Ecological site R072XY109KS
Rolling Sands

Accessed: 04/26/2024

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.

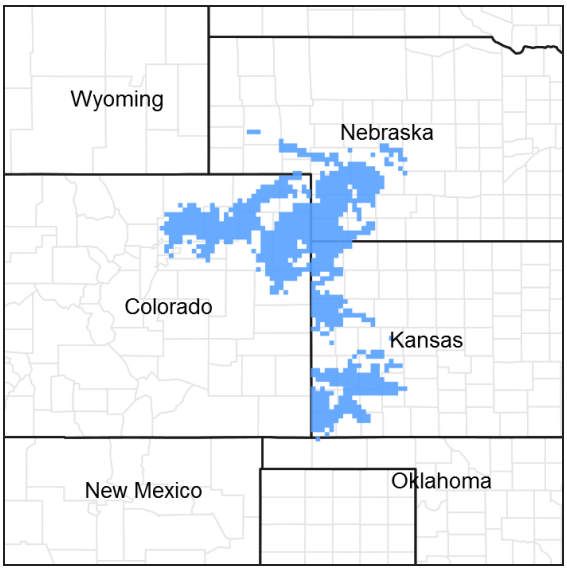


Figure 1. Mapped extent

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): 072-Central High Tableland

Ecological site concept

This site is characterized by sandy soils, generally with greater than 52 percent sand. Sandy eolian sediments make up the parent material of this ecological site. This site occurs mostly on rolling hills. The surface textures for the components that make up this site are loamy fine sand, sandy loam, and fine sandy loam.

Associated sites

R072XY110KS	**Choppy Sands** This site can be found adjacent to Rolling Sands site and is characterized by sandy soils, generally with greater than 52 percent sand. This site occurs on hummocky upland dunes and stream terraces. Slopes are generally greater than 24 percent, giving a short, steep, hummocky appearance.
R072XY111KS	**Sandy Plains** This site can be found adjacent to the Rolling Sands ecological site and is characterized by sandy soils, generally with greater than 52 percent sand. This site occurs on plains and tablelands. The textures for the surface of the components of this group are fine sandy loam, loamy sand, sandy loam, and loamy fine sand.

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) *Andropogon hallii* (2) *Calamovilfa longifolia*

Physiographic features

This site occurs on mostly rolling topography associated with sand dunes. This site generates very low to medium runoff. Inclusions of steep topography showing the characteristic “catstepped” slopes (a type of soil surface slippage caused by a combination of weak soil structure, hoof traffic of heavy herbivores, and gravity) should be very minimal on this site.

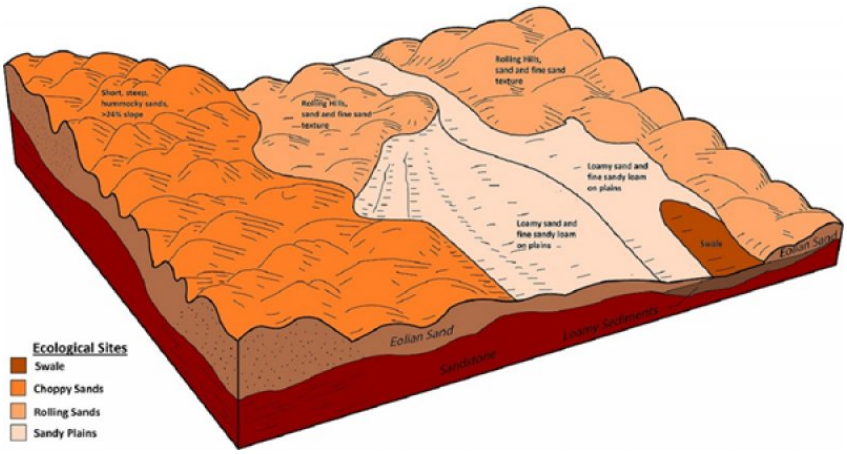


Figure 2. Sandy soils block diagram MLRA72 ESD

Table 2. Representative physiographic features

Landforms	(1) Dune (2) Hill
Flooding frequency	None
Ponding frequency	None
Elevation	3,600–5,000 ft
Slope	5–15%
Water table depth	60–80 in

