USDA Natural Resources Conservation Service

Ecological site GX070A04X070
Basalt Breaks

Last updated: 2/04/2020
Accessed: 05/13/2025

General information

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

MLRA notes

Major Land Resource Area (MLRA): 070A–High Plateaus of the Southwestern Great Plains

The Basalt Breaks occurs in MLRA 70A

LRU notes

The Basalt Breaks ecological site occurs in the Volcanic Plateaus LRU of MLRA 70A

Ecological site concept

This site is on escarpments and benches of basalt plateaus along the southern boundary of Colorado. Elevations range from 5900 to 6700 feet. The climate is semi-arid with precipitation averaging 15 to 17 inches annually. Temperatures are cool with an average temperature of 56F. Soils are derived from colluvium and alluvium descending from basalt cap rock. Soil texture spans from clay loam to loam.

The Basalt Breaks ESD was drafted from the existing Basalt Breaks No. 70 Colorado Range Site, January 1982.

Associated sites

GX070A04X071	**Basalt Loam** Basalt Loam occurs on plateau summits and along benches and fans

Similar sites

R070AY010NM	**Malpais Breaks** Malpais breaks

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	Not specified

Legacy ID

R070AX070CO

Physiographic features

This site is on moderate to steep colluvial slopes of basalt capped mesas formed by ancient lava flows. It consists of a series of ridges, benches and escarpments. The site can occur on shoulder, backslope, and footslope positions. Elevations range from 5900 to 6700 ft (1798 to 2042 m).

Table 2. Representative physiographic features

Landforms	(1) Plateau > Escarpment (2) Plateau > Bench (3) Plateau > Ridge
Flooding frequency	None
Elevation	1,798–2,042 m
Slope	10–25%
Aspect	W, NW, N, NE, E, SE, S, SW

Table 3. Representative physiographic features (actual ranges)

Flooding frequency	None
Elevation	Not specified
Slope	1–35%

Climatic features

The climate is semi-arid with precipitation averaging 15 to 17 inches (38 to 43 cm). Total yearly snowfall is 37-54 inches (94 to 137 cm). The monthly precipitation is as follows:

Jan .6 inches; Feb .4 inches; March 1.3 inches; April 1.8 inches; May 2.1 inches; June 1.7 inches; July 1.2 inches; Aug 1.8 inches; Sept 1.7 inches; Oct 1.6 inches; Nov .6 inches; Dec .4 inches

The mean growing season avearges approximately 130 to 140 days from May 15 to October 1, and, in average years, there is sufficient moisture at the beginning of the growing season to initiate growth in such cool-season grasses as western wheatgrass and needleandthread. Their optimum growth is early May through June. The warm season grasses have their optimum growing season through June and July, if adequate moisture is available. About 57% of the 15 inches (38 cm) of annual precipitation falls in the form of rain during the frostfree season. About 30 percent benefits warm season plants and cool-season plants, 30 percent benefits warm season plants and the rest falls during the season of plant dormancy. There are 39 days per year that the precipitation equals or exceeds .1 inches (.04 cm), 10 days that meets, equals or exceeds .5 inches (.2 cm), and 2 days that equal or exceed 1 inch (2.54 cm).

The average annual temperature is 52 degrees F (11 degrees C) with 27 days higher than 90 degrees F (32 degrees C) and 140 days lower than 32 degrees F (0 degrees C). Winter low temperatures fall below the freezing mark much of the time in November through March. Dates of the last killing frost may vary from 9-17, and the first killing frost from September 27, to October 8.

Nearby mountains to the west intercept much of the precipitation from the Pacific storms coming through this area during the winter. Wind velocities for the area average 10 to 12 miles (16 - 19.2 km) per hour and are prevailing from the south and southwest. Generally, March is the windiest month. Strong winds during the spring cause rapid drying of the soil surface. Relative humidity is moderately low. The sun shines approximately 75% of the time during the year.

