USDA Natural Resources Conservation Service

Ecological site R047XA473UT
Mountain Very Steep Stony Loam (browse)

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

General information

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

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: Cutoff Family GRV-SCL, Moist 30-70% — loamy-skeletal, mixed frigid Calcixerollic Xerochrepts

Ecological site concept

The soils of this site formed in colluvium over residuum derived from sandstone and shale. Rock fragments are found on the soil surface and typically make up about 35 percent of the soil volume. Surface textures are very gravelly fine sandy loams and very cobbly fine sandy loams. These soils are well-drained, moderately deep to deep, and have moderately slow to moderately rapid permeability. The soil moisture regime is ustic and the soil temperature regime is frigid.

Associated sites

R047XA402UT	**Mountain Clay (slender wheatgrass)**
R047XA406UT	**Mountain Gravelly Loam (mountain big sagebrush)**
R047XA418UT	**Mountain Loam (bigtooth maple)**
R047XA430UT	**Mountain Loam (mountain big sagebrush)**
R047XA434UT	**Mountain Loam (shrub)**

Similar sites

R047XA432UT	**Mountain Loam (oak)**
R047XA410UT	**Mountain Gravelly Loam (oak)**
R047XA434UT	**Mountain Loam (shrub)**
R047XA406UT	**Mountain Gravelly Loam (mountain big sagebrush)**

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Prunus virginiana* (2) *Cercocarpus montanus*
Herbaceous	(1) *Pseudoroegneria spicata* (2) *Achnatherum lemmonii*

Physiographic features

This ecological site typically occurs on steep mountain slopes and ledges. Slope steepness, aspect and elevation will influence the vegetative floristics of this site. Sites are typically located located between 6,800 to 8,600 feet in elevation. Slopes normally range from 40 to 70 percent but may occasionally be steeper. Runoff is high.

Table 2. Representative physiographic features

Landforms	(1) Mountain slope (2) Ledge
Runoff class	High
Flooding frequency	None
Ponding frequency	None
Elevation	2,073–2,621 m
Slope	40–70%
Aspect	Aspect is not a significant factor

Climatic features

The climate of this site characterized by cold, snowy winters and warm summers. The average annual precipitation ranges from 16 to 22 inches. February and August thru October, are typically the wettest months with June being the driest. The most reliable sources of moisture for plant growth are the snow that accumulates over the winter and spring rains. Summer thunderstorms are intermittent and sporadic in nature, and thus, are not reliable sources of moisture to support vegetative growth on this site. The mean annual air temperature ranges from 38 to 42 degrees.The soil moisture regime for this site is xeric and the soil temperature regime is frigid.

Table 3. Representative climatic features

Frost-free period (characteristic range)	
Freeze-free period (characteristic range)	
Precipitation total (characteristic range)	406-559 mm
Frost-free period (average)	121 days
Freeze-free period (average)	147 days
Precipitation total (average)	

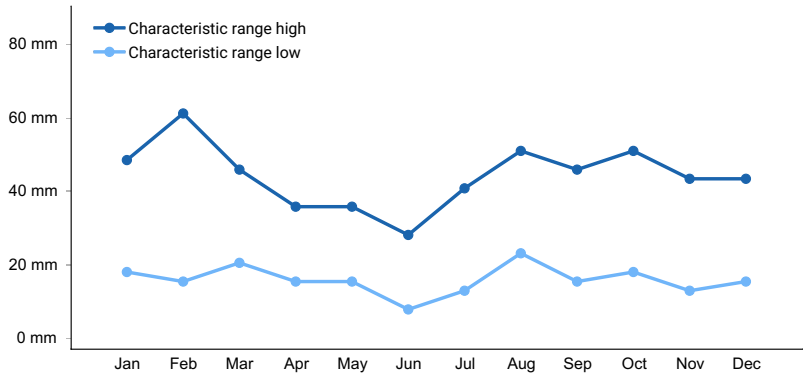


Figure 1. Monthly precipitation range

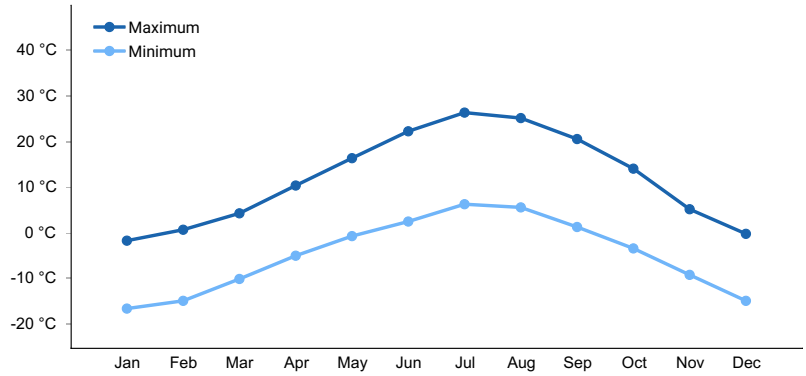


Figure 2. Monthly average minimum and maximum temperature

Influencing water features

This site is not typically influenced by streams or wetlands.

Wetland description

N/A

Soil features

The soils of this site formed in colluvium over residuum derived from sandstone and shale. Rock fragments are

found on the soil surface and typically make up about 35 percent of the soil volume. Surface textures are very gravelly fine sandy loams and very cobbly fine sandy loams. These soils are well-drained, moderately deep to deep, and have moderately slow to moderately rapid permeability. The soil moisture regime is ustic and the soil temperature regime is frigid.

Table 4. Representative soil features

Parent material	(1) Colluvium–sandstone and shale
Surface texture	(1) Very stony fine sandy loam (2) Very cobbly fine sandy loam
Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Moderately slow to moderately rapid
Soil depth	102–152 cm
Surface fragment cover <=3"	10–15%
Surface fragment cover >3"	33–35%
Available water capacity (0-101.6cm)	1.78–13.72 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)	6.6–7.8
Subsurface fragment volume <=3" (Depth not specified)	6–21%
Subsurface fragment volume >3" (Depth not specified)	15–30%

Ecological dynamics

This site developed under the Middle Rocky Mountains Province of the Rocky Mountain System, which includes the Wasatch Mountains, ecological conditions and the natural influences of herbivory, fire and climate. This site occurs on very steep slopes(40 to 70 percent) and can occur on all aspects. It is usually found on mountain slopes and ledges. Species composition is generally dominated by a mixture of shrubs with chokecherry, mountain big sagebrush and alderleaf mountain mahogany most dominant. Utah serviceberry, bitterbrush and mountain snowberry are other common shrub species. Bluebunch wheatgrass, Letterman's needlegrass and Geyer's sedge are the dominant herbaceous species. A wide diversity of perennial forbs are also present.

