USDA Natural Resources
Conservation Service

Ecological site R034AA240UT
Semi-desert Shallowbreaks (Bluebunch wheatgrass/ Utah juniper)

Last updated: 9/07/2023
Accessed: 05/18/2024

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): 034A–Cool Central Desertic Basins and Plateaus

Major Land Resource Area (MLRA) 34A, Cool Central Desertic Basins and Plateaus, consists of approximately 21 million acres in Wyoming, Colorado and Utah, it consists of 11 Land Resource Units (LRU). These units are divisions of the MLRA based on geology, landscape, common soils, water resources and plant community potentials. The elevation spans from approximately 5600 feet (1700 m) along the Green River in UT and CO to approximately 9500 feet (2900 m) near Jeffrey City, WY. Annual precipitation ranges from 7 to 16 inches (177 to 406 mm), with the driest areas in the Green River and Great Divide Basins and the wettest areas in northern Carbon County, Southeast Fremont County and Albany County. There is a seasonal weather pattern that trends west to east, with more winter precipitation in the west and more spring/summer in the east, illustrated by diminishing amounts of Big Sagebrush in the eastern part of the MLRA.

LRU notes

The Bear River Valley LRU is located on the far western side of MLRA 34A between the Bear River Divide and the Monte Cristo Range, from Woodruff, Utah at the southern end to Cokeville, Wyoming at the northern end. The total area of the LRU is approximately 340,000 acres. It shares a boundary with MLRA 47, 43B and 46 (proposed).
This LRU differs from the others in its geology, which is comprised mostly of alluvium and colluvium from the Stump Formation. Its weather patterns are such that the soil moisture is xeric, there is a slight peak in winter precipitation in this LRU, with typical yearly precipitation between 9 to 15 inches (230 to 380 mm). The soil temperature regime of this LRU is frigid with mean annual soil temperatures ranging from 44 to 48 degrees Fahrenheit (6.7 to 8.8°C). The elevation range is from 5700 to 7000 feet (1730 to 2130 m). The soils in the Bear River Valley are dominated by young aged very deep soils developed from sandstone and shale parent material re-worked with recent alluvium. Soils are dominated by Alfisols with young argillic horizons and by Fluvents in more recent alluvium.
The Bear River runs through this LRU, allowing for ample amounts of irrigation water used in the lowland areas to produce hay. Smaller tributaries originating from the neighboring mountains.

Ecological site concept

• This site does receive any additional water.
• These soils:
o are not saline or saline-sodic
o are shallow to moderately deep
o are skeletal within 20” of the soil surface; and have greater than 35 percent rock fragments in the soil subsurface
o are not strongly or violently effervescent in the surface mineral layer (within top 10”)
o have surface textures that usually range from silt loam to silty clay loam in surface mineral layer (4”)
• have slopes greater than 30 percent
• clay content is not greater than 35% in mineral soil surface layer (1-2”)

Associated sites

R034AA205UT	**Semi-desert Stony Loam (Black sagebrush)**

Similar sites

R034AY256WY	**Shallow Breaks Foothills and Basins West (SwBr)**

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Juniperus osteosperma*
Herbaceous	(1) *Pseudoroegneria spicata*

Physiographic features

This site occurs on mountain slopes and ridges at elevations between 5,700 and 7,000 feet. It is found on all aspects and on slopes between 25 and 70 percent. Runoff is very high and flooding and ponding do not occur on this site.

Table 2. Representative physiographic features

Landforms	(1) Mountain slope (2) Ridge
Flooding frequency	None
Ponding frequency	None
Elevation	1,737–2,134 m
Slope	25–70%
Water table depth	152 cm
Aspect	Aspect is not a significant factor

Climatic features

The climate is characterized by warm, dry summers and cold, snowy winters. This climate is modified by local topographic conditions. The mountains appreciably modify both the precipitation and temperature patterns. April, May, September and October are the wettest months; December, January, February and July are the driest.

