USDA Natural Resources Conservation Service

Ecological site R072XY101KS Limy Slopes

Accessed: 05/10/2025

General information

Approved. An approved ecological site description has undergone quality control and quality assurance review. It contains a working state and transition model, enough information to identify the ecological site, and full documentation for all ecosystem states contained in the state and transition model.

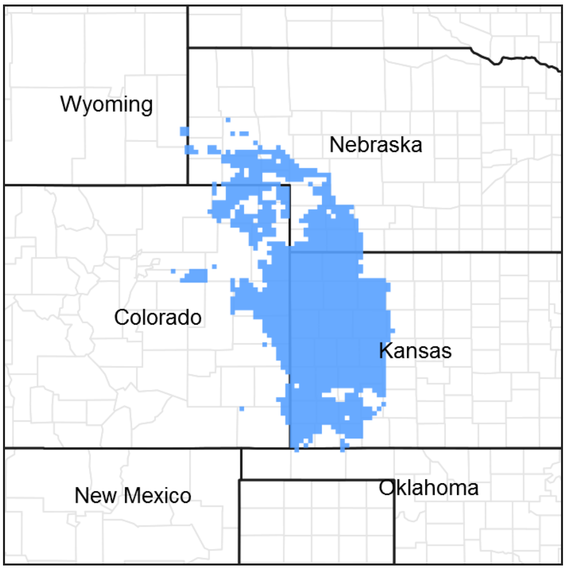


Figure 1. Mapped extent

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): 072X–Central High Tableland

Major Land Resource Area (MLRA) 72--Central High Tableland. This area is in Kansas (54 percent), Nebraska (25 percent), and Colorado (21 percent). A very small part of the area is in Wyoming. The area makes up about 34,550 square miles (89,535 square kilometers). It includes the towns of Garden City, Goodland, and Colby, Kansas; Imperial, North Platte, Ogallala, and Sidney, Nebraska; and Holyoke and Wray, Colorado. Interstate 70 bisects the area, and Interstates 76 and 80 follow the south side of the South and North Platte Rivers, respectively. The Cimarron National Grasslands occur in the southwest corner of the MLRA.

Classification relationships

Major Land Resource Area (MLRA) 72--Central High Tableland.

Ecological site concept

The Limy Slopes ecological site is located on shoulders and backslopes on hillslopes on tableland landscapes. Soils correlated with this site are moderately deep to very deep and have a surface that is <8 inches (20cm). The soil surface texture ranges from silt loam to loam, with the majority of the site surface textures being silt loam. Soils that are correlated to Limy Slopes have free carbonates occurring within 4 inches (10cm) of the surface. This site is dominated by loess parent material.

Associated sites

R072XY100KS	**Loamy Tableland** This site is located adjacent and usually upslope of Limy Slopes

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) *Schizachyrium scoparium* (2) *Bouteloua curtipendula*

Physiographic features

This site occurs on backslopes and shoulders of side slopes, nose slopes, and interfluves on hillslopes, rises, and alluvial fans of Tablelands and Breaks landscapes. This site is dominated by Quaternary Period loess deposits and eolian deposits of Tertiary Period material from the local rivers and streams. The Limy Slopes ecological site consists of very deep upland soils with silty or loamy surface layers and subsoil. This site receives runoff water from adjacent sites on plains and rises. This site is subject to erosion by wind and water if the vegetative cover is reduced or absent by such things as overgrazing and fire events. Elevation for this site ranges from 2200 to 5400 feet.

The extent of the major Hydrologic Unit Areas (identified by four-digit numbers) that make up MLRA 72 is as follows: Republican (1025), 38 percent; Middle Arkansas (1103), 20 percent; Smoky Hill (1026), 15 percent; South Platte (1019), 13 percent; Upper Cimarron (1104), 11 percent; North Platte (1018), 2 percent; and Upper Arkansas (1102), 1 percent. The North Platte River forms the northern boundary of this MLRA. The South Platte River joins the North Platte River at the town of North Platte, Nebraska. The Arkansas River bisects the southern part of the MLRA. Other large rivers between the North Platte and Arkansas Rivers in the area include the Republican, Sappa, Prairie Dog, Solomon, Saline, and Smoky Hill Rivers. The Cimarron River is the southern boundary of MLRA 72.

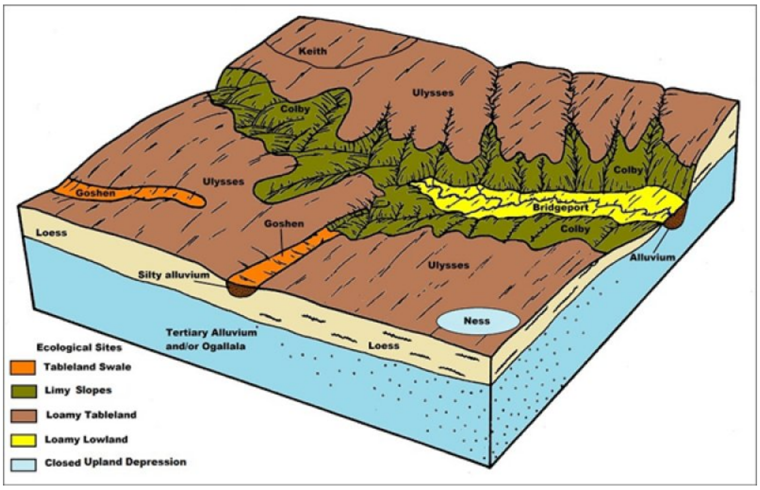


Figure 2. MLRA72 ESD block diagram

Table 2. Representative physiographic features

Landforms	(1) Hill (2) Rise
Flooding frequency	None
Ponding frequency	None
Elevation	2,200–5,400 ft

