

## Ecological site R049XY206CO Stony Foothill

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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): 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)

## **LRU notes**

Land Resource Unit (LRU) 03 (formerly C) is a transition zone between the mountains and plains and describes the central Colorado foothills of the Front Range including the Palmer Divide. It includes the cities of Highlands Ranch, Castle Rock, and Kiowa in Douglas and Elbert counties. The Black Forest/Palmer Divide area is central, while Cheyenne Mountain State Park at Colorado Springs is the southernmost extent in El Paso County. It is characterized by Gambel Oak and Ponderosa Pine with ponderosa pine increasing at higher elevations. The ponderosa pine grades into grasslands on the drier eastern fringes as it transitions into the plains. This area was historically used for ranching, some farming, timbering, mining and quarry activities. The area had an influx of people during the Colorado gold rush of 1859. Because of its proximity to Denver and Colorado Springs, many of the original ranches and small towns have been converted to subdivisions, small acreage land holdings and suburbs. Some cities and counties such as Castle Rock and Douglas County have zoned "open space" for recreation and rangeland leased for ranching.

## **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 M331I - Southern Rocky Mountain Steppe - Open Woodland - Coniferous Forest - Alpine Meadow (Cleland, 2007)

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 M331I - Southern Rocky Mountain Steppe - Open Woodland - Coniferous Forest - Alpine Meadow (Cleland, 2007)

331If – Arkansas Valley Tablelands; 331Ig- Arkansas Valley High Tablelands; 331Ih – Black Forest; and 331Ii – Southern Front Range Foothills < 331I – Arkansas Tablelands < 331I Great Plains – Palouse Dry Steppe (Cleland, 2007)

331Ha – Southern Denver-Julesburg Basin; 331Hc – Eastern Central High Plains; 331He – Northern Front Range Foothills and 331Hf – Denver-Julesburg Basin < 331H – Central High Plains < 331I Great Plains – Palouse Dry Steppe (Cleland, 2007)

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 (Chapman et. al, 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 (Chapman et. al, 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 (Chapman et. al, 2006).

USGS:  
 Southern Rocky Mountain Province, Colorado Piedmont and Raton

### Ecological site concept

R049XY206CO Stony Foothill occurs on hillslopes, ridges, hills and mountainsides. Slopes is between 5 to 60%. Soils range from shallow to deep (10 to 100 inches) in depth. Soils are derived from residuum and/or colluvium from sedimentary rock or alluvium, residuum or colluvium in general. Soil surface texture range from extremely stony loam, very cobbly loam, stony loam, bouldery clay loam or stony sandy loam. Family particle size is clayey, fine, and loamy-skeletal. It is a Big Bluestem – Little Bluestem- Rocky Mountain Juniper community. It has a typic ustic moisture regime and mesic temperature regime. The effective precipitation ranges from 17 to 20 inches.

### Associated sites

R049XB212CO	<b>Shaly Foothill</b> This site occurs on break areas with short steep slopes that expose the raw shale parent material. Slopes is between 3 to 35%. Soils are shallow with depths of 6 to 20 inches. Soils are derived from slopes alluvium, and/or residuum primarily from shale or clayey shale. Soil surface texture is clay, clay loam, silt loam or gravelly clay loam. Family particle size is clayey or loamy. It is a Western Wheatgrass– Green Needlegrass community. It has an aridic ustic moisture regime. The effective precipitation ranges from 13 to 18 inches.
R049XB208CO	<b>Clayey Foothill</b> This site 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.

### Similar sites

R049XY214CO	<b>Gravelly Foothill</b> This site occurs on gently rolling and sloping uplands. Slopes is between 0 to 35%. Soils are deep and greater than 60 inches in depth. Soils are derived from slopes alluvium, alluvium and colluvium from arkose or igneous and metamorphic rocks. Soil surface texture is gravelly, sandy loam, cobbly sandy loam, gravelly loam or very gravelly loam. Family particle size is sandy-skeletal, loamy-skeletal or fine-loamy over sandy-skeletal. It is a Little Bluestem – Needle-and-Thread community. It has an aridic ustic moisture regime. The effective precipitation ranges from 12 to 16 inches.
R049XY213CO	<b>Cobbly Foothill</b> This site occurs on fans, terraces, stream terraces, fan terraces, mesas and cuestas. Slopes is between 5 to 25%. Soils are moderately deep to very deep with depths of greater than 20 inches. Soils are derived from alluvium, colluvium and/or residuum primarily from sandstone and/or sedimentary rock. Soil surface texture is extremely cobbly sandy loam, stony sandy loam, cobbly sandy loam or extremely cobbly loam. Family particle size is loamy-skeletal or clayey skeletal. It is a Mountain Muhly – Big Bluestem community. It has a typic ustic moisture regime. The effective precipitation ranges from 15 to 18 inches.

