USDA Natural Resources Conservation Service

Ecological site R034BY302UT
Upland Clay (Western Wheatgrass)

Last updated: 9/09/2023
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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): 034B–Warm Central Desertic Basins and Plateaus

MLRA 34B occurs in is in Utah (70 percent) and Colorado (30 percent). It makes up about 12,850 square miles (33,290 square kilometers). A small part of the area is in the High Plateaus of Utah Section of the Colorado Plateaus Province of the Intermontane Plateaus. The northern part of the MLRA occurs in the Uinta Basin Section, which is bounded by the Uinta Mountains to the north, the Wasatch Range to the west, the Roan Plateau to the south, and the Rabbit Hills to the east. The southern part of the MLRA occurs in the northern third of the Canyon Lands Section. This section is bounded by the Roan Plateau to the north, the Wasatch Plateau to the west, the southern end of the San Rafael Swell to the south, and the western slope of the Rocky Mountains to the east. Elevation ranges from 4,100 feet (1,250 meters) near Green River, Utah, to 7,500 feet (2,285 meters) at the base of the Wasatch Range and the Roan Plateau.
Most of this area is covered by residual basin-floor materials and materials washed in from the surrounding mountains and plateaus. Shale and sandstone are the dominant rock types. The Tertiary-age Green River, Uinta, and Duchesne Formations dominate the northern part of the MLRA. The southern part is dominated by Cretaceous-age materials with lesser amounts of Jurassic and Triassic materials. The dominant Cretaceous formations are Mancos Shale, Dakota Sandstone, and the members of the Mesa Verde Group. The dominant Jurassic formations are the Morrison, Entrada, and Navajo. The dominant Triassic formations are the Chinle and Moenkopi. Quaternary alluvial, eolian, and glacial deposits occur in both parts of the MLRA.
The average annual precipitation in most of this area ranges from 6 to 10 inches (150 to 255 millimeters). A small part of this area receives as much as 24 inches of annual precipitation.
Much of the precipitation occurs as high-intensity, convective thunderstorms during the period July through September. May and June are usually the drier months. Precipitation is more evenly distributed throughout the year in the northern part of the MLRA than in the southern part, where there is a significant peak in late summer. The northern part of the MLRA receives more precipitation as snow during winter than the southern part. The average annual temperature ranges from 41 to 54 degrees F (5 to 12 degrees C). The freeze-free period averages 170 days and ranges from 110 to 235 days.
The dominant soil orders in this MLRA are Aridisols and Entisols. Mollisols occur at the higher elevations, particularly in the northern part of the MLRA. The dominant soil temperature regime is mesic, and the dominant soil moisture regime is aridic. The soils receiving less than 8 inches (205 millimeters) of precipitation annually have an aridic soil moisture regime. The soils receiving 8 to 12 inches (205 to 305 millimeters) have an aridic soil moisture regime that borders on ustic. The soils receiving 12 to 16 inches (305 to 405 millimeters) generally have an ustic soil moisture regime that borders on aridic. The dominant soil mineralogy is mixed and soils are formed in slope alluvium or residuum derived from shale or sandstone. Many of the soils are shallow or moderately deep to shale or sandstone bedrock. The soils at the lower elevations generally have significant amounts of calcium carbonate, salts, and gypsum.

Ecological site concept

The soils of this site formed mostly in alluvium and residuum from sandstone and shale. Surface soils are fine clay loam to silty clay loam in texture. Rock fragments may be present on the soil surface and throughout the profile, but

make up less than 35 percent of the soil volume. These soils are moderately deep to deep, well-drained, and have slow to very slow permeability. pH is slightly to moderately alkaline.. Available water-holding capacity ranges from 3.5 to 7.0 inches of water in the upper 60 inches of soil. The soil moisture regime is mostly ustic and the soil temperature regime is mesic. Precipitation ranges from 12 to 16 inches annually.

Associated sites

R034BY315UT	**Upland Shallow Clay Loam (Utah Juniper-Pinyon)**

Similar sites

R034BY315UT	**Upland Shallow Clay Loam (Utah Juniper-Pinyon)**

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Atriplex confertifolia* (2) *Artemisia tridentata ssp. wyomingensis*
Herbaceous	(1) *Pascopyrum smithii* (2) *Leymus salinus*

Physiographic features

This site occurs at elevations between 5,000 and 7,000 feet. It is found on hills, ridges, terraces valley sides, and fans. Flooding and ponding do not occur on this site. At lower elevations and low precipitation zones the site is on north and east facing slopes. At higher elevations and precipitation zones the site occurs on south and west exposures.

