USDA Natural Resources
Conservation Service

Ecological site R048AY443UT
Mountain Shallow Loam (Mixed Conifer)

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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.

MLRA notes

Major Land Resource Area (MLRA): 048A–Southern Rocky Mountains

MLRA 48A makes up about 45,920 square miles (119,000 square kilometers) and is the southern part of the Rocky Mountains. The Southern Rocky Mountains lies east of the Colorado Plateau, south of the Wyoming Basin, west of the Great Plains, and north of the Rio Grande Rift. It is in western and central Colorado, southeastern Wyoming, eastern Utah, and northern New Mexico. The headwaters of major rivers such as the Colorado, Yampa, Arkansas, Rio Grande, North Platte and South Plate rivers are located here. This MLRA has numerous national forests, including the Medicine Bow National Forest in Wyoming; the Routt, Arapaho, Roosevelt, Pike, San Isabel, White River, Gunnison, Grand Mesa, Uncompahgre, Rio Grande, and San Juan National Forests in Colorado; the Carson National Forest and part of the Santa Fe National Forest in New Mexico. Rocky Mountain National Park also is in this MLRA.

MLRA 48A is the southern Rocky Mountains physiographic region. The Southern Rocky Mountains consist primarily of two belts of strongly sloping to precipitous mountain ranges trending north to south. Several basins, or parks, are between the belts. Some high mesas and plateaus are included. It is characterized by mountain ranges that were uplifted during the Laramide Orogeny and then had periods of glaciation. The ranges include the Sangre de Cristo Mountains, the Laramie Mountains, and the Front Range in the east and the San Juan Mountains and the Sawatch and Park Ranges in the west. The ranges are dissected by many narrow stream valleys having steep gradients. In some areas the upper mountain slopes and broad crests are covered by snowfields and glaciers. Elevation typically ranges from 6,500 to 14,400 feet (1,980 to 4,390 meters) in this area. The part of this MLRA in central Colorado includes the highest point in the Rockies, Mount Elbert, which reaches an elevation of 14,433 feet (4,400 meters). More than 50 peaks in the part of the MLRA in

Colorado are at an elevation of more than 14,000 feet (4,270 meters). Many small glacial lakes are in the high mountains.

The mountains in this area were formed mainly by crustal uplifts during the late Cretaceous and early Tertiary periods. This large MLRA can be subdivided into at least 4 large general divisions. First is the Rockies on the east side of this area are called the “Front Range,” which is a fault block that has been tilted up on edge and uplifted and is largely igneous and metamorphic geology. It was tilted up on the east edge, so there is a steep front on the east and the west side is more gently sloping and in the south east there are rocks exposed in the mountains are mostly Precambrian igneous and metamorphic rocks. Second is the tertiary rocks, primarily basalt and andesitic lava flows, tuffs, breccias, and conglomerates, are throughout this area (San Juan Mountains Area). The third division is Northwest part of the MLRA is dominantly sedimentary rock from the cretaceous/tertiary and Permian/ Pennsylvanian periods. The fourth subset is the long and narrow Sangre de Cristos mountains uplifted in the Cenozoic are between the Rio Grande rift and the great plains. Many of the highest mountain ranges were reshaped by glaciation during the Pleistocene. Alluvial fans at the base of the mountains are recharge zones for local basin and valley fill aquifers. They also are important sources of sand and gravel.

The average annual precipitation ranges predominantly from 12 to 63 inches. Summer rainfall commonly occurs as high-intensity, convective thunderstorms. About half of the annual precipitation occurs as snow in winter; this proportion increases with elevation. In the mountains, deep snowpacks accumulate throughout the winter and generally persist into spring or early summer, depending on elevation. Some permanent snowfields and small glaciers are on the highest mountain peaks. In the valleys at the lower elevations, snowfall is lighter and snowpacks can be intermittent. The average annual temperature is 26 to 54 degrees F (-3 to 12 degrees C). The freeze-free period averages 135 days and ranges from 45 to 230 days, decreasing in length with elevation. The climate of this area is strongly dependent upon elevation; precipitation is greater, and temperatures are cooler at the higher elevations. The plant communities vary with elevation, aspect and change in latitudes due to changing in precipitation kind and timing and temperature.

The dominant soil orders in this MLRA are Mollisols, Alfisols, Inceptisols, and Entisols. The soils in the area dominantly have a frigid or cryic soil temperature regime and an ustic or udic soil moisture regime. Mineralogy is typically mixed, smectitic, or paramicaceous. In areas with granite, gneiss, and schist bedrock, Glossocryalfs (Seitz, Granile, and Leadville series) and Haplocryolls (Rogert series) formed in colluvium on mountain slopes. Dystrocryepts (Leighcan and Mummy series) formed on mountain slopes and summits at the higher elevations. In areas of andesite and rhyolite bedrock, Dystrocryepts (Endlich and Whitecross series) formed in colluvium on mountain slopes. In areas of sedimentary bedrock, Haplustolls (Towave series) formed on mountain slopes at low elevations and with low precipitation. Haplocryolls (Lamphier and Razorba series), Argicryolls (Cochetopa series), and Haplocryalfs (Needleton series) formed in colluvium on mountain slopes at high elevations.

Ecological site concept

This ecological site occurs in the Uintah Basin Section of the Southern Rocky Mountain Provence which extends westward into Utah. Mountains in this area are mostly crustal uplifts that formed in the Cretaceous and Tertiary periods. Alluvial fans at the base of these mountains are recharge zones for local aquifers.

This site occurs on shallow to deep soils over limestone or sandstone bedrock. The dry surface layer color is typically brown and the surface soil textures range from very channery fine sandy loams to gravelly loams. These soils are moderately well developed, well drained, and have moderate water holding capacities. Soil temperature regime is frigid and moisture regime is ustic.

