USDA Natural Resources Conservation Service

Ecological site R048AA235CO
Dry Exposure Gunnison Basin LRU

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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). It is in the Southern Rocky Mountains province, which is east of the Colorado Plateau, south of the Wyoming Basin, west of the Great Plains, and north of the Rio Grande rift. MLRA 48A is in western and central Colorado, southeastern Wyoming, eastern Utah, and northern New Mexico. The headwaters of major rivers, including the Colorado, Yampa, Arkansas, Rio Grande, North Platte, and South Platte Rivers are in this MLRA. It 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; and 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 in 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. The mountains were uplifted during the Laramide orogeny and then were subject to periods of glaciation. The ranges include the Sangre de Cristo Mountains, Laramie Mountains, and Front Range in the east and the San Juan Mountains and Sawatch and Park Ranges in the west. The ranges are dissected by many narrow stream valleys that have steep gradients. In some areas, the upper mountain slopes and broad crests are covered by snowfields and glaciers. Elevation of the MLRA typically is 6,500 to 14,400 feet (1980 to 4390 meters). The part of the MLRA in central Colorado includes the highest point in the Rocky Mountains, Mount Elbert, which reaches an elevation of 14,433 feet (4400 meters). More than 50 peaks in this part of the MLRA are at

an elevation of more than 14,000 feet (4270 meters). Many small glacial lakes are in the high mountains.

The mountains in this MLRA were formed mainly by crustal uplifts during the late Cretaceous and early Tertiary periods. This large MLRA can be subdivided into at least four general divisions. The first division includes the Rocky Mountains in the eastern part of this area, called the Front Range. This range is a fault block that has been tilted on edge and uplifted and is dominantly igneous and metamorphic rock. It was tilted on the east edge, so a steep front is on the east side and more gentle slopes are on the west side. In the southeast part, the exposed rock is mostly Precambrian igneous and metamorphic. The second division is the tertiary rock, primarily basalt and andesitic lava flows, tuff, breccia, and conglomerate, throughout the San Juan Mountains area . The third division is the northwest part of the MLRA, which is dominantly sedimentary rock from the Cretaceous and Tertiary periods and the Permian and Pennsylvanian periods. The fourth division is the long, narrow Sangre de Cristo Mountains uplifted during the Cenozoic era 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 and are an important source of sand and gravel.

The average annual precipitation is dominantly 12 to 63 inches. Summer rainfall commonly occurs as high-intensity, convective thunderstorms. About one-half of the annual precipitation is received as snow in winter; the proportion increases as elevation increases. In the mountains, deep snowpack accumulates in winter and generally persists until spring or early in 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 snowpack may be intermittent. The average annual temperature is 26 to 54 degrees F (-3 to 12 degrees C). The freeze-free period averages 135 days, but it ranges from 45 to 230 days, decreasing in length as elevation increases. The climate of this MLRA varies according to the elevation. Precipitation is higher and temperatures are cooler at the higher elevations. The plant communities vary according to elevation, aspect, and latitude due to variations in the kind and timing of the precipitation and the 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 typically is mixed, smectitic, or paramicaceous. In areas of granite, gneiss, and schist bedrock, Glossocryalfs (Seitz, Granile, and Leadville series) and Haplocryolls (Rogert series) formed in colluvium on the mountain slopes and 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 the mountain slopes. In areas of sedimentary bedrock, Haplustolls (Towave series) formed on the mountain slopes at low elevations that receive a low amount of precipitation. Haplocryolls (Lamphier and Razorba series), Argicryolls (Cochetopa series), and Haplocryalfs (Needleton series) formed in

colluvium on the mountain slopes at high elevations.

LRU notes

This site occurs only in the Gunnison Basin Land Resource Unit. The Gunnison Basin is a valley with hills that occurs along the frigid/cryic temperature break and the aridic bordering on ustic/typic ustic climate break. Gunnison Basin has 5 dominant ecological sites.

The lower elevations are in the dry mountain ecological site climate zone and the upper elevations are in the mountain ecological site climate zone. Aspect and wind directions further complicates where plant communities occur in the basin. Southern aspects tend to be dry and warmer and Dry Mountain Loam (R048AA231CO) usually can be found on these aspects at middle elevations in the basin. Mountain Loam (R048AA228CO) occurs on the Northern and eastern aspects and depression areas were the wind blows the snow too. Thus, creating a higher effective precipitation at lower and middle elevations in the Basin. Dry exposure (R048AA235CO) is found on the southern most aspects and landscape positions where it is windswept from moisture that is received. Mountain Swale and Mountain Meadows occur in the draws where the snow is deposited during the winter. Mountain Swale (R048AY245CO) received extra water only during snow melt and large precipitation events. Mountain Meadows (R048AA241CO) has a water table year-round.

Classification relationships

Natural Resources Conservation Service (NRCS):
Major Land Resource Area 48A, Southern Rocky Mountains (USDA-NRCS, 2006).

U.S. Forest Service (USFS):
M331G–South-Central Highlands Section Southern Rocky Mountain Steppe - Open Woodland - Coniferous Forest - Alpine Meadow

M331H–North-Central Highlands and Rocky Mountain Section Southern Rocky Mountain Steppe - Open Woodland - Coniferous Forest - Alpine Meadow

M331I–Northern Parks and Ranges Section Southern Rocky Mountain Steppe - Open Woodland - Coniferous Forest - Alpine Meadow

Environmental Protection Agency (EPA):
21b–Crystalline Subalpine Forests, 21c–Crystalline Mid-Elevations Forests, 21d–Foothill Shrublands, 21f–Sedimentary Mid-Elevation
Forests, and 21h–Volcanic Mid-Elevation Forests < 21 Southern Rockies < 6.2 Western Cordillera < 6 Northwestern Forested Mountains North American Deserts (Griffith, 2006)

U.S. Geological Survey (USGS):
Southern Rocky Mountain Province

Ecological site concept

The description of the Dry Exposure Gunnison Basin LRU ecological site was drafted from the description of the Dry Exposure range site (R048XY235CO, August 1975). The original concept was expanded based on the soil temperature and moisture regimes and the climate to cover the entire western slope of Colorado. The concept for this site was derived from data collected in the Gunnison Basin land resource unit of Colorado.

This site in the Gunnison Basin is on hills and ridges. The associated soils are very shallow or shallow and loamy-skeletal or loamy. They formed in residuum and slope alluvium. The site is in windswept areas of the Gunnison Basin, where the effective precipitation is lower than the actual precipitation due to aspect and wind effect. The site is a muttongrass-black sagebrush community. It has an aridic moisture regime that borders on ustic and a frigid temperature regime. The effective precipitation is 10 to 16 inches.

Associated sites

R048AA231CO	**Dry Mountain Loam Gunnison Basin LRU** Dry Mountain Loam occurs mainly hillsides. Slopes average between 5 and 25% but can range up to 45% in some areas. Soils are moderately deep (20-40 inches); fine-loamy soils derived from slope alluvium derived from rhyolite and/or sedimentary rock or residuum from granite and rhyolite. Surface textures are fine sandy loam or gravelly sandy loam with loamy subsurface with an average of 20-30% clay. It is a Wyoming Big Sagebrush - Indian Ricegrass community. It has an aridic ustic moisture regime. The effective precipitation ranges from 12 to 16 inches.
R048AA228CO	**Mountain Loam Gunnison Basin LRU** Mountain Loam occurs mainly hills, hillsides, mountainside, or mountain slopes. Slopes average between 3 and 25% but can range up to 45% in some areas. Soils are moderately deep to deep (20-60+ inches); fine-loamy soils derived from colluvium derived from rhyolite; slopes alluvium derived from rhyolite; colluvium derived from volcanic and sedimentary rock or igneous and metamorphic rock; residuum weathered from schist; or old alluvium derived from basalt and/or glacial till from basalt. Surface textures are loam, sandy loam, gravelly sandy loam, or sandy clay loam with subsurface clay content ranging from 25 to 45% clay. It is a Mountain Big Sagebrush -Arizona Fescue-needlegrass community. It has a typic ustic moisture regime. The effective precipitation ranges from 16 to 20 inches.

Similar sites

R036XY408CO	**Basin Shale** The Basin Shale site in MLRA 36 is associated with very shallow or shallow soils that support black sagebrush and bunchgrasses. The site has a mesic temperature regime.

R048AY235CO	**Dry Exposure** The Dry Exposure site was developed as a provisional ecological site that covers the entire MLRA 48A. It has a frigid or cryic temperature regime. It supports a black sagebrush-bunchgrass community, and the associated soils are shallow or very shallow.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Artemisia nova*
Herbaceous	(1) *Poa fendleriana*

Physiographic features

This ecological site is on hillsides, hills and ridges. It occurs on the windward side of ridges and on the top. Slopes range from 5 to 50 percent. It is located in windswept areas were snow is blown off in winter, exposing the plants. The downslope shape is linear or convex, and the across-slope shape is convex or linear. The characteristics of this site are ideal for black sagebrush. In North America, black sagebrush grows on rocky, windswept ridges in dry, shallow soils at elevations of 4,875 to 9,425 feet (Stubbendieck et al., 1994).

