USDA Natural Resources Conservation Service

Ecological site R047XA406UT
Mountain Gravelly Loam (mountain big sagebrush)

Last updated: 2/05/2025
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General information

Provisional. A provisional ecological site description has undergone quality control and quality assurance review. It contains a working state and transition model and enough information to identify the ecological site.

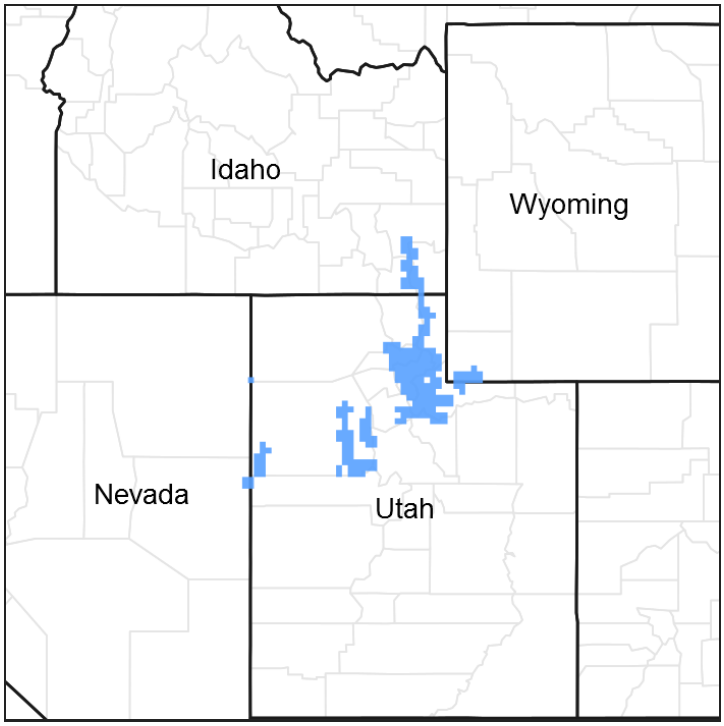

Figure 1. Mapped extent

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. 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 mineralogy is generally mixed and the soils are very shallow to very deep, generally well drained, and loamy or loamy-skeletal.

LRU notes

Major Land Resource Unit 47A is located in the northern half of the Middle Rocky Mountains Province of the Rocky Mountain System. This MLRA 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: Yeates Hollow GR-L, 3-50% – clayey-skeletal, montmorillonitic, frigid Typic Argixerolls

Ecological site concept

The soils of this site are well-drained and moderately-deep to deep. They formed in colluvium and alluvium (sometimes over residuum) from various sedimentary and igneous rocks including sandstone, shale, conglomerate, limestone, quartzite, and andesite. The surface soils are dark brown and often constitute a mollic epipedon. Gravels and cobbles are found throughout the soil profile, but may or may not be present on the soil surface. These soils are typically non-calcareous with a neutral pH. Available water capacity for the upper 40 inches is 2.2 to 4.7 inches. The soil temperature regime is frigid and the soil moisture regime is xeric.

Associated sites

R047XA430UT	**Mountain Loam (mountain big sagebrush)** This site is often found near the mountain gravelly loam (Mountain big sagebrush) site in areas where the soil is deeper and less gravelly. The loam site has a much higher annual production and a greater percentage of the community composition is made up of grasses.
R047XA434UT	**Mountain Loam (shrub)** This site can be found near the mountain gravelly loam (Mountain big sagebrush) site but has a greater diversity and abundance of mountain shrubs such as Curleaf mountain mahogany and Chokecherry. The soils also contain less gravel.
R047XA418UT	**Mountain Loam (bigtooth maple)**
R047XA432UT	**Mountain Loam (oak)**
R047XA440UT	**Mountain Shallow Loam (curl-leaf mountain mahogany)**
R047XA473UT	**Mountain Very Steep Stony Loam (browse)**
R047XA410UT	**Mountain Gravelly Loam (oak)** These two sites occur together in distinct patches. Gambel oak rarely propagates from seed in its northern ranges, and mountain big sagebrush cannot invade an oak stand due to resource limitations. The result is a sharp mosaic of oak and sagebrush sites that changes very slowly if at all.

Similar sites

R047XA461UT	**Mountain Stony Loam (mountain big sagebrush)** This site has larger rock fragments than the mountain gravelly loam (Mountain big sagebrush) site.