Table 2. Representative physiographic features

Landforms	(1) Hill (2) Ridge (3) Terrace (4) Valley side (5) Fan
Runoff class	High to very high
Flooding frequency	None
Ponding frequency	None
Elevation	5,000–7,000 ft
Slope	5–40%
Ponding depth	Not specified
Water table depth	Not specified
Aspect	NE, SW

Climatic features

Annual precipitation ranges from 12 to 16 inches with more than 50 percent occuring between April 1 and ends in late September. July, August, and September receive the highest precipitaion.

Table 3. Representative climatic features

Frost-free period (characteristic range)	80-100 days
Freeze-free period (characteristic range)	
Precipitation total (characteristic range)	12-16 in

Influencing water features

Due to its landscape position, this site is not typically influenced by streams or wetlands. It can sometimes be influenced by overland flow during heavy thunder storms and during wetter Spring runoff periods.

Wetland description

N/A

Soil features

The soils of this site formed mostly in alluvium and residuum from sandstone and shale. Surface soils are fine clay loam to silty clay loam in texture. Rock fragments may be present on the soil surface and throughout the profile, but make up less than 35 percent of the soil volume. These soils are moderately deep to deep, well-drained, and have slow to very slow permeability. pH is slightly to moderately alkaline.. Available water-holding capacity ranges from 3.5 to 7.0 inches of water in the upper 60 inches of soil. The soil moisture regime is mostly ustic and the soil temperature regime is mesic. Precipitation ranges from 12 to 16 inches annually.

Table 4. Representative soil features

Parent material	(1) Alluvium–sandstone and shale (2) Residuum–sandstone and shale
Surface texture	(1) Clay loam (2) Silty clay loam
Drainage class	Well drained
Permeability class	Very slow to slow
Depth to restrictive layer	20–60 in
Soil depth	20–60 in
Surface fragment cover <=3"	0–10%
Surface fragment cover >3"	0–2%
Available water capacity (Depth not specified)	3.5–7 in
Calcium carbonate equivalent (Depth not specified)	0–40%
Electrical conductivity (Depth not specified)	0–8 mmhos/cm
Soil reaction (1:1 water) (Depth not specified)	7.4–8.4
Subsurface fragment volume <=3" (Depth not specified)	0–10%
Subsurface fragment volume >3" (Depth not specified)	0–3%

Ecological dynamics

This ecological site is dominated (species composition by dry weight) by big sagebrush and perennial grasses, with forbs as a minor component. The site consists of four states: The Reference State (1), *Bare Ground* State (2), Disturbed State (3), and Highly Disturbed State (4). A Pasture State (5) may occur if the ecological site has been converted to a pasture landuse by cultivation or any other means of conversion to the pasture landuse.

The Reference State is a collection of two distinct plant communities that exist on a continuum relative to disturbances, primarily grazing, pests, and drought with no disturbance causing successional changes as well over

time. These Plant Communities represent the best adapted plant communities to the soils and climate found on the site, and they represent the best estimation of ecological dynamics present on this site at the time of European settlement.

The Reference Plant Community (big sage/rhizomatous wheatgrass) of this site is dominated by Wyoming big sagebrush (*Artemisia tridentata* var. wyomingensis) and cool-season rhizomatous species, primarily western wheatgrass (Pascopyron smithii) with Salina wildrye (Leymus salinas), and Indian ricegrass (Achnantherum hyminoides) as a subdominant. Minor components include short-statured bunchgrasses such as Sandberg bluegrass, perennial forbs, and shrubs, including green rabbitbrush (*Chrysothamnus viscidiflorus*).

After a sagebrush-killing disturbance, the Reference Plant Community transitions to the Rhizomatous Wheatgrass Plant Community, which is dominated by rhizomatous wheatgrasses. Sagebrush is a minor component of this plant community, and only time without a sagebrush-killing disturbance will advance this back to the Wyoming Big Sagebrush/Rhizomatous Wheatgrass Plant Community.

