USDA Natural Resources
Conservation Service

Ecological site R047XA461UT
Mountain Stony 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.

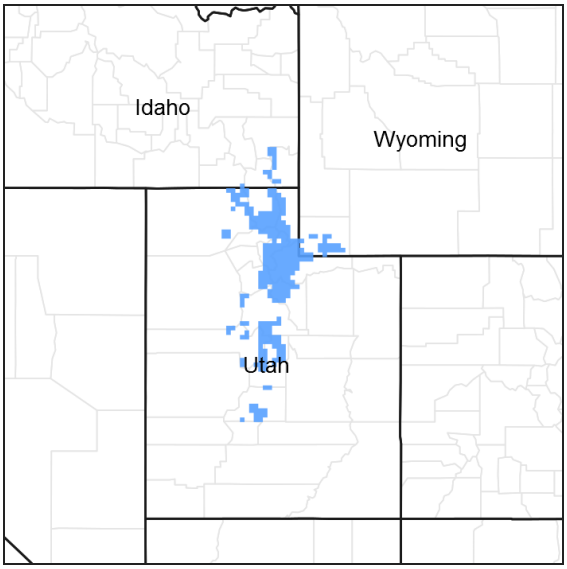


Figure 1. Mapped extent

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 F (-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 L, VCBL, 2-25% — clayey-skeletal, montmorillonitic, frigid Typic Argixerolls

Ecological site concept

The soils in this site are moderately-deep to deep and well-drained. They formed in a variety of parent materials including alluvium, colluvium, residuum, and slope alluvium derived from various sedimentary and igneous rock. They are characterized by very stony, very cobbly, or gravelly loam textures. Bedrock is often encountered at depths greater than 20 inches. Rock fragments are usually visible on the soil surface and make up greater than 35 percent of the soil volume. A layer of clay accumulation may be present in the subsoil. Permeability is moderately slow to moderate and available water-holding capacity ranges from 2.1 to 4.9 inches in the upper 40 inches of soil. Roots penetrate the soil readily and harvest extra water near large rock fragments. The soil moisture regime is xeric and the soil temperature regime is frigid.

Associated sites

R047XA402UT	**Mountain Clay (slender wheatgrass)**
R047XA430UT	**Mountain Loam (mountain big sagebrush)**
R047XA434UT	**Mountain Loam (shrub)**
R047XA440UT	**Mountain Shallow Loam (curl-leaf mountain mahogany)**
R047XA454UT	**Mountain Stony Clay (slender wheatgrass)**
R047XA463UT	**Mountain Stony Loam (Gambel oak)**
R047XA510UT	**High Mountain Loam (bigtooth maple)**

Similar sites

R047XA446UT	**Mountain Shallow Loam (mountain big sagebrush)** This site has soils less than 20 inches deep. It may be associated with the Mountain stony loam site in areas where the soil is shallow.
R047XA406UT	**Mountain Gravelly Loam (mountain big sagebrush)**

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Artemisia tridentata ssp. vaseyana*
Herbaceous	(1) *Pseudoroegneria spicata*

Physiographic features

This site is found on primarily on mountain slopes, but can also occur on hills, swales, stream terraces and terminal moraines. It occurs on all aspects at elevations between 5,500 and 8,400 feet. Slopes are generally between 25 and 70 percent, but may be as gentle as 2 percent in places. The runoff class for this site is high to very high.

Table 2. Representative physiographic features

Landforms	(1) Mountain slope (2) Hill (3) Swale
Runoff class	High to very high
Flooding frequency	None
Ponding frequency	None
Elevation	5,500–8,400 ft
Slope	5–70%
Aspect	Aspect is not a significant factor

Climatic features

The climate of this site characterized by cold snowy winters and cool dry summers. Winter snow and spring rain are the most dependable supply of moisture for plant growth. Lower precipitation and high evapotranspiration rates during July and August cause slowing of growth for all plant species and dormancy in most of the herbaceous species.

Table 3. Representative climatic features

Frost-free period (average)	95 days
Freeze-free period (average)	128 days
Precipitation total (average)	18 in

Influencing water features

Due to its landscape position, streams and wetlands have no influence on this site.