R047XA473UT	**Mountain Very Steep Stony Loam (browse)**
R047XA474UT	**Mountain Very Steep Stony Loam (mountain big sagebrush)**

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Artemisia tridentata ssp. vaseyana*
Herbaceous	(1) *Elymus trachycaulus*

Physiographic features

This site is found on gently sloping to very steep mountainsides and is occasionally present on stream terraces and alluvial fans. It can occur on all aspects at elevations between 5,300 and 8,000 feet. Flooding does not occur on this site with the exception of the Utaba soil in Morgan county, which occasionally experiences prolonged flooding. Runoff class ranges from low to high depending on slope and ground cover.

Table 2. Representative physiographic features

Landforms	(1) Mountain slope (2) Alluvial fan (3) Stream terrace
Flooding duration	Long (7 to 30 days)
Flooding frequency	None to occasional
Ponding frequency	None
Elevation	1,615–2,438 m
Slope	2–70%
Aspect	Aspect is not a significant factor

Climatic features

The climate of this is characterized by cold snowy winters and cool dry summers. The average annual precipitation ranges from 17 to 24 inches with much of the moisture falling as spring rain or winter snow. This snowpack is the most dependable supply of water for the site. Lower precipitation and higher evapo-transpiration rates during June, July, and August reduce growth for all plant species and may cause dormancy for some grasses and forbs.

Table 3. Representative climatic features

Frost-free period (average)	146 days

Freeze-free period (average)	113 days
Precipitation total (average)	533 mm

Influencing water features

Due to its landscape position, this site is not influenced by streams or wetlands. However, it may be located upslope from these influencing water features.

Wetland description

Further review is required.

Soil features

The soils of this site are well-drained and moderately-deep to deep. They formed in colluvium and alluvium (sometimes over residuum) from various sedimentary and igneous rocks including sandstone, shale, conglomerate, limestone, quartzite, and andesite. The surface soils are dark brown and often constitute a mollic epipedon. Gravels and cobbles are found throughout the soil profile, but may or may not be present on the soil surface. These soils are typically non-calcareous with a neutral pH. Available water capacity for the upper 40 inches is 2.2 to 4.7 inches. The soil temperature regime is frigid and the soil moisture regime is xeric.

Table 4. Representative soil features

Parent material	(1) Colluvium–limestone, sandstone, and shale (2) Alluvium–limestone, sandstone, and shale
Surface texture	(1) Cobbly loam (2) Loam (3) Very cobbly loam
Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Slow to moderate
Soil depth	51–152 cm
Surface fragment cover <=3"	0–25%
Surface fragment cover >3"	0–29%
Available water capacity (0-101.6cm)	5.59–11.94 cm
Calcium carbonate equivalent (0-101.6cm)	0–5%

Electrical conductivity (0-101.6cm)	0–2 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0
Soil reaction (1:1 water) (0-101.6cm)	6.1–7.8
Subsurface fragment volume <=3" (Depth not specified)	20–49%
Subsurface fragment volume >3" (Depth not specified)	8–27%

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. 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 1870s 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 1860s, 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, 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, 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