Associated sites

F048AY330UT	**Upland Shallow Stony Loam (Two-Needle Pinyon /Douglas Fir)**
R048AY322UT	**Upland Shallow Loam (Two-Needle Pinyon / Utah Juniper)**

Similar sites

F048AY330UT	**Upland Shallow Stony Loam (Two-Needle Pinyon /Douglas Fir)**

Table 1. Dominant plant species

Tree	(1) *Pinus longaeva* (2) *Pseudotsuga menziesii*
Shrub	(1) *Cercocarpus montanus* (2) *Holodiscus dumosus*
Herbaceous	(1) *Pseudoroegneria spicata*

Physiographic features

This ecological site typically occurs on hillsides, mountain back slopes and side slopes, and mesa sideslopes. Slope, aspect and elevation influence the vegetative floristics of this ecological site. Sites are located from 6,100 to over 9,300 feet in elevation. Slopes normally range from 40 to 70 percent but may occasionally be steeper.

Table 2. Representative physiographic features

Landforms	(1) Mountain slope (2) Hillside
Runoff class	Very high
Flooding frequency	None

Ponding frequency	None
Elevation	6,100–9,300 ft
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, March and August, 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 40 to 43 degrees and averages 41 degrees.

Table 3. Representative climatic features

Frost-free period (characteristic range)	
Freeze-free period (characteristic range)	
Precipitation total (characteristic range)	16-22 in
Frost-free period (average)	94 days
Freeze-free period (average)	121 days
Precipitation total (average)	

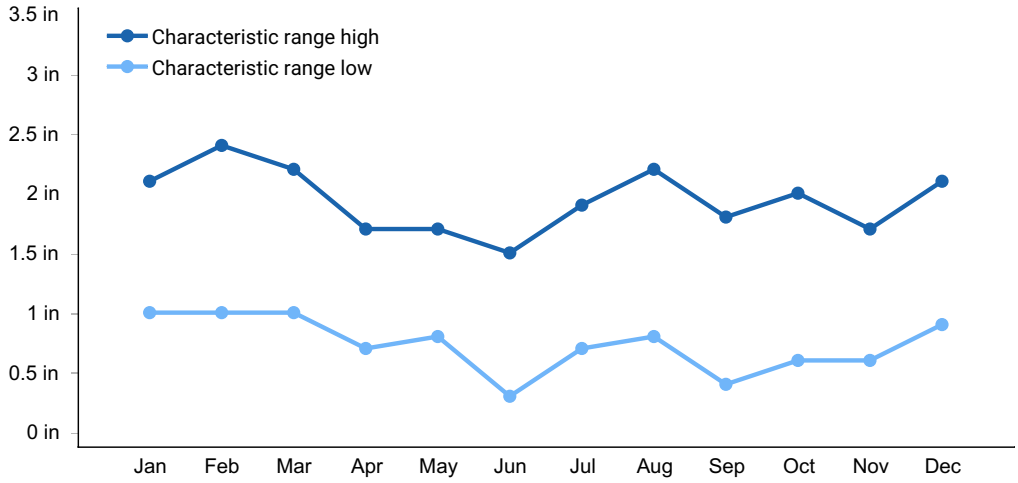


Figure 1. Monthly precipitation range

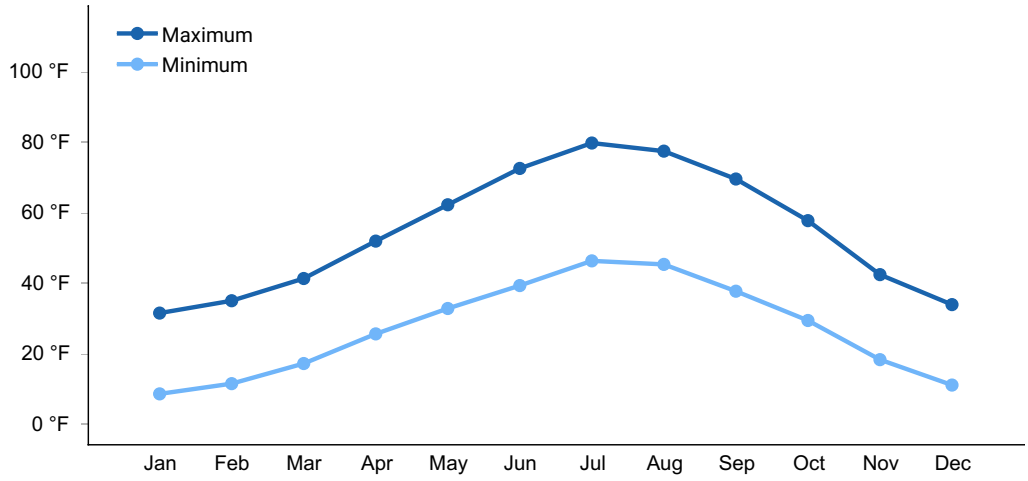


Figure 2. Monthly average minimum and maximum temperature

Influencing water features

There are no influencing water feathers found on this site.

Soil features

This site occurs on shallow over limestone or sandstone bedrock. The dry surface layer color is typically brown and the surface soil textures range from very channery fine sandy loams to gravelly loams. These soils are moderately well developed, well drained, and have moderate water holding capacities. Soil temperature regime is frigid and moisture regime is ustic.

This site has been used in the following soils surveys and has been correlated to the following components:

UT013—Duchesne: Paunsaugunt, Tosca.
UT653-Uintah and Ouray Indian Reservation: Paunsaugunt, Tosca.

Typical Soil Profile: (Paunsaugunt).
A1 0-3 inches; gravelly loam; strongly calcareous; disseminated calbonates; slightly alkaline.
A2 3-8 inches; cobbly sandy loam; strongly calcareous; disseminated calbonates; slighty alkaline.
c 8 to 15 inches; very cobbly sandy loam; strongly calcareous; disseminated calbonates; moderately alkaline.
R—15 inches; limestone bedrock.