Table 4. Representative climatic features

Frost-free period (characteristic range)	123-138 days
Freeze-free period (characteristic range)	151-161 days
Precipitation total (characteristic range)	432-483 mm

Frost-free period (actual range)	122-144 days
Freeze-free period (actual range)	150-166 days
Precipitation total (actual range)	432-483 mm
Frost-free period (average)	131 days
Freeze-free period (average)	157 days
Precipitation total (average)	457 mm

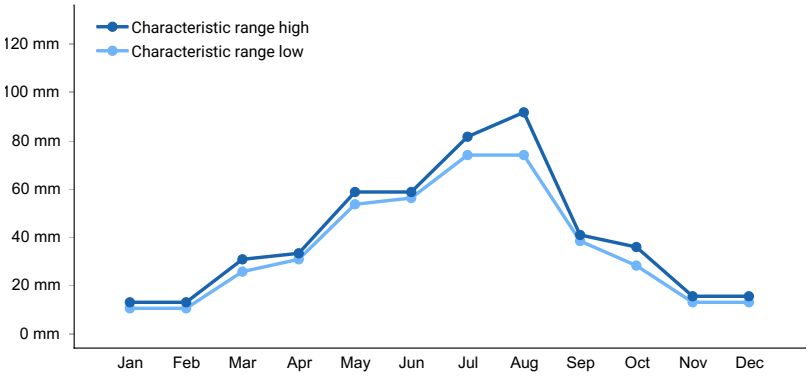


Figure 1. Monthly precipitation range

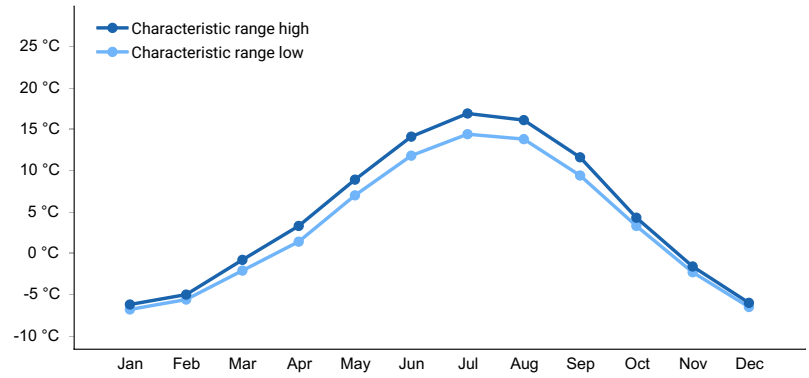


Figure 2. Monthly minimum temperature range

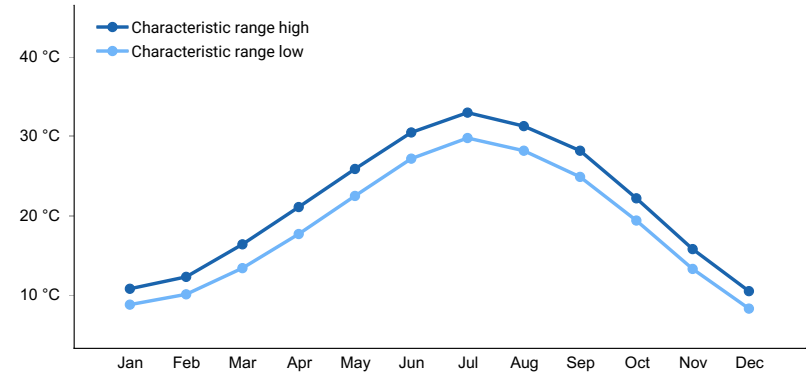


Figure 3. Monthly maximum temperature range

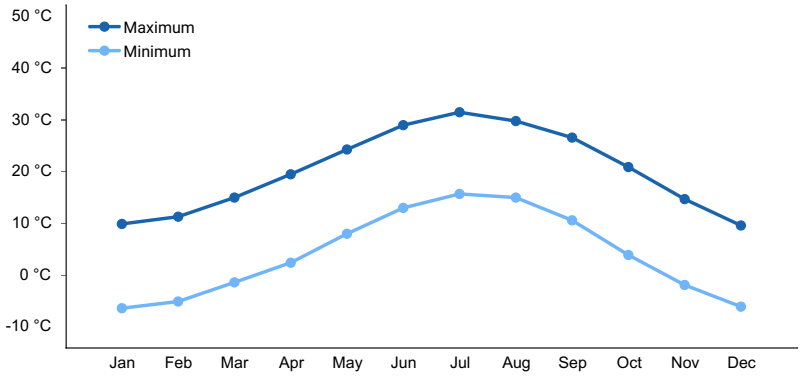


Figure 4. Monthly average minimum and maximum temperature

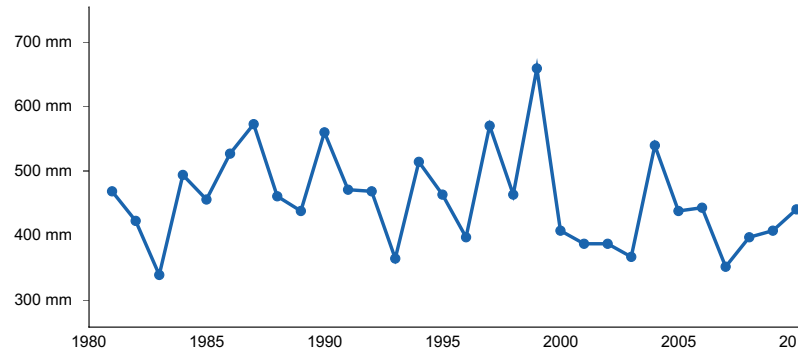


Figure 5. Annual precipitation pattern

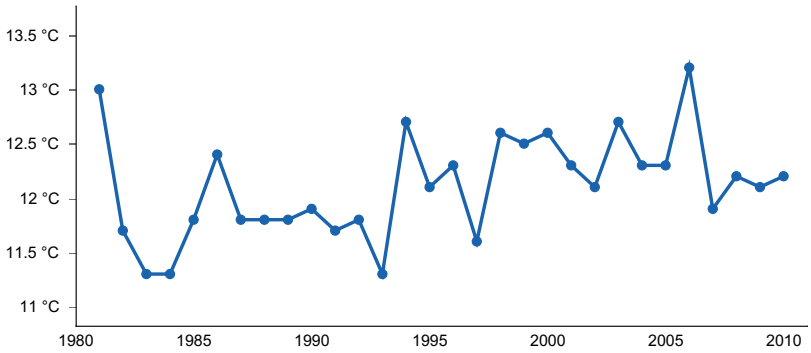


Figure 6. Annual average temperature pattern

Climate stations used

- (1) KIM 10SSE [USC00054546], Kim, CO
- (2) RATON FLTR PLT [USC00297279], Raton, NM
- (3) KENTON [USC00344766], Kenton, OK

Influencing water features

This is an upland site occuring on basalt capped plateaus and associated escarpments, benches, and plateau summits. Water infiltrates through cracks and fissures within the geology and works its way down slope to reappear in seeps and springs.

Soil features

