USDA Natural Resources Conservation Service

Ecological site R049XB202CO
Loamy Foothill

Last updated: 9/07/2023
Accessed: 05/04/2024

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): 049X–Southern Rocky Mountain Foothills

MLRA 49 is in Colorado (58 percent), Wyoming (27 percent), and New Mexico (15 percent). It makes up about 11,130 square miles (28,845 square kilometers). The major cities in or adjacent to this MLRA are Laramie, Wyoming; Fort Collins, Boulder, Denver, Colorado Springs, and Pueblo, Colorado; and Santa Fe and Las Vegas, New Mexico. Interstates 25, 70, and 80 cross the MLRA. Part of the Medicine Bow National Forest is in the northern tip of this area, in Wyoming; parts of the Roosevelt, Pike, and San Isabel National Forests are in this area in Colorado; and part of the Santa Fe National Forest is in the southern end of this area, in New Mexico. The Rocky Flats Nuclear Arsenal, Peterson Air Force Base, most of the Air Force Academy grounds, and part of the Fort Carson Military Reservation are in the part of this area in Colorado.

Almost half of this area is in the Southern Rocky Mountains and Wyoming Basin Provinces in the Rocky Mountain System. The rest is in the Colorado Pediment, Raton, and High Plains Sections of the Great Plains Province of the Interior Plains. The northern part of the MLRA consists of the Laramie Mountains. The central and southern parts generally are bounded on the east by the Great Plains and on the west by the Southern Rocky Mountains. Elevation ranges from 5,000 feet (1,525 meters) to 8,000 feet (2,440 meters) in most of the MLRA, but small mountains in the area are as high as 10,000 feet (3,050 meters). The Laramie and North Platte Rivers and their associated tributaries are the principal streams in the Wyoming portion of the MLRA. The Cache La Poudre, Big Thompson, Saint Vrain, South Platte, Arkansas, Saint Charles, Huerfano, Cucharas, and Purgatoire Rivers, Clear Creek, Fountain Creek, and their associated tributaries are the principal streams in the Colorado portion. The Vermejo, Cimarron, Pecos, and Mora Rivers and their associated tributaries are the principal streams in the New Mexico portion.

This area has been impacted by the geologic processes of uplift, folding, and faulting and by subsequent erosion and deposition. The Southern Rocky Mountains were uplifted 50 to 70 million years ago during the Laramide uplift. Most of this MLRA is adjacent to this uplift and was also affected. The uplift induced erosion of the relatively soft Late Pennsylvanian to Cretaceous sedimentary rocks from the uplands and dissected the underlying crystalline Precambrian rocks. The relief of the area was reduced by a combination of erosion of uplands and alluvial filling. Approximately 7 million years ago, a large portion of the area was uplifted again to elevations of 14,000 feet (4,270 meters) or more at the core of the Laramide uplift. Since then, precipitation occurring as both rain and snow led to the renewal of erosion and subsequent alluvial fills. The Wyoming portion of the MLRA, the Laramie Mountains, consists primarily of Precambrian plutonic rocks with Pennsylvanian and Permian sedimentary rocks folded and faulted at the margin of the range. The Colorado and New Mexico portions of the area consist primarily of remnants of the uplifted and folded Pennsylvanian through Cretaceous sedimentary rocks forming hogbacks, ridges, and hills, the ranges of which trend in a general north-south direction, parallel to the uplifted Southern Rocky Mountains. Tertiary volcanic flows filled valleys in some areas. After extensive erosion, these more resistant volcanic rocks now form prominent mesas, such as North and South Table Mountains near Golden, Colorado, and Fishers Peak Mesa near the Colorado-New Mexico border. Stream erosion from the eastern front of the Southern Rocky Mountains fostered the creation of a sequence of large alluvial fan remnants, pediments, and terrace deposits in this MLRA.

The average annual precipitation is 12 to 25 inches (305 to 635 millimeters) in most of this area, but it ranges from 10 to 35 inches (255 to 890 millimeters), generally increasing with elevation. The highest precipitation occurs in the Laramie Mountains, in Wyoming, and the lowest precipitation occurs in the Arkansas River Valley, above Salida, Colorado. Most of the rainfall occurs as high-intensity, convective thunderstorms during the growing season. Winter precipitation occurs as snow. The average annual temperature is 36 to 54 degrees F (2 to 12 degrees C). The freeze-free period averages 140 days and ranges from 90 to 195 days, decreasing in length with elevation and from south to north.

The dominant soil orders in this MLRA are Mollisols, Alfisols, Inceptisols, and Entisols. The soils in the Colorado and New Mexico portions of the MLRA dominantly have a frigid or mesic soil temperature regime. Those in the Wyoming portion have a frigid or cryic soil temperature regime. A few of the higher peaks and some north aspects have a cryic soil temperature regime. Most of the soils in the area have an ustic soil moisture regime, but those on the higher peaks and on some north aspects have a udic soil moisture regime. The soils in the area dominantly have smectitic or mixed mineralogy. They are very shallow to very deep and are dominantly well drained. The texture is dominantly loamy in soils that formed in material weathered from igneous and metamorphic rocks and is dominantly loamy or clayey in soils that formed in material weathered from sedimentary rocks. Some of the most extensive and representative great groups are Haplustolls (Baller series), Argiustolls (Nederland, Nunn, Santa Fe, and Enmedio series), Haplustalfs (Fort Collins, Stoneham, and Dargol series), Haplustepts (Stout series), Ustorthents (Lorencito and Saruche series), and Paleustolls (Flatirons series). (USDA-NRCS, 2006)

Classification relationships

NRCS:
Major Land Resource Area 49, Southern Rocky Mountain Foothills (United States Department of Agriculture, Natural Resources Conservation Service, 2006).