**Table 1. Dominant plant species**

Tree	(1) <i>Juniperus scopulorum</i>
Shrub	Not specified
Herbaceous	(1) <i>Andropogon gerardii</i> (2) <i>Schizachyrium scoparium</i>

## Physiographic features

Elevation ranges from 5500 to 8200 ft. The topography may be steep to rolling.

**Table 2. Representative physiographic features**

Landforms	(1) Hill (2) Hillslope (3) Mountainside
Runoff class	Medium to high
Flooding frequency	None
Ponding frequency	None
Elevation	1,676–2,499 m
Slope	5–60%
Aspect	Aspect is not a significant factor

## Climatic features

Optimum growing season of native plants is 110 days of frost-free period with maximum reached during the summer months. The average annual precipitation averages from 17 to 20 inches per year, but can range from 12 to over 22 inches depending on the year and location within the MLRA. Approximately 60 to 75 percent of the annual precipitation occurs during the growing season from late-April to late-September. The Rocky Mountains to the west intercept much of the precipitation from Pacific storms. Snowfall can vary from 39 inches to 75 inches, depending upon elevation and location. Snowfall averages 63 inches annually. Wind speeds average 10 miles per hour annually. Daytime winds are generally stronger than nighttime, and occasional strong storms may bring brief periods of high winds with gusts to more than 60 miles per hour.

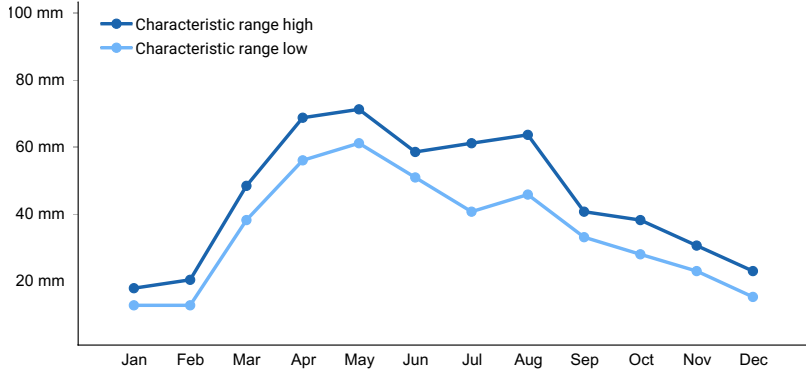
The average length of the freeze-free period is 133 days, but varies from 109 to 156 days in 5 out of 10 years. The average date of first freeze (28 degrees or below) in the fall is September 22, and the average last freeze in the spring is May 17. July is the hottest month and January is the coldest. Summer temperatures are moderate, with average highs in the low 80s and occasionally reaching the mid 90s. Summer nights are comfortably cool, with lows averaging in the 50s. Higher elevations can receive a dusting of snow in early September. Severe cold is normally of short duration. Summer humidity is low and evaporation is high.

Cool season plants generally begin growth from April 1 to April 15. Native warm season plants typically begin growth about May 1 to May 15. Cool season plants generally continue to grow through the summer and fall, in comparison to the warmer and drier eastern plains where cool season plants typically exhibit summer dormancy. Regrowth of cool season plants occurs in September and October of most years, depending on moisture availability.

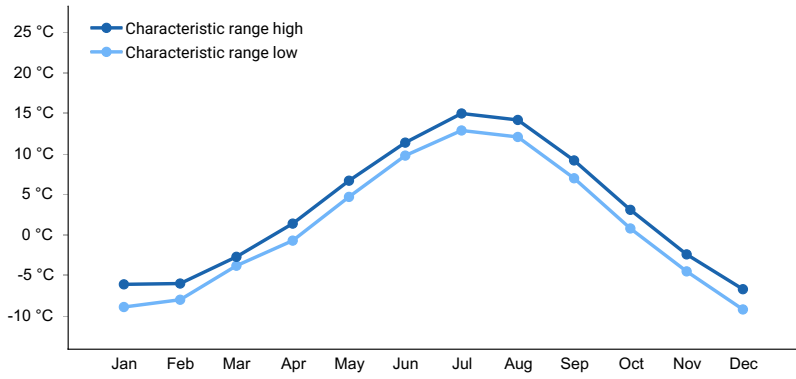
**Table 3. Representative climatic features**

