

Ecological site R047XA305UT Upland Stony Loam (Utah juniper)

Last updated: 2/05/2025
Accessed: 05/13/2025

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.

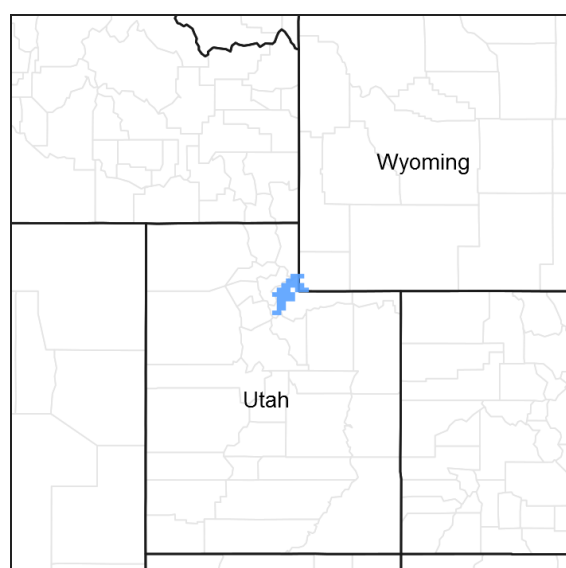


Figure 1. Mapped extent

Areas shown in blue indicate the maximum mapped extent of this ecological site. Other ecological sites likely occur within the highlighted areas. It is also possible for this ecological site to occur outside of highlighted areas if detailed soil survey has not been completed or recently updated.

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 Fahrenheit (-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.

Classification relationships

Modal Soil: Bequinn Family GVR-L, 25-70% — loamy-skeletal, mixed (calcareous) frigid Xeric Torriorthents

Ecological site concept

The soils for this site formed in colluvium and slope alluvium or colluvium over residuum derived from sandstone and other sedimentary rock. They are shallow to moderately deep having bedrock within 20 to 40 inches of the soil surface. They are well-drained and moderately slow to moderate in terms of permeability. Surface textures are loamy and usually contain gravels or channers. However, rock fragments may or may not be present on the soil surface and throughout the profile. These soils are calcareous and have a pH range of 7.4 to 8.4. The water holding capacity ranges from 0.8 inches on shallower soils to 4.3 inches on deeper soils. The soil moisture regime is aridic xeric and the soil temperature regime is frigid bordering on mesic.

Associated sites

R047XA301UT	Upland Clay Loam (early sagebrush)
R047XA308UT	Upland Loam (basin big sagebrush)
R047XA338UT	Upland Stony Loam (Wyoming big sagebrush)

Similar sites

R047XA336UT	Upland Stony Loam (pinyon/Utah juniper) This site has Pinyon pine as well as Utah juniper.
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Table 1. Dominant plant species

Tree	(1) <i>Juniperus osteosperma</i>
Shrub	Not specified
Herbaceous	(1) <i>Pseudoroegneria spicata</i>

Physiographic features

This site occurs primarily on mountain slopes, but can also be found on hillslopes and in canyons. Slopes are moderately steep to very steep and the primary aspect is south to southwest. Runoff is high to very high. Flooding and ponding do not occur on this site.

Table 2. Representative physiographic features

Landforms	(1) Mountain slope (2) Hill (3) Canyon
Runoff class	High to very high
Flooding frequency	None
Ponding frequency	None
Elevation	1,707–2,256 m

Slope	20–70%
Aspect	W, S, SW

Climatic features

The climate for this site is characterized by cold, snowy winters and warm, dry summers. The average annual precipitation is 16 to 17 inches with about 65 percent of that moisture falling between September and May. This cool-season precipitation is the most reliable source of water for plant growth. June, July and August are the driest months for this site and many herbaceous species go dormant during these hot, dry summer months.