USFS:
M331Ib – North Front Range; M331Ic – North Laramie Mountains; M331Id – South Laramie Mountains; and M331Ii – Northern Arkansas Granitics – 39 mile Mountain M331I – Northern Parks and Ranges M331 - Southern Rocky Mountain Steppe - Open Woodland - Coniferous Forest - Alpine Meadow

M331Fb – Wet Mountains; M331Fc – Wet Mountain Valley; M331Ff – Raton Basin; M331Fg – Sangre de Cristo Mountains Woodland; and M331Fh – Sangre de Cristo Mountains Coniferous Forest M331F – Southern Parks and Rocky Mountain Range M331 - Southern Rocky Mountain Steppe - Open Woodland - Coniferous Forest - Alpine Meadow

331If – Arkansas Valley Tablelands; 331Ig- Arkansas Valley High Tablelands; 331Ih – Black Forest; and 331Ii – Southern Front Range Foothills < 331I – Arkansas Tablelands < 331 Great Plains – Palouse Dry Steppe

331Ha – Southern Denver-Julesburg Basin; 331Hc – Eastern Central High Plains; 331He – Northern Front Range Foothills and 331Hf – Denver-Julesburg Basin < 331H – Central High Plains < 331 Great Plains – Palouse Dry Steppe

EPA:
21b – Crystalline Subalpine Forests, 21c – Crystalline Mid-Elevations Forests, 21d -Foothill Shrublands, 21e – Sedimentary Subalpine Forests, and 21f – Sedimentary Mid-Elevation Forests, 21j – Grassland Parks < 21 Southern Rockies < 6.2 Western Cordillera < 6 Northwestern Forested Mountains North American Deserts (Griffith, 2006).

25c – Moderate Relief Plains, 25d – Flat to Rolling Plains, and 25l – Front Range Fans < 25 High Plains < 9.4 South Central Semi-Arid Prairies < 9 Great Plains (Griffith, 2006).

26e – Piedmont Plains and Tablelands, 26f- Mesa de Maya/Black Mesa, 26h- Pinyon-Juniper Woodlands and Savannas, 26i – Pine-Oak Woodlands, 26j – Foothills Grasslands, 26k – Sandsheets, and 26l – Upper Canadian Plateau < 26 Southwestern Tablelands < 9.4 South Central Semi-arid Prairies < 9 Great Plains (Griffith, 2006).

USGS:
Southern Rocky Mountain Province, Colorado Piedmont and Raton

Ecological site concept

Loamy Foothill occurs on fans, fan remnants, hills and terraces. Slopes is between 0 to 12%. Soils are between 20 to 60 inches in depth. Soils are derived from alluvium, residual and loess material derived from sedimentary rock (shale, siltstone, sandstone, interbedded sandstone and shale, interbedded limestone and shale), and calcareous mixed lithology. Soil surface texture is loam. silt loam or fine sandy loam. Family particle size is fine-loamy. It is a Western Wheatgrass– Green Needlegrass community. It has an aridic ustic moisture regime. The effective precipitation ranges from 12 to 17 inches.

Associated sites

R049XB208CO	**Clayey Foothill** Clayey Foothill occurs on undulating hills to gently sloping uplands. Slopes is between 0 to 15%. Soils are moderately deep to deep (20 to 60 inches). Soils are derived from alluvium from basalt, and/or calcareous shale; or residuum from clayey shale, sandstone, calcareous shale and/or shale. Soil surface texture is clay loam or silty clay loam and it may or may not have cobbles, stone, or gravels (up to 15%). Family particle size is fine. It is a Western Wheatgrass – Green Needlegrass community. It has an aridic ustic moisture regime. The effective precipitation ranges from 12 to 17 inches.
R049XB210CO	**Sandy Foothill** Sandy Foothill occurs on gently sloping to rolling hills and uplands. Slopes is between 0 to 10%. Soils are greater than 40 inches. Soils are derived from alluvium, eolian deposits, eolian sands, and residuum primarily from arkosic sedimentary rock and sandstone. Soil surface texture is loamy sand, sandy loam or fine sandy loam. Family particle size is coarse-loamy or sandy. It is a Big Bluestem– Prairie Sandreed community. It has an aridic ustic moisture regime. The effective precipitation ranges from 12 to 16 inches.

Similar sites

R049XB208CO	**Clayey Foothill** Clayey Foothill occurs on undulating hills to gently sloping uplands. Slopes is between 0 to 15%. Soils are moderately deep to deep (20 to 60 inches). Soils are derived from alluvium from basalt, and/or calcareous shale; or residuum from clayey shale, sandstone, calcareous shale and/or shale. Soil surface texture is clay loam or silty clay loam and it may or may not have cobbles, stone, or gravels (up to 15%). Family particle size is fine. It is a Western Wheatgrass – Green Needlegrass community. It has an aridic ustic moisture regime. The effective precipitation ranges from 12 to 17 inches.
R049XB210CO	**Sandy Foothill** Sandy Foothill occurs on gently sloping to rolling hills and uplands. Slopes is between 0 to 10%. Soils are greater than 40 inches. Soils are derived from alluvium, eolian deposits, eolian sands, and residuum primarily from arkosic sedimentary rock and sandstone. Soil surface texture is loamy sand, sandy loam or fine sandy loam. Family particle size is coarse-loamy or sandy. It is a Big Bluestem– Prairie Sandreed community. It has an aridic ustic moisture regime. The effective precipitation ranges from 12 to 16 inches.
R049XY220CO	**Ponderosa Loam** Ponderosa Loam occurs on fans, valley sides, mountain slopes, lava plateau and drainageways. Slopes is between 1 to 35%. Soils are deep with depths of greater than 60 inches. Soils are derived from alluvium from arkose or sandstone. Soil surface texture is sandy loam, loam or stony coarse sandy loam. Family particle size is coarse-loamy or fine loamy. It is a Mountain Muhly – Arizona Fescue plant community. It has a typic ustic moisture regime. The effective precipitation ranges from 15 to 18 inches.