Wetland description

N/A

Soil features

The soils in this site are moderately-deep to deep and well-drained. They formed in a variety of parent materials including alluvium, colluvium, residuum, and slope alluvium derived from various sedimentary and igneous rock. They are characterized by very stony, very cobbly, or gravelly loam textures. Bedrock is often encountered at depths greater than 20 inches. Rock fragments are usually visible on the soil surface and make up greater than 35 percent of the soil volume. A layer of clay accumulation may be present in the subsoil. Permeability is moderately slow to moderate and available water-holding capacity ranges from 2.1 to 4.9 inches in the upper 40 inches of soil.

Roots penetrate the soil readily and harvest extra water near large rock fragments. The soil moisture regime is xeric and the soil temperature regime is frigid.

Soil Survey Area - Soil Components (Map Units in parentheses)
Box Elder County, Eastern Part (UT602)- Yeates Hollow (GLE, YHE, YHG, YRE);
Cache Valley Area (UT603)- Bradshaw (ABG2); Datwyler (DLG, DNG, HLG2, MAG); Hoskin (HKG2, HLG2, HMG2, HNG, HOG2, HSG2, LVE, STG2); Sheep Creek (BLG2, SNG2, SOG2, SPG2, SRG2, SAG, SCG); Yeates Hollow (GOE2, YHE, YHG);
Rich County (UT604)- Dagan (DAF); Etchen (ECE); Horrocks (HDC);
Fairfield-Nephi Area (UT608)- Bezzant (BdD, BdF); Mower (MsD, MtF); Yeates Hollow (YaC, YaD, YaE);
Morgan Area (UT609)- Durst (DuG); Etchen (EtG, EVG, EXG, RaG); Hoskin (HwG, HxG, StG);
Summit Area (UT613)- Horrocks (144, 145, 146); Yeates Hollow (134, 135, 180, 181, 182);
Heber Valley Area (UT622)- Bezzant (BeD2, BfC, BGE); Bradshaw (BKF, BLF, BMF, GPF, HFF); Holmes (Hk, Hm, Ho, Hr); Horrocks (HWC, HWE, HWF);
Sanpete Valley Area (UT627)- Mower (DFF, KM, MSD, MTD, MUF2, MVE);
Sevier County (UT628)- Accord (AOF); Parkay (PFD, PSE);

Table 4. Representative soil features

Parent material	(1) Alluvium–igneous and sedimentary rock (2) Colluvium–igneous and metamorphic rock (3) Residuum–igneous and metamorphic rock (4) Slope alluvium–igneous and metamorphic rock
Surface texture	(1) Very stony loam (2) Very cobbly loam (3) Gravelly loam
Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Moderately slow to moderate
Soil depth	20–60 in
Surface fragment cover <=3"	7–25%
Surface fragment cover >3"	0–40%
Available water capacity (0-40in)	2.1–4.9 in
Calcium carbonate equivalent (0-40in)	0–5%
Electrical conductivity (0-40in)	0–2 mmhos/cm
Sodium adsorption ratio (0-40in)	0
Soil reaction (1:1 water) (0-40in)	5.6–8.4
Subsurface fragment volume <=3" (Depth not specified)	13–28%
Subsurface fragment volume >3" (Depth not specified)	11–36%

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.

