USDA Natural Resources Conservation Service

Ecological site R073XY107KS
Sandy Floodplain

Last updated: 8/17/2020
Accessed: 05/13/2025

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.

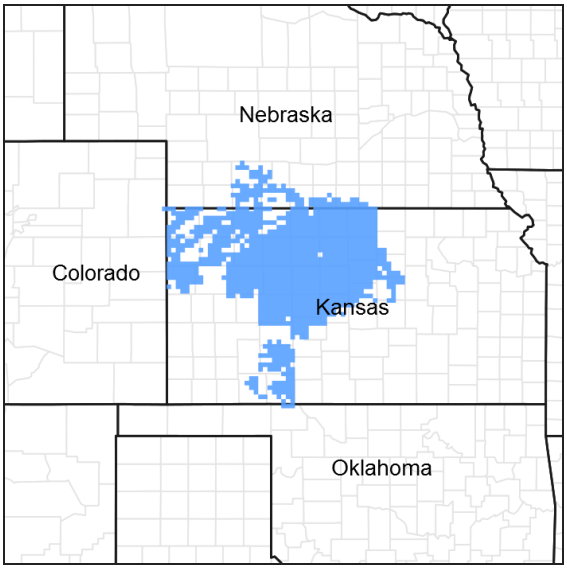


Figure 1. Mapped extent

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): 073X–Rolling Plains and Breaks

This ESD is located in the Rolling Plains and Breaks Major Land Resource Area (MLRA) 73 of the Central Great Plains Winter Wheat and Range Region of the United States. MLRA 73 is in Kansas (78 percent) and Nebraska (22 percent). It makes up about 21,485 square miles (13,750,400 acres). The towns of Hays, Great Bend, and Dodge City, Kansas, and Alma, Curtis, Holdrege, and McCook, Nebraska are in this MLRA. The MLRA is bisected by Interstate 70. The Platte River is at the northern edge of the area, and the Arkansas River is at the southern edge.

Classification relationships

Major land resource area (MLRA): 073-Rolling Plains and Breaks

Ecological site concept

This site occurs on nearly level to moderately sloping floodplains and low terraces. The Sandy Floodplain site is characterized by soils with greater than 52 percent sand in the surface. The soils characteristic of this site formed in sandy alluvium from mixed sources.

Associated sites

R073XY103KS	**Subirrigated** The Subirrigated ecological site occurs adjacent to and in conjunction with Sandy Floodplain. This site occurs on nearly level to very gently sloping areas along drainageways of uplands and sand hills, below permanent springs, and on floodplains in valleys with high water tables. This site is subject to flooding except for positions on interdunes. The soils have a seasonal high water table within the root zone that limits the species capable of long-term survival within the site. This site receives runoff from areas higher on the landscape.
R073XY111KS	**Sandy Plains** The Sandy Plains ecological site occurs adjacent to and in conjunction with the Sandy Floodplain sites. The Sandy Plains ecological site occurs on plains.

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	Not specified

Physiographic features

The western half of MLRA 73 and areas along the Arkansas River have remnants of the Tertiary river-laid sediments washed out onto the plains from erosion of the prehistoric Rocky Mountains in Colorado. In the valley of the Arkansas River, the wind reworked these sediments, forming a hummocky dune surface of eolian sand. A loess mantle occurs on the higher ground in the western half of the area. The Tertiary-age Ogallala and White River Formations cover Cretaceous Pierre Shale in the northern part of the area. The Ogallala Formation consists of loose to well cemented sand and gravel, and the White River Formation consists of ashy claystone and sandstone. Pierre Shale and Niobrara Chalk are at the surface in the valleys of the Republican, Smoky Hill, and Saline Rivers. Fort Hays limestone of the Niobrara Formation and Blue Hill shale of the Carlile Formation are at the surface in the valleys of the Saline and Smoky Hill Rivers. Shale can be seen exposed in the eastern half of this MLRA, in Kansas. Quaternary and more recent sand and gravel partially cover the shale in the river valleys.

The Sandy Floodplain site occurs on nearly level to moderately sloping floodplains, upland drainageways, alluvial fans, and terraces. This site consists of deep, well drained to excessively well drained soils formed in stratified moderately coarse alluvium on bottomlands. The surface layer textures are sandy or loamy. The Sandy Floodplain site receives runoff from areas higher on the landscape and flooding frequency ranges from rare to occasional while flooding duration is very brief to brief. Sedimentation is usually rare, but is common on alluvial fans and terraces. The water table may enter the root zone, but is not the dominant factor controlling vegetative growth. This site often occupies the first bench between the streambed and higher sandy land.

