USDA Natural Resources Conservation Service

Ecological site R072XY107KS
Sandy Lowland

Accessed: 04/10/2021

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.

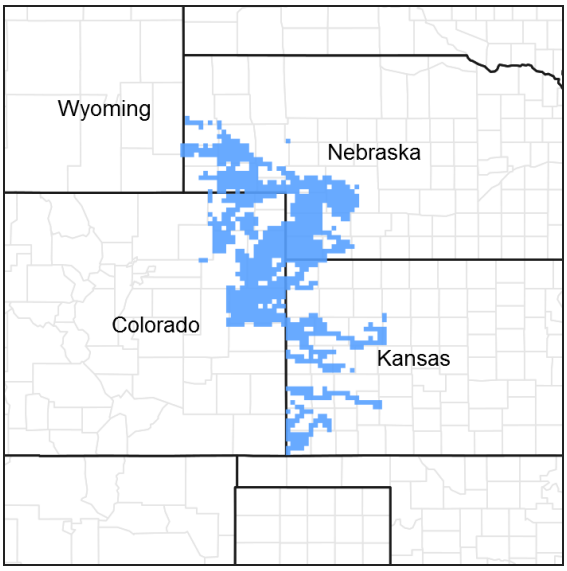


Figure 1. Mapped extent

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 occurs on nearly level to moderately sloping floodplains and low terraces. The Sandy Lowland site is characterized by soils with greater than 55 percent sand in the surface. The soils characteristic of this site formed in sandy alluvium from mixed sources.

Associated sites

R072XY109KS	**Rolling Sands** This site is made up of sandy soils located on rolling hills that can be adjacent to the Sandy Lowland ecological site.
R072XY111KS	**Sandy Plains** This site is made up of sandy soils located on plains that can occur adjacent to the Sandy Lowland ecological site.

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) *Andropogon hallii* (2) *Schizachyrium scoparium*

Physiographic features

This site occurs on nearly level to moderately sloping floodplains, upland drainageways, alluvial fans, and terraces. This site receives runoff from areas higher on the landscape. Flooding frequency ranges from none to frequent and flooding duration is very brief to brief. Sedimentation is usually rare, but is common on alluvial fans and terraces.

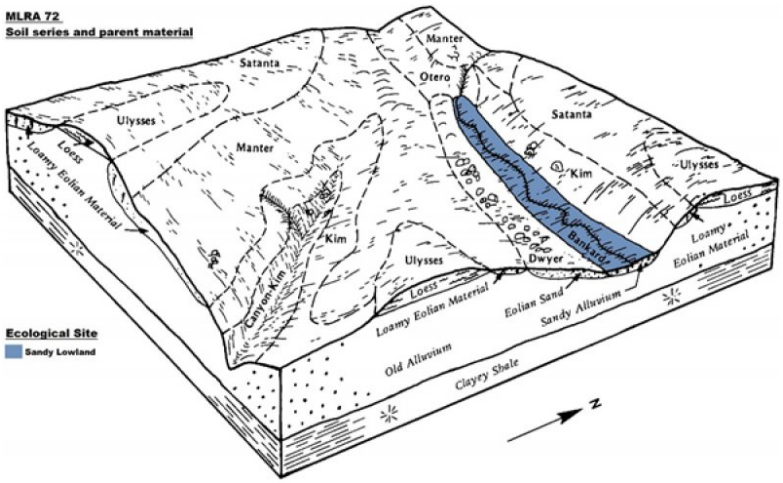


Figure 2. MLRA72 block diagram

Table 2. Representative physiographic features

Landforms	(1) Flood plain (2) Terrace
Flooding duration	Very brief (4 to 48 hours) to brief (2 to 7 days)
Flooding frequency	Rare to frequent
Ponding frequency	None
Elevation	2,230–5,150 ft
Slope	0–4%
Ponding depth	0 in
Water table depth	73 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 159 days and ranges from 135 to 210 days, increasing in length from northwest to southeast. Climate data comes from the Natural Resources Conservation Service (NRCS) National Water and Climate Center. The data set is from 1981-2010.