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 161 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)	140 days
Freeze-free period (average)	161 days
Precipitation total (average)	20 in

Climate stations used

- (1) CROOK [USC00051996], Crook, CO
- (2) LAKIN [USC00144464], Lakin, KS
- (3) HERSHEY 5 SSE [USC00253810], Hershey, NE
- (4) IMPERIAL [USC00254110], Imperial, NE
- (5) WALLACE 2W [USC00258920], Wallace, NE
- (6) IDALIA [USC00054242], Idalia, CO
- (7) GARDEN CITY EXP STN [USC00142980], Garden City, KS
- (8) HAIGLER [USC00253515], Haigler, NE

Influencing water features

This ecological site is characterized by very deep sandy soils that are excessively drained.

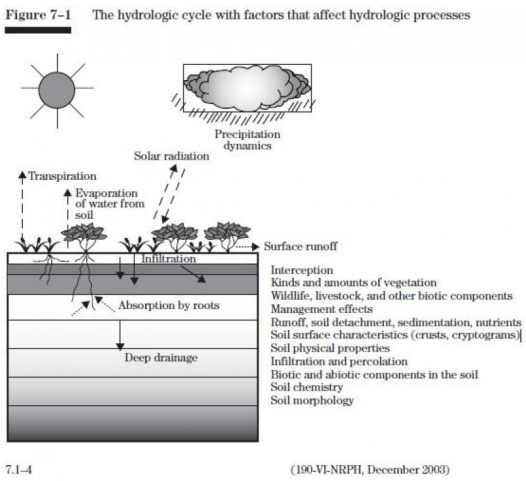


Figure 7. Fig. 7-1 from National Rangeland and Pasture Handb

Soil features

The soils of this site are moderately deep to very deep, very sandy and have thin, generally light colored surface layers. Organic matter content is generally low to moderately low in the surface layer. Sod formation is very weak or non-existent in these soils. These soils often have loose, single-grained to subangular blocky structure soil structure in all layers beneath the surface layer. These soils are highly susceptible to wind erosion when the vegetative cover is opened. Roads, trails, pipeline, overgrazing, fire and all other disturbances can be the cause of severe wind erosion on this site.

The Reference Plant Community should display slight to no evidence of rills. Water flow paths, if present, are broken, irregular in appearance or discontinuous with numerous debris dams or vegetative barriers. Minor wind

scoured areas may exist. Pedestaled plants caused by wind erosion would be minor. The soil surface is stable and intact. Sub-surface soil layers are non-restrictive to water movement and root penetration. These soils can be susceptible to erosion hazards where vegetative cover is inadequate.

Major soil series correlated to this ecological site include: Ascalon, Ashollow, Blanche, Dwyer, Julesburg, Manter, Otero, Pratt, Sarben, Valent, and Vona.

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

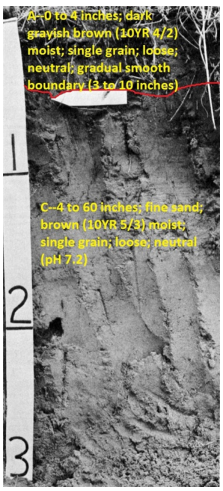


Figure 8. Valent soils profile from Lincoln, Nebraska

Table 4. Representative soil features

Surface texture	(1) Loamy fine sand (2) Fine sand (3) Loamy sand
Family particle size	(1) Sandy
Drainage class	Well drained to excessively drained
Permeability class	Moderately slow to rapid
Soil depth	40–60 in
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-40in)	3.7–5.7 in
Calcium carbonate equivalent (0-40in)	0–10%
Electrical conductivity (0-40in)	0–2 mmhos/cm
Sodium adsorption ratio (0-40in)	0
Soil reaction (1:1 water) (0-40in)	5.6–9
Subsurface fragment volume <=3" (Depth not specified)	0–12%
Subsurface fragment volume >3" (Depth not specified)	0–3%

Ecological dynamics

The plant community for this site is dynamic due to the complex interaction of many ecological processes. The

interpretive plant community for this site is the reference plant community. The reference plant community has been determined by the study of rangeland relic areas, areas protected from excessive disturbance, and areas under long-term rotational grazing strategies. 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 shrub state, and a tillage state. The grassland state is characterized by non-broken land (no tillage), both warm and cool season, tall, mid and short bunchgrasses, sod-forming grasses, forbs, and shrubs. The shrub state is dominated by sand sagebrush with a minor component of understory species. 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 depends upon on the sites geographical location inside Major Land Resource Area (MLRA) 72 the Central High Tablelands. 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).