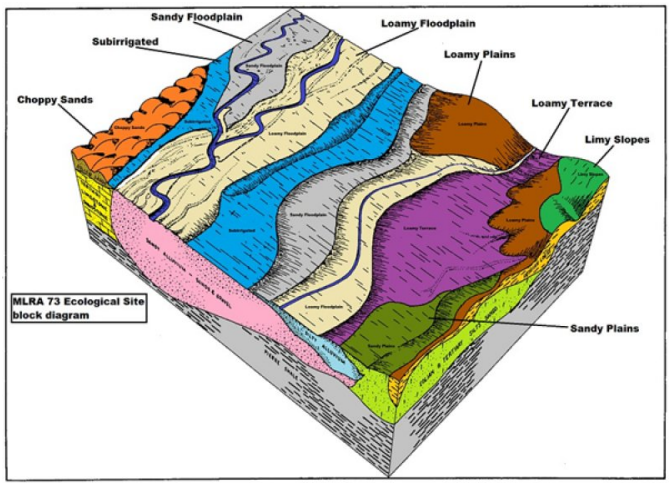


Figure 2. MLRA 73 Ecological Site block diagram.

Table 2. Representative physiographic features

Landforms	(1) Flood plain (2) Alluvial fan (3) Terrace
Flooding duration	Very brief (4 to 48 hours) to brief (2 to 7 days)
Flooding frequency	Rare to occasional
Ponding frequency	None
Elevation	488–853 m
Slope	0–8%
Ponding depth	0 cm
Water table depth	61–152 cm

Climatic features

For MLRA 73 the average annual precipitation is 19 to 30 inches (48 to 76 centimeters). Most of the rainfall occurs as high-intensity, convective thunderstorms during the growing season. The maximum precipitation occurs from the middle of spring to the early autumn months. Precipitation in winter occurs as snow. The annual snowfall ranges from about 17 inches (45 centimeters) in the southern part of the area to 24 inches (60 centimeters) in the northern part. The average annual temperature is 48 to 56 degrees F (9 to 14 degrees C). The freeze-free period averages 180 days and ranges from 145 to 210 days, increasing in length from northwest to southeast. The following weather data originated from weather stations chosen across the geographical extent of the ecological site, and will likely vary from the data for the entire MLRA. The climate data derives 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)	148 days
Freeze-free period (average)	170 days
Precipitation total (average)	635 mm

Climate stations used

- (1) WEBSTER DAM [USC00148648], Stockton, KS
- (2) CAMBRIDGE [USC00251415], Cambridge, NE
- (3) HARLAN CO LAKE [USC00253595], Republican City, NE
- (4) OXFORD 6NNW [USC00256454], Oxford, NE
- (5) ALTON 1 W [USC00140201], Alton, KS
- (6) DODGE CITY [USW00013985], Dodge City, KS
- (7) BELOIT [USC00140693], Beloit, KS
- (8) HOXIE [USC00143837], Hoxie, KS
- (9) NESS CITY [USC00145692], Ness City, KS

Influencing water features

This site is made up of alluvial soils that have a water table greater than 6 feet from the surface. Fluctuations with this water table occur and there could be times throughout the year that it is less than 6 feet from the surface. Water influences this site due to landform position. This site is adjacent to streams and is in a water receiving position.

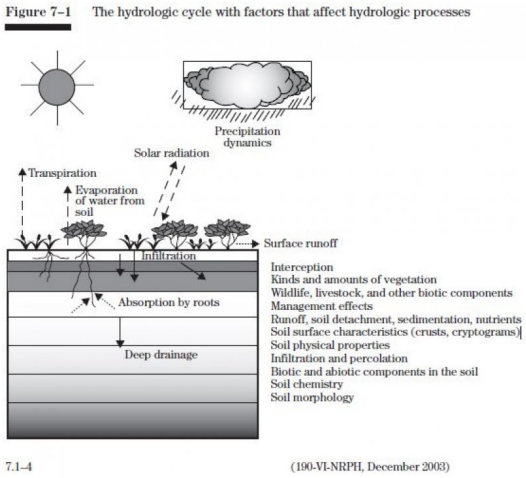


Figure 7. Fig.7-1 from National Range and Pasture Handbook.

Soil features

The soils on this site are moderately deep to deep and range from well drained to excessively well drained. The parent material is local alluvium formed in stratified moderately coarse alluvium bottomlands. The surface soil is from 4 to 20 inches thick, generally is light colored, and ranges widely from very fine sandy loam to loamy fine sand in texture. The underlying material is light colored and also ranges widely in texture. Carbonates are often leached from the upper soil profile, but may occur throughout in some soils. The content of organic matter is generally low to moderately low. Available water capacity ranges from very low to moderate. Flooding is rare to occasional, depending on landform, and normally is very brief.

Major soil series correlated to this ecological site are Bridgeport, Inavale, McCook, and Munjor.

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

Figure 8. Inavale soil series.

