USDA Natural Resources Conservation Service

Ecological site R058CY072ND
Clayey

Last updated: 10/31/2018
Accessed: 04/26/2024

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.

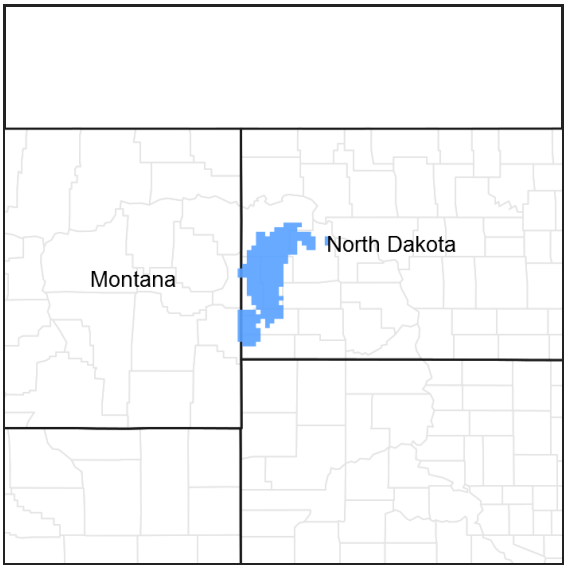


Figure 1. Mapped extent

Areas shown in blue indicate the maximum mapped extent of this ecological site. Other ecological sites likely occur within the highlighted areas. It is also possible for this ecological site to occur outside of highlighted areas if detailed soil survey has not been completed or recently updated.

MLRA notes

Major Land Resource Area (MLRA): 058C–Northern Rolling High Plains, Northeastern Part

MLRA 58C covers 2,780 square miles and encompasses approximately 1.8 million acres. MLRA 58C spans two states with 96% of the area in North Dakota and 4% in Montana. The acreage inside MLRA 58C is 54% privately owned and 44% federal land. The federal land consists of the Fort Berthold Indian Reservation, Little Missouri National Grasslands, and Theodore Roosevelt National Park. MLRA 58C landscape is characterized by steeply sloping, dissected badlands along the Little Missouri River and its tributaries. Tertiary marine shale, siltstone, and sandstone sediments are the most common soil parent materials in this MLRA. Primary land uses are rangeland for grazing and wildlife habitat. Micro-climates inherent in badlands landscapes influence both variety and abundance of vegetation in MLRA 58C. South- and west-facing exposures are dry, hot, and sparsely vegetated. More humid and cooler north- and east-facing exposures are favorable for abundant forage and woody vegetation.

Classification relationships

Major land resource area (MLRA): 058C-Northern Rolling High Plains, Northeastern Part

Ecological site concept

The Clayey ecological site in MLRA 58C occurs on stable backslopes, erosional foot slopes, and toe slopes of

upland landforms. Slopes range from 0 to 35 percent. Soils on this site are moderately deep to deep, fine-textured soils with greater than 18 percent clay in the surface horizon and greater than 35 percent clay in the subsoil. Soils on the Clayey ecological site formed in calcareous residuum and in alluvium derived from residuum. Thickness of the soil surface horizon ranges from 3 to 15 inches.

Associated sites

R058CY073ND	**Claypan** The Claypan ecological site is adjacent to and in conjunction with the Clayey ecological site. The Claypan site has well or moderately well drained, moderately deep to very deep soils on the same upland landforms as the Clayey site, but lateral subsurface water movement and sodium in the soil have formed a dense claypan layer in these soils. The Claypan site has soils with a dense sodic subsoil below 6 inches with visible salts and gypsum crystals below 16 inches. Like the Clayey ecological site, Claypan sites are down slope from Shallow Loamy sites and up slope from Loamy Overflow ecological sites. The indicator species are western wheatgrass with blue grama, heath aster, and western yarrow along with a few shrubs of fringed sagewort and Nuttall's Saltbush. This site has less western wheatgrass, significantly less green needlegrass, and lower production than the Clayey ecological site.
R058CY074ND	**Loamy Overflow** Soils on the Loamy Overflow ecological site developed in run-on positions such as swales and drainageways that accumulate sediments eroded from the surrounding landforms and receive additional moisture from runoff. When associated with Clayey ecological sites, soils on Loamy Overflow sites are typically fine-textured and will make a ribbon longer than 2 inches before breaking. Soils on the Loamy Overflow site are moderately well drained, very deep soils with a thick, dark A horizon that is usually at least 16 inches thick. Carbonates, if present, are deeper in the soil profile than on the Clayey site. The Loamy Overflow ecological site is down slope from Clayey, Loamy, Limy Residual, and Claypan sites, and is typically in drainageways below steeper landforms or in swales at the head of upland wooded draws. Principle species: Big bluestem, green needlegrass, and western wheatgrass.
R058CY080ND	**Loamy** Loamy ecological sites are often adjacent to Clayey ecological sites on upland landforms that do not receive additional moisture from runoff or flooding. Loamy sites are on similar upland landforms and landscape positions as the Clayey sites, but the soil parent materials are medium-textured, soft siltstone or mudstone sedimentary beds, rather than fine-textured shale beds. Loamy ecological sites have well-drained, moderately deep to very deep, medium-textured soils that will form a ribbon longer than 1 inch, but less than 2 inches before breaking. Like the Clayey ecological site, Loamy ecological sites are up slope from Loamy Overflow sites and down slope from Limy Residual and Shallow Loamy ecological sites. Indicator species are western wheatgrass, green needlegrass, and blue grama, with fringed sagewort and western snowberry being the dominant shrubs. This site has less green needlegrass and western wheatgrass, but has slightly higher production than the Clayey ecological site.
R058CY086ND	**Shallow Loamy** Due to limited acres in MLRA 58C, the Shallow Clayey ecological site was combined with the Shallow Loamy ecological site. When associated with the Clayey site in MLRA 58C, soils on Shallow Loamy sites may be fine-textured or medium-textured, depending on the sedimentary parent material from which they formed. If fine textured, the soils on Shallow Loamy sites will make a ribbon longer than 2 inches before breaking. If medium textured, the soils will make a ribbon longer than 1 inch, but less than 2 inches before breaking. Soils on the Shallow Loamy ecological site are well drained with soft, unweathered shale, siltstone, or mudstone beds between 10 inches and 20 inches below the soil surface. The unweathered shale, siltstone, and mudstone beds are a root restrictive layer. Shallow Loamy sites are up slope from Clayey, Claypan, and Loamy sites and down slope from Very Shallow sites. This site has less production than the Clayey site due to its position on droughty shoulder slopes of steep upland landforms and the presence of a restrictive layer above twenty inches. Indicator species: western wheatgrass, blue grama, little bluestem, plains muhly, and sideoats grama, with dotted gayfeather, fringed sagewort, western yarrow, and shrubs like broom snakeweed.

