

Ecological site R053AE058MT Loamy Steep (Lostp) (Legacy) RRU 53AE

Last updated: 6/14/2023
Accessed: 04/22/2026

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 rolling till plains, hills and hill slopes. Slopes are in excess of 15%. This site occurs on all exposures. Elevations normally range from 2000 to 3500 feet.

Table 2. Representative physiographic features

Landforms	(1) Till plain (2) Hill
Flooding frequency	None
Ponding frequency	None
Elevation	570 – 1,160 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 formed in glacial till. The surface layer of these soils vary from 0-3 inches in depth and typically have loam, silt loam, gravelly loam or silty clay loam texture. Underlying material, to a depth of 60 inches or more, has a clay loam texture. Permeability is moderate to moderately slow, and available water capacity is high. Effective rooting depth is >60 inches. Where this soil is under native vegetation, the average wetting depth is about 24 inches. Runoff is medium to very high rapid, and the hazard of water erosion is high. The hazard of soil blowing is also high. Soils are often calcareous. The following soil taxonomic units characterize this site: Zahill and Hillon. Soil ph normally ranges from 7.4 to 8.4.

Table 4. Representative soil features

Surface texture	(1) Gravelly loam (2) Silt loam (3) Clay loam
Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Slow to moderately slow
Soil depth	50 – 180 cm
Surface fragment cover <=3"	0 – 40 %
Surface fragment cover >3"	0 – 10 %
Available water capacity (0-101.6cm)	10.16 – 17.78 cm

Calcium carbonate equivalent (0-101.6cm)	0 – 20 %
Electrical conductivity (0-101.6cm)	Not specified
Sodium adsorption ratio (0-101.6cm)	0 – 10
Soil reaction (1:1 water) (0-101.6cm)	7.4 – 8.4
Subsurface fragment volume ≤3" (Depth not specified)	0 – 10 %
Subsurface fragment volume >3" (Depth not specified)	0 – 10 %

Ecological dynamics

This ecological site developed under Northern Great Plains climatic conditions, the natural influence of herbivory 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 colonization and recruitment, etc. As the HCPC regresses to lower seral stages, the deep-rooted perennial grasses are replaced by blue grama, sandberg bluegrass, fringed sagewort, hood's 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 the Loamy-Steep 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	
	thickspike wheatgrass	ELLAL	<i>Elymus lanceolatus ssp. lanceolatus</i>	101-202	–
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	101-202	–
2	Native perennial grasses			1-1143	
	bluebunch wheatgrass	PSSP6	<i>Pseudoroegneria spicata</i>	1-336	–
	little bluestem	SCSC	<i>Schizachyrium scoparium</i>	224-336	–
	needle and thread	HECOC8	<i>Hesperostipa comata ssp. comata</i>	135-269	–
	porcupinegrass	HESP11	<i>Hesperostipa spartea</i>	101-202	–
	plains muhly	MUCU3	<i>Muhlenbergia cuspidata</i>	101-202	–
	green needlegrass	NAVI4	<i>Nassella viridula</i>	101-202	–
3	Native perennial grasses and grasslikes			1-135	
	Grass, perennial	2GP	<i>Grass, perennial</i>	1-45	–
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	1-45	–
	threadleaf sedge	CAFI	<i>Carex filifolia</i>	1-45	–
	plains reedgrass	CAMO	<i>Calamagrostis montanensis</i>	1-45	–
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	1-45	–
	Sandberg bluegrass	POSE	<i>Poa secunda</i>	1-45	–
Forb					
4	Native perennial forbs			13-67	
	dotted blazing star	LIPU	<i>Liatris punctata</i>	13-67	–
	American vetch	VIAM	<i>Vicia americana</i>	13-67	–
5	Native perennial forbs			13-67	
	white prairie clover	DACA7	<i>Dalea candida</i>	13-67	–
	purple prairie clover	DAPU5	<i>Dalea purpurea</i>	13-67	–
6	Native perennial forbs			1-67	
	Forb, perennial	2FP	<i>Forb, perennial</i>	1-11	–
	pussytoes	ANTEN	<i>Antennaria</i>	1-11	–
	aster	ASTER	<i>Aster</i>	1-11	–
	milkvetch	ASTRA	<i>Astragalus</i>	1-11	–
	bastard toadflax	COUM	<i>Comandra umbellata</i>	1-11	–
	buckwheat	ERIOG	<i>Eriogonum</i>	1-11	–
	hairy false goldenaster	HEVI4	<i>Heterotheca villosa</i>	1-11	–
	beardtongue	PENST	<i>Penstemon</i>	1-11	–
	spiny phlox	PHHO	<i>Phlox hoodii</i>	1-11	–
	scurfpea	PSORA2	<i>Psoralegium</i>	1-11	–
	upright prairie coneflower	RACO3	<i>Ratibida columnifera</i>	1-11	–
	Missouri goldenrod	SOMI2	<i>Solidago missouriensis</i>	1-11	–
	scarlet globemallow	SPCO	<i>Sphaeralcea coccinea</i>	1-11	–
	prairie thermopsis	THRH	<i>Thermopsis rhombifolia</i>	1-11	–
	lesser spikemoss	SEDE2	<i>Selaginella densa</i>	0-1	–
	plains pricklypear	OPPO	<i>Opuntia polyacantha</i>	0-1	–
Shrub/Vine					
7	Native shrubs and half-shrubs			17-67	
	winterfat	KRLA2	<i>Krascheninnikovia lanata</i>	17-67	–