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) *Pascopyrum smithii* (2) *Nassella viridula*

Physiographic features

Topography varies from rolling hills to narrow valleys to large open flats. Slopes generally range from nearly level to 12 percent. Elevation ranges from 5000 to 7000 feet.

Table 2. Representative physiographic features

Landforms	(1) Fan remnant (2) Fan (3) Hill (4) Terrace
Elevation	1,524–2,134 m
Slope	0–12%

Climatic features

Precipitation averages 12 to 17 inches annually with 60 to 70 percent falling during the growing season. The amount of snowfall averages 50 inches annually. Snows during March and April can amount to significant moisture in some years. Early spring snows and high intensity summer thunderstorms followed by hot, dry periods are a common occurrence.

The optimum growing season for the major forage species is spring and early summer. Cool season plants begin growth approximately April 1 and the warm season plants begin growth May 1 and after. The length of the growing season ranges from 120 to 150 days with average frost dates occurring on May 13 and October 1. The average annual temperature is 49 F with the hottest temperatures occurring during the months of July and August.

Table 3. Representative climatic features

Frost-free period (characteristic range)	84-112 days
Freeze-free period (characteristic range)	114-136 days
Precipitation total (characteristic range)	356-432 mm
Frost-free period (actual range)	70-123 days
Freeze-free period (actual range)	105-142 days
Precipitation total (actual range)	330-432 mm
Frost-free period (average)	99 days
Freeze-free period (average)	125 days
Precipitation total (average)	381 mm