Table 2. Representative physiographic features

Landforms	(1) Ridge (2) Hill (3) Hillslope
Runoff class	High to very high
Flooding frequency	None
Ponding frequency	None
Elevation	1,486–2,873 m
Slope	5–50%
Aspect	Aspect is not a significant factor

Climatic features

The average annual precipitation is 10 to 16 inches, of which 50 percent or more is received as snow. The average total snowfall is 49.7 inches at the Gunnison 1 N climate station. The highest annual snowfall, 104.9 inches, was recorded at the Gunnison 1 N climate station in 2008. This site is on south and west aspects, which are drier because of solar radiation and the prevailing winds.

The optimum growing season for native plants is late in spring through midsummer. The frost-free period is 55 to 75 days. The last frost in spring occurs sometime in the middle of

June to the first week of July, and the first frost in fall is as early as the middle of August to the first week of September. The average monthly air temperature typically ranges from 80.7 to -7.4 degrees F throughout the year, but the mean annual air temperature is 37.7 degrees F. The coldest temperature in winter, -47 degrees F, was recorded on December 10, 1939, and the coldest temperature in summer, 15 degrees F, was recorded on June 1, 1919. Associated with this site are areas in which wind exposure limits the height and growth of plants. Climate data are from the Western Regional Climate Center, Cochetopa and Gunnison 1 N climate stations (2012).

Table 3. Representative climatic features

Frost-free period (characteristic range)	35-47 days
Freeze-free period (characteristic range)	82 days
Precipitation total (characteristic range)	254-406 mm
Frost-free period (actual range)	32-50 days
Freeze-free period (actual range)	82 days
Precipitation total (actual range)	254-406 mm
Frost-free period (average)	41 days
Freeze-free period (average)	82 days
Precipitation total (average)	330 mm