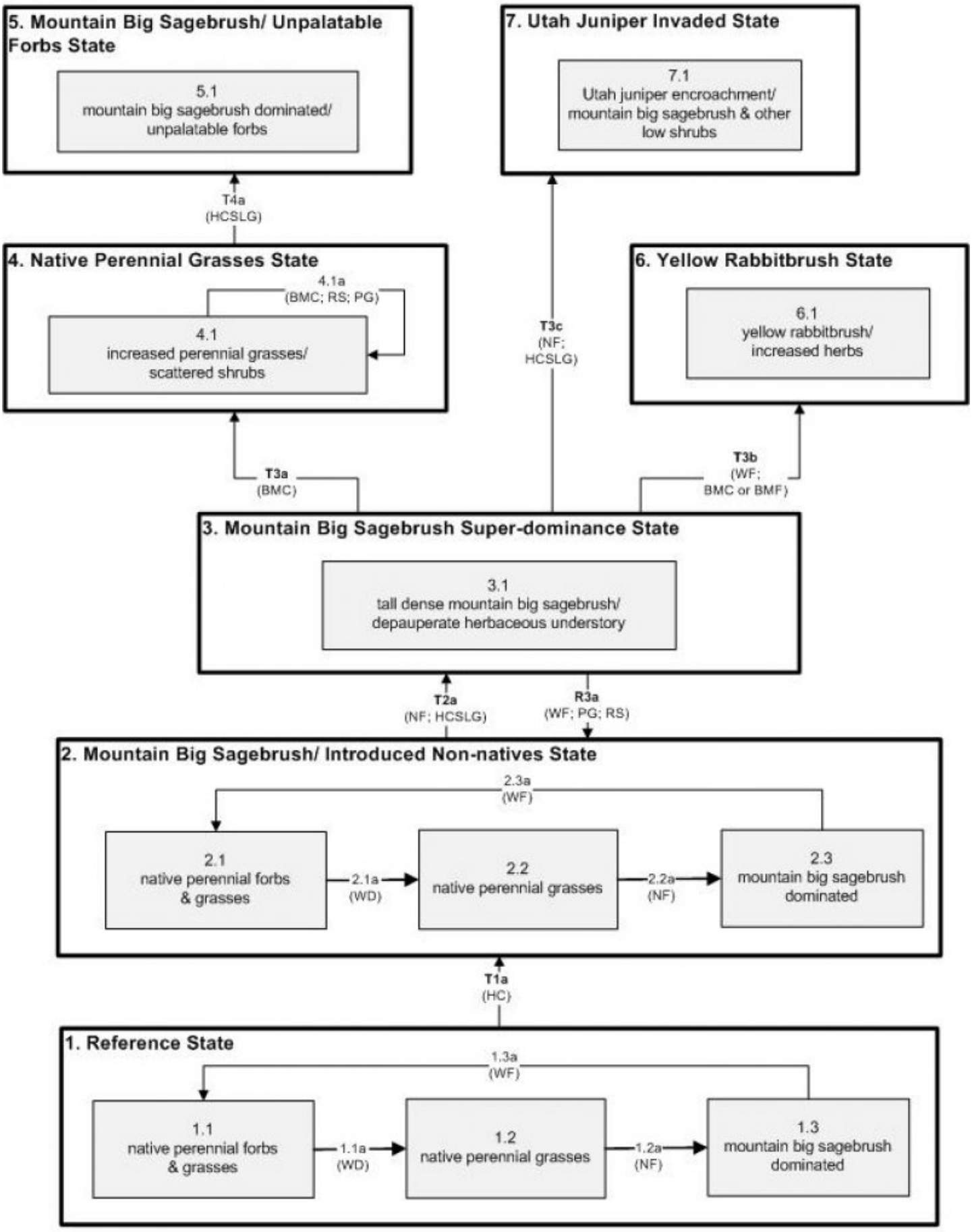
The major successional pathways within states, (“community pathways”) are indicated by arrows between phases. “Transitions” are indicated by arrows between states. The drivers of these changes are indicated in codes decipherable by referring to the legend at the bottom of the page and by reading the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

R047AY461UT: Mountain Stony Loam (Mountain Big Sagebrush)



BMC	Brush Management (chemical)	PG	Prescribed Grazing
BMF	Brush Management (fire)	RS	Re-seeding
HC	Historic Change	WD	Wildlife Damage (pocket gophers)
HCSLG	Heavy Continuous Season Long Grazing	WF	Wildfire
NF	No Fire		