Fires are a part of the natural disturbance regime of this site. 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.

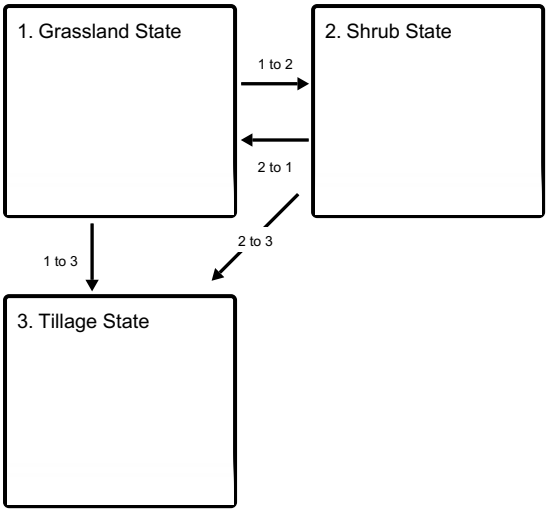
Drought cycles have historically had a major impact upon the vegetation of this site. The species composition changes according to the duration and severity of the drought cycle. Initially, the shorter rooted species die out and the deeper-rooted species persist. Eventually the opened up spaces will go through secondary succession as higher precipitation cycles return.

This ecological site occurs on undulating topography or rolling hills landscape. This site is found adjacent to the Sandy Plains and Choppy Sands ecological sites. The flatter slopes of the rolling sands are preferred by livestock, which can lead to grazing distribution problems. Water locations, salt placement, and other aids help to distribute grazing on this site. Other management techniques such as concentrated grazing and/or grazing systems can also help distribute grazing more evenly.

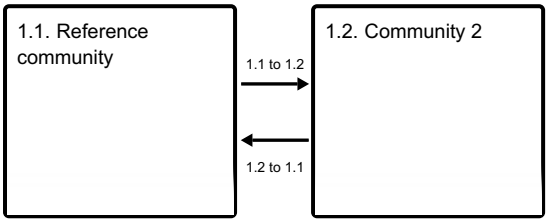
The general response of this site to heavy long-term continuous grazing is to gradually lose the vigor and reproductive potential of the tall and mid-grass species and shift the plant community toward short-grass, shrubs, and unpalatable species. The use of grazing management that includes needed distribution tools, a forage and animal balance, and adequate recovery periods during the growing season, helps to maintain and restore the reference plant community.

State and transition model

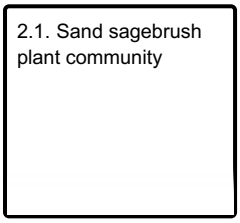
Ecosystem states



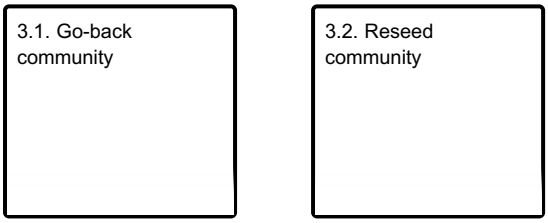
State 1 submodel, plant communities



State 2 submodel, plant communities



State 3 submodel, plant communities



State 1
Grassland State

The grassland state is supported by empirical data and is defined by two native plant communities that are a result of periodic fire, drought, herbivore, and ungulate grazers. These events are part of the natural disturbance regime and climatic process that contribute to the development of the site. The reference plant community consists of tall, mid, short, warm and cool season grasses, forbs and shrubs. This plant community is dominated (65% composition by weight) by tall and mid, warm season grasses. Plant community 1.2 is dominated by blue grama, sand sagebrush, and little bluestem and is vulnerable to exceeding the resilience limits of the Grassland State and transitioning to State 2. A loss of plant cover and an increase in bare ground creates the probability of wind erosion. Drought-induced wind scouring coupled with disturbance (fire, continuous grazing, rodents, vehicle traffic) can lead to blow outs and possibly an active dune. Extreme care and management should be taken when managing these areas. Ongoing field investigations and evaluations are necessary to assess the ecological communities in regards to resilience and changes in vegetation, soil, and hydrology of the site. The following paragraphs are narratives for each of the described plant communities. These plant communities may not represent every possibility, but they probably are the most prevalent and repeatable plant communities that exist on this ecological site. The plant composition table shown below has been developed from the best available knowledge at the time of this revision.

