USDA Natural Resources
Conservation Service

Ecological site R034AY423CO
Limy Cold Desert

Last updated: 9/07/2023
Accessed: 05/12/2025

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): 034A–Cool Central Desertic Basins and Plateaus

Major Land Resource Area (MLRA): 34A-Cool Central Desertic
Basins and Plateaus
For further information regarding MLRAs, refer to:
http://soils.usda.gov/survey/geography/mlra/index.html

LRU notes

Land Resource Unit (LRU) 34A-10:
• Moisture Regime: aridic ustic
• Temperature Regime: frigid
• Dominant Cover: rangeland
• Representative Value (RV) Effective Precipitation: 7-10 inches
• RV Frost-Free Days: 95-115 days

Classification relationships

Relationship to Other Established Classification Systems
National Vegetation Classification System (NVC):
3 Semi-Desert
3.B.1 Cool Semi-Desert Scrub & Grassland
M171 Great Basin-Intermountain Dry Shrubland and Grassland Macrogroup
G310 Intermountain Semi-Desert Steppe and Shrubland Group
A3202 Winterfat Steppe and Dwarf-shrubland Alliance
CEGL001323 Krascheninnokovia lanata/Achnatherum hymenoides Dwarf-shrubland Association

Ecoregions (EPA):
Level I: 10 North American Deserts
Level II: 10.1 Cold Deserts
Level III: 10.1.4 Wyoming Basin

Ecological site concept

• Site does not receive any additional water.
• Soils are:
o may be slightly saline or saline-sodic.
o deep
o not skeletal within 10” of soil surface, minimal rock fragments at the soil surface; maybe skeletal (>35% fragments by volume) below 10"

o strongly or violently effervescent in surface mineral 10”.
o surface textures usually range from loamy fine sand in surface mineral 4”.
• Slope is < 12%.
• Clay content is < 18% in mineral soil surface 1-2”.

Associated sites

R034AY424CO	**Loamy 7-10 PZ** No CaCO3 accumulation, higher production

Similar sites

DX034A02X120	**Limy Pinedale Plateau (Li PP)** Similar site in adjoining LRU in Wyoming

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Krascheninnikovia lanata* (2) *Atriplex confertifolia*
Herbaceous	(1) *Achnatherum hymenoides* (2) *Hesperostipa comata*

Physiographic features

This site occurs on nearly level to moderately sloping areas. Slopes range from 1 to 12 percent. This site occurs on all aspects. Elevation for the site ranges from 5,400 to 6,000 feet above sea level.

Table 2. Representative physiographic features

Landforms	(1) Hill (2) Plateau (3) Fan
Runoff class	Negligible to high
Flooding frequency	None
Ponding frequency	None
Elevation	1,646–1,829 m
Slope	1–12%
Aspect	Aspect is not a significant factor

Climatic features

The climate of this site is arid to semi-arid, with precipitation averaging between 7 and 10 inches annually.

The growing season for the native plants averages 160 to 180 days. This usually starts about April 1 and goes until mid-August. Cool season grasses start spring growth using moisture stored in the soil from snow melt and spring rains. Optimum growth occurs from mid-April and continues until the soil profile is depleted of usable soil moisture, usually in mid-June. A second growth period may occur in the fall months as a result of fall precipitation.

The average annual air temperature is about 45 to 48 degrees Fahrenheit. Summer temperatures can reach 100 degrees Fahrenheit, and winter temperatures can dip to -30 degrees Fahrenheit. Temperatures fall below the freezing mark much of the time in October through May. The average frost-free period occurs from early June through mid-September, lasting about 105 days.

Spring and fall are peak periods of precipitation. July is usually the driest month. The distribution of precipitation and

relatively low spring temperatures favor production of cool season plants, making the site more productive than the annual precipitation might indicate.