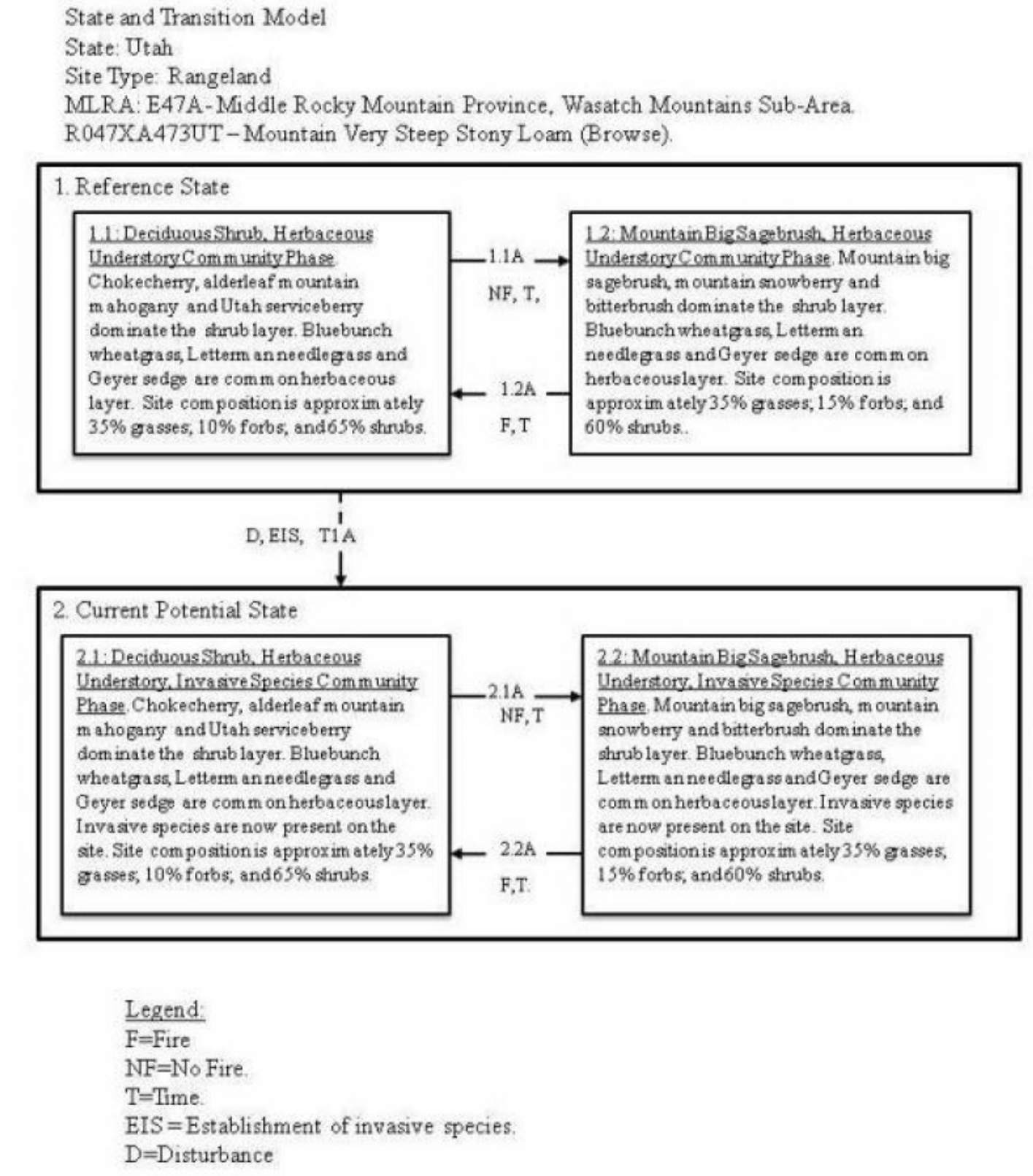
This site is extremely cobbly or gravelly soils combined with its steep slopes limit its availability for livestock grazing. Grazing is usually limited to bands of sheep that will quickly move through the site during the summer months.

Evidence indicates that this site historically maintained a fairly long burn cycle (100 years or more). Following a fire, shrub species are removed or much reduced and herbaceous species may dominate the site for a period of years. Over time a mix of shrub species will once again dominate the community. Two distinct phases of this site are commonly observed, a deciduous shrub phase and a mountain big sagebrush phase.

As vegetative communities respond to changes caused by natural or manmade events that cause them to cross ecological thresholds, a return to previous states may not be possible. The amount of effort needed to affect desired vegetative shifts depends on a sites present biotic and abiotic features and the desired results.

The following State and Transition diagram depicts the most common plant communities found on this ecological site. It does not necessarily depict all the plant communities that can occur, but does show the most prevalent and repeatable. As more data are collected, some of these plant communities may be revised or removed, and new ones added. These descriptions capture the current knowledge and experience at the time of this revision.

State and transition model



State 1
Reference State

This state describes the biotic communities that may become established on this ecological site if all successional sequences are completed under natural disturbance conditions. Species composition is generally dominated by a mixture of deciduous and non-deciduous shrubs with alderleaf mountain mahogany, chokecherry and mountain big sagebrush dominating. Other important shrubs include Utah serviceberry, bitterbrush and mountain snowberry. Perennial herbaceous species occurrence is directly related to canopy density with bluebunch wheatgrass, Letterman's needlegrass and geyer's sedge being the most common species. The primary disturbance mechanisms are overstory canopy density, weather fluctuations, and fire or lack of fire. The Reference State is self-sustaining and resistant to change due to a high resistance to natural disturbances and a high resilience following those disturbances. When natural disturbances occur, the rate of recovery can be quite variable. Two distinct community phases are observed and are described in this Reference State. They are the herbaceous shrub and the mountain big sagebrush phases. Reference State: Plant communities influenced by shrub canopy density, long-term weather fluctuations, and periodic fire. Indicators: A community dominated by alderleaf mountain mahogany, chokecherry and mountain big sagebrush. The density of the overstory canopy determines the amount and composition of the other native perennial grasses, grass-likes and forbs that may be present. Feedbacks: Natural fluctuations in weather patterns that allow for a self sustaining mixed shrub and native grass and grasslike community. Insect herbivory, more frequent fires, or other disturbances that may allow for the establishment of invasive species. At-risk Community Phase: All communities are at risk when native plants are stressed and nutrients become available for invasive plants to establish. Trigger: The establishment of invasive plant species

Community 1.1
Deciduous Shrub, Herbaceous Understory Community Phase.

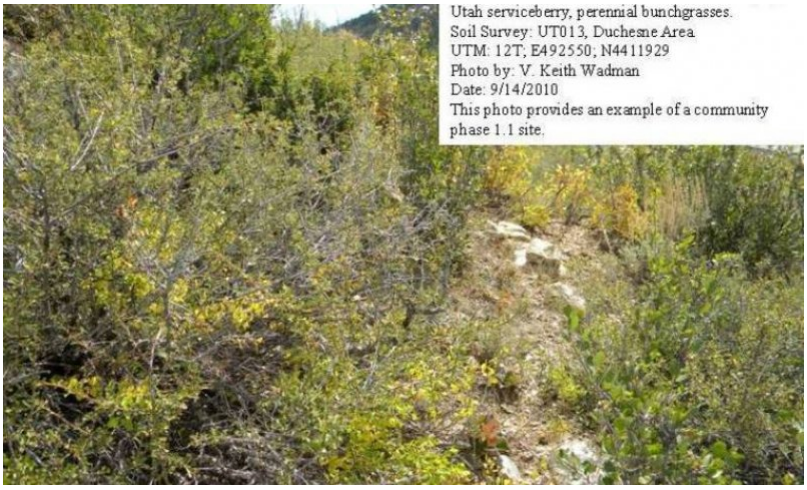


Figure 3. Community Phase 1.1

Community Phase 1.1 is characterized by an overstory canopy generally dominated by a mixture of deciduous shrubs with chokecherry, alderleaf mountain mahogany and Utah serviceberry occurring most often. Mountain big sagebrush, mountain snowberry and bitterbrush are also commonly present. Perennial herbaceous species occurrence is directly related to canopy density with bluebunch wheatgrass, Letterman's needlegrass and Geyer's sedge found most often. Other perennial grasses, shrubs, and forbs are also often present. Air dry composition of this site is approximately 35 percent grasses, 10 percent forbs, and 65 percent shrubs. Bare ground is variable (5 to 30 percent) depending on litter and biological crust cover, which are also variable (10 to 40 percent) and surface rock fragments (0 to 50 percent). Biological crusts can vary from sites dominated by light cyanobacteria in the plant interspaces, with occasional moss and lichen pinnacles under shrub canopies, to those dominated by lichen and moss pinnacles as well as cyanobacteria in the site interspaces. The following tables provide an example the typical vegetative floristics of a community phase 1.1 plant community.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Shrub/Vine	308	476	560
Grass/Grasslike	280	336	504
Forb	84	112	140
Total	**672**	**924**	**1204**

Table 6. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	35-45%
Grass/grasslike foliar cover	25-35%
Forb foliar cover	10-15%
Non-vascular plants	0%
Biological crusts	0%
Litter	10-15%
Surface fragments >0.25" and <=3"	0%
Surface fragments >3"	0%
Bedrock	0%
Water	0%
Bare ground	10-20%

Table 7. Canopy structure (% cover)

Height Above Ground (M)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.15	–	–	5-10%	5-10%
>0.15 <= 0.3	–	–	5-10%	–
>0.3 <= 0.6	–	–	–	–
>0.6 <= 1.4	–	10-15%	–	–
>1.4 <= 4	–	10-20%	–	–
>4 <= 12	–	–	–	–
>12 <= 24	–	–	–	–
>24 <= 37	–	–	–	–
>37	–	–	–	–

Community 1.2
Mountain Big Sagebrush, Herbaceous Understory Community Phase.