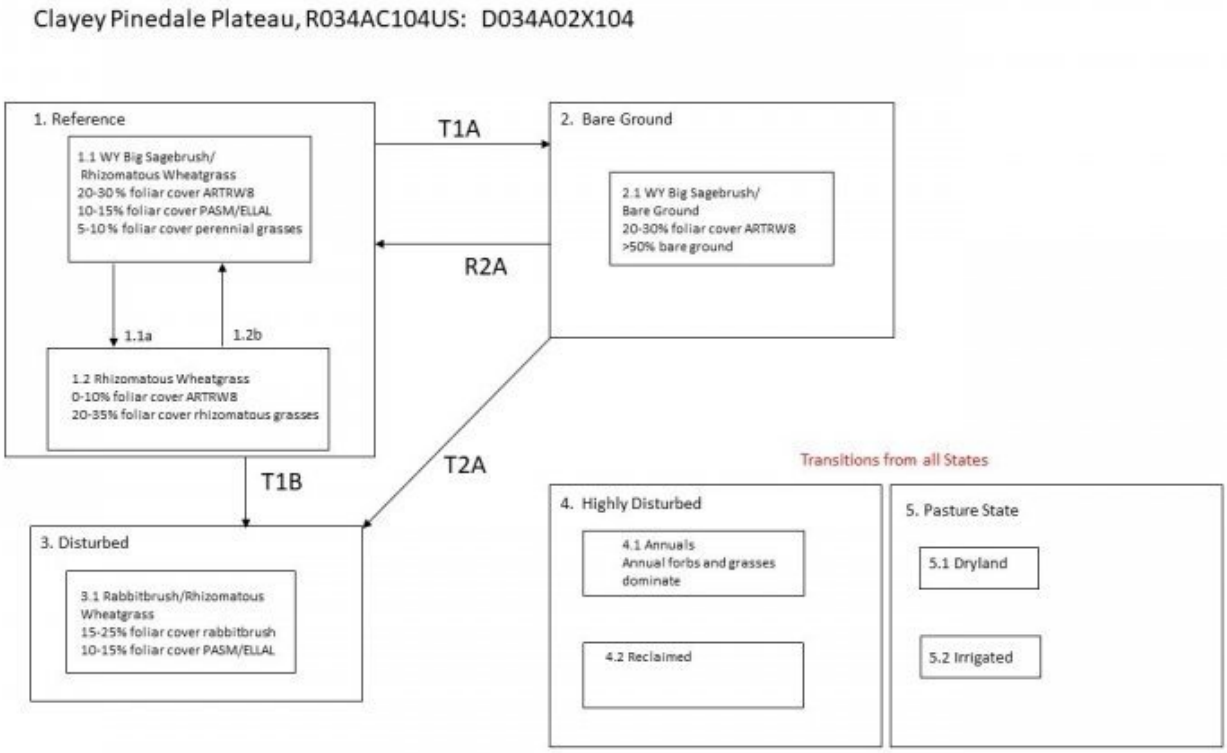
Mid-stature bunchgrasses act as decreaser species in the Reference Community. Low-stature bunchgrasses and rhizomatous grasses tolerate higher grazing pressure and grow on less fertile soils than mid-stature bunchgrasses. They often fill in the vegetation gaps created when mid-stature bunchgrasses decline, hence they are collectively referred to as increaser species.

Big sagebrush is the dominant shrub on this site. Most often Wyoming big sagebrush is the subspecies present. Snow catchment and run-in position are significant hydrologic components of this site, and the hydrology changes when shrubs are removed from this site.

Without ground-disturbing activities, this site is relatively free of invasive weeds, but once mechanically or physically disturbed it is prone to weed invasion, primarily by annuals such as lambsquarter (*Chenopodium album*), Russian thistle (*Salsola kali*), cheatgrass (*Bromus tectorum*), and broom snakeweed (*Gutierrezia sarothrae*). Soil disturbance can be caused by vehicles, equipment, severe overutilization of the herbaceous vegetation, or large amounts of bare ground created by extended drought conditions combined with overutilization.

Plant Communities and Transitional Pathways
A State-and-Transition Model (STM) for this site is depicted in Figure 1. Thorough descriptions of each state, transition, plant community, and pathway are found after the model in this document. This model is based on available experimental research, field observations, professional consensus, and interpretations. While based on the best available information, the STM will change over time as knowledge of ecological processes increases.