Table 4. Representative soil features

Parent material	(1) Alluvium–limestone and sandstone (2) Residuum–limestone and sandstone

Surface texture	(1) Very channery fine sandy loam (2) Gravelly loam
Drainage class	Well drained
Permeability class	Moderate to moderately rapid
Depth to restrictive layer	10–20 in
Soil depth	10–20 in
Surface fragment cover <=3"	30%
Surface fragment cover >3"	0%
Calcium carbonate equivalent (Depth not specified)	2–15%
Soil reaction (1:1 water) (Depth not specified)	7.4–8.4
Subsurface fragment volume <=3" (Depth not specified)	33%
Subsurface fragment volume >3" (Depth not specified)	6%

Ecological dynamics

This site developed under the Uintah Basin Section of the Southern Rocky Mountain Provence ecological conditions and the natural influences of herbivory, infrequent fire and climate. This site occurs on very steep slopes. The soil surface is covered by channers and is often loose and unstable. Species composition is generally dominated by a mixed conifer overstory canopy with bristlecone pine, limber pine, two-needle pinyon and Douglas fir occurring most often. Alderleaf mountain mahogany dominates the shrub layer with lesser amounts rockspirea, Utah serviceberry and mountain snowberry commonly present. Perennial herbaceous species occurrence is directly related to canopy density with bluebunch wheatgrass, Salina wildyre and geyer sedge found most often.

Evidence indicates that this site historically maintained a long burn cycle. Very old bristlecone pine, Douglas fir and two-needle pinyon are common on most undisturbed sites. Over time, their canopies increase in density, reducing understory vegetation dramatically. Following stand removing fire, the understory vegetation flourishes, but over time is again reduced.

The bristlecone pine and other coniferous trees on this site appear to be self sustaining with young seedlings and saplings found in most understories. Growth rate is very slow with a typical tree of 60 feet in height being well over 200 years old. Where old trees have been harvested, younger growth is slowly replacing them.

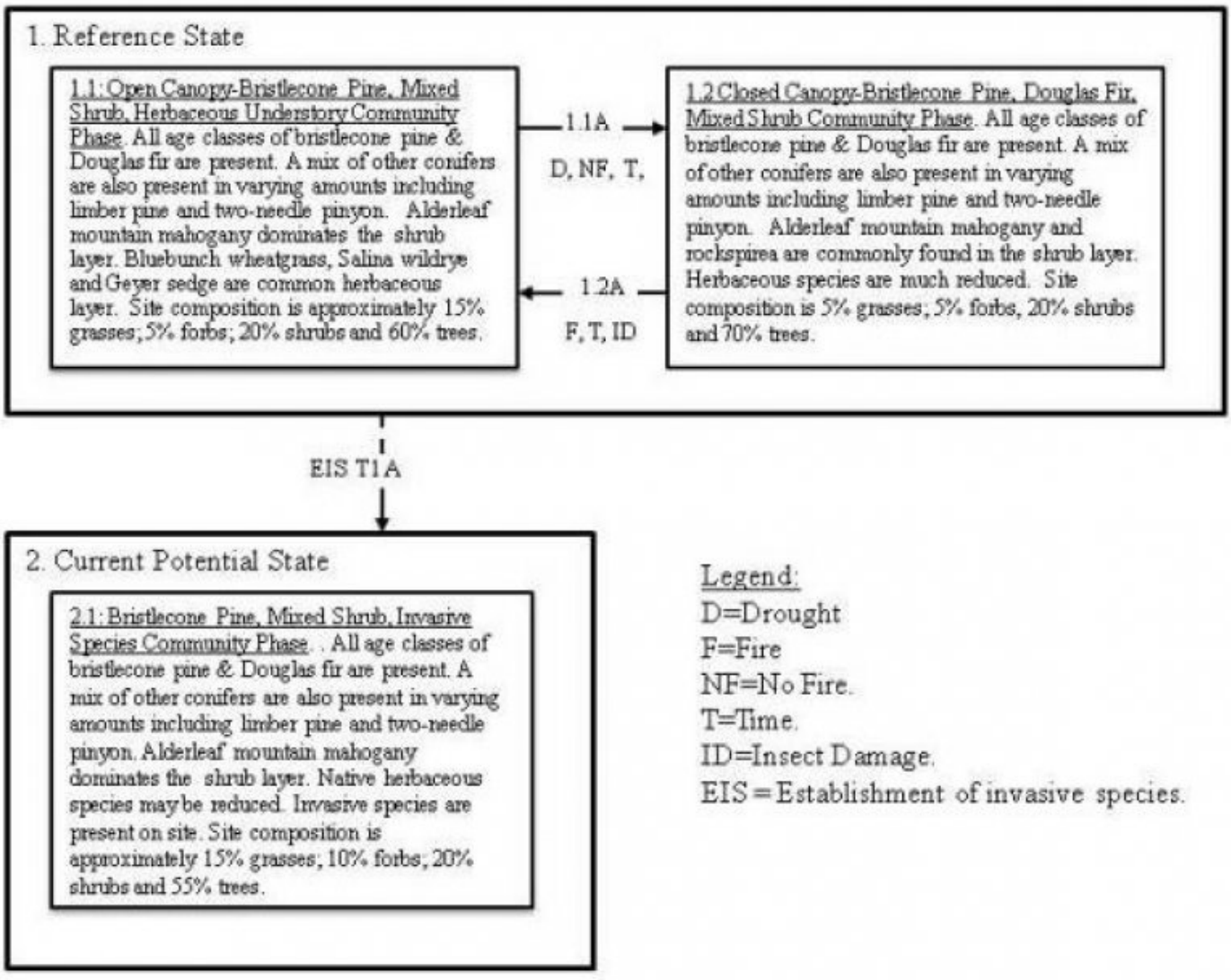
Severe drought and insect damage can affect two-needle pinyon in some locations,

causing it to die out. This event can allow for an increase in shrubs and herbaceous species during periods when wetter years return.