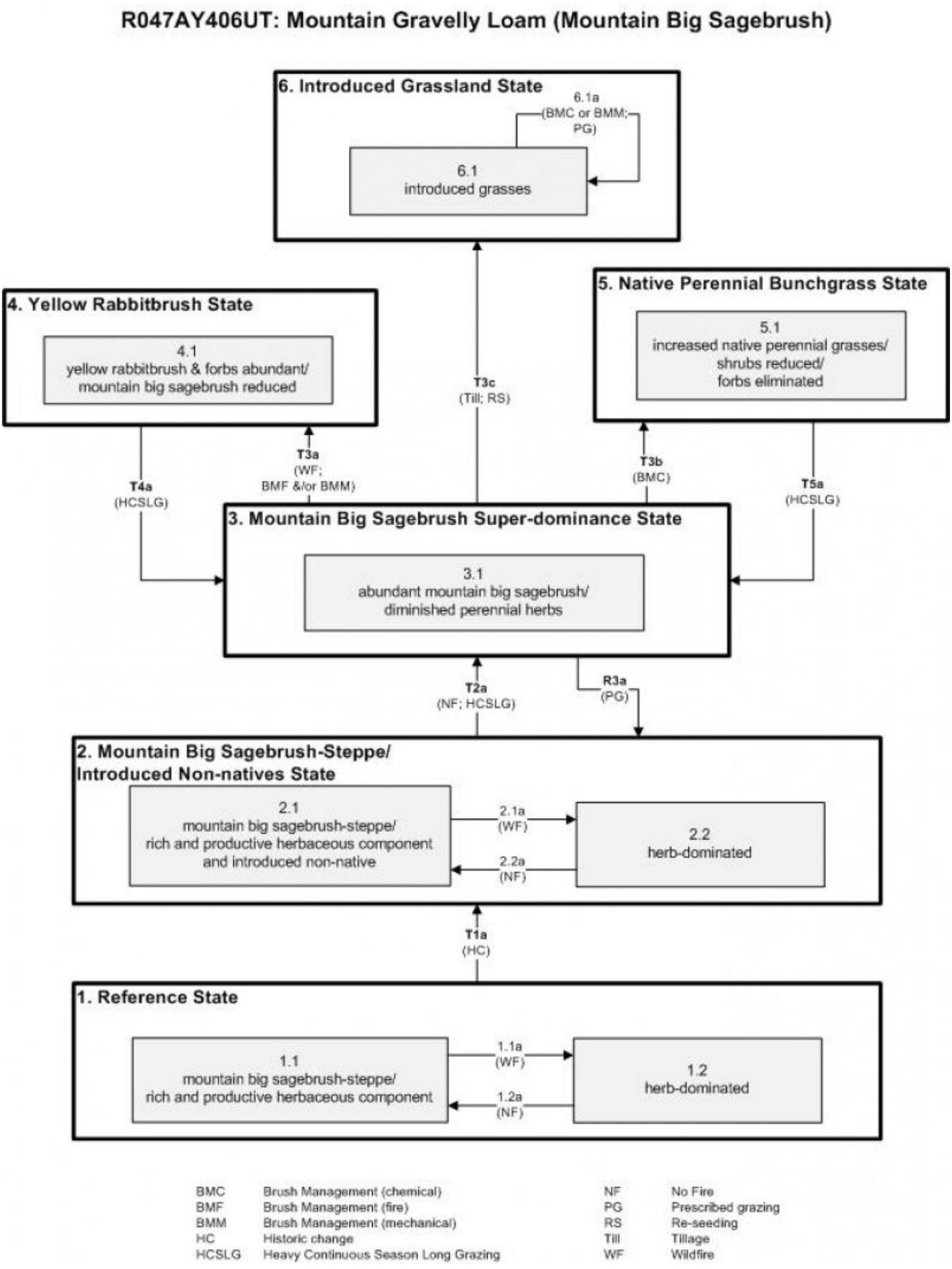

Figure 6. State and Transition Model

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 with rangeland relict areas where they exist. The least modified plant community would have been co-dominated by mountain big sagebrush (*Artemisia tridentata* ssp. vaseyana) and a mixture of herbaceous species. Dominant grasses would have included slender wheatgrass (*Elymus trachycaulus*), bluebunch wheatgrass (*Pseudoroegneria spicata*), and Letterman's needlegrass (*Achnatherum lettermanii*), and forbs would have included sticky purple geranium (*Geranium viscosissimum*), shortstem buckwheat (*Eriogonum brevicaule*), and lupines (*Lupinus caudatus* ssp. caudatus and *L. argenteus*), among others (1.1). The primary disturbance factor prior to European colonization would have been wildfire (1.1a), which would have removed the sagebrush and allowed the herbs to dominate for a time (1.2) As the time elapsed since the last wildfire grew longer (1.2a), mountain big sagebrush would have increased, and the herbaceous component would have decreased correspondingly. A more complete list of species by life form 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
Mountain big sagebrush-steppe/ rich & productive herbaceous component

This plant community would have been characterized by the presence of mountain big sagebrush with a rich and productive herbaceous layer.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	572	841	1311
Shrub/Vine	239	351	547
Forb	143	211	328
Total	**954**	**1403**	**2186**

Table 6. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	19-21%
Grass/grasslike foliar cover	39-41%
Forb foliar cover	14-16%

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 7. Canopy structure (% cover)

Height Above Ground (M)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.15	–	–	–	–
>0.15 <= 0.3	–	–	–	14-16%
>0.3 <= 0.6	–	–	39-41%	–
>0.6 <= 1.4	–	19-21%	–	–
>1.4 <= 4	–	–	–	–
>4 <= 12	–	–	–	–
>12 <= 24	–	–	–	–
>24 <= 37	–	–	–	–
>37	–	–	–	–

Community 1.2
Herb dominated

This phase would have been dominated by herbaceous species and having few, if any, mountain big sagebrush present.

