USDA Natural Resources
Conservation Service

Ecological site R047XC308UT
Upland Loam (Wyoming big sagebrush)

Last updated: 2/11/2025
Accessed: 02/26/2025

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.

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. The southern half is in the High Plateaus of the Utah Section of the Colorado Plateaus Province of the Intermontane Plateaus. 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, and the Uinta Mountains, which trend east and west. 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 Uinta Mountains have a broad, gently arching, elongated shape. Structurally, they consist of a broadly folded anticline that has an erosion-resistant quartzite core. The Wasatch and Uinta Mountains have an elevation of 4,900 to about 13,500 feet (1,495 to 4,115 meters).

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, but Precambrian rocks are exposed in the Uinta Mountains. The Uinta Mountains are one of the few ranges in the United States that are oriented west to east. The southern Wasatch Mountains consist of Tertiary volcanic rocks occurring as extrusive lava and intrusive crystalline rocks.

The average precipitation is from 8 to 16 inches (203 to 406 mm) in the valleys and can range up to 73 inches (1854 mm) in the mountains. In the northern and western portions of the MLRA, peak precipitation occurs in the winter months. The southern and eastern portions have a greater incidence of high-intensity summer thunderstorms; hence, a significant amount of precipitation occurs during the summer 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 Aridisols, Entisols, Inceptisols, and Mollisols. The lower elevations are dominated by a frigid temperature regime, while the higher elevations experience cryic temperature regimes. Mesic temperature regimes come in on the lower elevations and south facing slopes in the southern portion of this MLRA. The soil moisture regime is typically xeric in the northern part of the MLRA, but grades to ustic in the extreme eastern and southern parts. The minerology is generally mixed and the soils are very shallow to very deep, generally well drained, and loamy or loamy-skeletal.

LRU notes

E47C is the Uinta Mountains portion of MLRA 47 that run east and west which includes the Uinta Wilderness and The Flaming Gorge National Recreation Area and towns such as Evanston, Wyoming, Hanna and Tabiona, Utah. Structurally these mountains consist of a broadly folded anticline that has an erosion resistance quartzite core. The

Duchesne River and many other tributaries to the Green River run through this range, as well as the headwaters of the Bear River.

Ecological site concept

This site is located on toe slopes and lower terraces. The plant community is Wyoming big sagebrush; bluebunch wheatgrass; western wheatgrass; yellow rabbitbrush; and needle and thread.

The soils of this site formed mostly in slope alluvium from metamorphic and sedimentary rock. Surface soils are fine sandy loam, gravelly sandy loam to sandy loam in texture. Rock fragments may be present on the soil surface and throughout the profile, but make up less than 35 percent of the soil volume. These soils are deep but on occasion can be shallow to moderately deep, well-drained, and have moderately slow to moderately rapid permeability. pH is neutral to slightly alkaline. Available water-holding capacity ranges from 3.0 to 6.0 inches of water in the upper 60 inches of soil. The soil moisture regime is mostly ustic and the soil temperature regime is frigid. Precipitation ranges from 12 to 16 inches annually.

Associated sites

R047XC309UT	**Upland Loam (birchleaf mountain mahogany)** These sites can occur adjacent to each other.

Similar sites

R047XC338UT	**Upland Stony Loam (Wyoming big sagebrush)** These sites have similar floral characteristics, however this site has more rock fragment in the soil profile.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Artemisia tridentata var. wyomingensis*
Herbaceous	Not specified

Physiographic features

This ecological site typically occurs on fan remnants, alluvial fans, escarpments and valley floors. Slopes normally range from 5 to 50 percent but may occasionally be steeper. Slope steepness, aspect and elevation will influence the vegetative floristics of this site. Sites are typically located between 6,700 to 8,600 feet in elevation. Runoff is low to medium.

