112 days
Precipitation total (characteristic range)	305 mm
Frost-free period (actual range)	96 days
Freeze-free period (actual range)	112 days
Precipitation total (actual range)	305 mm
Frost-free period (average)	96 days
Freeze-free period (average)	112 days
Precipitation total (average)	305 mm

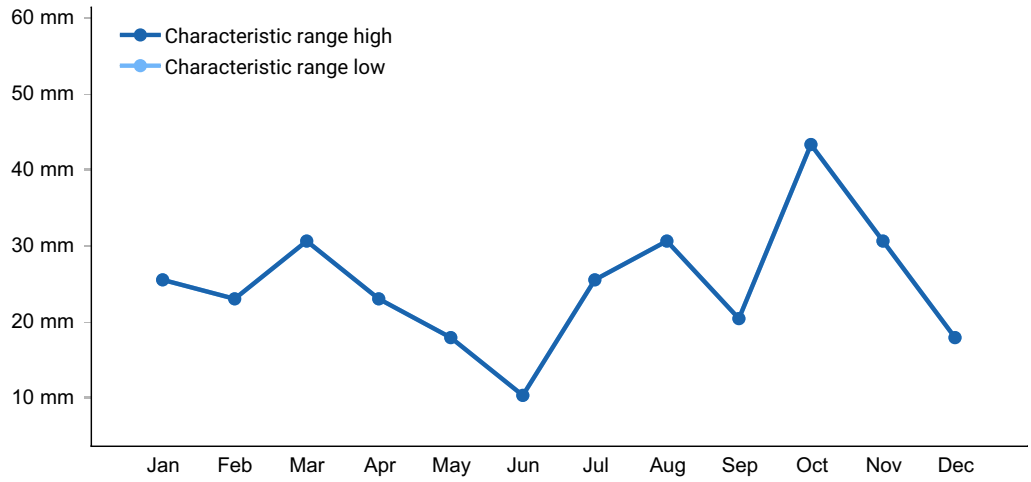


Figure 2. Monthly precipitation range

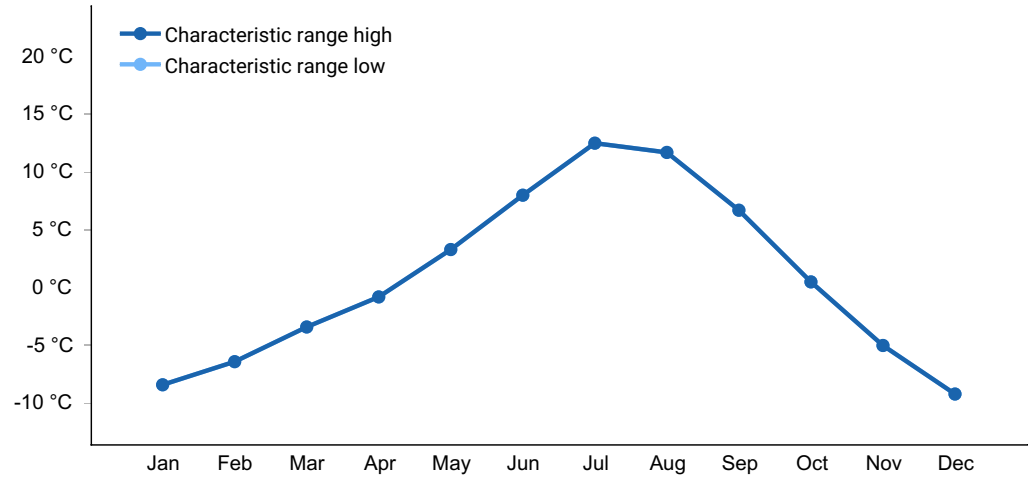


Figure 3. Monthly minimum temperature range

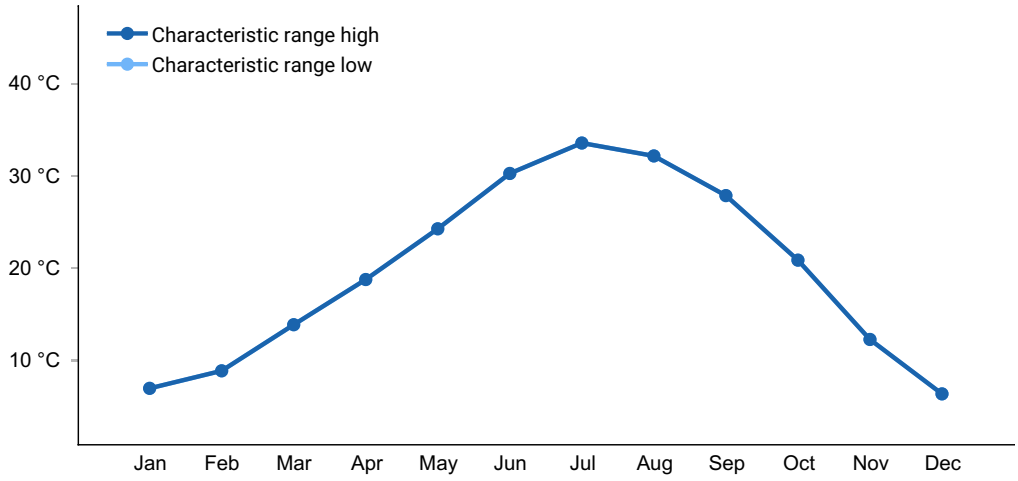


Figure 4. Monthly maximum temperature range

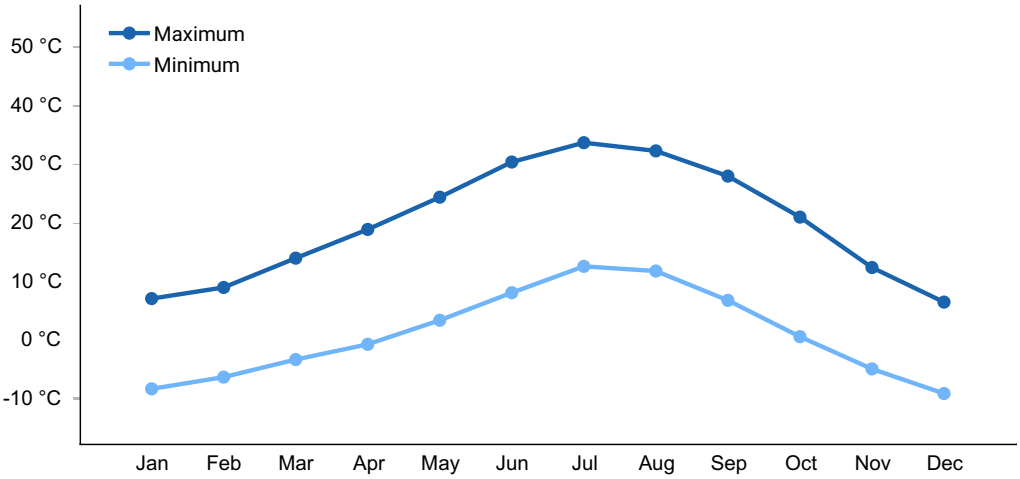


Figure 5. Monthly average minimum and maximum temperature

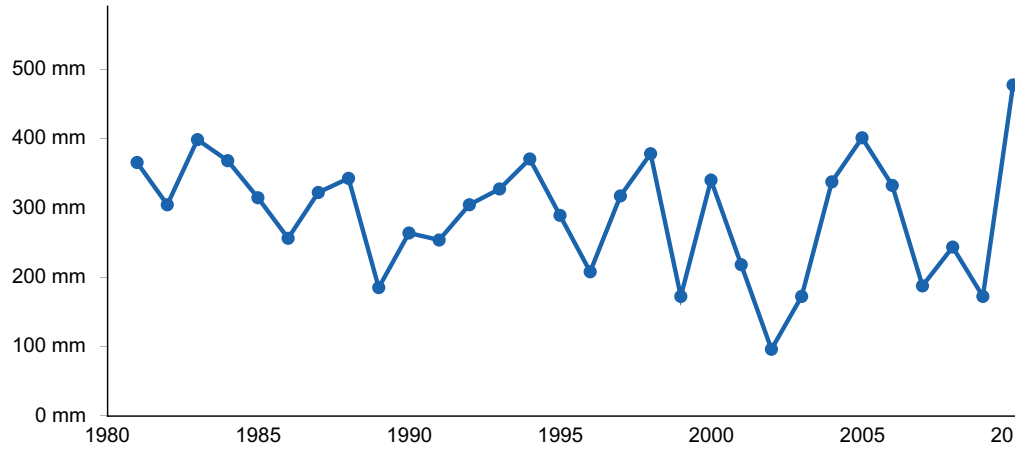


Figure 6. Annual precipitation pattern

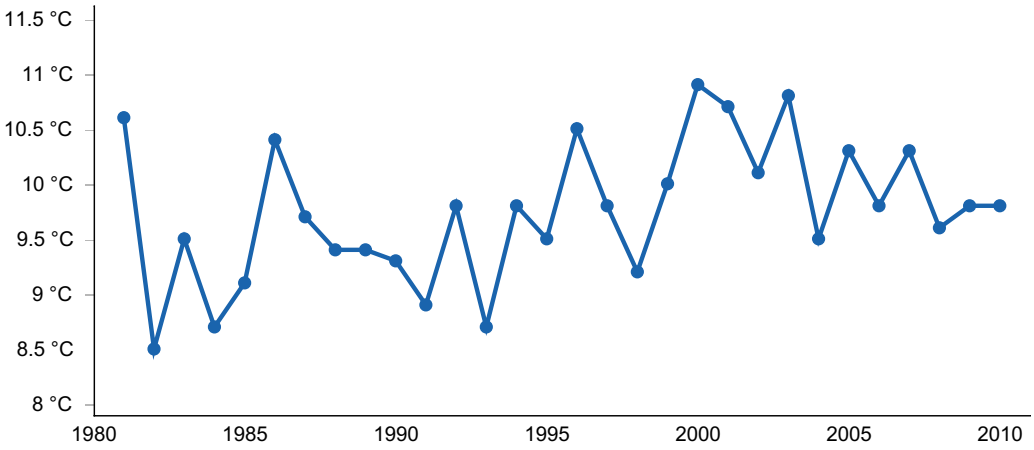


Figure 7. Annual average temperature pattern

Climate stations used

- (1) MODENA [USW00023177], Modena, UT

Influencing water features

Soil features

The soil is shallow to bedrock (10 to 20 inches deep). The soil surface is very cobbly loam texture. There are about 20 to about 60 percent volume of rock fragments in the subsurface.

Table 4. Representative soil features

Parent material	(1) Colluvium–igneous rock (2) Residuum–igneous rock