Table 3. Representative climatic features

Frost-free period (average)	140 days
Freeze-free period (average)	159 days
Precipitation total (average)	20 in

Climate stations used

- (1) HOLYOKE [USC00054082], Holyoke, CO
- (2) RICHFIELD [USC00146808], Richfield, KS
- (3) WINONA [USC00148988], Winona, KS
- (4) KIMBALL 2NE [USC00254440], Kimball, NE
- (5) WALLACE 2W [USC00258920], Wallace, NE
- (6) OAKLEY 4W [USC00145888], Oakley, KS
- (7) HERSHEY 5 SSE [USC00253810], Hershey, NE
- (8) MADRID [USC00255090], Madrid, NE
- (9) YUMA [USC00059295], Yuma, CO
- (10) GARDEN CITY RGNL AP [USW00023064], Garden City, KS
- (11) SYRACUSE 1NE [USC00148038], Syracuse, KS
- (12) HAIGLER [USC00253515], Haigler, NE
- (13) LODGEPOLE [USC00254900], Lodgepole, NE

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.

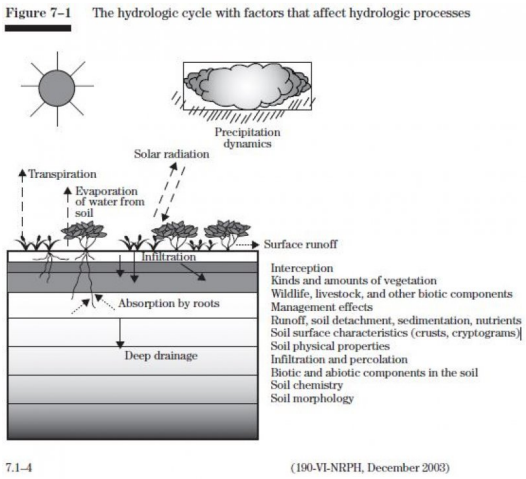


Figure 7. Fig. 7-1 from National Range and Pasture Handbook

Soil features

The soils on this site are very deep and range from moderately well drained to somewhat excessively drained. The parent material is local alluvium derived from mixed origins. The surface soil is from 3 to 20 inches thick, generally is light colored, and ranges widely from very sandy to loamy textures. 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 frequent, depending on landform, and normally is very brief.

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. Moving sand is inherent to this site. Wind-scoured areas may exist in areas. 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 Bankard, Calamus, Cass, Craft, Glenberg, Happyditch, and Haverson. Other soil series that have been correlated to this site include Broadwater (very gravelly surfaces, on drainageways and alluvial fans).

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

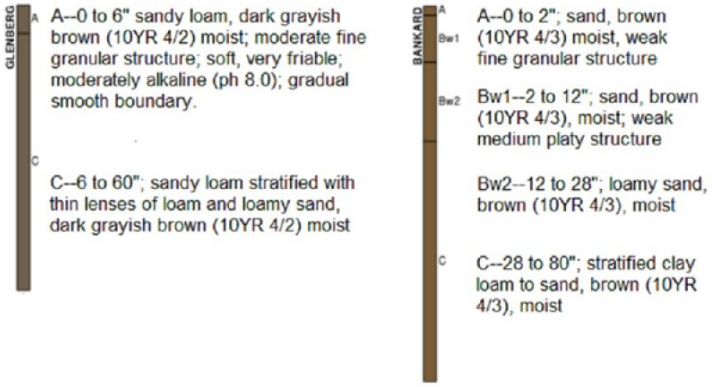


Figure 8. Glenberg and Bankard soil profiles

Table 4. Representative soil features

Surface texture	(1) Fine sandy loam (2) Loamy sand (3) Sandy loam
Family particle size	(1) Sandy
Drainage class	Very poorly drained
Permeability class	Moderate to very rapid
Soil depth	60–80 in
Surface fragment cover <=3"	0–5%
Surface fragment cover >3"	0–1%
Available water capacity (0-40in)	2–8 in
Calcium carbonate equivalent (0-40in)	0–15%
Electrical conductivity (0-40in)	0–4 mmhos/cm
Sodium adsorption ratio (0-40in)	0–5
Soil reaction (1:1 water) (0-40in)	5.6–9
Subsurface fragment volume <=3" (Depth not specified)	0–45%

Subsurface fragment volume >3" (Depth not specified)	0–10%

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 Woody State, and a Tillage State. The Grassland State is characterized by non-broken land (no tillage), both warm and cool season bunchgrasses, sod-forming grasses, forbs, and shrubs. The woody state is dominated by sand sagebrush with a canopy cover greater than 30 percent. 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 upon the site's geographical location inside Major Land Resource Area 72 (MLRA). Variation in precipitation east and west is not as affected as are temperature north and south. The northern part of MLRA 72 is characterized by cooler temperatures and a 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 grasshoppers, gophers, and root-feeding organisms impacted the vegetation historically, and continue to this day.

