USDA Natural Resources
Conservation Service

Ecological site R047XA504UT
High Mountain Clay (slender wheatgrass)

Last updated: 2/05/2025
Accessed: 02/26/2025

General information

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

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. 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. 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 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.
The average precipitation is from 12 to 16 inches in the valleys and can range up to 73 inches in the mountains. Peak precipitation occurs in the winter 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 Entisols, Inceptisols, and Mollisols. The lower elevations are dominated by a frigid temperature regime, while the higher elevations experience cryic temperature regimes. The soil moisture regime is typically xeric. The minerology is generally mixed and the soils are very shallow to very deep, generally well drained, and loamy or loamy-skeletal.

Classification relationships

Modal Soil: Herd CB-L, 3-15% — fine, montmorillonitic Mollic Cryoboralfs

Ecological site concept

The soils of this site are deep, well-drained clay loams. Clay content tends to increase with increasing depth. They formed on mountain slopes and ridges in colluvium and slope alluvium derived from sandstone, conglomerate and/or quartzite parent materials. Cobbles and gravels may be present on the soil surface and account for no more than 20 percent of the soil volume. Permeability of water is moderately slow to slow and roots penetrate the soil readily. These soils are non-calcareous and neutral to slightly acidic. Available water capacity is 5.3 to 7.9 inches in the upper 40 inches of soil. The soil moisture regime is xeric udic and the soil temperature regime is frigid or cryic.

Associated sites

R047XA516UT	**High Mountain Loam (mountain big sagebrush)**
R047XA517UT	**High Mountain Loam (silver sagebrush)**
R047XA528UT	**High Mountain Stony Clay (slender wheatgrass)**

Similar sites

R047XA402UT	**Mountain Clay (slender wheatgrass)**
R047XA528UT	**High Mountain Stony Clay (slender wheatgrass)** The soils of this site have greater than 35% rock fragments by volume. It also typically occurs at high elevations than the high mountain clay site, up to 9,000 feet.
R047XA454UT	**Mountain Stony Clay (slender wheatgrass)** The soil for this site has greater than 35% rock fragments by volume. It also recieves less annual precipitation than the high mountain clay site.

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) *Elymus trachycaulus* (2) *Bromus carinatus*

Physiographic features

This site occurs on mountain slopes and ridges at elevations between 7,000 and 8,000 feet. It can be found on gentle to moderately steep slopes and on all aspects. Flooding and ponding do not occur on this site.

Table 2. Representative physiographic features

Landforms	(1) Mountain slope (2) Ridge
Flooding frequency	None
Ponding frequency	None
Elevation	7,000–8,000 ft
Slope	3–30%

Aspect	Aspect is not a significant factor

Climatic features

The climate of this site is characterized by cold, snowy winters and cool, dry summers. The average precipitation ranges from 25 to 30 inches. Most of the effective moisture available for plant growth comes from snowmelt and spring moisture.

Table 3. Representative climatic features

Frost-free period (characteristic range)	26-52 days
Freeze-free period (characteristic range)	68-100 days
Precipitation total (characteristic range)	
Frost-free period (average)	
Freeze-free period (average)	
Precipitation total (average)	27 in

Influencing water features

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

Wetland description

N/A

Soil features

The soils of this site are deep, well-drained clay loams. Clay content tends to increase with increasing depth. They formed on mountain slopes and ridges in colluvium and slope alluvium derived from sandstone, conglomerate and quartzite parent materials. Cobbles and gravels may be present on the soil surface and account for no more than 20 percent of the soil volume. Permeability of water is moderately slow to slow and roots penetrate the soil readily. These soils are non-calcareous and neutral to slightly acidic. Available water capacity is 5.3 to 7.9 inches in the upper 40 inches of soil. The soil moisture regime is xeric and the soil temperature regime is frigid or cryic.

Soil Survey Area Soil Components (Map Units in parentheses)
Cache Valley Area (UT603) Goring (GOE2);
Morgan Area (UT609) Herd (HrC, HtC);

Table 4. Representative soil features

Parent material	(1) Colluvium–conglomerate (2) Slope alluvium–sandstone (3) Quartzite
Surface texture	(1) Cobbly clay loam (2) Clay loam
Family particle size	(1) Clayey
Drainage class	Well drained
Permeability class	Moderately slow to slow
Soil depth	40–60 in
Surface fragment cover <=3"	0–13%
Surface fragment cover >3"	0–18%

Available water capacity (0-40in)	5.3–7.9 in
Calcium carbonate equivalent (0-40in)	0%
Electrical conductivity (0-40in)	0–2 mmhos/cm
Sodium adsorption ratio (0-40in)	0
Soil reaction (1:1 water) (0-40in)	5.6–7.3
Subsurface fragment volume <=3" (Depth not specified)	3–12%
Subsurface fragment volume >3" (Depth not specified)	0–8%

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.