Table 2. Representative physiographic features

Landforms	(1) Fan remnant (2) Alluvial fan (3) Escarpment (4) Valley floor
Runoff class	Low to medium
Flooding frequency	None
Ponding frequency	None
Elevation	6,700–8,600 ft
Slope	5–50%
Aspect	Aspect is not a significant factor

Climatic features

The climate is characterized by cool, moist summers and cold, snowy winters. Approximately 60 percent of the

moisture comes as rain from May through October. On the average, January through April are the driest months and May through October are the wettest months.

Table 3. Representative climatic features

Frost-free period (characteristic range)	
Freeze-free period (characteristic range)	90-110 days
Precipitation total (characteristic range)	12-16 in

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 of this site formed mostly in slope alluvium from metamorphic and sedimentary rock. Surface soils are fine sandy loam, gravelly sandy loam to sandy loam in texture. Rock fragments may be present on the soil surface and throughout the profile, but generally make up less than 35 percent of the soil volume. These soils are deep (greater than 40 inches) but on occasion can be moderately deep (lithic bedrock between 20 to 40 inches), well-drained, and have moderately slow to moderately rapid permeability. pH is neutral to slightly alkaline. Available water-holding capacity ranges from 3.0 to 6.0 inches of water in the upper 60 inches of soil. The soil moisture regime is mostly ustic and the soil temperature regime is frigid. Precipitation ranges from 12 to 16 inches annually.

Table 4. Representative soil features

Parent material	(1) Slope alluvium–metamorphic and sedimentary rock
Surface texture	(1) Sandy loam (2) Gravelly sandy loam (3) Fine sandy loam
Family particle size	(1) Fine-loamy (2) Coarse-loamy
Drainage class	Well drained
Permeability class	Moderately slow to moderately rapid
Depth to restrictive layer	20–60 in
Soil depth	20–60 in
Surface fragment cover <=3"	0–10%
Surface fragment cover >3"	0–5%
Available water capacity (20-40in)	3–6 in
Calcium carbonate equivalent (20-40in)	0%
Electrical conductivity (20-40in)	0–1 mmhos/cm
Sodium adsorption ratio (20-40in)	0
Soil reaction (1:1 water) (20-40in)	6.6–7.6

Subsurface fragment volume <=3" (20-40in)	0–6%
Subsurface fragment volume >3" (20-40in)	0–5%

Ecological dynamics

It is impossible to determine in any quantitative detail the Historic Climax Plant Community for this ecological site because of the lack of historical documentation. 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). Although there is evidence of Native Americans passing through southern extent of this ecological site, there has been no evidence of permanent inhabitants. The northern extent of this ecological site did have signs of permanent inhabitants for a short time (Spangler 1995), then became similar to the southern extent of this site. The first Europeans came to eastern Utah in 1765 as a Spanish expedition, however it wasn't until approximately 1870 that Europeans brought livestock to the area (Watt 1997). Itinerant and local sheep flocks followed, largely replacing cattle as the browse component increased.

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

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

When available, monitoring data (of various types) were employed to validate more subjective inferences made in this diagram. See the complete files in the office of the State Range Conservationist for more 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/or new ones may be added. 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, not to imply what the desired plant community should be.

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 with rangeland relict areas where they exist. The Reference State for this site would have been a shrub semi-desert characterized by Wyoming big sagebrush and associated native perennial forbs and grasses. 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 Phase 1.1: Wyoming big sagebrush with native perennial grasses and forbs
This community is dominated by Wyoming big sagebrush and associated native perennial forbs and grasses. Natural fire frequency is estimated to be 10 to 70 years (USDA-FS, 2006).

Community Phase Pathway 1.1-1.2
Extended period of time without a major disturbance such as fire or insect. This allows Wyoming big sagebrush to dominate the plant community and suppress the understory species. Fire frequency extends well beyond the 10 to

70 year average for the site.

Community Phase Pathway 1.1-1.3
Recent fire occurrence, lightning or human caused, eliminating sagebrush and other non-sprouting species from the community. Site is properly grazed.