Pathway 1.1a
Community 1.1 to 1.2

Wildfire would remove sagebrush, allowing the herbs to dominate for a time.

Pathway 1.2a
Community 1.2 to 1.1

Over time, sagebrush would increase, and the herbaceous understory would decrease slightly.

State 2
Mountain Big Sagebrush-Steppe/ Introduced Non-natives State

State 2 is identical 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 shortly following Euro-American settlement. This State can be regarded as the current potential. This State varies in the amount of mountain big sagebrush present based upon the time elapsed since the last wildfire. The least modified plant community is a mountain big sagebrush-steppe, characterized by the co-dominance shrubs and herbaceous species. Mountain big sagebrush is the dominant shrub, but other minor shrubs may be present. There is a rich and diverse mixture of herbs as well. Dominant grasses include slender wheatgrass, bluebunch wheatgrass, and Letterman's needlegrass, and forbs include sticky purple geranium, shortstem buckwheat, and lupines, among others (2.1). A small component of non-natives will also be present. Wildfire (2.1a) will remove sagebrush and allow the community to become dominated by herbaceous species for a time (2.2). As the length of time elapsed since the last wildfire grows longer (2.2a), sagebrush will re-establish, and the herbs will decrease slightly. This State is maintained by periodic wildfire and by a healthy, productive, and diverse plant community that can provide native seed sources and promotes soil stability, water infiltration, and soil moisture retention. These sites are more resistant to accelerated soil erosion because of the self-armament of many of these gravelly soils. The resiliency of this State will be maintained by reducing or altering seasons of use and number of livestock. Conversely, this State's resiliency will be negatively impacted by continuous season-long livestock use.

Community 2.1
Mountain big sagebrush-steppe/ rich & productive herbaceous component

This plant community is characterized by co-dominance of mountain big sagebrush and a rich and productive understory of herbs.

Community 2.2
Herb dominated

This phase is dominated by herbaceous species and having few, if any, mountain big sagebrush present.

Pathway 2.1a
Community 2.1 to 2.2

Wildfire will remove sagebrush, allowing the herbs to dominate for a time.

Pathway 2.2a
Community 2.2 to 2.1

Over time, sagebrush will increase, and the herbaceous understory will decrease slightly.

State 3
Mountain Big Sagebrush Super-dominance State

This State is characterized by a super-dominance of mountain big sagebrush with a markedly diminished grass component which occurs in the absence of fire and with continued heavy impacts from livestock grazing. The stability of this State is maintained by the lack of a healthy, productive and diverse herb component capable of providing native seed source, soil stabilization, and soil moisture retention, and by an abundant seed source for mountain big sagebrush. The resiliency of this State will be maintained by decreased grazing during the growing season of grasses. Conversely, the resiliency of this State will be negatively impacted by continued heavy growing season livestock use.

Community 3.1
Abundant Mountain big sagebrush / diminished perennial herbs

This plant community is characterized by a dramatic increase in mountain big sagebrush with substantial reduction in the perennial herbaceous component as compared to State 2.

State 4
Yellow Rabbitbrush State

This State is characterized by having an abundance of yellow rabbitbrush and forb species and a reduced amount of mountain big sagebrush. This State occurs when the sagebrush is removed by fire or mechanical means from an area where it was previously super-dominant. This State is maintained by lack of sagebrush seedling establishment. It could also be maintained by periodic sagebrush removal by fire.

Community 4.1
Yellow rabbitbrush & forbs abundant/ mountain big sagebrush reduced

This Phase is characterized by having an abundance of yellow rabbitbrush and forb species and having a reduced amount of mountain big sagebrush.

State 5
Native Perennial Bunchgrass State

This State is dominated by native perennial bunchgrasses such as slender wheatgrass, bluebunch wheatgrass, and Letterman’s needlegrass. Shrubs and have been reduced and forbs eliminated by 2,4-D™ or 2,4-5T™ application. This State is maintained by the lack of

shrub and forb seed source, and the abundance of native perennial grass seed source.