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	Not specified

Physiographic features

MLRA 58C is known as the Little Missouri Badlands, which formed when the Little Missouri River was diverted along a shorter, steeper course by Pleistocene glaciers. Due to the resulting increased gradient after its eastward diversion by the glaciers, the Little Missouri River began rapidly down cutting into the soft, calcareous sedimentary shale, siltstone, and sandstone of the Fort Union and Hell Creek geological formations. This rapid down cutting eroded and carved the badlands of MLRA 58C. This cycle of erosion and deposition continues today.

Most of the soils in MLRA 58C developed from residuum weathered in place. As a result of constant erosion and deposition, the majority of soils in MLRA 58C are Entisols and Inceptisols. Mollisols have formed on the high, stable drainage divides and plateaus above the steeper, dissected hillslopes and fans that define the Badlands. Elevation ranges from 1,838 feet (560 meters) to 3,430 feet (1,045 meters). The Little Missouri River flows through the entire length of MLRA 58C and empties into Lake Sakakawea that was formed by the Garrison Dam on the Missouri River.

The Clayey ecological site is located on stable backslopes, erosional foot slopes, and toe slopes on level to steep landforms on upland sedimentary plains. Slope gradients range from 0 to 35 percent.

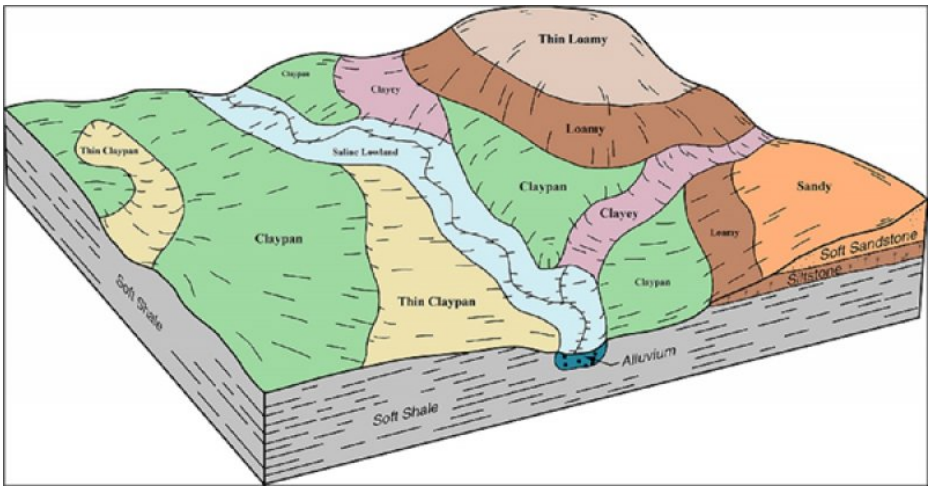


Figure 2. MLRA 58C ecological site block diagram.

Table 2. Representative physiographic features

Landforms	(1) Hill
Flooding frequency	None
Ponding frequency	None
Elevation	560–1,045 m
Slope	0–35%
Ponding depth	0 cm
Water table depth	122–183 cm
Aspect	Aspect is not a significant factor

Climatic features

MLRA 58C is considered to have a continental climate with cold winters and hot summers, low humidity, light rainfall, and much sunshine. Extremes in temperature are common and characteristic of MLRA 58C. The continental climate is the result of this MLRA's location in the geographic center of North America. There are few natural barriers on the northern Great Plains, so air masses move unobstructed across the plains and account for rapid changes in temperature.