Community Phase 1.2: Wyoming big sagebrush and juniper
Wyoming big sagebrush increases significantly in percent composition. Rabbitbrush may increase also. Shrubs become decadent due to age. Perennial grasses and forbs lose vigor, due to competition for available resources, and juniper may have begun to encroach on the site. With the plant interspaces becoming larger from the reduction of the understory, soil erosion may accelerate. Water flow patterns and pedestals become more abundant. Although the overall functionality of the site is still intact, it is at risk of further degradation.

Community Phase 1.3: Perennial grasses with sprouting shrubs and scattered annual species.
Native perennial bunchgrasses dominate this community phase. Wyoming big sagebrush decrease in the community. Winterfat has the ability to re-sprout and re-establish following a fire. Rabbitbrush and horsebrush species may increase significantly following fire and much of the excess fine fuel accumulation is removed. Fire tolerant shrubs typically persist as dominant shrubs in the community for 30 years or longer. Perennial grasses flourish.

Community Phase Pathway 1.2-1.3
This pathway occurs with natural or human induced fire. Site is properly grazed.

Community Phase Pathway 1.3-1.1
This represents the time following a fire with a normal fire return interval of 10 to 70 years. Site is properly grazed.

Transition 1-2
A threshold is crossed when there is an introduction of non-native species, primarily cheatgrass and various annual forbs, that become established in the community.

State 2: Current Potential
This state includes plant communities dominated by a diverse mixture of perennial grasses, a mixture of Wyoming big sagebrush and perennial grasses, and a community dominated by Wyoming big sagebrush. These community phases occur depending on the time since a disturbance that kills Wyoming big sagebrush has occurred, such as fire, insects, or drought, and grazing that provides adequate duration, timing, and intensity that maintain plant vigor and health of the plant community.

Plant communities in this state can include native, acclimatized, naturalized and invasive non-native species. This state is irreversibly changed from the reference state because these non-native species will now remain a permanent part of the community.
This plant community has the composition, structure and cover present that facilitates the capture, storage, and safe release of precipitation. Nutrients are being cycled through deep rooted perennial grasses, forbs, and evergreen shrubs, and energy capture throughout the entire growing season (March to October) such that this plant community and site resiliency is maintained. With a lengthened fire return interval (greater than 70 years), an increase in sagebrush canopy occurs until sagebrush dominates available resources. This results in a decrease in vigor, cover and reproduction of perennial grasses, and an increase in invasive annuals such as cheatgrass. Once junipers become a dominant feature, they are a permanent part of the plant community until a fire or management action removes them. The understory is depleted (lack of both living plants and seed bank) so that a return to state 2 is not possible.

Community Phase 2.1: Wyoming big sagebrush/perennial native herbs with minor component of exotic species
This community is dominated by Wyoming big sagebrush and associated native perennial forbs and grasses. Naturalized and invasive non-native species are also present. Natural fire frequency is estimated to be 10 to 70 years.

Community Phase Pathway 2.1-2.2
Fire or brush management or excessive browsing removes non-sprouting shrubs from the community.

Community Phase Pathway 2.1-2.3
Improper grazing (including season long, overstocking, wrong season, etc.) and/or drought remove annual and perennial fine fuels from the site decreasing the potential for fire to occur. Fire frequency extends beyond the 10 to 70 year average for the site. Utah juniper may begin to invade the site if a seed source is available.

Community Phase 2.2: Perennial grasses and sprouting shrubs and scattered annual species.
Wyoming big sagebrush decrease in the community. Rabbitbrush and horsebrush may increase significantly in the community following fire. Several native grasses dominate the understory. Fire tolerant shrubs typically persist as dominants shrubs in the community for 30 years or longer. The abundance of invasive annuals prior to the disturbance will dictate their abundance post disturbance.

Community Phase Pathway 2.2-2.1
Site is properly grazed for an extended period of time without disturbance. Plant community succession results in an increase of non-sprouting shrubs such as sagebrush.