As more data is collected, some, of these plant communities may be adjusted or removed and new ones may be added. None of these plant communities should necessarily be thought of as “Desired Plant Communities." According to the USDA NRCS National Range and Pasture Handbook, Desired Plant Communities will be determined by the decision-makers and will meet minimum quality criteria established by NRCS. The main purpose for including any description of a plant community here is to capture the current knowledge and experience at the time of this revision.

Community 1.1
Reference community

Figure 9. reference plant community

The reference plant community serves as the basis for all other interpretations. The potential vegetation is about 80 percent grasses and grass-like plants, 10 percent forbs, and 10 percent shrubs. Sand bluestem, prairie or giant sandreed, switchgrass, Indiangrass, and little bluestem make up approximately 65% of the total annual production and are considered the dominant species in this community. Sub-dominant species making up 10% of the plant community include needle and thread, blue grama, sand lovegrass, sideoats grama, sand dropseed, composite dropseed, and western wheatgrass. The forb community is diverse and makes up approximately 10% of the total annual production per acre. Shrubs comprise 10% of this community and include sand sagebrush, plains pricklypear, soapweed yucca, western sandcherry, leadplant, prairie rose, Chicksaw plum, American plum, brittle pricklypear, and skunkbrush sumac. This plant community is well adapted to the Northern Great Plains climatic conditions and is relatively resistant to many disturbances except prolonged heavy continuous grazing, sodbusting, urban and other development. The diversity in plant species allows for high drought tolerance. Plant litter is uniformly distributed with very little movement off-site, and natural plant mortality is very low. This is a sustainable plant community in terms of soil stability, watershed function, and biologic integrity. This plant community is diverse and productive. With proper management and adequate recovery periods, this community will remain diverse, productive, and functioning at a peak ecological level. Total annual production ranges from 1,000 to 3,000 pounds of air-dried vegetation per acre per year and will average 2,000 pounds.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	800	1600	2400
Shrub/Vine	100	200	300
Forb	100	200	300
Total	**1000**	**2000**	**3000**

Figure 11. Plant community growth curve (percent production by month). KS4672, Sand Bluestem, Giant Sandreed.

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
Community 2

This plant community evolves with continuous heavy grazing without adequate recovery periods between grazing events during the growing season. Sand bluestem, prairie or giant sandreed, Indiangrass, switchgrass, western sandcherry, and leadplant have decreased in frequency and production. Blue grama, sand sagebrush, and little bluestem are the dominant species. Sand dropseed, fendler threeawn, slimflower scurfpea, hairy goldenaster, croton, cuman ragweed, stickleaf, lupine, locoweed, and milkvetch have also increased. Spring grazing and summer deferment will reduce the cool season component (needle and thread, western wheatgrass, Indian ricegrass, and sedges) of this plant community and increase the warm season component. Spring deferment and summer grazing will increase the cool season component and decrease the warm season component (sand bluestem, prairie sandreed, switchgrass) of this plant community. Community 2 is relatively stable but at risk of crossing an ecological threshold. Tall grass species, palatable forbs, and key shrubs have been replaced by increased amounts of sand sagebrush and warm season short and midgrasses. It will require considerable time and expense to return to this community once it crosses a threshold to the shrub state. If heavy, continuous spot grazing, fire, or physical disturbance occur, the reduction of ground cover may cause this plant community to shift toward a blowout condition.

Pathway 1.1 to 1.2
Community 1.1 to 1.2

This community pathway is driven by short term management (<10 years) devoid of a forage and animal balance, lack of prescription fire, and heavy continuous grazing without adequate recovery periods between grazing events. These drivers will convert the reference plant community to a community of blue grama, sand sagebrush, and little bluestem. Drought, in combination with this type of management or spring deferment and summer grazing can accelerate the rate at which the Reference Community pathways to Community phase 1.2.