These soils range from shallow to very deep. They are formed in alluvium and colluvium derived predominantely from basalt with some shale influence on steep side slopes. Typically, the surface layer is very cobbly loam or very stony clay loam. They are neutral on the surface to mildly alkaline to moderately alkaline. Characteristically there are large boulders on the surfaces and the underlying material. Permeability of these soils is moderately slow to slow. Available water capacity ranges from low to high depending on the content of coarse fragments in the profile.

The Raton and Apache soils are very low in water holding capacity because it is a shallow soil over basalt bedrock. This soil occurs above and at the edge of the basalt escarpments. Runoff is medium to rapid and the hazard of water erosion is moderate to very high.

Soil Unit & Percent Slope:
Apache very stony loam 5-30%
Ayon 3-25%
Raton stony loam 3-20%

Table 5. Representative soil features

Parent material	(1) Colluvium–basalt (2) Alluvium–basalt
Surface texture	(1) Cobbly loam (2) Very stony clay loam
Family particle size	(1) Clayey-skeletal (2) Loamy-skeletal
Drainage class	Well drained
Surface fragment cover <=3"	15–20%
Surface fragment cover >3"	20–30%

Table 6. Representative soil features (actual values)

Drainage class	Well drained
Surface fragment cover <=3"	15–20%
Surface fragment cover >3"	20–30%

Ecological dynamics

The plant community is about 71-80% grasses, 12-15% forbs, and 21-25% shrubs air dry weight.

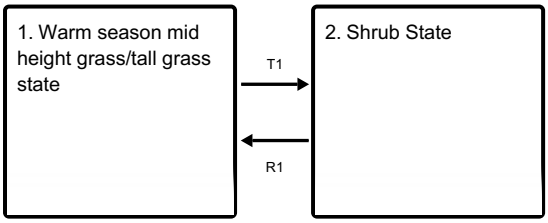
The production is predominately made up of grasses; however its appearance is that of being dominated by woody species. This is especially apparent on the north facing slopes having large patches of Gambel oak, alderleaf mountain mahogany, oneseed juniper and other shrubs.