Table 3. Representative climatic features

Frost-free period (average)	79 days
Freeze-free period (average)	112 days
Precipitation total (average)	330 mm

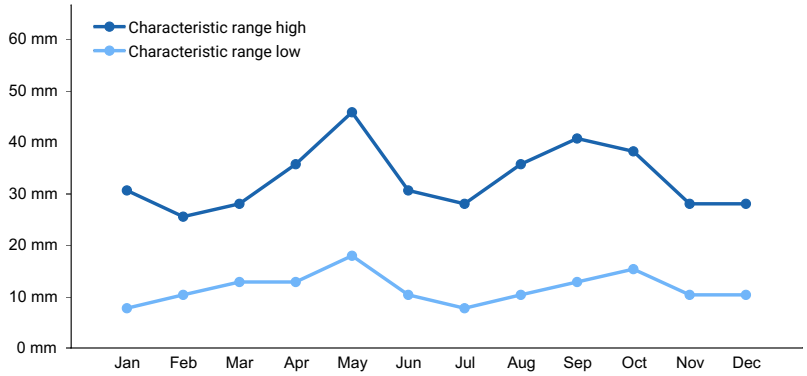

Figure 1. Monthly precipitation range

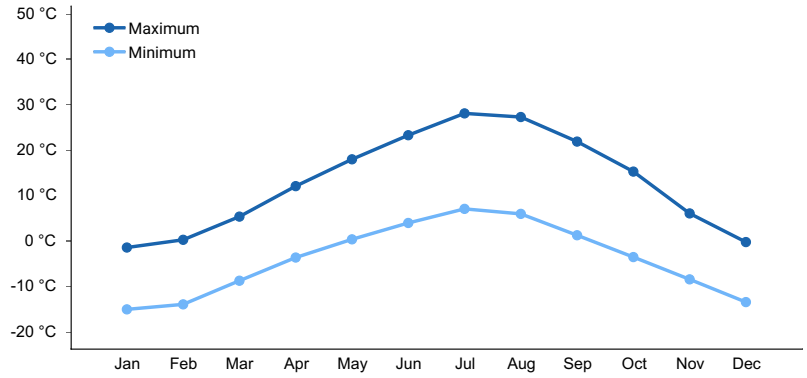

Figure 2. Monthly average minimum and maximum temperature

Influencing water features

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

Wetland description

N/A

Soil features

The soils of this site are shallow and formed in residuum derived from sandstone, quartzite, limestone, or conglomerate. Surface textures are gravelly, stony, or cobbly loams. Bedrock is typically less than 20 inches below the soil surface. Rock fragments increase with proximity to bedrock. These soils are somewhat excessively drained with moderate permeability. Available water holding capacity ranges from 1 to 2 inches. The soil moisture regime is xeric and the soil temperature regime is frigid.

Table 4. Representative soil features

Parent material	(1) Residuum–metamorphic and sedimentary rock
Surface texture	(1) Gravelly loam (2) Cobbly loam (3) Stony loam
Family particle size	(1) Loamy
Drainage class	Somewhat excessively drained
Permeability class	Moderate
Soil depth	51 cm
Surface fragment cover <=3"	0–35%
Surface fragment cover >3"	0–35%

Available water capacity (0-101.6cm)	2.54–5.08 cm
Soil reaction (1:1 water) (0-101.6cm)	7.9–9
Subsurface fragment volume <=3" (Depth not specified)	15–90%
Subsurface fragment volume >3" (Depth not specified)	15–90%

Ecological dynamics

It is impossible to determine in any quantitative detail the Reference Plant Community 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 1870's 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 1860's, 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 as the proportion of browse 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 details.

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, and 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