Surface texture	(1) Very stony, gravelly, very cobbly loam
Drainage class	Well drained to somewhat excessively drained
Permeability class	Very slow
Depth to restrictive layer	20–51 cm
Soil depth	20–51 cm
Surface fragment cover <=3"	15–27%
Surface fragment cover >3"	5–29%
Available water capacity (Depth not specified)	3.3–4.83 cm
Calcium carbonate equivalent (Depth not specified)	10–30%

Electrical conductivity (Depth not specified)	0–4 mmhos/cm
Sodium adsorption ratio (Depth not specified)	0–10
Soil reaction (1:1 water) (Depth not specified)	7.4–9
Subsurface fragment volume <=3" (Depth not specified)	18–34%
Subsurface fragment volume >3" (Depth not specified)	7–33%

Ecological dynamics

Black sagebrush is the dominant shrub in the ecological site with bluebunch wheatgrass as the dominant understory species. Fire in the Reference State can occur and increase the occurrence of fire tolerant shrubs, such as rabbitbrush (Chrysothamnus and Ericameria) and horsebrush (Tetradymia). Fire may also temporarily increase cover and production of grasses along with warm season grasses (see community phase 1.2). Shrubs can also increase in the absence of fire (see community phase 1.3). As ecological condition deteriorates due to overgrazing, lack of fire, and introduction of non-native species (see T1a), bluebunch wheatgrass and Indian ricegrass decrease, while black sagebrush, low rabbitbrush and snakeweed increase.

Cheatgrass (*Bromus tectorum*) and annual forbs are most likely to invade this site. Fire return intervals are often altered and decreased after the introduction of annual grasses and forbs. This can create an altered plant community and state (see T2b and State 4). Utah juniper can also increase in this site with the lack of fire (see T2a and State 3). There is no known recovery to State 1 or 2 from either of these alternate states.

State 1: Reference State
Narrative:
Community Phase 1.1: Reference State
This community is dominated by black sagebrush. Shadscale and Nevada ephedra are also commonly present. Winterfat and Mexican cliffrose are important browse species. Principle grasses include bluebunch wheatgrass, Indian ricegrass, needle and thread and bottlebrush squirreltail. Abundant forbs include carpet phlox and hairy balsamroot. Percent composition by air-dry weight is 45 percent grass, 5 percent forbs, and 50 percent shrubs. Natural fire frequency is estimated to be 50 to 60 years.

