

## **Ecological site R034AY293CO Sandhills**

Last updated: 9/07/2023  
Accessed: 05/14/2025

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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): 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: 11-13 inches
- RV Frost-Free Days: 75-95 days

### **Classification relationships**

Relationship to Other Established Classification Systems

Ecoregions (EPA):

Level I: 10 North American Deserts

Level II: 10.1 Cold Deserts

Level III: 10.1.4 Wyoming Basin

### **Ecological site concept**

- This site does not receive any additional water.
- These soils:
  - o are not saline or saline-sodic
  - o are deep, or very deep
  - o are not skeletal within 20" of the soil surface; and have minimal rock fragments at the soil surface
  - o are not strongly or violently effervescent in the surface mineral layer (within top 10")
  - o have surface textures that usually range from loamy sand to sand in surface mineral layer (4")
- slopes are 3-45 percent
- does not have a clay content that is greater than 20% in mineral soil surface layer (1-2")

### **Associated sites**

R034AY330CO	<b>Sandy Land</b>
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## Similar sites

R034AY434CO	<b>Dry Sandy</b>
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**Table 1. Dominant plant species**

Tree	Not specified
Shrub	(1) <i>Purshia tridentata</i> (2) <i>Artemisia cana</i>
Herbaceous	(1) <i>Achnatherum hymenoides</i> (2) <i>Hesperostipa comata</i>

## Physiographic features

This site occurs on rolling sandhills and alluvial fans. Slopes range from 3 to 45 percent. Elevations range from 6000 to 7000 feet. This site occurs on all exposures.

### Range Site Description:

Rolling sandhills from aeolian sands from the Brown's Park sandstone form the topography of this landscape. The site is within an elevational range of 5900 to 6300 feet.

**Table 2. Representative physiographic features**

Landforms	(1) Hill (2) Breaks (3) Alluvial fan (4) Dune
Runoff class	Negligible to medium
Flooding frequency	None
Ponding frequency	None
Elevation	1,829–2,134 m
Slope	3–45%
Aspect	Aspect is not a significant factor

## Climatic features

The climate is arid to semi-arid. Winters are cold and summers are warm. The average annual precipitation ranges from 11 to 13 inches.

About half of this precipitation comes in the form of winter snow and spring rains. 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.

Plants begin growth in late April. The optimum growth period is from mid-May to late June, unless summer rains occur and are effective in maintaining plant growth. The growing season for native plants is about 110 days. There may be a second growth period in the fall due to a fall precipitation peak.

The average annual air temperature ranges from 42 to 45 degrees Fahrenheit.

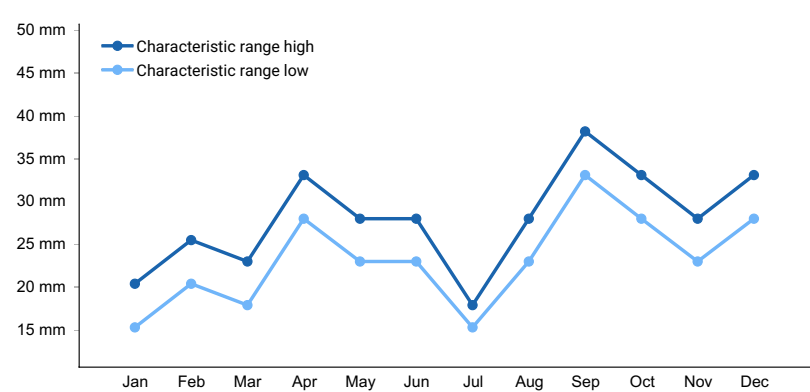
The frost free period ranges from 75 to 95 days.

### Range Site Description:

The average annual precipitation is 12 to 15 inches with an estimated 50 percent of the moisture falling as snow. The optimum growing season for the native plants is between May 15 to July 15. The average annual temperature is 42 degrees Fahrenheit.