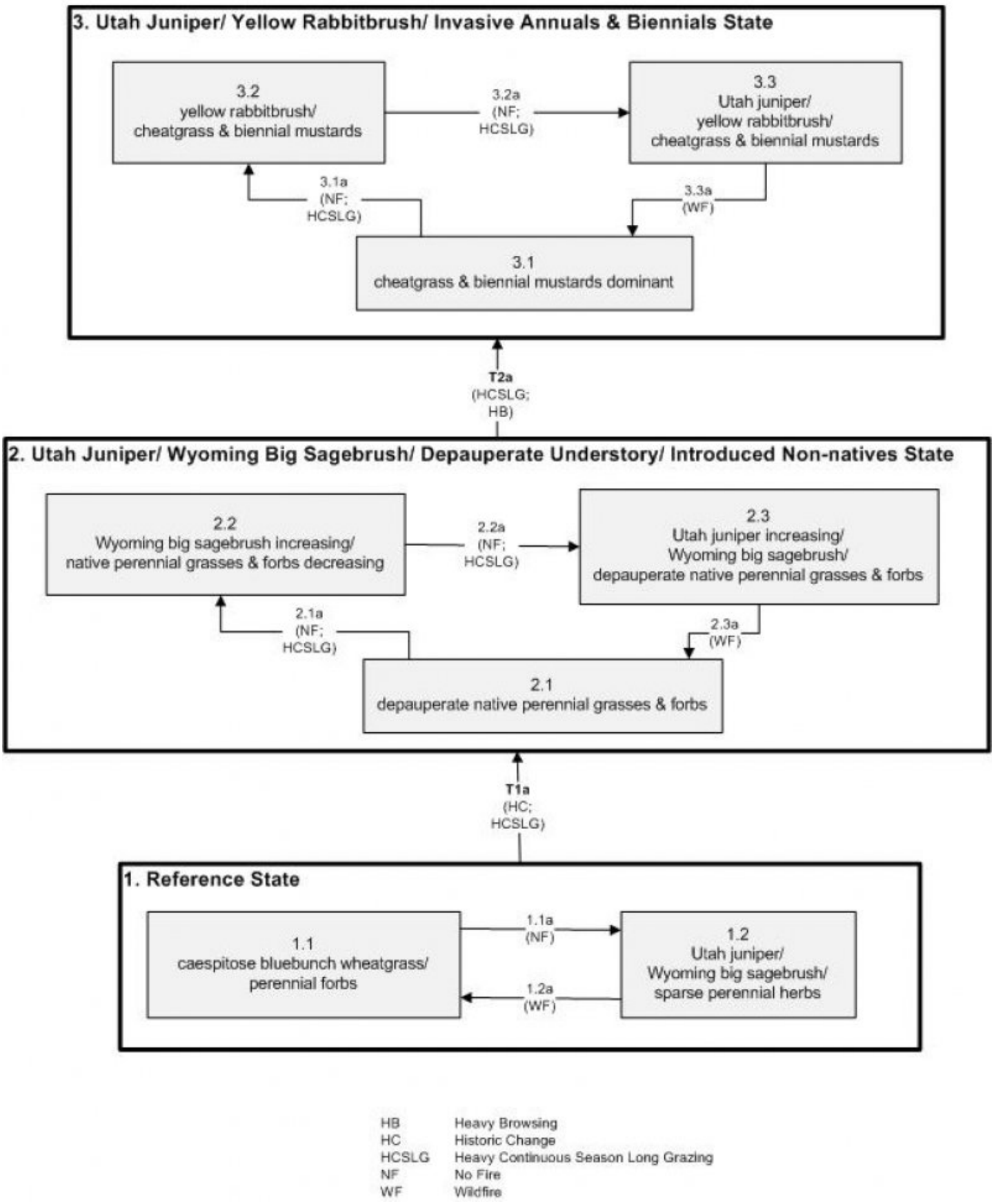

Figure 3. State and Transition Model

State 1
Reference State

The Reference State is a description of the 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 (in the files of the State Range Conservationist) and the familiarity of rangeland relict areas where they exist. The least modified plant community (1.1) would have been a caespitose bluebunch wheatgrass (*Pseudoroegneria spicata*) dominated grassland with scattered perennial forbs such as buckwheat (Eriogonum spp.), fleabane (Erigeron spp.), beardtongue (Penstemon spp.), locoweed (Astragalus spp.), wild onion (Allium spp.), and western yarrow (*Achillea millefolium*). Other common grasses would have included needle and thread (*Hesperostipa comata*), Indian ricegrass (*Achnatherum hymenoides*), and bluegrasses (Poa spp.) Shrubs such as Wyoming big sagebrush (*Artemisia tridentata* ssp. wyomingensis) and Utah juniper (*Juniperus osteosperma*) would have been found on the rockiest microsites where fine fuel production was least (1.2) and thus the chances of fires reaching them low (1.1a). With fire, these woody dominated patches would have returned to the grassland-dominated phase (1.2a). 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
Caespitose Bluebunch Wheatgrass/ Perennial forbs

Community Phase 1.1: Caespitose Bluebunch Wheatgrass/ Perennial forbs This is a sparsely vegetated grassland dominated by a caespitose form of bluebunch wheatgrass and assorted perennial forbs.