Table 3. Representative climatic features

Frost-free period (characteristic range)	50-69 days
Freeze-free period (characteristic range)	105-106 days
Precipitation total (characteristic range)	406-432 mm
Frost-free period (actual range)	46-73 days
Freeze-free period (actual range)	105-106 days
Precipitation total (actual range)	381-432 mm
Frost-free period (average)	60 days
Freeze-free period (average)	106 days
Precipitation total (average)	406 mm

Climate stations used

- (1) COALVILLE [USW00024120], Coalville, UT
- (2) ECHO DAM [USC00422385], Coalville, UT

Influencing water features

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

Wetland description

N/A

Soil features

The soils for this site formed in colluvium and slope alluvium or colluvium over residuum derived from sandstone and other sedimentary rock. They are shallow to moderately deep having bedrock within 20 to 40 inches of the soil surface. They are well-drained and moderately slow to moderate in terms of permeability. Surface textures are loamy and usually contain gravels or channers. However, rock fragments may or may not be present on the soil surface and throughout the profile. These soils are calcareous and have a pH range of 7.4 to 8.4. The water holding capacity ranges from 0.8 inches on shallower soils to 4.3 inches on deeper soils. The soil moisture regime is xeric and the soil temperature regime is frigid bordering on mesic.

Table 4. Representative soil features

Parent material	(1) Colluvium—sandstone and shale (2) Colluvium—conglomerate
Surface texture	(1) Very gravelly loam (2) Gravelly loam
Family particle size	(1) Loamy-skeletal

Drainage class	Well drained
Permeability class	Moderately slow to moderate
Depth to restrictive layer	51–102 cm
Soil depth	51–102 cm
Surface fragment cover <=3"	0–32%
Surface fragment cover >3"	0–5%
Available water capacity (0-101.6cm)	2.03–10.92 cm
Calcium carbonate equivalent (0-101.6cm)	15–30%
Electrical conductivity (0-101.6cm)	0 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0
Soil reaction (1:1 water) (0-101.6cm)	7.4–8.4
Subsurface fragment volume <=3" (0-101.6cm)	0–32%
Subsurface fragment volume >3" (0-101.6cm)	0–11%

Table 5. Representative soil features (actual values)

Drainage class	Not specified
Permeability class	Not specified
Depth to restrictive layer	25–102 cm
Soil depth	25–102 cm
Surface fragment cover <=3"	Not specified
Surface fragment cover >3"	Not specified
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.

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.

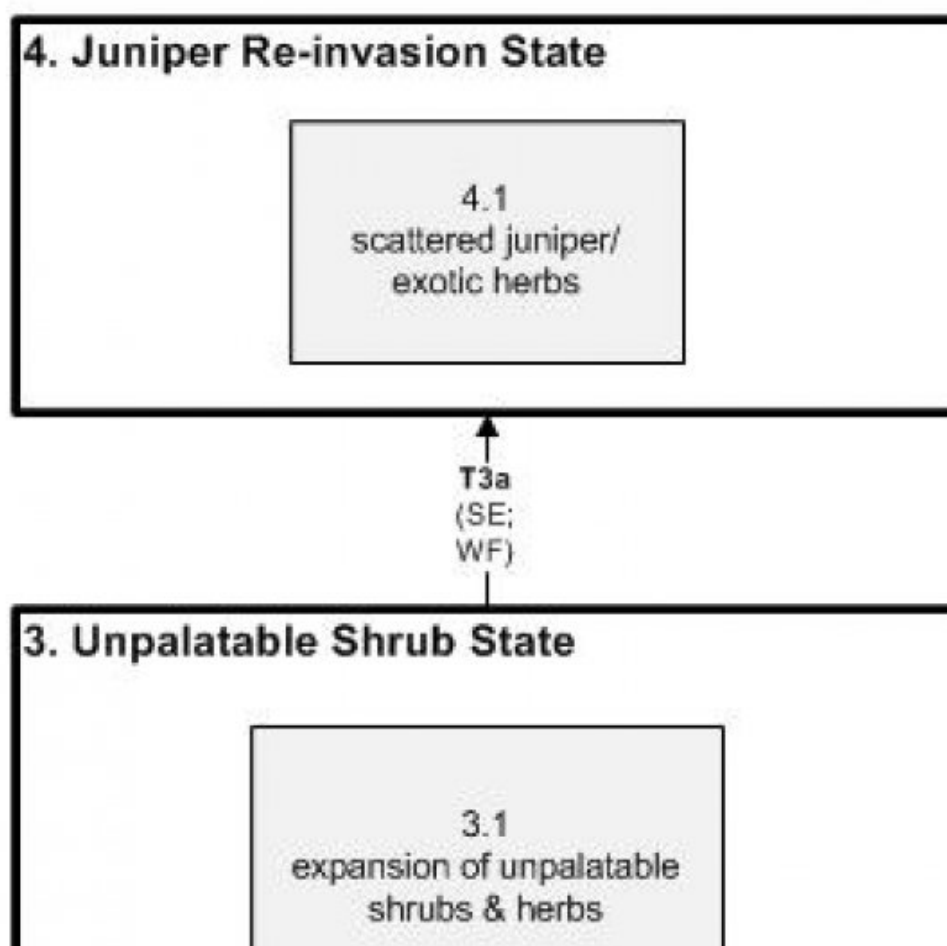
The major successional pathways within states, (“community pathways”) are indicated by arrows between phases. “Transitions” are indicated by arrows between states. The drivers of these changes are indicated in codes decipherable by referring to the legend at the bottom of the page and by reading the 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.