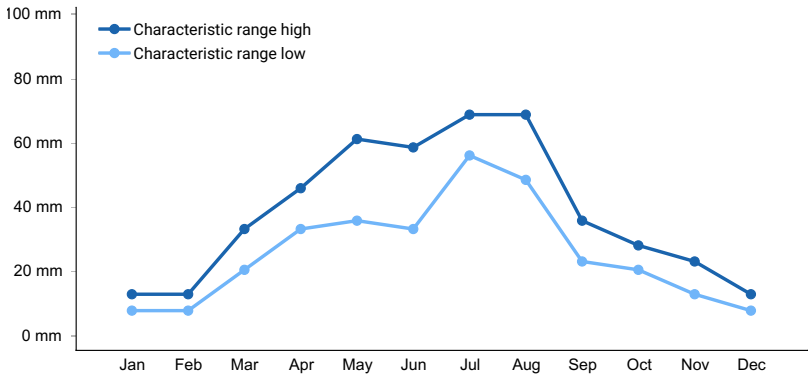


Figure 1. Monthly precipitation range

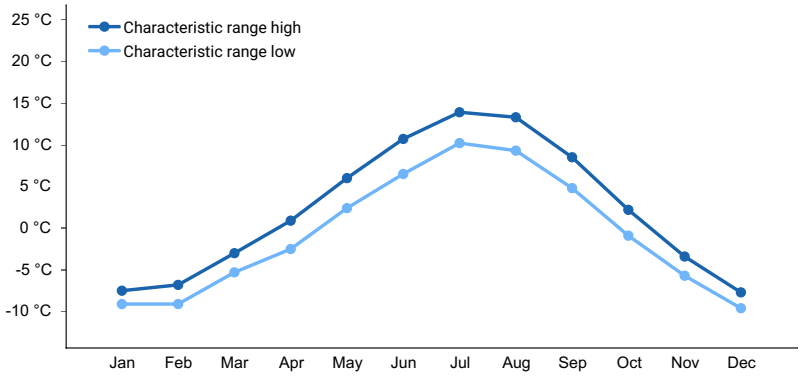


Figure 2. Monthly minimum temperature range

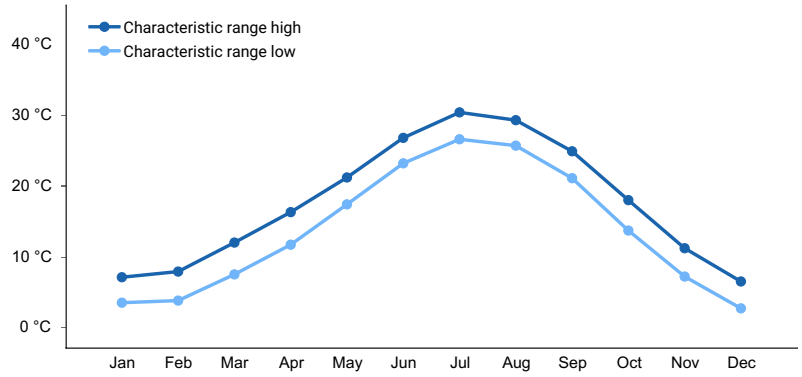


Figure 3. Monthly maximum temperature range

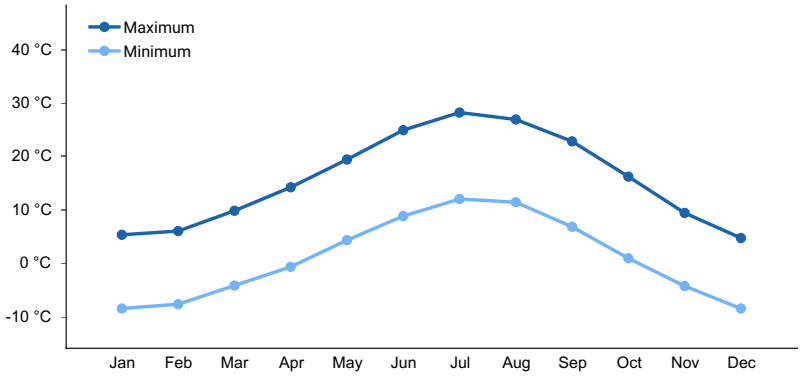


Figure 4. Monthly average minimum and maximum temperature

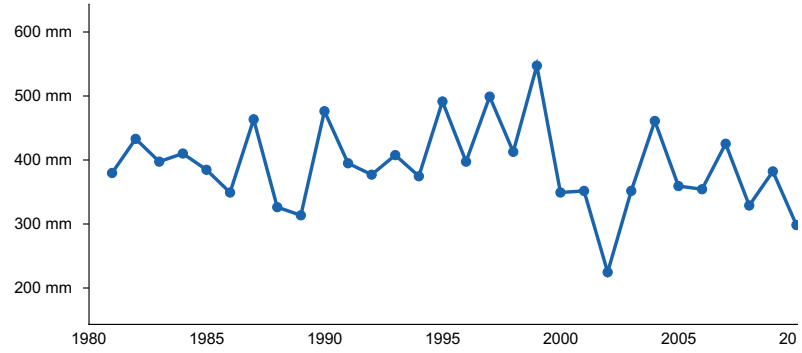


Figure 5. Annual precipitation pattern

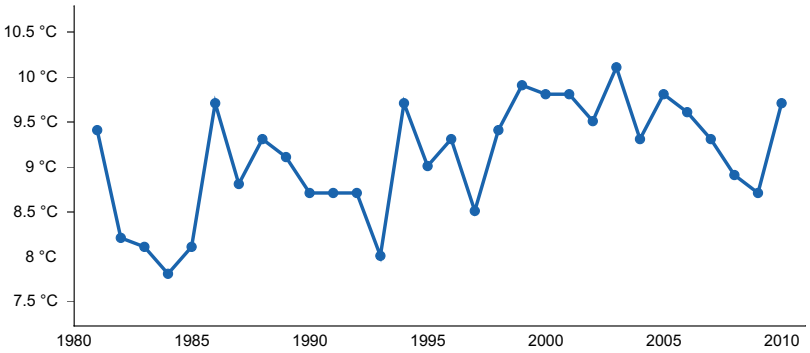


Figure 6. Annual average temperature pattern

Climate stations used

- (1) VIRGINIA DALE 7 ENE [USC00058690], Livermore, CO
- (2) WATERDALE [USC00058839], Loveland, CO
- (3) PARKER 6 E [USC00056326], Parker, CO
- (4) RUSH 1N [USC00057287], Rush, CO
- (5) COLORADO SPRINGS MUNI AP [USW00093037], Colorado Springs, CO
- (6) SHEEP MTN [USC00057572], Gardner, CO
- (7) RED WING 1 WSW [USC00056977], Gardner, CO

Influencing water features

None

Soil features

The soils of this site are moderately deep to deep and are well drained. They occur on fans, terraces, hillsides, and upland ridges. The surface textures are loams, silt loams and fine sandy loams. The surface soils vary in reaction from a pH of 6.1 to 8.4. These soils are formed in alluvium, residual and loess material derived from sedimentary rock (shale, siltstone, sandstone, interbedded sandstone and shale, interbedded limestone and shale), and calcareous mixed lithology.

Permeability varies from moderate to moderately slow. Generally, runoff is medium to rapid and the erosion hazard is moderate to high for most of the soils associated with this range site. However, for the Sampson, and Satanta soils the runoff is slow and the erosion hazard is slight to moderate.

Soils associated with this site:
Ascalon, Neville, Sampson, Santanta, Patent, Trujillo, Potts, Molinaro, Noden, Manzano, Kim and Table Mountain.

Table 4. Representative soil features

Parent material	(1) Alluvium–sedimentary rock (2) Eolian deposits–sedimentary rock (3) Alluvium (4) Eolian deposits
Surface texture	(1) Loam (2) Fine sandy loam (3) Silt loam
Family particle size	(1) Fine-loamy
Drainage class	Well drained
Soil depth	51–152 cm
Surface fragment cover <=3"	0–10%
Surface fragment cover >3"	0–10%

Calcium carbonate equivalent (Depth not specified)	0–10%
Sodium adsorption ratio (Depth not specified)	0–2
Soil reaction (1:1 water) (Depth not specified)	6.1–8.4
Subsurface fragment volume <=3" (Depth not specified)	0–10%
Subsurface fragment volume >3" (Depth not specified)	0–10%

Ecological dynamics

The information in this ESD, including the state-and-transition model diagram (STM), was developed using historical data, and professional experience. The information is representative of a dynamic set of plant communities that represent the complex interaction of several ecological processes. The plant composition has been determined by study of rangeland relic areas, areas protected from excessive disturbance, seasonal use pastures, short duration/time-controlled grazing strategies, and historical accounts.