Community 1.2
Utah juniper/ Wyoming Big Sagebrush/ Sparse Perennial Forbs

Community Phase 1.2: Utah juniper/ Wyoming Big Sagebrush/ Sparse Perennial Forbs This is a sparsely vegetated juniper savanna.

Pathway CP 1.1A
Community 1.1 to 1.2

Community Pathway 1.1a: As time lengthens since the last wildfire, Wyoming big sagebrush and Utah juniper slowly begin to re-invade the site.

Pathway CP 1.2A
Community 1.2 to 1.1

Community Pathway 1.2a: Wildfire would have caused the return to an herbaceous dominated phase, where bluebunch wheatgrass would be the dominant species. Perennial forbs would have included various species of buckwheat, fleabane, beardtongue, locoweed, wild onion, and western yarrow. Other common grasses would have included needle and thread and Indian ricegrass.

State 2
Utah Juniper/ Wyoming Big Sagebrush/ Depauperate Understory/ Introduced Non-natives State

State 2 is a description of the ecological site shortly following Euro-American settlement, and is considered the current potential for this site. This site was heavily utilized by livestock (first by horses and cattle, then later by sheep) almost year around (Parson 1996). Because of the close proximity of these areas to home ranches, livestock were grazed very early in the spring with some feeding and calving/lambing due to the largely southern exposures and excessive drainage to keep the animals out of mud. Especially heavy utilization during the spring quickly led to the loss of bluebunch wheatgrass and other palatable companions such as needle and thread, Indian ricegrass, and the bluegrasses (Stoddart 1940). This heavy grazing diminished the fine fuels, which, along with directed fire suppression, led to the expansion of brush first and later the juniper trees. A small component of introduced annuals were also present, but not yet dominant.

Community 2.1
Utah Juniper/ Wyoming Big Sagebrush/ Depauperate Understory/ Introduced Non-natives State

Community Phase 2.1: Depauperate Native Perennial Grasses & Forbs This phase occurs if early, intense grazing started in phase 1.1.

Community 2.2
Wyoming Big Sagebrush Increasing/ Native Perennial Grasses & Forbs Decreasing

Community Phase 2.2: Wyoming Big Sagebrush Increasing/ Native Perennial Grasses & Forbs Decreasing This phase occurs if early, intense, grazing started in phase 1.2.

Community 2.3
Utah Juniper Increasing/ Wyoming Big Sagebrush/ Depauperate Native Perennial Grasses & Forbs

Community Phase 2.3: Utah Juniper Increasing/ Wyoming Big Sagebrush/ Depauperate Native Perennial Grasses & Forbs In this phase, woody plants prevail because of consumption of herbs by livestock and lack of burning.

Pathway CP 2.1A
Community 2.1 to 2.2

Community Pathway 2.1a: Fire suppression, followed by heavy continuous season-long grazing

Pathway CP 2.2A
Community 2.2 to 2.3

Community Pathway 2.2a: Fire suppression, simultaneous with heavy continuous season-long grazing

Pathway CP 2.3A
Community 2.3 to 2.1

Community Pathway 2.3a: Wildfire will temporarily remove the woody plants and return the site to an herbaceous dominated phase.

State 3
Utah Juniper/ Yellow Rabbitbrush/ Invasive Annuals & Biennials State

This state is dominated by the less palatable woody plants and invasive annuals, mainly cheatgrass (*Bromus tectorum*), and biennials including tall tumble mustard (*Sisymbrium altissimum*) and tansy mustard (Descurainia spp.). Because of the steep, rocky character of this site, there are few options available to try and reverse these trends. Simply reducing grazing pressure will only result in a buildup in fuels. The potential for even more noxious plants such as Dyer's woad (*Isatis tinctoria*) and knapweed (Centaurea spp.) is high. The prevention of wildfires and limiting grazing can help maintain state resiliency in the phase. Alternatively, recurring fire after a short period of recovery will reduce state resiliency.