Figure 4. 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 dominant plant communities found on these sites would have depended on the time since last wildfire and activity of pocket gophers (Thomomys spp.). The first phase immediately following wildfire (1.3a) would have been dominated by a mixture of native perennial forbs and grasses including tapertip hawksbeard (*Crepis acuminata*), arrowleaf balsamroot (*Balsamorhiza sagittata*), sticky purple geranium (*Geranium viscosissimum*), shortstem buckwheat (*Eriogonum brevicaule*), bluebunch wheatgrass (*Pseudoroegneria spicata*), slender wheatgrass (*Elymus trachycaulus*), and Letterman's needlegrass (*Achnatherum lettermanii*) (1.1). When present, pocket gophers would have substantially reduced the forb component (1.1a) creating a grass-dominated phase (1.2). With increased time since the last wildfire (1.2a), mountain big sagebrush (*Artemisia tridentata* spp. vaseyana) would have ultimately regained its dominance on the site (1.3). Several other mountain shrub species would have also been present including antelope bitterbrush (*Purshia tridentata*) and mountain snowberry (*Symphoricarpos oreophilus*). 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
native perennial forbs and grasses

This plant community would have been dominated by a mixture of native perennial forbs and grasses following wildfire. Dominant forbs would have included tapertip hawksbeard, arrowleaf balsamroot, sticky purple geranium, and shortstem buckwheat. Grasses would have included bluebunch wheatgrass, slender wheatgrass, and Letterman's needlegrass.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	585	943	1138
Shrub/Vine	225	363	438
Forb	90	145	175
Total	**900**	**1451**	**1751**

Table 6. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	14-16%
Grass/grasslike foliar cover	44-46%
Forb foliar cover	9-11%
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 (Ft)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.5	–	–	–	–
>0.5 <= 1	–	–	–	9-11%
>1 <= 2	–	–	44-46%	–
>2 <= 4.5	–	14-16%	–	–
>4.5 <= 13	–	–	–	–
>13 <= 40	–	–	–	–
>40 <= 80	–	–	–	–
>80 <= 120	–	–	–	–
>120	–	–	–	–

Community 1.2
native perennial grasses

This plant community would have been grass-dominated following heavy utilization by pocket gophers. Dominant grasses would have been bluebunch wheatgrass, slender wheatgrass, and Letterman’s needlegrass.

Community 1.3
mountain big sagebrush dominated

Mountain big sagebrush would have re-established on the site following 20 to 30 years without fire. The perennial forbs would have returned as well, complementing the graminoid counterpart in the understory.

Pathway 1.1a
Community 1.1 to 1.2

If an outbreak of pocket gophers had occurred, the site would have temporarily become grass-dominated, as pocket gophers tend to consume only the freshly-rooted forb component.

Pathway 1.2a
Community 1.2 to 1.3

Absence of fire and removal of pocket gophers would have allowed both the mountain big sagebrush and the freshly-rooted forb components to return to the site.

Pathway 1.3a
Community 1.3 to 1.1

Wildfire would have removed the sagebrush, bringing the plant community back to an herbaceous phase.

State 2
Mountain Big Sagebrush/ 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. The relative amount of shrubs, grasses, and forbs depends upon the length of time elapsed since the last wildfire and the presence of pocket gophers. Immediately following fire (2.3a), the site will be in a mixed forb-grass phase (2.1). If pocket gophers remove the forbs (2.1a), the site could become grass-dominated (2.2). Sagebrush will re-establish 20 to 30 years after fire (2.2a), becoming dominant while still retaining much of its mixed perennial herbaceous understory (2.3). Dominant grasses are western wheatgrass (*Pascopyrum smithii*), with slightly diminished bluebunch

wheatgrass, slender wheatgrass, and Letterman's needlegrass (compared to the Reference State). Forbs include tapertip hawksbeard, arrowleaf balsamroot, and sticky purple geranium, among others. A small component of non-native species may also occur. 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. The resiliency of this State can be maintained by reductions in livestock numbers and seasons of grazing, but heavy continued grazing during the growing season will negatively impact the resiliency of this State.

Community 2.1
native perennial forbs & grasses

This plant community is dominated by a mixture of native perennial forbs and grasses following wildfire. Dominant forbs include tapertip hawksbeard, arrowleaf balsamroot, sticky purple geranium, and shortstem buckwheat. Grasses include bluebunch wheatgrass, slender wheatgrass, and Letterman's needlegrass.

