

Ecological site R072XY105KS

Chalk Fans

Last updated: 6/06/2025
Accessed: 09/07/2026

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.

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

MLRA 72 is in the Central Great Plains Winter Wheat and Range Land Resource Region. It is in the High Plains Section, of the Great Plains Province, of the Interior Plains (USDA, 2006). MLRAs can be defined by climate, landscapes, geology, and annual precipitation zones (PZ). Other features such as landforms, soil properties, and key vegetation further refine these concepts, and are described at the Ecological Site Description (ESD) level. Relationship to Other Classifications: Natural Resource Conservation Service (NRCS) Classification Hierarchy: Physiographic Division Physiographic Province Physiographic Section Land Resource Region Major Land Resource Area Land Resource Unit (Fenneman, 1946) United States Forest Service (USFS) Classification Hierarchy: Domain Division Province Section Subsection Landtype Association Landtype Landtype Phase (Cleland et al, 1997) REVISION NOTES: The Chalk Fans site was developed by an earlier version of the Chalk Fans (2018). The earlier version of the Chalk Fans ESD was based upon input from NRCS (formerly Soil Conservation Service) and historical information obtained from the Chalk Flats (CF) Range Site Description (1967, updated 1983).

Ecological site concept

The Chalk Fans ecological site name replaces Chalk Flats due to a change in landform position description usage. This site occurs on nearly level to gently sloping alluvial fans, fan aprons, and colluvial aprons below raw exposures of Niobrara Chalk formation. This site is dominated by calcareous slope alluvium and residuum weathered from chalk, shale and soft limestone. The majority of this site is adjacent to the Smoky Hill River, in Logan and Gove counties, with few acres in Lane and Trego counties in Kansas. Badlands or Outcrop areas that are characterized by steep slopes and lack of vegetative cover are associated with this ecological site.

Associated sites

R072XY101KS	Limy Slopes The Limy Slopes ecological site is located on shoulders and backslopes on hillslopes on tableland landscapes. 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. Limy Slopes generally occurs above this site on the uplands.
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Similar sites

R072XY101KS	Limy Slopes The Limy Slopes ecological site is located on shoulders and backslopes on hillslopes on tableland landscapes. 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.
R072XY112KS	Shallow Limy This site occurs on the breaks landscape and characterized by soils that are less than 20 inches to bedrock. The breaks landscape is the area between the tableland and river valleys highlighted by cliff faces. The Shallow Limy ecological site occurs on nearly level to steeply sloping uplands. Much of the site is steep and characterized by rock ledges forming vertical drops.

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) <i>Schizachyrium scoparium</i> (2) <i>Bouteloua curtipendula</i>

Physiographic features

The Chalk Fans ecological site occurs on nearly level to gently sloping alluvial fans, fan aprons, and colluvial aprons below raw exposures of Niobrara Chalk formation. This site is dominated by calcareous slope alluvium and residuum weathered from chalk, shale and soft limestone. This site consists of deep to very deep, strongly calcareous soils, with silty or loamy surface layers and subsoils over soft chalky bedrock. This site receives 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 2,470 to 3,350 feet.

Figure 1. MLRA72 ESD block diagram

Table 2. Representative physiographic features

Landforms	(1) Alluvial fan (2) Fan apron
Flooding frequency	None
Ponding frequency	None
Elevation	750 – 1,020 m
Slope	0 – 10 %
Ponding depth	0 cm

Water table depth	200 cm
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Climatic features

The climate moisture regime of this region is mostly semiarid. Although a 30-year average of four weather stations (1981-2010), showed ranges of precipitation from 14-25 inches. Large daily and annual variations in temperature are common. Winters are cold because of frequent polar air masses moving into the area from the north from December into March. Summer temperatures are warm and usually prevail for about six months of the year. July typically has the most rainfall, and January is the driest. Most of the rainfall occurs as high-intensity, convective thunderstorms. The annual snowfall averages 16 to 35 inches. Drought occurs an average of three times in a 30-year period (1981-2010).