Slope	1–20%
Water table depth	80 in
Aspect	Aspect is not a significant factor

Climatic features

The average annual precipitation in this area is 14 to 25 inches (355 to 635 millimeters). It fluctuates widely from year to year. Most of the rainfall occurs as high-intensity, convective thunderstorms during the growing season. The maximum precipitation occurs from late spring through early autumn. Precipitation in winter occurs as snow. The annual snowfall ranges from about 16 inches (40 centimeters) in the southern part of the area, to 35 inches (90 centimeters) in the northern part. The average annual temperature is 46 to 57 degrees F (8 to 14 degrees C). The freeze-free period averages 159 days and ranges from 135 to 210 days, increasing in length from northwest to southeast. Climate data comes from the Natural Resources Conservation Service (NRCS) National Water and Climate Center. The data set is from 1981-2010.

Table 3. Representative climatic features

Frost-free period (average)	142 days
Freeze-free period (average)	159 days
Precipitation total (average)	20 in

Climate stations used

- (1) SCOTT CITY [USC00147271], Scott City, KS
- (2) WALLACE 2W [USC00258920], Wallace, NE
- (3) BREWSTER 4W [USC00141029], Brewster, KS
- (4) JULESBURG [USC00054413], Julesburg, CO
- (5) YUMA [USC00059295], Yuma, CO
- (6) TRIBUNE 1W [USC00148235], Tribune, KS
- (7) ULYSSES 3NE [USC00148287], Ulysses, KS
- (8) KIMBALL 2NE [USC00254440], Kimball, NE
- (9) TRENTON DAM [USC00258628], Trenton, NE

Influencing water features

There are no water features of the Limy Slopes ecological site or adjacent wetland/riparian regimes that influence the vegetation and/or management of the site that make it distinctive from other ecological sites.

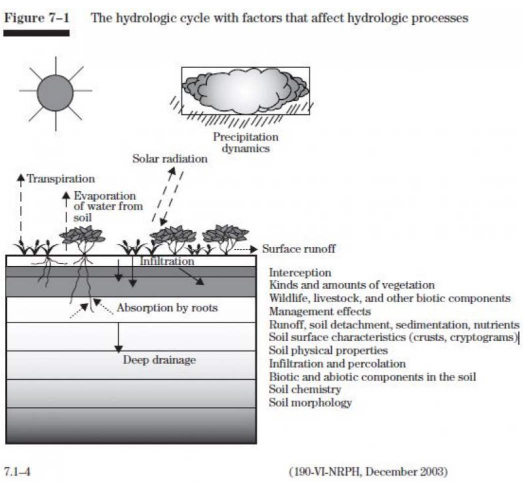


Figure 7. Fig.7-1 from National Range & Pasture Handbook

Soil features

The soils on this site are well drained and are moderately deep to very deep on slopes ranging from nearly level to 20 percent. Most of the soils associated with this site have loess as parent material and are dominated by silt loam and loam textures. The vast majority of parent material is Peoria Loess, which was deposited during the glacial retreat to the north during the Quaternary period. The other parent material for this site is eolian deposits from local river valley with Tertiary material.

The surface layer ranges from a depth of 3 to 8 inches thick and permeability is moderate to moderately slow. The subsoil and underlying material have a similar range in texture as the surface layer. Soils in this site are generally high in fertility, and most have strong effervescence within 6 inches of the surface. These soils are susceptible to erosion by water and wind. The potential for water erosion accelerates with increasing slope.

Surface soil structure is granular to subangular blocky, and structure below the surface is prismatic or subangular blocky. Soil structure describes the manner in which soil particles are aggregated and defines the nature of the system of pores and channels in a soil. Together, soil texture and structure help to determine the ability of the soil to hold and conduct the water and air necessary for sustaining life.

Available water holding capacity (AWC) ranges from .77 to 2.93 inches of water per foot of soil depth in the upper 40 inches of the profile. Available water is the portion of water in a soil that can be readily absorbed by plant roots. This is the amount of water released between the field capacity and the permanent wilting point. As fineness of texture increases, there is a general increase in available moisture storage from sands to loams and silt loams.

Major soil series correlated to this ecological site and their relative percent acres include: Colby (54%), Sulco (22%), Kimst, Atchison, Wagonbed, Campus, and Penden.

These attributes represent 0-40 inches in depth or to the first restrictive layer.