Annual precipitation ranges from 14 to 17 inches per year. The normal average annual temperature is about 41° F. January is the coldest month with an average temperature of about 17° F. July is the warmest month with an average temperature of about 70° F. The range of normal average monthly temperatures between the coldest and warmest months is 53° F. This large temperature range attests to the continental nature of MLRA 58C's climate. Daytime wind speeds are generally stronger than nighttime wind speeds, and occasional strong storms may bring

brief periods of high winds with gusts to more than 50 miles per hour.

Growth of native cool-season plants begins in late March and continues to early to mid-July. Native warm-season plants begin growth in mid-May and continue to the end of August. Green up of cool-season plants can occur in September and October when adequate soil moisture is present.

Table 3. Representative climatic features

Frost-free period (average)	107 days
Freeze-free period (average)	131 days
Precipitation total (average)	406 mm

Climate stations used

- (1) FAIRFIELD [USC00322809], Fairfield, ND
- (2) MEDORA [USC00325813], Medora, ND
- (3) GRASSY BUTTE 2ENE [USC00323705], Grassy Butte, ND
- (4) TROTTERS 3 SSE [USC00328812], Beach, ND
- (5) WATFORD CITY 14S [USC00329246], Grassy Butte, ND

Influencing water features

No significant water features influence this site.

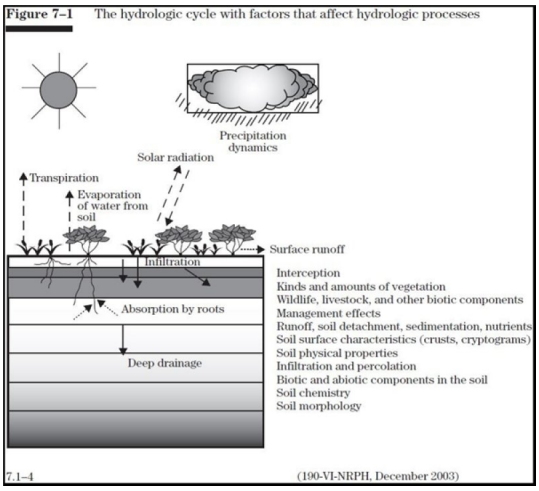


Figure 7. Fig.7-1 from National Range and Pasture Handbook.

Soil features

The Clayey ecological site in MLRA 58C is represented by moderately deep to very deep fine-textured soils. Common features of the soils on this site are surface textures that are dominantly silty clay loam, but may also be silt loam, clay loam, or loam. The surface layer is 3 to 15 inches thick. Subsoil textures range from silty clay loam to clay. Slopes range from 0 to 35 percent. The soils on this site are moderately well to well drained and have a very slow to slow infiltration rate. These soils formed in calcareous clayey residuum or clayey alluvium derived from residuum. Parent materials are typically soft sedimentary shale or siltstone. When dry, these soils can crack. When wet, surface compaction can occur with heavy traffic.

This site should show slight to no evidence of rills, wind scoured areas or pedestalled plants. Water flow paths are broken, irregular in appearance or discontinuous with numerous debris dams or vegetative barriers. The soil surface is stable and intact. Sub-surface soil layers are non-restrictive to water movement and root penetration.

These soils are mainly susceptible to water erosion. The hazard of water erosion increases on slopes greater than about 5 percent. Loss of the soil surface layer can result in a shift in species composition and/or production.

The major soil series which characterize the Clayey ecological site in MLRA 58C are Ethridge, Tanna, Abor, Belfield, and Marias.

The following soil properties listed in the table below represent the soil profile above the sedimentary beds or to a depth of 40 inches (100 cm).

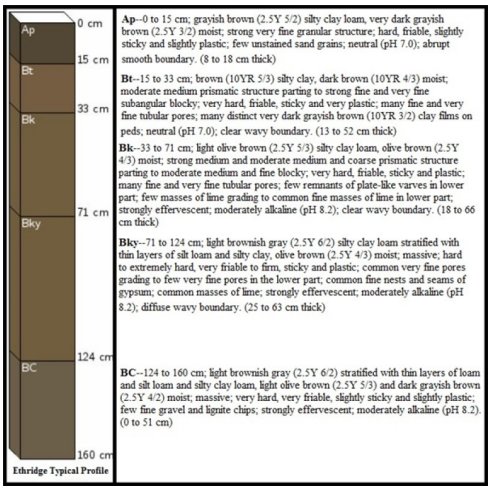


Figure 8. Ethridge typical soil profile.