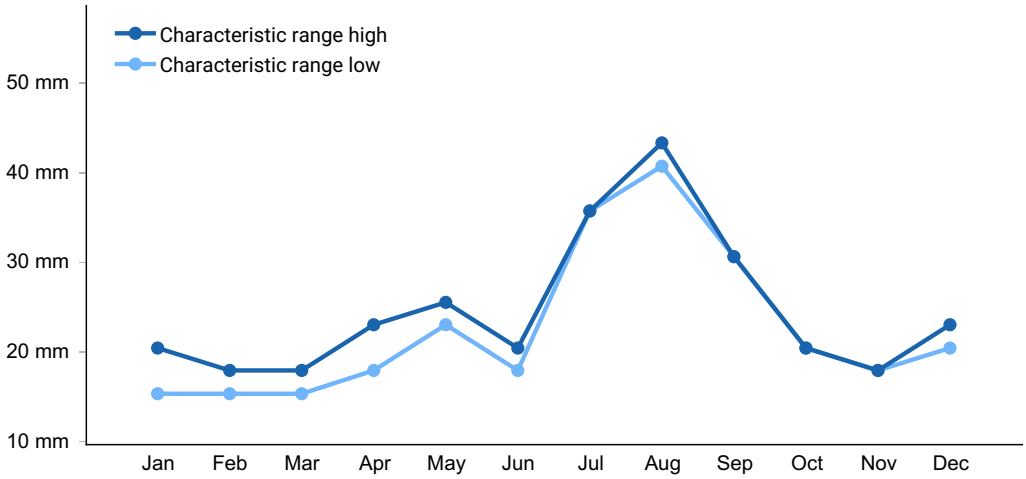


Figure 1. Monthly precipitation range

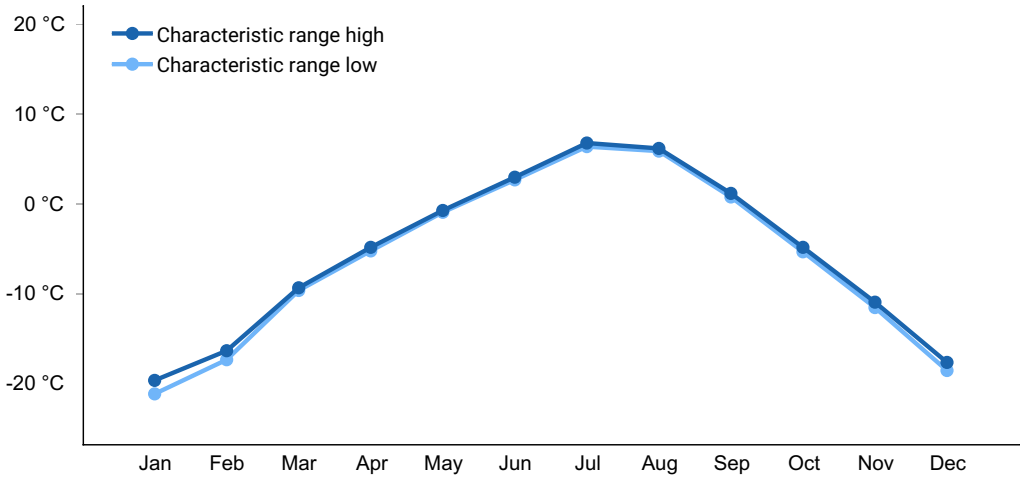


Figure 2. Monthly minimum temperature range

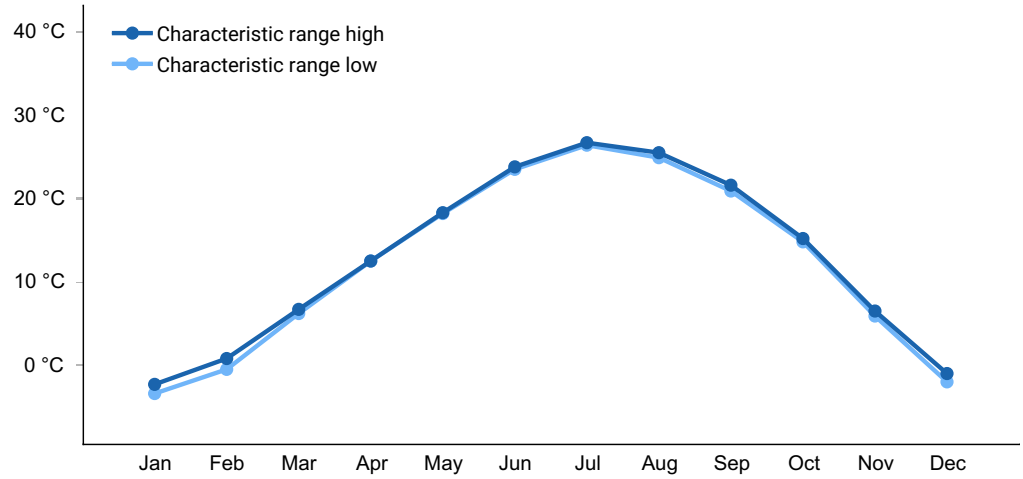


Figure 3. Monthly maximum temperature range

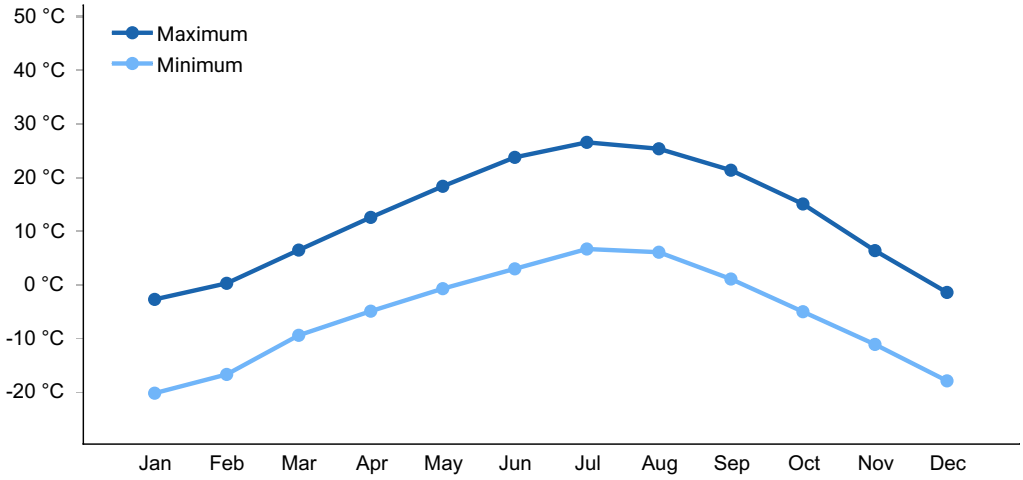


Figure 4. Monthly average minimum and maximum temperature

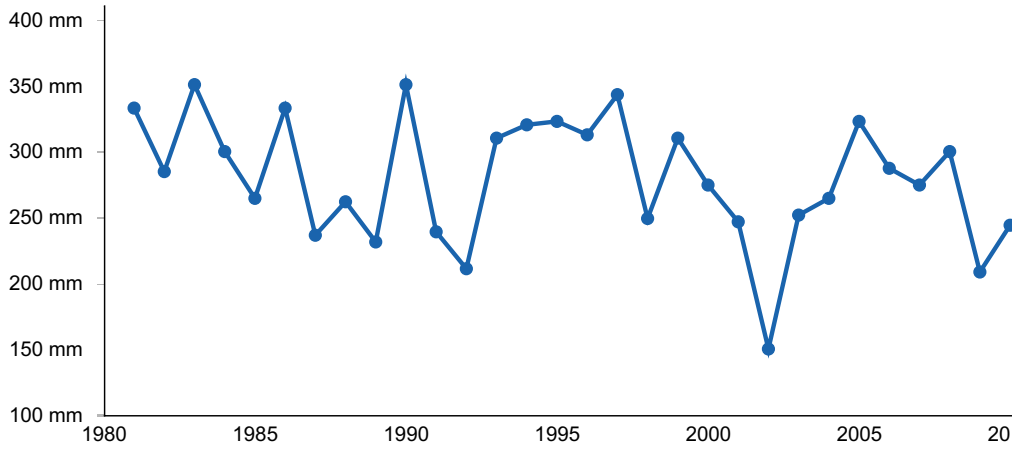


Figure 5. Annual precipitation pattern

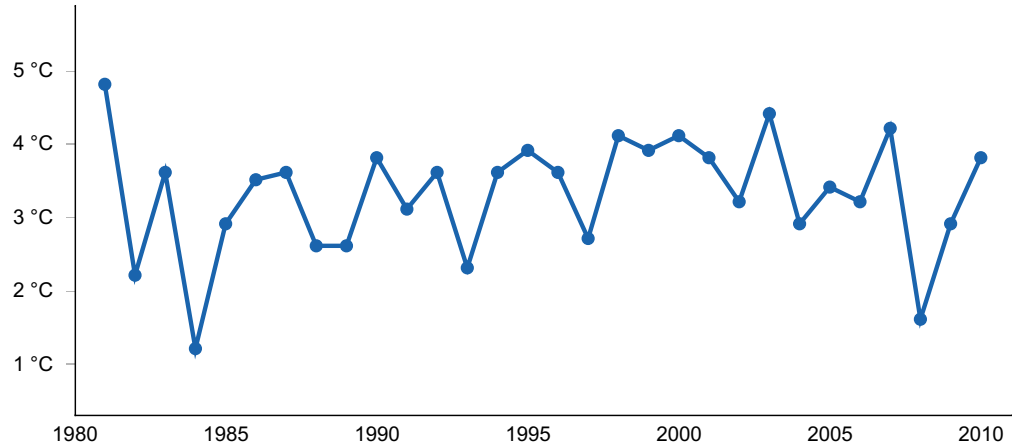


Figure 6. Annual average temperature pattern

Climate stations used

- (1) GUNNISON 3SW [USC00053662], Gunnison, CO
- (2) COCHETOPA CREEK [USC00051713], Gunnison, CO

Influencing water features

No water features are associated with this site.

Soil features

The upper part of the soils associated with this ecological site is very gravelly or very channery loam or sandy loam and 15 to 22 percent clay, and the lower part is very gravelly, very cobbly, extremely gravelly, or extremely cobbly sandy clay loam, loam, or clay loam and 20 to 30 percent clay. Rock fragments cover the soils similar to that of a desert pavement, which helps to reduce evaporation and protect the soil from substantial erosion. The potential for sheet and rill erosion is slight to severe, depending on the percentage of the soil surface covered with rock fragments and the slope gradient. The major soil orders are Mollisols and Alfisols. The lower part of the soils (argillic horizon)

generally has a higher content of clay than does the upper part. The soils are very shallow or shallow to lithic or fractured bedrock. The geology of the site consists of felsic gneiss, Tertiary andesite tuff, Tertiary ashflow tuff, Tertiary andesite, and Cretaceous/Jurassic sandstone or mudstone. In areas of soils that are underlain by fractured bedrock and support black sagebrush, the rock fragments may have carbonate coatings that are effervescent, but the soil matrix is non-effervescent.

The soils data are based on fieldwork (2011-2019) and the Soil Survey of Gunnison Area, Colorado (1975). When the Gunnison Area originally was surveyed, this site was not identified. The major map units from the 1975 publication associated with this description were: Cheadle (map unit LhF), Corpening (map unit DrE), and Spring Creek (map unit DsE). The map units were part of an updated project in 2018-2020; Beenom component in map units 2GB1, 2GB2, 2GB3, 2GB4, 2GB5 and 2GB8 is characteristic soil that it is correlated to currently.

Figure 7. Soil pit in an area of the reference state.

Table 4. Representative soil features

Parent material	(1) Slope alluvium–rhyolite (2) Residuum–gneiss (3) Residuum–granite (4) Residuum–rhyolite
Surface texture	(1) Very gravelly, gravelly loam (2) Very gravelly, gravelly sandy loam
Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Moderate
Soil depth	25–51 cm

Surface fragment cover <=3"	15–65%
Surface fragment cover >3"	0–15%
Available water capacity (Depth not specified)	3.81–6.35 cm
Calcium carbonate equivalent (Depth not specified)	0%
Electrical conductivity (Depth not specified)	0 mmhos/cm
Sodium adsorption ratio (Depth not specified)	0
Soil reaction (1:1 water) (Depth not specified)	6.6–7.8
Subsurface fragment volume <=3" (Depth not specified)	20–40%
Subsurface fragment volume >3" (Depth not specified)	0–20%

Ecological dynamics

The description of the Dry Exposure Gunnison Basin LRU ecological site is based on the description of the Dry Exposure range site (USDA-SCS, 1975), which covered the entire western slope of Colorado. This ecological site is in high mountain valleys of MLRA 48A. The site is on ridges and hills that are exposed to wind. It is treeless. Black sagebrush, Indian ricegrass, blue grama, pine needlegrass, needle and thread, prairie Junegrass, bottlebrush squirreltail, Sandberg bluegrass, muttongrass, and upland sedges create a sparse grassland appearance. Hood's phlox, buckwheat, winterfat, and fringed sage are common forbs and shrubs. The composition of species and relative production may fluctuate from year to year, depending on precipitation and other climatic factors. Small areas adjacent to the crest of the ridges support communities of dominantly needle and thread and fringed sage. Snow stays longer in these areas than in the rest of the site; therefore, they stay wet longer and are subject to a microclimate that is not suitable for growth of sagebrush.

The Gunnison Basin is in a climatic zone where pinyon (*Pinus edulis*) and juniper (*Juniperus osteosperma*) normally occur; however, the basin generally does not support these species because of its unique ecological characteristics. The basin does support intergradations of Wyoming big sagebrush and mountain big sagebrush. The Gunnison Basin is recognized for its unusual ecological characteristics, including absence of certain plants and vertebrates. Pinyon pine is rare in the basin, and western rattlesnake is absent. Winters are extremely cold, and the cold air settles into the basin. Also, this area is drier than other regions at similar elevations. It is thought that the temperature, moisture, and topography are responsible for the sagebrush-dominant plant communities in the Upper

Gunnison Basin (Emslie et al., 2005). Also, black sagebrush has a taproot and wide-spreading lateral roots. The shallow soils associated with this site prevent development of deep roots; thus, they support plants that have more fibrous roots than those of big sagebrush (Fryer, 2009). The shallow soils also prevent deeper rooted trees from invading the site, allowing black sagebrush to remain dominant.

The soils, topographic location, climate, and periodic drought and fire influence the stability of the reference state. The reference state is presumed to be the community encountered by European settlers in the early 1800's that developed under the prevailing climate over time. Grazing and browsing by wildlife also influenced the plant community. The resulting plant community is a cool-season bunchgrass/shrub community. Sagebrush communities in Colorado above an elevation of 8,500 feet are in relatively good condition and appear to be recovering slowly from the impacts of settlement in the west. Sagebrush communities below an elevation of 8,500 feet have been slower to recover (Winward, 2004). Black sagebrush is highly tolerant of drought; thus, it is more likely to survive drought than other sagebrush taxa. It is also slightly tolerant of salt and intolerant of flooding (Fryer, 2009). Black sagebrush plants survive periods when the soils are highly saturated in spring and extremely dry in summer (Winward, 2004).

