Ecological site R053AE065MT
Clayey Steep (Cystp) (Legacy)
RRU 53AE

Last updated: 5/13/2025
Accessed: 09/17/2026

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.

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	Not specified

Physiographic features

This site occurs on slopes of till plains, hills and ridges that drain into stream valleys and channels. Slopes are usually greater than 15%. This site occurs on all exposures. Elevations normally range from 2200 to 3500 feet.

Table 2. Representative physiographic features

Landforms	(1) Till plain (2) Ridge (3) Hill
Flooding frequency	None
Ponding frequency	None
Elevation	610 – 1,220 m
Slope	20 – 60 %
Aspect	Aspect is not a significant factor

Climatic features

A semi-arid, temperate climate characterizes the Glaciated Plains. The predominance of cool season species has evolved to take advantage of the precipitation regime that peaks in late spring-early summer (June). Seventy-five percent of the annual precipitation usually falls as steady, soaking, frontal system rains. Summer rains usually come with thunderstorms. Precipitation is the most important factor influencing production (Heitschmidt et al 2005). Severe drought occurs on average in two out of every ten years (Cooper, et al., 2001).

Table 3 Representative climatic features

Frost-free period (average)	130 days
Freeze-free period (average)	100 days
Precipitation total (average)	310 mm

Influencing water features

Soil features

These soils were formed in glacial till. They occur on steep or hilly landscapes. The surface layer of these soils are usually less than 3 inches in depth and typically have a clay loam, silty clay loam, silty clay, sandy clay, sandy clay loam, and clay texture. The underlying material is typically a clay loam to a depth of 60 inches or more. Soils are often calcareous. Soils are well drained and permeability is very slow. This site is characterized by the following soil components: Sunburst, Bascovy, and Abor. Soil ph varies from 7.4 to 9.0.

Table 4. Representative soil features

Surface texture	(1) Clay loam (2) Silty clay (3) Clay
Family particle size	(1) Clayey
Drainage class	Well drained
Permeability class	Very slow
Soil depth	50 – 180 cm
Surface fragment cover <=3"	Not specified
Surface fragment cover >3"	Not specified
Available water capacity (0-101.6cm)	10.16 – 17.78 cm

Calcium carbonate equivalent (0-101.6cm)	0 – 10 %
Electrical conductivity (0-101.6cm)	0 – 10 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0 – 10
Soil reaction (1:1 water) (0-101.6cm)	7.4 – 10
Subsurface fragment volume <=3" (Depth not specified)	0 – 10 %
Subsurface fragment volume >3" (Depth not specified)	Not specified

Ecological dynamics

This ecological site developed under Northern Great Plains climatic conditions, the natural influence of large herbivores and a fire frequency of 5-7 years (Frost 1998).

Plant community interpretations are based on the Historic Climax Plant Community (HCPC). Changes in the HCPC are brought about by frequency, timing and intensity of past grazing use, series of dry or wet years, or disturbances by fire, insect infestations, noxious weed invasions, etc. As the HCPC regresses to lower seral stages, the deep-rooted cool and warm season perennial grasses are replaced by warm season short perennial grasses (blue grama, sandberg bluegrass, etc), and warm season forbs and half-shrubs (fringed sagewort, hoods phlox, threadleaf sedge, hairy gold aster, and dense clubmoss). The dominance of these short grasses, warm season forbs and half-shrubs in the plant community disrupts ecological processes, impairs the biotic integrity of the site, and adversely affects resiliency. The system’s ability to recover to higher seral states is restricted or impeded.

State and Transition Diagram

Traditional theories of plant succession leading to a single climax community are inadequate for understanding the complex successional pathways of this ecological site in the glaciated plains (Stringham et al. 2003). This ecological site is more aptly described using state-and-transition vegetation dynamics in a non-linear framework. A “state” is an alternative, persistent vegetation community that is not simply reversible in the linear successional framework. States are depicted as seral stages, while pathways between states are “transitions.” The latter can be transient or persisting (crosses a threshold). Transitions may be triggered by climatic events, fire, grazing, farming, etc.

Three important plant communities and associated successional pathways for the Reference state (State #1), and the transitions across a threshold to State #2 are illustrated below for a Clayey-Steep 10-14” p.z. site in the Glaciated Plains.