As vegetative communities respond to changes caused by natural or man-made events that cause them to cross ecological thresholds, a return to previous state may not be possible. The amount of effort needed to affect desired vegetative shifts depends on a site's 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

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 mixed conifer overstory canopy with bristlecone pine, limber pine, two-needle pinyon and Douglas fir occurring most often. Alderleaf mountain mahogany dominates the shrub layer with lesser amounts rockspirea, Utah serviceberry and mountian snowberry commonly present. Perennial herbaceous species occurrence is directly related to canopy density with bluebunch wheatgrass, Salina wildyre and geyer sedge found most often. 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. Typically, in the reference state, this ecological site will naturally fluctuate between community phases 1.1 and 1.2. Reference State: Plant communities influenced by canopy density, long term weather fluctuations, and periodic fire. Indicators: A community dominated by bristlecone pine, Douglas fir, two-needle pinyon, and alderleaf mountain mahogany. The density of the overstory canopy determines the amount and composition of the other native perennial grasses, grasslikes and forbs that may be present. Feedbacks: Natural fluctuations in weather patterns that allow for a self sustaining bristlecone pine, Douglas fir, two-needle pinyon, alderleaf mountain mahogany 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
Open Canopy-Bristlecone pine, Mixed Shrub, Herbaceous Understory Community Phase.

Figure 3. Community Phase 1.1

This community phase is characterized by an overstory canopy generally dominated by a mixed conifer overstory canopy with bristle-cone pine, limber pine, two-needle pinyon and Douglas fir occurring most often. Alderleaf mountain mahogany dominates the shrub layer with lesser amounts rockspirea, Utah serviceberry and mountian snowberry commonly present. Perennial herbaceous species occurrence is directly related to canopy density with bluebunch wheatgrass, Salina wildyre and geyer sedge found most often. Other perennial grasses, shrubs, and forbs are also often present. Air dry composition of this site is approximately 15 percent grasses, 5 percent forbs, 20 percent shrubs and 60 percent trees. Bare ground is variable (5-30%) depending on litter and biological crust cover, which are also variable (10-40%) and surface rock fragments (0-50%). 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 (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Tree	150	250	350
Shrub/Vine	150	175	200
Grass/Grasslike	100	150	200
Forb	50	75	100
Total	**450**	**650**	**850**

Table 6. Ground cover

Tree foliar cover	35-55%
Shrub/vine/liana foliar cover	20-25%
Grass/grasslike foliar cover	15-20%
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	25-40%

Community 1.2
Closed Canopy- Bristlecone Pine, Douglas fir, Mixed Shrub Community Phase.

Figure 5. Community Phase 1.2

This community phase is characterized by an dense overstory canopy dominated by bristlecone pine, Douglas fir and two-needle pinyon, lesser amounts of limber pine, Utah and Rocky Mountain juniper are also present. Alderleaf mountain mahogany, rockspirea, Utah serviceberry and mountain snowberry are the most common understory shrubs. Grasses and grasslikes are much reduced or missing. There present they may include bluebunch wheatgrass, Salina wildrye and Geyer sedge. Other perennial grasses, shrubs, and forbs may also be present in small amounts. Air dry composition of this site is approximately 5 percent grasses, 5 percent forbs, 20 percent shrubs and 70 percent trees. Bare ground is variable (5-30%) depending on litter and biological crust cover, which are also variable (10-40%) and surface rock fragments (0-50%). 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 7. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Tree	210	340	470
Shrub/Vine	150	175	200
Grass/Grasslike	50	75	100
Forb	40	60	80
Total	**450**	**650**	**850**

Table 8. Ground cover

Tree foliar cover	50-70%
Shrub/vine/liana foliar cover	15-20%
Grass/grasslike foliar cover	5-10%
Forb foliar cover	5-10%
Non-vascular plants	0%
Biological crusts	0%
Litter	20-30%
Surface fragments >0.25" and <=3"	0%
Surface fragments >3"	0%
Bedrock	0%
Water	0%
Bare ground	15-20%

Pathway 1.1A
Community 1.1 to 1.2

Open Canopy-Bristlecone pine, Mixed Shrub, Herbaceous Understory Community Phase.

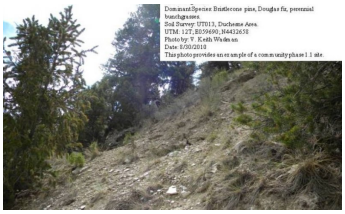
Closed Canopy- Bristlecone Pine, Douglas fir, Mixed Shrub Community Phase.

This community pathway occurs when long-term drought and/or extended periods without fire allows canopies of bristlecone pine, Douglas fir, limber pine, two-needle pinyon and Rocky Mountain juniper to significantly increase. This closed canopy causes understory vegetation to be reduced or nearly eliminated from the site. Drought alone can also reduce

native perennial grass production and eventually eliminate them from the system.

Pathway 1.2A
Community 1.2 to 1.1

Closed Canopy- Bristlecone Pine, Douglas fir, Mixed Shrub Community Phase.



Open Canopy-Bristlecone pine, Mixed Shrub, Herbaceous Understory Community Phase.

This community pathway occurs when weather patterns return to within normal ranges and fire reduces or removes bristlecone pine, Douglas fir, and other coniferous species, significantly opening the sites canopy. Insect damage on two-needle pinyon can also cause it to be reduced on this site. This more open canopy allows understory vegetation to increase and under some circumstances, flourish on the site.