Table 4. Representative soil features

Surface texture	(1) Sandy loam (2) Sandy loam (3) Loamy sand
Family particle size	(1) Sandy
Drainage class	Well drained to excessively drained
Permeability class	Very rapid
Soil depth	0–152 cm

Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	13.13–24.31 cm
Calcium carbonate equivalent (0-101.6cm)	0–8%
Electrical conductivity (0-101.6cm)	0–1 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0
Soil reaction (1:1 water) (0-101.6cm)	6.7–8
Subsurface fragment volume <=3" (Depth not specified)	0%
Subsurface fragment volume >3" (Depth not specified)	0%

Ecological dynamics

The grasslands of Major Land Resource Area (MLRA) 73, the Rolling Plains and Breaks, are located in south-central Nebraska and central Kansas. The site evolved under sub-humid (20-40 inch precipitation range) climates, characterized by much the same weather extremes of temperatures, rainfall, and snowfall we are familiar with today. As a result of glacial activity and other natural forces, then and later, plants have migrated from their places of origin, so that today MLRA 73 grasslands are simple-to-complex mixtures of perennial grasses and forbs, plus a few native annuals and biennials. Species composition has been modified by the introduction of Kentucky bluegrass and cool-season annual and perennial grasses, particularly Japanese brome (Launchbaugh and Owensby, 1978).

Through the ages to modern times, wildfires – many started by lightning, but most by primitive people – influenced development of fire-tolerant grasses and suppressed woody vegetation (Sauer, 1950). Certain woody plants, however, always were present as natural components of some grasslands. Browsing by animals and frequent prairie fires were largely responsible for maintaining “normal” amounts of woody species (Dyksterhuis, 1958). In primitive time, numerous large herbivores subjected herbaceous vegetation to grazing stress. After the last glacial retreat, bison emerged as the major dominant large grazer, although the prairies and plains simultaneously supported many pronghorn antelope, elk, deer, prairie dogs, rabbits, rodents, and insects. And each exerted grazing pressures on the vegetation (Launchbaugh and Owensby, 1978). There is little doubt that during and long before Spanish explorations into this area, most of the grassland was used almost continuously throughout the year by one roving herd of buffalo after another and other grazing animals (early exploration accounts reviewed by Dary in 1974; diaries of early Kansas residents cited by Choate and Fleharty in 1975). Grazing and trampling by bison and their associates were often intensive, as was uncontrolled grazing by livestock in the late 1800s after most of the wild grazers had been eliminated.

The plant communities for the Sandy Floodplain 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 Woody State, and a Tillage State. The Grassland State is characterized by non-broken land (no tillage), warm-season bunchgrasses, sod forming grasses, forbs, and shrubs. The Woody State is characterized by a community made up of eastern redcedar, Siberian elm, Russian Olive, and cottonwood with few remnant native grasses making up the understory and 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) 73. Variation in precipitation east and west is not as affected as is temperature north and south. The northern part of MLRA 73 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 Sandy Floodplain 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 sub-humid, High Plains and Smoky Hills 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 and Smoky Hills climate, largely dictates the plant communities for the site.

Drought cycles were part of the natural range of variability within the site and historically have had a major impact upon the vegetation. The species composition changes according to the duration and severity of the drought cycle (Albertson and Weaver, 1940).

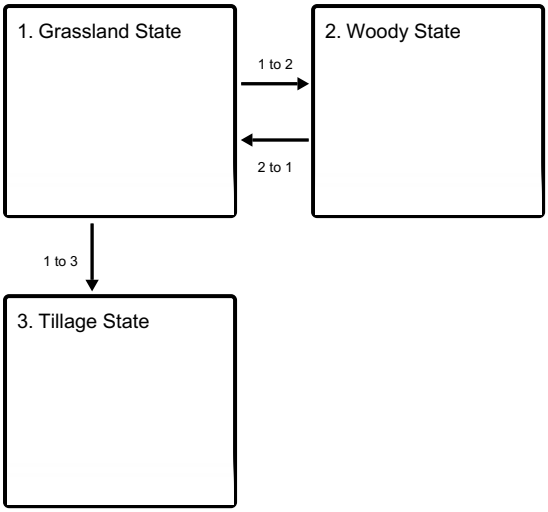
This site appears on nearly level bottomland adjacent to streams in the area. It is seldom found as extensive areas, but rather occurs as isolated pockets. Management of this ecological site by itself is difficult.

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 midgrass species, and shift the plant community toward cool-season and annual species.

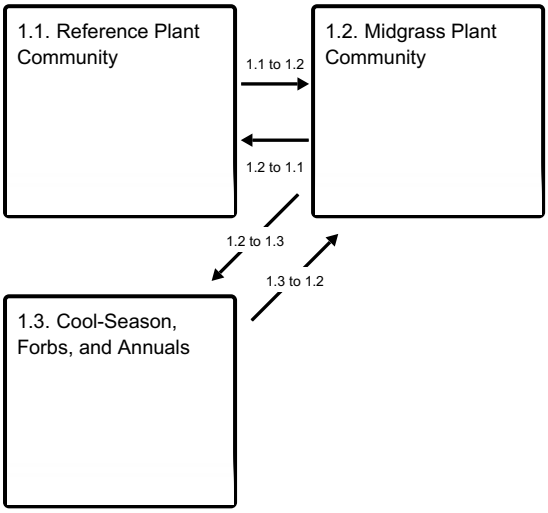
The following diagram illustrates pathways that the vegetation on this site may take from the Reference Plant Community as influencing ecological factors change. There may be other states or plant communities not shown in the diagram, as well as noticeable variations within those illustrated and described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