The Loamy Foothill ecological site is characterized by four states: Reference, Warm-Season Shortgrass Dominated, Increased *Bare Ground*, and Invaded States. The Reference State is characterized by dominant cool-season rhizomatous midgrass (western wheatgrass), and secondary cool-season mid-height bunchgrass (green needlegrass). The Warm-Season Shortgrass State is characterized by a warm- season short bunchgrass (blue grama). The Increased *Bare Ground* State is characterized by early successional warm-season bunchgrass (threeawn), cool-season short bunchgrass (squirreltail), annual grasses, annual forbs, and yucca. The Invaded State has been disturbed by equipment and includes early successional annual plants as well as invasive species (knapweeds, yellow toadflax).

The degree of grazing has a significant impact on the ecological dynamics of the site. This region was historically occupied by large grazing animals such as bison and elk, along with pronghorn and mule deer. Grazing by these large herbivores, along with climatic and seasonal weather fluctuations, had a major influence on the ecological dynamics of the site.

Historically, it is believed, grazing patterns by herds of large ungulates was driven by water distribution, precipitation events, drought events, and fire. It is believed that grazing periods would have been short, followed by long recovery periods. These large migrating herds impacted the ecological processes of nutrient and hydrologic cycles, by urination, trampling (incorporation of litter into the soil surface), and breaking of surface crust, to increase water infiltration.

This site developed with occasional fires being part of the ecological processes. Historic fire frequency (pre-industrial), is estimated at 10- 12 years (Guyette, 2012), randomly distributed, and started by lightning at various times throughout the growing season.
Dendroecological reconstructions of fire history showed that fires burned during years of extreme drought (2011. Schoennagel, Sherriff, Veblen).

Early human inhabitants were also likely to start fires for various reasons (deliberately or accidentally). Both of these types of fire events likely impacted the site by leaving mosaic vegetation patterns. The impact of fire over the past 50 years has been relatively insignificant due to wildfire suppression and the lack of acceptance of prescribed fire as a management tool. However, prolonged drought, coupled with fire suppression has increased the frequency and intensity of periodic wildfires in the area.

Deterioration of this site, due to continuous grazing without adequate recovery periods following each grazing occurrence and/or overstocking, will cause blue grama to increase. Cool-season grasses such as green needlegrass and western wheatgrass will decrease. Warm-season grasses such as big bluestem, and palatable forbs will also decrease. Threeawn, annuals and bare ground increase under heavy continuous grazing. Lack of grazing and lack of fire initially causes increased herbaceous litter. Decadence of bunchgrasses, such as green

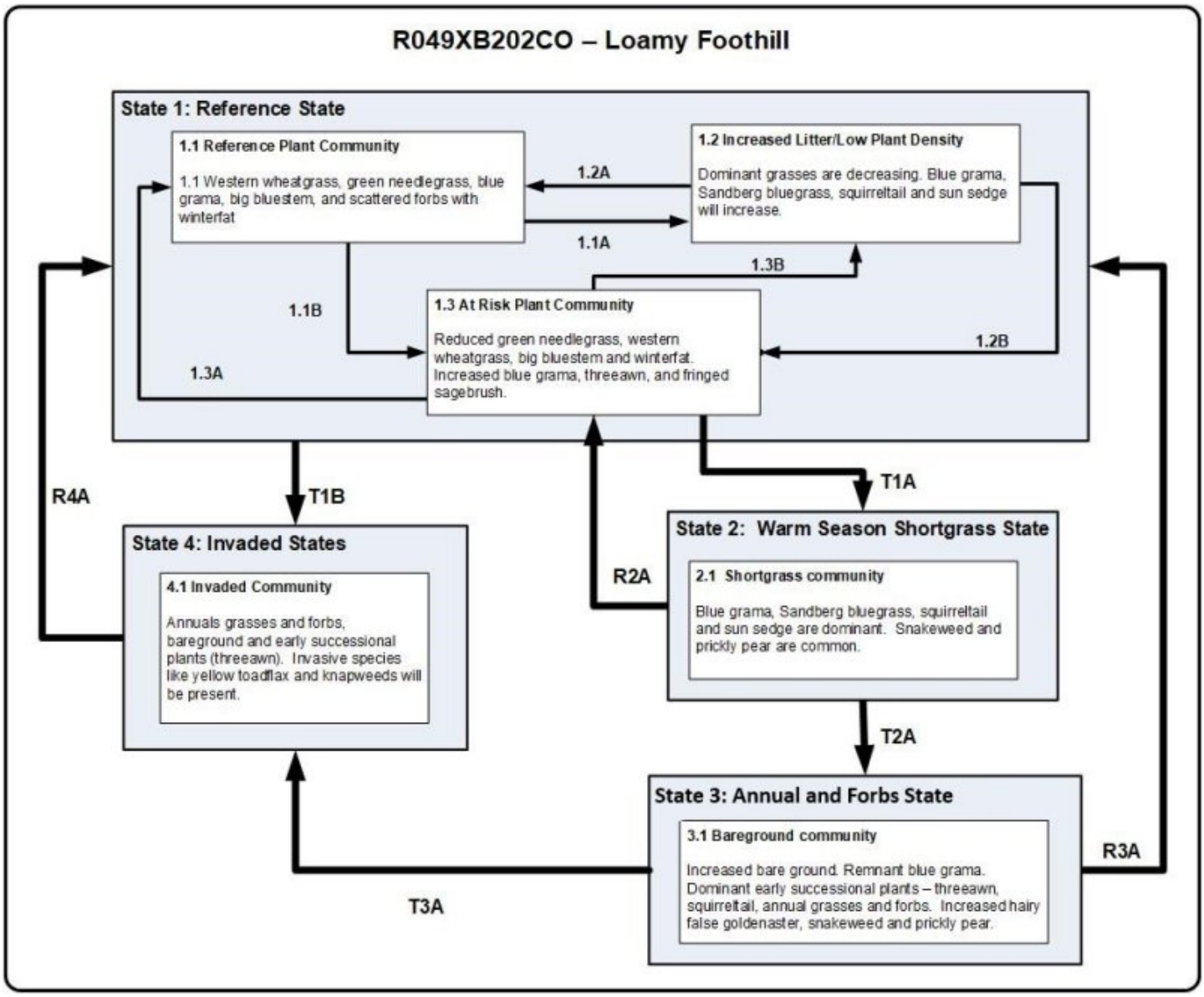
needlegrass and Indian ricegrass, and lower vigor vegetation is expected to occur with non-use and lack of fire. This also allows invasive species like diffuse knapweed, spotted knapweed, cheatgrass, toadflax and other similar vegetation to establish. Grazing which allows adequate recovery periods following each grazing event and proper stocking will maintain ecological resilience and resistance to disturbances.