Pathway 1.2 to 1.1
Community 1.2 to 1.1

This community pathway is driven by management incorporating long-term (>10-20 years) prescription grazing that includes a forage and animal balance, prescription fires at a frequency of 1 in 10 years, possibly mechanical/chemical brush management, and adequate rest and recovery periods of the dominate reference community species. This type of management will shift the plant community dominated by blue grama, sand sagebrush, and little bluestem to a community dominant of those species found in the Reference Plant Community.

State 2
Shrub State

The Shrub State is supported by empirical data and is defined by one plant community phase. The Reference Grassland State ecosystem has been driven beyond the limits of ecological resilience and has crossed a threshold into the Shrub State. The designation of the Shrub State denotes changes in plant species composition. This change in plant species affects the hydrology, erosion potential, forage production, and wildlife habitat. Understory plants may be negatively affected by shrubs reducing the availability of light, soil moisture, and soil nutrients. As the size and density of shrubs increase, the cover and productivity of understory plants decrease. Desirable forage grasses are often the most severely reduced (Eddleman, 1983). As the vegetative cover changes from grasses to shrubs, a greater proportion of precipitation leaves rangeland via evaporation; therefore, less precipitation is available for producing herbaceous forage or for deep drainage or runoff (Thurow and Hester, 1997). As establishment of shrubs increase, fine-fuel loads decrease. When the shrubs increase to greater than 30 percent canopy, the processes and functions that are inherent to this state's resiliency, become active and dominate over a grassland state. Prescribed fire can become an ineffective tool to eradicate or decrease the shrubs due to the lack of fine fuel loads. This alternative state should be tested through long-term observation of ecosystem behavior and repeated application of conservation and restoration practices. This state should be re-evaluated and refined continually.

Community 2.1
Sand sagebrush plant community

This plant community is dominated almost entirely by sand sagebrush with few understory species present. Favorable species that remain are minor and are protected by the sagebrush. The plant community evolved with no prescription fires, long term, heavy continuous grazing that did not allow adequate recovery periods between grazing events. Brush management (spraying) accelerates this change even if it includes one growing season of deferment following spraying. Brush management initially reduces the sagebrush and eliminates or greatly reduces most, if not all, other forbs and shrubs. Heavy, continuous grazing then reduces and can eliminate the remaining grass to a point where only reestablishing or established sagebrush remains. Further brush spraying at this point eliminates the sand sagebrush that is the only protection the sandy soil has. Species diversity has substantially decreased. Production varies with density and vigor of sand sagebrush. Litter distribution and nutrient cycling/carbon sequestration are not uniform. Litter levels are high and nutrients are cycling under sagebrush plants and are largely absent in the inter-spaces between plants. The water cycle is impaired. Dense shrub canopy and increased bare ground reduce effective precipitation/infiltration through evaporation and interception. Energy flow is impaired. Warm season grasses, forbs, and shrubs have been replaced by a dominance of sand sagebrush. Wind scouring can occur and can enlarge to form blowouts. Water flow paths can become connected and runoff is possible during intense storms. It has been observed that Eastern Red Cedar is encroaching this site, especially in the East, Northeast area of the MLRA. Field investigations are necessary to determine the amount and degree of infestation and whether a new community needs added to the state and transition model.

State 3
Tillage State

The Reference Grassland State ecosystem has been driven beyond the limits of ecological resilience and has crossed a threshold into the Tillage State. The designation of the Tillage State denotes changes in infiltration, runoff, bulk density, aggregate stability and species composition. The changes in inherent soil properties, water movement and the plant community affect changes in hydrologic functionality, biotic integrity, and soil and site stability. The Tillage State includes two community phases that are highly variable. These communities are derived through two distinct management scenarios, and are not related successionally. Infiltration, runoff, and soil erosion vary depending on the vegetation present. The Tillage State consist of abandoned cropland that has been naturally revegetated (go-back) or has been planted/seeded to a local grassland seed mix. 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). The Tillage State is an alternative state because the ecological functions, i.e. dynamic soil properties and plant communities are not fully restored to that of the Grassland State. Tillage can destroy soil aggregation, which is 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). This alternative state should be tested through long-term observation of ecosystem behavior and repeated application of conservation and restoration practices. This state should be re-evaluated and refined continually.