Frost-free period (characteristic range)	94-122 days
Freeze-free period (characteristic range)	126-142 days
Precipitation total (characteristic range)	457-508 mm
Frost-free period (actual range)	84-129 days

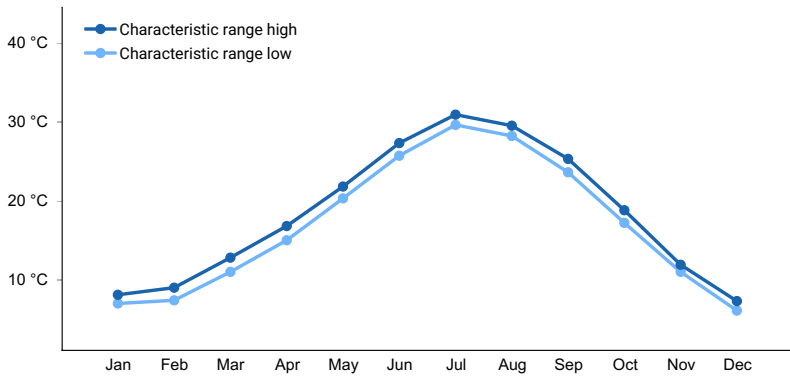
Freeze-free period (actual range)	109-156 days
Precipitation total (actual range)	432-508 mm
Frost-free period (average)	110 days
Freeze-free period (average)	133 days
Precipitation total (average)	483 mm



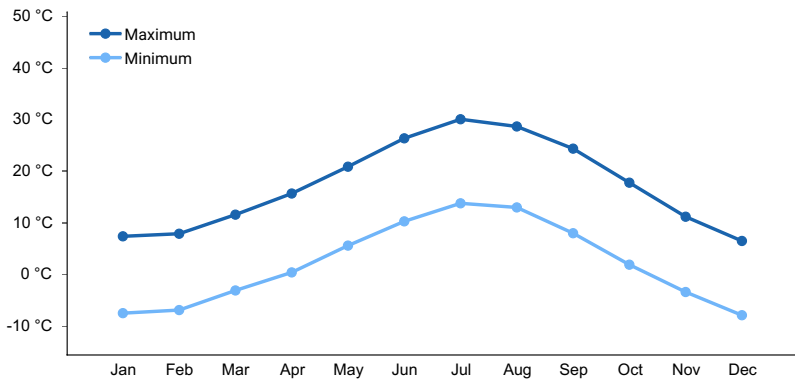
**Figure 1. Monthly precipitation range**



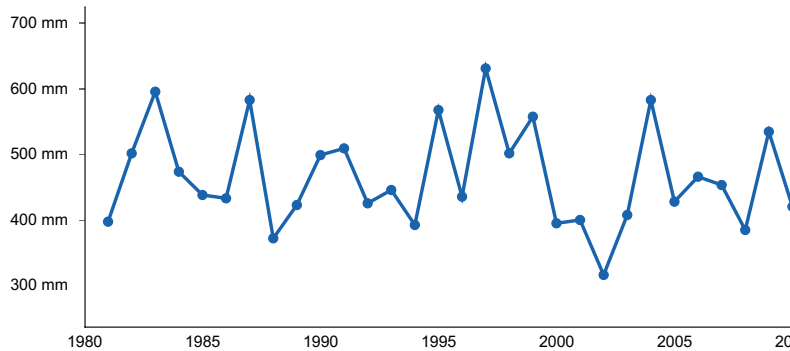
**Figure 2. Monthly minimum temperature range**