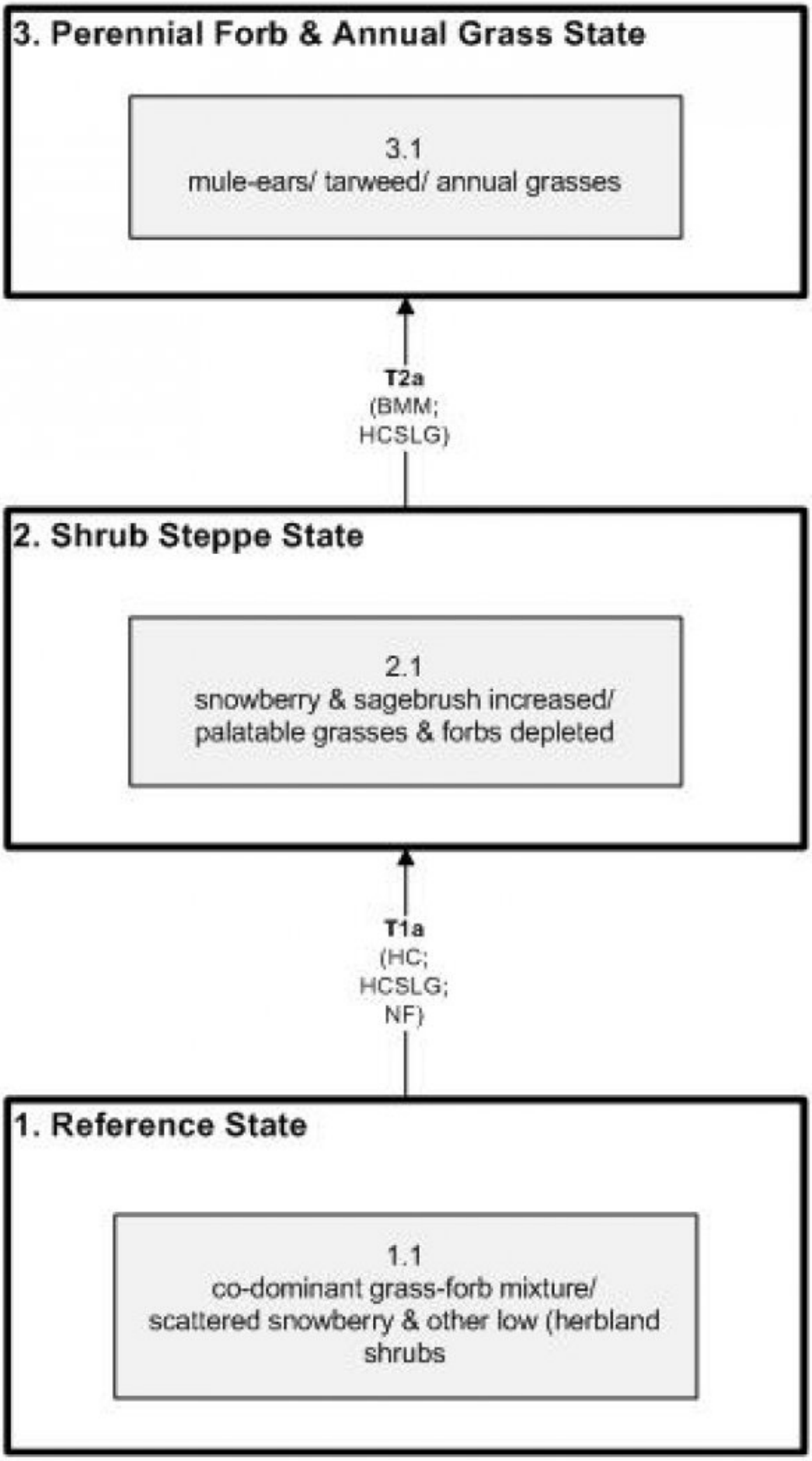
The major successional pathways within states, (“community pathways”) are indicated by arrows between phases. “Transitions” are indicated by arrows between states. The drivers of these changes are indicated in codes decipherable by referring to the legend at the bottom of the page and by reading the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

R047AY504UT: High Mountain Clay (Slender Wheatgrass)