Community 2.2
Native perennial grasses

This plant community will become a grass-dominated following heavy utilization by pocket gophers. Dominant grasses will be bluebunch wheatgrass, slender wheatgrass, and Letterman's needlegrass.

Community 2.3
mountain big sagebrush dominated

Mountain big sagebrush will re-establish on the site following a period of 20 to 30 years without fire. The perennial forbs will return as well, complementing the graminoid counterpart in the understory.

Pathway 2.1a
Community 2.1 to 2.2

If an outbreak of pocket gophers occurs, the site will become grass-dominated, as pocket gophers tend to favor the freshly-rooted forb component.

Pathway 2.2a
Community 2.2 to 2.3

Absence of fire and removal of pocket gophers will allow both the mountain big sagebrush and forb components to return to the site

Pathway 2.3a
Community 2.3 to 2.1

Wildfire will remove the sagebrush, bringing the plant community back to an herbaceous phase.

State 3
Mountain Big Sagebrush Super-dominance State

In the absence of fire, and with continued heavy impacts from livestock grazing, the native herbaceous understory will markedly decrease, allowing the shrubs, mainly mountain big sagebrush, to become super-dominant and take over the site (3.1). The stability of this State is maintained by an abundance of mountain big sagebrush seed source and a lack of native perennial herb seed source. The paucity of the herbaceous understory may allow accelerated soil erosion to occur. The resiliency of this State can be maintained by reductions in livestock numbers and seasons of grazing, but heavy continued grazing during the growing season will negatively impact the resiliency of this State.

Community 3.1
tall dense mountain big sagebrush/ depauperate herbaceous understory

This plant community is characterized by a dramatic increase in mountain big sagebrush and a corresponding

reduction in the perennial herbaceous understory.

State 4
Native Perennial Grasses State

Native perennial grasses such as western wheatgrass and Letterman's needlegrass will temporarily dominate the site (4.1) if chemicals (e.g. 2, 4-D™) are used to reduce the shrub and forb components. This grassland can be sustained by re-application of chemical, re-seeding with native seed when necessary, and moderating the livestock grazing during the growing season of the grasses (4.1a). Continued heavy livestock grazing will negatively impact the resiliency of this State.

Community 4.1
increased perennial grasses/ scattered shrubs

This plant community is dominated by native perennial grasses such as western wheatgrass and Letterman's needlegrass released from competition by the chemical reduction of mountain big sagebrush.

State 5
Mountain big sagebrush / Unpalatable forbs state

If heavy livestock grazing continues, the grasses will be depleted once again, allowing the sagebrush and unpalatable forbs to regain dominance. The approach to this transition is indicated by an increase in sagebrush seedlings, a loss of perennial grasses, and an increase in unpalatable forbs. This transition is triggered by heavy livestock grazing and fire exclusion.

Community 5.1
Mountain big sagebrush and unpalatable forbs increase.

With heavy continued season-long grazing perennial bunchgrass species such as bluebunch wheatgrass and slender wheatgrass will dramatically decrease. This will give the ecological advantage (space and soil moisture) for mountain big sagebrush and unpalatable forbs to dominate the site.

State 6
Yellow rabbitbrush State

Yellow rabbitbrush and some common disturbance-following herbaceous species such as houndstongue (Cynoglossum spp.), tarweed (Madia spp.), and mule-ears (*Wyethia amplexicaulis*) will increase following fire (6.1), whether prescribed or wild, and chemical removal of mountain big sagebrush. This State could be maintained by periodic fire.

Community 6.1
yellow rabbitbrush/ increased herbs

This plant community is dominated by yellow rabbitbrush and a suite of hearty herbaceous disturbance followers such as snakeweed (Gutierrezia spp.), houndstongue, tarweed, mule-ears, and knotweed (Polygonum spp.).

State 7
Utah Juniper Invaded State

If the suppression of wildfire continues, particularly during droughty periods, and neighboring stands of Utah juniper exist, juniper will eventually move into these sites. Mountain big sagebrush and other lower shrubs will still be present initially, but with time will be outcompeted by the invading juniper trees (7.1). This State is maintained by juniper outcompeting understory species and by accelerated soil erosion. A cool-season prescribed burn will serve to remove juniper temporarily, allowing the understory to recover.