The plant communities shown in this State and Transition Model may not represent every possibility, but are probably the most prevalent and recurring plant communities. As more monitoring data are collected, some phases or states may be revised, removed, or new ones may be added. None of these plant communities should necessarily be thought of as “Desired Plant Communities.” According to the USDA NRCS National Range & Pasture Handbook (USDA-NRCS 2003), Desired Plant Communities (DPC’s) will be determined by the decision-makers and will meet minimum quality criteria established by the NRCS. The main purpose for including descriptions of a plant community is to capture the current knowledge at the time of this revision.

State and transition model

R047AY305UT: Upland Gravelly Loam (Utah Juniper)



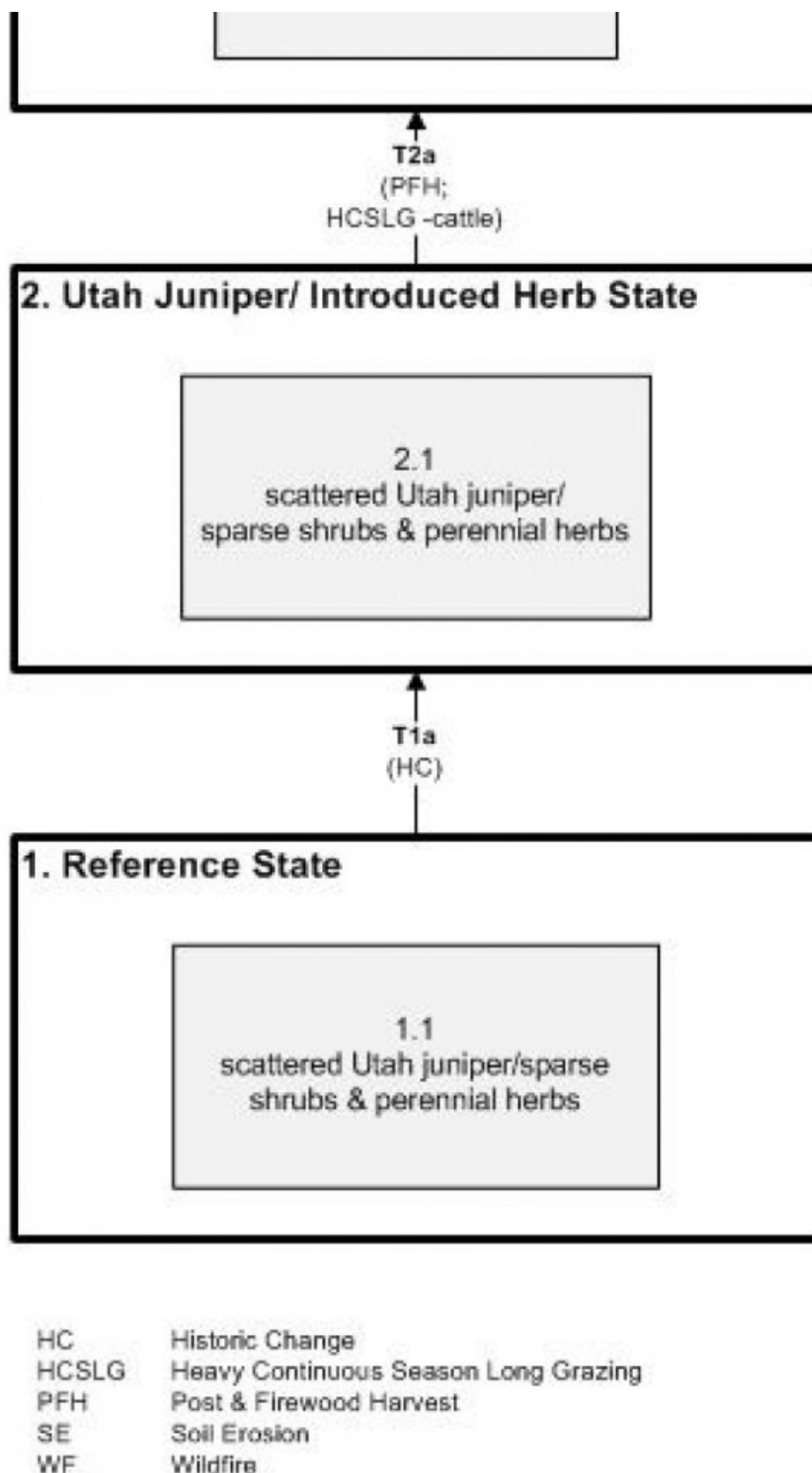


Figure 8. State and Transition Model

State 1 Reference State

The Reference State is a description of this ecological site just prior to Euro-American settlement but long after the arrival of Native Americans. The description of the Reference State was determined by NRCS Soil Survey Type Site Location information and familiarity of rangeland relict areas where they exist. The Reference State for this site would have been a savanna characterized by scattered Utah juniper (*Juniperus osteosperma*) and a sparse understory of shrubs and low density perennial herbs. A more complete list of species by lifeform for the Reference

State is available in the accompanying tables in the “Plant Community Composition by Weight and Percentage” section of this document.