3. Perennial Forb & Annual Grass State
3.1
mule-ears/ tarweed/ annual grasses
T2a
(BMM;
HCSLG)
2. Shrub Steppe State
2.1
snowberry & sagebrush increased/
palatable grasses & forbs depleted
T1a
(HC;
HCSLG;
NF)
1. Reference State
1.1
co-dominant grass-forb mixture/
scattered snowberry & other low (herbland
shrubs

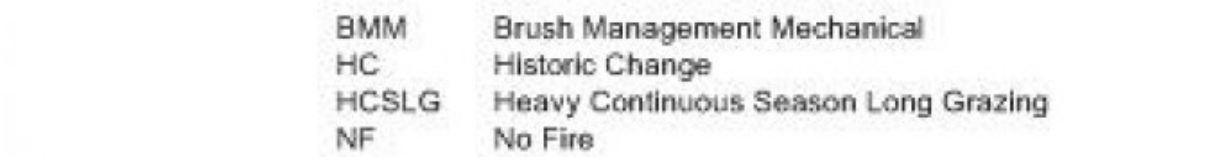


Figure 2. State and Transition Model

State 1
Reference State

The Reference State is a description of this ecological site just prior to Euro-American settlement but long after the arrival of Native Americans. The description of the Reference State was determined by NRCS Soil Survey Type Site Location information and familiarity with rangeland relict areas where they exist. The least modified plant community would have been co-dominated by a mixture of grass and forb species (1.1), with slender wheatgrass (*Elymus trachycaulus*) and mule-ears (*Wyethia amplexicaulis*) as the primary species. A more complete list of species by lifeform for the Reference State is available in accompanying tables in the “Plant Community Composition by Weight and Percentage” section of this ESD document.

Community 1.1
Co-dominant grass-forb mixture/ scattered snowberry and other low shrubs

This plant community would have been characterized by a co-dominance of grass and forb species. Grasses would have included slender wheatgrass, mountain brome (*Bromus marginatus*), basin wildrye (*Leymus cinereus*), sheep fescue (*Festuca ovina*), Columbia needlegrass (*Achnatherum nelsonii*), and Letterman's needlegrass (*Achnatherum lettermanii*). Forb species would have included mule-ears, silvery lupine (*Lupinus argenteus*), showy goldeneye (*Heliomeris multiflora*), and western mountain aster (*Symphyotrichum spathulatum*) among others. Mountain snowberry (*Symphoricarpos oreophilus*) and low sagebrush (*Artemisia arbuscula*) would also have been scattered throughout the site.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	230	350	450
Forb	230	350	450
Shrub/Vine	173	263	338
Total	**633**	**963**	**1238**

Table 6. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	4-6%
Grass/grasslike foliar cover	39-41%
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	–	–	39-41%	–
>2 <= 4.5	–	4-6%	–	–
>4.5 <= 13	–	–	–	–
>13 <= 40	–	–	–	–
>40 <= 80	–	–	–	–
>80 <= 120	–	–	–	–
>120	–	–	–	–

State 2
Shrub Steppe State

State 2 is a description of the ecological site shortly following Euro-American settlement, which has been influenced by the introduction of several non-native plants and animals, possible extinctions of native species, and a different climate. Historic heavy continuous season-long grazing by livestock and the prevention of wildfire also had a major impact on these sites creating a shrub steppe which should now be considered the present potential. Unpalatable species such as mule-ears and native woody species such as mountain snowberry, silver sagebrush (*Artemisia cana*), and low sagebrush increased while the palatable herbaceous species diminished.

Community 2.1
Snowberry and sagebrush increased/ palatable grasses and forbs depleted

Figure 4. R047XA454UT High Mountain Clay (Slender wheatgrass) Community 2.1, 15% grasses, 30% forbs, 15% shrubs, 15% bare ground, 5% rock and 15% litter. Dominant forb is Mules ears; dominant shrub is Low sagebrush; dominant grass is Sandberg's bluegrass.

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cana), and low sagebrush increased while the palatable herbaceous species diminished.

State 3
Perennial Forb and Annual Grass State

With continued impacts from heavy livestock grazing and mechanical, herbicidal, or fire removal of native shrubs, the native grass component will markedly decrease or be absent, shrubs will also be reduced to absence, but perennial forbs and annual grasses such as mule-ears, tarweed , (*Madia glomerata*) and cheatgrass (*Bromus tectorum*) will increase.