8	Native shrubs and half-shrubs			1-135	
	Shrub, broadleaf	2SB	<i>Shrub, broadleaf</i>	1-34	-
	silver sagebrush	ARCA13	<i>Artemisia cana</i>	1-34	-
	prairie sagewort	ARFR4	<i>Artemisia frigida</i>	1-34	-
	rubber rabbitbrush	ERNAN5	<i>Ericameria nauseosa ssp. nauseosa var. nauseosa</i>	1-34	-
	creeping juniper	JUHO2	<i>Juniperus horizontalis</i>	1-34	-
	rose	ROSA5	<i>Rosa</i>	1-34	-
	snowberry	SYMPH	<i>Symphoricarpos</i>	1-34	-
9	Native shrubs and half-shrubs			0-1	
	broom snakeweed	GUSA2	<i>Gutierrezia sarothrae</i>	0-1	-
	plains pricklypear	OPPO	<i>Opuntia polyacantha</i>	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. Its plant communities are moderately resistant to disturbances which may alter ecological processes. They are also moderately resilient. Following perturbations such as drought, which allows blue grama and other increasers to increase at the expense of the mid and tall grasses, succession occurs with subsequent rainfall. Thus, the HCPC, or Communities A and 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 a high seral or HCPC state. Without proper grazing management the mid-to-tall grass community will regress to a blue grama, prairie junegrass, dense clubmoss community. In comparison to the high seral state, suggested stocking rates on sites in the early seral state represent a 4-fold reduction. Experience indicates that prescribed grazing prevents further deterioration in State #2. Furthermore, significant plant succession may occur within a reasonable time frame. Very few livestock losses are reported from poisonous plants. Similarity index values of 35-55% characterized most of the Loamy-Steep sites inventoried on the Fort Peck and Fort Belknap Reservations in 2001-2004. SI values of less than 25% were not encountered. In contrast, SI's of less than 25% were frequently associated with adjacent Loamy sites. Similar observations occur on other ranches in the Glaciated Plains. In contrast to adjacent Loamy site (often near water) where very few highly palatable cool season grasses remain because of repeated, frequent grazing events, a fairly diverse mix of desirable, cool season plants often grow on the Loamy-Steep site. The higher range health rating of this site probably results from less livestock grazing. Utilization of plants growing on slopes and on sites more distant from water developments is normally less than it is for plants growing on lower, more gently sloping terrain that is situated near watering facilities. This site is suitable for livestock grazing from May through October. The grass-dominant 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 Loamy-Steep ecological site includes the HCPC and two additional communities. This state provides forage for mule deer during most of the year. However, the overall forage potential is limited by the relatively low production and diversity of forbs and shrubs. Low shrub cover also limits the potential of the site for thermal and escape cover. Most deer use occurs along the edges of the site where it borders deciduous wooded draws, badland sites, etc. Species diversity and cover associated with the HCPC or other communities in the Reference State also provide habitat for sharp-tailed grouse and other upland birds. Most wildlife usage occurs along the "ecotones" between the Loamy-Steep site and 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 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 a problem on Loamy-Steep sites because slopes are greater than 15%. Prairie dogs prefer slopes of 1-10%. 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. The runoff potential is medium to very high, varying with slope and ground cover. Good hydrologic conditions exist on Loamy-Steep sites that are either in a high seral state or at the HCPC (State #1). Canopy cover (grass, forbs and shrubs) is greater than 90% in these communities, which is conducive to high infiltration rates and minimizes runoff and erosion. Communities in early seral states (State #2) are generally considered to be in poor hydrologic condition. Concerns are valid. The excessive amount of bare ground results from inadequate plant cover and litter. Therefore, infiltration decreases and surface runoff increases. The desirable tall and mid-grasses are unable to effectively utilize available moisture. Water and wind erosion are major concerns on Loamy-Steep sites. Prescribed grazing management is needed to restore vigor of the higher-successional plants and to replenish or maintain about 50% litter to protect the soil resource.