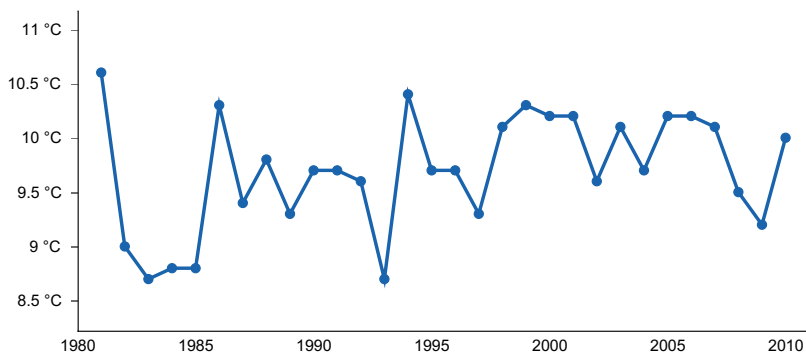
**Figure 3. Monthly maximum temperature range**



**Figure 4. Monthly average minimum and maximum temperature**



**Figure 5. Annual precipitation pattern**



**Figure 6. Annual average temperature pattern**

### Climate stations used

- (1) CASTLE ROCK [USC00051401], Castle Rock, CO
- (2) ROXBOROUGH SP [USC00057249], Sedalia, CO
- (3) KASSLER [USC00054452], Littleton, CO
- (4) PARKER [USC00056323], Parker, CO
- (5) RALSTON RSVR [USC00056816], Arvada, CO
- (6) BOULDER [USC00050848], Boulder, CO
- (7) WATERDALE [USC00058839], Loveland, CO
- (8) VIRGINIA DALE 7 ENE [USC00058690], Livermore, CO

### Influencing water features

None

### Soil features

The soils are shallow to deep with extremely stony loam, very cobbly loam, stony loam, bouldery clay loam or stony sandy loam surface soils. The parent material is generally colluvial-alluvial and widely variable. The moisture is held

well. Stones and/or boulders act to concentrate moisture in a given volume of soil which makes increased water available for plant growth more than would be the case in a rock-free soil under the same precipitation. Areas of deep, rock-free soils of the Loamy or Sandy Foothills range sites are often in close association with this site.

Typical Soils in assigned this site are:

Celeste, Leyden, Primen, Standley, Curecanti and Sixmile.

**Table 4. Representative soil features**

Parent material	(1) Colluvium (2) Residuum (3) Alluvium (4) Residuum–sedimentary rock (5) Colluvium–sedimentary rock
Surface texture	(1) Very stony, extremely stony, bouldery clay loam (2) Extremely stony, stony, very cobbly loam (3) Cobbly, stony sandy loam
Family particle size	(1) Loamy-skeletal (2) Clayey (3) Fine
Drainage class	Well drained
Permeability class	Slow to moderate
Soil depth	25–254 cm
Surface fragment cover ≤3"	10–35%
Surface fragment cover >3"	20–60%
Calcium carbonate equivalent (Depth not specified)	0–5%
Electrical conductivity (Depth not specified)	0 mmhos/cm
Sodium adsorption ratio (Depth not specified)	0
Soil reaction (1:1 water) (Depth not specified)	6.1–8.4
Subsurface fragment volume ≤3" (Depth not specified)	10–30%
Subsurface fragment volume >3" (Depth not specified)	10–60%

## 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 Stony Foothill ecological site is characterized by four states: Reference, Shortgrass Dominated, Increased Bareground and Invaded States. The Reference State is characterized by Mixed Mid/Tall Grasses (Reference Community) that is dominated by big/little bluestem, western and Montana (Griffith) wheatgrass, blue grama, various forbs and shrubs and secondary cool-season mid-height bunchgrass (needle and thread, green needlegrass). The Shortgrass Dominated State is characterized by a warm-season short bunchgrass (blue grama), and secondary warm-season short stoloniferous grass (buffalograss). The Annuals and Forbs State is characterized by early successional warm-season bunchgrass (Fendler threeawn), cool-season bunchgrass (sleepygrass, squirreltail), annual grasses, annual forbs, and soapweed 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 shorter, followed by longer 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.

The soil moisture regime is favorable to the production of mid and tallgrass species giving this range site a rolling, mixed prairie aspect. Stones and boulders are on the surface of the soil and mixed with the soils which reduce the volume of effective soil but have the beneficial effect of concentrating the moisture in a smaller volume of soil that a stone-free soil would have. Big bluestem, little bluestem, blue grama, western wheatgrass, sideoats grama, Indiangrass and make up most of the plant community and provide about 60-75% of the total production. Plants such as needle and thread, green needlegrass, prairie junegrass, Sandberg bluegrass, prairie sandreed, American vetch and purple prairie clover are secondary in the plant community. Small amounts of sand dropseed, sun sedge, and dotted blazing star are scattered throughout the plant community. Shrubs that can occur are skunkbush sumac, alderleaf mountain mahogany and American plum.