Community 3.1
Mule-ears/ tarweed/ annual grasses

This plant community is characterized by a suite of very grazing-tolerant herbaceous species such as mule-ears, tarweed, and cheatgrass.

Transition T1a
State 1 to 2

The simultaneous introduction of exotic species, both plants and animals, possible extinctions of native flora and fauna, climate change, the advent of heavy continuous season long livestock grazing, and fire prevention 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

Mechanical disturbance of woody species and continued heavy livestock grazing during the growing-season of grasses will cause a transition from State 2 to a perennial forb and annual grass-dominated state (State 3). The churning clay soils naturally favor herbs over woody species, thus shrubs are a temporary occupier of such sites. However both the mechanical and herbivory of interzonal grazing can trigger the shrubs which are moderately palatable, especially to sheep. Mule-ears is however, unpalatable to all animals and its massive root structure allows it to prevail under all treatments except deep plowing and herbicides. Reducing livestock grazing has little effect on reducing its competitive hold. The only potential restoration pathway requires massive tillage with subsequent herbicide and re-seeding efforts to convert these sites to perennial grasslands.

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**			144–270	
	mountain snowberry	SYOR2	*Symphoricarpos oreophilus*	90–180	–
	little sagebrush	ARAR8	*Artemisia arbuscula*	54–90	–
3	**Sub-Dominant Shrubs**			144–270	
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	54–90	–
	Saskatoon serviceberry	AMAL2	*Amelanchier alnifolia*	18–36	–
	silver sagebrush	ARCA13	*Artemisia cana*	18–36	–
	yellow rabbitbrush	CHVIV4	*Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus*	18–36	–
	slender buckwheat	ERMI4	*Eriogonum microthecum*	18–36	–
	antelope	PUTR2	*Purshia tridentata*	18–36	–

	antelope bitterbrush	PUTR2	*Purshia tridentata*	18–90	
Grass/Grasslike					
0	**Dominant Grasses**			720–990	
	slender wheatgrass	ELTR7	*Elymus trachycaulus*	540–630	–
	basin wildrye	LECI4	*Leymus cinereus*	90–180	–
	California brome	BRCA5	*Bromus carinatus*	90–180	–
1	**Sub-Dominant Grasses**			792–1260	
	Grass, annual	2GA	*Grass, annual*	180–270	–
	Grass, perennial	2GP	*Grass, perennial*	180–270	–
	Letterman's needlegrass	ACLE9	*Achnatherum lettermanii*	54–90	–
	Columbia needlegrass	ACNE9	*Achnatherum nelsonii*	54–90	–
	Geyer's sedge	CAGE2	*Carex geyeri*	54–90	–
	blue wildrye	ELGL	*Elymus glaucus*	54–90	–
	sheep fescue	FEOV	*Festuca ovina*	54–90	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	54–90	–
	western wheatgrass	PASM	*Pascopyrum smithii*	54–90	–
	muttongrass	POFE	*Poa fendleriana*	54–90	–
Forb					
0	**Dominant Forbs**			108–180	
	tailcup lupine	LUCAC3	*Lupinus caudatus ssp. caudatus*	54–90	–
	mule-ears	WYAM	*Wyethia amplexicaulis*	54–90	–
2	**Sub-Dominant Forbs**			432–1116	
	Forb, annual	2FA	*Forb, annual*	90–180	–
	Forb, perennial	2FP	*Forb, perennial*	90–180	–
	common yarrow	ACMI2	*Achillea millefolium*	18–54	–
	silverleaf milkvetch	ASAR4	*Astragalus argophyllus*	18–54	–
	shortstem buckwheat	ERBR5	*Eriogonum brevicaule*	18–54	–
	sticky purple geranium	GEVI2	*Geranium viscosissimum*	18–54	–
	showy goldeneye	HEMU3	*Heliomeris multiflora*	18–54	–
	Nevada pea	LALA3	*Lathyrus lanszwertii*	18–54	–
	western stoneseed	LIRU4	*Lithospermum ruderale*	18–54	–
	Gray's biscuitroot	LOGR	*Lomatium grayi*	18–54	–
	tall fringed bluebells	MECI3	*Mertensia ciliata*	18–54	–
	western sweetroot	OSOC	*Osmorhiza occidentalis*	18–54	–
	Fendler's meadow-rue	THFE	*Thalictrum fendleri*	18–54	–
	tobacco root	VAED	*Valeriana edulis*	18–54	–
	mountain deathcamas	ZIEL2	*Zigadenus elegans*	18–54	–

Animal community

This site is dominanted by grasses but has enough forbs and shrubs to supply a fairly good balance of nutritious feed. It is well adapted for summer and fall use for horses, cattle and sheep. Many of the plants remain green until frost, maintaining animal gains throughout the grazing period. When this site deteriorates, mules ear dock may dominate the site and valuable forage may be lost.