Reference State, Community 1.2: Black sagebrush decreases in the community. Shadscale, Mexican cliffrose and other shrubs may decrease also. Winterfat typically resprouts and recovers. Bluebunch wheatgrass, Indian ricegrass and other cool season bunchgrasses flourish. Yellow rabbitbrush and, at times, horsebrush (*Tetradymia nuttallii*) increase in the community. Much of the excess fine fuel accumulation is removed. Fire

tolerant shrubs may persist as dominates for 30 years or longer.

Reference State, Community 1.3 – Black sagebrush increases significantly in percent composition. Shadscale, winterfat, Mexican cliffrose, and other shrubs typically increase also. Shrubs become decadent due to age. Bluebunch wheatgrass, Indian ricegrass, and other cool season bunchgrasses begin to lose vigor due to increased shrub competition and become dense with old vegetation. Percent composition by air-dry weight is 35 percent grass, 5 percent forbs, and 60 percent shrubs.

Community Pathways

1.1a – Extended period of time without a major disturbance such as fire, insect damage or drought. Fire frequency extends well beyond the 50 to 60 year average for the site.

1.1b – Recent fire occurrence, 1 to 30 years. Site is properly grazed.

1.2a – Normal fire frequency of 50 to 60 years returns on the site.

1.3a – Recent fire occurrence, 1 to 30 years. Site is properly grazed.

Transitions

T1a – Long-term improper grazing (including, season long overstocking, wrong season, etc.) and/or prolonged drought that removes fine fuels from the site lessening the potential for fire to occur. This allows both sprouting and non-sprouting shrubs such as black sagebrush, shadscale, winterfat, and yellow rabbitbrush to increase. Shrubs may become decadent due to age. Bluebunch wheatgrass, Indian ricegrass, and other perennial buchgrasses lose vigor and decrease in the community due to shrub competition and grazing pressures. Purple threeawn and sand dropseed may increase. Utah juniper seedlings and saplings may begin to invade the community if a seed source is present.

The threshold is crossed when there is an introduction of non-native species, primarily cheatgrass and various annual mustards, that become established in the community.

Prior to crossing the threshold, if the site is properly grazed over an extended period of time, native perennial vegetation may recover. Fire frequency can return to within normal range for the site. These events could set the site back into the normal range of variability.

State 2 – Current Potential State

Plant communities in this state can include native and acclimatized, naturalized and invasive non-native species. The Current Potential State is irreversibly changed from the Reference State because these non-native species will now remain a permanent part of the community.

Plant Community Narratives

Current Potential State, Community 2.1 - This community is dominated by black sagebrush. Shadescale and Nevada (jointfir) ephedra are also commonly present. Winterfat and Mexican cliffrose are important browse species. Principle grasses include bluebunch wheatgrass, Indian ricegrass, needle and thread, and bottlebrush squirreltail. Abundant forbs include carpet phlox and hairy balsamroot. This community is dominated by native species, but may include acclimatized, naturalized and invasive non-native species. Percent composition by air-dry weight is 45 percent grass, 5 percent forbs, and 50 percent shrubs. Natural fire frequency is estimated to be 50 to 60 years.

Current Potential State, Community 2.2 - Black sagebrush decreases in the community. Shadscale, Mexican cliffrose, and other shrubs may decrease also. Winterfat typically resprouts and recovers. Bluebunch wheatgrass, Indian ricegrass, and other cool-season bunchgrasses flourish. Yellow rabbitbrush and, at times, horsebrush increase in the community. Much of the excess fine fuel accumulation is removed. Fire tolerant shrubs may persist as dominates for 30 years or longer. This community is dominated by native species, but may include acclimatized, naturalized, and invasive non-native species.

Current Potential State, Community 2.3 - Black sagebrush increases significantly in percent composition. Shadscale, winterfat, Mexican cliffrose, and other shrubs typically increase also. Shrubs become decadent due to age. Bluebunch wheatgrass, Indian ricegrass, and other cool-season bunchgrasses begin to lose vigor due to increased shrub competition and become dense with old vegetation. This community is dominated by native species, but may include acclimatized, naturalized and invasive non-native species. Percent composition by air-dry weight is 35 percent grass, 5 percent forbs, and 60 percent shrubs.

Community Pathways

2.1a – Long-term improper grazing (including season long, overstocking, wrong season, etc.) and/or drought remove annual and perennial fine fuels from the site lessening the potential for fire to occur. Fire frequency is greater than 100 years. Utah juniper typically invades site if a seed source is available.

2.1b – Recent fire occurrence, 1 to 30 years.

2.2a – Fire frequency returns to within the normal range for the site (50 to 60 years).

2.3a – Recent fire occurrence, 1 to 30 years.