State and transition model

Additional community tables

Table 5. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
Grass/Grasslike					
1	**Native perennial grasses**			202-404	
	tufted wheatgrass	ELMA7	*Elymus macrourus*	101-202	–
	western wheatgrass	PASM	*Pascopyrum smithii*	101-202	–
2	**Native perennial grasses**			22-1143	
	bluebunch wheatgrass	PSSP6	*Pseudoroegneria spicata*	112-336	–
	little bluestem	SCSC	*Schizachyrium scoparium*	179-269	–
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	22-202	–
	plains muhly	MUCU3	*Muhlenbergia cuspidata*	22-202	–
	green needlegrass	NAVI4	*Nassella viridula*	67-202	–
3	**Native perennial grasses and grasslikes**			11-135	
	Grass, perennial	2GP	*Grass, perennial*	11-45	–
	blue grama	BOGR2	*Bouteloua gracilis*	11-45	–
	threadleaf sedge	CAFI	*Carex filifolia*	11-45	–
	plains reedgrass	CAMO	*Calamagrostis montanensis*	11-45	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	11-45	–
	Sandberg bluegrass	POSE	*Poa secunda*	11-45	–
Forb					
4	**Native perennial forbs**			11-67	
	dotted blazing star	LIPU	*Liatris punctata*	11-67	–
	American vetch	VIAM	*Vicia americana*	11-67	–
5	**Native perennial forbs**			11-67	
	white prairie clover	DACA7	*Dalea candida*	11-67	–
	purple prairie clover	DAPU5	*Dalea purpurea*	11-67	–
6	**Native perennial forbs**			1-45	
	Forb, perennial	2FP	*Forb, perennial*	1-17	–
	common yarrow	ACMI2	*Achillea millefolium*	1-17	–
	pussytoes	ANTEN	*Antennaria*	1-17	–
	groundplum milkvetch	ASCR2	*Astragalus crassicarpus*	1-17	–
	aster	ASTER	*Aster*	1-17	–
	milkvetch	ASTRA	*Astragalus*	1-17	–
	bastard toadflax	COUM	*Comandra umbellata*	1-17	–
	buckwheat	ERIOG	*Eriogonum*	1-17	–
	hairy false goldenaster	HEVI4	*Heterotheca villosa*	1-17	–
	beardtongue	PENST	*Penstemon*	1-17	–
	spiny phlox	PHHO	*Phlox hoodii*	1-17	–
	white milkwort	POAL4	*Polygala alba*	1-17	–
	scurfpea	PSORA2	*Psoralidium*	1-17	–
	Missouri goldenrod	SOMI2	*Solidago missouriensis*	1-17	–
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	1-17	–
	prairie thermopsis	THRH	*Thermopsis rhombifolia*	1-17	–
	lesser spikemoss	SEDE2	*Selaginella densa*	0-1	–
Shrub/Vine					
7	**Native shrubs and half-shrubs**			27-135	

	Nuttall's saltbush	ATNU2	*Atriplex nuttallii*	13-67	–
	winterfat	KRLA2	*Krascheninnikovia lanata*	13-67	–
8	**Native shrubs and half-shrubs**			1-90	
	Shrub, broadleaf	2SB	*Shrub, broadleaf*	1-28	–
	silver sagebrush	ARCA13	*Artemisia cana*	1-28	–
	prairie sagewort	ARFR4	*Artemisia frigida*	1-28	–
	rubber rabbitbrush	ERNAN5	*Ericameria nauseosa ssp. nauseosa var. nauseosa*	1-28	–
	creeping juniper	JUHO2	*Juniperus horizontalis*	1-28	–
	rose	ROSA5	*Rosa*	1-28	–
	snowberry	SYMPH	*Symphoricarpos*	1-28	–
9	**Native shrubs and half-shrubs**			1-28	
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	1-28	–
	brittle pricklypear	OPFR	*Opuntia fragilis*	0-1	–
	plains pricklypear	OPPO	*Opuntia polyacantha*	0-1	–

Table 6. Community 1.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)

Table 7. Community 1.3 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)

Table 8. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)