The dominant grasses are tall and mid-height stature grasses. The most abundant of the grasses are little bluestem, big bluestem, blue grama, hairy grama, sideoats grama and western wheatgrass. Less abundant grasses are spike muhly, wolftail, prairie junegrass, switchgrass, New Mexico feahthergrass and Indian ricegrass. Forbs that make up the plant community are dotted gayfeather, threadleaf groundsel, purple prairieclover, scarlet globemallow and Louisiana sagebrush.

Shrubs that occur on this site are Gambel oak, New Mexico hoptree, skunkbush sumac, true mountain mahogany, oneseed juniper, Rocky Mountain juniper, wax currant and small soapweed. An occasional pinyon and ponderosa pine may occur on the north facing slope.

State and transition model

Ecosystem states



State 1 submodel, plant communities

1.1. Warm season mid height grass/tall grass state

State 1
Warm season mid height grass/tall grass state

The plant community is about 71-80% grasses, 12-15% forbs, and 21-25% shrubs air dry weight. The production is predominately made up of grasses; however its appearance is that of being dominated by woody species. This is especially apparent on the north facing slopes having large patches of Gambel oak, true mountain mahogany, oneseeded junipers and other shrubs. The dominant grasses are tall and mid-grasses. The most abundant of the grasses are little bluestem, big bluestem, blue grama, hairy grama, sideoats grama and western wheatgrass. Less abundant grasses are spike muhly, wolftail, prairie junegrass, switchgrass, New Mexico feahthergrass and Indian ricegrass. Forbs that make up the plant community are dotted gayfeather, threadleaf groundsel, purple prairieclover, scarlet globemallow and Louisiana sagebrush. Shrubs that occur on this site are Gambel oak, New Mexico hoptree, skunkbush sumac, true mountain mahogany, oneseed juniper, Rocky Mountain juniper, wax currant and small soapweed. An occasional pinyon and ponderosa pine may occur on the north facing slope.

Dominant plant species

- Gambel oak (*Quercus gambelii*), shrub
- alderleaf mountain mahogany (*Cercocarpus montanus*), shrub
- Rocky Mountain juniper (*Juniperus scopulorum*), shrub
- common hop (*Humulus lupulus*), shrub
- skunkbush sumac (*Rhus trilobata*), shrub
- sideoats grama (*Bouteloua curtipendula*), grass
- hairy grama (*Bouteloua hirsuta*), grass
- little bluestem (*Schizachyrium*), grass
- big bluestem (*Andropogon gerardii*), grass

Community 1.1
Warm season mid height grass/tall grass state

State 2
Shrub State

This state will have an increase in shrubs such as oneseed juniper, broom snakeweed, and gambel oak. Tall, warm season grasses will be mostly absent from the site.

Characteristics and indicators. Other plant indicators of this state include: spike muhly, sleepygrass, plains pricklypear, walkingstick cholla, threeawn, threadleaf groundsel, wooly loco and annuals such as Russian thistle, cheatgrass, annual sunflower, and fetid marigold.

Transition T1
State 1 to 2

Season-long cattle grazing with little rest and recovery and a moderate to heavy stocking rate.

Constraints to recovery. Distribution of domestic livestock is a problem on this site due to the slopes. All ages and classes of livestock tend to graze the flatter slopes, leaving the steeper slopes ungrazed. The site is better suited to be grazed by younger age of livestock due to the slope and roughness.

Restoration pathway R1

State 2 to 1

Prescribed grazing with proper recovery periods.