Community Phase 2.3: Wyoming big sagebrush with scattered juniper and depleted herbaceous understory and annuals.
Wyoming big sagebrush increase significantly in percent composition. Rabbitbrush may increase also. Shrubs become decadent due to age. Grasses begin to lose vigor because of improper grazing (including, season long overstocking, wrong season, etc.) and/or increased shrub competition. This community is dominated by native species, but may include acclimatized, naturalized and invasive non-native species. Utah Juniper may begin to encroach in this community phase but is small and low in cover.

Community Phase Pathway 2.3-2.2
Fire, brush management or excessive browsing removes non-sprouting shrubs from the community. Rabbitbrush and/or horsebrush species may become dominant.

Transition 2-3
Sustained, long-term improper grazing (including season long, overstocking, wrong season, etc.); and prolonged drought. Lengthening of the fire return interval.

Transition 2-4
Long-term improper grazing (including season long, overstocking, wrong season, etc.) and prolonged drought; shortened fire frequency.

Transition 2-5.1
Disturbance such as a fire or brush management followed by a rangeland seeding.

Transition 2-6
Sustained, long-term improper grazing or the lack of fire.

State 3: Juniper Invasion
Native shrubs such as Wyoming big sagebrush or rabbitbrush dominate the site. The occurrence of fire extends well beyond the normal period for the site. Wyoming big sagebrush is non-sprouting and will be killed by fire. Rabbitbrush can sprout after a fire and can become the dominant shrub. This state typically has invasive grasses and/or forbs as the dominant understory species. There may be a few native species remaining, but they do not dominate. Utah junipers may increase to occupy a significant portion of the over story, if a seed source is present. Wyoming big sagebrush dominates the shrub layer and may be decadent due to age. Native bunchgrasses are significantly reduced due to increased shrub and tree competition and heavy grazing pressure.

Community Phase 3.1: Wyoming big sagebrush and Utah juniper, invasive annuals
Wyoming sagebrush is typically the dominant shrub in this community phase. Where Utah juniper has invaded, Wyoming big sagebrush and other shrubs decline, otherwise they dominate the community. Remaining perennial herbaceous vegetation is mostly found only in protected locations under shrubs. Invasive, non-native grasses and weeds including cheatgrass, annual mustards, redstem storksbill, etc. typically dominate the understory.

Community Phase Pathway 3.1-3.2
Lengthening of the fire return interval.

Community Phase 3.2: Juniper near monoculture
The number and size of trees has increased with the absence of fire. The understory shrub and herbaceous vegetation has become very decadent or absent. A few scattered shrubs may still exist with the herbaceous component nearly nonexistent. Exposed soil results in increased runoff and erosion.

Transition 3-4
Fire, with long-term improper grazing (including season long, overstocking, wrong season, etc.) and prolonged drought.

Restoration Pathway 3-5
Fire or brush management with the seeding of introduced species with prescribed grazing.

State 4: Invasive Annuals
Invasive grasses and forbs dominate this state. This may occur under a shortened fire return cycle which excludes native non sprouting shrubs by frequent burning or this may occur with repeated improper grazing, or a combination of the two. Native bunchgrasses are significantly reduced due to competition from invasive annuals and/or improper grazing and shortened fire return interval. Only remnant perennial species remain. Highly combustible fine fuels from invasive annuals dominate the community. Reoccurring fire is common. Fire frequency is 5 to 30 years. Cheatgrass dominance prevents reestablishment of sagebrush due to competition.

Community Phase 4.1: Invasive annuals dominated community with sprouting shrubs.
Invasive annuals dominate this community phase. If shrubs are present, rabbitbrush dominates the shrub layer. Fire tolerant shrubs may persist as dominants with fire periods re-occurring at intervals of 5 to 30 years. Broom snakeweed may be a dominant episodic species when conditions are favorable. Only remnant perennial bunchgrasses remain, if any; invasive annuals including cheatgrass, annual mustards, redstem storksbill, etc. dominate the understory

Restoration Pathway 4-5
Seeding of introduced species with prescribed grazing.