Natural fire plays an important role in the function of most sites in high mountain valleys, especially the sagebrush communities. Fire stimulates growth of grasses such as needlegrasses and bluegrasses. It also helps to keep sagebrush stands from becoming too dense and invigorates other sprouting shrubs such as serviceberry and snowberry. Fire helps to maintain a balance among grasses, forbs, and shrubs. The dynamics of a plant community are improved by opening the canopy and stimulating growth of forbs, creating a mosaic of different age classes of species and a diverse composition of species in the communities. Shrubs that resprout, such as yellow rabbitbrush and spineless horsebrush, are suppressed for a period. This allows grasses to become dominant. If periodic fires or other methods of brush control are not used, sagebrush slowly increases in abundance and can become dominant.

Few records of historic fire frequencies for black sagebrush communities are available. Prior to the 1850’s, the mean fire return interval is thought to be 35 to 100 years for black sagebrush communities in the Great Basin and 60 to 150 years for low (dwarf) sagebrush shrubland in the southwest (Fryer, 2009). Black sagebrush communities tend to be in barren areas that have little buildup of fine fuel, so fires are rare in these areas. The wide spacing among black sagebrush plants also makes it difficult for fires to move across the plant community. Fires most often occur in wet years when the production of forage is high, creating sufficient fine fuel to carry fires across the landscape. Black sagebrush does not resprout after a fire; it establishes from seed. Establishment of black sagebrush is best if browsing pressure is light in the years following a fire. Several years may be needed for black sagebrush to establish and produce seed after a fire; therefore, frequent fires can eliminate it from an area.

Several sagebrush taxa have been subject to die-off in the past 10 to 15 years. The

dominant factors are disease (pathogens) and drought. Disease and stem and root pathogens have caused die-off dominantly in dense, overmature sagebrush stands throughout the west. Drought and heavy browsing in conjunction with disease (pathogens) have caused complete die-off in other areas.

The major drivers of transitions from the reference plant community are continuous, season-long grazing by ungulates and a decrease in the frequency of fires. As the population of ungulates increases and grazing exceeds the ability of plants to sustain under defoliation, the more palatable plants decline in stature, vigor, and density.

Limited cheatgrass (*Bromus tectorum*) currently is in the Gunnison Basin. It is primarily along roadsides and in campgrounds. A study of cheatgrass seeds collected in the Gunnison Basin showed significant differences in germination characteristics regarding storage duration and temperature. This may indicate that cheatgrass is adapting to the colder temperatures in the Gunnison Basin, but further study is needed (Gasch and Bingham, 2006). If cheatgrass or other non-native species are found in this site in the future, the state-and-transition model will be revised to include a non-native state.

Variability in climate, soils, aspect, and complex biological processes results in differing plant communities. The species listed in this description are representative; not all occurring or potentially occurring species are listed. The species listed do not cover the full range of conditions and responses of the site. The state-and-transition model is based on available research, field observations, and interpretations by experts; changes may be needed as knowledge increases. The reference plant community is the interpretive community. This plant community evolved as a result of grazing, fire, and other disturbances such as drought. This community is well suited to grazing by domestic livestock and wildlife, and it is in areas that are properly managed by prescribed grazing.