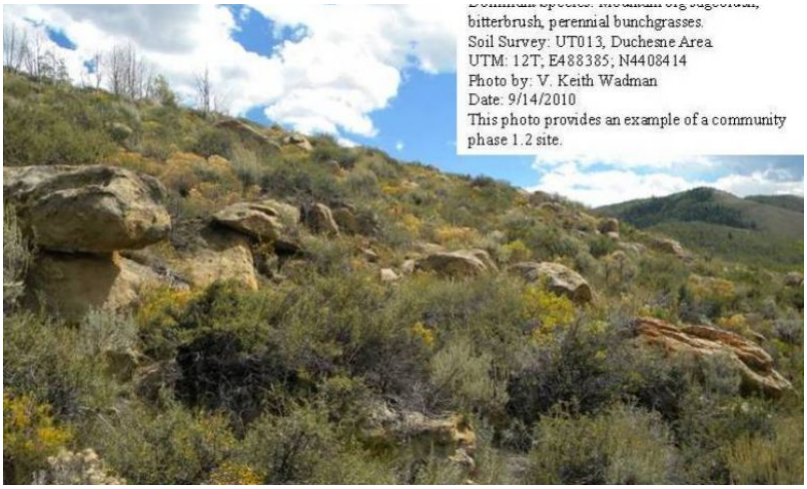


Figure 5. Community Phase 1.2

This community phase is characterized by an overstory canopy generally dominated by mountain big sagebrush, mountain snowberry and bitterbrush. A mixture of deciduous shrubs including chokecherry, alderleaf mountain mahogany and Utah serviceberry are also commonly present. Perennial herbaceous species occurrence is directly related to canopy density with bluebunch wheatgrass, Letterman needlegrass and Geyer's sedge found most often. Other perennial grasses, shrubs, and forbs are also often present. Air dry composition of this site is approximately 35 percent grasses, 15 percent forbs, and 60 percent shrubs. Bare ground is variable (5 to 30 percent) depending on litter and biological crust cover, which are also variable (10 to 40 percent) and surface rock fragments (0 to 50 percent). Biological crusts can vary from sites dominated by light cyanobacteria in the plant interspaces, with occasional moss and lichen pinnacles under shrub canopies, to those dominated by lichen and moss pinnacles as well as cyanobacteria in the site interspaces. The following tables provide an example the typical vegetative floristics of a community phase 1.2 plant community.

Table 8. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Shrub/Vine	308	476	560
Grass/Grasslike	280	336	504
Forb	84	112	140
Total	**672**	**924**	**1204**

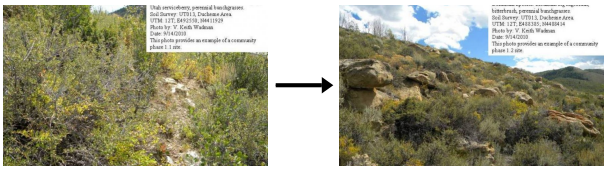
Table 9. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	35-45%
Grass/grasslike foliar cover	25-35%
Forb foliar cover	10-15%
Non-vascular plants	0%
Biological crusts	0%
Litter	10-15%
Surface fragments >0.25" and <=3"	0%
Surface fragments >3"	0%
Bedrock	0%
Water	0%
Bare ground	10-20%

Table 10. Canopy structure (% cover)

Height Above Ground (M)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.15	–	–	5-10%	5-10%
>0.15 <= 0.3	–	–	5-10%	–
>0.3 <= 0.6	–	10-15%	–	–
>0.6 <= 1.4	–	10-15%	–	–
>1.4 <= 4	–	–	–	–
>4 <= 12	–	–	–	–
>12 <= 24	–	–	–	–
>24 <= 37	–	–	–	–
>37	–	–	–	–

Pathway 1.1A
Community 1.1 to 1.2

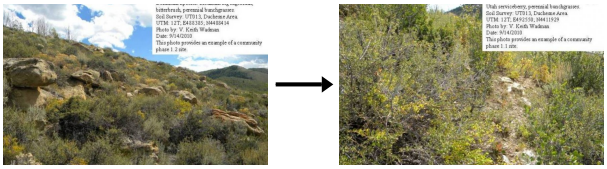


Deciduous Shrub, Herbaceous Understory Community Phase.

Mountain Big Sagebrush, Herbaceous Understory Community Phase.

This community pathway occurs when natural fire is excluded from the site for a long periods of time. This will allow for non-sprouting shrubs such as mountain big sagebrush and native perennial grasses to slowly increase in the community.

Pathway 1.2A
Community 1.2 to 1.1



Mountain Big Sagebrush, Herbaceous Understory Community Phase.

Deciduous Shrub, Herbaceous Understory Community Phase.

This community pathway occurs when natural fire returns to the site, restoring natural burn cycles. This will allow for sprouting shrubs such as chokecherry and alderleaf mountain mahogany and native perennial grasses to dominate the community.

State 2
Current Potential State

The current potential state is similar to the Reference State, however minor amounts of invasive species may now present in all community phases. This state describes the biotic communities that may become established on this ecological site if all successional sequences are completed under natural disturbance conditions. The current potential state is generally dominated by a mixture of deciduous and non-deciduous shrubs with alderleaf mountain mahogany, chokecherry and mountain big sagebrush dominating. Other important shrubs include Utah serviceberry, bitterbrush and mountain snowberry. Perennial herbaceous species occurrence is directly related to canopy density with bluebunch wheatgrass, Letterman's needlegrass and geyer's sedge being the most common species. Cheatgrass and non-native annual forbs could potentially be present in both community phases but this occurrence has not yet been well documented. Areas disturbed by road building and mining are most likely to allow this invasion to occur. The primary disturbance mechanisms are overstory canopy density, weather fluctuations and fire

or lack of fire. The current potential state is still self-sustaining but has a lower resistant to change due to a reduced resistance to disturbances. When disturbances do occur, the rate of recovery can be highly variable. Current Potential State: Plant communities influenced by shrub canopy density, long term weather fluctuations, and periodic fire. Indicators: A community dominated by alderleaf mountain mahogany, chokecherry and mountain big sagebrush. The density of the overstory canopy determines the amount and composition of the other native and non-native grasses, grass-likes and forbs that may be present. Feedbacks: Natural fluctuations in weather patterns that allow for a self sustaining mixed shrub and native grass and grasslike community. Insect herbivory, more frequent fires, or other disturbances that may allow for the development of invasive species. At-risk Community Phase: All communities are at risk when native plants are stressed and nutrients become available for invasive plants to increase. Trigger: The increase of invasive plant species.

Community 2.1
Deciduous Shrub, Herbaceous Understory , Invasive Species Community Phase.