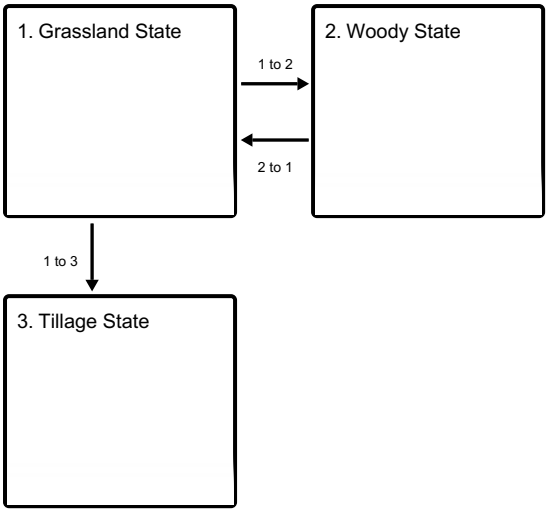
The management of herbivory by humans through grazing of domestic livestock and/or manipulation of wildlife populations has been a major influence on the ecological dynamics of the site. This management coupled with the High Plains climate largely dictates the plant communities for the site.

Drought cycles were part of the natural disturbance regime and contribute to the range of variability of the vegetation within the site. Droughts have historically had a major impact upon the vegetation of this MLRA as well as this site. The species composition changes according to the duration and severity of the drought cycle (Albertson, F. W., Weaver, J. E.).

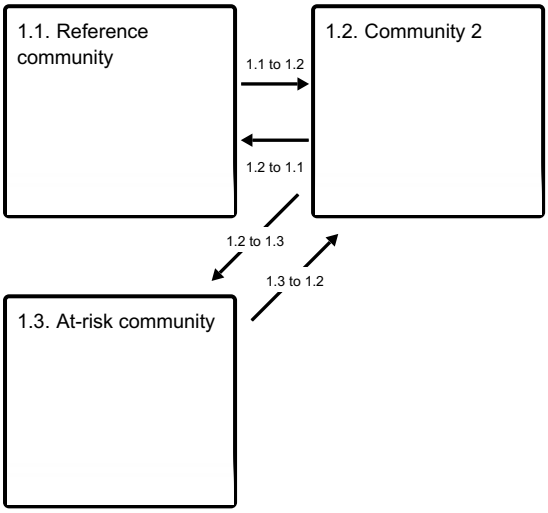
This site occurs on nearly-level bottomland adjacent to streams. It is seldom found in extensive areas, but rather in isolated pockets. Management of this range site by itself can generate challenges. The Sandy Lowland site is preferred by livestock, which can lead to grazing distribution concerns. Water locations, salt placement, and other aids help to distribute grazing on this site. Other management techniques such as concentrated grazing and/or grazing systems also to help distribute grazing more evenly. The general response of this site to heavy, long term continuous grazing pressure without adequate rest and recovery is to gradually lose the vigor and reproductive potential of the tall and mid-grass species and shift the plant community toward less palatable species, cool season dominant species, shrubs and or short-grass species.

State and transition model

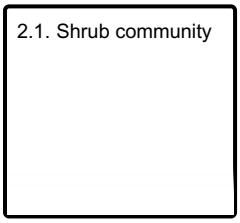
Ecosystem states



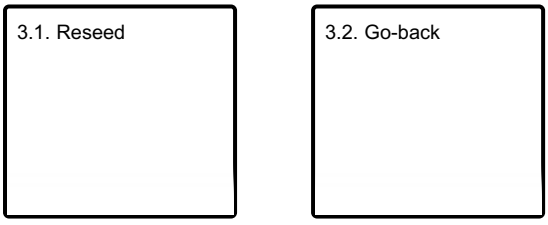
State 1 submodel, plant communities



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 three native plant communities that are a result of periodic fire, drought, and 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 and mid, warm and cool season grasses, forbs, and shrubs. Plant community 2 is dominated by

sand dropseed and western wheatgrass and combined with a minor component of reference community plant species. The third plant community that makes up the grassland state is called an at-risk plant community. This plant community is most vulnerable to exceeding the resilience limits of the grassland state and transitioning to an alternative state. This plant community is dominated by sand sagebrush and blue grama.