State and transition model

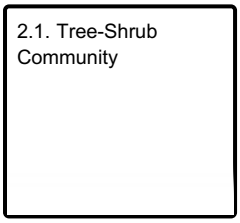
Ecosystem states



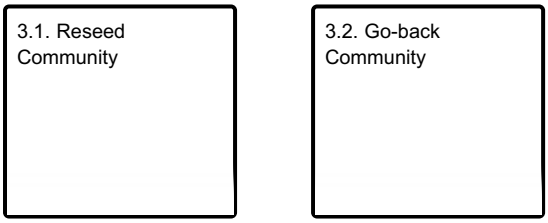
State 1 submodel, plant communities



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 tall- and midgrasses, forbs, shrubs. The Midgrass Plant Community consists of cool- and warm-season midgrasses, forbs, shrubs, and/or woody species. Community 3 consists of cool-season grasses, forbs, and annuals.

Community 1.1
Reference Plant Community

The Reference Plant Community serves as the basis for all other interpretations. The potential vegetation of this site is a tall-and midgrass bottomland. This community is comprised of approximately 85 percent grasses and grass-like plants, 10 percent forbs, and 5 percent trees, shrubs, and cacti. Sand bluestem, Indiangrass, switchgrass, prairie sandreed, composite dropseed, and sand dropseed are the dominant species in this community, making up 60 percent of the total annual production per acre per year (ac/yr). Sub-dominant species making up 15 percent of the total annual production include little bluestem, sideoats grama, sand lovegrass, and blue grama. Cool-season grasses make up 10 percent of the plant community and include western wheatgrass, Canada wildrye, sedge, Scribner's rosette grass, and thin paspalum. The Reference Plant Community has a diverse forb population that makes up 10 percent of the total annual production per ac/yr. Trees, shrubs, and cacti make up 5 percent as well. Prescription grazing that allows for adequate recovery periods after each grazing event and a forage and animal balance will maintain the biotic integrity of this plant community. Spring grazing and summer deferment will reduce the cool-season component of this plant community and increase the warm-season component and palatable shrubs. Spring deferment and summer grazing will increase the cool-season component and decrease the warm-season component of this plant community. The Reference Plant Community is diverse and productive. The abundance and diversity of vegetation found on this site allows for excellent capture and storage of precipitation and increased infiltration rates. Plant litter, lack of large areas of bare ground, and a shrub component of less than 5 percent canopy cover will promote the proper function of the water and nutrient cycles. Decomposition of roots, high infiltration rates, and high litter cover allow for the proper function of the nutrient cycle in the Reference Plant Community. Total annual production ranges from 3,000 to 4,500 pounds of air-dried vegetation per acre per year and will average 3,500 pounds.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	3172	3335	4287
Forb	191	392	504
Shrub/Vine	–	196	252
Total	**3363**	**3923**	**5043**

Figure 10. Plant community growth curve (percent production by month). KS7330, Sand Bluestem, Tall Grasses.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	0	5	20	35	25	10	5	0	0	0

Community 1.2
Midgrass Plant Community

This plant community developed under heavy, continuous season-long grazing. The dominant Reference Plant Community species were not given adequate rest and recovery during the growing season. Sand bluestem, switchgrass, Indiangrass, prairie sandreed, and other desirable species lose productive capacity through loss of vigor and reproductive potential. Forb diversity is reduced. Periodic flooding and a fluctuating water table on this site help to sustain the tallgrasses in the plant community. However, midgrasses such as western wheatgrass, sideoats grama, and various sedges will increase to become the dominant species. A decrease in tallgrass production and density is indicative of changes leading to a major shift in the plant community. This community phase marks a shift in plant composition from a tall- and midgrass community to a mid- and cool-season plant community. Tallgrasses, such as sand bluestem, Indiangrass, and switchgrass are decreasing in vigor with continued defoliation. Tallgrasses are being replaced by grasses such as little bluestem, sideoats grama, and western wheatgrass. The remainder palatable, tall-, mid-, warm-, and cool-season grasses such as sand bluestem, sideoats grama, little bluestem, needle and thread, switchgrass, and Indiangrass are reduced to remnant populations or possibly removed as heavy, continuous grazing occurs at heights below species recommendations. Sand dropseed and western wheatgrass will increase to fill the voids left by the decreasing species. Sand sagebrush, Cuman ragweed, and

other unpalatable forbs and annual grasses will also increase in the voids. Areas of bare ground can increase, making the site more susceptible to erosion. Timing of defoliation (grazing, wildfire, hail, etc.) will have an impact on the proportions of species within the plant community. Due to the decrease in plant litter, organic matter, and biomass, effective precipitation is reduced, causing a decline in production compared to the Reference Plant Community. Rangeland health on this site is affected by less efficient nutrient cycling, the biotic integrity of the site, as well as hydrologic cycle disturbance. The total annual production of this site is approximately 2,500 pounds per acre (air-dry weight).