Community 3.1
Cheatgrass & Biennial Mustards Dominant

Community Phase 3.1: Cheatgrass & Biennial Mustards Dominant Within the first 3 to 5 years following wildfire, invasive annuals and biennial forbs will dominate the site.

Community 3.2
Yellow Rabbitbrush/ Cheatgrass & Biennial Mustards

Community Phase 3.2 Yellow Rabbitbrush/ Cheatgrass & Biennial Mustards Approximately 5 to 15 years post fire, yellow rabbitbrush will begin to re-establish. Cheatgrass and assorted biennial mustards still characterize the understory component.

Community 3.3
Utah juniper Increasing/ Yellow Rabbitbrush/ Cheatgrass & Biennial Mustards

Community Phase 3.3: Utah juniper Increasing/ Yellow Rabbitbrush/ Cheatgrass & Biennial Mustards Utah juniper will begin to re-establish and ultimately dominate the site as the time since last fire increases. Yellow rabbitbrush and cheatgrass are likely to be the primary understory species.

Pathway CP 3.1A
Community 3.1 to 3.2

Community Pathway 3.1a: As the time since last fire increases, and heavy continuous season-long grazing ensues, woody species such as yellow rabbitbrush will begin to re-establish.

Pathway CP 3.2A
Community 3.2 to 3.3

Community Pathway 3.2a: A lack of fire for more than 15 years combined with continued heavy season-long grazing will allow for re-establishment of juniper.

Pathway CP 3.3A
Community 3.3 to 3.1

Community Pathway 3.3a: Wildfire will temporarily remove the woody plants and return the site to an herbaceous dominated phase, which will be dominated by cheatgrass or other biennial species.

Transition T1A
State 1 to 2

Transition T1a: from State 1 to State 2 (Reference State to Utah Juniper/ Wyoming Big Sagebrush/ Depauperate Understory/ Introduced Non-natives State) The simultaneous introduction of exotic species, both plants and animals, and possible extinctions of native flora and fauna, along with climate change, causes State 1 to transition to State 2.

Transition T2A
State 2 to 3

Transition T2a: from State 2 to State 3 (Utah Juniper/ Wyoming Big Sagebrush/ Depauperate Understory/ Introduced Non-natives State to Utah Juniper/ Yellow Rabbitbrush/ Invasive Annuals & Biennials State) Although the number of livestock, and their timing of use, began to be restricted on BLM land after 1934, heavy utilization by livestock continued on private and state lands. The dominance of woody plants continued to develop. In part due to this increase in browse material, mule deer numbers greatly increased during the 1950 to 1970s. This ESD is a major part of the winter range of mule deer migrating from their summer range in Wyoming to northeast Utah. Despite many special hunts, many deer spend their winters on this ESD. Deer utilize on sagebrush in the winter and native perennial herbs in the early spring. This additional grazing impact pushes the vegetation to State 3. A key indicator of this transition is the build up of fuel. Wildfire will trigger this transition.

Additional community tables

Animal community

The suitability for livestock grazing is fair to good. This site provides grazing for cattle and sheep year-round, however prolonged heavy spring use will result in loss of native perennial herbs and expansion of shrubs, trees, and exotics.

Recreational uses

Recreation activities include hunting, horseback riding, ATV riding, birdwatching, etc.

Wood products

Juniper grows on this site, which can produce cedar posts and firewood.

Inventory data references

Data gathered by qualified range professionals within NRCS and cooperating partners.

Other references

Galatowitsch, S.M. 1990. Using the original land survey notes to reconstruct pre-settlement landscapes in the American West. Great Basin Naturalist: 50(2): 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]

Contributors

USU

Approval

Kirt Walstad, 9/07/2023

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	05/18/2024
Approved by	Kirt Walstad
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

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

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):**

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

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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:

    Sub-dominant:

    Other:

    Additional:

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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:**