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, Indiangrass and palatable forbs such as American vetch and purple prairie clover will also decrease. Fendler 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 the palatable plants.

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.

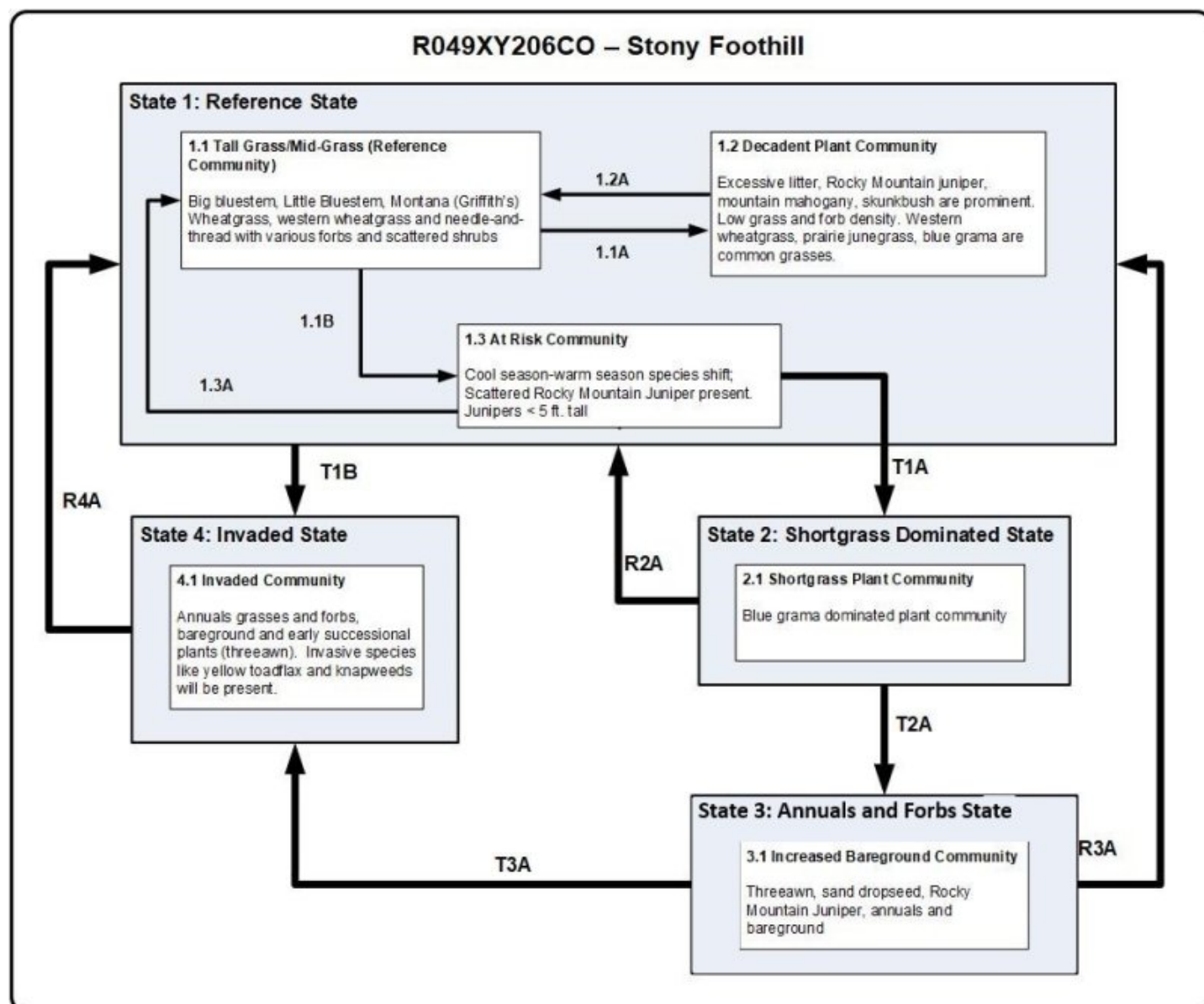
Today, much of this site is urban/suburban residence and small acreage development. Residential development leads to fire suppression. This is an important site for livestock grazing, especially beef cattle. Today the management of livestock grazing has been a major influence on the ecological dynamics 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