Continuous use, an absent forage and animal balance, in combination with inadequate rest of the dominant Reference Plant Community species, will reduce the production of the bluestems allowing western wheatgrass and sand dropseed to increase. To a small extent, some buffalograss will also increase. After the vegetation is reduced to western wheatgrass and heavy continuous grazing of the dominant plant species continues, kochia, Russian thistle, and other undesirable annuals can invade the area.

Once most of the taller species are eliminated from the site through grazing pressure and/or dry weather, regaining the potential vegetation through management is extremely slow and may take several decades. Where remnants of the taller species remain, grazing management that includes a forage and animal balance and scheduled rest during the growing season can be effective in returning the site to near its potential.

Cottonwood trees and sandbar willow trees can persist on this site due to fire suppression. These trees establish well and are a minor component of the reference vegetation of this 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

The Reference Plant Community serves as the basis for all other interpretations. The potential vegetation of this site is a mixed grass prairie. This community is comprised of approximately 85 percent grasses and grass-like plants, 10 percent forbs, and 5 percent shrubs. Sand bluestem, little bluestem, switchgrass, and sideoats grama are the dominant species in this community making up 55 percent of the total annual production per acre per year (ac/yr). Sub-dominant species making up 20 percent of the total annual production include Indiangrass, prairie sandreed, giant sandreed, sand lovegrass, needle and thread, vine mesquite, and western wheatgrass. The Reference Community has a very diverse forb population that makes up 10 percent of the total annual production per ac/yr.

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 (needle and thread, sedges) of this plant community and increase the warm season component (sand bluestem, prairie sandreed, switchgrass, Indiangrass) and palatable shrubs (western sandcherry, leadplant). 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 mineral 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 1,300 to 3,000 pounds of air-dried vegetation per acre per year and will average 2,400 pounds.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	1125	2040	2500
Forb	100	240	300
Shrub/Vine	75	120	200
Total	**1300**	**2400**	**3000**

Figure 10. Plant community growth curve (percent production by month). KS5572, Sand Bluestem, Little Bluestem.

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 developed under heavy, continuous season long grazing that did not allow for the rest and recovery of dominant reference plant community species. This community is dominated by sand dropseed and western wheatgrass. Other species that make up less than 10 percent of the total annual production include needle and thread, little bluestem, blue grama, sideoats grama, and switchgrass. Compared to the reference plant community, sand bluestem and other highly palatable species have decreased due to grazing pressure.

The remainder palatable, tall and 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.

The total annual production of this site is approximately 2,200 pounds per acre (air-dry weight).

Community 1.3
At-risk community

This plant community evolves with long term, continuous grazing during the growing season or throughout the year. There is no forage and animal balance to allow for adequate rest and recovery. Prescription fire has been removed as a management tool. Remnant tall grasses and palatable forbs and shrubs may still be present, but have significantly decreased in abundance and likely make up less than 2 percent of the total production of the site. Blue grama and sand sagebrush dominate the plant community, making up greater than 40 percent of the plant community. In some locations it is evident that needle and thread is a sub-dominant species of this plant community, consisting of 10-40 percent. Minor component species include thin paspalum, yucca, prickly pear cactus, and annual grasses.

The mineral, nutrient, and water cycles are moderately impaired at this point. Large areas of bare ground are obvious, as well as reduced litter. These factors limit infiltration, which affects the uptake of nutrients from the soil to the plant. The extra moisture (snowfall) trapped by the sand sagebrush plant in this state becomes less beneficial for all plants because of the decrease in forage and the continual increase of sand sagebrush. The more desirable and palatable grasses are not able to compete with the sand sagebrush plant for the moisture mainly due to individual growth patterns. The sand sagebrush plant starts using available moisture to put on leaf cover in mid to late April and warm season grasses normally will not start growth until mid to late May.

This community is at risk of completely losing many of the palatable species and crossing a threshold into the woody state. Once this occurs it will require considerable energy, time, and expense to return to the grassland state.