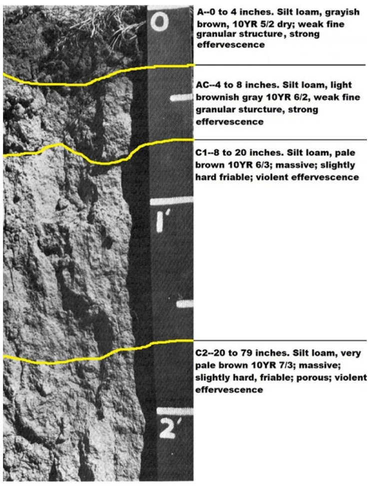


Figure 8. Colby silt loam, 7-15% slopes. Thomas co. KS

Table 4. Representative soil features

Surface texture	(1) Silt loam (2) Loam (3) Clay loam
Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Moderately slow to moderately rapid
Soil depth	20–80 in
Surface fragment cover <=3"	0–5%

Surface fragment cover >3"	0%
Available water capacity (0-40in)	2.56–9.79 in
Calcium carbonate equivalent (0-40in)	5–30%
Electrical conductivity (0-40in)	0–16 mmhos/cm
Sodium adsorption ratio (0-40in)	0
Soil reaction (1:1 water) (0-40in)	7.4–9
Subsurface fragment volume <=3" (Depth not specified)	0–3%
Subsurface fragment volume >3" (Depth not specified)	0%

Ecological dynamics

The plant communities for the Limy Slopes ecological site are dynamic due to the complex interaction of many ecological processes. The interpretive plant community for this site is the Reference Plant Community. The Reference Community has been determined by the study of rangeland relic areas, areas protected from excessive disturbance, areas under long term rotational grazing strategies, literature of plant communities from the early 1900s and local expertise. Trends in plant community dynamics ranging from heavily grazed to lightly grazed areas, seasonal use pastures, and historical accounts have also been used.

This ecological site is made up of a Grassland State, a Sod-bound State, and a Tillage State. The Grassland State is characterized by non-broken land (no tillage), both warm and cool season bunchgrasses, sod-forming grasses, forbs, and shrubs. The Sod-bound State is characterized by a warm season, shortgrass plant community made up of primarily blue grama and buffalograss, with few remnant sideoats grama and western wheatgrass motts, and very few forbs. The tillage state has been mechanically disturbed (broken) by equipment and includes either a variety of reseeded warm season bunch and sod-forming grasses or early successional plants to include the latter as well as annual grasses and forbs.

Vegetation changes are expected within this ecological site and will be dependent on the site's geographical location inside Major Land Resource Area (MLRA) 72. Variation in precipitation east and west is not as affected as is temperature north and south. The northern part of MLRA 72 is characterized by cooler temperatures and shorter growing season in respect to the southern end. As a result, cool season bunchgrasses and sod formers proliferate. Growth of native cool season plants begins about April 15, and continues to about June 15. Native warm season plants begin growth about May 15, and continue to about August 15. Green up of cool season plants may occur in September and October if adequate moisture is available (weather data from National Climate Data Center 1980-2010).

The Limy Slopes ecological site developed with occasional fires as part of the ecological processes. Historically, it is believed that the fires were infrequent, randomly distributed, and started by lightning at various times throughout the season when thunderstorms were likely to occur. It is also believed that pre-European inhabitants may have used fire as a management tool for attracting herds of large migratory herbivores (bison, elk, deer, and pronghorn). The impact of fire over the past 100 years has been relatively insignificant due to the human control of wildfires and the lack of acceptance of prescribed fire as a management tool in the semi-arid, High Plains area.

The degree of herbivory (feeding on herbaceous plants) has a significant impact on the dynamics of the site. Historically, periodic grazing by herds of large migratory herbivores was a primary influence. Secondary influences of herbivory by species such as prairie dogs, grasshoppers, gophers, and root-feeding organisms impacted the vegetation historically, and continue to this day.

The management of herbivory by humans through grazing of domestic livestock and/or manipulation of wildlife populations has been a major influence on the ecological dynamics of the site. This management, coupled with the

High Plains climate, largely dictates the plant communities for the site.

Drought cycles were part of the natural range of variability within the site and have historically had a major impact upon the vegetation. The species composition changes according to the duration and severity of the drought cycle (Albertson and Weaver 1942).

The vegetation on this site is impacted by topography. The percent (steepness) and aspect of the slope interact with the other ecological processes to further influence the vegetative dynamics of the site.

The Limy Slopes site generally occurs on the more sloping parts of the landscape. The flatter slopes of this site and adjacent, more level sites are preferred by livestock, which can lead to grazing distribution problems. Water locations, salt placement, and other aids help to distribute grazing. Other management techniques such as concentrated grazing and/or grazing systems also help to distribute grazing more evenly.

The general response of the Limy Slopes ecological site to long-term continuous grazing pressure is to gradually lose the vigor and reproductive potential of the tall and mid-grass species and shift the plant community toward short-grass species.

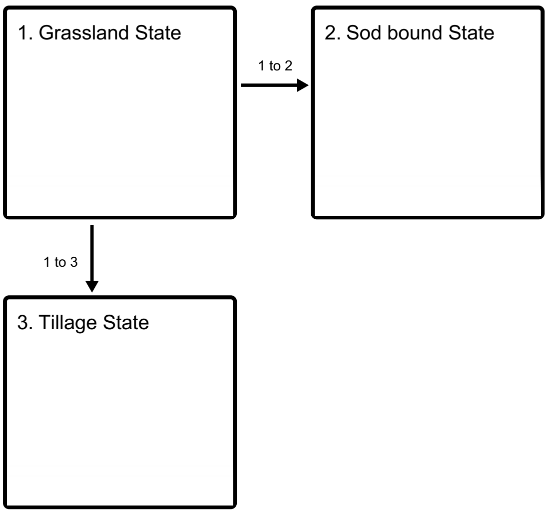
The tall and mid-grass species generally escape excessive grazing pressure on the steeper, less accessible areas. The tall and mid grasses maintained on the steep area help to provide a source for these species to repopulate the site after long periods of drought and/or overgrazing. The use of grazing management that includes needed distribution tools, proper stocking, and adequate recovery periods during the growing season, helps to restore this site to its productive potential.