State and transition model

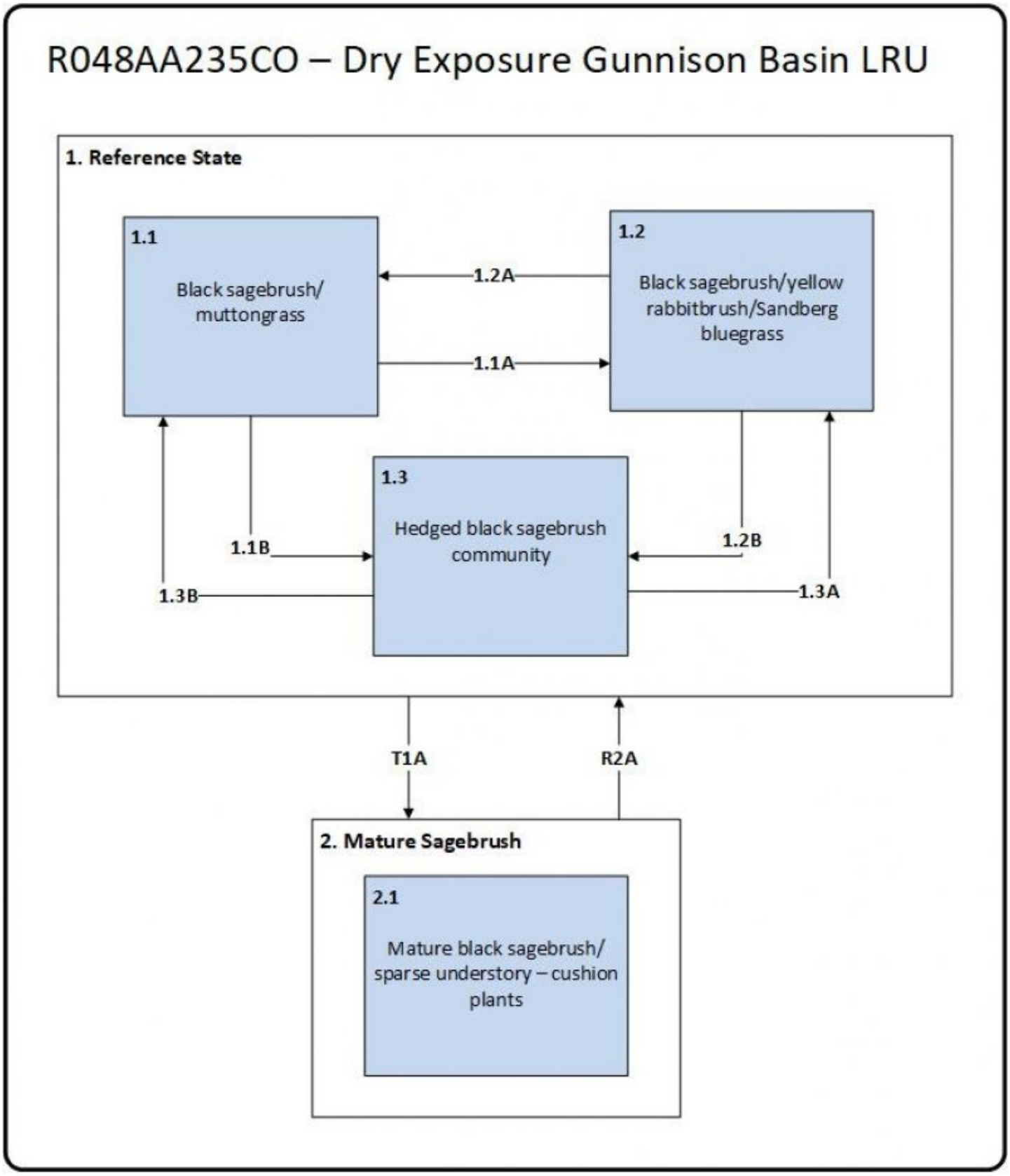


Figure 8. S & T model

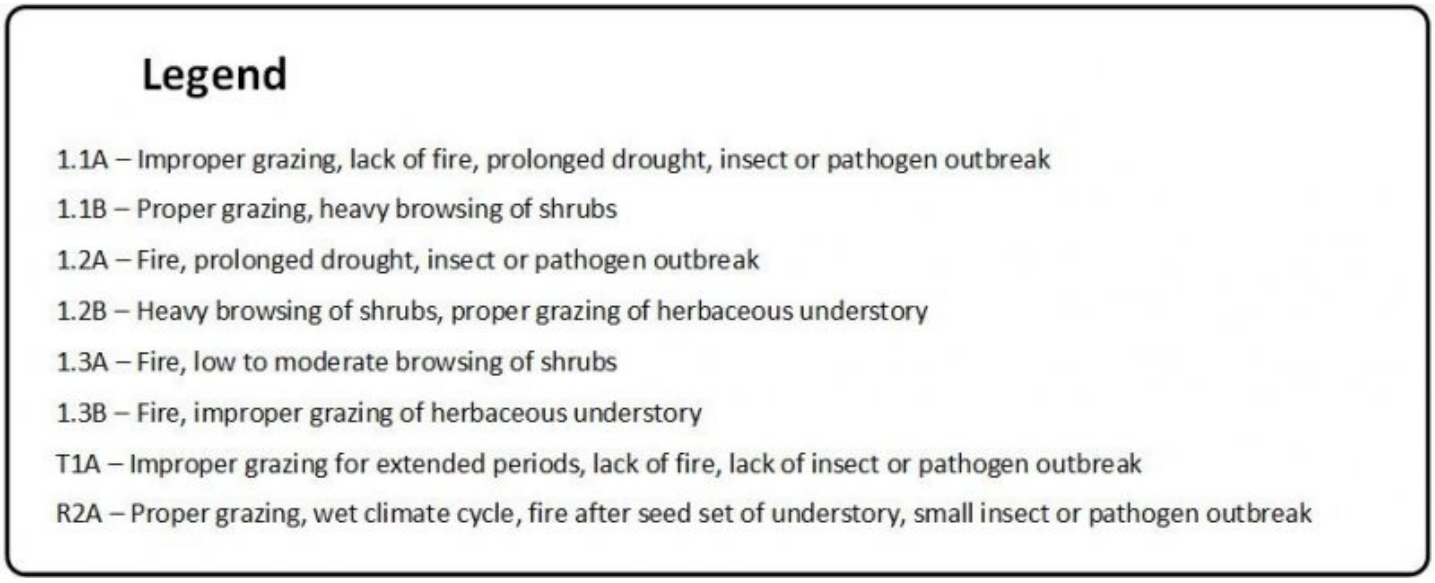


Figure 9. Legend

State 1
Reference

The reference state is a perennial bunchgrass/shrub community. The site is treeless. Grasses, woody shrubs such as black sagebrush, and several forbs make up most of the vegetative cover. Indian ricegrass, blue grama, pine needlegrass, needle and thread, prairie Junegrass, bottlebrush squirreltail, Sandberg bluegrass, muttongrass, and upland sedges create a sparse grassland appearance in which the black sagebrush is noticeable. Hood's phlox, winterfat, buckwheat, and fringed sage are common. Small amounts of mountain big sagebrush, Wyoming big sagebrush, serviceberry, spineless horsebrush, and antelope bitterbrush may be present, especially at the edges of the site. The species composition and relative productivity may fluctuate from year to year, depending on precipitation and other climatic factors. Historically, black sagebrush communities experienced an extended fire return interval due to the widely spaced shrubs and low production of herbaceous material (fine fuel). Establishment of sagebrush seedlings is solely from seed, and recruitment pulses are episodic based on favorable climatic conditions. Black sagebrush may be heavily browsed. Browsing should be monitored to ensure that sufficient new seedlings are establishing to replace the current stand. Drought may compound the effects of heavy browsing (Winward, 2004).

Community 1.1
Black Sagebrush/Muttongrass

Figure 10. Typical area of community 1.1.

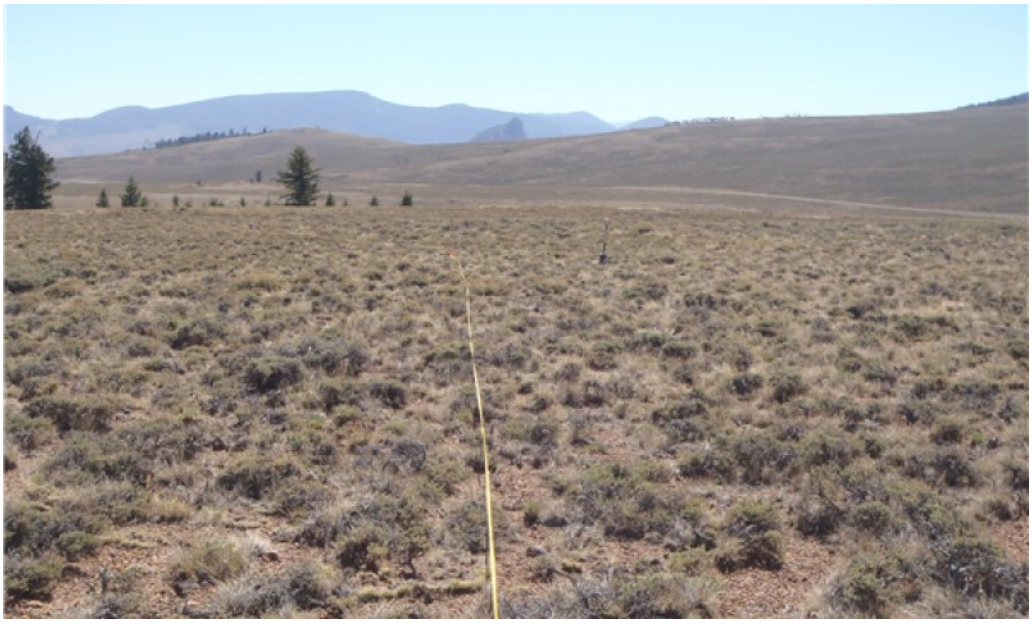


Figure 11. Typical area of community 1.1.

Figure 12. Close-up view of community 1.1.

This site has a bald appearance because of the absence of large shrubs. Grasses and cushion forbs characterize the site. Common grasses are muttongrass, Indian ricegrass, squirreltail, and Letterman’s needlegrass. Cushion and mat-forming forbs and shrubs in this site include fringed sage, yellow rabbitbrush, buckwheat, stonecrop, Hood’s phlox (spiny phlox), globemallow, pussytoes, and hollyleaf clover. This plant community is long-lived, stable, and rarely subject to large-scale natural disturbances. The ground cover is about 25 to 35 percent. This plant community is subject to small-scale disturbances that remove patches of mature vegetation. Initially, grasses and forbs are dominant in the disturbed areas because of the absence of competition from shrubs.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	185	280	370
Shrub/Vine	118	174	235
Forb	34	50	67
Total	**337**	**504**	**672**

Table 6. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	15-30%
Grass/grasslike foliar cover	10-20%
Forb foliar cover	2-10%
Non-vascular plants	0%
Biological crusts	0-3%
Litter	5-15%
Surface fragments >0.25" and <=3"	20-40%
Surface fragments >3"	0-5%
Bedrock	0-5%
Water	0%
Bare ground	10-25%

Table 7. Canopy structure (% cover)

Height Above Ground (M)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.15	0%	15-30%	15-30%	5-10%
>0.15 <= 0.3	0%	15-25%	10-20%	1-10%
>0.3 <= 0.6	0%	5-15%	1-5%	1-5%
>0.6 <= 1.4	–	–	–	–
>1.4 <= 4	–	–	–	–
>4 <= 12	–	–	–	–
>12 <= 24	–	–	–	–
>24 <= 37	–	–	–	–
>37	–	–	–	–

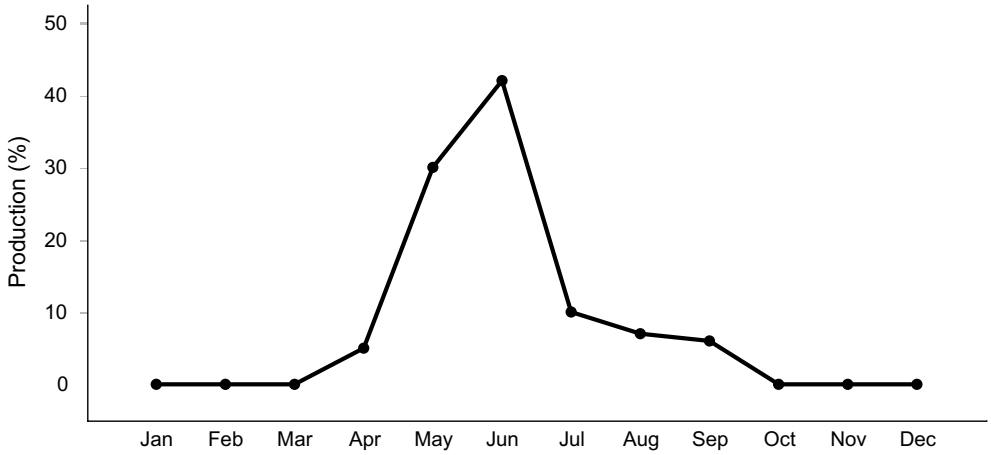


Figure 14. Plant community growth curve (percent production by month). CO4808, MLRA 48A - Foothill Mountain Valley. MLRA 48A.

Community 1.2
Black Sagebrush/ yellow rabbitbrush/ Sandberg bluegrass

Figure 15. Typical area of community 1.2.

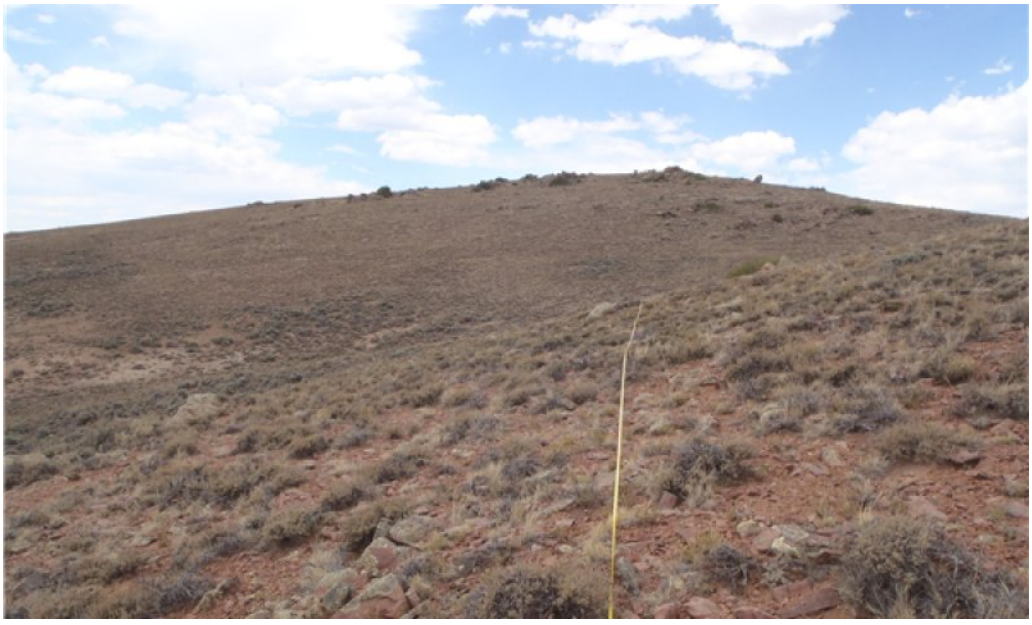


Figure 16. Typical area of community 1.2.