Caution should be taken when chemical shrub control method is used on this site. The chemical control not only controls the sand sagebrush, but removes most if not all of the other shrubs and forbs in the applied vicinity. Plant

diversity is reduced, resulting in a plant community predominately made up of grasses. Due to a lack of species diversity and an increase in bare ground, the site becomes susceptible to wind erosion. The species and production can vary considerably depending upon what was present when the management was applied, how long ago it was applied, and how long and in what manner the grazing has been managed. The community can vary from predominately blue grama to nearly pure stands of prairie sandreed. Secondary species can include needle and thread, sand dropseed, Fendler threeawn, and sandhill muhly.

The total annual production of this site is approximately 1,500 pounds per acre (air-dry weight).

Pathway 1.1 to 1.2
Community 1.1 to 1.2

Short term management (<10 years) without a forage and animal balance, no prescription fires, and continuous grazing without adequate recovery periods between grazing events will convert the reference plant community to a community of sand dropseed and western wheatgrass. Drought, in combination with this type of management, will quicken the rate at which the Reference Community pathways to community 2.

Pathway 1.2 to 1.1
Community 1.2 to 1.1

Management that incorporates long-term (>10-20 years) prescription grazing that includes a forage and animal balance, incorporating prescription fires at a frequency of 1 in 10 years and providing adequate rest and recovery periods. This type of management will move from a plant community dominated by sand dropseed and western wheatgrass and restore those species found in the reference plant community.

Pathway 1.2 to 1.3
Community 1.2 to 1.3

Long-term (>20 years) management without a forage and animal balance, an absence of brush maintenance or removal, no prescription fires, and continuous grazing without adequate recovery periods between grazing events will convert community 2 to a community of sand sagebrush and blue grama. Drought, in combination with this type of management, will quicken the rate at which community 2 pathways to the at-risk community.

Pathway 1.3 to 1.2
Community 1.3 to 1.2

Management that incorporates long-term (>40 years) prescription grazing, a forage and animal balance, brush management, and adequate rest and recovery periods will favor this plant community to restore from a sand sagebrush and blue grama community to community phase 2. Caution should be taken when chemical shrub control method is used on this site. See at-risk narrative above for further guidance.

State 2
Woody State

The Woody State is supported by empirical data and is defined by one plant community phase.
The Grassland State ecosystem has been driven beyond the limits of ecological resilience, and has crossed a threshold into the Woody State. The designation of the Woody State denotes changes in plant species composition. This change in plant species affects the hydrology, erosion potential, forage production, and wildlife habitat of the site. 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 often are 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 increases, fine-fuel loads decrease. When the shrubs increase to greater than 30 percent canopy, the processes and functions that allow this state to become resilient become active and dominate over a grassland state. Prescribed fire can become an ineffective tool to eradicate 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
Shrub community

This plant community is a result of approximately 40 years of management that includes an absence of prescribed fire and continuous grazing that does not allow for adequate recovery periods between grazing events. Sand sagebrush dominates the plant community, with small amounts of invader and other unpalatable species present. Favorable species that remain are few, and are protected from grazing by the growth habit of the sand sagebrush plant.

Brush management through the use of chemicals initially reduces the sand sagebrush plant and, unfortunately, 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 established sand sagebrush remains. Further brush spraying eliminates the sand sagebrush, which is the only protection the sandy soil has at this point.

Sand sagebrush is visually noticeable in this community. The canopy cover has increased to 30 percent or greater. Chemical treatment of sand sagebrush becomes feasible in this state due to the potential increase in forage production, but note that deferment is needed before grazing can resume. Sand sagebrush cover greater than 30 percent competes heavily with more desirable plants for available soil moisture.

The water, nutrient, and mineral cycles are severely impaired. Infiltration is reduced considerably and runoff is greatly increased. The amount of brush present leads to large areas of bare ground. Forage production has decreased to the point that litter is present only in very small amounts. With an increase in evaporation and decrease in infiltration occurring, nutrients and minerals have no avenue to travel from the soil to the plant, further decreasing the health and vigor of the grass plant.

Adversely, the amount of sand sagebrush present will very efficiently catch and trap snow. This does increase available water for the sand sagebrush plant. This extra moisture is not readily available to more desirable and palatable grasses, as the sand sagebrush plant has eliminated the majority of the vegetation around themselves. The extra moisture increases sagebrush production while having no beneficial effect on forage production.