Table 4. Representative soil features

Surface texture	(1) Silty clay loam (2) Silt loam (3) Clay loam
Family particle size	(1) Clayey
Drainage class	Moderately well drained to well drained
Permeability class	Slow
Soil depth	51–203 cm
Surface fragment cover <=3"	0–10%
Surface fragment cover >3"	0–5%
Available water capacity (0-101.6cm)	12.7–20.32 cm
Calcium carbonate equivalent (0-101.6cm)	0–20%
Electrical conductivity (0-101.6cm)	0–16 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0–15
Soil reaction (1:1 water) (0-101.6cm)	6.1–9
Subsurface fragment volume <=3" (Depth not specified)	0–35%
Subsurface fragment volume >3" (Depth not specified)	0–10%

Ecological dynamics

The site developed under Northern Great Plains climatic conditions, and included natural influence of large herbivores and occasional fire. Changes will occur in the plant communities due to climatic conditions and/or management actions. Due to the nature of the soils, the site is considered quite stable. Under continued adverse

impacts, a slow decline in vegetative vigor and composition will occur. Under favorable vegetative management treatments the site can quickly return to the Reference Plant Community.

The plant community upon which interpretations are primarily based is the Reference Plant Community. The Reference Plant Community has been determined by study of rangeland relic areas, areas protected from excessive disturbance, and areas under long-term rotational grazing regimes. Trends in plant community dynamics ranging from heavily grazed to lightly grazed areas, seasonal use pastures, and historical accounts also have been used. Subclimax plant communities, states, transitional pathways, and thresholds have been determined through similar studies and experience.

Heavy continuous grazing and/or continuous seasonal (spring) grazing, without adequate recovery periods following each grazing occurrence causes this site to depart from the Reference Plant Community. Blue grama and buffalograss will begin to increase. Western wheatgrass will increase initially and then begin to decrease. Green needlegrass will decrease in frequency and production. In time, heavy continuous grazing will likely cause blue grama and buffalograss to dominate and pioneer perennials, annuals, and club moss (in its range) to increase. This plant community is relatively stable and the competitive advantage prevents other species from establishing. This plant community is less productive than the Reference Plant Community. Runoff increases and infiltration will decrease. Soil erosion will be minimal.

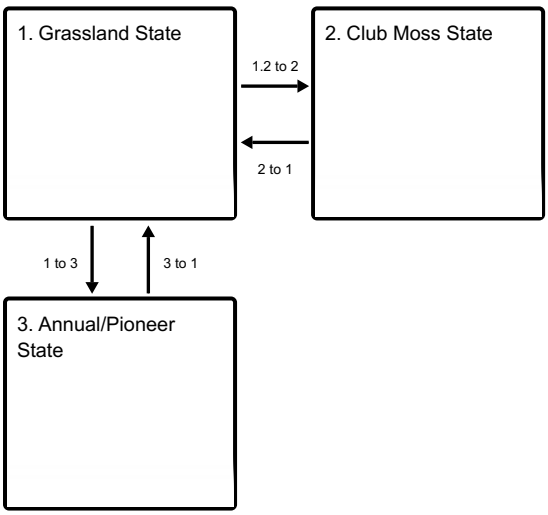
Extended periods of non-use and/or lack of fire will result in a plant community having high litter levels, which favors an increase in Kentucky bluegrass and/or smooth bromegrass.

Due to a general invasion of exotic species (such as Kentucky bluegrass and smooth bromegrass) across the MLRA within this site, returning to the Reference Plant Community Phase may not be possible.

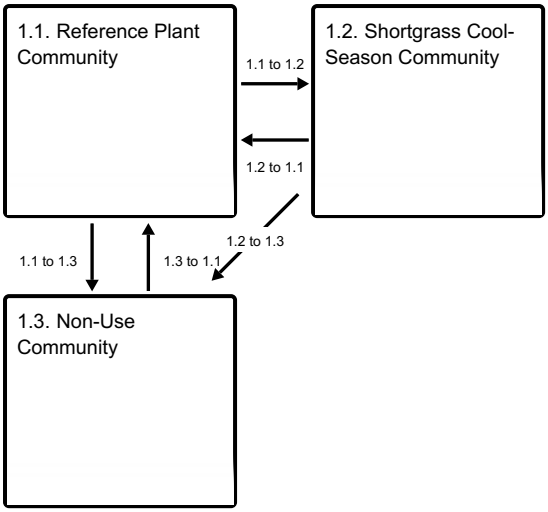
Following the state and transition diagram are narratives for each of the described states and community phases. These may not represent every possibility, but they are the most prevalent and repeatable states/community phases. The plant composition tables shown below have been developed from the best available knowledge at the time of this revision. As more data are collected, some of these community phases and/or states may be revised or removed, and new ones may be added. The main purpose for including the descriptions here is to capture the current knowledge and experience at the time of this revision.

State and transition model

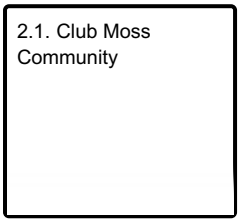
Ecosystem states



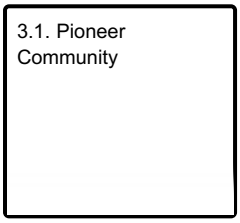
State 1 submodel, plant communities



State 2 submodel, plant communities



State 3 submodel, plant communities



State 1
Grassland State

The Grassland State is supported by empirical data, historical data, local expertise, and photographs. This state is defined by three native plant communities that are a result of periodic fire, drought, and grazing. These events are part of the natural disturbance regime and climatic process. The Reference Plant Community consists of both warm- and cool-season, tall- and midgrasses, forbs, shrubs. Plant Community 1.2 the Shortgrass cool-season community is dominated by blue grama and western wheatgrass. The Non-Use Plant Community 1.3 consists of decadent plants or excessive litter, and few remnant native grasses and forbs.