The climate data listed in the tables below represents minimum and maximum averages and ranges for the climate stations located within the geographic boundaries of Chalk Fans. The dates referenced are from 1981-2010 (latest 30-year average). All weather data is supported by the National Oceanic and Atmospheric Administration (NOAA) 1981-2010 Climate Normals. For the average annual precipitation of individual climate station locations and additional climate data, access the National Water and Climate Center at <http://www.wcc.nrcs.usda.gov>

Table 3 Representative climatic features

Frost-free period (characteristic range)	130-140 days
Freeze-free period (characteristic range)	150-170 days
Precipitation total (characteristic range)	460-580 mm
Frost-free period (actual range)	130-140 days
Freeze-free period (actual range)	140-170 days
Precipitation total (actual range)	430-580 mm
Frost-free period (average)	130 days
Freeze-free period (average)	160 days
Precipitation total (average)	510 mm

- (1) RUSSELL SPRINGS [USC00147049], Winona, KS
- (2) RUSSELL SPRINGS 3N [USC00147050], Winona, KS
- (3) QUINTER [USC00146637], Quinter, KS
- (4) HEALY [USC00143554], Healy, KS

Influencing water features

This site does not have a plant community that is influenced by water or water table from a wetland or stream.

There are water influencing features within the soil properties. According to field observations and an article by Linnell, 1961 "Where little bluestem was dominant, infiltration was considerably higher than where side-oats grama was dominant, primarily because of partially

weathered chalk-rock fragments in the soil supporting little bluestem".

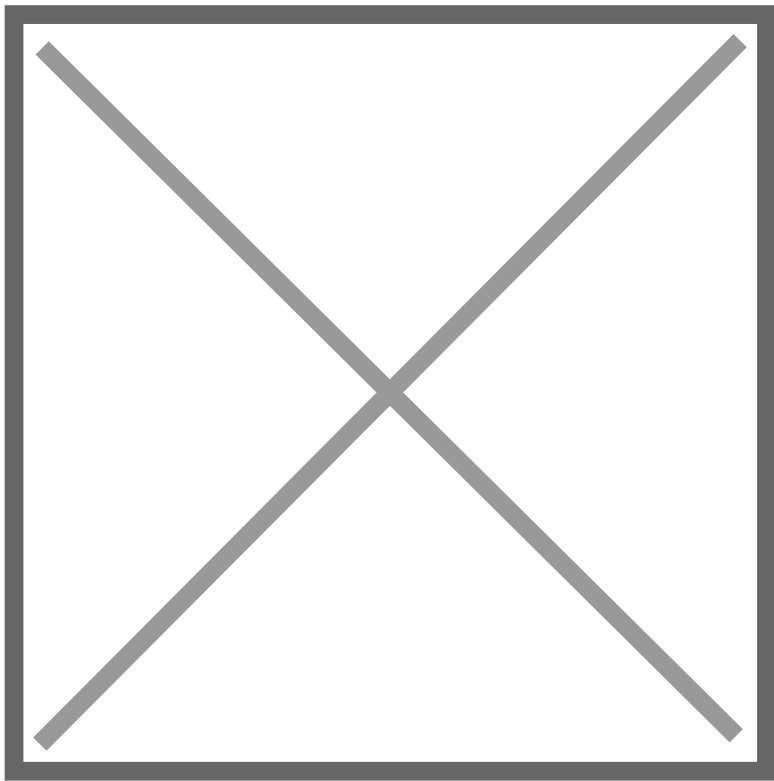


Figure 8. Fig.7-1 from National Range and Pasture Handbook

Soil features

The Chalk Fans ecological site consists of deep to very deep, well drained, moderately slow permeable soils on alluvial fans, and fan aprons. Slopes are nearly level to gently sloping. Runoff is negligible to low. These soils have a silty surface with weak structure and are generally 3 inches thick over Fine-silty subsoil.

The major soils that characterize this site are Marvel and Minnequa.