**Table 3. Representative climatic features**

Frost-free period (actual range)	75-95 days
Freeze-free period (actual range)	
Precipitation total (actual range)	279-330 mm
Frost-free period (average)	95 days
Freeze-free period (average)	
Precipitation total (average)	330 mm



**Figure 1. Monthly precipitation range**

## Influencing water features

None

## Wetland description

N/A

## Soil features

Soils of this site are deep and excessively drained. They formed in eolian sands or residuum. Typically the surface layer is sand or loamy sands 3 to 5 inches thick and is underlain by sands, loamy sands, and sandy loams to a depth greater than 60 inches. The available water holding capacity for these soils is low; runoff is low; hazard for water erosion is slight to high, and hazard for soil blowing is high. This is particularly true on areas where the vegetation has been abused, exposing the soil to wind action. Effective rooting depth is greater than 60 inches. Soils in this site are usually formed from the Browns Park geologic formation.

Soil Series in this site Include:  
 Maybell Sand 5 to 30 percent slopes  
 Maybell Sand 3 to 12 percent slopes  
 Maybell Sand 12 to 45 percent slopes  
 Yetull Loamy Sand 5 to 25 percent slopes

**Table 4. Representative soil features**

Parent material	(1) Eolian deposits–sandstone
Surface texture	(1) Sand (2) Loamy sand

Family particle size	(1) Sandy
Drainage class	Excessively drained
Permeability class	Moderately rapid to rapid
Soil depth	152 cm
Surface fragment cover <=3"	0–5%
Available water capacity (0-101.6cm)	6.6–10.92 cm
Calcium carbonate equivalent (0-101.6cm)	2%
Soil reaction (1:1 water) (0-101.6cm)	6.6–9

## Ecological dynamics

The plant community is about 40 percent grasses, 10 percent forbs, and 50 percent shrubs, air-dry weight.

The production is predominantly made up of antelope bitterbrush. Its aspect is a grass-shrub community dominated by antelope bitterbrush, silver sagebrush, Indian ricegrass, and needleandthread.

The dominant grasses are Indian ricegrass and needleandthread; and the less abundant of the grasses are sand dropseed, prairie Junegrass, and Nevada bluegrass. Smaller amounts of thickspike wheatgrass, western wheatgrass, and galleta. Forbs that make up the plant community include Louisiana sagewort, arrowleaf balsamroot, scarlet globemallow, and western yarrow.

Shrubs that occur on this site are antelope bitterbrush, Wyoming big sagebrush, silver sagebrush, gray horsebrush, and plains pricklypear.

If ecological retrogression is cattle induced, the percentage and production of desirable plants such as Indian ricegrass, needleandthread, prairie Junegrass, Nevada bluegrass, antelope bitterbrush, and winterfat will decrease. If retrogression is sheep induced, the percentage and production of desirable plants such as Indian ricegrass, Nevada bluegrass, prairie Junegrass, arrowleaf balsamroot, Louisiana sage, antelope bitterbrush, black sagebrush, gray horsebrush, silver sagebrush, winterfat, and Wyoming big sagebrush will decrease. Along with the decrease in desirable plants, there will be an increase in plants such as bottlebrush squirreltail, galleta, sand dropseed, foothills deathcamas, hairy goldaster, wooly locoweed, wormwood, rubber rabbitbrush, plains prickly pear, small low rabbitbrush, and annuals such as Russian thistle, cheatgrass, and annual mustards.

Further evidence of retrogression may be "hedging" of shrubs, particularly antelope bitterbrush, blowouts, active dune movement, a large increase in annuals, absence of plant litter and new seedlings, and highly unstable forage production from year to year.

During winters of severe temperatures and snows there will be heavy use in local areas of Wyoming big sagebrush, winterfat, silver sagebrush, gray horsebrush, and rubber rabbitbrush by deer, antelope, livestock, and any elk which occupy the site. Wildlife and livestock will make use of low palatable species to avoid starvation.

Generally there is adequate fuel on this site to carry fire. Should a fire burn across the site, the grasses will be benefited. Shrubs, particularly antelope bitterbrush, will be severely affected and will be several years in recovering. Rabbitbrush and horsebrush species will flourish. Production on the site will decline the first year and, thereafter, grasses and forbs will increase while most shrub species will have a long term increase.

This site will recover slowly from prolonged and/or severe drought. Grasses and forbs will show signs of stress and recovery earlier than shrubs because of their shallow root systems.