Recreational uses

Hunters are probably the most common recreational user this ecological sites. The site is also used by hikers and photographers. Many of these sites show symptoms of exuberant off-road ATV use. ATV use should be discouraged on these sites.

Wood products

This site has no significant value for wood products.

Other information

The Loamy-Steep ecological site in the eastern 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 the higher successional plants and annual production declines as the site moves toward the threshold separating State #1 from State #2. Annual production in early seral states is less than 1/4 of the potential at HCPC. Thus, litter and the number of structural/functional groups are adversely affected.

Inventory data references

SCS-Range-417 (#513,#514) 1991-1992 MT Phillips ECS-1 Modified Double Sampling 18 2001-2004 MT Blaine, Phillips, Roosevelt, Sheridan, Valley USDA-SCS-MT 1981 Technical Range Site Description

Other references

Branson, F. A., and R. F. Miller. 1981. Effects of increased precipitation and grazing management on Northeastern Montana rangelands. *J. Range Manage.* 34: 3-10.

Dyksterhuis, E. J. 1949. Condition and management of rangeland based on quantitative ecology. *J. Range Manage.*2:104-115.

Frost, Cecil C. 1998. Presettlement fire frequency regimes of the United States: a first approximation. Pages 70-81 in Teresa L. Pruden and Leonard A. Brennan (eds.). *Fire in ecosystem management: shifting the paradigm from suppression to prescription*. Tall Timbers Fire Ecology Conference Proceedings, No. 20. Tall Timbers Research Station, Tallahassee, FL.

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.

Stringham, T. K., W. C. Krueger, and P. L. Shaver. 2003. State and transition modeling: an ecological process approach. *J. Range Manage.* 56:106-113.

USDI BLM USGS and USDA NRCS. 2000. Interpreting indicators of rangeland health. Tech. Ref. 1734-6.

Approval

Kirt Walstad, 6/14/2023

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)	Dr. John Lacey, Maxine Rasmussen, Jon Siddoway & Rick Bandy
Contact for lead author	
Date	03/30/2005
Approved by	
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** Careful examination will yield slight evidence of rills following a rainfall event in HCPC. If in Plant community A, careful examination will yield slight evidence of rills regardless of precipitation event. In HCPC and in plant community A, rill would be less than ½ inch deep, linear, but short in length. If in Plant community B, rills are readily observed; regularly spaced, ½ inch deep, linear and exceeding 1 foot but not exceeding 3 feet.