Community 5.1
increased native perennial grasses/ shrubs reduced/ forbs eliminated

This Phase is characterized by the dominance of perennial native bunchgrasses such as slender wheatgrass, bluebunch wheatgrass, and Letterman’s needlegrass. Shrubs and have been reduced and forbs eliminated.

State 6
Introduced Grassland State

This state is characterized by the dominance of seeded grasses such as intermediate wheatgrass, smooth brome, or orchardgrass. This state occurs when a decision is made to increase forage production by tilling and re-seeding introduced grasses. Periodic brush management is required to maintain the grass-dominance of this state. This resiliency of this State can be maintained by sustainable levels of livestock grazing as determined by monitoring. Conversely, continued heavy use will negatively impact the resiliency of this state.

Community 6.1
Introduced Grassland

This community phase is characterized by the dominance of seeded grasses such as intermediate wheatgrass, smooth brome, or orchardgrass. This state occurs when a decision is made to increase forage production by tilling and re-seeding introduced grasses. Periodic brush management is required to maintain the grass-dominance of this community phase. This resiliency of this community phase can be maintained by sustainable levels of livestock grazing as determined by monitoring. Conversely, continued heavy use will negatively impact the resiliency of this community phase.

Transition T1A
State 1 to 2

The simultaneous introduction of exotic species, both plants and animals, possible extinctions of native flora and fauna, and climate change has 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

Lack of fire and continued heavy livestock grazing during the growing season of grasses will cause State 2 to transition into the Mountain Big sagebrush Super-dominance State

(State 3). The approach to this transition is indicated by a loss of the perennial grass understory, an increase in the shrub component relative to the grasses, and evidence of soil loss. The trigger causing this transition is heavy growing season grazing.

Restoration pathway R3a
State 3 to 2

Prescribed grazing during the non-growing season of the grasses and forbs will allow the native perennial herbaceous species to re-establish, returning the community to a mountain big sagebrush-steppe (State 2).

Transition T3A
State 3 to 4

Wildfire or brush management, either by mechanical means or prescribed fire, will temporarily remove the mountain big sagebrush. However, an increase in yellow rabbitbrush (*Chrysothamnus viscidiflorus*) is expected in most circumstances. The herbaceous component will also increase after fire or brush beating. The approach to this transition is indicated by an increase in rabbitbrush seedlings. The transition is triggered by wildfire or mechanical removal of sagebrush accompanied by heavy grazing.

Transition T3B
State 3 to 5

Brush management using 2, 4-D or 2, 4-5T will remove both the shrub and forb components, leaving the grasses. This transition is triggered by herbicide application.

Transition T3C
State 3 to 6

This transition occurs when a decision is made to increase forage production by tilling and re-seeding with intermediate wheatgrass (*Thinopyrum intermedium*), smooth brome (*Bromus inermis*), or orchardgrass (*Dactylis glomerata*) –all introduced (non-native) species.

Transition T4A
State 4 to 3

Heavy continuous season-long grazing will impact the herbaceous component, allowing the shrubs to return to dominance.

Transition T5A
State 5 to 3

Heavy continuous season-long grazing will impact the native graminoids, allowing the shrubs to return to dominance. The approach to this transition is indicated by an increase in sagebrush seedlings. This transition is triggered by heavy growing season livestock grazing.

Additional community tables

Table 8. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Shrub/Vine					
0	**Dominant Shrubs**			233–364	
	mountain big sagebrush	ARTRV	*Artemisia tridentata ssp. vaseyana*	146–219	–
	alderleaf mountain mahogany	CEMO2	*Cercocarpus montanus*	44–73	–
	antelope bitterbrush	PUTR2	*Purshia tridentata*	44–73	–
3	**Sub-Dominant Shrubs**			45–78	
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	44–73	–
	Saskatoon serviceberry	AMAL2	*Amelanchier alnifolia*	15–29	–
	yellow rabbitbrush	CHVIV4	*Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus*	15–29	–
	slender buckwheat	ERMI4	*Eriogonum microthecum*	15–29	–
	mountain snowberry	SYOR2	*Symphoricarpos oreophilus*	15–29	–
	spineless horsebrush	TECA2	*Tetradymia canescens*	15–29	–
Grass/Grasslike					
0	**Dominant Grasses**			452–729	
	slender wheatgrass	ELTR7	*Elymus trachycaulus*	146–219	–
	bluebunch wheatgrass	PSSP6	*Pseudoroegneria spicata*	146–219	–
	Letterman's needlegrass	ACLE9	*Achnatherum lettermanii*	73–146	–
	muttongrass	POFE	*Poa fendleriana*	44–73	–