Figure 11. Plant community growth curve (percent production by month). KS7331, Western Wheatgrass, Little Bluestem, Sideoats Grama.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	5	15	20	25	20	10	5	0	0	0

Community 1.3
Cool-Season, Forbs, and Annuals

Figure 12. Inavale soil series, Graham Cty., Kansas

This plant community is a result of heavy, continuous grazing during the growing season and/or throughout the year. Remnants of tallgrasses and palatable forbs are still present, but have significantly decreased due to lack of adequate recovery periods following grazing events. Western wheatgrass and western ragweed are considered the dominant plant group of this community. Other forbs such as Texas croton, stickleaf mentzalia, kochia, and Russian thistle will increase. As a result of this type of management and loss of plant species the soil surface is exposed more frequently. This increases bare ground percentages leaving the site vulnerable to wind and water erosion. A significant amount of production and diversity has been lost when compared to the Reference Plant Community. Loss of warm-season grasses and desirable forbs have negatively impacted the plant community. Soil loss is obvious where water flow paths are connected. The plant community lacks biodiversity. Due to the decrease in plant litter and biomass, effective precipitation is reduced, causing a decline in biotic integrity and soil and site stability. The relative value of total annual production of air-dry vegetation per acre per year is 2,000 pounds.

Figure 13. Plant community growth curve (percent production by month). KS7332, Western Wheatgrass/Western Ragweed.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	10	20	20	25	5	5	10	5	0	0

Pathway 1.1 to 1.2
Community 1.1 to 1.2

Long-term (>10 years) management that includes repetitive heavy use (grazing/defoliation) during the growing season, lack of rest, and recovery of the grazed key forage species, no prescribed fires, and/or no forage and animal balance may contribute to the cause of shift between community phases.

Pathway 1.2 to 1.1
Community 1.2 to 1.1

Management incorporating long-term (>10 years) prescription grazing that includes a forage and animal balance, prescription fires at a frequency of 1 in 7 years, and providing adequate rest and recovery periods of the key forage species during the growing season. Shifts in community phases are reversible through succession, natural disturbances, short-term climatic variations, and use of practices such as grazing management.

Conservation practices

Brush Management
Prescribed Burning
Prescribed Grazing

Pathway 1.2 to 1.3
Community 1.2 to 1.3

Long-term (>10 years) management without a forage and animal balance, an absence of brush maintenance or removal, consistently grazing during the summer months, no prescription fires, and continuous grazing without adequate recovery periods between grazing events. These types of management scenarios will convert Community 2 to a community of cool-season forbs, and annuals.

Pathway 1.3 to 1.2
Community 1.3 to 1.2

Management that incorporates long-term (~10 years) prescription grazing, a forage and animal balance, brush management, adequate rest and recovery of the key forage species, and prescription fires will favor this plant community to restore Community Phase 2.

Conservation practices

Brush Management
Prescribed Burning
Prescribed Grazing

State 2
Woody State

This state is dominated by a tree and/or shrub plant community. The increase and spread of trees results from an absence of fire. Woody plants can increase up to 34% from a lack of fire according to a study from 1937 to 1969, in contrast to a 1% increase on burned areas (Bragg and Hulbert, 1976). Periodic burning tends to hinder the establishment of most woody species, and favors forbs and grasses. However, it should be pointed out that not all unburned areas have a woody plant invasion. Hydrologic function is affected by the amount of vegetative cover. Canopy interception loss can vary from 25.4% to 36.7% (Thurow and Hester, 1997). A small rainfall event is usually retained in the foliage and does not reach the litter layer at the base of the tree. Only when canopy storage is reached and exceeded does precipitation fall to the soil surface. Interception losses associated with the accumulation of leaves, twigs, and branches at the bases of trees are considerably higher than losses associated with the canopy. The decomposed material retains approximately 40% of the water that is not retained in the canopy (Thurow and Hester, 1997). Soil dynamic property changes affected include biological activity, infiltration rates, and soil fertility. Special planning will be necessary to assure that sufficient amounts of fine fuel are available to carry fires with enough intensity to control woody species. In some locations the use of chemicals as a brush management tool may be desirable to initiate and accelerate this transition. Birds, small mammals, and livestock are instrumental in the distribution of seed and accelerating the spread of most tree and shrubs common to this site. The speed of encroachment varies considerably and can occur on both grazed and non-grazed pastures. Many species of wildlife, especially bobwhite quail, turkey, and white-tailed deer benefit from the growth of trees and shrubs for both food and cover. Conversely, the presence of trees is considered detrimental to populations of

greater prairie chickens. When management for specific wildlife populations is desirable, these options should be considered in any brush management plan.