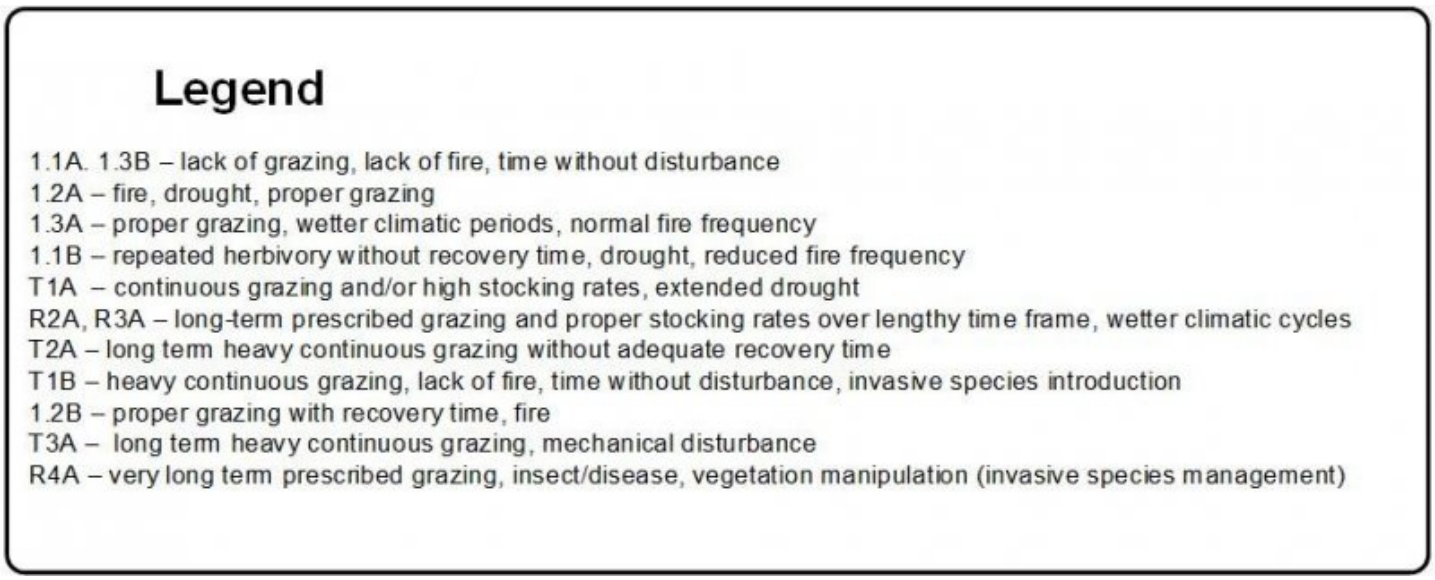
Drought and/or early killing frost cycles have historically impacted the vegetation. Changes in species composition will vary depending upon the duration and severity of the drought and/or frost cycle.

Some of this ecological site has been tilled and used for crop production. Today, much of this site is urban/suburban residence and small acreage development. Residential development leads to fire suppression. This is an important site for livestock grazing, especially beef cattle. Today the management of livestock grazing has been a major influence on the ecological dynamics of the site. This management, coupled with the effects of annual climatic variations, largely dictates the plant communities for the site.

The following diagram illustrates the common plant communities that can occur on the site and the pathways (arrows) among communities. Bold lines surrounding each plant community or communities represent ecological thresholds and a plant community state. Community phase pathways in the reference state represent shifts in the plant community within the natural range of variability. Transition and Restoration pathways represent the plant community crossing an ecological threshold between states. The ecological processes are discussed in more detail in the plant community descriptions following the diagram.

State and transition model





State 1
Reference State

The Reference State is characterized by three distinct plant community phases; Reference Plant Community, At Risk Plant Community, and Increased Litter/Low Plant Density. These plant communities, and the various successional stages between them, represent the natural range of variability due to the disturbance regimes applicable to this site. This site has a rolling grassland aspect with mid-grasses dominating. Western wheatgrass clearly dominates the plant community. Green needlegrass is also abundant. Western wheatgrass and green needlegrass produce about 55-60% of the total vegetation on this site. Plants such as blue grama, muttongrass, Sandberg bluegrass, sun sedge, and winterfat are secondary in the plant community. Indian ricegrass, bottlebrush squirreltail, threeawn, scarlet globemallow, slimflower scurfpea and prairie sagewort (fringed sagebrush) occur in small amounts in scattered distribution. Following is the narrative for the reference plant community. This plant community may not represent every possibility, but it probably is the most prevalent and repeatable plant community. As more data are collected, some of these plant communities may be revised or removed, and new ones may be added. None of these plant communities should necessarily be thought of as “Desired Plant Communities”. According to the USDA NRCS National Range and Pasture Handbook, Desired Plant Communities will be determined by the decision- makers and will meet minimum quality criteria established by the NRCS. The main purpose for including any description of a plant community here is to capture the current knowledge and experience at the time of this revision.