Figure 17. Close-up view of community 1.2.

Under improperly managed grazing, the abundance of Sandberg bluegrass, blue grama, yellow rabbitbrush, Hood's phlox, and black sagebrush will increase and that of muttongrass, Indian ricegrass, and needle and thread will decrease. A few remnant herbaceous plants are under the sagebrush cover in this community, but the number of understory plants may not be sufficient to reseed if the site is disturbed. The sagebrush consists of a single-aged stand. The abundance of Sandberg bluegrass and western wheatgrass is increased and that of prairie Junegrass is decreased in this community phase. Less palatable low shrubs such as yellow rabbitbrush and spineless horsebrush have replaced some of the herbaceous component. Lack of an understory helps to suppress low-intensity fires because of insufficient fuel, but high-intensity fires may occur. The increased sagebrush canopy may be due to the lack of disturbance such as wildfires. Cumulating effects of degrading sagebrush habitat may include higher susceptibility to erosion and sedimentation, decreased water quality, decreased forage for domestic livestock, and decreased habitat for wildlife species (McIver, et al, 2010). The diversity of species in this community is lower as compared to community 1.1.

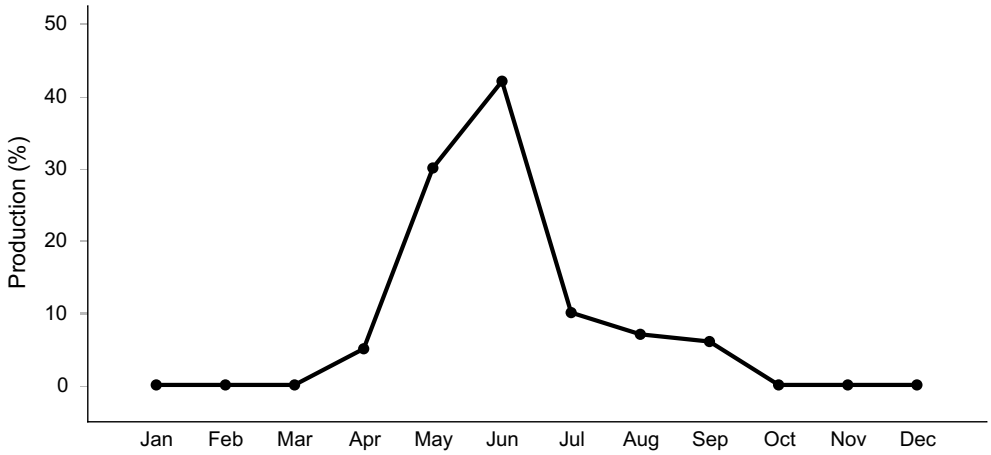


Figure 18. Plant community growth curve (percent production by month). CO4808, MLRA 48A - Foothill Mountain Valley. MLRA 48A.

Community 1.3
Hedged Black Sagebrush

Figure 19. Typical area of community 1.3.

Figure 20. Typical area of community 1.3.

Figure 21. Soil pit in an area of community 1.3.

This community is characterized by black sagebrush that is heavily browsed in winter by wildlife. Black sagebrush normally has an irregular, spreading, U-shaped crown, but in this community, it has been rounded from browsing. Under severe browsing, it may be nearly level along the ground (Fryer, 2009). This community is susceptible to excessive wind and water erosion, and its biotic integrity is at risk. The percentage of bare ground is increased, and larger interspaces are between plants. Black sagebrush remains, and it may be dominant in the shrub cover. Due to browsing, the height of the sagebrush plants is 2 to 4 inches instead of the normal 4 to 12 inches. Plants such as Sandberg bluegrass, western wheatgrass, yellow rabbitbrush and low-growing forbs such as Hood's phlox will become dominant.

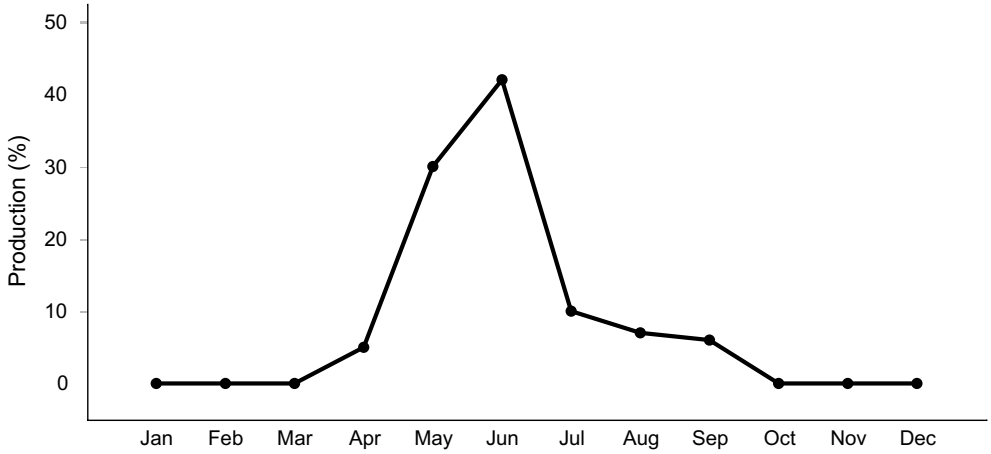
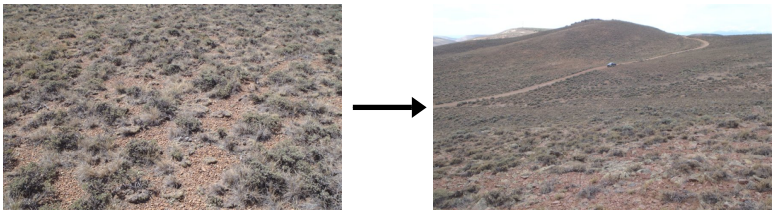


Figure 22. Plant community growth curve (percent production by month). CO4808, MLRA 48A - Foothill Mountain Valley. MLRA 48A.

Pathway 1.1A
Community 1.1 to 1.2



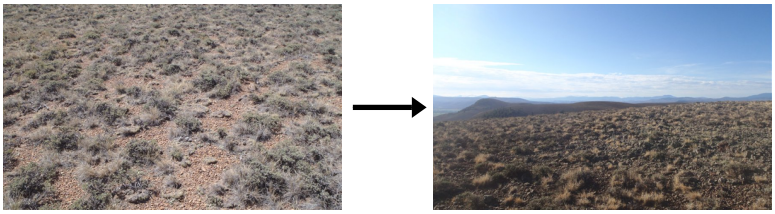
Black Sagebrush/Muttongrass

Black Sagebrush/ yellow rabbitbrush/ Sandberg bluegrass

This pathway is the result of improper grazing and lack of fire or other disturbances. Improper grazing can decrease the abundance of the understory, increase the canopy cover of sagebrush, and shorten the period needed to transition back to community 1.1. Extended drought and improper grazing can speed up this transition. Improper browsing and suitable grazing of the understory species, frequent fires prior to seed set of sagebrush but after seed set of understory species, and large-scale die-off of sagebrush due to insect or pathogen outbreaks can result in this pathway (Evers et al, 2011).

Pathway 1.1B

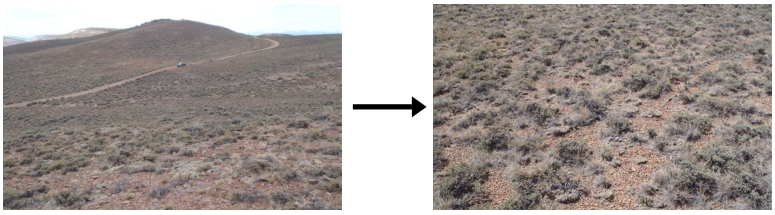
Community 1.1 to 1.3



Black Sagebrush/Muttongrass | Hedged Black Sagebrush

Proper grazing by livestock and heavy browsing by livestock, elk, and deer result in a community of hedged black sagebrush and perennial bunchgrasses. Browsing can decrease the abundance of black sagebrush and winterfat.