State 2
Current Potential

The current potential state is similar to the reference state, however minor amounts of invasive species are 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 mixed conifer overstory canopy with bristlecone pine, limber pine, two-needle pinyon and Douglas fir occurring most often. Alderleaf mountain mahogany dominates the shrub layer with lesser amounts Utah serviceberry, rockspirea and mountian snowberry commonly present. Perennial herbaceous species occurrence is directly related to canopy density with cheatgrass, bluebunch wheatgrass, Salina wildyre and geyer sedge found most often. All age classes of coniferous trees are present in the current potential state. Other introduced and native grasses, forbs, and shrubs may be present in the plant community. 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 wildlife browsing, insect herbivory, weather fluctuations, fire periods and surface disturbances. Indicators: A community dominated by bristlecone pine, Douglas fir, two-needle pinyon and alderleaf mountain mahogany. The density of the overstory canopy determines the amount and composition of the other introduced and native grasses, grasslikes and forbs that may be present. Feedbacks: Natural fluctuations in weather patterns that allow for a self sustaining Douglas fir, two-needle pinyon, Utah juniper, alderleaf mountain mahogany and native grass and grasslike community. Insect herbivory, more frequent fires, or other

disturbances that may allow for the increase 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 flourish.

Community 2.1
Bristlecone Pine, Mixed Shrub, Invasive Species Community Phase.

Figure 7. Community Phase 2.1

This community phase is characterized by an overstory canopy generally dominated by a mixed conifer overstory canopy with bristle-cone pine, limber pine, two-needle pinyon and Douglas fir occurring most often. Alderleaf mountain mahogany dominates the shrub layer with lesser amounts rockspirea, Utah serviceberry and mountian snowberry commonly present. Perennial herbaceous species occurrence is directly related to canopy density with cheatgrass, bluebunch wheatgrass, Salina wildyre and geyer sedge found most often. Other perennial grasses, shrubs, and forbs are also often present. Air dry composition of this site is approximately 15 percent grasses, 10 percent forbs, 20 percent shrubs and 55 percent trees. Bare ground is variable (5-30%) depending on litter and biological crust cover, which are also variable (10-40%) and surface rock fragments (0-50%). 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 9. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Tree	150	250	350
Shrub/Vine	150	175	200
Grass/Grasslike	100	150	200
Forb	50	75	100
Total	**450**	**650**	**850**

Table 10. Ground cover

Tree foliar cover	35-55%
Shrub/vine/liana foliar cover	20-25%
Grass/grasslike foliar cover	15-20%
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	25-40%

Transition T1A
State 1 to 2

This transitional pathway occurs when non-native, invasive species invade the site, the perennial herbaceous community is often reduced allowing species such as cheatgrass, and other weeds to become established. Once invasive species occupy the site, a threshold has been crossed. Cheatgrass, however, has been known to become established in healthy communities on this site.

Additional community tables

Table 11. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					

1	**Dominant Grass/Grasslikes**			50–75	
	saline wildrye	LESA4	*Leymus salinus*	40–60	–
	bluebunch wheatgrass	PSSP6	*Pseudoroegneria spicata*	40–60	–
	Geyer's sedge	CAGE2	*Carex geyeri*	20–40	–
2	**Sub-Dominant**			30–60	
	Letterman's needlegrass	ACLE9	*Achnatherum lettermanii*	10–20	–
	blue grama	BOGR2	*Bouteloua gracilis*	10–20	–
	squirreltail	ELEL5	*Elymus elymoides*	10–20	–
	slender wheatgrass	ELTR7	*Elymus trachycaulus*	10–20	–
	western wheatgrass	PASM	*Pascopyrum smithii*	10–20	–
	James' galleta	PLJA	*Pleuraphis jamesii*	10–20	–
	muttongrass	POFE	*Poa fendleriana*	10–20	–
	Sandberg bluegrass	POSE	*Poa secunda*	10–20	–
Forb					
3	**Forbs**			60–100	
	low pussytoes	ANDI2	*Antennaria dimorpha*	10–20	–
	Holboell's rockcress	ARHO2	*Arabis holboellii*	10–20	–
	woollypod milkvetch	ASPU9	*Astragalus purshii*	10–20	–
	aridland goosefoot	CHDE	*Chenopodium desiccatum*	10–20	–
	Douglas' dustymaiden	CHDO	*Chaenactis douglasii*	10–20	–
	narrowstem cryptantha	CRGR3	*Cryptantha gracilis*	10–20	–
	roundspike cryptantha	CRHU2	*Cryptantha humilis*	10–20	–
	sulphur-flower buckwheat	ERUM	*Eriogonum umbellatum*	10–20	–
	northern bedstraw	GABO2	*Galium boreale*	10–20	–
	scarlet gilia	IPAG	*Ipomopsis aggregata*	10–20	–
	hoary tansyaster	MACA2	*Machaeranthera canescens*	10–20	–
	sweetcicely	OSBE	*Osmorhiza berteroi*	10–20	–
	rock goldenrod	PEPU7	*Petradoria pumila*	10–20	–
	Whipple's penstemon	PEWH	*Penstemon whippleanus*	10–20	–