Community 3.1
Go-back community

Many areas that were once used for crop production have been returned to a native plant community, as “go-back,” i.e., allowing natural processes to repopulate the site with seeds from the surrounding area. The resulting plant community has shown various degrees of recovery depending on the extent of degradation of the original soil, time since tillage, and management of the revegetated site. Annual grasses and forbs and other opportunistic species are common in the early developmental years of go-back sites. The initial cover will primarily consist of kochia, pigweed, Russian thistle, witchgrass and tumblegrass. The next succession of plants will be grasses such as sand dropseed, threeawns and annuals. Eventually desirable warm and cool season grasses may come back if an adequate seed source is available. However, the time frame involved may prove to be too long, so a range seeding may better serve the needs of the landowner.

Community 3.2
Reseed 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. Prescription grazing to include a forage and animal balance, combined with adequate rest and recovery periods, will be necessary to maintain and enhance 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 range sites compared to native range sites with similar species composition. Species diversity is lower and forb species generally take longer to re-establish. Seeded rangeland should be managed separately, if possible, due to the natural ecological differences and vegetation preferences by livestock.

Transition 1 to 2
State 1 to 2

The triggers for this transition are long term (>30 years) management without a forage and animal balance, no prescription fires, heavy continuous grazing in the growing season and/or throughout the year, and inadequate recovery periods between grazing events. This type of management will convert the grassland state to the shrub state. Sand sagebrush is now the dominant species making up greater than 40 percent of the composition by weight. Due to the increased canopy cover of sand sagebrush there is less infiltration and an increase in interception of rainfall events. The hydrologic cycle and soil/site stability of the site are the ecological process affected.

Transition 1 to 3
State 1 to 3

This transition is triggered by a management action as opposed to a natural event. Mechanical tillage is the event that contributes directly to the loss of state resilience and is the result in a shift between the grassland state and the tillage state. Ecological structure and function has been compromised. The effects of tillage include changes in soil structure, aggregate stability, bulk density, nutrient availability, plant cover, hydrologic function, and temperature. This alternative state should be tested through long-term observation of ecosystem behavior and repeated application of conservation and restoration practices. This state should be re-evaluated and refined continually.

Restoration pathway 2 to 1
State 2 to 1

Management actions required to recover the grassland state include the removal of sand sagebrush to levels of approximately 10 percent canopy cover. Prescription fire might not be an option due to the lack of a fine fuel load. Chemical treatment of sand sagebrush is an option. Precaution and care should be taken when attempting this treatment method. The residual ecosystem properties, such as seed sources, species composition, nutrient content, and hydrologic properties, greatly influence the rate and probability of successful restoration and the management required for restoration pathways. Recommendations include a consultation and field evaluation prior to undertaking restoration activities. This restoration activity needs more field investigation and documentation.

Transition 2 to 3
State 2 to 3

This transition is triggered by a management action as opposed to a natural event. Mechanical tillage is the event that contributes directly to the loss of state resilience and is the result in a shift between the shrub state and the tillage state. Ecological structure and function has been compromised. The effects of tillage include changes in soil structure, aggregate stability, bulk density, nutrient availability, plant cover, hydrologic function, and temperature. This alternative state should be tested through long-term observation of ecosystem behavior and repeated application of conservation and restoration practices. This state should be re-evaluated and refined continually.