Community 2.1
Tree-Shrub Community

This community is dominated by trees with a canopy cover usually greater than 15-20 percent. Trees characterizing this community can include eastern redcedar, Siberian elm, Russian olive, locust, and cottonwood. When tree encroachment occurs on areas that have been subjected to long-term continuous overgrazing, the associated grasses will usually consist of composite dropseed, purpletop tridens, purple lovegrass, Kentucky bluegrass, and Scribner's rosette grass. Trees will also invade areas where both grazing and fire have been excluded for many years. A heavy accumulation of plant mulch and litter retarding herbage growth. This provides a favorable habitat for seed germination and establishment of many woody species. Grass yields are significantly reduced, 10 to 30 percent of the total vegetative production, due to the competition from woody species. The combination of less water entering the soil and strong ability by the trees to extract water, means that little water has a chance to drain beneath the root zone. Therefore, invasion of trees and shrubs on large areas that were once primarily grassland has strong implications for recharge of aquifers. It can be a common occurrence to have seeps and springs stop flowing in conjunction with increases in tree and shrub cover (Thurow and Hester, 1997). In this plant community, the amount of available forage is heavily dependent upon the predominant woody species cover and the kind(s) of livestock and/or wildlife utilizing the site. A prescribed burning program, mechanical brush removal, and periodic rest and recovery accompanied by prescribed grazing can return the plant community to one dominated by grasses and forbs. The time frame will be dependent upon the percentage of canopy cover and remnant native grass population remaining. Special planning will be necessary to assure that sufficient amounts of fine fuel are available to carry fires with enough intensity to control woody species. Use of labeled herbicides and mechanical removal as a brush management tool will usually be necessary to reduce fire-resistant woody species populations in order to accelerate the recovery of desired vegetative cover. Some landowners rely on the browsing habits of goats to suppress the woody growth.

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 can exist. Many of these communities are represented by the genus Aristida (threeawns). This is an alternative state since the energy, hydrologic, and nutrient cycles are functioning altered to that of the Reference State in its natural disturbance regime. Bulk density, aggregate stability, soil structure, and plant functional and structural groups are not fully restored to that of the Reference State. Mechanical 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 altered, and a plowpan or compacted layer can be observed, limiting water infiltration. Synthetic chemicals may remain as a residual in the soil from farming operations. In early successional stages, this community is not stable. Wind and water erosion is a concern within this plant community. This plant community can vary considerably depending on 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 that incorporates adequate recovery periods between grazing events and a forage and animal balance is necessary to maintain the health, vigor, and productivity of 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 and livestock grazing preference.

Community 3.2
Go-back Community

This plant community originates 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 is altered, and a plowpan or compacted layer can be formed, limiting water infiltration. Many times synthetic chemicals remain as a residual from farming operations. Wind and water erosion is a concern within this plant community. 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, after decades, blue grama, sideoats grama, and buffalograss will come back. These species will not regain in proportions to that of the Reference State plant communities. Soil structure, aggregate stability, and organic matter will also not recover to conditions of the Reference State. Range seeding can accelerate the process of species composition and possibly production, but with high energy expense and inputs.

Transition 1 to 2
State 1 to 2

The absence of managing woody species are the variables that contribute directly to loss of state resilience and result in shifts between states. This transition involves a change in vegetation type and a canopy cover of greater than 15%. This transition could take generations, and possibly will not occur if there is not a tree-shrub seed source available.

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. The resilience of the Reference State has been compromised by the fracturing and blending of the native virgin sod. The energy, hydrologic, and nutrient cycles are altered and vary from that of the Grassland State.

Restoration pathway 2 to 1
State 2 to 1

Restoration efforts will be costly, labor-intensive and can take many years, if not decades, to return to a Grassland State. Once canopy levels reach greater than 20 percent, estimated cost to remove trees is very expensive and includes high energy inputs. The technologies needed in order to go from an invaded Woody State to a Grassland State include but are not limited to: prescribed burning—the use of fire as a tool to achieve a management objective on a predetermined area under conditions where the intensity and extent of the fire are controlled; brush management—manipulating woody plant cover to obtain desired quantities and types of woody cover and/or to reduce competition with herbaceous understory vegetation, in accordance with overall resource management objectives; prescribed grazing—the controlled harvest of vegetation with grazing or browsing animals managed with the intent to achieve a specified objective. Grazing at an intensity that will maintain enough cover to protect the soil and maintain or improve the quantity and quality of desirable vegetation. When a juniper tree is cut and removed, the soil structure, and the associated high infiltration rate may be maintained for over a decade (Hester, 1996). This explains why the area near the dripline usually has substantially greater forage production for many years after the tree has been cut. It also explains why runoff will not necessarily dramatically increase once juniper is removed. Rather, the water continues to infiltrate at high rates into soils previously ameliorated by junipers, thereby increasing deep drainage potential. In rangeland, deep drainage amounts can be 16 percent of the total rainfall amount per year (Thurow and Hester, 1997).