Community 7.1

Utah juniper encroachment/ mountain big sagebrush and other low shrubs

This community has a scattering of Utah juniper that have moved in from adjacent sites. Mountain big sagebrush and other low shrubs such as yellow rabbitbrush, alderleaf mountain mahogany (*Cercocarpus montanus*), and plains pricklypear (*Opuntia polyacantha*), will also be present.

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 a transition to the Mountain Big Sagebrush Super-dominance State. The approach to this transition is indicated by a loss of perennial grass understory and an increase in shrub component relative to grasses and forbs. Grasses will consist of a residual population occurring closely under larger shrubs. The trigger causing this transition is sustained heavy grazing over the growth season.

Restoration pathway R3A
State 3 to 2

The Mountain Big Sagebrush Super-dominance State can be returned to the Mountain Big Sagebrush/ Introduced Non-natives State by applying a cool-season prescribed fire to remove sagebrush. This needs to be followed by a deferment of livestock grazing and reseeding of desirable species.

Transition T3A
State 3 to 4

With the application of 2, 4-D™ it may be possible to reduce the shrub layer and allow the native perennial grasses to re-establish. This seems similar to Restoration Pathway R3a described below; however the difference is that this is produced by application of herbicides which also knock out many forbs.

Transition T3B
State 3 to 6

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 T3C
State 3 to 7

With continued suppression of fire and heavy continuous livestock grazing, the site may slowly be invaded by Utah juniper (*Juniperus osteosperma*). The approach to this transition is indicated by the increasing presence of juniper seedlings. This transition is triggered by overgrazing and fire exclusion.

Transition T4A
State 4 to 5

If heavy livestock grazing continues, the grasses will be depleted once again, allowing the sagebrush and unpalatable forbs to regain dominance. The approach to this transition is indicated by an increase in sagebrush

seedlings, a loss of perennial grasses, and an increase in unpalatable forbs. This transition is triggered by heavy livestock grazing and fire exclusion.

Additional community tables

Table 8. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Shrub/Vine					
0	**Dominant Shrubs**			240–300	
	mountain big sagebrush	ARTRV	*Artemisia tridentata ssp. vaseyana*	150–225	–
	alderleaf mountain mahogany	CEMO2	*Cercocarpus montanus*	45–75	–
	antelope bitterbrush	PUTR2	*Purshia tridentata*	45–75	–
3	**Sub-Dominant Shrubs**			165–450	
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	75–150	–
	Saskatoon serviceberry	AMAL2	*Amelanchier alnifolia*	15–60	–
	yellow rabbitbrush	CHVIV4	*Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus*	15–60	–
	slender buckwheat	ERMI4	*Eriogonum microthecum*	15–60	–
	creeping barberry	MARE11	*Mahonia repens*	15–60	–
	plains pricklypear	OPPO	*Opuntia polyacantha*	15–60	–
	mountain snowberry	SYOR2	*Symphoricarpos oreophilus*	15–60	–
Grass/Grasslike					
0	**Dominant Grasses**			615–825	
	bluebunch wheatgrass	PSSP6	*Pseudoroegneria spicata*	450–525	–
	slender wheatgrass	ELTR7	*Elymus trachycaulus*	75–150	–
	Letterman's needlegrass	ACLE9	*Achnatherum lettermanii*	45–75	–
1	**Sub-Dominant Grasses**			300–750	
	Grass, perennial	2GP	*Grass, perennial*	75–150	–
	Geyer's sedge	CAGE2	*Carex geyeri*	15–45	–
	squirreltail	ELEL5	*Elymus elymoides*	15–45	–
	sheep fescue	FEOV	*Festuca ovina*	15–45	–
	needle and thread	HECO26	*Hesperostipa comata*	15–45	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	15–45	–
	basin wildrye	LECI4	*Leymus cinereus*	15–45	–
	spike fescue	LEKI2	*Leucopoa kingii*	15–45	–
	oniongrass	MEBU	*Melica bulbosa*	15–45	–
	muttongrass	POFE	*Poa fendleriana*	15–45	–
	Sandberg bluegrass	POSE	*Poa secunda*	15–45	–
Forb					
2	**Sub-Dominant Forbs**			480–1440	
	Forb, annual	2FA	*Forb, annual*	75–225	–
	Forb, perennial	2FP	*Forb, perennial*	75–225	–
	common yarrow	ACMI2	*Achillea millefolium*	15–45	