Table 3. Representative climatic features

Frost-free period (characteristic range)	95-115 days
Freeze-free period (characteristic range)	
Precipitation total (characteristic range)	178-254 mm
Frost-free period (average)	105 days
Freeze-free period (average)	
Precipitation total (average)	254 mm

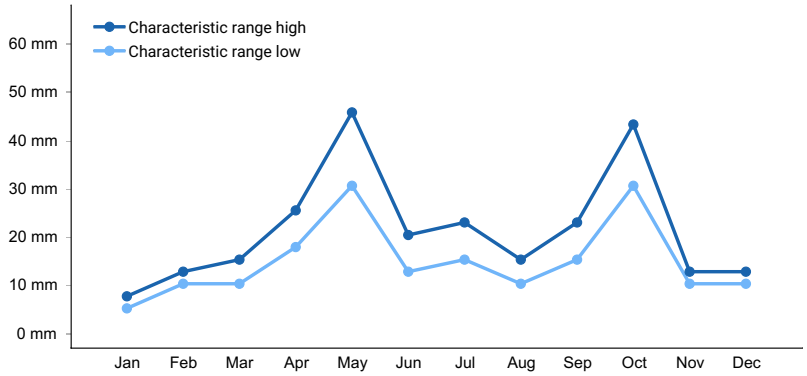


Figure 1. Monthly precipitation range

Influencing water features

None

Wetland description

None

Soil features

The soils in this site are deep and excessively drained, permeabilities are moderately rapid, available water holding capacities are low, runoff is slow, hazard of water erosion is slight, hazard of soil blowing high, and effective rooting depth 60 inches or more. Soils in this site have heavier lime accumulations on the rock fragments than other soils in Browns Park.

Soils associated with this site are:
Tipperary-Willwood complex, 1 to 12 percent

Table 4. Representative soil features

Parent material	(1) Slope alluvium–sandstone and shale (2) Alluvium–sandstone and shale (3) Eolian deposits–sandstone
Surface texture	(1) Loamy fine sand (2) Silt loam
Family particle size	(1) Sandy or sandy-skeletal
Drainage class	Excessively drained
Permeability class	Moderately slow to rapid

Soil depth	152 cm
Surface fragment cover <=3"	0–10%
Surface fragment cover >3"	0–5%
Available water capacity (0-101.6cm)	7.37–12.45 cm
Calcium carbonate equivalent (0-101.6cm)	5–15%
Soil reaction (1:1 water) (0-101.6cm)	6.6–8.4
Subsurface fragment volume <=3" (0-101.6cm)	5–40%
Subsurface fragment volume >3" (0-101.6cm)	0–5%

Ecological dynamics

Historical records and photographs document the fact that the Browns Park area was under severe grazing pressure by cattle, sheep, and horses during the last half of the 1800's and early 1900's. This pressure significantly altered the native vegetation, particularly in the lowlands immediately adjacent to the Green River and the area north of the river. This has made it difficult to determine the potential natural vegetation.

Dominant grasses are Indian ricegrass, needle and thread, and Sandberg bluegrass. Less abundant grasses are thickspike wheatgrass, western wheatgrass, and bottlebrush squirreltail. Forbs present in the plant community are few and are scattered across the site. Shrubs, half-shrubs and trees that occur on this site are winterfat, shadscale, Nuttall's horsebrush, and bud sagebrush.

If ecological retrogression is cattle induced, the percentage and production of desirable plants such as Indian ricegrass, needle-and-thread, Sandberg bluegrass, western wheatgrass, winterfat, and Gardner's saltbush will decrease. If retrogression is sheep induced, the percentage and production of desirable plants such as Indian ricegrass, Sandberg bluegrass, winterfat, shadscale, bud sagebrush, Wyoming big sagebrush, and Nuttall saltbush will decrease. Along with the decrease in desirable plants, there will be an increase in plants such as six-weeks fescue, dusty maiden, Nuttall's horsebrush, plains pricklypear, stickyleaf low rabbltbrush, black greasewood, and annuals such as cheatgrass and halogeton.