1	**Sub-Dominant Grasses**			146–219	
	Grass, perennial	2GP	*Grass, perennial*	146–219	–
	Columbia needlegrass	ACNE9	*Achnatherum nelsonii*	15–73	–
	California brome	BRCA5	*Bromus carinatus*	15–73	–
	Geyer's sedge	CAGE2	*Carex geyeri*	15–73	–
	squirreltail	ELEL5	*Elymus elymoides*	15–73	–
	sheep fescue	FEOV	*Festuca ovina*	15–73	–
Forb					
2	**Sub-Dominant Forbs**			146–224	
	Forb, perennial	2FP	*Forb, perennial*	146–219	–
	common yarrow	ACMI2	*Achillea millefolium*	15–44	–
	littleleaf pussytoes	ANMI3	*Antennaria microphylla*	15–44	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	15–44	–
	silverleaf milkvetch	ASAR4	*Astragalus argophyllus*	15–44	–
	tapertip hawksbeard	CRAC2	*Crepis acuminata*	15–44	–
	shortstem buckwheat	ERBR5	*Eriogonum brevicaule*	15–44	–
	sticky purple geranium	GEVI2	*Geranium viscosissimum*	15–44	–
	showy goldeneye	HEMU3	*Heliomeris multiflora*	15–44	–
	Nevada pea	LALA3	*Lathyrus lanszwertii*	15–44	–
	tailcup lupine	LUCAC3	*Lupinus caudatus ssp. caudatus*	15–44	–
	lobeleaf groundsel	PAMU11	*Packera multilobata*	15–44	–
	low beardtongue	PEHU	*Penstemon humilis*	15–44	–
	longleaf phlox	PHLO2	*Phlox longifolia*	15–44	–
	Forb, annual	2FA	*Forb, annual*	0–28	–

Animal community

This site has a large amount of grasses and shrubs (about equal amounts by total air-dry production). Diverse species of forbs are found on this site, but make up a relatively small proportion of the total annual production. With this composition, good forage and balanced

animal nutrition is provided during spring, summer, and fall. Cattle, sheep, goats, and horses graze this site to good advantage.

This site produces excellent forage for deer and elk and is preferred habitat for these species from late fall through early spring.

This site is fair habitat for mule deer and other wildlife.

Recreational uses

This site has excellent potential for aesthetics and natural beauty. It has a large number of forbs and shrubs which have flowers in bloom from early spring, throughout the summer, and into the fall. It has shrubs which offer screening for camping and picnicking. Hunting for upland game birds, snowshoe rabbits, elk and mule deer is good to excellent. Fishing is opportune on streams through and adjacent to this site. This site has values for snowmobiling and skiing during a fairly long period of the winter season.

Wood products

None

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

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]

UDWR, Utah Big Game Range Trend Studies. 2007. Available at: http://wildlife.utah.gov/range/statewide%20management%20units.htm. Accessed 5 February 2009.

Western Regional Climate Center, Western U.S. Climate Historical Summaries. Available

at: http://www.wrcc.dri.edu/summary/Climsmut.html. Accessed 5 February 2009.

Web Soil Survey, Official Soil Series Descriptions. Available at: http://soils.usda.gov/technical/classification/osd/index.html. Accessed 20 February 2009.

Contributors

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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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Date	11/09/2012
Approved by	Kendra Moseley
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** Rare to Very Slight. Some slight rill development may occur on steeper slopes (> 20%) or on areas located below exposed bedrock or other water shedding areas where increased runoff may occur. Where these rills are present, they should be fairly short (4-8 feet), < 1 inch deep and somewhat widely spaced (5-10 feet). Minor rill development may be observed on all slopes following major thunderstorm or spring runoff events but should heal during the next growing season.

2. **Presence of water flow patterns:** Slight. Some minor evidence of water flow patterns may be found winding around perennial plant bases. They show little evidence of current erosion. They are expected to be short (3-6 feet), stable, sinuous and normally not connected. There may be very minor evidence of deposition. Evidence of water flow may increase somewhat on slopes > 20%.

3. **Number and height of erosional pedestals or terracettes:** Perennial vegetation shows little evidence of erosional pedestalling (1 to 2% of individual plants). Plant roots are covered and most litter remains in place around plant crowns. Terracettes should be absent or, if present, stable. A slight increase in both pedestal and terracette development may occur with increasing slope.