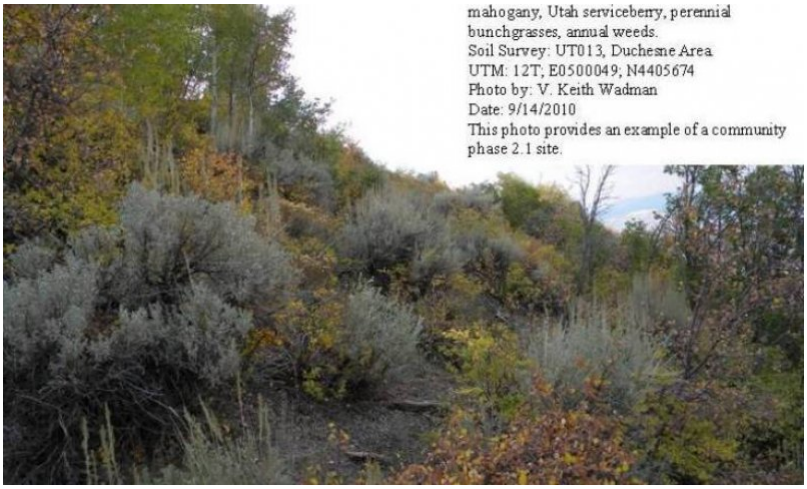


Figure 7. Community Phase 2.1

This community phase is characterized by an overstory canopy generally dominated by a mixture of deciduous shrubs with chokecherry, alderleaf mountain mahogany and Utah serviceberry occurring most often. Mountain big sagebrush, mountain snowberry and bitterbrush are also commonly present. Perennial herbaceous species occurrence is directly related to canopy density with cheatgrass, bluebunch wheatgrass, Letterman needlegrass and Geyer's sedge found most often. Other perennial grasses, shrubs, and forbs are also often present. Air dry composition of this site is approximately 35 percent grasses, 10 percent forbs, and 65 percent shrubs. Bare ground is variable (5 to 30 percent) depending on litter and biological crust cover, which are also variable (10 to 40 percent) and surface rock fragments (0 to 50 percent). Biological crusts can vary from sites dominated by light cyanobacteria in the plant interspaces, with occasional moss and lichen pinnacles under shrub canopies, to those dominated by lichen and moss pinnacles as well as cyanobacteria in the site interspaces. The following tables provide an example the typical vegetative floristics of a community phase 2.1 plant community.

Table 11. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Shrub/Vine	308	476	560
Grass/Grasslike	280	336	504
Forb	84	112	140
Total	**672**	**924**	**1204**

Table 12. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	35-45%
Grass/grasslike foliar cover	25-35%
Forb foliar cover	10-15%

Non-vascular plants	0%
Biological crusts	0%
Litter	10-15%
Surface fragments >0.25" and <=3"	0%
Surface fragments >3"	0%
Bedrock	0%
Water	0%
Bare ground	10-20%

Table 13. Canopy structure (% cover)

Height Above Ground (M)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.15	–	–	5-10%	5-10%
>0.15 <= 0.3	–	–	5-10%	–
>0.3 <= 0.6	–	–	–	–
>0.6 <= 1.4	–	10-15%	–	–
>1.4 <= 4	–	10-20%	–	–
>4 <= 12	–	–	–	–
>12 <= 24	–	–	–	–
>24 <= 37	–	–	–	–
>37	–	–	–	–

Community 2.2
Mountain Big Sagebrush, Herbaceous Understory, Invasive Species Community Phase.

Figure 9. Community Phase 2.2

This community phase is characterized by an overstory canopy generally dominated by mountain big sagebrush, mountain snowberry and bitterbrush. A mixture of deciduous shrubs including chokecherry, alderleaf mountain mahogany and Utah serviceberry are also commonly present. Perennial herbaceous species occurrence is directly related to canopy density with cheatgrass, bluebunch wheatgrass, Letterman needlegrass and geyer sedge found most often. Other perennial grasses, shrubs, and forbs are also often present. Air dry composition of this site is approximately 35 percent grasses, 15 percent forbs, and 60 percent shrubs. Bare ground is variable (5 to 30 percent) depending on litter and biological crust cover, which are also variable (10 to 40 percent) and surface rock fragments (0 to 50 percent). Biological crusts can vary from sites dominated by light cyanobacteria in the plant interspaces, with occasional moss and lichen pinnacles under shrub canopies, to those dominated by lichen and moss pinnacles as well as cyanobacteria in the site interspaces. The following tables provide an example the typical

vegetative floristics of a community phase 2.2 plant community.

Table 14. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Shrub/Vine	308	476	560
Grass/Grasslike	280	336	504
Forb	84	112	140
Total	**672**	**924**	**1204**

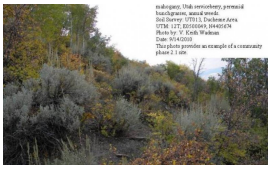
Table 15. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	35-45%
Grass/grasslike foliar cover	25-35%
Forb foliar cover	10-15%
Non-vascular plants	0%
Biological crusts	0%
Litter	10-15%
Surface fragments >0.25" and <=3"	0%
Surface fragments >3"	0%
Bedrock	0%
Water	0%
Bare ground	10-20%

Table 16. Canopy structure (% cover)

Height Above Ground (M)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.15	–	–	5-10%	5-10%
>0.15 <= 0.3	–	–	5-10%	–
>0.3 <= 0.6	–	10-15%	–	–
>0.6 <= 1.4	–	10-15%	–	–
>1.4 <= 4	–	–	–	–
>4 <= 12	–	–	–	–
>12 <= 24	–	–	–	–
>24 <= 37	–	–	–	–
>37	–	–	–	–

Pathway 2.1A
Community 2.1 to 2.2



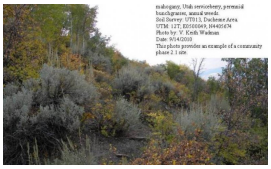
Deciduous Shrub, Herbaceous Understory , Invasive Species Community Phase.

Mountain Big Sagebrush, Herbaceous Understory, Invasive Species Community Phase.

This community pathway occurs when natural fire is excluded from the site for a long periods of time. This will allow for non-sprouting shrubs such as mountain big sagebrush and native perennial grasses to slowly increase in the community. Any non-native species present may also increase during this time.

Pathway 2.2A
Community 2.2 to 2.1

Mountain Big Sagebrush, Herbaceous Understory, Invasive Species Community Phase.



Deciduous Shrub, Herbaceous Understory , Invasive Species Community Phase.

This community pathway occurs when natural fire returns to the site, restoring natural burn cycles. This will allow for sprouting shrubs such as chokecherry and alderleaf mountain mahogany and native perennial grasses to dominate the community. Any non-native present in the community may decrease somewhat during this time due to more aggressive competition from large shrubs.

Transition T1A
State 1 to 2

This transitional pathway occurs when drought and improper livestock grazing causes the perennial herbaceous community to become significantly reduced, allowing non-native species such as cheatgrass, alyssum, Russian thistle and other invasive weeds the opportunity to become established. Green rabbitbrush may also increase during this time. Once invasive species occupy the site, a threshold has been crossed. Little evidence exists to verify that this transition is common. Invaded sites are likely present but are of small extent.