Animal species occaisoinally found on this site are; songbirds, golden eagles, small rodents, snowshoe hares, small rodents, weasels, ferrets, coyotes, cougars, mule deer, elk, and black bear.

Hydrological functions

Recreational uses

This site has aesthetic value and provides open space. It is a component of a larger landscape that is good for elk and deer hunting. It has high potential for hiking, biking, horseback riding, skiing, snowshoeing and snowmobiling.

Wood products

None

Inventory data references

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

Other references

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Approval

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Rangeland health reference sheet

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

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

Indicators

1. **Number and extent of rills:** None to rare. Some very minor rill development may occur on steeper slopes (>10%) or on areas located below exposed bedrock or other water shedding areas where increased runoff may occur. Any rills present should be <1 inch deep, fairly short (<6 feet long) and somewhat widely spaced (8-10 feet). Minor rill development may be observed following major thunderstorm or spring runoff events, but they should heal during the next growing season. Vertical cracking and slickensides (due to clay soil textures) are natural components of the soils on this site and should not be mistaken for rills.

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2. **Presence of water flow patterns:** Slight. Some very minor evidence of water flow patterns may be found around perennial plant bases. They show little evidence of current erosion. They are expected to be somewhat short (3-6 feet), stable, sinuous and not connected. There may also be very minor evidence of deposition. Evidence of water flow may increase somewhat with slope and following large storm events.

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3. **Number and height of erosional pedestals or terracettes:** None to rare. Perennial vegetation shows very little evidence of erosional pedestalling (2 to 3% of individual plants). Plant roots are covered and 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. Gilgai micro-relief may be evident and is natural on this site.

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4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** 20-25% bare ground. Soil surface is typically covered by up to 30% coarse fragments. Bare ground spaces should not be greater than 1 to 2 feet in diameter and should not be connected.

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5. **Number of gullies and erosion associated with gullies:** None to Very Few. A few gullies may be present in landscape settings where they transport runoff from areas of greater water flow such as exposed bedrock. These gullies will be limited to slopes exceeding 20% slope and adjacent to sites where this runoff accumulation occurs. Any gullies

present should show little sign of accelerated erosion and should be stabilized with perennial vegetation.

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6. **Extent of wind scoured, blowouts and/or depositional areas:** None. No evidence of wind generated soil movement is expected. No blowouts or depositional materials are present.

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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 > 10% and/or increased runoff resulting from heavy thunderstorms.

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8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** This site should have a soil stability rating of 5 or 6 under the plant canopies, and a rating of 4 to 5 in the interspaces. The average rating should be a 5. Soil surface texture is typically a silty clay.

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** (Herd) Soil surface 0-3 inches. Texture is a cobbly clay loam; color is yellowish brown (10YR 2/2); structure is moderate 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.

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** The clay content within the soil profile may limit infiltration during all but the most gentle storms and snowmelt periods. Perennial vegetation provides sufficient cover and spatial arrangement to intercept most raindrops and reduce raindrop splash erosion. Litter on soil surface and cryptogamic crusting, where present, protect soil surface from splash erosion and encourages a higher rate of infiltration. Good plant spatial distribution will slow runoff, allowing additional time for infiltration. Bare spaces are expected to be small and irregular in shape and are usually not connected. Vegetative structure is usually adequate to capture snow and ensure that snowmelt occurs in a controlled manner, allowing time for good infiltration, reducing runoff and erosion. When perennial grasses and shrubs decrease due to natural events, including drought, insect damage, etc., which may reduce ground cover, runoff is expected 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: Rhizomatous grasses (slender wheatgrass) > Sprouting shrubs (silver sagebrush, mountain snowberry), > Perennial bunchgrasses (mountain brome, basin wildrye)

    Sub-dominant: Perennial Forbs (northern mulesears)

Other: Perennial and annual forbs can be expected to vary widely in their expression in the plant community based upon departures from average growing conditions.

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 state. 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 a functional community phase 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 2.5 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 1700 - 1800#/acre on an average year, but could range from 1100 to 2300#/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 and/or medusahead, Canada thistle, morningglory, Russian thistle, alyssum, dock & mustard species, leafy spurge. Mulesears commonly become dominant.

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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 should be present during average and above average growing years.