	common yarrow	ACMI2	*Achillea millefolium*	15–45	–
	tapertip onion	ALAC4	*Allium acuminatum*	15–45	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	15–45	–
	silverleaf milkvetch	ASAR4	*Astragalus argophyllus*	15–45	–
	arrowleaf balsamroot	BASA3	*Balsamorhiza sagittata*	15–45	–
	Wyoming Indian paintbrush	CALI4	*Castilleja linariifolia*	15–45	–
	meadow thistle	CISC2	*Cirsium scariosum*	15–45	–
	bastard toadflax	COUM	*Comandra umbellata*	15–45	–
	tapertip hawksbeard	CRAC2	*Crepis acuminata*	15–45	–
	shortstem buckwheat	ERBR5	*Eriogonum brevicaule*	15–45	–
	sticky purple geranium	GEVI2	*Geranium viscosissimum*	15–45	–
	showy goldeneye	HEMU3	*Heliomeris multiflora*	15–45	–
	oneflower helianthella	HEUN	*Helianthella uniflora*	15–45	–
	hairy false goldenaster	HEVI4	*Heterotheca villosa*	15–45	–
	western stoneseed	LIRU4	*Lithospermum ruderale*	15–45	–
	tailcup lupine	LUCAC3	*Lupinus caudatus ssp. caudatus*	15–45	–
	Tolmie's owl's-clover	ORTO	*Orthocarpus tolmiei*	15–45	–
	low beardtongue	PEHU	*Penstemon humilis*	15–45	–
	spiny phlox	PHHO	*Phlox hoodii*	15–45	–
	Munro's globemallow	SPMU2	*Sphaeralcea munroana*	15–45	–
	mule-ears	WYAM	*Wyethia amplexicaulis*	15–45	–

Animal community

This site provides summer and fall grazing for all classes of livestock.
Topography on this site is broken and provides good diversity of cover and food.
This site has value as winter range for mule deer and elk.

Recreational uses

This site has values for open space and aesthetics. It has a variety of grasses, forbs and shrubs which add diversity and color to the landscape. Hunting for upland game birds, deer and elk is good to excellent. Roads facilitate motorized recreation. Hiking, horseback riding, snowshoeing, and snowmobiling can be good on this site.

Wood products

Trees are not found on this site except in the Juniper invasion state. Mature juniper trees can be harvested for fenceposts when straight. Juniper resists decompostion and is a good fuel wood.

Inventory data references

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

Other references

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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	11/13/2012
Approved by	Kendra Moseley
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

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

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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% - 25%. Soil surface may be covered by 20 to 70% 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.

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.

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** (Bezzant) Soil surface 0-2 inches. Texture is a very cobbly loam; color is very dark grayish brown (10YR 3/2); and structure weak fine granular. Mollic epipedon ranges from 10 to 20 inches. Use the specific information for the soil you are assessing found in the published soil survey to supplement this description.

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 encourage higher infiltration. Bare spaces are expected to be small and irregular in shape and usually not connected. Vegetative structure and distribution are 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 such as long-term drought, insect damage, etc., runoff is likely to increase and infiltration be 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: Non-sprouting shrub (mountain big sagebrush) = > Perennial bunchgrasses (bluebunch wheatgrass, Letterman needlegrass) > Rhizomatous Grasses (slender wheatgrass) >> Sprouting shrubs (bitterbrush, alderleaf mountain mahogany).

    Sub-dominant: Perennial forbs (northern mulesears).

    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 40 to 60+ 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 1400 - 1500 #/acre on an average year but could range from 850 - 1800 #/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.