Additional community tables

Table 17. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Dominant Grasses**			224–280	
	bluebunch wheatgrass	PSSP6	*Pseudoroegneria spicata*	112–168	–
	Letterman's needlegrass	ACLE9	*Achnatherum lettermanii*	34–67	–
	Geyer's sedge	CAGE2	*Carex geyeri*	34–67	–
2	**Sub-Dominant Grasses**			140–280	
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	17–28	–
	squirreltail	ELEL5	*Elymus elymoides*	17–28	–
	slender wheatgrass	ELTR7	*Elymus trachycaulus*	17–28	–
	sheep fescue	FEOV	*Festuca ovina*	17–28	–
	needle and thread	HECO26	*Hesperostipa comata*	17–28	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	17–28	–
	basin wildrye	LECI4	*Leymus cinereus*	17–28	–
	saline wildrye	LESA4	*Leymus salinus*	17–28	–
	oniongrass	MEBU	*Melica bulbosa*	17–28	–
	muttongrass	POFE	*Poa fendleriana*	17–28	–
	Sandberg bluegrass	POSE	*Poa secunda*	17–28	–

Forb					
3	**Forbs**			140–168	
	common yarrow	ACMI2	*Achillea millefolium*	17–28	–
	tapertip onion	ALAC4	*Allium acuminatum*	17–28	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	17–28	–
	arrowleaf balsamroot	BASA3	*Balsamorhiza sagittata*	17–28	–
	Wyoming Indian paintbrush	CALI4	*Castilleja linariifolia*	17–28	–
	rough lipfern	CHHO	*Cheilanthes horridula*	17–28	–
	wavyleaf thistle	CIUN	*Cirsium undulatum*	17–28	–
	narrowleaf blue eyed Mary	COLI	*Collinsia linearis*	17–28	–
	bastard toadflax	COUM	*Comandra umbellata*	17–28	–
	shortstem buckwheat	ERBR5	*Eriogonum brevicaule*	17–28	–
	sulphur-flower buckwheat	ERUM	*Eriogonum umbellatum*	17–28	–
	woodland strawberry	FRVE	*Fragaria vesca*	17–28	–
	sticky purple geranium	GEVI2	*Geranium viscosissimum*	17–28	–
	showy goldeneye	HEMU3	*Heliomeris multiflora*	17–28	–
	oneflower helianthella	HEUN	*Helianthella uniflora*	17–28	–
	hairy false goldenaster	HEVI4	*Heterotheca villosa*	17–28	–
	western stoneseed	LIRU4	*Lithospermum ruderale*	17–28	–
	tailcup lupine	LUCAC3	*Lupinus caudatus ssp. caudatus*	17–28	–
	Tolmie's owl's-clover	ORTO	*Orthocarpus tolmiei*	17–28	–
	low beardtongue	PEHU	*Penstemon humilis*	17–28	–
	spiny phlox	PHHO	*Phlox hoodii*	17–28	–
	longleaf phlox	PHLO2	*Phlox longifolia*	17–28	–
	sticky cinquefoil	POGL9	*Potentilla glandulosa*	17–28	–
	Munro's globemallow	SPMU2	*Sphaeralcea munroana*	17–28	–
	yellow salsify	TRDU	*Tragopogon dubius*	17–28	–
Shrub/Vine					
4	**Dominant Shrubs**			308–364	
	Utah serviceberry	AMUT	*Amelanchier utahensis*	84–112	–
	alderleaf mountain mahogany	CEMO2	*Cercocarpus montanus*	84–112	–
	chokecherry	PRVI	*Prunus virginiana*	84–112	–
5	**Sub-Dominant Shrubs**			196–392	
	mountain big sagebrush	ARTRV	*Artemisia tridentata ssp. vaseyana*	45–67	–
	yellow rabbitbrush	CHVIV4	*Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus*	22–34	–
	slender buckwheat	ERMI4	*Eriogonum microthecum*	22–34	–
	creeping barberry	MARE11	*Mahonia repens*	22–34	–
	plains pricklypear	OPPO	*Opuntia polyacantha*	22–34	–
	quaking aspen	POTR5	*Populus tremuloides*	22–34	–
	antelope bitterbrush	PUTR2	*Purshia tridentata*	22–34	–

	Gambel oak	QUGA	*Quercus gambelii*	22–34	–
	golden currant	RIAU	*Ribes aureum*	22–34	–
	Woods' rose	ROWO	*Rosa woodsii*	22–34	–
	mountain snowberry	SYOR2	*Symphoricarpos oreophilus*	22–34	–
	spineless horsebrush	TECA2	*Tetradymia canescens*	22–34	–
	Saskatoon serviceberry	AMAL2	*Amelanchier alnifolia*	22–34	–
	prairie sagewort	ARFR4	*Artemisia frigida*	22–34	–

Table 18. Community 1.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Dominant Grasses**			224–280	
	bluebunch wheatgrass	PSSP6	*Pseudoroegneria spicata*	112–168	–
	Letterman's needlegrass	ACLE9	*Achnatherum lettermanii*	34–67	–
	Geyer's sedge	CAGE2	*Carex geyeri*	34–67	–
2	**Sub-Dominant Grasses**			140–280	
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	17–28	–
	squirreltail	ELEL5	*Elymus elymoides*	17–28	–
	slender wheatgrass	ELTR7	*Elymus trachycaulus*	17–28	–
	sheep fescue	FEOV	*Festuca ovina*	17–28	–
	needle and thread	HECO26	*Hesperostipa comata*	17–28	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	17–28	–
	basin wildrye	LECI4	*Leymus cinereus*	17–28	–
	saline wildrye	LESA4	*Leymus salinus*	17–28	–
	oniongrass	MEBU	*Melica bulbosa*	17–28	–
	muttongrass	POFE	*Poa fendleriana*	17–28	–
	Sandberg bluegrass	POSE	*Poa secunda*	17–28	–
Forb					
3	**Forbs**			140–168	
	common yarrow	ACMI2	*Achillea millefolium*	17–28	–
	tapertip onion	ALAC4	*Allium acuminatum*	17–28	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	17–28	–
	arrowleaf balsamroot	BASA3	*Balsamorhiza sagittata*	17–28	–
	Wyoming Indian paintbrush	CALI4	*Castilleja linariifolia*	17–28	–
	rough lipfern	CHHO	*Cheilanthes horridula*	17–28	–
	wavyleaf thistle	CIUN	*Cirsium undulatum*	17–28	–
	narrowleaf blue eyed Mary	COLI	*Collinsia linearis*	17–28	–
	bastard toadflax	COUM	*Comandra umbellata*	17–28	–
	shortstem buckwheat	ERBR5	*Eriogonum brevicaule*	17–28	–
	sulphur-flower buckwheat	ERUM	*Eriogonum umbellatum*	17–28	–

	woodland strawberry	FRVE	*Fragaria vesca*	17–28	–
	sticky purple geranium	GEVI2	*Geranium viscosissimum*	17–28	–
	showy goldeneye	HEMU3	*Heliomeris multiflora*	17–28	–
	oneflower helianthella	HEUN	*Helianthella uniflora*	17–28	–
	hairy false goldenaster	HEVI4	*Heterotheca villosa*	17–28	–
	western stoneseed	LIRU4	*Lithospermum ruderale*	17–28	–
	tailcup lupine	LUCAC3	*Lupinus caudatus ssp. caudatus*	17–28	–
	Tolmie's owl's-clover	ORTO	*Orthocarpus tolmiei*	17–28	–
	low beardtongue	PEHU	*Penstemon humilis*	17–28	–
	spiny phlox	PHHO	*Phlox hoodii*	17–28	–
	longleaf phlox	PHLO2	*Phlox longifolia*	17–28	–
	sticky cinquefoil	POGL9	*Potentilla glandulosa*	17–28	–
	Munro's globemallow	SPMU2	*Sphaeralcea munroana*	17–28	–
	yellow salsify	TRDU	*Tragopogon dubius*	17–28	–
Shrub/Vine					
4	**Dominant Shrubs**			308–364	
	mountain big sagebrush	ARTRV	*Artemisia tridentata ssp. vaseyana*	84–140	–
	antelope bitterbrush	PUTR2	*Purshia tridentata*	56–84	–
	mountain snowberry	SYOR2	*Symphoricarpos oreophilus*	56–84	–
5	**Sub-Dominant Shrubs**			196–392	
	mountain big sagebrush	ARTRV	*Artemisia tridentata ssp. vaseyana*	45–67	–
	alderleaf mountain mahogany	CEMO2	*Cercocarpus montanus*	22–34	–
	yellow rabbitbrush	CHVIV4	*Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus*	22–34	–
	slender buckwheat	ERMI4	*Eriogonum microthecum*	22–34	–
	creeping barberry	MARE11	*Mahonia repens*	22–34	–
	plains pricklypear	OPPO	*Opuntia polyacantha*	22–34	–
	quaking aspen	POTR5	*Populus tremuloides*	22–34	–
	chokecherry	PRVI	*Prunus virginiana*	22–34	–
	antelope bitterbrush	PUTR2	*Purshia tridentata*	22–34	–
	Gambel oak	QUGA	*Quercus gambelii*	22–34	–
	golden currant	RIAU	*Ribes aureum*	22–34	–
	Woods' rose	ROWO	*Rosa woodsii*	22–34	–
	mountain snowberry	SYOR2	*Symphoricarpos oreophilus*	22–34	–
	spineless horsebrush	TECA2	*Tetradymia canescens*	22–34	–
	Saskatoon serviceberry	AMAL2	*Amelanchier alnifolia*	22–34	–
	Utah serviceberry	AMUT	*Amelanchier utahensis*	22–34	–
	prairie sagewort	ARFR4	*Artemisia frigida*	22–34	–