Community 1.1

Scattered Utah Juniper/ Sparse Shrubs & Perennial Herbs

This plant community would have had a scattering of Utah juniper with an understory of sparsely distributed shrubs and native perennial herbs. Associated shrub species would have included mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), antelope bitterbrush (*Purshia tridentata*), and mountain snowberry (*Symphoricarpos oreophilus*) among others. The primary bunchgrasses would have included bluebunch wheatgrass (*Pseudoroegneria spicata*), Indian ricegrass (*Achnatherum hymenoides*), and needle and thread (*Hesperostipa comata*). Common forb associates are low beardtongue (*Penstemon humilis*), littleleaf pussytoes (*Antennaria microphylla*), and longleaf phlox (*Phlox longifolia*).

Table 6. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	252	336	448
Shrub/Vine	127	168	224
Tree	76	101	135
Forb	50	67	90
Total	505	672	897

Table 7. Ground cover

Tree foliar cover	14-16%
Shrub/vine/liana foliar cover	4-6%
Grass/grasslike foliar cover	9-11%
Forb foliar cover	4-6%
Non-vascular plants	0%
Biological crusts	0%
Litter	0%
Surface fragments >0.25" and <=3"	0%
Surface fragments >3"	0%
Bedrock	0%
Water	0%
Bare ground	0%

Table 8. Canopy structure (% cover)

Height Above Ground (M)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.15	—	—	—	—
>0.15 <= 0.3	—	—	—	4-6%
>0.3 <= 0.6	—	4-6%	9-11%	—
>0.6 <= 1.4	—	—	—	—
>1.4 <= 4	14-16%	—	—	—
>4 <= 12	—	—	—	—
>12 <= 24	—	—	—	—
>24 <= 37	—	—	—	—
>37	—	—	—	—