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	**Tall and midgrass warm season Dominant 65%**			930–1300	

	sand bluestem	ANHA	*Andropogon hallii*	400–600	–
	giant sandreed	CAGI3	*Calamovilfa gigantea*	0–300	–
	prairie sandreed	CALO	*Calamovilfa longifolia*	200–275	–
	switchgrass	PAVI2	*Panicum virgatum*	200–250	–
	little bluestem	SCSC	*Schizachyrium scoparium*	50–230	–
	Indiangrass	SONU2	*Sorghastrum nutans*	80–200	–
2	**Group 2 mix of grasses Sub-Dominant 10%**			85–200	
	blue grama	BOGR2	*Bouteloua gracilis*	25–80	–
	sand lovegrass	ERTR3	*Eragrostis trichodes*	10–80	–
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	50–80	–
	sideoats grama	BOCU	*Bouteloua curtipendula*	0–40	–
	western wheatgrass	PASM	*Pascopyrum smithii*	0–25	–
	composite dropseed	SPCO16	*Sporobolus compositus*	0–25	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	10–25	–
3	**Group 3 mix of grasses and sedges Minor 5%**			15–100	
	purple threeawn	ARPU9	*Aristida purpurea*	5–25	–
	hairy grama	BOHI2	*Bouteloua hirsuta*	5–25	–
	Scribner's rosette grass	DIOLS	*Dichanthelium oligosanthes var. scribnerianum*	5–20	–
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	0–20	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	0–15	–
	sandhill muhly	MUPU2	*Muhlenbergia pungens*	0–15	–
	sun sedge	CAINH2	*Carex inops ssp. heliophila*	0–15	–
	sedge	CAREX	*Carex*	0–15	–
	Great Plains flatsedge	CYLU2	*Cyperus lupulinus*	0–15	–
	thin paspalum	PASE5	*Paspalum setaceum*	0–10	–
Forb					
4	**Forbs and Legumes Sub-Dominant 10%**			100–200	
	lemon scurfpea	PSLA3	*Psoralidium lanceolatum*	5–20	–
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	5–20	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	5–20	–
	annual buckwheat	ERAN4	*Eriogonum annuum*	10–20	–
	Texas croton	CRTE4	*Croton texensis*	0–15	–
	tenpetal blazingstar	MEDE2	*Mentzelia decapetala*	0–15	–
	chickenthief	MEOL	*Mentzelia oligosperma*	0–10	–
	common evening primrose	OEBI	*Oenothera biennis*	0–10	–
	othake	PASP	*Palafoxia sphacelata*	0–10	–
	slimflower scurfpea	PSTE5	*Psoralidium tenuiflorum*	0–10	–
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	0–10	–
	golden prairie clover	DAAU	*Dalea aurea*	0–10	–
	silky prairie clover	DAVI	*Dalea villosa*	0–10	–
	Carolina larkspur	DECAV2	*Delphinium carolinianum ssp. virescens*	0–10	–
	bush morning-glory	IPLE	*Ipomoea leptophylla*	0–10	–

	manystem pea	LAPO2	*Lathyrus polymorphus*	0–10	–
	common starlily	LEMO4	*Leucocrinum montanum*	0–10	–
	longbract spiderwort	TRBR	*Tradescantia bracteata*	0–10	–
	snowball sand verbena	ABFR2	*Abronia fragrans*	0–10	–
	meadow deathcamas	ZIVE	*Zigadenus venenosus*	0–5	–
	dotted blazing star	LIPU	*Liatris punctata*	0–5	–
	rush skeletonplant	LYJU	*Lygodesmia juncea*	0–5	–
	plains snakecotton	FRFL	*Froelichia floridana*	0–5	–
	bluebowls	GIAC4	*Giliastrum acerosum*	0–5	–
	common sunflower	HEAN3	*Helianthus annuus*	0–5	–
	stiff sunflower	HEPA19	*Helianthus pauciflorus*	0–5	–
	camphorweed	HESU3	*Heterotheca subaxillaris*	0–5	–
	hairy false goldenaster	HEVI4	*Heterotheca villosa*	0–5	–
	coneflower	DRACO3	*Dracopis*	0–5	–
	Engelmann's daisy	ENPE4	*Engelmannia peristenia*	0–5	–
	purple prairie clover	DAPU5	*Dalea purpurea*	0–5	–
	milkvetch	ASTRA	*Astragalus*	0–5	–
	white heath aster	SYERE	*Symphyotrichum ericoides var. ericoides*	0–5	–
	beardtongue	PENST	*Penstemon*	0–5	–
Shrub/Vine					
5	**Shrubs Sub-Dominant 10%**			100–200	
	sand sagebrush	ARFI2	*Artemisia filifolia*	45–100	–
	soapweed yucca	YUGL	*Yucca glauca*	0–65	–
	western sandcherry	PRPUB	*Prunus pumila var. besseyi*	0–50	–
	plains pricklypear	OPPO	*Opuntia polyacantha*	5–25	–
	leadplant	AMCA6	*Amorpha canescens*	0–25	–
	prairie rose	ROAR3	*Rosa arkansana*	0–20	–
	Chickasaw plum	PRAN3	*Prunus angustifolia*	0–15	–
	skunkbush sumac	RHTR	*Rhus trilobata*	0–10	–
	brittle pricklypear	OPFR	*Opuntia fragilis*	0–10	–