Table 19. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					

Grass/Grasslike					
1	**Dominant Grasses**			224–280	
	bluebunch wheatgrass	PSSP6	*Pseudoroegneria spicata*	112–168	–
	Letterman's needlegrass	ACLE9	*Achnatherum lettermanii*	34–67	–
	Geyer's sedge	CAGE2	*Carex geyeri*	34–67	–
2	**Sub-Dominant Grasses**			140–280	
	cheatgrass	BRTE	*Bromus tectorum*	22–45	–
	squirreltail	ELEL5	*Elymus elymoides*	17–28	–
	slender wheatgrass	ELTR7	*Elymus trachycaulus*	17–28	–
	sheep fescue	FEOV	*Festuca ovina*	17–28	–
	needle and thread	HECO26	*Hesperostipa comata*	17–28	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	17–28	–
	basin wildrye	LECI4	*Leymus cinereus*	17–28	–
	saline wildrye	LESA4	*Leymus salinus*	17–28	–
	oniongrass	MEBU	*Melica bulbosa*	17–28	–
	muttongrass	POFE	*Poa fendleriana*	17–28	–
	Sandberg bluegrass	POSE	*Poa secunda*	17–28	–
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	17–28	–
Forb					
3	**Forbs**			140–168	
	common yarrow	ACMI2	*Achillea millefolium*	17–28	–
	tapertip onion	ALAC4	*Allium acuminatum*	17–28	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	17–28	–
	arrowleaf balsamroot	BASA3	*Balsamorhiza sagittata*	17–28	–
	Wyoming Indian paintbrush	CALI4	*Castilleja linariifolia*	17–28	–
	rough lipfern	CHHO	*Cheilanthes horridula*	17–28	–
	wavyleaf thistle	CIUN	*Cirsium undulatum*	17–28	–
	narrowleaf blue eyed Mary	COLI	*Collinsia linearis*	17–28	–
	bastard toadflax	COUM	*Comandra umbellata*	17–28	–
	herb sophia	DESO2	*Descurainia sophia*	17–28	–
	shortstem buckwheat	ERBR5	*Eriogonum brevicaule*	17–28	–
	sulphur-flower buckwheat	ERUM	*Eriogonum umbellatum*	17–28	–
	woodland strawberry	FRVE	*Fragaria vesca*	17–28	–
	sticky purple geranium	GEVI2	*Geranium viscosissimum*	17–28	–
	showy goldeneye	HEMU3	*Heliomeris multiflora*	17–28	–
	oneflower helianthella	HEUN	*Helianthella uniflora*	17–28	–
	hairy false goldenaster	HEVI4	*Heterotheca villosa*	17–28	–
	prickly lettuce	LASE	*Lactuca serriola*	17–28	–
	western stoneseed	LIRU4	*Lithospermum ruderale*	17–28	–
	tailcup lupine	LUCAC3	*Lupinus caudatus ssp. caudatus*	17–28	–
	Tolmie's owl's-clover	ORTO	*Orthocarpus tolmiei*	17–28	–
	low beardtongue	PEHU	*Penstemon humilis*	17–28	–

	low beardtongue	PEHA	*Penstemon humilis*	17–28	
	spiny phlox	PHHO	*Phlox hoodii*	17–28	–
	longleaf phlox	PHLO2	*Phlox longifolia*	17–28	–
	sticky cinquefoil	POGL9	*Potentilla glandulosa*	17–28	–
	tall tumblemustard	SIAL2	*Sisymbrium altissimum*	17–28	–
	Munro's globemallow	SPMU2	*Sphaeralcea munroana*	17–28	–
	yellow salsify	TRDU	*Tragopogon dubius*	17–28	–
Shrub/Vine					
4	**Dominant Shrubs**			308–364	
	Utah serviceberry	AMUT	*Amelanchier utahensis*	84–112	–
	alderleaf mountain mahogany	CEMO2	*Cercocarpus montanus*	84–112	–
	chokecherry	PRVI	*Prunus virginiana*	84–112	–
5	**Sub-Dominant Shrubs**			196–392	
	mountain big sagebrush	ARTRV	*Artemisia tridentata ssp. vaseyana*	45–67	–
	yellow rabbitbrush	CHVIV4	*Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus*	22–34	–
	slender buckwheat	ERMI4	*Eriogonum microthecum*	22–34	–
	creeping barberry	MARE11	*Mahonia repens*	22–34	–
	plains pricklypear	OPPO	*Opuntia polyacantha*	22–34	–
	quaking aspen	POTR5	*Populus tremuloides*	22–34	–
	antelope bitterbrush	PUTR2	*Purshia tridentata*	22–34	–
	Gambel oak	QUGA	*Quercus gambelii*	22–34	–
	golden currant	RIAU	*Ribes aureum*	22–34	–
	Woods' rose	ROWO	*Rosa woodsii*	22–34	–
	mountain snowberry	SYOR2	*Symphoricarpos oreophilus*	22–34	–
	spineless horsebrush	TECA2	*Tetradymia canescens*	22–34	–
	Saskatoon serviceberry	AMAL2	*Amelanchier alnifolia*	22–34	–
	prairie sagewort	ARFR4	*Artemisia frigida*	22–34	–

Table 20. Community 2.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Dominant Grasses**			224–280	
	bluebunch wheatgrass	PSSP6	*Pseudoroegneria spicata*	112–168	–
	Letterman's needlegrass	ACLE9	*Achnatherum lettermanii*	34–67	–
	Geyer's sedge	CAGE2	*Carex geyeri*	34–67	–
2	**Sub-Dominant Grasses**			140–280	
	cheatgrass	BRTE	*Bromus tectorum*	22–45	–
	squirreltail	ELEL5	*Elymus elymoides*	17–28	–
	slender wheatgrass	ELTR7	*Elymus trachycaulus*	17–28	–
	sheep fescue	FEOV	*Festuca ovina*	17–28	–
	needle and thread	HECO26	*Hesperostipa comata*	17–28	–