State 2

Utah Juniper/ Introduced Herb State

State 2 is very similar to State 1 in form and function, with the exception of the presence of non-native plants and animals, possible extinctions of native species, and a different climate. State 2 is a description of the ecological site following Euro-American settlement. Native perennial herbs and shrubs with a scattering of Utah junipers characterize State 2. A small component of introduced species, namely cheatgrass (*Bromus tectorum*) will also likely be present. This state will maintain resiliency with periodic, light, cool-season fire. Alternatively, heavy grazing and lack of frequent, light, cool-season fires will reduce state resiliency.

Community 2.1

Scattered Utah Juniper / Sparse shrubs & perennial herbs

This plant community will have a few Utah junipers and a sparse understory of shrubs and perennial herbs, but with the occasional non-native species (e.g. cheatgrass).

State 3

Unpalatable Shrub State

An expansion of unpalatable shrubs and herbs particularly rabbitbrush (*Chrysothamnus* spp.) and spineless horsebrush (*Tetradymia canescens*), will move into the site if the juniper trees are heavily harvested for firewood and fence posts, and the understory is subject to year-round livestock grazing.

Community 3.1

Expansion of unpalatable shrubs & herbs

This plant community will have an assortment of unpalatable shrub and herbaceous species such as rabbitbrush and horsebrush.

State 4

Juniper Re-invasion State

Once the site has experienced accelerated soil loss, few species other than juniper and introduced annuals and biennials will be able to grow. With the added impact of fire, this will remove what species were left, making the site available for the re-invasion by Utah juniper.

Community 4.1

Scattered Juniper/ Exotic herbs

This plant community is characterized by scattered Utah juniper and fire-tolerant exotic herb species, such as tobacco, black henbane, cheatgrass, Russian thistle, and tall thistles. Frequently occurring fire will maintain the site

in this state.

Transition T1a
State 1 to 2

The simultaneous introduction of exotic species, both plants and animals, and possible extinctions of native flora and fauna, along with climate change caused State 1 to transition to State 2. Reversal of such historic changes (i.e. a return pathway) back to State 1 is not practical.

Transition T2a
State 2 to 3

The Utah Juniper/ Introduced Herb State will transition to the Unpalatable Shrub State when the site is exposed to harvesting for fence posts and firewood and heavy continuous season-long grazing by cattle. A key indicator of the approach to this transition is an increase in the size-age growth form of the trees. Human harvest of trees and excessive livestock grazing will trigger this transition. Mechanical, herbicidal, and prescribed burning are not recommended because of slope steepness and potential for soil erosion. A possible restoration pathway would involve reseeding shortly after fire with native grasses and forbs. Trampling in seed with sheep, moved quickly in tight flocks over burned areas, may help seeds germinate.

Transition T3a
State 3 to 4

Wildfire will remove the shrub component as none of the preferred species at the site are likely to re-sprout. Accelerated soil erosion will further limit which species will re-occupy the site, making the site available for re-invasion by Utah juniper and fire-tolerant exotic herbs such as tobacco (*Nicotiana* spp.), black henbane (*Hyoscyamus niger*), cheatgrass, Russian thistle (*Salsola* spp.), and tall thistles (*Cirsium* spp.). A key indicator of the approach to this transition is an increase in fine fuels, and the trigger is wildfire. As with State 2, mechanical, herbicidal, and prescribed burning are not recommended because of slope steepness and soil erosion potential. A possible restoration pathway involves reseeding quickly with native grasses following fire, and trampling in seed with sheep. Scattered alfalfa hay may be used as an inducement for sheep to trample in reseeded area.

