

Ecological site R034AY430CO Shale

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

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: 75-90 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

D040 Western North American Cool Semi-Desert Scrub & Grassland

M093 Great Basin Shrubland Scrub Group

A1110 Gardner's saltbrush Low shrub Alliance

CEGL001438 Atriplex gardneri 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 Shallow to moderately deep
 - o skeletal within 20" of soil surface, minimal rock fragments at the soil surface

- o not strongly or violently effervescent in surface mineral 10".
- o surface textures usually range from sandy loam to clay loam in surface mineral 4".
- Slope is < 12%.
- Clay content is >35% in mineral soil surface 1-2".

Associated sites

R034AY424CO	Loamy 7-10 PZ Deep soil adjacent to this site with loamy textures, big sagebrush dominates
-------------	--

Similar sites

R034AY154WY	Shale Green River and Great Divide Basins (Sh) Similar site in adjoining LRU in Wyoming
-------------	---

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) <i>Atriplex gardneri</i>
Herbaceous	(1) <i>Elymus elymoides</i>

Physiographic features

This site is commonly on nearly level to strongly sloping eroded upland ridges, side slopes, and breaks. Slopes of this site range from nearly level to 12 percent. The site occurs on all exposures. Elevation for this site is between 6000 and 7000 feet (1829 and 2134 m).

Table 2. Representative physiographic features

Landforms	(1) Ridge (2) Hill (3) Plateau
Runoff class	Medium to high
Elevation	1,829–2,134 m
Slope	1–12%
Aspect	Aspect is not a significant factor

Climatic features

The climate is arid to semi-arid. Winters are cool and summers are warm. The average annual precipitation ranges from 7 to 10 inches (18 to 25 cm). Peak precipitation occurs during the winter, with spring rains accounting for most of the rest.

Plants begin growth between March 15 and April 1. The optimum growth period is April 1 through the end of May for most plants. Average air temperature is 42 to 47 degrees Fahrenheit (5.5 to 8.3 degrees C). Frost-free period ranges from 75 to 90 days.

Table 3. Representative climatic features

Frost-free period (characteristic range)	75-90 days
Freeze-free period (characteristic range)	
Precipitation total (characteristic range)	178-254 mm
Frost-free period (average)	90 days
Freeze-free period (average)	

Precipitation total (average)	254 mm
-------------------------------	--------

Influencing water features

None

Wetland description

None

Soil features

The soils of this site are shallow to moderately deep and well drained. One of the soils has a surface texture of sandy loam about 1 inch (2.5 cm) thick with desert pavement on the surface. The subsoil is light olive brown clay loam about 11 inches (27.5 cm) thick which is the natric horizon. The upper 7 inches (17.5 cm) of the substratum is grayish brown silty clay loam. The lower 9 inches (22.5 cm) is very dark grayish brown silty clay loam. The other soil is a complex of two soils. One is an interbedded pattern of shales, soft sandstones, hard sandstone, and siltstone high in salts. The other part of this complex is 10 to 65 percent coarse fragments. Textures range from silty clay to sandy loam.

Permeability is very slow. Available water capacity is low. Effective rooting depth is 51 to 100 cm. Runoff is rapid and the hazard of water erosion is high.

Major soils associated with this site are:

Unnamed sandy loam (137) 0 to 6 percent slope

Torriorthents - Natragids (136) 3 to 12 percent slope

Table 4. Representative soil features

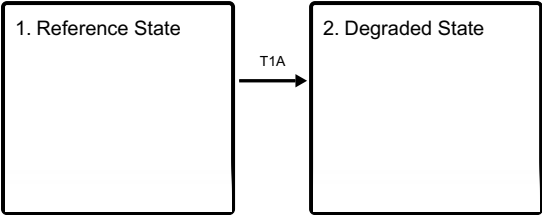
Parent material	(1) Residuum–shale
Surface texture	(1) Sandy loam
Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Very slow
Depth to restrictive layer	51–254 cm
Soil depth	51–254 cm
Surface fragment cover <=3"	0–5%
Available water capacity (0-50.8cm)	7.11–9.14 cm
Electrical conductivity (0-50.8cm)	2–4 mmhos/cm
Sodium adsorption ratio (0-50.8cm)	10–20
Soil reaction (1:1 water) (0-50.8cm)	8.5–9
Subsurface fragment volume <=3" (0-50.8cm)	0–5%