Conservation practices

Brush Management

Prescribed Burning
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	**Warm-season tallgras dominant 60%**			1373–2550	
	sand bluestem	ANHA	*Andropogon hallii*	785–1569	–
	switchgrass	PAVI2	*Panicum virgatum*	196–588	–
	Indiangrass	SONU2	*Sorghastrum nutans*	196–588	–
	prairie sandreed	CALO	*Calamovilfa longifolia*	118–224	–
	composite dropseed	SPCO16	*Sporobolus compositus*	0–34	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	0–34	–
2	**Warm-season mid-, shortgrass subdominant 15%**			118–588	
	little bluestem	SCSC	*Schizachyrium scoparium*	196–588	–
	sideoats grama	BOCU	*Bouteloua curtipendula*	118–224	–
	sand lovegrass	ERTR3	*Eragrostis trichodes*	0–118	–
	blue grama	BOGR2	*Bouteloua gracilis*	0–34	–
3	**Cool-season minor 10%**			84–196	
	western wheatgrass	PASM	*Pascopyrum smithii*	118–224	–
	Canada wildrye	ELCA4	*Elymus canadensis*	0–118	–
	sedge	CAREX	*Carex*	0–34	–
	Scribner's rosette grass	DIOLS	*Dichanthelium oligosanthes var. scribnerianum*	0–34	–
	thin paspalum	PASE5	*Paspalum setaceum*	0–34	–
Forb					
4	**Forb minor component 10%**			106–392	
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	17–67	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	17–67	–
	Texas croton	CRTE4	*Croton texensis*	17–67	–
	prairie sunflower	HEPE	*Helianthus petiolaris*	17–67	–
	Nuttall's sensitive-briar	MINU6	*Mimosa nuttallii*	6–22	–
	lemon scurfpea	PSLA3	*Psoralidium lanceolatum*	6–22	–
	slimflower scurfpea	PSTE5	*Psoralidium tenuiflorum*	6–22	–
	white heath aster	SYERE	*Symphyotrichum ericoides var. ericoides*	6–22	–
	Illinois bundleflower	DEIL	*Desmanthus illinoensis*	6–22	–
	Engelmann's daisy	ENPE4	*Engelmannia peristenia*	6–22	–
	Maximilian sunflower	HEMA2	*Helianthus maximiliani*	6–22	–
Shrub/Vine					
5	**Trees, shrubs, and cacti minor component 5%**			22–196	
	sand sagebrush	ARFI2	*Artemisia filifolia*	0–56	–
	eastern cottonwood	PODE3	*Populus deltoides*	0–56	–
	western sandcherry	PRPUB	*Prunus pumila var. besseyi*	0–56	–
	soapweed yucca	YUGL	*Yucca glauca*	0–56	–

Animal community

Animal Community
Wildlife Interpretations

This ecological site is characterized by sandy soils that are nearly level to weakly hummocky and are usually associated with the sandy rivers and streams. These sites have historically been subject to frequent flooding, sorting, scouring, and redeposition. Therefore, vegetative composition can change quickly and frequently. As a result, virtually none of these sites have been cultivated. Since these areas are not farmed, they are often utilized for wintering areas by livestock, especially where trees are present. Overutilization by livestock tends to degrade terrestrial as well as aquatic wildlife habitat.

Historically these sites have supported a diversity of wildlife because of the mixture of forbs and grasses and the nearly steady supply of water. These forbs and grasses were utilized by a number of large mammals including deer, elk, and bison. Due to all landscape's inherent heterogeneity, some areas were not grazed uniformly by these historic large herds of grazing animals. This type of grazing enhanced habitat for wildlife by creating a mosaic pattern, or patchiness, of vegetative structural diversity throughout the landscape. Wildlife native to the site depend on a plant community diverse in species and structure. This need is evident in the variability of known habitat requirements of grassland associated wildlife.

If cottonwood trees become established on these sites, the types of wildlife species using the area will shift from grassland species to woodland species. Striped skunks, opossums, porcupines, and whitetail deer habitat will increase. Habitat also becomes more suitable for northern bobwhite quail and turkeys.

In recent times cottonwood trees have begun dying off as a result of irrigation and a corresponding reduction in the water table. With the loss of water flows, very few new trees are able to replace them. These dead cottonwood trees have created ideal habitat for species that utilize dead "snags" such as northern flickers, red-headed woodpeckers, wood ducks, and raccoons.

The site's close proximity to permanent or seasonal water in streams generally meets the needs of wildlife requiring open water for drinking. Seasonal pools present during the spring offer breeding habitat for amphibians.

Periodic events such as prolonged drought, wildfire, disease, or high insect numbers will alter plant community diversity and structure and associated wildlife species.

The Reference Plant Community

The high diversity of grasses and forbs in this community provides habitat for a diverse group of insects. Areas with high forb diversity will generally support more insects such as the leaf-hoppers important to young grassland nesting birds. Grasshoppers, associated with grasses, are a critical food source for birds in later stages of development. Plains garter snakes and northern water snakes are common reptiles on the site. Areas with high forb and insect populations coupled with nearby roost trees offer suitable brood habitat for wild turkeys. Reference Plant Communities with tall-, native, warm-season bunchgrasses, and openings at ground level offer suitable northern bobwhite quail nesting habitat. Small mammals such as white-footed mice are common and will attract raptors such as red-tailed hawks, great-horned owls, and eagles if suitable perches are available. Small mammals also provide prey for coyotes and other predators.

Animal Community – Grazing Interpretations

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.