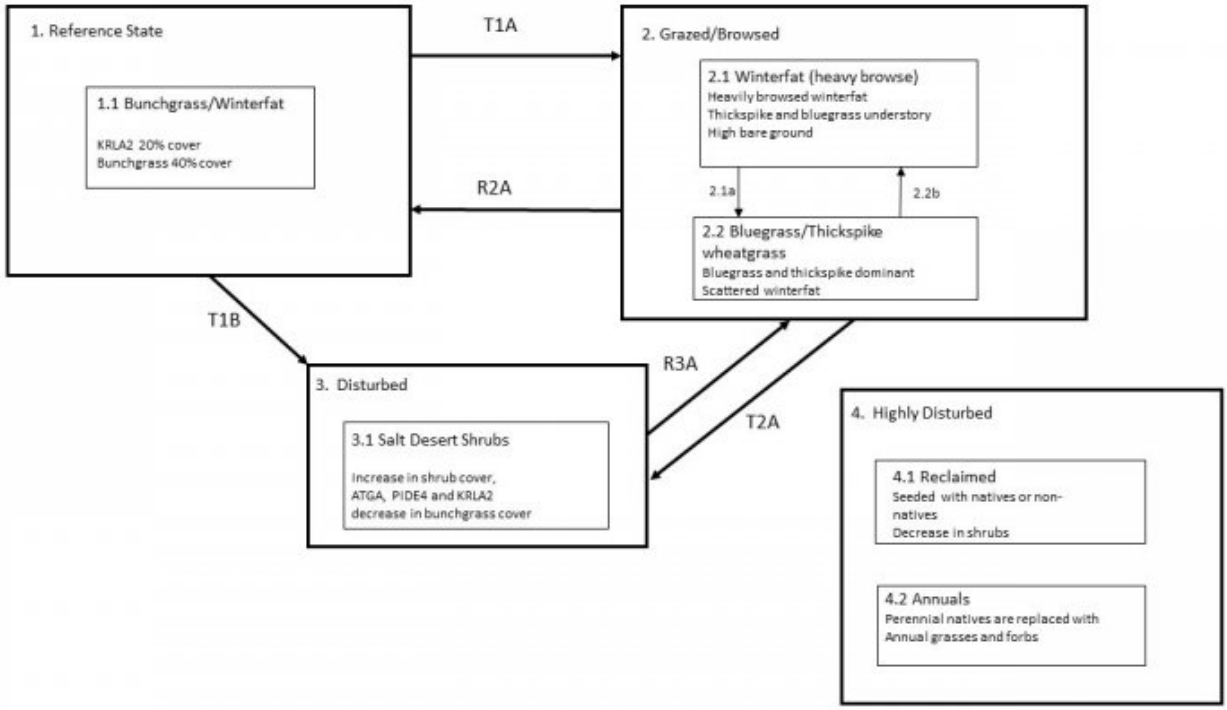
Further evidence of retrogression may be "hedging" of shrubs, a large increase in annuals, an absence of plant litter and new seedlings, and highly unstable forage production from year to year. During the winters of severe temperatures and snows, there will be heavy use in local areas of winterfat, Wyoming big sagebrush, shadscale, and Nuttall saltbush by deer, antelope, livestock , and any elk which may occupy the site. Wildlife and livestock will make use of low palatable species to avoid starvation.

Generally, there is inadequate fuel on this site to carry fire. Should a fire burn across the site, the bunchgrass will be only slightly benefited, while western and thickspike wheatgrass will be greatly benefited and Nuttall's horsebrush and stickyleaf low rabbitbrush will flourish. Shrubs, particularly winterfat, Wyoming big sagebrush, and shadscale, will be severely affected, and will be several years recovering. The production will decline the first year and, thereafter, grasses and forbs will increase, with shrubs having long-term increase .