Ecological dynamics

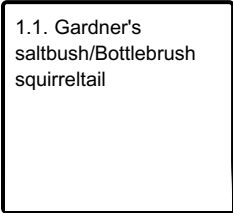
The plant community is about 50 percent grasses, 10 percent forbs, and 40 percent shrubs. Gardner's saltbush are the dominant plants. Other plants which make up a substantial part of the production are bottlebrush squirreltail.

State and transition model

Ecosystem states



State 1 submodel, plant communities



State 1
Reference State

The plant community is about 50 percent grasses, 10 percent forbs, and 40 percent shrubs. Streambank and thickspike wheatgrass are the dominant plants. Ohter plants which make up a substantial part of the production are bottlebrush squirreltail.

Community 1.1
Gardner's saltbush/Bottlebrush squirreltail

If ecological retrogression is cattle-induced, desirable grasses will decrease. However, if retrogression is caused by sheep, desirable grasses, forbs, and shrubs may be reduced. Deterioration of the site will decrease Indian ricegrass, Salina wildrye, Gardner's satlbush, bud sagebrush, shadscale, and winterfat. Retrogression of the site will increase greenmolly summer cypress, longleaf phlox, spiny horsebrush, woodyaster, plains prickly pear, greasewood, and desert princesplume. Plant species likely to invade this site and become part of the plant community when the range is in a degenerated condition are cheatgrass, halogeton, mustard, annual buckwheat, tarweed, and borage. Vegetation density is approximately 5 to 15 percent. Vegetation density = basal area. This is the area of the ground surface covered by the stem or stems. Usually, this is measured at 1 inch (2.54 cm) above the soil surface in contrast to the full spread of perennial foliage. Annual Production: If range is in excellent condition, the approximate total annual production (air-dry) ranges are: Favorable years 300 pounds per acre (336 kg/ha) Normal years 250 pounds per acre (280 kg/ha) Unfavorable years 150 pounds per acre (168 kg/ha) Of this production, about 40 percent will likely be unpalatable or out of reach of grazing animals.

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 5. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	Grasses			84–168	
	thickspike wheatgrass	ELLAL	<i>Elymus lanceolatus</i> ssp. <i>lanceolatus</i>	21–59	–
	squirreltail	ELEL5	<i>Elymus elymoides</i>	9–17	–
	Indian ricegrass	ACHY	<i>Achnatherum hymenoides</i>	6–17	–
	alkali sacaton	SPAI	<i>Sporobolus airoides</i>	4–9	–
	saline wildrye	LESA4	<i>Leymus salinus</i>	0–6	–
	Sandberg bluegrass	POSE	<i>Poa secunda</i>	0–6	–
Forb					
2	Forbs			17–34	
	tapertip onion	ALAC4	<i>Allium acuminatum</i>	2–3	–
	milkvetch	ASTRA	<i>Astragalus</i>	2–3	–
	springparsley	CYMOP2	<i>Cymopterus</i>	2–3	–
	western daisy fleabane	ERBE2	<i>Erigeron bellidiastrum</i>	2–3	–
	foothill bladderpod	LELU	<i>Lesquerella ludoviciana</i>	2–3	–
	fernleaf biscuitroot	LODI	<i>Lomatium dissectum</i>	2–3	–
	tufted evening primrose	OECA10	<i>Oenothera caespitosa</i>	2–3	–
	spiny phlox	PHHO	<i>Phlox hoodii</i>	2–3	–
	longleaf phlox	PHLO2	<i>Phlox longifolia</i>	2–3	–
	scarlet globemallow	SPCO	<i>Sphaeralcea coccinea</i>	2–3	–
	stemless four-nerve daisy	TEACA2	<i>Tetraneuris acaulis</i> var. <i>acaulis</i>	2–3	–
	desert princesplume	STPI	<i>Stanleya pinnata</i>	2–3	–
Shrub/Vine					
3	Shrub			67–135	
	Gardner's saltbush	ATGA	<i>Atriplex gardneri</i>	7–27	–
	bud sagebrush	PIDE4	<i>Picrothamnus desertorum</i>	3–20	–
	greasewood	SAVE4	<i>Sarcobatus vermiculatus</i>	3–7	–
	yellow rabbitbrush	CHVI8	<i>Chrysothamnus viscidiflorus</i>	3–7	–
	plains pricklypear	OPPO	<i>Opuntia polyacantha</i>	3–7	–
	shortspine horsebrush	TESP2	<i>Tetradymia spinosa</i>	3–7	–
	charming woodyaster	XYVE	<i>Xylorhiza venusta</i>	3–7	–
	shadscale saltbush	ATCO	<i>Atriplex confertifolia</i>	3–7	–
	Nuttall's horsebrush	TENU2	<i>Tetradymia nuttallii</i>	2–3	–