	prairie Junegrass	KOMA	*Koeleria macrantha*	17–28	–
	basin wildrye	LECI4	*Leymus cinereus*	17–28	–
	saline wildrye	LESA4	*Leymus salinus*	17–28	–
	oniongrass	MEBU	*Melica bulbosa*	17–28	–
	muttongrass	POFE	*Poa fendleriana*	17–28	–
	Sandberg bluegrass	POSE	*Poa secunda*	17–28	–
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	17–28	–
Forb					
3	**Forbs**			140–168	
	common yarrow	ACMI2	*Achillea millefolium*	17–28	–
	tapertip onion	ALAC4	*Allium acuminatum*	17–28	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	17–28	–
	arrowleaf balsamroot	BASA3	*Balsamorhiza sagittata*	17–28	–
	Wyoming Indian paintbrush	CALI4	*Castilleja linariifolia*	17–28	–
	rough lipfern	CHHO	*Cheilanthes horridula*	17–28	–
	wavyleaf thistle	CIUN	*Cirsium undulatum*	17–28	–
	narrowleaf blue eyed Mary	COLI	*Collinsia linearis*	17–28	–
	bastard toadflax	COUM	*Comandra umbellata*	17–28	–
	herb sophia	DESO2	*Descurainia sophia*	17–28	–
	shortstem buckwheat	ERBR5	*Eriogonum brevicaule*	17–28	–
	sulphur-flower buckwheat	ERUM	*Eriogonum umbellatum*	17–28	–
	woodland strawberry	FRVE	*Fragaria vesca*	17–28	–
	sticky purple geranium	GEVI2	*Geranium viscosissimum*	17–28	–
	showy goldeneye	HEMU3	*Heliomeris multiflora*	17–28	–
	oneflower helianthella	HEUN	*Helianthella uniflora*	17–28	–
	hairy false goldenaster	HEVI4	*Heterotheca villosa*	17–28	–
	prickly lettuce	LASE	*Lactuca serriola*	17–28	–
	western stoneseed	LIRU4	*Lithospermum ruderale*	17–28	–
	tailcup lupine	LUCAC3	*Lupinus caudatus ssp. caudatus*	17–28	–
	Tolmie's owl's-clover	ORTO	*Orthocarpus tolmiei*	17–28	–
	low beardtongue	PEHU	*Penstemon humilis*	17–28	–
	spiny phlox	PHHO	*Phlox hoodii*	17–28	–
	longleaf phlox	PHLO2	*Phlox longifolia*	17–28	–
	sticky cinquefoil	POGL9	*Potentilla glandulosa*	17–28	–
	tall tumblemustard	SIAL2	*Sisymbrium altissimum*	17–28	–
	Munro's globemallow	SPMU2	*Sphaeralcea munroana*	17–28	–
	yellow salsify	TRDU	*Tragopogon dubius*	17–28	–
Shrub/Vine					
4	**Dominant Shrubs**			308–364	
	mountain big sagebrush	ARTRV	*Artemisia tridentata ssp. vaseyana*	84–140	–
	antelope bitterbrush	PUTR2	*Purshia tridentata*	56–84	–

	mountain snowberry	SYOR2	*Symphoricarpos oreophilus*	56–84	–
5	**Sub-Dominant Shrubs**			196–392	
	mountain big sagebrush	ARTRV	*Artemisia tridentata ssp. vaseyana*	45–67	–
	alderleaf mountain mahogany	CEMO2	*Cercocarpus montanus*	22–34	–
	yellow rabbitbrush	CHVIV4	*Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus*	22–34	–
	slender buckwheat	ERMI4	*Eriogonum microthecum*	22–34	–
	creeping barberry	MARE11	*Mahonia repens*	22–34	–
	plains pricklypear	OPPO	*Opuntia polyacantha*	22–34	–
	quaking aspen	POTR5	*Populus tremuloides*	22–34	–
	chokecherry	PRVI	*Prunus virginiana*	22–34	–
	antelope bitterbrush	PUTR2	*Purshia tridentata*	22–34	–
	Gambel oak	QUGA	*Quercus gambelii*	22–34	–
	golden currant	RIAU	*Ribes aureum*	22–34	–
	Woods' rose	ROWO	*Rosa woodsii*	22–34	–
	mountain snowberry	SYOR2	*Symphoricarpos oreophilus*	22–34	–
	spineless horsebrush	TECA2	*Tetradymia canescens*	22–34	–
	Saskatoon serviceberry	AMAL2	*Amelanchier alnifolia*	22–34	–
	Utah serviceberry	AMUT	*Amelanchier utahensis*	22–34	–
	prairie sagewort	ARFR4	*Artemisia frigida*	22–34	–

Animal community

--Wildlife Interpretation--
The very steep slopes and scarcity of water on this site may limit its species richness and the abundance of large mammals. It does provide thermal cover and limited browsing opportunities for mule deer and elk. Birds, bats, lizards, snakes and rodents are quite common. Several species of birds can be found using this site. Golden eagles and red-tailed hawks are common as well as great horned-owls. Other species typical of mixed forest areas including black-chinned and rufous hummingbirds, several fly catchers, woodpeckers, and corvids will use this site for nesting and foraging. Several species of rodents occupy this site including desert cottontail, black-tailed jackrabbit, Colorado chipmunk, white–tailed antelope squirrel, Apache pocket mouse, and several species of Peromyscus. Bats (Myotis, Pipisturellus, and others) can be observed in this ecological site, but are likely limited to areas near water or canyons.

--Grazing Interpretations—
This sites plant community primarily consists of a mixed shrubs and herbaceous grasses and forbs growing on very steep slopes. Common shrubs include alderleaf mountain mahogany, Utah serviceberry, and mountain snowberry. Grasses include Letterman needlegrass and bluebunch wheatgrass.

This sites very steep slopes seriously limit its use for livestock grazing. Its lack natural perennial water sources also reduces its suitability. Mule deer and Rocky Mountain Elk often utilize this site, and heavy browsing on palatable shrub species is common. Bands of sheep may utilize the site as they move through the mountains and will browse on the palatable shrubs and herbaceous vegetation.

Hydrological functions

The soils associated with this ecological site are generally in Hydrologic Soil Group B (NRCS National Engineering Handbook). Once these soils become saturated, however, because of their steep slopes, runoff potential is high. Hydrological groups are used in equations that estimate runoff from rainfall. These estimates are needed for solving

hydrologic problems that arise in planning watershed-protection and flood-prevention projects and for designing structures for the use, control and disposal of water. Heavy grazing can alter the hydrology by decreasing plant cover and increasing bare ground. Fire can also affect hydrology, but its affect is variable. Fire intensity, fuel type, soil, climate, and topography can each have different influences. Fires can increase areas of bare ground and hydrophobic layers that reduce infiltration and increase runoff (National Range and Pasture Handbook, 2003).

Recreational uses

This steep site has good aesthetic appearance and natural beauty. 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.

Wood products

None

Other information

--Poisonous and Toxic Plant Communities--
Toxic plants associated with this site include woolly locoweed, broom snakeweed, and Russian thistle.

Woolly locoweed is toxic to all classes of livestock and wildlife. Locoweed is palatable and has similar nutrient value to alfalfa, which may cause animals to consume it even when other forage is available. Locoweed contains swainsonine (indolizidine alkaloid) and is poisonous at all stages of growth. Poisoning will become evident after 2-3 weeks of continuous grazing and is associated with 4 major symptoms: 1) neurological damage, 2) emaciation, 3) reproductive failure and abortion, and 4) congestive heart failure linked with “high mountain disease”.

Broom snakeweed contains steroids, terpenoids, saponins, and flavones that can cause abortions or reproductive failure in sheep and cattle, however, cattle are most susceptible. These toxins are most abundant during active growth and leafing stage. Cattle and sheep generally will only graze broom snakeweed when other forage is unavailable, typically in winter when toxicity levels are at their lowest (Knight and Walter, 2001).

Russian thistle is an invasive toxic plant, causing nitrate and to a lesser extent oxalate poisoning, which affects all classes of livestock. The buildup of nitrates in these plants is highly dependent upon environmental factors such as after a rain storm, during a drought, during periods with cool/cloudy days, and when growing on soils high in nitrogen and low in sulfur and phosphorus. Nitrate collects in the stems and can persist throughout the growing season. Clinical signs of nitrate poisoning include drowsiness, weakness, muscular tremors, increased heart and respiratory rates, staggering gait, and death. Conversely, oxalate poisoning causes kidney failure; clinical signs include muscle tremors, tetany, weakness, and depression. Poisoning generally occurs when livestock consume and are not accustomed to grazing oxalate-containing plants. Animals with prior exposure to oxalates have increased numbers of oxalate-degrading rumen microflora, and thus, are able to degrade the toxin before clinical poisoning can occur.