Historically, mechanical treatment of this site was practiced. The theory of mechanical treatment was that it improves production and plant composition on rangeland. These mechanical treatments include such things as contour furrowing, contour pitting, terracing, chiseling, disking, and inter-seeding. Many of these treatments were implemented during the 1930s through the 1960s and have shown to have no significant long-term benefits for improving production. Many of these practices result in a permanently rough ground surface. Inter-seeding may be beneficial depending upon stand achieved and management used after seeding.

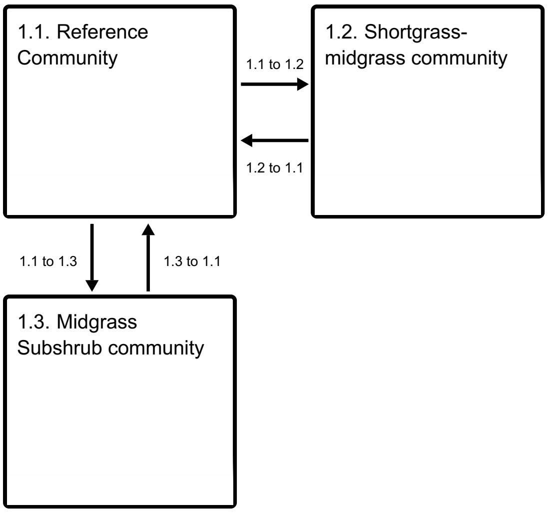
The following diagram illustrates pathways that the vegetation on this site may take from the Reference Plant Community as influencing ecological factors change. There may be other states or plant communities not shown in the diagram, as well as noticeable variations within those illustrated and described in the following sections.

State and transition model

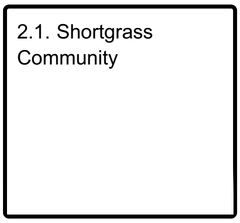
Ecosystem states



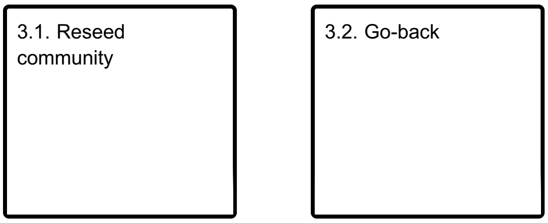
State 1 submodel, plant communities



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 warm season sod and bunchgrasses, cool season sod forming grasses, forbs and shrubs. The Shortgrass-Midgrass Community is made up primarily of warm season shortgrass and midgrasses with decreasing amounts of forbs. The Midgrass Subshrub Community is dominated by warm season midgrasses and yucca.

Community 1.1
Reference Community

The Reference Community is supported by empirical data, historical data, local expertise, and photographs. The potential vegetation is a mixed grass prairie consisting of approximately 85 percent grasses and grass-like plants, 10 percent forbs, and 5 percent shrubs. Little bluestem, sideoats grama, blue grama, and western wheatgrass are the primary grasses in this community. Secondary species include big bluestem, needle and thread, buffalograss, switchgrass, threadleaf sedge, and sedge. Big bluestem and switchgrass are most likely to be present in the areas of MLRA 72 that receive the higher end of the average annual precipitation and/or are located in a lower position on the landform which receives more water. This community has a diverse forb population, most of which occur in small amounts. Shrubs include broom snakeweed, fourwing saltbush, winterfat, pricklypear, and yucca. Fourwing saltbush and winterfat are more prevalent in the western portion of MLRA 72. Little bluestem and sideoats are considered primary mid-grass species in this plant community. Western wheatgrass is considered a primary cool season grass in this plant community. It is a valuable forage plant in late spring and/or early summer, and heavily relied upon for early season grazing. Needle and thread appears to be more prevalent in the northern part of MLRA

72 as well as along the western reaches. This plant community is diverse and productive. Litter is uniformly distributed with very little movement off-site and natural plant mortality is very low. This community is resistant to many disturbances with the exception of extreme, long term continuous grazing, tillage, and/or development into urban or other uses. Total annual production ranges from 800 to 2,400 pounds of air-dried vegetation per acre per year and will average 1,650 pounds. These production figures are the fluctuations expected during favorable, normal and unfavorable years due to the timing and amount of precipitation and temperature. Total annual production should not be confused with species productivity, which is annual production and variability by species throughout the extent of the community phase.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	680	1400	2040
Forb	80	165	240
Shrub/Vine	40	85	120
Total	**800**	**1650**	**2400**

Figure 10. Plant community growth curve (percent production by month). KS1472, Little Bluestem, Sideoats Grama, Blue Grama.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	0	5	25	30	25	10	5	0	0	0