Additional community tables

Table 7. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1				–	
	sideoats grama	BOCU	*Bouteloua curtipendula*	269–404	–
	little bluestem	SCSC	*Schizachyrium scoparium*	175–269	–
	big bluestem	ANGE	*Andropogon gerardii*	175–269	–
	blue grama	BOGR2	*Bouteloua gracilis*	175–229	–
	needle and thread	HECO26	*Hesperostipa comata*	67–135	–
	New Mexico feathergrass	HENE5	*Hesperostipa neomexicana*	67–135	–
	western wheatgrass	PASM	*Pascopyrum smithii*	27–67	–
	James' galleta	PLJA	*Pleuraphis jamesii*	0–67	–
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	0–67	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	0–67	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	0–67	–
	silver bluestem	BOSA	*Bothriochloa saccharoides*	0–67	–
	spike muhly	MUWR	*Muhlenbergia wrightii*	0–67	–
	switchgrass	PAVI2	*Panicum virgatum*	0–67	–
	common wolfstail	LYPH	*Lycurus phleoides*	0–67	–
Shrub/Vine					
2				–	
	Gambel oak	QUGA	*Quercus gambelii*	67–135	–
	alderleaf mountain mahogany	CEMO2	*Cercocarpus montanus*	67–135	–
	common hop	HULU	*Humulus lupulus*	40–67	–
	oneseed juniper	JUMO	*Juniperus monosperma*	40–67	–
	skunkbush sumac	RHTR	*Rhus trilobata*	27–40	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	13–40	–
	Rocky Mountain juniper	JUSC2	*Juniperus scopulorum*	13–40	–
	winterfat	KRLA2	*Krascheninnikovia lanata*	13–40	–
Forb					
3				–	
	white sagebrush	ARLU	*Artemisia ludoviciana*	40–67	–
	dotted blazing star	LIPU	*Liatris punctata*	13–40	–
	hairy false goldenaster	HEVI4	*Heterotheca villosa*	15–40	–
	silvery lupine	LUAR3	*Lupinus argenteus*	15–40	–

Animal community

Grazing:

Distribution of domestic livestock is a problem on this site due to the slopes. All ages and classes of livestock tend to graze the flatter slopes, leaving the steeper slopes ungrazed. The site is better suited to be grazed by younger age of livestock due to the slope and roughness. This site is best suited for grazing during the spring, summer and fall. Approximately 70% of the total annual yield is from species that furnish forage for grazing animals. These species are a variety of grasses, and shrubs that provide good nutrition for grazing animals. Continuous year-long grazing or grazing from April to October by cattle cause the little and big bluestem, sideoats grama, western wheatgrass and true mountain mahogany to be replaced by blue grama, galleta, threeawn, Gambel oak, oneseed juniper, broom snakeweed, and walkingstick cholla. A system of deferred grazing, which varies the season of grazing use in pastures during successive years, is needed to maintain a healthy well-balanced plant community. Rest during different seasons of the year benefits different plants. Summer rest (July-September) benefits warm-season plants such as sideoats grama, big and little bluestem. Fall and winter rest (October-February) beneftis shrubs such as mountain mahogany, winterfat and currants. Spring rest (March-June) benefits cool-season plants such as western wheatgrass, Indian ricegrass, New Mexico feathergrass and needleandthread. Deferment during late winter and spring reduces competition between cattle and deer for palatable shrubs and forbs.

Habitat for Wildlife:
This ecological site provides habitats which support a resident animal community that is characterized by mule deer, bobcat, desert cottontail, brush mouse, rock mouse, rock squirrel, great horned owl, sparrow hawk, scurb jay, rufous-sided towhee, garter snake and fence lizard.

There is seasonal use by turkey, deer and mountain lion. The Lewis woodpecker breeds in these habitats. Band tailed pigeons will flock to these habitats during years of heavy mast production.

Major Poisonous Plants to Livestock:

Common name - Scientific name - Season dangerous - Animals affected

broom snakeweed - Gutierrezia sarothrae - when forage is scarce - cattle-sheep

Effects Upon Animals - Poisoning is not common but will occur on overgrazed ranges. Causes abortion in cattle or may produce weak underweight calves. Losses are sporadic and will occur when 10 to 20% of the body weight of green material is consumed in 1/2 to 20 weeks.

Gambel oak - quercus gambelii - early spring during budding and leafing and after a frost. As leaves mature toxicity decreases - cattle-sheep

Effect Upon Animals - Cattle may graze up to 50% of their diet without showing signs of sickness, more than 75% of their diet will cause death. Tannins are suspected to cause death. Symptoms of oak poisoing include constipation, feces are dry and appear in small pellets. They are often surrounded with mucus, and even blood but is always scanty and always dark in color. The animal loses its appetite, appears gaunt, the coat becomes rough, nose is dry and cracked, and the animal may die in 2 weeks to a month.

silvery lupine - Lupinus argenteus - when other forage is scarce and if hay contains immature lupine pods (especially dangerous during seed stage) - all livestock are occasionaly poisoned

Effects Upon Animals - Lupine seeds are toxic to sheep when .25 to 1.5% of the animal's body weight is consumed in one feeding. 150 to 175 gm per day has been lethal to sheep. The toxin is an alkaloid not cumulative and small amounts ingested over a period of time create no difficulties.