## Legend

- 1.1A, 1.3B – lack of grazing, lack of fire, time without disturbance
- 1.2A – fire, drought, proper grazing
- 1.3A – proper grazing, wetter climatic periods, normal fire frequency
- 1.1B – repeated herbivory without recovery time, drought, reduced fire frequency
- T1A – continuous grazing and/or high stocking rates, extended drought
- R2A, R3A – long-term prescribed grazing and proper stocking rates over lengthy time frame, wetter climatic cycles
- T2A – long term heavy continuous grazing without adequate recovery time
- T1B – heavy continuous grazing, lack of fire, time without disturbance, invasive species introduction
- 1.2B – proper grazing with recovery time, fire
- T3A – long-term heavy continuous grazing, mechanical disturbance, invasive species present
- R4A – very long term prescribed grazing, insect/disease, vegetation manipulation (invasive species management)

## Reference State

The Reference State is characterized by three distinct plant community phases; Reference Plant Community, At Risk Plant Community, and Decadent Plant Community. These plant communities, and the various secessional 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/tall grasses dominating. Big bluestem, little bluestem, western wheatgrass and Montana (Griffith) wheatgrass clearly dominate the plant community. Other warm-season tallgrasses are also abundant. Blue grama, sideoats grama and needle and thread are secondary grasses on this site. Plants such as Sandberg bluegrass, sun sedge, American vetch and purple prairie clover also occur in the plant community. Prairie junegrass, buffalograss, bottlebrush squirreltail, Fendler threeawn, slimflower scurfpea, skunkbush sumac and alderleaf mountain mahogany occur in scattered distribution. This site has a potential plant community which is transitional between Plains and Mountains and between grassland and woodland. As a result, there is a mixture of shrubs, grasses, forbs and occasional trees. Dominant grasses are big bluestem, little bluestem, Montana (Griffith's) wheatgrass, sideoats grama, needle and thread and western wheatgrass. Frequent shrubs are soapweed yucca, Rocky Mountain juniper, skunkbush sumac, American plum, wax currant, and alderleaf mountain mahogany. Forbs include Geyer larkspur, hairy false goldaster, mountain sunflower, small pod milk vetch, prairie spiderwort, deathcamas and buckwheat. 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

#### Tall Grass/Mid-Grass (Reference Community)

The Tallgrass/Midgrass Plant Community 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 vegetation is about 70-80% grasses and grass-like plants, 15-25% forbs, 1-10% shrubs and 1-3% trees (air-dry weight). The major grasses in the Reference Plant Community include big bluestem, little bluestem, blue grama, Indiangrass, western wheatgrass, Montana (Griffith) wheatgrass and sideoats grama. These plants provide valuable forage throughout the growing season. Sub-dominant grasses include Sandberg bluegrass, switchgrass and prairie junegrass. Major forbs include American vetch, purple prairie clover, upright prairie coneflower, and dotted blazing star. Dominant shrubs include skunkbush sumac, alderleaf mountain mahogany and American plum. Overgrazing with cattle will cause desirable grasses such as big bluestem, little bluestem, Indiangrass and green needlegrass to decrease. Overgrazing by sheep will cause desirable forbs and shrubs to be reduced. With the decrease of above-mentioned plants blue grama, Fendler threeawn, and sleepygrass will increase initially. Heavy continuous grazing will cause plants such as cheatgrass, yellow toadflax and knapweed to invade 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 and/or development into urban or other uses. Total annual production ranges from 1000 to 1550 pounds of air-dry vegetation per acre and will average 1250 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 following each grazing event will maintain this community and provide sustainable ecosystem goods and services from the plant community

Table 5. Annual production by plant type

<b>Plant Type</b>	<b>Low (Kg/Hectare)</b>	<b>Representative Value (Kg/Hectare)</b>	<b>High (Kg/Hectare)</b>
Grass/Grasslike	841	1037	1250
Forb	258	291	336
Shrub/Vine	11	39	84
Tree	11	34	67
<b>Total</b>	<b>1121</b>	<b>1401</b>	<b>1737</b>