State 5: Seeded State
This state is seeded to rangeland species that are composed of mostly introduced species. Trees and/or shrubs are initially reduced but they will eventually re-occupy the site through natural succession. Invasive annual grasses and weedy forb species primarily, cheatgrass and various annual mustards, may be present in the seeding, but do not dominate. The introduced perennial grasses prevent the reestablishment of native herbaceous species due to competition, and can persist indefinitely.

Community Phase 5.1: Introduced Perennial Grasses
This plant community is the result of a seeding of introduced grasses. Although there may be some native species present, however the introduced species will dominate the site. Shrubs are sparse to absent. Range seedings, when healthy, are usually resistant to fire.

Community Phase Pathway 5.1-5.2
Over time Wyoming big sagebrush and other shrubs gradually move back into the site. The rate of this re-colonization may depend on factors such as climate, management and grazing (both domestic and wildlife). Re-colonization of non-sprouting shrubs requires 10 to 70 years without fire.

Community Phase 5.2: Wyoming big sagebrush, introduced perennial grasses
This community shows where sagebrush and other shrubs have slowly re-established in the area and have become dominant or codominant with the herbaceous component.

Community Phase Pathway 5.2-5.1
Site receives good grazing management. Mechanical, chemical, biological or fire disturbances reduce the woody vegetation components of the community. Perennial herbaceous vegetation becomes dominant.

Transition 5.2-3
Invasion of the site by junipers, long-term improper grazing (including season long, overstocking, wrong season,

etc.) and prolonged drought; lengthened fire frequency allows the site to be invaded by juniper.

Transition 5-4
Long-term improper grazing (including season long, overstocking, wrong season, etc.) and/or prolonged drought; shortened fire frequency allows the understory vegetation on the site to be dominated by invasive annuals.

State 6: Sagebrush with cheatgrass understory
This state is characterized by a decadent sagebrush overstory with scattered other shrubs and the understory that is dominated by cheatgrass with scattered native grasses and forbs, caused by long-term improper grazing (including season long, overstocking, wrong season, etc.). Sagebrush and native herbaceous species cannot re-establish due to competition from cheatgrass.

Community Phase 6.1: Sagebrush with invasive annual understory
Cheatgrass and other invasive annuals dominate the understory of a decadent stand of Wyoming big sagebrush. A component of other shrubs is typically present and remnant populations of native grasses and forbs may still be present. This community phase is very susceptible to wildfire due to the high amounts of fine fuels produced from the invasive annuals.

Transition 6-4
Fire, with long-term improper grazing (including season long, overstocking, wrong season, etc.) and prolonged drought.

Restoration Pathway 6-5.1
Disturbance such as a fire or brush management followed by a rangeland seeding.