Community 1.1
Reference Plant Community

This is the interpretive plant community and is considered to be the Reference Plant Community Phase. This community evolved with grazing by large herbivores and occasional prairie fires and can be found on areas that are properly managed with grazing and/or prescribed burning, and sometimes on areas receiving occasional short periods of rest. The potential vegetation is about 90% grasses or grass-like plants, 5% forbs, and 5% shrubs. Green needlegrass and western wheatgrass dominate the plant community. Other grasses and grass-like plants include thickspike wheatgrass, needleandthread, blue grama, porcupine grass, buffalograss, prairie junegrass, and sedges. Significant forbs include scurfpea, Lambert's crazyweed, scarlet globemallow, cudweed sagewort, and western yarrow. In many areas western snowberry is the principal shrub and occurs in patchy mosaics. In other areas, silver sagebrush is the dominant shrub and occurs more evenly dispersed across the site. Other shrubs include prairie rose, leadplant, winterfat, and fringed sagewort. This plant community is well adapted to the Northern Great Plains climatic conditions. Individual species can vary greatly in production depending on growing conditions (timing and amount of precipitation and temperature). Community dynamics, nutrient cycle, water cycle, and energy flow are

functioning properly. Plant litter is properly distributed with very little movement off-site and natural plant mortality is very low. The diversity in plant species allows for high drought tolerance. Run-off from adjacent sites and moderate or high available water capacity provides a favorable soil-water-plant relationship.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	1115	1777	2365
Forb	34	67	90
Shrub/Vine	17	39	50
Total	**1166**	**1883**	**2505**

Community 1.2
Shortgrass Cool-Season Community

This plant community is the result of long-term, heavy, continuous grazing and/or annual, early spring seasonal grazing. Repeated spring grazing depletes stored carbohydrates, resulting in weakening and eventual death of the cool season mid-grasses. Blue grama and western wheatgrass are the dominant species with the balance being a few species of cool-season grasses/grass-likes and warm-season grasses including upland sedges, needleandthread, prairie junegrass, and annual grasses. Forbs such as western ragweed, scurfpea, cudweed sagewort and scarlet globemallow may also be present. This plant community can occur throughout the pasture, on spot grazed areas, and around water sources where season-long grazing patterns occur This plant community is less productive than the Reference Plant Community. Lack of litter and reduced plant vigor result in higher soil temperatures, poor water infiltration rates, and high evapotranspiration, which gives blue grama a competitive advantage over cool-season mid-grasses.

Community 1.3
Non-Use Community

This plant community develops after an extended period of 10 or more years of non-use by herbivores or exclusion of fire. Non-native grasses, such as Kentucky bluegrass, crested wheatgrass, and smooth bromegrass tend to invade and may dominate this plant community. Other grasses present include western wheatgrass, porcupine grass, green needlegrass, and Sandberg bluegrass. The common forbs include sweetclover and cudweed sagewort. Western snowberry and/or silver sagebrush are the principal shrubs and tend to increase in density and cover. Litter buildup reduces plant vigor and density, and native seedling recruitment declines. Due to a lack of tiller stimulation and sunlight, native bunchgrasses typically develop dead centers and native rhizomatous grasses are limited to small colonies. This plant community is dispersed throughout the pasture, encircling spot grazed areas, and areas distant from water sources. This is a typical pattern found in properly stocked pastures grazed season-long. This plant community is resistant to change without prescribed grazing or fire. The combination of both grazing and fire is most effective in moving this plant community towards the Reference Plant Community. Soil erosion is low. Runoff is similar to the Reference Plant Community. Once this plant community is reached, time and external resources will be needed to see any recovery in diversity.

Pathway 1.1 to 1.2
Community 1.1 to 1.2

Heavy, continuous grazing and/or continuous seasonal (i.e. spring) grazing will convert this plant community to the 1.2 Blue Grama/Western Wheatgrass Plant Community

Pathway 1.1 to 1.3
Community 1.1 to 1.3

Non-use and no fire for extended periods of time will convert this plant community to the Excessive Litter Plant Community.

Pathway 1.2 to 1.1
Community 1.2 to 1.1

Prescribed grazing that includes changing season of use and allowing adequate recovery periods between grazing events will lead this plant community back to the Green Needlegrass/Western Wheatgrass (Reference Plant Community).

Conservation practices

Prescribed Grazing

Pathway 1.2 to 1.3
Community 1.2 to 1.3

Non-use and no fire over an extended period of time may lead this plant community to the Excessive Litter Plant Community. This shift may take considerably longer than the corresponding transition from the Reference Plant Community, depending on how much residual cool-season mid-grasses are present upon initiation of non-use or fire exclusion.