Animal community

Livestock Management This site evolved with trampling, defoliation (ungulates, grasshoppers and jackrabbits, and other herbivores), fire and drought. The site is moderately resistant and resilient to disturbances which may alter its ecological processes. Following perturbations such as drought, which allows blue grama and other lower successional plants to increase at the expense of the mid and tall grasses, succession occurs with subsequent rainfall. Thus, the HCPC, or Communities A or B may be present at any given time in State #1. During “average” years, the site has the potential to produce 1200 lbs of forage per acre. Forage production shows far greater variations in response to changes in annual precipitation than to different grazing intensities (Heitschmidt et al 2005). However, proper stocking rates and prescribed grazing is needed to ensure that the site remains in State #1. Without proper grazing management the mid-to-tall grass community will transition to State #2 plant community species. In comparison to State #1, suggested stocking rates on sites in State #2 represent a 4-fold reduction. Experience indicates that prescribed grazing prevents further deterioration in State #2. However, significant plant succession may not occur within a reasonable time frame. Death camas, milk vetch (Astragalus spp.), and white point loco may occur on this ecological site. However, in the Glaciated Plains there are few reported incidences of livestock losses from these potentially poisonous plants. It is likely that forage production and livestock numbers are balanced, and livestock are not forced to graze the plant when it is most toxic. Similarity indices (SI) of 25-55% characterized most of the Clayey-Steep 10-14” p.z. sites inventoried on the Fort Peck and Fort Belknap Reservations in 2001 -2004. SI’s of 0-25% were not encountered. In contrast, SI’s of 0-25% were frequently associated with adjacent Clayey 10-14” p.z. sites. Similar observations occur on other ranches in the eastern and central Glaciated Plains. In contrast to the Clayey 10-14” p.z. site (which occupies a lower landscape position) where very few highly palatable cool season grasses can be found because of repeated, frequent grazing events, a fairly diverse mix of desirable, cool season plants will be found growing on adjacent Clayey-Steep 10-14” p.z. sites. This site is suitable for livestock grazing from May through October. The grass dominated plant community is better suited for cattle, rather than sheep grazing. However, sheep are better adapted to grazing the steep slopes, especially if watering facilities are relatively distant. Therefore, a mix of cattle and sheep usage often merits consideration. Wildlife Interpretations State #1 of the Clayey-Steep 10-14” p.z. ecological site includes the HCPC and two additional communities. This state provides forage for mule deer during most of the year. Low shrub cover limits the potential of the site for thermal and escape cover. Most deer use occurs along the edges of the site where it borders woody draws, badlands, etc. Species diversity and cover associated with the HCPC or other communities in the Reference State (State #1) also provide habitat for sharp-tailed grouse and other upland birds. Most wildlife usage occurs along the transitions between the Clayey-Steep 10-14” p.z. site and deciduous wooded draws. The relative absence of big sagebrush limits the potential of this site for sage grouse habitat. The few sage grouse that exist in the Glaciated Plains are usually associated with silver sagebrush. Species diversity and litter also provide favorable habitats for deer mice, rabbits and other small mammals. Golden eagles, redtail and ferruginous hawks are often circling over the landscape searching for prey. Communities that are in State #2 are much less suitable for big game, upland birds and most species of small mammals. Prairie dogs usually are not found inhabiting Clayey-Steep sites because slopes exceed 15%. Prairie dogs typically prefer upland sites of 8% slope. Plant Preferences by

Animal Kind Refer to NRCS Field Office Technical Guide, Section IIE, General Information, for tables displaying plant preferences by livestock and wildlife.

Hydrological functions

Soils associated with this ecological site are in Hydrologic Soil Groups B and C. Infiltration rates are generally moderate to slow. Permeability class is very slow. The runoff potential is high to very high, depending on slope and ground cover. Good hydrologic conditions exist on Clayey-Steep 10-14” p.z. sites that are either in a high seral state or at the HCPC (State #1). Canopy cover (grasses, forbs and shrubs) is greater than 80% in these communities, which is conducive to moderately high infiltration rates and minimizes runoff and erosion. Communities in early seral states (State #2) are generally considered to be in poor hydrologic condition. The potential for soil erosion increases in State #2. Plant cover and litter are inadequate to protect the soil surface and the amount of bare ground is excessive. As infiltration decreases, surface runoff and soil erosion increases. Thus, the site gradually becomes more xeric and also loses much of its organic matter and nutrients that are needed for the growth of higher successional plants.

Recreational uses

Hunters are probably the most common recreational user of this ecological site. The site is also used by hikers and photographers. The Clayey-Steep 10-14” p.z. site that is located near roads and towns often show symptoms of exuberant off-road ATV use. Unauthorized ATV use on this site increases susceptibility to erosion and to noxious weed invasion.

Wood products

This site has no significant value for wood products.

Other information

The Clayey-Steep 10-14” p.z. ecological site in the Glaciated Plains is resistant to perturbations. However, the site loses its resiliency when the plant community regresses from State #1 to State #2. Reproductive capability of higher successional plants and annual aboveground production decline as the site moves toward the threshold separating State #1 from State #2. Production in State #2 is less than 1/4 of the potential at HCPC. Thus, litter and the number of plant structural/functional groups are adversely affected.

Inventory data references

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Other references

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Heitschmidt, R. K., K. D. Klement, and M. R. Haferkamp. 2005. Interactive effects of drought and grazing on Northern Great Plains rangelands. Rangeland Ecol. Manage. 58: 11-19.

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Approval

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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	09/17/2026
Approved by	
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):**

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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):**

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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:**