Additional community tables

Table 9. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Tree					
0	Dominant Trees			73–146	
	Utah juniper	JUOS	<i>Juniperus osteosperma</i>	73–146	–
Grass/Grasslike					
0	Dominant Grasses			104–184	
	bluebunch wheatgrass	PSSP6	<i>Pseudoroegneria spicata</i>	37–73	–
	Indian ricegrass	ACHY	<i>Achnatherum hymenoides</i>	22–37	–
	needle and thread	HECO26	<i>Hesperostipa comata</i>	22–37	–
Forb					
2	Sub-Dominant Forbs			100–176	
	Forb, annual	2FA	<i>Forb, annual</i>	15–22	–
	Forb, perennial	2FP	<i>Forb, perennial</i>	15–22	–
	common yarrow	ACMI2	<i>Achillea millefolium</i>	8–15	–
	littleleaf pussytoes	ANMI3	<i>Antennaria microphylla</i>	8–15	–
	tapertip hawksbeard	CRAC2	<i>Crepis acuminata</i>	8–15	–
	Torrey's cryptantha	CRT04	<i>Cryptantha torreyana</i>	8–15	–
	butter and eggs	LIVU2	<i>Linaria vulgaris</i>	8–15	–
	tailcup lupine	LUCAC3	<i>Lupinus caudatus ssp. caudatus</i>	8–15	–
	low beardtongue	PEHU	<i>Penstemon humilis</i>	8–15	–
	longleaf phlox	PHLO2	<i>Phlox longifolia</i>	8–15	–
Shrub/Vine					
3	Sub-Dominant Shrubs			76–185	
	Shrub (>.5m)	2SHRUB	<i>Shrub (>.5m)</i>	37–73	–
	mountain big sagebrush	ARTRV	<i>Artemisia tridentata ssp. vaseyana</i>	8–22	–
	yellow rabbitbrush	CHVIV4	<i>Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus</i>	8–22	–
	antelope bitterbrush	PUTR2	<i>Purshia tridentata</i>	8–22	–
	mountain snowberry	SYOR2	<i>Symphoricarpos oreophilus</i>	8–22	–
	spineless horsebrush	TECA2	<i>Tetradymia canescens</i>	8–22	–

Animal community

This site provides some forage for livestock. Big game may use it for thermal and visual cover in the winter if a nearby food source is available. Many reptiles and birds can be found on this site, as well as the deer mouse, desert woodrat, cottontail, coyote, mule deer, and elk.

Recreational uses

This site can be good for hiking and horseback riding, though it is often steep and rocky. Visibility is poor due to thick Utah juniper cover which makes hunting and wildlife viewing difficult. Four-wheeling requires trail development.

Wood products

Post wood can be harvested from straight, mature Utah juniper. It is highly resistant to decay and also provides a fairly clean stove fuel.

Inventory data references

Information presented here has been derived from NRCS clipping data and other inventory data. Field observations from range trained personnel were also used.

Other references

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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.

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Contact for lead author	shane.green@ut.usda.gov
Date	10/22/2012
Approved by	Kendra Moseley
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** None to Very Few. Some very minor rill development may be evident following significant thunderstorm or snow melt events, but they should mostly heal during the following growing season. The presence of rill development may also be more apparent on steeper slopes (> 15%) or where run-on from adjacent upland sites or exposed bedrock concentrate flow. Any rill development present should be less than 1 inch deep, moderately short (< 6') and spaced a minimum of 10 to 12 feet apart.

2. **Presence of water flow patterns:** Very Few. A very few stable overland flow patterns may be present. They will typically wind around perennial plant bases. They should show no evidence of current erosion or deposition. Flow patterns present are normally 15 to 20 feet long, follow natural contours, and are typically spaced at least 10 to 15 feet apart. A slight increase in flow activity may be observed immediately following significant weather events such as thunderstorms or spring run-off events.

3. **Number and height of erosional pedestals or terracettes:** None. There should be no evidence of pedestals or terracettes caused by accelerated water erosion. One to 2 inches of elevational mounding under Mountain big sagebrush and other shrub canopies, and within biological soil crusts, is normal for this site and is not caused by water erosion. There are no exposed roots around perennial grasses and shrubs.

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Bare ground ranges from 20% - 30%. Soil surface may be covered by 50 to 60% coarse fragments. Bare ground openings should not be greater than 2 to 3 feet in diameter and should normally not be connected.