Conservation practices

Prescribed Burning
Prescribed Grazing

Pathway 1.3 to 1.1
Community 1.3 to 1.1

Prescribed grazing or prescribed burning followed by prescribed grazing, will move this plant community toward the Western Wheatgrass/Green Needlegrass Plant Community (Reference). This would require long-term management with prescribed grazing and/or prescribed burning under controlled conditions.

Conservation practices

Prescribed Burning
Prescribed Grazing

State 2
Club Moss State

The Club Moss State is supported by empirical data, historical data, local expertise, and photographs. This state represents a plant community change as well as changes to the energy flow and nutrient cycling processes. This state is defined by one plant community.

Community 2.1
Club Moss Community

A dense sod of club moss dominates this plant community. Club moss occupies bare soil areas within deteriorated or disturbed higher successional plant communities due to long-term repeated disturbances. Club moss cover is often 25% or greater. Club moss creates a more arid microclimate, resulting in extreme competition for available moisture. Vigor and production of other species is reduced dramatically. Grasses and grass-like plants include western wheatgrass, needleandthread, blue grama, prairie junegrass, and upland sedges. Forbs commonly found in this plant community include green sagewort and western yarrow. When compared to the Green Needlegrass/Western Wheatgrass Plant Community, blue grama and club moss have increased, while green needlegrass and western wheatgrass have decreased. This plant community is very resistant to change. The competitive advantage of both the clubmoss and the blue grama prevents other species from expanding and establishing. This plant community is far less productive than the Reference Plant Community. Initial runoff rates

are low but then increase as clubmoss becomes saturated. Once clubmoss has been saturated then runoff increases and infiltration decreases as compared the Reference Plant Community. Soil erosion will be minimal due to the sod forming habit of both the clubmoss and blue grama.

State 3
Annual/Pioneer State

The Annual/Pioneer State is supported by empirical data, historical data, local expertise, and photographs. This state represents a plant community change as well as changes to the energy flow and nutrient cycling processes. This state is defined by one plant community.

Community 3.1
Pioneer Community

This plant community develops under severe disturbance and/or excessive defoliation. This can result from heavy livestock or wildlife concentration, and cropping abandonment (go-back land). The dominant vegetation includes pioneer annual grasses, forbs, invaders, and early successional biennial and perennial species. Grasses may include red threeawn, sixweeks fescue, smooth bromegrass, crested wheatgrass, annual brome, needleandthread, prairie junegrass, and western wheatgrass. The dominant forbs include curlycup gumweed, marestail, salsify, kochia, field bindweed, thistles, western ragweed, pussytoes, prostrate verbena, and other early successional species. Shrubs that may be present include prairie rose, fringed sagewort, and broom snakeweed. Plant species from adjacent ecological sites may become minor components of this plant community. The community is susceptible to invasion of other non-native species due to severe soil disturbances and relatively high percent of bare ground. This plant community is resistant to change, as long as soil disturbance or severe vegetation defoliation persists, thus holding back secondary plant succession. Soil erosion is potentially high in this vegetation state. Reduced surface cover, low plant density, low plant vigor, loss of root biomass, and soil compaction, all contribute to decreased water infiltration, increased runoff, and accelerated erosion rates. Significant economic inputs, management and time would be required to move this plant community toward a higher successional stage and a more productive plant community. Secondary succession is highly variable, depending upon availability and diversity of a viable seed bank of higher successional species within the existing plant community and neighboring plant communities. This plant community can be renovated to improve the production capability, but management changes would be needed to maintain the new plant community.

Transition 1.2 to 2
State 1 to 2

Heavy, continuous grazing may cause further deterioration resulting in a shift to the Club Moss Plant Community.

Transition 1 to 3
State 1 to 3

Heavy, continuous grazing, excessive defoliation and/or mechanical tillage may shift this plant community to the Annual/Pioneer Perennial Plant Community.

Restoration pathway 2 to 1
State 2 to 1

Fertilization combined with prescribed grazing may move this plant community through the successional stages leading toward the Green Needlegrass/Western Wheatgrass Plant Community. Mechanical renovation followed by prescribed grazing will reduce club moss, increase western wheatgrass, and eventually shift this plant community back toward the Green Needlegrass/Western Wheatgrass Plant Community. Prescribed burning may reduce club moss, and eventually convert this plant community back to the Green Needlegrass/Western Wheatgrass Plant Community.

Conservation practices

Prescribed Burning

Prescribed Grazing

Restoration pathway 3 to 1
State 3 to 1

Under long-term prescribed grazing and/or removal of disturbance, including adequate rest periods, this plant community will move through the successional stages, and may eventually lead to a plant community resembling the Reference Plant Community. Depending on the slope, aspect, and size, and if adequate perennial plants exist, this change can occur more rapidly. This process will likely take a long period of time (50+ years).