Transitions

T2a – Sustained, long-term improper grazing (including season long, overstocking, wrong season, etc.) and/or prolonged drought; reduced fine fuels resulting in the continued

lengthening of a fire period and a dense shrub and/or tree overstory. This leads to a significant reduction of native perennial species and an increase in invading annuals. Utah junipers may increase to occupy a significant portion of the overstory, if a seed source is present. Black sagebrush dominates the shrub layer and may be decadent due to age. Bluebunch wheatgrass and other perennial bunchgrasses are significantly reduced due to increased shrub competition and/or heavy grazing pressure. Purple threeawn and sand dropseed may increase. The threshold is crossed when invasive annuals such as cheatgrass and annual mustards dominate the understory. The occurrence of fire extends well beyond the normal period for this site.

T2b – Long-term improper grazing (including season long, overstocking, wrong season, etc.) and/or prolonged drought. Shortened fire frequency allows site to be dominated by sprouting shrubs including yellow rabbitbrush and horsebrush species. Bluebunch wheatgrass and other perennial bunchgrasses are significantly reduced due to increased shrub competition and/or heavy grazing pressure. Purple threeawn and sand dropseed may increase. Highly combustible fine fuels from invasive annuals dominate the community. Fire frequency is typically 10 to 30 years.

State 3 – Non-sprouting shrubs/Utah juniper/Invasive annuals State

Plant Community Narratives

Non-sprouting shrubs/Utah juniper/Invasive annuals State, Community 3.1 – Where Utah juniper has invaded, Black sagebrush and other shrubs decrease, otherwise they dominate the community. Winterfat and Mexican cliffrose are dead or dying. Remaining perennial herbaceous vegetation is declining and is mostly found only in protected locations under shrubs. Invasive, non-native grasses and weeds including cheatgrass, annual mustards, and red-stem storksbill dominate the understory.

Non-sprouting shrubs/Utah juniper/Invasive annuals State, Community 3.2 - Where Utah juniper has invaded, black sagebrush and other shrub species decrease, otherwise they often dominate the community. Winterfat and Mexican cliffrose are mostly dead. Remaining perennial herbaceous vegetation is rare and is found only in protected locations under shrubs. Invasive, non-native grasses and weeds included cheatgrass, annual mustards, and red-stem storksbill dominate the understory.

Community Pathways

3.1a – Long-term improper grazing (including season long, overstocking, wrong season, etc.) and/or prolonged drought remove annual and perennial fine fuels from this site lessening the potential for a fire to occur. Fire frequency is greater than 100 years.

3.2a – Site is properly grazed for an extended period of time. Native perennial vegetation is recovering, but annual weeds still dominate the understory. Fire frequency is greater than 100 years.

Transitions

T3a – Long-term improper grazing (including season long, overstocking, wrong season, etc.) and/or prolonged drought, shortens fire frequency which allows site to be dominated by sprouting shrubs including yellow rabbitbrush and horsebrush species. There is a significant reduction in perennial bunchgrass species. Highly combustible fine fuels from invasive annuals dominate the community. Fire frequency is typically 10 to 30 years.

Restoration Pathways

R3a – Mechanical chaining of Utah juniper on slopes up to 35 percent where invasion has occurred and/or mechanical or chemical treatment of unwanted brush. Natural regeneration of native grasses and/or forbs or seeding of introduced, native or combination of rangeland species.

State 4 – Sprouting shrubs/Invasive annuals State

Plant Community Narratives

Sprouting shrubs / Invasive annuals State, Community 4.1 – Yellow rabbitbrush typically dominates the shrub layer. Various horsebrush species can also be plentiful if conditions are right. Fire tolerant shrubs may persist as dominates with fire period intervals of 10 to 30 years. Broom snakeweed, a non-sprouting species, may be an episodic dominant species in these communities when conditions are favorable. Most palatable perennial bunchgrasses are significantly reduced. Purple threeawn and James' galleta may increase. Invasive annuals including cheatgrass, annual mustards, and red-stem storksbill dominate the understory.

Sprouting shrubs/Invasive annuals State, Community 4.2 – Yellow rabbitbrush dominates the shrub layer. Various horsebrush species can be plentiful if conditions are right. Fire tolerant shrubs may persist as dominates with fire periods of 10 to 30 years or less. Broom snakeweed may be an episodic dominate species when conditions are favorable. Only remnant palatable bunchgrases remain. Purple threeawn and sand dropseed decrease. Invasive annuals including cheatgrass, annual mustards, and red-stem storksbill dominate the understory.