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 preference of plant species, and/or grazing system, and site grazeability 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. The soils on this site are moderately deep to deep and range from well drained to excessively well drained. In many cases, areas with greater than 75 percent ground cover have the greatest potential for high infiltration and lower runoff.

Recreational uses

The sandy nature of this site limits its use primarily to rangeland. Large areas, however, are cultivated successfully when high residue-producing crops are grown and the residues are managed to prevent wind erosion.

Wood products

No appreciable wood products are present on the site.

Other products

None noted.

Other information

Site Development and Testing Plan

This site 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 were used extensively to develop this ecological site description.

NRCS individuals involved in developing the Sandy Floodplain (formerly Sandy Lowland) ESD in 2002 include Darrell Beougher, Jon Deege, Lorne Denetclaw, Sharla Schwien, Joel Willhoft, Dwayne Rice, and Bob Tricks from Kansas; and Nadine Bishop, Kristin Dickinson, Kim Stine, Dana Larson, and Chuck Markley from Nebraska.

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Contributors

Chris Tecklenburg

Approval

David Kraft, 8/17/2020

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Rangeland health reference sheet

Interpreting Indicators of Rangeland Health is a qualitative assessment protocol used to determine ecosystem condition based on benchmark characteristics described in the Reference Sheet. A suite of 17 (or more) indicators are typically considered in an assessment. The ecological site(s) representative of an assessment location must be known prior to applying the protocol and must be verified based on soils and climate. Current plant community cannot be used to identify the ecological site.

Author(s)/participant(s)	Chris Tecklenburg Revision 5-05-2017 David Kraft, John Henry, Doug Spencer and Dwayne Rice Original Authors 2-2005
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Date	09/30/2019
Approved by	David Kraft
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** There are no rills or active headcutting present on the site.

2. **Presence of water flow patterns:** There is no evidence of water flow patterns, soil deposition or erosion on the site.

3. **Number and height of erosional pedestals or terracettes:** There is no evidence of pedestaled plants or terracettes or the site.

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. Cover can be defined as live plants, litter, rocks, moss, lichens, etc.

5. **Number of gullies and erosion associated with gullies:** There are no gullies present on the site.

6. **Extent of wind scoured, blowouts and/or depositional areas:** There is no evidence of wind erosion creating bare areas or denuding vegetation.

7. **Amount of litter movement (describe size and distance expected to travel):** Plant litter is distributed evenly throughout the site.

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** Plant canopy is sufficient to intercept the majority of raindrops. Soil organic matter is incorporated into aggregates at the surface, and/or adhesion of decomposing organic matter is present, and/or biological crusts are present on the surface. Soil stability scores will range from 4-6.

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** OSD from Inavale series; A--0 to 8 inches; dark grayish brown (10YR 4/2) moist, loamy fine sand; weak coarse granular structure;

loose; slightly alkaline; clear smooth boundary. AC--8 to 17 inches ; grayish brown (10YR 5/2) moist, loamy sand; single grained; loose; slightly alkaline; abrupt smooth boundary. C--17 to 79 inches; light brownish gray (10YR 6/2) moist, fine sand; single grained; loose; thin strata of finer and coarser textured sediments; slightly alkaline.

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** There is no negative effect on water infiltration and/or runoff due to plant community composition or distribution. Plant composition and spatial distribution are adequate to prevent any rill formation and/or pedastalling. Plant rooting patterns, litter production, decomposition processes, and spatial distribution are adequate to establish good infiltration and prevent all runoff.

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11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):** There is no evidence of compacted soil layers due to animal impact or cultural practices.

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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 tallgrasses Dominant-60%. Sand bluestem 700-1400, Indiangrass 175-525, switchgrass 175-525, prairie sandreed 105-200, composite dropseed 0-30, sand dropseed 0-30.

    Sub-dominant: Warm-season mid-, shortgrass sub-dominant 15%. little bluestem 175-525, sideoats grama 105-200, sand lovegrass 0-105, blue grama 0-30.

    Other: Cool-season grasses minor component 10%. Canada wildrye 0-105, western wheatgrass 105-200, sedge 0-30, Scribner's rosette grass 0-30, thin paspalum 0-30.

    Additional: Forbs Minor component 10%. Trees, Shrubs, and Cacti Minor 5%.

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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 subdominant groups.

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14. **Average percent litter cover (%) and depth (in):** Plant litter is distributed evenly throughout the site. There is no restriction to plant regeneration due to depth of litter. Plant litter at 45-55% cover, at a depth of .25 of an inch.

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 3,000 pounds of production per ac/yr for a below average year, 4,500 pounds of production per ac/yr for an above average year. Relative value is 3,000 pounds of production per ac/yr.

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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: There are no noxious weeds present. Invasive plants make up a small percentage of plant community, and invasive brush species are < 5% canopy.

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17. **Perennial plant reproductive capability:** The number and distribution of tillers or rhizomes is assessed on perennial plants occupying the evaluation area. No reduction in vigor or capability to produce seed or vegetative tillers given the constraints of climate and herbivory.