Community 1.2
Shortgrass-midgrass community

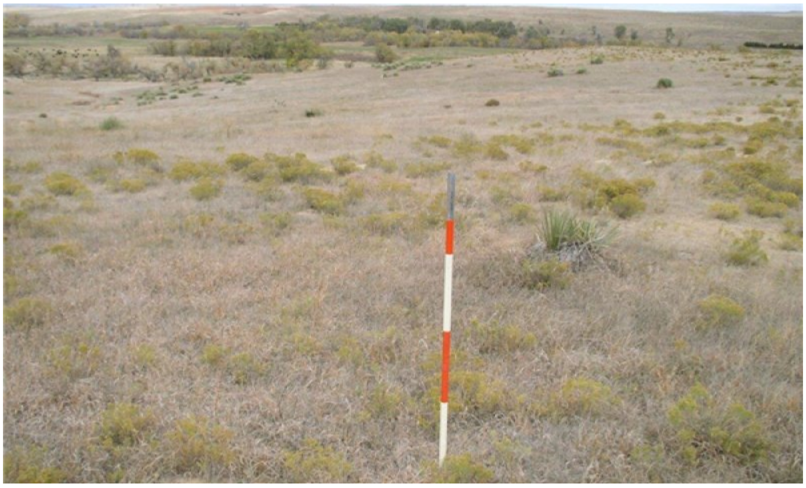


Figure 11. Sulco soil series, Nebraska

The potential vegetation is a warm season shortgrass dominant prairie with both warm and cool season midgrasses as a sub-dominant species. Total production is approximately 95 percent grasses and 5 percent forbs. Blue grama and buffalograss are the primary short grasses in this community. Sideoats grama, western wheatgrass, and needle and thread are the primary mid-grasses. Forb diversity has declined. Fourwing saltbush and winterfat have been reduced to remnant amounts in the western portion of the MLRA. This plant community evolved with long-term continuous grazing, moderate stocking, and in some instances heavy winter stocking. Recognition of this plant community will enable the land user to implement key management decisions before a significant economic/ecological threshold is crossed. Blue grama and buffalograss are the dominant shortgrass species and are in the early stages of forming a sod-bound appearance. Sideoats grama, western wheatgrass, green needlegrass, and needle and thread are reduced. Once the remnant cool season grass species are completely removed and other plants have increased, it will take a long time to bring them back by management alone. Substantial increases in money and other resources will be required to replace the lost species in a shorter period of time. Reduction of western wheatgrass, nitrogen- fixing forbs, climax-dominant shrubs, and increased warm season short grasses has begun to alter the biotic integrity of this community. Water infiltration is reduced and runoff is increased due to the sod nature of the buffalograss and blue grama. Total annual production ranges from

700 to 1,800 pounds of air-dried vegetation per acre per year and will average 1,250 pounds.

Community 1.3
Midgrass Subshrub community

This plant community develops when grazing is removed or the site is not grazed for long periods of time in the absence of fire. Little bluestem, sideoats grama, and soapweed yucca are the dominant plants. Much of the nutrients are tied up in excessive litter. The semiarid environment and the absence of animal traffic to break down litter slow nutrient recycling. Aboveground litter also limits sunlight from reaching plant crowns. Many plants, especially bunchgrasses (little bluestem), can die off. Thick litter and absence of grazing or fire reduce seed germination and establishment. In advanced stages, plant mortality can increase and erosion may eventually occur if bare ground increases. Once this happens it will require increased energy input in terms of cost and management to bring back.

Pathway 1.1 to 1.2
Community 1.1 to 1.2

Long-term management without a forage and animal balance and continuous grazing without adequate recovery periods between grazing events will convert the Reference Plant Community to a community of more sideoats grama and blue grama and less amounts of both cool and warm season midgrasses as well as lesser amounts of forbs. Drought, in combination with this type of management will quicken the rate at which the Reference Community pathways to the Shortgrass-Midgrass Community.

Pathway 1.1 to 1.3
Community 1.1 to 1.3

The removal of livestock grazing or non-use for long periods of time in the absence of fire will move towards a plant community dominated by little bluestem, sideoats grama, and soapweed yucca.

Pathway 1.2 to 1.1
Community 1.2 to 1.1

Management that incorporates long-term prescribed grazing, a forage and animal balance, and adequate rest and recovery periods will favor this plant community to move from a blue grama and buffalograss shortgrass dominant plant community to a midgrass-shortgrass community found in the Reference phase.

Pathway 1.3 to 1.1
Community 1.3 to 1.1

Long-term management with adequate uses and prescribed fire or chemical/mechanical treatment of soapweed yucca. With adequate recovery periods following each grazing event this plant community will shift back to the Little Bluestem, Sideoats Grama, Blue Grama, Western Wheatgrass Plant Community. Empirical data suggests the use of winter grazing and summer deferment as an effective grazing management tool for the reduction of yucca.

State 2
Sod bound State

With continuous grazing, buffalograss and blue grama will become the dominant species and have a sod-bound appearance. Unable to withstand the grazing pressure, only a remnant population of western wheatgrass remains. Species diversity has been reduced further. Water infiltration is reduced and there is an increase in runoff due to the sod nature of buffalograss and blue grama. Specific dynamic soil property changes between the Grassland State and the Sod-bound State has been documented. As plant community cover decreases from bunchgrasses to more of the sod grasses there is a decrease in infiltration and interception and an increase in surface runoff (Thurow, 2003). The total average annual production of this site is approximately 1,200 pounds per acre (air-dry weight).