--Invasive Plant Communities--
Generally, as ecological conditions deteriorate and perennial vegetation decreases due to disturbance (fire, drought, off road vehicle overuse, erosion, etc.) annual forbs and grasses may invade the site. Of particular concern in semi-arid environments are annual invaders including cheatgrass, Russian thistle, alyssum and annual mustards. The presence of these species will depend on soil properties and moisture availability; however, these invaders are highly adaptive and can flourish in many locations. Once established, complete removal is difficult, but suppression may be possible.

--Fire Ecology--
The ability for an ecological site to carry fire depends primarily on its' present fuel load and plant moisture content. Sites with small fuel loads will burn more slowly and less intensely than sites with large fuel loads. Most research agrees that historic fire return intervals are at a minimum 100 years, indicating that fire may have not played an important role in short term community dynamics. Fires are more common when plants are stressed or dead due to drought. Fire tolerant shrubs will recover quickly following fire. Sagebrush will reestablish either by seeds dispersed from adjacent unburned patches or by unburned seeds found at the burn site. Continuous (every 20 to 40 years) burning of these ecological sites can result in herbaceous dominated communities, due to the relatively fast

recovery of grasses and forbs when compared to shrubs. If invasive annual grasses are allowed to establish, fires may become more frequent, inhibiting the site's ability to recover.

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

Baily, R.G. 1995. Description of the ecoregions of the United Sates. Available http://www.fs.fed.us/land/ecosysmgmt/ecoreg1_home.html. Accessed February 27, 2008.

Belnap, J. and S.L. Phillips. 2001. Soil biota in an ungrazed grassland: response to annual grass (Bromus tectorum) invasion. Ecological Applications. 11:1261-1275

Chapin, S.F., B.H. Walker, R.J. Hobbs, D.U. Hooper, J.H. Lawton, O.E. Sala, and D. Tilman. 1997. Biotic control over the functioning of ecosystems. Science. 277:500-504

Cox R.D. and V.J. Anderson. 2004. Increasing native diversity of cheatgrass-dominated rangeland through assisted succession. Journal of Range Management. 57:203-210,

Knight, A.P. and R.G. Walter. 2001. A guide to plant poisoning of animals in North America. Teton NewMedia. Jackson, WY.

National Engineering Handbook. US Department of Agriculture, Natural Resources Conservation Service. Available: http://www.info.usda.gov/CED/Default.cfm#National%20Engineering%20Handbook. Accessed February 25, 2008.

NRCS Grazing Lands Technology Institute. 2003. National Range and Pasture Handbook. Fort Worth, TX, USA: US Department of Agriculture, Natural Resources Conservation Service, 190-VI-NRPH.

Tilley, D.J. 2007. Reintroducing native plants to the American West. Aberdeen Plant Materials Center, Aberdeen, ID, USA: US Department of Agriculture. Available: http://plant-materials.nrcs.usda.gov/idpmc/publications.html. Accessed February 22, 2008.

Utah Climate Summaries. 2008. Available: http://www.wrcc.dri.edu/summary/climsmut.html. Accessed on February 25, 2008.

Utah Division of Wildlife Resources. 2007.
Woods, A.J., D.A. Lammers, S.A. Bryce, J.M. Omernik, R.L. Denton, M. Domeier, and J.A. Comstock. 2001. Ecoregions of Utah (color poster with map, descriptive text, summary tables, and photographs). Reston, Virginia, U.S. Geological Survey (map scale 1:1,175,000).

Contributors

Darryl Trickler
V. Keith Wadman

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.

Author(s)/participant(s)	Jacob Owens (NRCS), Shane Green (NRCS); adapted to this site by V. Keith Wadman, (NRCS Retired).
Contact for lead author	shane.green@ut.usda.gov
Date	10/15/2011
Approved by	Kendra Moseley
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** None to very few. Due to the surface coarse fragments on this site, traditional rill formation is reduced. The overall gravelly to channery surface is expected to be resistant to rill formation and accelerated erosion in general. Where rills do occur, they may extend down entire slope.

---

2. **Presence of water flow patterns:** Due to the steep slopes, flow patterns are present and tend to be very sinuous and wind around rock fragments and perennial plant bases. They show some evidence of erosion with fines and litter depositing against the uphill side of gravel, rocks and plants. During episodic precipitation events e.g. thunderstorms, these sites are expected to shed large volumes of water to adjacent ecological sites.

---

3. **Number and height of erosional pedestals or terracettes:** Pedestals may form at the base of plants that occur on the edge of primary flow patterns and rills. Terracettes are present. Debris dams of small to medium sized litter (up to 2 inches in diameter) may form in water flow patterns, rills, and gullies. These debris dams may accumulate smaller litter (leaves, grass and forb stems).

---

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** 20 – 30 %. Most bare ground is associated with water flow patterns, rills, and gullies. Soil is covered by up to 30 percent rock fragments. Any areas with well developed biological soil crusts should not be counted as bare ground. Poorly developed biological soil crusts that are interpreted as functioning as bare ground (therefore they would be susceptible to raindrop splash erosion) should be recorded as bare ground. Ground cover is based on first raindrop impact, and bare ground is the opposite of ground cover.

---

5. **Number of gullies and erosion associated with gullies:** Few gullies may be present. Length often extends from exposed bedrock until gully reaches a stream or an area where water and sediment accumulate, but they may be wide and shallow and armored with very large rocks.

---

6. **Extent of wind scoured, blowouts and/or depositional areas:** None.

---

7. **Amount of litter movement (describe size and distance expected to travel):** Due to the steepness of slope being

between 40 to 70 percent, down slope redistribution of any incident litter caused by water is expected. Deposition would likely occur at points of obstruction such as the uphill side of gravel, rocks and plants, especially following major storm events. Fine litter is moved with even moderate precipitation events and spring runoff. Woody stems may be washed from site. Gullies may remove accumulated litter from under shrubs.

---

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** 80 to 90% of this site should have an erosion rating of 5 or 6. Vegetation cover, litter, biological soil crusts and surface rock reduce erosion.

---

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** The Modo series soil surface is 2 inches deep. Structure is weak fine granular. Color is light brownish gray (10YR 6/2). The A horizon would be expected to be more strongly developed under plant canopies. It is important if you are sampling to observe the A horizon under plant canopies as well as the interspaces. 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:** Spatial distribution of plants and/or well developed biological soil crusts (where present) intercept raindrops reducing splash erosion and provide areas of surface detention to store water allowing additional time for infiltration. Crowns of shrubs and accumulating litter at base of shrubs appear to create a micro-topography that may enhance development of water flow patterns below the drip line of the canopy. Significant increases in shrub canopy reduces understory vegetation causing an associated increase in runoff.

---

11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):** None. There may be layers of calcium carbonate, gravel, cobbles or other naturally occurring hard layers found in the soil subsurface. These should not be considered to be compaction layers.

---

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: Dominance by average annual production: Sprouting Shrubs (chokecherry, Utah serviceberry)> Non-sprouting shrubs (mountain big sagebrush) >Cool season perennial grasses (bluebunch wheatgrass, Letterman needlegrass).

    Sub-dominant: forbs

    Other:

    Additional: Following a recent disturbance such as fire, or drought that removes woody vegetation, forbs and perennial grasses (herbaceous species) may dominate the community for a time. Sprouting shrubs would be the first to recover with non-sprouting shrubs lagging behind. If a disturbance such as fire has not occurred for an extended period of time, these woody species will continue to increase reducing the perennial herbaceous understory species. These conditions would reflect functional community phases within the reference state.

---

13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** In general, a mix of age classes may be expected with a few dead and decadent plants present.

14. **Average percent litter cover (%) and depth (in):** Litter cover 30-40%. Depth is highly variability due to slope and the stability of the soil surface.

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 800-1000 #/acre on an average year.

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:** Possible invaders on this site are cheatgrass, alyssum and mustard species.

17. **Perennial plant reproductive capability:** All perennial plants should have the ability to reproduce sexually or asexually in most years, except in drought years.