Conservation practices

Prescribed Grazing

Additional community tables

Table 6. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Wheatgrasses**			471–751	
	western wheatgrass	PASM	*Pascopyrum smithii*	471–751	–
	thickspike wheatgrass	ELLAL	*Elymus lanceolatus ssp. lanceolatus*	0–191	–
2	**Needlegrasses**			375–566	
	green needlegrass	NAVI4	*Nassella viridula*	280–471	–
	porcupinegrass	HESP11	*Hesperostipa spartea*	0–56	–
3	**Short Warm-Season**			95–191	
	blue grama	BOGR2	*Bouteloua gracilis*	95–191	–
	buffalograss	BODA2	*Bouteloua dactyloides*	22–95	–
4	**Native Cool-Season**			17–112	
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	17–95	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	17–95	–
	plains reedgrass	CAMO	*Calamagrostis montanensis*	17–56	–
	slender wheatgrass	ELTRT	*Elymus trachycaulus ssp. trachycaulus*	17–56	–
	sedge	CAREX	*Carex*	17–39	–
	Sandberg bluegrass	POSE	*Poa secunda*	17–39	–
5	**Other Native Grasses**			17–112	
	big bluestem	ANGE	*Andropogon gerardii*	0–95	–
	sideoats grama	BOCU	*Bouteloua curtipendula*	0–95	–
	plains muhly	MUCU3	*Muhlenbergia cuspidata*	0–39	–
	saltgrass	DISP	*Distichlis spicata*	0–17	–
Forb					
6	**Forbs**			39–95	
	blazing star	LIATR	*Liatris*	17–39	–
	prairie thermopsis	THRH	*Thermopsis rhombifolia*	17–39	–
	tarragon	ARDR4	*Artemisia dracunculus*	17–39	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	17–39	–

	common yarrow	ACMI2	*Achillea millefolium*	17–39	–
	blacksamson echinacea	ECAN2	*Echinacea angustifolia*	17–39	–
	leafy wildparsley	MUDI	*Musineon divaricatum*	17–39	–
	scarlet beeblossom	OESU3	*Oenothera suffrutescens*	17–39	–
	purple locoweed	OXLA3	*Oxytropis lambertii*	17–39	–
	scurfpea	PSORA2	*Psoralidium*	17–39	–
	upright prairie coneflower	RACO3	*Ratibida columnifera*	17–39	–
	goldenrod	SOLID	*Solidago*	17–39	–
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	17–39	–
	white heath aster	SYERE	*Symphyotrichum ericoides var. ericoides*	17–39	–
	white prairie aster	SYFA	*Symphyotrichum falcatum*	0–17	–
	spiny phlox	PHHO	*Phlox hoodii*	0–17	–
	old man's whiskers	GETR	*Geum triflorum*	6–17	–
	autumn onion	ALST	*Allium stellatum*	6–17	–
	pussytoes	ANTEN	*Antennaria*	0–17	–
	false boneset	BREU	*Brickellia eupatorioides*	6–17	–
	wavyleaf thistle	CIUN	*Cirsium undulatum*	6–17	–
	larkspur	DELPH	*Delphinium*	0–17	–
	American vetch	VIAM	*Vicia americana*	6–17	–
	desertparsley	LOMAT	*Lomatium*	6–17	–
	rush skeletonplant	LYJU	*Lygodesmia juncea*	0–17	–
Shrub/Vine					
7	**Shrubs**			17–56	
	prairie sagewort	ARFR4	*Artemisia frigida*	17–39	–
	prairie rose	ROAR3	*Rosa arkansana*	17–39	–
	western snowberry	SYOC	*Symphoricarpos occidentalis*	17–39	–
	winterfat	KRLA2	*Krascheninnikovia lanata*	0–17	–
	plains pricklypear	OPPO	*Opuntia polyacantha*	0–17	–
	silver sagebrush	ARCA13	*Artemisia cana*	0–17	–

Animal community

Grazing Interpretations:

This site is well adapted to managed grazing by domestic livestock. The predominance of herbaceous plants across all plant community phases best lends these sites to grazing by cattle but other domestic grazers with differing diet preferences may also be a consideration depending upon management objectives.

Calculating Safe Stocking Rates: Proper stocking rates should be incorporated into a grazing management strategy that protects the resource, maintains or improves rangeland health, and is consistent with management objectives. In addition to usable forage, safe stocking rates should consider ecological condition, trend of the site, past grazing use history, season of use, stock density, kind and class of livestock, forage digestibility, forage nutritional value, variation of harvest efficiency based on desirability preference of plant species and/or grazing system and site graze ability factors (such as steep slopes, site inaccessibility, or distance to drinking water).

Often the current plant community does not entirely match any particular Community Phase as described in this

Ecological Site Description. Because of this, a resource inventory is necessary to document plant composition and production. Proper interpretation of inventory data will permit the establishment of a safe initial stocking rate.

No two years have exactly the same weather conditions. For this reason, year-to-year and season-to season fluctuations in forage production are to be expected on grazing lands. Livestock producers must make timely adjustments in the numbers of animals or in the length of grazing periods to avoid overuse of forage plants when production is unfavorable and to make advantageous adjustments when forage supplies are above average.