Community 2.1

Shortgrass Community

Figure 12. 4-8-2013, Photo by Tecklenburg, left-Limy Slopes, right Loamy Tableland

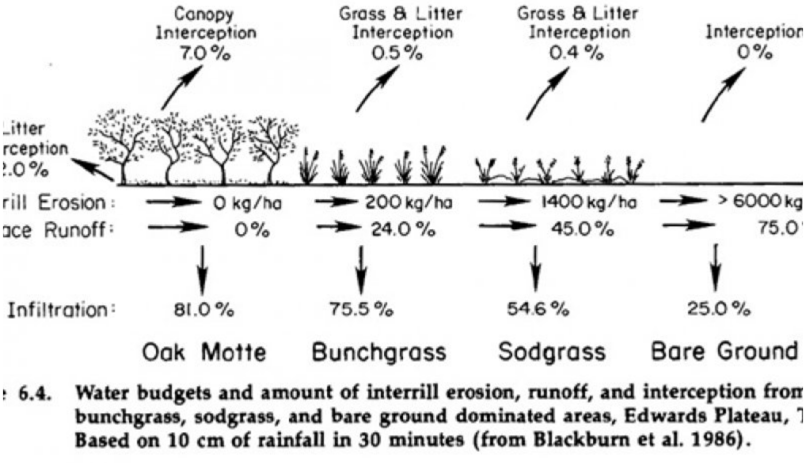


Figure 13. Water budget & erosion, runoff and interception

The potential vegetation is a short grass prairie consisting of approximately 90 percent grasses and grass-like plants, 7 percent forbs, and 3 percent woody plants. Blue grama and buffalograss are the primary grasses in this community. A slight increase in red threeawn, fringed sage, and pricklypear cactus could potentially be observed. Forb diversity has declined. This plant community is resistant to change due to grazing and drought tolerance of both buffalograss and blue grama. A significant amount of production and diversity has been lost when compared to the Reference Community. Losses of cool season grasses, the shrub component, and nitrogen fixing forbs have impacted the energy flow and nutrient cycling. Water infiltration is reduced due to the massive shallow root system, “root pan," characteristic of sod-bound blue grama and buffalograss. Soil loss from water may be noticeable where flow paths are connected. Buffalograss and blue grama have developed a dense sod. Remnant sideoats grama plants may be present and western wheatgrass will have been almost entirely removed from the plant community. It is typical to see an increase of small soapweed, broom snakeweed, pricklypear cactus, and perennial threeawns. During years of drought, western wheatgrass makes little or no growth and the whole site may appear to be just buffalograss and blue grama. Blue grama provides this site with a unique feature in that the leaves on blue grama remain semi-dormant during drought periods, but resume growing each time adequate moisture is available during the growing season. Reseeding of blue grama is unlikely because young seedlings seldom survive the extended drought periods that are common on this site. Blue grama does maintain itself by tillering. This also provides blue grama with another unique feature of being able to withstand drought and heavy grazing use. Typically blue grama is a bunchgrass, but quickly forms a sod-bound condition when heavily grazed. Prairie dog presence can affect production and speed of transition depending upon colony density, livestock/prairie dog competition, and precipitation patterns.

State 3
Tillage State

The Tillage State consists of abandoned cropland that has been naturally revegetated (go-back) or planted/seeded to grassland. Many reseeded plant communities were planted with a local seeding mix under the Conservation Reserve Program (CRP) or were planted to a monoculture of sideoats grama. Go-back communities are difficult to define due to the variability of plant communities that exist. Many of these communities are represented by the genus Aristida (three-awns). This is an alternative state because the ecological functions, i.e. dynamic soil properties and plant communities, are not fully restored to that of the reference state. Tillage can destroy soil aggregation. Soil aggregates are an example of dynamic soil property change. Aggregate stability is critical for infiltration, root growth, and resistance to water and wind erosion (Brady and Weil, 2008).

Community 3.1
Reseed community

This plant community is created when the soil is tilled or farmed (sodbusted), and abandoned. All of the native plants are killed, soil organic matter and carbon reserves are reduced, soil structure is changed, and a plowpan or compacted layer can be formed decreasing water infiltration. Synthetic chemicals may remain as a residual in the soil from farming operations. In early successional stages, this community is not stable. The potential for wind and water erosion is a concern. This plant community can vary considerably depending upon how eroded the soil was, the species seeded, the stand that was established, how long ago the stand was established, and the management of the stand since establishment. Prescribed grazing with adequate recovery periods will be needed to maintain productivity and desirable species. Selection of grass species by grazing animals on seeded rangeland sites can be significantly different from native range sites. Typically there is a reduced production level on seeded sites compared to native sites with similar species composition. Species diversity is lower and forb species generally take longer to re-establish. Seeded rangeland should be managed separately due to the natural ecological differences.

Community 3.2
Go-back

This plant community is created when the soil is tilled or farmed (sodbusted), and abandoned. Generally land that has been used for purposes other than rangeland or hayland will start to revegetate when left undisturbed. Due to tillage activity there are no native plants, soil organic matter and carbon reserves are reduced, soil structure has changed, and a plowpan or compacted layer can be formed decreasing water infiltration. Many times, synthetic chemicals remain as a residual from farming operations. Erosion is a concern. The initial ground cover will primarily consist of kochia, annual bromes, pigweed, foxtail (bristlegrass), Russian thistle, witchgrass and tumblegrass, as well as other annuals. These plants give some protection from erosion and start to rebuild organic matter. The next succession of plants will be grasses such as sand dropseed, threeawn, silver bluestem, and annuals. Eventually blue grama, sideoats grama, and buffalograss will come back. These species will not regain in proportions to that of the Reference State. Soil structure, aggregate stability, and organic matter will not recover to levels of the Reference Plant Community. Range seeding can accelerate the process of species composition and possibly production, but will be at a high cost.