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

Table 4. Representative soil features

Parent material	(1) Slope alluvium – chalk (2) Residuum – limestone
Surface texture	(1) Silt loam (2) Loam
Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Moderately slow to moderate

Soil depth	100 – 200 cm
Surface fragment cover <=3"	0 – 10 %
Surface fragment cover >3"	Not specified
Available water capacity (0-101.6cm)	5.59 – 23.77 cm
Calcium carbonate equivalent (0-101.6cm)	0 – 30 %
Electrical conductivity (0-101.6cm)	Not specified
Sodium adsorption ratio (0-101.6cm)	0 – 20
Soil reaction (1:1 water) (0-101.6cm)	7.4 – 10
Subsurface fragment volume <=3" (Depth not specified)	0 – 20 %
Subsurface fragment volume >3" (Depth not specified)	Not specified

Ecological dynamics

The plant communities for this 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. The Grassland State is characterized by non-broken land (no tillage), warm-season tall, mid and shortgrasses, bunchgrasses and sod-forming grasses, forbs, and shrubs.

This 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 1946).

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

Most of this site occurs in the valleys of Hackberry Creek in Gove County and the Smoky Hill River of Gove, Logan, Lane, and Trego counties. This site is preferred for grazing and is more productive and accessible than much of the surrounding area. The flatter, larger areas of this site are preferred by livestock, which can lead to grazing distribution problems. Water locations, salt placement, and other aids help distribute grazing. Other management techniques such as concentrated grazing and/or rotational grazing systems also help distribute grazing more evenly.

The general response of this 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 mid and short grass species.

The tall and midgrass species generally escape excessive grazing pressure on the less accessible areas of the rangeland. The tall and midgrasses maintained in these areas help 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 restore this site to its productive potential.

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

Additional community tables

Table 5. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
Grass/Grasslike					
1	Midgrass-tallgrass warm season			1009-1480	
	little bluestem	SCSC	<i>Schizachyrium scoparium</i>	282-863	–
	sideoats grama	BOCU	<i>Bouteloua curtipendula</i>	336-493	–
	big bluestem	ANGE	<i>Andropogon gerardii</i>	252-370	–
	switchgrass	PAVI2	<i>Panicum virgatum</i>	56-123	–
2	Shortgrasses and cool season			420-616	
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	252-370	–
	buffalograss	BODA2	<i>Bouteloua dactyloides</i>	168-247	–
	saltgrass	DISP	<i>Distichlis spicata</i>	84-123	–
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	84-123	–
3	Other grasses			84-123	
	threeawn	ARIST	<i>Aristida</i>	22-45	–
	composite dropseed	SPCO16	<i>Sporobolus compositus</i>	22-45	–
	sand dropseed	SPCR	<i>Sporobolus cryptandrus</i>	22-45	–
Forb					
4	Forbs			168-247	
	desert princesplume	STPI	<i>Stanleya pinnata</i>	34-67	–
	white heath aster	SYERE	<i>Symphotrichum ericoides</i> var. <i>ericoides</i>	34-67	–

	Cuman ragweed	AMPS	<i>Ambrosia psilostachya</i>	34-67	–
	white sagebrush	ARLU	<i>Artemisia ludoviciana</i>	34-67	–
	Missouri milkvetch	ASMI10	<i>Astragalus missouriensis</i>	0-17	–
	woolly locoweed	ASMO7	<i>Astragalus mollissimus</i>	0-17	–
	narrowleaf milkvetch	ASPE5	<i>Astragalus pectinatus</i>	0-17	–
Shrub/Vine					
5	Shrubs			0-50	
	spreading buckwheat	EREF	<i>Eriogonum effusum</i>	0-50	–
	broom snakeweed	GUSA2	<i>Gutierrezia sarothrae</i>	0-50	–
	winterfat	KRLA2	<i>Krascheninnikovia lanata</i>	0-17	–
	fourwing saltbush	ATCA2	<i>Atriplex canescens</i>	0-17	–

Table 6. Community 1.2 plant community composition

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

This site is used by livestock and wildlife. Some of the major wildlife species in MLRA 72 are white-tailed deer, antelope, coyote, badger, raccoon, skunk, rabbit, prairie dog, pheasant, prairie chicken, quail, and mourning dove.

Hydrological functions

Water is the principal factor limiting forage production on this site. Infiltration and runoff potential for this site varies from negligible to medium depending on landform position and ground cover. In many cases, areas with greater than 75 percent ground cover has 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

This site provides hunting, hiking, photography, bird watching, and other opportunities.

Wood products

No appreciable wood products are present on the site.