	spiny phlox	PHHO	*Phlox hoodii*	10–20	–
	longleaf phlox	PHLO2	*Phlox longifolia*	10–20	–
	basindaisy	PLIN7	*Platyschkuhria integrifolia*	10–20	–
	woolly plantain	PLPA2	*Plantago patagonica*	10–20	–
	stemless mock goldenweed	STAC	*Stenotus acaulis*	10–20	–
	longstalk clover	TRLO	*Trifolium longipes*	10–20	–
	American vetch	VIAM	*Vicia americana*	10–20	–
Shrub/Vine					
4	**Dominant Shrubs**			80–120	
	alderleaf mountain mahogany	CEMO2	*Cercocarpus montanus*	80–120	–
	rockspirea	HODU	*Holodiscus dumosus*	50–75	–
5	**Sub-Dominant Shrubs**			60–100	
	antelope bitterbrush	PUTR2	*Purshia tridentata*	20–30	–
	blue elderberry	SANIC5	*Sambucus nigra ssp. cerulea*	10–20	–
	mountain snowberry	SYOR2	*Symphoricarpos oreophilus*	10–20	–
	narrowleaf yucca	YUAN2	*Yucca angustissima*	10–20	–
	Utah serviceberry	AMUT	*Amelanchier utahensis*	10–20	–
	basin big sagebrush	ARTRT	*Artemisia tridentata ssp. tridentata*	10–20	–
	shadscale saltbush	ATCO	*Atriplex confertifolia*	10–20	–
	yellow rabbitbrush	CHVI8	*Chrysothamnus viscidiflorus*	10–20	–
	western white clematis	CLLI2	*Clematis ligusticifolia*	10–20	–
	mormon tea	EPVI	*Ephedra viridis*	10–20	–
	bastardsage	ERWR	*Eriogonum wrightii*	10–20	–
	spiny hopsage	GRSP	*Grayia spinosa*	10–20	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	10–20	–
	Mexican cliffrose	PUME	*Purshia mexicana*	10–20	–
Tree					
6	**Dominant Trees**			150–300	
	twoneedle pinyon	PIED	*Pinus edulis*	75–150	–

	Great Basin bristlecone pine	PILO	*Pinus longaeva*	75–150	–
	Douglas-fir	PSME	*Pseudotsuga menziesii*	75–150	–
	limber pine	PIFL2	*Pinus flexilis*	25–50	–
	white fir	ABCO	*Abies concolor*	25–50	–
	Utah juniper	JUOS	*Juniperus osteosperma*	25–50	–
	Rocky Mountain juniper	JUSC2	*Juniperus scopulorum*	25–50	–

Table 12. Community 1.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	**Dominant Grass/Grasslikes**			30–60	
	saline wildrye	LESA4	*Leymus salinus*	20–40	–
	bluebunch wheatgrass	PSSP6	*Pseudoroegneria spicata*	20–40	–
	Geyer's sedge	CAGE2	*Carex geyeri*	10–20	–
2	**Sub-Dominant Grasses/Grasslikes**			20–40	
	Letterman's needlegrass	ACLE9	*Achnatherum lettermanii*	5–10	–
	blue grama	BOGR2	*Bouteloua gracilis*	5–10	–
	squirreltail	ELEL5	*Elymus elymoides*	5–10	–
	slender wheatgrass	ELTR7	*Elymus trachycaulus*	5–10	–
	western wheatgrass	PASM	*Pascopyrum smithii*	5–10	–
	James' galleta	PLJA	*Pleuraphis jamesii*	5–10	–
	muttongrass	POFE	*Poa fendleriana*	5–10	–
	Sandberg bluegrass	POSE	*Poa secunda*	5–10	–
Forb					
3	**Forbs**			40–80	
	low pussytoes	ANDI2	*Antennaria dimorpha*	5–10	–
	Holboell's rockcress	ARHO2	*Arabis holboellii*	5–10	–
	woollypod milkvetch	ASPU9	*Astragalus purshii*	5–10	–
	aridland goosefoot	CHDE	*Chenopodium desiccatum*	5–10	–
	Douglas' dustymaiden	CHDO	*Chaenactis douglasii*	5–10	–

	narrowstem cryptantha	CRGR3	*Cryptantha gracilis*	5–10	–
	roundspike cryptantha	CRHU2	*Cryptantha humilis*	5–10	–
	sulphur-flower buckwheat	ERUM	*Eriogonum umbellatum*	5–10	–
	northern bedstraw	GABO2	*Galium boreale*	5–10	–
	scarlet gilia	IPAG	*Ipomopsis aggregata*	5–10	–
	hoary tansyaster	MACA2	*Machaeranthera canescens*	5–10	–
	sweetcicely	OSBE	*Osmorhiza berteroi*	5–10	–
	rock goldenrod	PEPU7	*Petradoria pumila*	5–10	–
	Whipple's penstemon	PEWH	*Penstemon whippleanus*	5–10	–
	basindaisy	PLIN7	*Platyschkuhria integrifolia*	5–10	–
	woolly plantain	PLPA2	*Plantago patagonica*	5–10	–
	stemless mock goldenweed	STAC	*Stenotus acaulis*	5–10	–
	longstalk clover	TRLO	*Trifolium longipes*	5–10	–
	American vetch	VIAM	*Vicia americana*	5–10	–
	spiny phlox	PHHO	*Phlox hoodii*	5–10	–
	longleaf phlox	PHLO2	*Phlox longifolia*	5–10	–
Shrub/Vine					
4	**Dominant Shrub**			60–80	
	alderleaf mountain mahogany	CEMO2	*Cercocarpus montanus*	60–80	–
	rockspirea	HODU	*Holodiscus dumosus*	30–60	–
5	**Sub-Dominant Shrubs**			40–80	
	Utah serviceberry	AMUT	*Amelanchier utahensis*	5–10	–
	basin big sagebrush	ARTRT	*Artemisia tridentata ssp. tridentata*	5–10	–
	shadscale saltbush	ATCO	*Atriplex confertifolia*	5–10	–
	yellow rabbitbrush	CHVI8	*Chrysothamnus viscidiflorus*	5–10	–
	western white clematis	CLLI2	*Clematis ligusticifolia*	5–10	–
	mormon tea	EPVI	*Ephedra viridis*	5–10	–