Pathway 1.2A
Community 1.2 to 1.1



Black Sagebrush/ yellow rabbitbrush/ Sandberg bluegrass | Black Sagebrush/Muttongrass

This pathway is characterized by the natural return interval and intensity of fires (McIver, et al, 2010). Fires occur on this site only during years of normal or above-normal precipitation, when enough fine fuel is produced to carry a fire. Wildfire, prolonged drought, and disease or insect outbreaks kill shrubs. Proper grazing management, including proper timing of grazing and periods of rest, allows for the native bunchgrasses and perennial forbs to increase and moves the community toward phase 1.1. Shrub management, including application of herbicides and mowing, can be used to mimic this pathway. Drought and prescribed grazing or improper grazing can influence the period of this pathway. Management practices should be aimed at restoring the forb and grass species that historically helped to cover openings between the crowns of the black sagebrush (Winward, 2004).

Pathway 1.2B
Community 1.2 to 1.3

Black Sagebrush/ yellow rabbitbrush/ Sandberg bluegrass | Hedged Black Sagebrush

This pathway is the result of heavy browsing in winter by wildlife and livestock. Proper grazing management helps to increase the abundance of perennial bunchgrasses. Browsing decreases the abundance of black sagebrush and winterfat.

Pathway 1.3B
Community 1.3 to 1.1

Hedged Black Sagebrush **Black Sagebrush/Muttongrass**

This pathway is the result of fire or proper browsing management and improper grazing of the understory. Fires occur only in years of above-normal precipitation.

Pathway 1.3A
Community 1.3 to 1.2

Hedged Black Sagebrush **Black Sagebrush/ yellow rabbitbrush/ Sandberg bluegrass**

This pathway is the result of fire or low or moderate browsing by wildlife and livestock. Fires occur only in years of above-normal precipitation.

State 2
Mature Black Sagebrush

State 2 is a black sagebrush dominated community. This state has an increase in shrub cover and a decrease in the understory cover from State 1. The sagebrush community is a single age stand.

Community 2.1
Mature Black Sagebrush/sparse understory - cushion plants

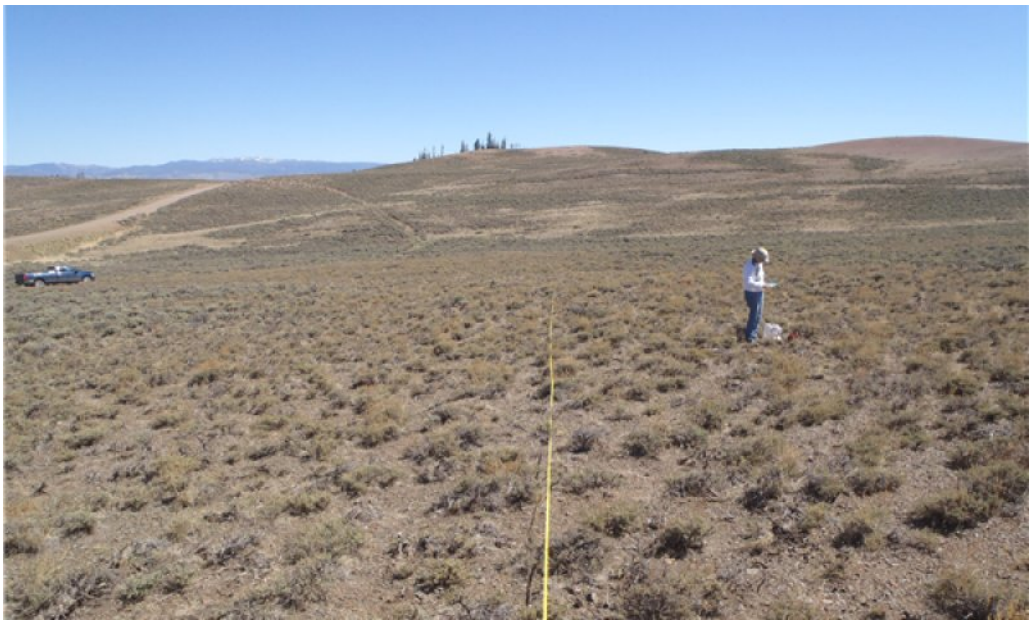


Figure 23. Typical area of community 2.1.

Figure 24. Close-up view of community 2.1.

Figure 25. Soil pit in an area of community 2.1.

The more palatable grasses such as muttongrass, Indian ricegrass, and prairie Junegrass would decrease or be absent in this state as a result of improper grazing. Also, unpalatable low shrubs such as yellow rabbitbrush and spineless horsebrush will increase and replace part of the herbaceous component in the understory. This state has a lower diversity of species as compared to State 1. Improper grazing management practices that decrease the abundance of deep-rooted understory species can lead to soil compaction and erosion, decreased soil organic matter content, and increased soil exposure due to a reduction in the plant canopy and litter cover.

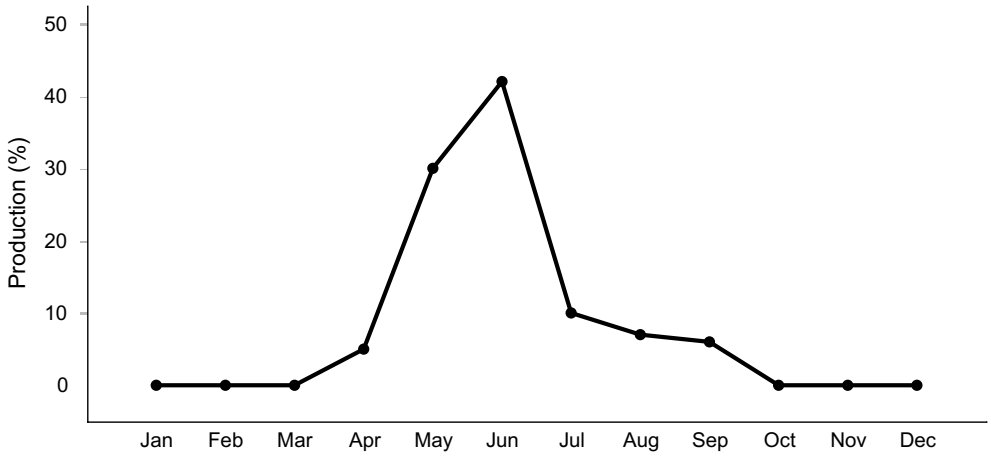


Figure 26. Plant community growth curve (percent production by month). CO4808, MLRA 48A - Foothill Mountain Valley. MLRA 48A.

Transition T1A
State 1 to 2

Improper grazing for extended periods during the growing season can reduce the understory and favor encroachment by sagebrush. Lack of fire over time also can cause this transition (McIver, et al, 2010). Extended periods of drought and lack of insects or pathogens can result in a single-aged stand of sagebrush. This transition is characterized by loss of understory, increased bare ground between shrubs, and increased soil erosion. Inappropriate grazing decreases the abundance of fine fuel and shifts the fire regime to longer intervals.

Restoration pathway R2A
State 2 to 1

Proper grazing, wet climatic periods, fire after seed set of the understory, and small scale mortality of shrubs due to insects or pathogens can move the community toward a more diverse understory and away from a dense, single-aged stand of sagebrush (Evers et al, 2011). Shrub management, including application of herbicides and prescribed burning, can be used to mimic this pathway. Seeding of native species after burning is severely limited by the rocky, shallow soils, the harsh climate, and the high potential for runoff. The rockiness of the soils also severely limits the use of ground-moving equipment for brush management.

Additional community tables

Table 8. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Dominant Perennial Native Cool Bunchgrasses**			28–84	
	muttongrass	POFE	*Poa fendleriana*	45–84	–
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	6–34	–
2	**Subdominant Perennial Native Cool Bunchgrasses**			56–84	
	squirreltail	ELEL5	*Elymus elymoides*	28–56	–
	Sandberg bluegrass	POSE	*Poa secunda*	17–50	–
	Letterman's needlegrass	ACLE9	*Achnatherum lettermanii*	11–39	–
	pine needlegrass	ACPI2	*Achnatherum pinetorum*	11–39	–
3	**Occasional Native Perennial Cool Bunchgrasses**			22–101	
	Arizona fescue	FEAR2	*Festuca arizonica*	11–56	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	6–28	–
	needle and thread	HECO26	*Hesperostipa comata*	6–17	–
4	**Occasional Native Perennial Warm Grasses**			3–17	
	blue grama	BOGR2	*Bouteloua gracilis*	3–17	–
	mountain muhly	MUMO	*Muhlenbergia montana*	0–17	–
5	**Occasional Native Perennial Cool Rhizomatous**			11–45	
	Geyer's sedge	CAGE2	*Carex geyeri*	6–28	–
	western wheatgrass	PASM	*Pascopyrum smithii*	6–17	–
Forb					
6	**Dominant Native Perennial Forbs**			17–56	
	spiny phlox	PHHO	*Phlox hoodii*	6–28	–
	spearleaf stonecrop	SELA	*Sedum lanceolatum*	6–17	–
	germander beardtongue	PETE9	*Penstemon teucrioides*	6–17	–
7	**Occasional Perennial Native Forbs**			0–45	
	agoseris	AGOSE	*Agoseris*	0–6	–