Other products

Vertical chalk "pyramids" and bluffs are closely associated with this site, although the site itself is relatively flat. The "Pyramids" and "Castle Rock" associated with this site are historical landmarks and tourist attractions.

Other information

Site Development and Testing Plan. Future work (for approved ESD) includes field visits to verify ecological site concepts with field staff. Field staff include but are 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 personal. This site is of small extent and isolated to mainly Logan and Gove County Kansas. 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 are not limited to identifying the soil, landform, plant community, and verifying existing site concepts.

Inventory data references

The 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. Range Condition Guides and Technical Range Site Descriptions for Kansas, Chalk Flats, USDA, Soil Conservation Service, August 1967 Range Site Description for Kansas, Chalk Flats, USDA-Soil Conservation Service, September 1983

Other references

Albertson, F. W. and Weaver, J. E., "Reduction of Un-Grazed Mixed Prairie to Short Grass as a Result of Drought and Dust" (1946). Agronomy & Horticulture -- Faculty Publications. Paper 496.

Andrews, R. and R. Righter. 1992. Colorado Birds. Denver Museum Nat. Hist., Denver, CO. 442 pp.

Kuchler, A. W. 1974. A New Vegetation Map of Kansas. Ecology. 55: 586-604.

Linnell, Lyle D. 1961. Soil-Vegetation Relationships On A Chalk-Flat Range Site in Gove County, Kansas. Transactions of the Kansas Academy of Science, 64 (4) 293-303.

National Range and Pasture Handbook 1997

Soil Series—Official Series Descriptions, <https://soilseries.sc.egov.usda.gov/osdname.asp>

Natural Resources Conservation Service—1968 and 1982 Range Site Descriptions

USDA Handbook 296, LRR and MLRA of the U.S., the Caribbean, and the Pacific Basin

USDA-Natural Resources Conservation Service—Soil Surveys and Web Soil Survey

Contributors

Chris Tecklenburg

Approval

Suzanne Mayne-Kinney, 6/06/2025

Acknowledgments

Those involved with the development of this ecological site description include the entire MLRA72 technical team. Due to the small geographical extent of this site, specific individual contributions include: Roger Tacha, Ted Houser, and Tom Cochran. The ecological site development process is a collaborative effort, conceptual in nature, dynamic, and is never considered complete. I thank all those who set the foundational work in the early 2000s in regard to this ESD. I thank all those who contributed to the development of this site. In advance, I thank those who would provide insight, comments and questions about this ESD in the future.

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	02/24/2014
Approved by	

Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. Number and extent of rills: None

2. Presence of water flow patterns: None

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):
Less than 5% bare ground is found on this site.

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): Expect small size herbaceous litter to travel short distances, associated with water flow patterns following extremely high intensity storms.

8. Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):
Stability class of 4-5 under canopies and in intercanopy spaces.

9. Soil surface structure and SOM content (include type of structure and A-horizon color and thickness): Typical A is 0-7 inches; brown (10YR 4/3), moist; weak fine granular structure; soft, friable; strongly effervescent.

10. Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff: High grass canopy and basal cover and small gaps between plants should reduce raindrop impact and slow overland flow, providing increased time for infiltration to occur. High herbaceous vegetation on this site will result in less rain necessary to sustain this site because more water is retained.

11. Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site): None.
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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: Warm Season midgrass some tallgrasses (60%) little bluestem > sideoats grama > big bluestem >> switchgrass

Sub-dominant: Shortgrasses-cool season (25%) blue grama > buffalograss > inland saltgrass = western wheatgrass

Other: Forbs (10%) other grasses (5%) shrubs (1%)

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.
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14. Average percent litter cover (%) and depth (in): Plant litter is distributed evenly throughout the site.
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15. Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production): 1500-3000 lbs/acre. Representative value is 2200 lbs/forage/acre. Below normal precipitation during the growing season expect 1500 lbs/forage/acre and above normal precipitation during the growing season expect 3000 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.
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16. Potential invasive (including noxious) species (native and non-native). List species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicators, we are describing what is NOT expected in the reference state for the ecological site: None
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17. Perennial plant reproductive capability: The number and distribution of tillers or rhizomes is assessed relative to the expected production of the perennial warm season midgrass and shortgrasses.
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