State and transition model

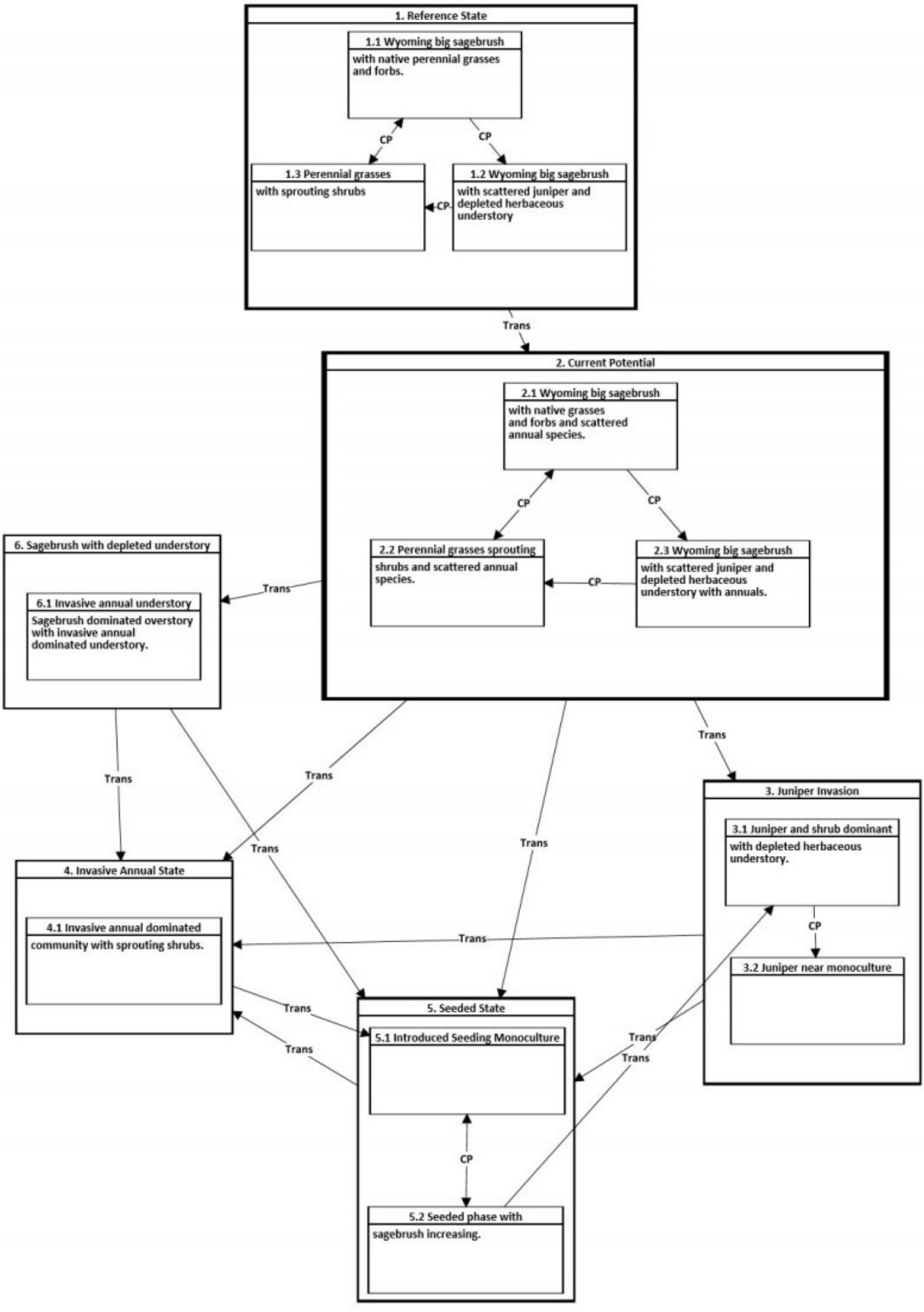
1. Reference State
1.1 Wyoming big sagebrush
with native perennial grasses and forbs.
CP
CP
1.3 Perennial grasses
with sprouting shrubs
CP
1.2 Wyoming big sagebrush
with scattered juniper and depleted herbaceous understory
Trans
2. Current Potential
2.1 Wyoming big sagebrush
with native grasses and forbs and scattered annual species.
CP
CP
2.2 Perennial grasses sprouting
shrubs and scattered annual species.
CP
2.3 Wyoming big sagebrush
with scattered juniper and depleted herbaceous understory with annuals.
6. Sagebrush with depleted understory
Trans
6.1 Invasive annual understory
Sagebrush dominated overstory with invasive annual dominated understory.
Trans
Trans
Trans
Trans
Trans
Trans
3. Juniper Invasion
3.1 Juniper and shrub dominant
with depleted herbaceous understory.
CP
3.2 Juniper near monoculture
4. Invasive Annual State
4.1 Invasive annual dominated
community with sprouting shrubs.
Trans
Trans
Trans
5. Seeded State
5.1 Introduced Seeding Monoculture
CP
5.2 Seeded phase with
sagebrush increasing.
Trans
Trans