	agoseris	AGOSE2	*Agoseris*	0–6	
	pussytoes	ANTEN	*Antennaria*	0–6	–
	rockcress	ARABI2	*Arabis*	0–6	–
	milkvetch	ASTRA	*Astragalus*	0–6	–
	cryptantha	CRYPT	*Cryptantha*	0–6	–
	spreading fleabane	ERDI4	*Erigeron divergens*	0–6	–
	redroot buckwheat	ERRA3	*Eriogonum racemosum*	0–6	–
	bladderpod	LESQU	*Lesquerella*	0–6	–
	desertparsley	LOMAT	*Lomatium*	0–6	–
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	0–6	–
	hollyleaf clover	TRGY	*Trifolium gymnocarpon*	0–6	–
	yucca	YUCCA	*Yucca*	0–6	–
8	**Occasional Annual Native Forbs**			0–6	
	bird's-beak	CORDY	*Cordylanthus*	0–6	–
Shrub/Vine					
9	**Dominant Native Non-Sprouting Shrub**			140–280	
	black sagebrush	ARNO4	*Artemisia nova*	140–280	–
10	**Occasional Native Non-sprouting Shrubs**			11–84	
	yellow rabbitbrush	CHVI8	*Chrysothamnus viscidiflorus*	6–28	–
	winterfat	KRLA2	*Krascheninnikovia lanata*	2–11	–
	spineless horsebrush	TECA2	*Tetradymia canescens*	2–11	–
	prairie sagewort	ARFR4	*Artemisia frigida*	1–11	–
	mountain big sagebrush	ARTRV	*Artemisia tridentata ssp. vaseyana*	0–6	–
	Wyoming big sagebrush	ARTRW8	*Artemisia tridentata ssp. wyomingensis*	0–6	–
	plains pricklypear	OPPO	*Opuntia polyacantha*	0–6	–
	mountain ball cactus	PESI	*Pediocactus simpsonii*	0–6	–
11	**Occasional Native Sprouting Shrubs**			0–17	
	antelope bitterbrush	PUTR2	*Purshia tridentata*	0–11	–
	serviceberry	AMELA	*Amelanchier*	0–11	–

	snowberry	SYMPH	*Symphoricarpos*	0–11	–

Animal community

Interpretations for grazing animals:
This site has a low value rating for cattle, sheep, and horses.

Interpretations for grazing wildlife:
This site has a high value rating for antelope and elk and a medium value rating for bison and deer. A rating is not applicable for cottontail, jackrabbit, upland game birds, and waterfowl.

Hydrological functions

Soils originally were assigned to hydrologic soil groups based on measured rainfall, runoff, and infiltrometer data (Musgrave, 1955). Since the initial work was done to establish these groupings, assignment of soils to hydrologic soil groups has been based on the judgment of soil scientists. Assignments are made based on comparison of the characteristics of unclassified soil profiles with profiles of soils already placed into hydrologic soil groups. Most of the groupings are based on the premise that soils in a specific climatic region will have a similar runoff response if the depth to a restrictive layer or water table, the transmission rate of water, texture, structure, and the degree of swelling when saturated are similar. Four hydrologic soil groups are recognized (A, B, C, and D). For specific definitions of each group, see the National Engineering Handbook, Chapter 7, Part 630, Hydrology (http://policy.nrcs.usda.gov/OpenNonWebContent.aspx? content=22526.wba).

The hydrologic soil groups are based on the following factors:
—intake and transmission of water under maximum yearly wetness (thoroughly wet),
—unfrozen soil,
—bare soil surface, and
—maximum swelling of expansive clays.

The slope of the soil surface is not considered when assigning hydrologic soil groups. In its simplest form, the hydrologic soil group is determined by the water-transmitting soil layer that has the lowest saturated hydraulic conductivity and depth to any layer that is more or less water impermeable (such as a fragipan or duripan) or depth to a water table (if present) (Caudle et al., 2013). The runoff curve numbers are determined by field investigations using the hydrologic cover conditions and hydrologic soil groups.

Hydrologic soil groups of typical soils:
Corpening—Group D
Cheadle—Group C
Spring Creek—Group C

Hydrologic soil groups of atypical deep soils:

Hopkins—Group C
Mergel—Group C

Definitions of hydrologic groups:
Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission (Soil Survey Staff, 2014).

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission (Soil Survey Staff, 2014).

Recreational uses

The cool summers make this site desirable for a wide range of outdoor activities such as picnicking, sightseeing, photographing, wildlife watching, hiking, and camping.

Wood products

No wood products are produced on this site.

Inventory data references

This site occurs in the Gunnison and Montrose field offices.

Other references

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Contributors

Suzanne Mayne-Kinney

Approval

Kirt Walstad, 4/02/2025

Acknowledgments

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Those involved in developing earlier versions of this site description include Bob Rayer, retired NRCS soil scientist, and Herman Garcia, retired State rangeland management specialist and MLRA ecological site specialist (quality assurance).

Site Development and Testing:
Future work is needed to validate and further refine the information in this provisional ecological site description (pESD). This will include field activities to collect low-, medium-, and high-intensity samples, soil correlation, and analysis of data.

Additional information and data are required to refine the plant production and annual production data in the tables for this ecological site. The extent of MLRA 48A requires further investigation.

Field testing of the information in this pESD is required. As this pESD progresses to the approved level, reviews will be conducted by the technical team, quality control and quality assurance staff, and peers.

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)	J. Murray, C. Holcomb, L. Santana, F. Cummings, S Jaouen. 01/19/05 Updated by Suzanne Mayne-Kinney 7/27/2015
Contact for lead author	
Date	07/27/2015

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

Indicators

1. **Number and extent of rills:** Slight on slopes of less than 10 percent. Rock fragments help to protect the surface. Rills may be more defined on slopes of 15 to 25 percent, especially following intense storms.

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2. **Presence of water flow patterns:** Slight or moderate, depending on the percent slope. Flow paths are more apparent on slopes of more than 15 percent.

---

3. **Number and height of erosional pedestals or terracettes:** Slight or moderate. Frost heaving of shallow-rooted plants should not be considered an indicator of erosional pedestaling. Pedestals may occur more frequently on slopes that are steeper and exposed to wind.

---

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** 15 to 25 percent. Exposed surface gravel and bedrock are inherent to this site and are considered to be rock. Extended drought may result in an increase in bare ground.

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5. **Number of gullies and erosion associated with gullies:** None

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6. **Extent of wind scoured, blowouts and/or depositional areas:** Wind scouring is possible any time of year in areas that do not have rocks or other fragments on the surface.

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7. **Amount of litter movement (describe size and distance expected to travel):** Extensive fine litter from the movement of grasses and perennial and annual forbs by wind and during thunderstorms in summer. More persistent, larger woody litter from shrubs expected to

remain in place except during major disturbances.

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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):** Stability class rating anticipated to average 1 to 3 in interspaces at soil surface.

---

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** The A horizon is gravelly sandy loam to gravelly loam and has fine or medium gravel on the surface. It is 0 to 2 inches deep and is grayish brown to very dark grayish brown. The soils are shallow and have weak medium granular structure.

---

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** The perennial herbaceous plants help to slow runoff and increase infiltration. Low basal and canopy cover and inherent interspaces among plants allow for some overland flow and loss of infiltration.

---

11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):** None. The subsurface argillic horizon common in the soils should not be interpreted as compaction.

---

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: Dominant Native Non-Sprouting Shrub > Subdominant Perennial Native Cool Bunchgrasses > Dominant Perennial Native Cool Bunchgrasses >

    Sub-dominant: Occasional Native Perennial Cool Bunchgrasses > Occasional Native Non-sprouting Shrubs > Dominant Native Perennial Forbs >

    Other: Occasional Native Perennial Cool Rhizomatous >= Occasional Perennial Native Forbs >= Occasional Native Perennial Warm Grasses > Occasional Native Sprouting Shrubs > Occasional Annual Native Forbs

    Additional:

13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** Typically minimal, but slight mortality or decadence of shrubs and grasses due to wind desiccation during and following drought or lack of disturbance.

14. **Average percent litter cover (%) and depth (in):** 5 to 15 percent litter less than 0.25 inch thick in interspaces between plants and under shrub canopy cover.

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 200 pounds per acre in years of low precipitation, 400 pounds per acre in years of average precipitation, and 500 pounds per acre in years of above-average precipitation. After extended drought or during the first growing season following a wildfire, production may be significantly reduced by 100 to 200 pounds per acre or more.

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:** None.

17. **Perennial plant reproductive capability:** Wind and other weather-related disturbances, wildfire, natural disease, competition among species, wildlife, and insects may temporarily reduce the reproductive capability of the plants.