Animal community

Grazing:

This site is used almost exclusively as winter range for sheep. Much of the feed consists of shrubs since many years other forage is covered by snow. When an area is left un-grazed for a number of years, brush species increase in vigor and can become dominant.

Wildlife:

This site is particularly important for antelope and sage grouse. It also serves as mule deer habitat, and where in

proximity to mountain ridges, occasionally elk critical winter range. Other common wildlife species to the site include; desert and Nuttall's cottontail, white-tailed jackrabbit, white-tailed prairie dog, sage thrasher, Western bluebird, Western meadowlark, Brewer's sparrow, mourning dove, red-tailed hawk, and golden eagle.

Major Plants Poisonous to Livestock

Common Name - black greasewood

Scientific Name - *Sarcobatus vermiculatus*

Season Dangerous - spring

Animal Affected - sheep and cattle

Effects and Symptoms - Poisoning is "acute" (symptoms appear within a few hours after poisonous plant has been eaten). Early signs of poisoning (4 to 6 hours after animals eat toxic amounts) are dullness, loss of appetite, lowering of the head, reluctance to follow the band and irregular gait. Advanced signs are drooling, nasal discharge, progressive weakening, rapid shallow breathing and coma. Cattle may die after 3.0 to 3.5 pounds (1.35 to 1.6 kg) in a short period. Sheep may die after consuming 2 pounds (0.9 kg) of green leaves and fine stems in a short period without other forage.

Common Name - woody aster

Scientific Name - *Machaeranthera venusta*

Season Dangerous - spring and early summer when more palatable forage is not available.

Animal Affected - sheep

Effects and Symptoms - Poisoning is cumulative (poisoning effect increases in severity by successive additions of the poisonous plant. Symptoms appear weeks or months after poisonous plants are first eaten). Symptoms most evident include impairment of vision, depraved appetite, evidence of abdominal pain, and paralysis.

Common Name - desert princesplume

Scientific Name - *Stanleya pinnata*

Season Dangerous - spring when more palatable green forage is not available

Effects and Symptoms - Poisoning is cumulative. Poisoning can cause alkali disease (the chronic disease) which develops from eating small amounts of selenium-bearing vegetation over an extensive period of time or poisoning can cause blind staggers (the acute disease) which results from feeding on relatively large amounts of selenium in a short time.

Common Name - halogeton

Scientific Name - *Halogeton glomeratus*

Season Dangerous - when growing rapidly in spring (April - June)

Animal Affected - sheep

Effects and Symptoms - Poisoning is acute. Signs of poisoning occurs in 2 to 6 hours after an animal eats a fatal amount and death occurs in 9 to 11 hours. Early signs are dullness, loss of appetite, lowering of the head, and reluctance to follow the band. Advanced signs are drooling with white or reddish froth about the mouth, progressive weakening, animals unable to stand, rapid, shallow breathing, and coma followed by a violent struggle for air.