## **Additional community tables**

Table 6. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
<b>Grass/Grasslike</b>					
1	<b>Warm season tallgrass</b>			224–392	
	big bluestem	ANGE	<i>Andropogon gerardii</i>	224–336	–
	Indiangrass	SONU2	<i>Sorghastrum nutans</i>	56–112	–
2	<b>Warm season midgrass</b>			168–392	
	little bluestem	SCSC	<i>Schizachyrium scoparium</i>	168–280	–
	sideoats grama	BOCU	<i>Bouteloua curtipendula</i>	84–112	–
	sand dropseed	SPCR	<i>Sporobolus cryptandrus</i>	28–56	–
3	<b>Cool season mid-rhizomatous grass</b>			224–336	
	Montana wheatgrass	ELAL7	<i>Elymus albicans</i>	168–224	–
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	84–140	–
4	<b>Cool season mid-bunchgrass</b>			56–112	
	needle and thread	HECO26	<i>Hesperostipa comata</i>	56–140	–
	squirreltail	ELEL5	<i>Elymus elymoides</i>	28–39	–
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	28–39	–
5	<b>Warm season short-bunchgrass</b>			56–112	
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	84–168	–
	purple threeawn	ARPUP6	<i>Aristida purpurea</i> var. <i>purpurea</i>	0–28	–
<b>Shrub/Vine</b>					
6	<b>Shrubs</b>			28–112	
	alderleaf mountain mahogany	CEMO2	<i>Cercocarpus montanus</i>	56–112	–
	American plum	PRAM	<i>Prunus americana</i>	56–112	–
	skunkbush sumac	RHTR	<i>Rhus trilobata</i>	28–56	–
	wax currant	RICE	<i>Ribes cereum</i>	28–56	–
<b>Forb</b>					
7	<b>Forbs</b>			168–448	
	scarlet globemallow	SPCO	<i>Sphaeralcea coccinea</i>	28–56	–
	American vetch	VIAM	<i>Vicia americana</i>	28–56	–
	dotted blazing star	LIPU	<i>Liatris punctata</i>	28–56	–
	prairie spiderwort	TROC	<i>Tradescantia occidentalis</i>	28–56	–
	Geyer's larkspur	DEGE2	<i>Delphinium geyeri</i>	28–56	–
	hairy false goldenaster	HEVI4	<i>Heterotheca villosa</i>	28–56	–
	slimflower scurfpea	PSTE5	<i>Psoraleidium tenuiflorum</i>	28–56	–
<b>Tree</b>					
8	<b>Trees</b>			0–56	
	Rocky Mountain juniper	JUSC2	<i>Juniperus scopulorum</i>	0–168	–

## Animal community

Livestock Grazing:

This site produces excellent forage for cattle and horses during years of average precipitation. It provides fair to

good forage for sheep, pronghorn and deer.

The animal forage preference changes as the growing season progresses. Western wheatgrass, green needlegrass, and needle and thread are very palatable during the spring. Therefore, it is necessary to periodically defer grazing in the spring and early summer so that these cool season plants are not overgrazed and replaced by less desirable species. Deferment of grazing through the late spring and summer months will benefit the warm season plants.

It is important that proper grazing use and planned deferred rotation grazing be followed on this site. This level of grazing management will ensure maximum utilization of the available forage while maintaining the desirable plants.

Vegetation 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.

Guide to Initial Stocking Rates (Stocking rates recommendations from site concept circa 1989 and based on estimated plant community succession):

The stocking rate calculations are based on the 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/ 1250/ 0.34

Decadent PC / 650/ 0.18

At Risk PC/ 850/ 0.23

Shortgrass PC/ 550/ 0.15

Increased Bareground PC/ \*/ \*

Invaded PC/ \*/ \*

\* Highly variable; stocking rate needs to be determined on site.

Adjustments to the 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.

## Other information

This site description was formerly known as Rocky Foothill. The name has been changed to Stony Foothill to be descriptive of the the kind of rock fragments that typify the soils the site occurs on, and to correspond with the Ecological Site Key for MLRA 49C dated December 5, 2019.

Rare, Threatened or Endangered Plants and Animals:  
(To be added when known)

## Inventory data references

Typical Location:

West side of Hogback (George Ross Ranch) south of Horsetooth Reservoir Dam, Larimer County.

This site occurs in the following counties: Arapahoe, Boulder, 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	05/20/2024
Approved by	Kirt Walstad
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

## Indicators

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

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

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

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

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

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

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

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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):**

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

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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):**
- 

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

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

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:**
- 

17. **Perennial plant reproductive capability:**
-