Initial stocking rates should be improved through the use of vegetation monitoring and actual use records that include number and type of livestock, the timing and duration of grazing, and utilization levels. Actual use records over time will assist in making stocking rate adjustments based on the variability factors.

Average annual production must be measured or estimated to properly assess useable forage production and stocking rates.

Hydrological functions

Water is the principal factor limiting herbage production on this site. The site is dominated by soils in hydrologic groups C with localized areas in hydrologic group D. Infiltration varies from moderately slow to slow and runoff potential varies from medium to very high for this site depending on soil surface texture and ground cover. In many cases, areas with greater than 75% ground cover have the greatest potential for high infiltration and lower runoff. An exception would be where short grasses form a dense sod and dominate the site. Areas where ground cover is less than 50% have the greatest potential to have reduced infiltration and increase runoff (refer to Section 4, NRCS National Engineering Handbook for runoff quantities and hydrologic curves).

Recreational uses

This site provides hunting opportunities for upland game species. The wide variety of plants which bloom from spring until fall have an esthetic value that appeals to visitors.

Wood products

No appreciable wood products are present on the site.

Other products

Seed harvest of native plant species can provide additional income on this site.

Other information

Site Development and Testing Plan.

Chris Tecklenburg (Natural Resources Specialist, Ecological Sites, Kansas NRCS) assumed responsibilities for development of provisional ESDs in MLRA 58C on 8-17-2017. Most information for the provisional Clayey ecological site comes from adjacent MLRA 54 Clayey site.

This site is going through the Provisional ESD process. It contains information above and beyond what is required of a provisional due to foundational work completed in adjacent MLRA 54 during the early 2000's. This site is scheduled to go through the approval process fiscal year 2021.

Future work (for approved ESD) includes field visits to verify ecological site concepts with field staff. Field staff include but not limited to project office leader, area soil scientist, state soil scientist, ecological site specialist, state rangeland conservationist, area rangeland management specialist, and local field personnel. This site should include collaboration between North Dakota and Montana. Field visits are to be determined by spatial extent of the site as well as personal knowledge of the site. Activity during field visits will include but not limited to: identifying the soil, landform, plant community, and verifying existing site concepts. Data collection will be determined by the MLRA 58C technical team.

Inventory data references

Chris Tecklenburg (Natural Resources Specialist, Ecological Sites, Kansas NRCS) was assigned responsibilities for the development of provisional ESDs in MLRA 58C on 8-17-2017.

Information for the provisional Clayey ecological site originates from adjacent MLRA 54 Clayey site.

Information presented here has been derived from NRCS clipping and other inventory data. Also, field knowledge of range-trained personnel was used. All descriptions were peer reviewed and/or field tested by various private, state and federal agency specialist.

NRCS individuals involved in developing MLRA 54 Clayey ecological site description include: Dennis Froemke, Jeff Printz, Stan Boltz, Darrell Vanderbusch, L. Michael Stirling, Josh Saunders, Jody Forman, David Dewald, and Brad Podoll.

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Ocular estimates 5 1987 – 2000 ND Dunn, Hettinger, Morton

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Contributors

Chris Tecklenburg

Approval

David Kraft, 10/31/2018

Acknowledgments

The ecological site development process is a collaborative effort, conceptual in nature, dynamic and is never considered complete.

Non-discrimination Statement

In accordance with Federal civil rights law and U.S. Department of Agriculture (USDA) civil rights regulations and

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)	Jeff Printz
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Date	04/04/2012
Approved by	Jeff Printz
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** None

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2. **Presence of water flow patterns:** None

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3. **Number and height of erosional pedestals or terracettes:** None

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Bare ground is 5 to 15%. Bare ground will occur as small patches less than 2 inches in diameter and disconnected.

5. **Number of gullies and erosion associated with gullies:** None

6. **Extent of wind scoured, blowouts and/or depositional areas:** None

7. **Amount of litter movement (describe size and distance expected to travel):** No observable plant litter movement

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** Soil surface fragments will typically retain structure indefinitely when dipped in distilled water. Stability 5 or greater.

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Use soil series description for depth, color and structure of A horizon/surface layer.

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Combination of shallow and deep rooted species (mid & tall rhizomatous and tufted perennial cool- and warm-season grasses) with fine and coarse roots positively influences infiltration.

11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):** None

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: Mid, cool-season rhizomatous grasses> short, warm-season bunchgrasses >

    Sub-dominant: short, cool-season bunchgrasses >

    Other: Mid, cool-season bunchgrasses = grass-likes = forbs = shrubs

    Additional: Due to differing root structure and distribution, Kentucky bluegrass and smooth bromegrass do not fit into reference plant community F/S groups.

13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** None

14. **Average percent litter cover (%) and depth (in):** Plant litter is in contact with soil surface.

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** Representative value (RV) is 1500 lbs./acre air dry.

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:** State and local noxious, Kentucky bluegrass, smooth bromegrass

17. **Perennial plant reproductive capability:** All species exhibit high vigor relative to climatic conditions. Do not rate based solely on seed production. Perennial grasses should have vigorous rhizomes or tillers.