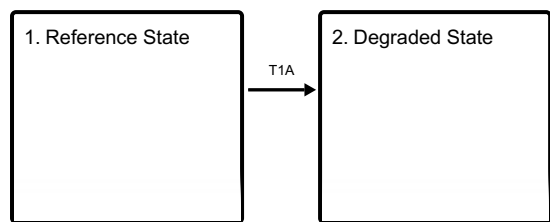
### Range Site Description:

This site is dominated by antelope bitterbrush. Associated with this shrub are big sagebrush, silver sagebrush, gray

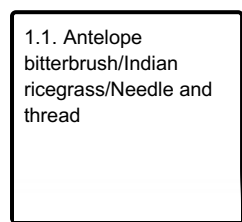
horsebrush, low rabbitbrush and rubber rabbitbrush. Prickly pear occurs infrequently. The principal grasses are Indian ricegrass, needle-and-thread, sand dropseed and Sandberg bluegrass. Conspicuous forbs are hairy goldaster, eriogonum, lupine, loco, arrowleaf balsamroot, yarrow, wormwood, death camas, scarlet globemallow, cryptantha, evening-primrose and daisy fleabane.

## State and transition model

### Ecosystem states



### State 1 submodel, plant communities



## State 1 Reference State

### Community 1.1 Antelope bitterbrush/Indian ricegrass/Needle and thread

This site supports a plant community of approximately 30 to 50 percent grass/grass-like, 5 to 10 percent forbs, and 45 to 60 percent shrubs. Of this production, 25 percent will likely be unpalatable or out of reach of grazing animals. Basal area is approximately 25 percent. Range Site Description: Percent ground cover is generally about 25 percent. Plants not a part of the potential community that are most likely to invade when the cover deteriorates are cheatgrass and other introduced annuals. Total Annual Production: Favorable years 1200 lbs/ac air dry Unfavorable years 600 lbs/ac air dry Median years 850 lbs/ac air dry

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	258	381	628
Shrub/Vine	370	499	616
Forb	45	73	101
<b>Total</b>	<b>673</b>	<b>953</b>	<b>1345</b>

## State 2 Degraded State

This State is result of soil-disturbing activities such as hoof-action, anthropogenic activity, and rodent activity. It can also occur after brush management followed by improper grazing techniques that usually include high-intensity grazing without appropriate recovery periods.

## Transition T1A State 1 to 2

The driver for transition T1A from State 1 (Reference State) to State 2 (Degraded) is low to high intensity, long duration, and high frequency herbivory events.

## 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				286–476	
	Indian ricegrass	ACHY	<i>Achnatherum hymenoides</i>	95–140	–
	needle and thread	HECOC8	<i>Hesperostipa comata ssp. comata</i>	95–140	–
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	39–95	–
	sand dropseed	SPCR	<i>Sporobolus cryptandrus</i>	39–95	–
	Sandberg bluegrass	POSE	<i>Poa secunda</i>	39–95	–
	squirreltail	ELEL5	<i>Elymus elymoides</i>	17–39	–
	thickspike wheatgrass	ELLAL	<i>Elymus lanceolatus ssp. lanceolatus</i>	11–28	–
	threadleaf sedge	CAFI	<i>Carex filifolia</i>	11–28	–
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	11–28	–
	James' galleta	PLJA	<i>Pleuraphis jamesii</i>	11–28	–
	bluebunch wheatgrass	PSSP6	<i>Pseudoroegneria spicata</i>	11–28	–
	sixweeks fescue	VUOC	<i>Vulpia octoflora</i>	11–17	–
	Grass, perennial	2GP	<i>Grass, perennial</i>	0–11	–
<b>Forb</b>					
2				50–95	
	sand lupine	LUAM	<i>Lupinus ammophilus</i>	11–17	–
	locoweed	OXYTR	<i>Oxytropis</i>	11–17	–
	longleaf phlox	PHLO2	<i>Phlox longifolia</i>	11–17	–
	scarlet globemallow	SPCO	<i>Sphaeralcea coccinea</i>	11–17	–
	deathcamas	ZIGAD	<i>Zigadenus</i>	11–17	–
	white sagebrush	ARLU	<i>Artemisia ludoviciana</i>	11–17	–
	arrowleaf balsamroot	BASA3	<i>Balsamorhiza sagittata</i>	11–17	–
	bastard toadflax	COMAN	<i>Comandra</i>	11–17	–
	common yarrow	ACMI2	<i>Achillea millefolium</i>	11–17	–
	sulphur-flower buckwheat	ERUM	<i>Eriogonum umbellatum</i>	11–17	–
	hairy false goldenaster	HEVI4	<i>Heterotheca villosa</i>	0–11	–
	tarragon	ARDR4	<i>Artemisia dracunculus</i>	0–11	–
	prairie fleabane	ERST3	<i>Erigeron strigosus</i>	0–11	–
	spotted evening primrose	OECA3	<i>Oenothera canescens</i>	0–11	–
	Forb, perennial	2FP	<i>Forb, perennial</i>	0–11	–
<b>Shrub/Vine</b>					
3				426–572	