Transition 1 to 2
State 1 to 2

Long-term management without a forage and animal balance and continuous grazing without adequate recovery periods between grazing events will convert the Reference Plant Community to a community of blue grama and buffalograss sod. Drought, in combination with this type of management, will quicken the rate at which the Reference Community pathways to the Shortgrass Community. The impacts on the hydrologic cycle have reduced the Grassland State resilience. Soil dynamic property changes include an increase bulk density and a decrease in aggregate stability.

Transition 1 to 3
State 1 to 3

This transition is triggered by a management action as opposed to a natural event. Tillage or breaking the ground with machinery for crop production will move the grassland state to a tillage state.

Additional community tables

Table 6. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	**Midgrass warm season Dominant component 38%**			225–625	
	little bluestem	SCSC	*Schizachyrium scoparium*	125–315	–
	sideoats grama	BOCU	*Bouteloua curtipendula*	100–250	–
	plains muhly	MUCU3	*Muhlenbergia cuspidata*	0–45	–
	Fendler threeawn	ARPUL	*Aristida purpurea var. longiseta*	0–20	–
2	**Cool-season bunchgrass Sub-dominant 19%**			50–315	
	western wheatgrass	PASM	*Pascopyrum smithii*	35–120	–
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	15–110	–
	green needlegrass	NAVI4	*Nassella viridula*	0–50	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	0–30	–
	squirreltail	ELEL5	*Elymus elymoides*	0–10	–
3	**Shortgrass warm season Sub-dominant 16%**			85–265	
	blue grama	BOGR2	*Bouteloua gracilis*	75–200	–
	buffalograss	BODA2	*Bouteloua dactyloides*	10–45	–
	hairy grama	BOHI2	*Bouteloua hirsuta*	0–15	–
4	**Tallgrass warm season Sub-dominant component 10%**			0–165	
	big bluestem	ANGE	*Andropogon gerardii*	0–95	–
	switchgrass	PAVI2	*Panicum virgatum*	0–30	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	0–20	–
	composite dropseed	SPCOC2	*Sporobolus compositus var. compositus*	0–15	–
	prairie sandreed	CALO	*Calamovilfa longifolia*	0–10	–
5	**Sedges-Trace component 2%**			10–30	
	threadleaf sedge	CAFI	*Carex filifolia*	5–15	–
	sedge	CAREX	*Carex*	5–15	–
Forb					
6	**Forbs Minor component 10%**			30–165	
	white heath aster	SYERE	*Symphyotrichum ericoides var. ericoides*	5–20	–
	dotted blazing star	LIPU	*Liatris punctata*	5–20	–
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	5–15	–
	purple locoweed	OXLAL2	*Oxytropis lambertii var. lambertii*	5–15	–
	slimflower scurfpea	PSTE5	*Psoralidium tenuiflorum*	5–15	–
	upright prairie coneflower	RACO3	*Ratibida columnifera*	5–15	–
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	0–15	–
	purple prairie clover	DAPU5	*Dalea purpurea*	0–10	–
	blacksamson echinacea	ECAN2	*Echinacea angustifolia*	0–10	–
	white penstemon	PEAL2	*Penstemon albidus*	0–10	–
	silverleaf Indian breadroot	PEAR6	*Pediomelum argophyllum*	0–10	–
	prairie sagewort	ARFR4	*Artemisia frigida*	0–10	

	prairie sagewort	ARFR4	*Artemisia frigida*	0–10	–
	rush skeletonplant	LYJU	*Lygodesmia juncea*	0–10	–
	lacy tansyaster	MAPI	*Machaeranthera pinnatifida*	0–10	–
	Nuttall's sensitive-briar	MINU6	*Mimosa nuttallii*	0–10	–
	scarlet beeblossom	OESU3	*Oenothera suffrutescens*	0–10	–
	yellow sundrops	CASE12	*Calylophus serrulatus*	0–5	–
	yellowspine thistle	CIOC2	*Cirsium ochrocentrum*	0–5	–
	golden prairie clover	DAAU	*Dalea aurea*	0–5	–
	spiny phlox	PHHO	*Phlox hoodii*	0–5	–
	Missouri goldenrod	SOMI2	*Solidago missouriensis*	0–5	–
	stiff greenthread	THFIF	*Thelesperma filifolium var. filifolium*	0–5	–
Shrub/Vine					
7	**Shrub Minor component 5%**			0–85	
	winterfat	KRLA2	*Krascheninnikovia lanata*	0–25	–
	fourwing saltbush	ATCA2	*Atriplex canescens*	0–25	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	5–20	–
	prairie rose	ROAR3	*Rosa arkansana*	0–15	–
	brittle pricklypear	OPFR	*Opuntia fragilis*	0–15	–
	western snowberry	SYOC	*Symphoricarpos occidentalis*	0–10	–
	soapweed yucca	YUGL	*Yucca glauca*	0–10	–
	tarragon	ARDR4	*Artemisia dracunculus*	0–10	–
	leadplant	AMCA6	*Amorpha canescens*	0–5	–
	plains pricklypear	OPPO	*Opuntia polyacantha*	0–5	–
	skunkbush sumac	RHTR	*Rhus trilobata*	0–5	–

Animal community

Grazing by domestic livestock is one of the major income-producing industries in the area. Rangelands in this area provide yearlong forage under prescribed grazing for cattle, sheep, horses, and other herbivores. During the dormant period, livestock may need supplementation based on reliable forage analysis.