Community 1.1
Reference Plant Community

This is the interpretive plant community. This plant community evolved with grazing by large herbivores and is well suited for grazing by domestic livestock. It can be found on areas that are properly managed with prescribed grazing that allows for adequate recovery periods following each grazing event. The potential plant community is about 75 to 85 percent grasses, 10 to 15 percent forbs and 5 to 10 percent shrubs. (air-dry weight). The major grasses in the Reference Plant Community include western wheatgrass, green needlegrass, blue grama, big and little bluestem, and sideoats grama. These plants provide valuable forage throughout the growing season. Sub-dominant grasses include mountain muhly, Montana wheatgrass (Griffith's wheatgrass), native bluegrass, and prairie junegrass. Major forbs include scarlet globemallow, upright prairie coneflower, and dotted blazing star (dotted gayfeather). Dominant shrubs include winterfat and fourwing saltbush. Overgrazing with cattle will cause western wheatgrass, green needlegrass, Indian ricegrass, muttongrass, fourwing saltbush and winterfat to decrease in the plant community. Blue grama, Sandberg bluegrass, bottlebrush squirreltail, and sun sedge will increase. Overgrazing with sheep will cause scarlet globemallow, slimflower scurfpea, fourwing saltbush and winterfat to decrease. With further deterioration of this site blue grama, Sandberg bluegrass, bottlebrush squirreltail, and sun sedge will disappear and be replaced by threeawn and sand dropseed. Continued heavy grazing will cause plants such as cheatgrass, plains pricklypear, broom snakeweed, and curlycup gumweed to dominate the site. This plant community is diverse, and productive. Litter is properly distributed with very little movement off-site, and natural plant mortality is very low. It is well-suited to carbon sequestration, effective water cycle, and wildlife use by many species, livestock use, and is

aesthetically pleasing. Community dynamics, nutrient cycle, water cycle, and energy flow are functioning properly. This community is resistant to disturbances except moderate to heavy continuous grazing, tillage, and/or development into urban or other uses. Total annual production ranges from 800 to 1800 pounds of air-dry vegetation per acre and will average 1400 pounds during an average year. Of this production, 5 to 10% will likely be unpalatable out of reach of grazing animals. These production figures are the fluctuations expected during favorable, normal and unfavorable years due to the timing and amount of precipitation and temperature. Total annual production should not be confused with species productivity, which is annual production and variability by species throughout the extent of the community phase. Resilience management. Grazing management that provides for proper stocking and adequate recovery opportunity will maintain this community and provide sustainable ecosystem goods and services from the plant community.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	717	1255	1614
Forb	90	157	202
Shrub/Vine	90	157	202
Total	**897**	**1569**	**2018**

Additional community tables

Table 6. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Grass and Grass-likes**			1009–1457	
	western wheatgrass	PASM	*Pascopyrum smithii*	549–628	–
	green needlegrass	NAVI4	*Nassella viridula*	314–392	–
	blue grama	BOGR2	*Bouteloua gracilis*	157–235	–
	big bluestem	ANGE	*Andropogon gerardii*	78–157	–
	sun sedge	CAINH2	*Carex inops ssp. heliophila*	78–157	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	47–78	–
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	47–78	–
	mountain muhly	MUMO	*Muhlenbergia montana*	47–78	–
	needle and thread	HECO26	*Hesperostipa comata*	31–78	–
	switchgrass	PAVI2	*Panicum virgatum*	31–78	–
	Montana wheatgrass	ELAL7	*Elymus albicans*	16–78	–
	muttongrass	POFE	*Poa fendleriana*	16–78	–
	little bluestem	SCSC	*Schizachyrium scoparium*	16–78	–
	Sandberg bluegrass	POSE	*Poa secunda*	16–78	–
	sideoats grama	BOCU	*Bouteloua curtipendula*	16–78	–
	Canada wildrye	ELCA4	*Elymus canadensis*	1–47	–
	Grass, perennial	2GP	*Grass, perennial*	1–47	–
	squirreltail	ELEL5	*Elymus elymoides*	1–31	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	1–31	–
	purple threeawn	ARPU9	*Aristida purpurea*	1–16	–
Forb					
2	**Forbs**			112–224	

	Forb (herbaceous, not grass nor grass-like)	2FORB	*Forb (herbaceous, not grass nor grass-like)*	1–47	–
	Drummond's milkvetch	ASDR3	*Astragalus drummondii*	16–47	–
	upright prairie coneflower	RACO3	*Ratibida columnifera*	16–47	–
	dotted blazing star	LIPU	*Liatris punctata*	16–31	–
	hairy false goldenaster	HEVI4	*Heterotheca villosa*	16–31	–
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	16–31	–
	slimflower scurfpea	PSTE5	*Psoralidium tenuiflorum*	16–31	–
	tarragon	ARDR4	*Artemisia dracunculus*	1–31	–
	hoary tansyaster	MACAC3	*Machaeranthera canescens ssp. canescens var. canescens*	1–16	–
	rosy pussytoes	ANRO2	*Antennaria rosea*	1–16	–
	Douglas' ragwort	SEFLD	*Senecio flaccidus var. douglasii*	1–16	–
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	1–16	–
Shrub/Vine					
3	**Shrubs**			112–224	
	winterfat	KRLA2	*Krascheninnikovia lanata*	16–78	–
	fourwing saltbush	ATCA2	*Atriplex canescens*	16–78	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	1–47	–
	prairie sagewort	ARFR4	*Artemisia frigida*	16–31	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	16–31	–
	rubber rabbitbrush	ERNA10	*Ericameria nauseosa*	16–31	–
	spineless horsebrush	TECA2	*Tetradymia canescens*	1–16	–
	plains pricklypear	OPPO	*Opuntia polyacantha*	1–16	–
	soapweed yucca	YUGL	*Yucca glauca*	1–16	–