	antelope bitterbrush	PUTR2	<i>Purshia tridentata</i>	280–392	–
	silver sagebrush	ARCA13	<i>Artemisia cana</i>	50–95	–
	Wyoming big sagebrush	ARTRW8	<i>Artemisia tridentata ssp. wyomingensis</i>	50–95	–
	plains pricklypear	OPPO	<i>Opuntia polyacantha</i>	22–50	–
	spineless horsebrush	TECA2	<i>Tetradymia canescens</i>	22–39	–
	rubber rabbitbrush	ERNA10	<i>Ericameria nauseosa</i>	22–39	–
	winterfat	KRLA2	<i>Krascheninnikovia lanata</i>	11–22	–
	granite prickly phlox	LIPU11	<i>Linanthus pungens</i>	11–22	–
	yellow rabbitbrush	CHVIV4	<i>Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus</i>	11–22	–
	black sagebrush	ARNO4	<i>Artemisia nova</i>	11–22	–

## Animal community

### WILDLIFE INTERPRETATIONS:

This range site provides habitats which support a resident animal community that is characterized by antelope, sagegrouse, Nuttall and desert cottontail, white-tailed jackrabbit, sage thrasher, western bluebird, western meadowlark, Brewers sparrow, mourning dove, red-tailed hawk, marsh hawk, golden eagle, seasonal use by muledeer, and occasionally elk during winter.

### GRAZING INTERPRETATIONS:

This site is very productive in palatable species. In order to maintain this high productivity, care must be taken to avoid overgrazing. Herding of sheep and movement of cattle during early spring growth is necessary to avoid depletion of stored carbohydrates and photosynthetic material by continual spring grazing. 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 (October-March) benefits shrubs such as antelope bitterbrush, winterfat, silver sagebrush, Wyoming big sagebrush, and black sagebrush. Spring rest (March-May) benefits cool season plants such as Indian ricegrass, needleandthread, prairie junegrass, Nevada bluegrass, arrowleaf balsamroot, and Louisiana sage. Deferment during late winter and early spring reduces competition between wildlife and livestock for palatable shrubs and forbs.

Vegetation palatability by animal class is based on the attractiveness of the plant to animals as forage. Grazing preference changes from time to time and place to place depending on the animal class, plant palatability and nutrient value, stage of growth, and season of use.

### GUIDE TO INITIAL STOCKING RATES:

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 lbs 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., 35 percent of the palatable forage produced is considered available for grazing by large herbivores.

### CONDITION CLASS - (PERCENT CLIMAX VEGETATION)

excellent - (76-100) - 3.7 AC/AUM - .27 AUM/AC

good - (51-75) - 6.0 AC/AUM - .17 AUM/AC

fair - (26-50) - 13.0 AC/AUM - .08 AUM/AC

poor - (0-25) - 20.0+ AC/AUM - .05 AUM/AC

Adjustments 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, etc.,

stocking rate adjustments will be required.

## **Hydrological functions**

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**

There is limited potential for this site with regard to natural beauty. There is, however, a very high potential for this site in hunting big game species, as well as coyotes and rabbits. There is also a high potential for wildlife observation and picture taking.

## **Wood products**

None.

## **Other products**

None noted.

## **Other information**

Deathcamas is poisonous to sheep and may affect cattle and horses. One half pound will poison sheep. Spring and summer are the seasons of most common poisoning.

## **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.

## **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	05/14/2025
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):**
- 
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):**
- 
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:

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17. Perennial plant reproductive capability:

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