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 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 is high and runoff potential for this site varies from moderate to low depending on ground cover. Areas where ground cover is less than 50 percent have the greatest potential to have reduced infiltration and higher runoff. (Refer to NRCS Section 4, National Engineering Handbook (NEH-4) for runoff quantities and hydrologic curves).

Recreational uses

None noted.

Wood products

No appreciable wood products are present on the site.

Other products

None noted.

Other information

Site Development and Testing Plan.

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

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 Sands (South) ESD in 2001 include: Tim Watson (KS), Amanda Shaw (KS), Susan Francis (KS), Jon Deege (KS), Harvey Sprock (CO), Robert Schiffner (KS) and Josh Saunders (CO).

NRCS individuals involved in developing the Sands (North) ESD in 2001 include: Harvey Sprock (CO), Carol Eakins (NE), Chuck Markley (NE), Jeff Nichols (NE), Mary Schrader (NE), Joan Gienger (KS) and Ted Houser (KS).

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Contributors

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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 2000's in regards 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	07/14/2016
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, are broken, irregular in appearance or discontinuous with numerous debris dams or vegetative barriers.

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

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4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** 5% or less bare ground, with bare patches ranging from 3-5 inches in diameter. Prolonged drought or wildfire events will cause bare ground to increase upwards to 5-10% with bare patches ranging from 8-12 inches in diameter.

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

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6. **Extent of wind scoured, blowouts and/or depositional areas:** Minor wind scouring may occur on knolls. Wind erosior can occur with disturbances such as wildfire or extended drought.

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7. **Amount of litter movement (describe size and distance expected to travel):** Litter should be uniformly distributed with little movement. On steep slopes or knolls, litter may move from a few inches to 1-2 feet depending on intensity of wind/rainfall event.

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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): Stability class rating anticipated to be 2-3 in interspaces at soil surface.

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** SOM ranges from 2-4%. A-horizon ranges from 0-7 inches. Soils are very deep, very dark brown (10YR 2/2) moist; loamy sand; weak fine granular structure;

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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. Extended drought and/or wildfire may reduce canopy cover and litter amounts resulting in decreased infiltration and increased runoff on slopes of 15-25%.

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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):** 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: Tall and mid warm season grasses 65%--sand bluestem >> prairie or giant sandreed = swithgrass > Indiangrass = little bluestem

    Sub-dominant: Group2 grasses 10% needleandthread = blue grama = sand lovegrass > sidoats grama > sand dropseed > composite dropseed = western wheatgrass

    Other: Group3 grasses Minor 5%. Forbs and legumes Sub-dominant 10% and Shrubs Sub-dominant at 10%.

    Additional: See functional and structural group sheet for specific forbs and shrubs.

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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 sub-dominant groups.

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14. **Average percent litter cover (%) and depth (in):** 40-65% litter cover at 0.25-0.50 inch depth. Litter cover during and following drought can range from 25-35% and 5-15% following wildfire.

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 1000 lbs./ac. low precip years, 2000 lbs./ac. average precip years, 3000 lbs./ac. high precip years. After extended drought or the first growing season following wildfire, production may be significantly reduced by 400 – 750 lbs./ac. or more.

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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: Invasive plants should not occur in reference plant community. Following wildfire or extended drought, cheatgrass, Russian thistle, kochia, Rocky Mountain beeplant will invade assuming a seed source is available. Blue grama and sand sagebrush are the major native (non-invasive) increasers on this site.

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17. **Perennial plant reproductive capability:** The only limitations are weather-related, wildfire, natural disease, and insects that may temporarily reduce reproductive capability.