Lupinus sericeus will cause crooked leg disease in calves during the 40th and 70th day of gestation and other congenital deformities. Most characteristic symptom is labored breathing. Animals may vary from depression and coma to extreme activity. Animals may butt objects and other animals may stand with lowered head pressing against a solid object. Death from respiratory paralysis follows a short period of convulsions.

Poisoning of cattle show dry nose, stilted walk, lethargy, depression, hard dry feces, rough dry hair coat, quivering, extreme body weakness, irregular heart beat, prostration, coma and convulsions. Moving the animal exaggerates these symptoms.

threadleaf groundsel - Senecio longilobus - early spring when forage is short or on overgrazed ranges - cattle and horses. Normally will not affect sheep if a supplement is fed on dry range during the spring.

Effects Upon Animals - Signs may not appear until 6 months or more after plant is eaten. The best prevention is proper range use. Symptoms are progressive and effects are cumulative. Losses are sporadic. Degeneration of the liver results. Depression, weakness, diarrhea, darkly stained urine may be observed. Animals may die quickly or wander aimlessly.

Oneseed juniper - Juniperus osteosperma - Juniper is eaten only when animals lack desirable forage - cattle

Effects and Symptoms - Death losses from these species are rare. Stock may be poisoned if large quantities of berries are eaten.

wooly locoweed - Astragalus mollissimus - Plants appear early in spring. All parts of the plant are toxic - all animals but chiefly horses

Effect Upon Animals - Poisoning is cumulative. Signs of poisoning are loss of flesh, irregular gait, loss of sense of direction, nervousness, weakness, withdrawal from other animals, loss of muscular control and violent actions when disturbed.

Other plants that can cause poisoning when large quantities are eaten are fetid marigold, cutleaf nightshade and Russian thistle. The latter two accumulate nitrate and cause nitrate poisoning. Generally these plants do not cause a problem when other forage is available.

Guide to Initial Stocking Rates:

Stocking rates are based on an average growing season. Based on 1200 lbs (540 kg) of forage (air-dry) per animal unit month. (This figure does not take into account the vegetation that disappears through trampling, small herbivores, etc., which amounts to approximately 7.9 lbs (3.6 kg) per day under normal conditions).

Condition Class/ % Climax Vegetation/ AUM/ac/ ac/AUM/ AUM/ha/ ha/AUM
excellent/ 76-100/ .35-.26/ 2.9-3.9/ .88-.64/ 1.13-1.6
good/ 51-75/ .25-.18/ 4-.59/ .63-.49/ 1.59-2.1
fair/ 26-50/ .17-.09/ 6-11.9/ .48-.25/ 2.09-4.2
poor/ 0-25/ .08+/ 12+/ .24+/ 4.19+

Hydrological functions

Soils in this site are grouped into "B" hydrologic group, as outlined in the "Soils of Colorado Loss Factors and Erodibility Hydrologic Groupings 1979" handbook. Field investigations are needed to determine hydrological cover conditions and hydrologic curve numbers. The hydrologic curve number for Group B soil is about 61 for all the soils except Apache and Raton series which are Group D with a hydrologic curve number of 80 when hydrologic conditions are good, as shown in "Peak Flows in Colorado" handbook.

Refer to SCS "National Engineering Handbook", Section 4, to determine runoff quantities from the curves.

Recreational uses

Due to the break in physiographic features, this site has good aesthetic appeal and natural beauty. It is fair for screening, fair to good for hiking and picknicking, and fair to poor for camping. Hunting is fair to good for deer and rabbits. This is excellent winter range for deer.

Wood products

Fuel for fireplaces, fence posts, and Christmas trees.

Other information

Endangered Plants and Animals:
(Species names to be included as reliable information becomes available).

Location of Typical Examples of the Site:
Mesa De Mayo Ranch, Branson, Colorado
Bill Doherty Ranch, Trinidad, Colorado

Field Offices:
Springfield
Trinidad

Approval

Scott Woodall, 2/04/2020

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	02/04/2020
Approved by	Scott Woodall
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:**

11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):**

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:

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:**