	bastardsage	ERWR	*Eriogonum wrightii*	5–10	–
	spiny hopsage	GRSP	*Grayia spinosa*	5–10	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	5–10	–
	Mexican cliffrose	PUME	*Purshia mexicana*	5–10	–
	antelope bitterbrush	PUTR2	*Purshia tridentata*	5–10	–
	blue elderberry	SANIC5	*Sambucus nigra ssp. cerulea*	5–10	–
	mountain snowberry	SYOR2	*Symphoricarpos oreophilus*	5–10	–
	narrowleaf yucca	YUAN2	*Yucca angustissima*	5–10	–
Tree					
6	**Dominant Trees**			250–400	
	twoneedle pinyon	PIED	*Pinus edulis*	125–200	–
	Great Basin bristlecone pine	PILO	*Pinus longaeva*	125–200	–
	Douglas-fir	PSME	*Pseudotsuga menziesii*	125–200	–
	limber pine	PIFL2	*Pinus flexilis*	50–75	–
	Utah juniper	JUOS	*Juniperus osteosperma*	50–75	–
	Rocky Mountain juniper	JUSC2	*Juniperus scopulorum*	50–75	–

Table 13. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	**Dominant Grass/Grasslikes**			50–75	
	cheatgrass	BRTE	*Bromus tectorum*	40–80	–
	bluebunch wheatgrass	PSSP6	*Pseudoroegneria spicata*	40–60	–
	Geyer's sedge	CAGE2	*Carex geyeri*	20–40	–
	saline wildrye	LESA4	*Leymus salinus*	20–40	–
2	**Sub-Dominant Grasses/Grasslikes**			30–60	
	Letterman's needlegrass	ACLE9	*Achnatherum lettermanii*	10–20	–
	blue grama	BOGR2	*Bouteloua gracilis*	10–20	–
	squirreltail	ELEL5	*Elymus elymoides*	10–20	–
	slender wheatgrass	ELTR7	*Elymus trachycaulus*	10–20	–

	western wheatgrass	PASM	*Pascopyrum smithii*	10–20	–
	James' galleta	PLJA	*Pleuraphis jamesii*	10–20	–
	muttongrass	POFE	*Poa fendleriana*	10–20	–
	Sandberg bluegrass	POSE	*Poa secunda*	10–20	–
Forb					
3	**Forbs**			60–100	
	desert madwort	ALDE	*Alyssum desertorum*	10–20	–
	annual ragweed	AMAR2	*Ambrosia artemisiifolia*	10–20	–
	low pussytoes	ANDI2	*Antennaria dimorpha*	10–20	–
	Holboell's rockcress	ARHO2	*Arabis holboellii*	10–20	–
	woollypod milkvetch	ASPU9	*Astragalus purshii*	10–20	–
	aridland goosefoot	CHDE	*Chenopodium desiccatum*	10–20	–
	Douglas' dustymaiden	CHDO	*Chaenactis douglasii*	10–20	–
	narrowstem cryptantha	CRGR3	*Cryptantha gracilis*	10–20	–
	roundspike cryptantha	CRHU2	*Cryptantha humilis*	10–20	–
	herb sophia	DESO2	*Descurainia sophia*	10–20	–
	sulphur-flower buckwheat	ERUM	*Eriogonum umbellatum*	10–20	–
	northern bedstraw	GABO2	*Galium boreale*	10–20	–
	scarlet gilia	IPAG	*Ipomopsis aggregata*	10–20	–
	hoary tansyaster	MACA2	*Machaeranthera canescens*	10–20	–
	sweetcicely	OSBE	*Osmorhiza berteroi*	10–20	–
	rock goldenrod	PEPU7	*Petradoria pumila*	10–20	–
	Whipple's penstemon	PEWH	*Penstemon whippleanus*	10–20	–
	spiny phlox	PHHO	*Phlox hoodii*	10–20	–
	longleaf phlox	PHLO2	*Phlox longifolia*	10–20	–
	basindaisy	PLIN7	*Platyschkuhria integrifolia*	10–20	–
	woolly plantain	PLPA2	*Plantago patagonica*	10–20	–
	Russian thistle	SAKA	*Salsola kali*	10–20	–
	stemless mock	STAC	*Stenotus acaulis*	10–20	–

	goldenweed				
	longstalk clover	TRLO	*Trifolium longipes*	10–20	–
	American vetch	VIAM	*Vicia americana*	10–20	–
	tall tumblemustard	SIAL2	*Sisymbrium altissimum*	10–20	–
Shrub/Vine					
4	**Dominant Shrub**			80–120	
	alderleaf mountain mahogany	CEMO2	*Cercocarpus montanus*	60–90	–
	rockspirea	HODU	*Holodiscus dumosus*	40–60	–
5	**Sub-Dominant Shrubs**			60–100	
	rubber rabbitbrush	ERNA10	*Ericameria nauseosa*	20–40	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	20–40	–
	antelope bitterbrush	PUTR2	*Purshia tridentata*	20–30	–
	blue elderberry	SANIC5	*Sambucus nigra ssp. cerulea*	10–20	–
	mountain snowberry	SYOR2	*Symphoricarpos oreophilus*	10–20	–
	narrowleaf yucca	YUAN2	*Yucca angustissima*	10–20	–
	bastardsage	ERWR	*Eriogonum wrightii*	10–20	–
	spiny hopsage	GRSP	*Grayia spinosa*	10–20	–
	Mexican cliffrose	PUME	*Purshia mexicana*	10–20	–
	Utah serviceberry	AMUT	*Amelanchier utahensis*	10–20	–
	basin big sagebrush	ARTRT	*Artemisia tridentata ssp. tridentata*	10–20	–
	shadscale saltbush	ATCO	*Atriplex confertifolia*	10–20	–
	yellow rabbitbrush	CHVI8	*Chrysothamnus viscidiflorus*	10–20	–
	mormon tea	EPVI	*Ephedra viridis*	10–20	–
Tree					
6	**Dominant Trees**			150–300	
	Douglas-fir	PSME	*Pseudotsuga menziesii*	75–150	–
	twoneedle pinyon	PIED	*Pinus edulis*	50–100	–
	limber pine	PIFL2	*Pinus flexilis*	50–100	–
	Great Basin bristlecone pine	PILO	*Pinus longaeva*	50–100	–
	Utah juniper	JUOS	*Juniperus osteosperma*	25–50	–
	Rocky Mountain	JUSC2	*Juniperus scopulorum*	25–50	–