Animal community

Livestock Grazing:
This site provides excellent forage for cattle and horses during the spring, summer, and fall seasons. It provides fair to good forage for sheep, pronghorn, and deer.

The animal forage preference changes as the growing season progresses. This, coupled with the fact that this site has a good complement of cool and warm season plants, make it important that planned deferment and rotation be scheduled. This level of grazing management will ensure maximum utilization of the available forage while maintaining the desirable plants.

Cool season plants such as western wheatgrass, green needlegrass, needle and thread, Montana wheatgrass, muttongrass, and Indian ricegrass are very nutritious during the early spring. Therefore it is necessary to periodically defer grazing in the spring so that these cool season grasses are not grazed out and replaced by less desirable species. Warm season plants such as big bluestem, little bluestem, sideoats grama, switchgrass and blue grama will benefit by deferment from grazing during the late spring and early summer months.
Vegetative palatability will influence proper use considerations. The season of use, kind of grazing animal, past grazing use, and the plant composition will directly influence the animal preference and performance.

The following suggested initial stocking rate calculations are based on the estimated total annual forage production in a normal year multiplied by 25% harvest efficiency divided by 912.5 pounds of ingested air-dry vegetation for an animal unit per month.

Plant Community (PC)/Production (lbs./acre)/ Stocking Rate (AUM/acre)

Reference PC/ 1400/ 0.38
Increased Litter/Decadence PC/ 650/ 0.18
At Risk PC/ 800/ 0.22
Shortgrass Dominated PC/ 600/ 0.16
Bare Ground PC/ 300/ 0.08
Invaded PC/ */ *
* Highly variable; stocking rate needs to be determined on site.

Adjustments to these suggested initial stocking rates should be made as needed to obtain proper use. With specialized grazing systems, large livestock breeds, uncontrolled ungulates, inaccessibility, dormant season use, presence of introduced forage species, seeded rangeland etc., stocking rate adjustments will be required.

Hydrological functions

Soils in this site are grouped into "C" hydrologic group, as outlined in the Soils of Colorado Loss Factors and as outlined in the Soils of Colorado Loss Factors and Erodibility Hydrologic Groupings 1979 Handbook. Field investigations are needed to determine hydrologic cover conditions and hydrologic curve numbers. Refer to NRCS National Engineering Handbook, Section 4, and Peak Flows in Colorado Handbook for more information.

Recreational uses

This site has fair to good aesthetic appeal and natural beauty due to the numerous forbs and shrubs that bloom from spring to summer. The recreation provided through hunting for deer and pronghorn is generally good on this site.

Wood products

No potential production on this site.

Other information

Endangered Plants and Animals
Gaura neomexicana coloradensis or Colorado butterfly weed has been reported as endangered in Douglas County. However, its occurrence on this range site has not been proven. The Plains sharp-tailed Grouse is listed as endangered by the Colorado Division of Wildlife. This species is associated with this site in Douglas County.

Inventory data references

Location of Typical Examples of the Site:
a. College Pastures, CSU, Fort Collins
b. Arapahoe Conservation District property, (Plains Conservation Center) Arapahoe County
c. Red Creek Ranch, Pueblo County
d. SWl/4, SWl/4, Section 14, T.16S., R.67W., El Paso County
e. Fort Carson Army Base, approximately 12 Mi. South and 2 Mi. West, Colorado Springs, Colo.
f. Larimer County Parks, around Horsetooth Reservoir, Larimer County

Counties in which this ecological site occurs:
Arapahoe, Boulder, Custer, Douglas, Elbert, El Paso, Fremont, Huerfano, Jefferson, Larimer, and Las Animas.

Other references

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Approval

Kirt Walstad, 9/07/2023

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--Site Development and Testing Plan--:

Future work to validate and further refine the information in this Provisional Ecological Site Description is necessary. This will include field activities to collect low-, medium-, and high-intensity sampling, soil correlations, and analysis of that data.

Additional information and data are required to refine the Plant Production and Annual Production tables for this ecological site. The extent of MLRA 49 must be further investigated.

Field testing of the information contained in this Provisional ESD is required. As this ESD is moved to the Approved

ESD level, reviews from the technical team, quality control, quality assurance, and peers will be conducted.

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)	
Contact for lead author	
Date	05/04/2024
Approved by	Kirt Walstad
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

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

2. **Presence of water flow patterns:**

3. **Number and height of erosional pedestals or terracettes:**

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):**

5. **Number of gullies and erosion associated with gullies:**

6. **Extent of wind scoured, blowouts and/or depositional areas:**

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

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):**

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):**

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and 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):**

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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:

    Sub-dominant:

    Other:

    Additional:

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):**

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14. **Average percent litter cover (%) and depth (in):**

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):**

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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:**

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17. **Perennial plant reproductive capability:**