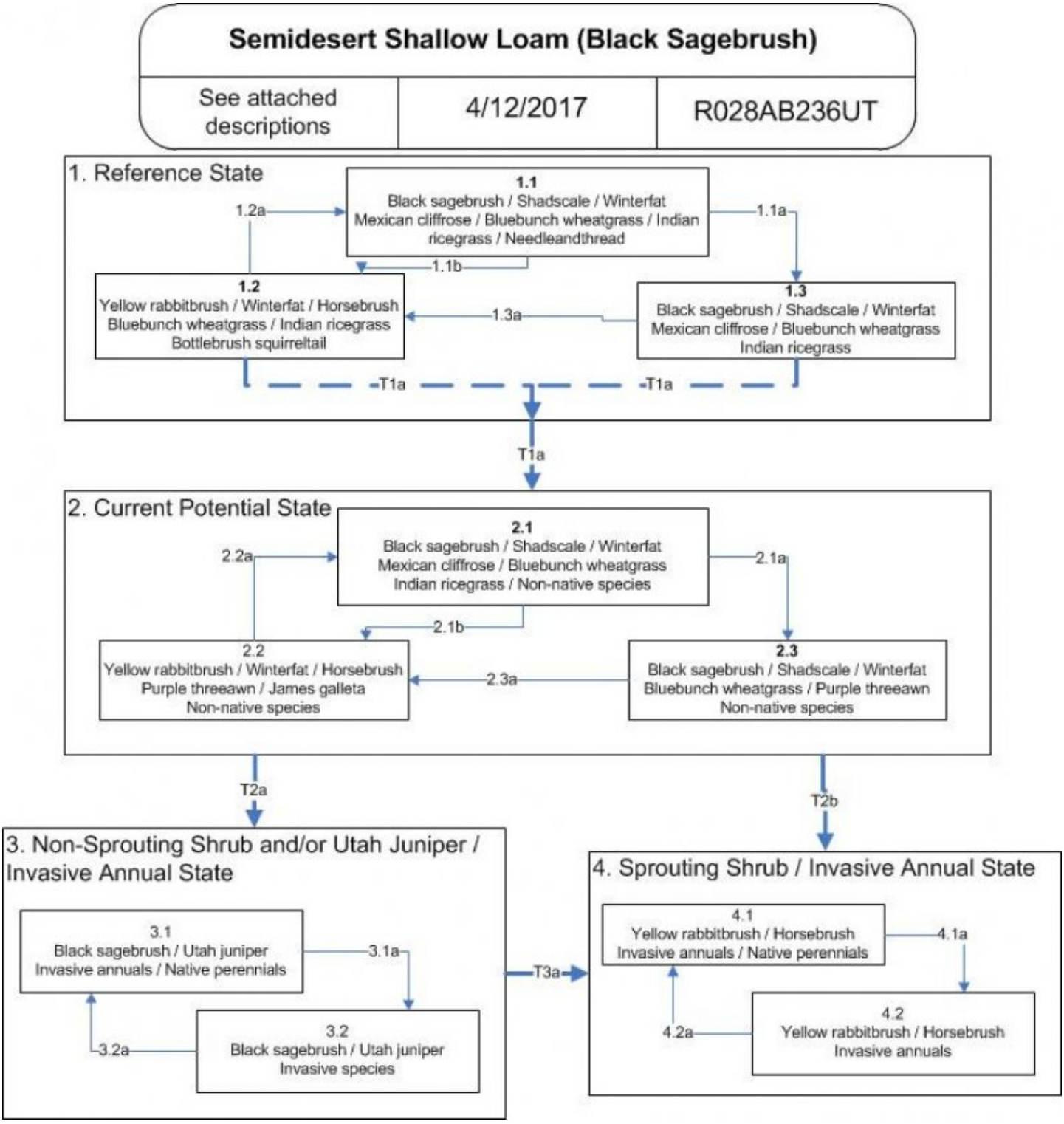
Community Pathways

4.1a – Long-term improper grazing (including season long, overstocking, wrong season, etc.) and/or prolonged drought reduce annual and perennial fine fuels from the site. Fire removes black sagebrush and shadscale occupying the site. Yellow rabbitbrush and, at times, various horsebrush species may become dominant.

4.2a – Site properly grazed for an extended period of time. Native perennial vegetation

slowly recovers. Fire frequency is 5 to 30 years.

State and transition model



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	02/09/2026
Approved by	Kendra Moseley
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:

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17. **Perennial plant reproductive capability:**