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 up to 30% coarse fragments. Bare ground openings should not be greater than 1 foot in diameter and should normally not be connected.

5. **Number of gullies and erosion associated with gullies:** None to Rare at site level. Scattered landscape level gully channels, however, are a normal component of basin/range 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. Wind caused blowouts and deposition are not present.

7. **Amount of litter movement (describe size and distance expected to travel):** Most litter resides in place with some redistribution caused by water movement. Minor litter removal may occur in flow channels with deposition occurring within 1 to 2 feet at points of obstruction. The majority of litter accumulates at the base of plants. Some grass leaves and small twigs (grass stems) may accumulate in soil depressions adjacent to plants. Woody

stems are not likely to move. However, some litter movement is expected (up to 6 feet) with increases in slopes >20% and/or increased runoff resulting from heavy thunderstorms.

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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 the plant canopies, and a rating of 4 to 5 in the interspaces. The average rating should be a 5. Soil surface textures are typically loams, very fine sandy loams and silt loams.

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** (Bullnel) Soil surface 0-8 inches. Texture is a gravelly loam; color is dark reddish brown (5YR 2/2); and structure moderate very fine granular. Mollic epipedon ranges to 8 inches. Use the specific information for the soil you are assessing found in the published soil survey to supplement this description.

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Perennial vegetation produces sufficient cover and spatial arrangement to intercept most raindrops and reduce raindrop splash erosion. Litter on soil surface and cryptogamic crusting, where present, also protect the soil surface from splash erosion and encourages a higher rate of infiltration. Plant spatial distribution should slow runoff, allowing additional time for infiltration. Bare spaces are expected to be small and irregular in shape and are usually not connected. Vegetative structure is usually adequate to capture snow and ensure that snowmelt occurs in a controlled manner, allowing maximum time for infiltration, and reducing runoff and erosion in all but the most extreme storm events. When perennial grasses and shrubs decrease due to natural events including drought, insect damage, etc., which reduce ground cover and increase bare ground, runoff is expected to increase and associated infiltration reduced.

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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. Some soils may have natural textural variability within their profiles, including changes in clay content, these should not be mistaken for a compaction pan.

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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: Rhizomatous grasses (slender wheatgrass), > Perennial bunchgrasses (bluebunch wheatgrass, Letterman needlegrass), = Non-sprouting shrub (mountain big sagebrush, >> Sprouting shrub (bitterbrush).

Sub-dominant: Perennial bunchgrasses & grasslikes (Nevada bluegrass, Geyer sedge) > Sprouting shrubs (green rabbitbrush, mountain snowberry) > Perennial forbs (thickleaf peavine).

Other: A wide variety of other perennial grasses and both perennial and annual forbs can be expected to occur in the plant community.

Additional: Natural disturbance regimes include fire, drought, and insects. Assumed fire cycle of 30 to 40+ years. Functional/structural groups may appropriately contain non-native species if their ecological function is the same as the native species in the reference. Following a disturbance such as fire, drought, rodents or insects that remove woody vegetation, forbs and perennial grasses (herbaceous species) may dominate the community for a period of time. If a disturbance has not occurred for an extended period of time, woody species may continue to increase. These conditions would reflect different functional community phases within the reference state.

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** All age classes of perennial grasses should be present under average to above average growing conditions with age class expression likely subdued during periods of extended drought. Slight decadence in the principle shrubs could occur near the end of the fire cycle or during periods of extended drought, or insect infestations. In general, a mix of age classes should be expected with some dead and decadent plants present.

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14. **Average percent litter cover (%) and depth (in):** Litter cover will be heavier under plants. Most litter will be herbaceous and depths of 1 to 2 inches would be considered normal. Perennial vegetation should be well distributed on the site.

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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 1200 - 1300 #/acre on an average year but could range from 800 - 2000

#/acre during periods of prolonged drought or above average precipitation.

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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, Alyssum, mustard species, Canada thistle, black medic, Utah juniper, Gamble oak.

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17. **Perennial plant reproductive capability:** All perennial plants should have the ability to reproduce in all years, except in extreme drought years. Green rabbitbrush sprouts vigorously following fire. There are no restrictions on either seed or vegetative reproduction. Some seedling recruitment of major species is expected to be present during average and above average growing years.