5. **Number of gullies and erosion associated with gullies:** None at site level. Scattered landscape level gully channels, however, are a normal component of these environments. Where landscape gullies are present, they should be stable, partially vegetated on their sides and bottoms, with no evidence of head-cutting. Some slight increase in disturbance may be evident following significant weather events or when gullies convey considerable runoff from higher elevation rocky or naturally eroding areas.

6. **Extent of wind scoured, blowouts and/or depositional areas:** None. No evidence of wind generated soil movement is present. Slight depositional mounding within perennial grass crowns, under Mountain big sagebrush and other shrub canopies, and within biological soil crusts is normal for this site.

7. **Amount of litter movement (describe size and distance expected to travel):** The majority of litter accumulates in place at the base of plants canopies. Slight movement of the finest material (< 1/8 inch) may move 1 to 2 feet in the direction of prevailing winds or down slope if being transported by water. Little accumulation is observed behind

obstructions.

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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):** This site should have a soil stability rating of 5 or 6 under plant canopies, and a 4 to 5 in the interspaces. Average should be a 5. Surface textures are typically gravelly loams, gravelly sandy loams, and sandy clay loams containing up to 50% coarse fragments.
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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** (Bequinn) Soil surface is typically 0 to 5 inches deep. Surface texture is a very gravelly loam and structure is fine granular. The A-horizon color is dark brown (7.5YR 4/3). Soils have an Ochric epipedon that extends 12 inches into the soil profile. The A horizon is normally deeper and better developed under plant canopies.
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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Spatial distribution of well developed biological soil crusts (where present) intercept raindrops, reducing splash erosion, and provide areas of surface detention to store water allowing additional time for infiltration. Crowns of trees and accumulating litter at base of trees appear to create a micro-topography that may enhance development of water flow patterns below the drip line of the canopy. On community phases within the reference state where juniper canopy increases, understory vegetation may be reduced causing an associated increase in runoff.
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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, There may be dense layers of rock fragments or other naturally occurring hard layers found in the soil subsurface. These should not be considered to be 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: Trees (Utah juniper)> Non-sprouting shrubs (Mountain big sagebrush, > Sprouting Shrubs (Mountain snowberry, bitterbrush) > Perennial bunchgrasses (bluebunch wheatgrass, Indian ricegrass) >> Perennial forbs (low beardstongue).
- Sub-dominant: Sprouting shrubs (green rabbitbrush, gray horsebrush) > = Warm season grasses (western wheatgrass).
- Other: A wide variety of other grasses and both perennial and annual forbs can be expected to occur in the plant community.
- Additional: Moss and lichen communities will normally be found under plant canopies while cyanobacteria can be found throughout the site. Functional/structural groups may appropriately contain non-native species if their ecological function is the same as the native species. Perennial and annual forbs can be expected to vary widely in their expression in the plant community based upon departures from average growing conditions.
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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 trees, shrubs, or grasses. During severe (multi-year) drought up to 10% of the Utah junipers may die, either from drought, insect damage or pathogens such as mistletoe. There may be partial mortality on individual

bunchgrasses and shrubs during drought periods, and complete mortality of individual plants during severe drought periods, particularly on the shallower and coarser soils associated with this site. Because woody stems may persist for many years, Utah junipers (especially older trees) will normally have dead stems within the plant canopy.

14. **Average percent litter cover (%) and depth (in):** Litter cover averages from 15 to 20% (including under plants) with the majority being fine litter. Depth should be 1 leaf thickness in the interspaces, up to 1/2" under shrub canopies, and up to 1" under tree canopies. Litter cover may increase to 30% on some years due to increased production of plants.
 15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** Annual production in air-dry herbage should be approximately 550 to 650 pounds per acre on an average year. Production could vary from 400 to 850 pounds per acre during drought or above-average years.
 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, Russian thistle, alyssum, and mustard species are most likely to invade this site.
 17. **Perennial plant reproductive capability:** All perennial plant species have the ability to reproduce in most years except drought years. There are no restrictions on either seed or vegetative reproduction. Some seedling recruitment of major species may be present during average or above average years.
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