Due to low precipitation of the area, this site will recover slowly from a prolonged and severe drought. Grasses and forbs will show signs of stress and recovery earlier than shrubs because of their shallow root systems.

Basal area (the area of ground surface covered by the perennial vegetation measured one inch above the soil) is approximately 15 percent when near the potential plant community.

State and transition model



State 1
Reference State

Community 1.1
Bunchgrass/Winterfat

The aspect of this site is a grass-shrub community dominated by winterfat. The plant community is about 25 to 50 percent grass, 5 to 10 percent forbs, and 45 to 65 percent shrubs (air-dry weight of current seasons growth). Basal area is approximately 15 percent when near the potential plant community. Annual Production: If the range is in excellent condition, the approximate total annual production (air-dry) is: Favorable years 600 lbs/ac Normal years 450 lbs/ac Unfavorable years 200 lbs/ac Of this production, 30 percent will likely be unpalatable or out of reach to grazing animals.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Shrub/Vine	179	275	364
Grass/Grasslike	22	191	252
Forb	22	39	56
Total	**223**	**505**	**672**

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				151–252	
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	34–50	–
	Sandberg bluegrass	POSE	*Poa secunda*	34–50	–
	needle and thread	HECO26	*Hesperostipa comata*	34–50	–
	western wheatgrass	PASM	*Pascopyrum smithii*	17–22	–
	squirreltail	ELEL5	*Elymus elymoides*	17–22	–
	thickspike wheatgrass	ELLAL	*Elymus lanceolatus ssp. lanceolatus*	17–22	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	6–11	–
	sixweeks fescue	VUOC	*Vulpia octoflora*	6–11	–
Forb					
2				28–50	
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	11–17	–
	Douglas' dustymaiden	CHDO	*Chaenactis douglasii*	6–11	–
Shrub/Vine					
3				230–336	
	winterfat	KRLA2	*Krascheninnikovia lanata*	151–202	–
	shadscale saltbush	ATCO	*Atriplex confertifolia*	50–73	–
	Nuttall's horsebrush	TENU2	*Tetradymia nuttallii*	22–50	–
	bud sagebrush	PIDE4	*Picrothamnus desertorum*	17–22	–
	greasewood	SAVE4	*Sarcobatus vermiculatus*	6–11	–
	plains pricklypear	OPPO	*Opuntia polyacantha*	6–11	–
	Gardner's saltbush	ATGA	*Atriplex gardneri*	6–11	–
	yellow rabbitbrush	CHVI8	*Chrysothamnus viscidiflorus*	6–11	–
	Wyoming big sagebrush	ARTRW8	*Artemisia tridentata ssp. wyomingensis*	0–11	–

Animal community

WILDLIFE INTERPRETATIONS:
This range site provides habitats which support a resident animal community that is characterized by mule deer, antelope, desert prairiedog, mourning dove, sage thrasher, western bluebird, red-tailed hawk, western meadowlark, and midget faded prairie rattlesnake. There is seasonal use by elk when the site is adjacent to pinyon-juniper sites.

This site supports a wide variety of animals. Management should be geared to provide cover and food for the wildlife present, particularly a sustained high yield of winterfat, which is readily utilized by deer, elk, and antelope. Brush control is not recommended on this site because of the value of winterfat. If range seeding is done, the seeding mixtures should meet the needs of the wildlife and livestock present.

GRAZING INTERPRETATIONS:
This site is best suited for winter grazing by cattle and sheep. Stock water developments are difficult to establish and, therefore, are few and far between. Winter snows provide water for grazing animals. Livestock are usually sent to the high country in June, where they graze on Federal lands. A system of deferred grazing which varies the season of grazing 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. Fall and winter rest (Oct-Mar) benefits shrubs such as winterfat, shadscale, bud sagebrush, and Wyoming big sagebrush. Spring rest (March through May) benefits cool-season plants such as needle and thread, Indian ricegrass, western wheatgrass,

Sandberg bluegrass, and thickspike wheatgrass. Deferment during late winter and spring reduces competition between grazing animals for palatable shrubs and forbs.