Diagram Legend

T 1-2	Introduction of exotic species.
T 2-3	Poor grazing management and/or lengthened fire return interval.
T 2-4	Poor grazing management and/or drought with increased fire return interval.
T 2-5	Disturbance such as fire or brush management followed by a rangeland seeding.
T 2-6	Improper grazing and/or lack of fire.
T 3-4	Poor grazing management and/or drought and a shortened fire return interval.
T 3-5	Disturbance such as brush management or fire and range seeding.
T 4-5.1	Seeding of introduced species with prescribed grazing.
T 5.2-3.1	Long-term improper grazing (including season long, overstocking, wrong season, etc.) and/or lengthened fire frequency.
T 5-4	Long-term improper grazing (including season long, overstocking, wrong season, etc.) and/or prolonged drought; shortened fire frequency allows the understory vegetation on the site to become dominated by invasive annuals.
T 6-4	Fire without a rangeland seeding.
T 6-5	Brush management and/or fire followed by rangeland seeding with primarily introduced species.
CP 1.1-1.2	Increased time since disturbance/fire.
CP 1.1-1.3	Fire.
CP 1.2-1.3	Fire.
CP 1.3-1.1	Time after fire with prescribed grazing.
CP 2.1-2.2	Fire, brush management or heavy browse use.
CP 2.1-2.3	Poor grazing management and/or drought.
CP 2.2-2.1	Time after fire with prescribed grazing.
CP 2.3-2.2	Fire, brush management or heavy browse use.
CP 3.1-3.2	Continued poor grazing management and/or drought and lengthened fire return interval.
CP 5.1-5.2	Overgrazing and/or drought.
CP 5.2-5.1	Prescribed grazing with brush management or fire.

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

Alexander, R. R. 1985. Major habitat types, community types, and plant communities in the Rocky Mountains. USDA- Forest Service Rocky Mountain Forest and Range Experiment Station. General technical report RM-123. 105p.

Alexander 1988. Forest vegetation on National Forests in the Rocky Mountain and Intermountain Regions: Habitat types and community types. USDA- Forest Service Rocky Mountain Forest and Range Experiment Station. General technical report RM-162. 47p.

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]

Western Regional Climate Center, Western U.S. Climate Historical Summaries. Available at: http://www.wrcc.dri.edu/summary/Climsmut.html. Accessed 15 June 2009.

Web Soil Survey, Official Soil Series Descriptions. Available at: http://soils.usda.gov/technical/classification/osd/index.html. Accessed 15 June 2009.

Contributors

M. Dean Stacy

Approval

Sarah Quistberg, 2/11/2025

Rangeland health reference sheet

Interpreting Indicators of Rangeland Health is a qualitative assessment protocol used to determine ecosystem condition based on benchmark characteristics described in the Reference Sheet. A suite of 17 (or more) indicators are typically considered in an assessment. The ecological site(s) representative of an assessment location must be known prior to applying the protocol and must be verified based on soils and climate. Current plant community cannot be used to identify the ecological site.

Author(s)/participant(s)	
Contact for lead author	
Date	02/26/2025
Approved by	Sarah Quistberg
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

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

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

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

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

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

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

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

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

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

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

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

12. **Functional/Structural Groups (list in order of descending dominance by above-ground annual-production or live foliar cover using symbols: >>, >, = to indicate much greater than, greater than, and equal to):**

    Dominant:

    Sub-dominant:

    Other:

    Additional:

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

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

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

16. **Potential invasive (including noxious) species (native and non-native). List species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicators, we are describing what is NOT expected in the reference state for the ecological site:**

17. **Perennial plant reproductive capability:**