Sheep can tolerate small amounts when eaten with other forage. About 12 ounces (336 g) will kill sheep that have been without feed for a day. It takes 18 ounces (504 g) to kill sheep that have been feeding on other forage.

Common Name - spiny horsebrush

Scientific Name - *Tetradymia spinosa*

Season Dangerous - early spring

Animal Affected - sheep

Effects and Symptoms - Symptoms may vary but can include depression, weakness, and sometimes death within a few hours. In many cases acute illness is followed by sensitiveness and irritation about the head, followed by swelling of the head, neck, ears, eyelids, and nose. This is especially common in sheep that have been exposed to sunlight. Consumption of 2.2 pounds (1.0 kg) a day for two days in early spring is fatal to sheep. The poison is cumulative.

Guide to Initial Stocking Rates for Sheep:

Stocking rates are based on an average growing season and 1200 pounds (540 kg) of forage (air-dry) per animal unit month. (This figure takes into account the vegetation that disappears through trampling, small herbivores, etc

which amounts to approximately 8 pounds per day.

Condition Class/ % Climate Veg/ Ha/AUM(Ac/AUM)/ Aum/HA(AUM/Ac)

Excellent/ 76-100/ 8.1 20/ .12 .05

Good/ 51 - 75/ 10.1 25/ .10 .04

Fair/ 26-50/ Range in these condition classes is of very low grazing value.

Poor/ 0-25/ Range in these condition classes is of very low grazing value.

Hydrological functions

Watershed:

Soils of this site are grouped into "D" hydrologic group, as outline 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 D soils is about 90, when hydrologic conditions are poor, 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

This site has native forbs and shrubs that bloom from early spring to early summer, which are aesthetically pleasing. Hunting for upland gamebirds, rabbits, coyotes, and antelope provide recreation.

Other information

Threatened and Endangered Plants and Animals:

Plants that are rare in Colorado which occur on this site are-

- birdsfoot sage
- catseye
- dinosaur buckwheat
- wild buckwheat

There is a remote possibility black footed ferret could exist in association with prairie dog towns on this site.

Field Office:
Craig

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

Belnap, J. and S. L. Phillips. 2001. Soil biota in an ungrazed grassland: Response to annual grass (*Bromus tectorum*) invasion. *Ecological Applications*: 11: 1261-1275.

Caudle, D., H. Sanchez, J. DiBenedetto, C. Talbot, and M. Karl. 2013. Draft Interagency Ecological Site Handbook for Rangelands. US Dept. of Agriculture. Washington D.C

Cleland, D.T.; Freeouf, J.A.; Keys, J.E., Jr.; Nowacki, G.J.; Carpenter, C; McNab, W.H. 2007. Ecological Subregions: Sections and Subsections of the Conterminous United States.[1:3,500,000], Sloan, A.M., cartog. Gen. Tech. Report WO-76. Washington, DC: U.S. Department of Agriculture, Forest Service.

Musgrave, G.W. 1955. How much of the rain enters the soil? In Water: U.S. Department of Agriculture Yearbook. Washington, D.C. P. 151-159.

National Engineering Handbook. US Department of Agriculture, Natural Resources Conservation Service. Available: <http://www.info.usda.gov/CED/Default.cfm#National%20Engineering%20Handbook>. Accessed February 25, 2008.

Passey, H. B., W. K. Hugie, E. W. Williams, and D. E. Ball. 1982. Relationships between soil, plant community, and climate on rangelands of the Intermountain west. USDA, Soil Conservation Service, Tech. Bull. No. 1669.

Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture. Web Soil Survey. Available online at <http://websoilsurvey.nrcs.usda.gov/>. Accessed [8/10/2015].

United States Department of Agriculture, Natural Resources Conservation Service. 2006. Land Resource Regions and Major Land Resource Areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296.

Western Regional Climate Center. Retrieved from <http://www.wrcc.dri.edu/summary/Climsmco.html> on May 17, 2018.

Contributors

Suzanne Mayne Kinney

Approval

Kirt Walstad, 9/07/2023

Acknowledgments

Field offices where this 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:

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:**