	Rocky Mountain juniper	JUSCO2	*Juniperus scopulorum*	20-30	

Animal community

--Wildlife Interpretation--
The very steep slopes and scarcity of water on this site limits 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, wood peckers, and corvids will use this site for nesting and foraging. Several species of rodents occupy this site including desert cottontail, black tailed jack rabbit, 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 coniferous forest canopy growing on very steep slopes. Common shrubs include alderleaf mountain mahogany, Utah serviceberry, and mountain snoberry. Grasses include Salina wildrye 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.

Hydrological functions

The soils associated with this ecological site are generally in Hydrologic Soil Group D due to the shallow depth (NRCS National Engineering Handbook). These soils are saturated quickly due to high infiltration rates and shallow depth; once soils are saturated, run off 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. Fire can 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

Recreation activities include aesthetic value and good opportunities for hiking and hunting. Trees can provide excellent screening values for camping and picnicking. In good condition there are several forbs and shrubs that bloom in the spring. Shallow soils and

steep slopes limit this site’s ability to be used for vacation homes, other residences, or ponds.

Wood products

Both bristlecone pine Douglas fir have low Site Index ratings (40 to 60) on this site, its wood can be can be harvested for many types of building materials. The steep slopes and shallow soils make logging very difficult, however. All age classes of fir trees are present in healthy communities but a return to a mature forest is very slow because of its slow growth habit. Two-needle pinyon and Utah juniper can provide firewood and fence posts where growth is sufficient and regulations allow for such use.

Other information

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

Woolly locoweed is toxic to all classes of livestock and wildlife. Locoweed is palatable and has a similar nutrient value as alfalfa, which may cause animals to consume it even when other forage is available. Locoweed contains swainsonine (indolizdine 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”.

--Invasive Plant Communities--
As ecological conditions deteriorate and perennial vegetation decreases due to disturbance (fire, drought, erosion, etc.) annual forbs and grasses can invade the site. Of particular concern in semi-arid environments are annual invaders including, cheatgrass 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 the 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. Many semi-desert communities in the Colorado Plateau may have evolved without a significient influence of fire. However, a year of exceptionally heavy winter rains can generate enough fuels by producing heavy stands of annual forbs and grasses to carry fire. When fires do occur, the effect on the plant community may be extreme due to the harsh environment and slow rate of recovery.

There is no evidence that this site historically mainained a short burn frequency. Only a

few species show fire scars and can be aged. This ecological site is comprised of scatterd trees with bare interspaces to patchy occurrence of grasses and shrubs, which is unlikely to carry a fire unless under conditions of high winds, high temperature, and low humidity. Currently, burning is not a recommended brush management tool. If annual grasses or forbs dominate the area after disturbance, re-vegetating efforts could be hampered due to several factors including an increase in fire frequency.

Inventory data references

Data supporting this ecological site was derived from historic inventories by USDA range professionals.

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,

Howard, Janet L. 2003. Atriplex canescens. In: Fire Effects Information System. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: http://www.fs.fed.us/database/feis/. Accessed on February 25, 2008.

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

V. Keith Wadman

Approval

Kirt Walstad, 4/02/2025

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	12/07/2009
Approved by	Kirt Walstad
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** Very few. Due to the surface rock 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.

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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.

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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. Interspaces between any well developed biological soil crusts resemble pedestals and may be up to 2 inches high. 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).

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4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** 25 – 40 %. Most bare ground is associated with water flow patterns, rills, and gullies. Soil is covered by up to 50 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.

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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.

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

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

steepness of slope being between 50 to 80 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 trees.

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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):** 80 to 90% of this site should have an erosion rating of 3 or 4. 10 to 20% may have a rating of 2 to 3. The average should be a 4. Surface texture is gravelly loam to very channery sandy loam. Vegetation cover, litter, biological soil crusts and surface rock reduce erosion.

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Soil surface is 3 inches deep. Structure is weak thin platy vesicular crust over very fine granular material. Color is dark brown (10YR 3/3). 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.

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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 trees and accumulating litter at base of trees appear to create a micro-topography that may enhance development of water flow patterns below the drip line of the canopy. Significant increases in coniferous canopy (1.2 in the reference state) reduces understory vegetation causing an associated increase in runoff.

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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. 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.

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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: Dominance by average annual production: Trees (bristlecone pine, Douglas fir) > Shrubs (alderleaf mountain mahogany)> Cool season perennial grasses (blusbunch wheatgrass, Salina wildrye).

    Sub-dominant: Trees (limber pine, two-needle pinyon, Rocky Mountain juniper) > Shrubs (rockspirea, Utah serviceberry) > Grasses (slender wheatgress).

    Other: Biological soil crust is variable in it's expression where present on this site and is measured as a component of ground cover.

    Additional: Following a recent disturbance such as fire, drought, or insects that removes woody vegetation, forbs and perennial grasses (herbaceous species) may dominate the community for a time. If a disturbance has not occurred for an extended period of time, woody species may continue to increase crowding out the perennial herbaceous understory species. In either case, 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):** In general, a mix of age classes may be expected with a few dead and decadent plants present.

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14. **Average percent litter cover (%) and depth (in):** Litter cover 10-15%. Depth is highly variability due to slope and the stability of the soil surface.

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 550-650 #/acre on an average year.

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

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