2. **Presence of water flow patterns:** Careful examination will yield slight evidence of water flow patterns following a rainfall event in HCPC. If in Plant community A, careful examination will yield slight evidence of water flow patterns regardless of precipitation event. If in Plant community B, water flow patterns are readily observed.

3. **Number and height of erosional pedestals or terracettes:** Pedestals or terracettes would essentially be nonexistent in HCPC. If in Plant community A, careful examination will yield occasional pedestals and terracettes approximately ¼ inch above the soil surface. If in Plant community B, pedestals and terracettes are frequent and ½ - ¾ inch above the soil surface.

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Up to 10% of the soil surface is bare ground in HCPC & Plant community A. If in Plant Community B, 11 to 25% of the soil surface is bare ground.

5. **Number of gullies and erosion associated with gullies:** Active gullies should not be present. Existing gullies should be ?healed? with a good vegetative cover in all State 1 reference plant communities.

6. **Extent of wind scoured, blowouts and/or depositional areas:** Wind scoured, blowouts and/or depositional areas are not associated with any of the State 1 reference plant communities.

7. **Amount of litter movement (describe size and distance expected to travel):** Some litter movement is evident following a rainfall event in HCPC. If in Plant community A, some litter movement is evident regardless of precipitation event. If in Plant community B, litter, both fine and coarse, movement is readily observable.

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** Stability class anticipated to be 4 to 6.

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** The surface layer is 0-7" deep and typically have loam, silt loam, gravelly loam or silty clay loam textures. Surface color ranges from dark grayish brown to dark brown. Soil organic matter ranges from 0.5-2% with a high of 4%.

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** In HCPC, 85-90% plant canopy and 75-80% basal cover with small gaps between plants should reduce raindrop impact and slow overland flow, providing increased time for infiltration to occur. Healthy, deep rooted native grasses enhance infiltration and reduce runoff. Infiltration rate is moderate to moderately slow. If in plant community A, 85-90% plant canopy and 75-80% basal cover with small gaps between plants will still reduce raindrop impact and decrease overland flow. If in plant community B, 30-60% plant canopy and 50-75% basal cover with moderate gaps between plants, intensifies raindrop impact and increases overland flow. The site tends to be more xeric as runoff increases.

11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):** No compaction layer or soil surface crusting should be evident in any of the State 1 plant communities.

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: Tall and mid-stature, cool season bunch grasses = mid-stature warm season bunch grasses > mid-stature, cool season rhizomatous grasses> short stature, warm season rhizomatous grasses> shrubs > forbs. Plant community A: Mid-stature, cool season bunch grasses > mid-stature, cool season rhizomatous grasses> short stature, warm season rhizomatous > shrubs > forbs.

Sub-dominant: Plant community B: Mid-stature cool season bunch grasses > mid-stature, cool season rhizomatous grasses > short stature, warm season rhizomatous grasses > shrubs > forbs.

Other:

Additional:

13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):**
Plant mortality and decadence very low in HCPC and Plant community A. In periods of drought, shrubs would exhibit decadence in the state 1 reference communities.
-
14. **Average percent litter cover (%) and depth (in):** Litter cover is in contact with soil surface. Litter decreases in Plant community A to 40-50% and depth is reduced to 0.5 inch. Litter decreases to about 10% in Plant community B and is less than ¼ inch deep.
-
15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):**
800 - 1450 #/acre from Plant community B to HCPC.
-
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:** Needle and thread, threadleaf sedge, Hood's phlox, prickly pear, creeping juniper, fringed sagewort, blue grama.
-
17. **Perennial plant reproductive capability:** All species are capable of reproducing in HCPC and Plant community A. In Plant community B, plant seedlings will be weighed in favor of marginal and undesirable species. Replacement of desirable species will be very few.
-