State and transition model



- **Community Pathways**
- 1.1a: Sagebrush-killing event (Flood, disease, drought, chemical/biological/mechical)
- 1.2b: No disturbance, rest, deferment
- **State Transitions**
- T1A: Increased herbivory (long duration medium-high frequency)
- T1B: Soil-disturbing activity (hoof action, anthropogenic activity, rodent activity)
- T2A: Soil-disturbing activity (hoof action, anthropogenic activity, rodent activity
- All states will transition to State 4 (Highly Disturbed) when severe soil disturbance occurs (removal of topsoil)
- All state will transition to State 5 (Pasture) if converted to pasture plant species
- **State Restorations**
- R2A: Rest/deferment; range seeding; ???

State 1
Reference State

Community 1.1
Reference State

The general view of this site is big sagebrush and grass. The composition by air-dry weight is approximately 60 percent perennial grasses, 10 percent forbs and 30 percent shrubs.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	225	375	465
Shrub/Vine	113	188	233
Forb	38	63	78
Total	**376**	**626**	**776**

Table 6. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	14-16%
Grass/grasslike foliar cover	49-51%
Forb foliar cover	4-6%
Non-vascular plants	0%
Biological crusts	0%
Litter	0%
Surface fragments >0.25" and <=3"	0%
Surface fragments >3"	0%
Bedrock	0%
Water	0%
Bare ground	0%

Table 7. Canopy structure (% cover)

Height Above Ground (Ft)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.5	–	–	–	–
>0.5 <= 1	–	–	–	4-6%
>1 <= 2	–	–	49-51%	–
>2 <= 4.5	–	14-16%	–	–
>4.5 <= 13	–	–	–	–
>13 <= 40	–	–	–	–
>40 <= 80	–	–	–	–
>80 <= 120	–	–	–	–
>120	–	–	–	–

Additional community tables

Table 8. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Shrub/Vine					
0	**Dominant Shrubs**			105–164	
	shadscale saltbush	ATCO	*Atriplex confertifolia*	65–98	–
	Utah serviceberry	AMUT	*Amelanchier utahensis*	20–33	–
	mountain big sagebrush	ARTRV	*Artemisia tridentata ssp. vaseyana*	20–33	–
3	**Sub-Dominant Shrubs**			68–165	
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	33–65	–
	yellow rabbitbrush	CHVI8	*Chrysothamnus viscidiflorus*	7–20	–
	rubber rabbitbrush	ERNA10	*Ericameria nauseosa*	7–20	–
	greasewood	SAVE4	*Sarcobatus vermiculatus*	7–20	–
	mountain snowberry	SYOR2	*Symphoricarpos oreophilus*	7–20	–
	spineless horsebrush	TECA2	*Tetradymia canescens*	7–20	–
Grass/Grasslike					
0	**Dominant Grasses**			269–391	
	western wheatgrass	PASM	*Pascopyrum smithii*	163–195	–
	muttongrass	POFE	*Poa fendleriana*	33–65	–
	saline wildrye	LESAS	*Leymus salinus ssp. salinus*	33–65	–
	squirreltail	ELEL5	*Elymus elymoides*	20–33	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	20–33	–
1	**Sub-Dominant Grasses**			61–123	
	Grass, annual	2GA	*Grass, annual*	20–33	–
	Grass, perennial	2GP	*Grass, perennial*	20–33	–
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	7–20	–
	Sandberg bluegrass	POSE	*Poa secunda*	7–20	–
Forb					
2	**Sub-Dominant Forbs**			108–230	
	Forb, annual	2FA	*Forb, annual*	33–65	–
	Forb, perennial	2FP	*Forb, perennial*	33–65	–
	Nevada onion	ALNE	*Allium nevadense*	7–20	–
	basin fleabane	ERPU9	*Erigeron pulcherrimus*	7–20	–
	spiny phlox	PHHO	*Phlox hoodii*	7–20	–
	spearleaf stonecrop	SELA	*Sedum lanceolatum*	7–20	–
	Pacific aster	SYCHC	*Symphyotrichum chilense var. chilense*	7–20	–
	hollyleaf clover	TRGY	*Trifolium gymnocarpon*	7–20	–

Animal community

This site provides proper grazing for cattle and sheep during spring, summer, and fall.
This site produces food and cover for wildlife.
Wildlife using this site include jackrabbit, coyote, dove, mule deer, and elk.

Recreational uses

Recreation values are hiking and hunting.

Wood products

None

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

Type Location: South Slopes on Paul Kenney Ranch Spring Cr near Rangely, CO.

Contributors

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Approval

Kirt Walstad, 9/09/2023

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	05/10/2025
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):**

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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):**

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

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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:**