Grazing Interpretations
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 forage production on this site. Infiltration and runoff potential for this site varies from low to high. In many cases, areas with greater than 75 percent ground cover have the greatest potential for high infiltration and lower runoff. An example of an exception would be where short grasses form a strong sod and dominate the site. Areas where ground cover is less than 50 percent have the greatest potential to have reduced infiltration and higher runoff.

Recreational uses

Because of the deep, fertile soils and gentle slopes of this site, it is exposed to development for cropland, home sites, roads, and urban uses. The site exhibits little visual contrast but does present a panoramic view of the wide-open spaces cherished by many in the Great Plains States. Hunting opportunities for upland game species abound.

Wood products

No appreciable wood products are present on the site.

Other products

None noted.

Other information

Site Development and Testing Plan: This ESD went through the approval process.

Inventory data references

Information presented here has been derived from NRCS clipping data, numerous ocular estimates and other inventory data. Field observations from experienced range trained personnel was used extensively to develop this ecological site description.

NRCS individuals involved in developing the Limy Upland (South) ESD in 2001 include: Tim Watson, Amanda Shaw, Susan Francis, Jon Deege, and Robert Schiffner from Kansas. Harvey Sprock, and Josh Saunders from Colorado.

NRCS individuals involved in developing the Limy Upland (North) ESD in 2001 include: Harvey Sprock from Colorado. Carol Eakins, Chuck Markley, Jeff Nichols, and Mary Schrader from Nebraska. Joan Gienger, and Ted Houser from Kansas.

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Quality assurance review: David Kraft (acting QA for region 5 and 9)

Contributors

Chris Tecklenburg

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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.

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Date	01/05/2016
Approved by	David Kraft
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:** Typically none. If present (steeper slopes following intense storms) short and not connected.

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3. **Number and height of erosional pedestals or terracettes:** None, due to the slope percentage and amount of cover. Pedestals and terracettes are indicators of soil being moved by water and/or wind.

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4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Less than 5% bare ground is found on this site, with bare patches generally less than 2-3 inches in diameter. Extended drought can cause bare ground to increase. Bare ground is the remaining ground cover after

accounting for ground surface covered by vegetation (basal and foliar canopy), litter, standing dead vegetation, gravel/rock, and visible biological crust (e.g., lichen, mosses, algae).

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5. **Number of gullies and erosion associated with gullies:** None. There are no channels that are being cut into the soil by moving water. Gullies are not a natural feature of this landscape and site.

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6. **Extent of wind scoured, blowouts and/or depositional areas:** None. The vegetative cover in the Reference State is sufficient to limit wind-scoured or blowout areas. This site is not a depositional area for offsite wind erosion.

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7. **Amount of litter movement (describe size and distance expected to travel):** None. The inherent capacity for litter movement on a soil is a function of its slope and landscape position.

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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):** Plant canopy is large enough to intercept the majority of raindrops. The soil characteristic of this site is resistant to erosion. No physical crusts apparent. Soil stability scores will range from 5-6.

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Surface soil structure is weak fine granular structure. Typical color is 10YR 4/2 moist. The surface layer ranges from a depth of 4 to 8 inches thick.

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Diverse grass, forb, shrub canopy and root structure reduces raindrop impact and slows overland flow providing increased time for infiltration to occur.

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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):** There is no evidence of compacted soil layers due to cultural practices. Soil structure is conducive to water movement and root penetration.

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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: little bluestem > sideoats grama >> plains muhly = fendler threeawn

    Sub-dominant: cool season bunchgrasses/sod formers(western wheatgrass, needle and thread) > shortgrass warm season (blue grama, buffalograss) >> tallgrass warm season (big bluestem, switchgrass)

    Other: Minor: Forbs (western ragweed, dotted gayfeather, purple locoweed, slimflower scurfpea, upright prarieconeflower) = Sub/Shrubs (broom snakeweed, fourwing saltbush, winterfat, pricklypear, yucca) >> Sedges (threadleaf sedge)

    Additional:

13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** The majority of plants are alive and vigorous. Some mortality and decadence is expected for the site. This in part is due to drought, unexpected wildfire, or a combination of the two events. This would be expected for both dominant and sub-dominant groups.

14. **Average percent litter cover (%) and depth (in):** Plant litter is distributed evenly throughout the site.

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 800-2,400 lbs/acre. Representative value is 1,650 lbs/forage/acre. Below normal precipitation during the growing season expect 800 lbs/forage/acre and above normal precipitation during the growing season expect 2,400 lbs/forage/acre. If utilization has occurred, estimate the annual production removed or expected and include this amount when making the total site production estimate.

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:** Invasive or noxious weeds should not occur in the Reference Community. However, cheatgrass, Russian thistle, kochia, and other non-native annuals can invade following extended drought assuming as seed source is available.

17. **Perennial plant reproductive capability:** The number and distribution of tillers or rhizomes is assessed relative to the expected production of the perennial warm and cool season mid and shortgrasses.