Plants of particularly high grazing value on this site include Indian ricegrass, Sandberg bluegrass, needle-and-thread, western wheatgrass, Gardner's saltbush, and winterfat. Winterfat provides high quality forage and should be managed for a sustained high productivity.

Brush control is not a recommended practice due to the high value of winterfat. If the site is severely overgrazed and producing a high percentage of undesirable shrubs, seeding is recommended. Seeding mixtures used on this site should contain a high percentage of winterfat. Seedling establishment is difficult due to low precipitation, fall seeding is highly recommended. Species selected should meet the needs of livestock and wildlife. Mechanical disturbance of the soil should be minimized to prevent soil blowing.

Stocking rates given below are based on continuous use for the entire growing season, and are intended only as an initial guide. Forage needs are calculated on the basis of 900 pounds of air-dry forage per animal unit month (AUM). To maintain proper use and allow for forage that disappears through trampling, small herbivore use, weathering, etc., Of the palatable forage produced, 35 percent is considered available for grazing by large herbivores.

Condition Class - % Climax Vegetation - (Ac/AUM) (AUM/Ac)
Excellent - 76-100% - (4.4) (.23)
Good - 51-75% - (6.0) (.17)
Fair - 26-50% - (8.0) (.13)
Poor - 0-25% - (12.0+) (.08)

Adjustment to the initial stocking rates should be made as needed to obtain proper use. With specialized grazing systems, large livestock breeds, uncontrolled big game herbivores, inaccessibility, dormant season use, presence of introduced species, etc., stocking rate adjustments will be required.

Poisonous Plants to livestock:

Halogeton is poisonous to sheep and cattle. The type of poisoning is acute calcium oxalates. The spring is the most serious time of year.

Greasewood is poisonous to sheep and cattle. The type of poisoning is acute sodium and potassium oxalates. Again, the most serious time of year is spring.

Hydrological functions

As this site produces a high percentage of shrub species, the vegetative cover is relatively low compared to adjacent sites. Care should be taken to maintain a high percentage of cover, especially with sod forming wheatgrasses. Efforts to maintain or improve plant cover are recommended, and if the soil is severely disturbed, seeding is necessary to prevent water erosion.

Soils in this site are grouped into "A" hydrologic group, as outlined in the Soils of Colorado Loss Factors and Erodibility Hydrologic Groupings handbook. Field investigations are needed to determine hydrologic cover conditions and hydrologic curve numbers. Refer to Peak Flows in Colorado handbook, and SCS National Engineering Handbook, Section 4, for hydrologic curve numbers in determining runoff quantities.

Recreational uses

This site has low value for natural beauty. It is a great distance from any population center, and really does not draw people to it for scenic drives, camping, or picnicking. It has a high recreational value in the form of hunting deer and antelope.

Wood products

There is no potential for commercial wood products on this site.

Other products

None noted.

Other information

ENDANGERED PLANTS AND ANIMALS:
This site can be important hunting grounds for Peregrine falcons, expecially when rock outcroppings are nearby. The site is within the historic range of the blackfooted ferret, and any active prairie dog towns on this site are potential habitat for the ferret.

Inventory data references

Information presented here has been derived from NRCS clipping data and other inventory data. Field observations from range trained personnel were also used. Other sources used as references include: USDA NRCS Water and Climate Center, USDA NRCS National Range and Pasture Handbook, and USDA NRCS Soil Surveys from various counties.

Type locality

Location 1: Moffat County, CO	
Township/Range/Section	T10N R102W S28
General legal description	NW 1/4 of Section 28, T10N, R102W, Moffat County, Colorado.

Other references

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Contributors

Suzanne Mayne Kinney

Approval

Kirt Walstad, 9/07/2023

Acknowledgments

Field offices in Colorado where the site occurs: Craig

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	05/12/2025
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:**

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:**