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 soil properties and plant communities. These changes affect the hydrologic function, biotic integrity, and soil and site stability of the ecological site.

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 on a continual basis.

Community 3.1
Reseed

This plant community can vary considerably depending upon how eroded the soil was, the species seeded, the stand that was established, how long ago the stand was established, and the management of the stand since establishment. Prescription grazing, to include a forage and animal balance with adequate recovery periods, will be necessary to maintain productivity and desirable species.

There are several factors that make seeded rangeland a distinct grazing resource from native rangeland. 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 a seeded range site compared to native range site with similar species composition. Species diversity is lower, and forb species generally take longer to re-establish. The soil structure changes as a result of tillage affect the hydrologic function and the nutrient availability of the site. Seeded rangeland should be managed separately due to the natural ecological differences.

Community 3.2
Go-back

The go-back plant community is established when the soil is tilled or farmed (sodbusted), and then abandoned. All of the native plants are killed, soil organic matter/carbon reserves are reduced, soil structure is changed, and a plowpan or compacted layer can be formed, decreasing water infiltration. Synthetic chemicals may remain as a residual from farming operations. In early successional stages, this site is not stable. Erosion is a concern. The site evolves through several plant communities.

Succession begins with early perennial species such as sandhill muhly, blowout grass, lemon scurfpea, and various annuals. Eventually other perennial warm and cool season species can establish. This successional process takes many years (>40 years), and will require prescription grazing to include a forage and animal balance and adequate rest and recovery of the designated key forage species.

Transition 1 to 2
State 1 to 2

Transition from a grassland state to a woody state is a result of a prescription fire frequency greater than 20 years and the absence of managing shrub species at canopy levels below 5-10 percent, coupled with inadequate rest and recovery of dominant key plant community species. Prescribed fire can become an ineffective tool to eradicate shrubs due to the lack of fine fuel loads. This transition is a result of management applied over a period of approximately 40 years. The canopy cover of sand sagebrush is greater than 30 percent, which is beyond what a prescription fire or routine brush management techniques are able to control.

Transition 1 to 3
State 1 to 3

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. Soil properties affected by tillage include plant cover, nutrient availability, structure and aggregate stability, hydrologic function, temperature, and bulk density.

Transition 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 requires more field investigation and documentation.

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 mid warm season**			800–1320	
	sand bluestem	ANHA	*Andropogon hallii*	400–620	–
	little bluestem	SCSC	*Schizachyrium scoparium*	200–330	

	little bluestem	SCSC	*Schizachyrium scoparium*	200–330	–
	switchgrass	PAVI2	*Panicum virgatum*	200–300	–
	sideoats grama	BOCU	*Bouteloua curtipendula*	0–180	–
2	**Tall warm season**			110–240	
	Indiangrass	SONU2	*Sorghastrum nutans*	110–200	–
	prairie sandreed	CALO	*Calamovilfa longifolia*	0–100	–
	giant sandreed	CAGI3	*Calamovilfa gigantea*	0–70	–
	sand lovegrass	ERTR3	*Eragrostis trichodes*	0–50	–
3	**Cool and warm season**			75–240	
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	75–100	–
	vine mesquite	PAOB	*Panicum obtusum*	0–70	–
	western wheatgrass	PASM	*Pascopyrum smithii*	0–70	–
4	**Short and tall warm season**			0–120	
	sand dropseed	SPCR	*Sporobolus cryptandrus*	0–100	–
	blue grama	BOGR2	*Bouteloua gracilis*	0–50	–
	hairy grama	BOHI2	*Bouteloua hirsuta*	0–50	–
	composite dropseed	SPCOC2	*Sporobolus compositus var. compositus*	0–25	–
5	**Cool and warm season**			0–120	
	Canada wildrye	ELCA4	*Elymus canadensis*	0–75	–
	sedge	CAREX	*Carex*	0–50	–
	Scribner's rosette grass	DIOLS	*Dichanthelium oligosanthes var. scribnerianum*	0–40	–
	thin paspalum	PASE5	*Paspalum setaceum*	0–40	–
	purple threeawn	ARPU9	*Aristida purpurea*	0–15	–
Forb					
6				50–240	
	lemon scurfpea	PSLA3	*Psoralidium lanceolatum*	10–25	–
	white heath aster	SYERE	*Symphyotrichum ericoides var. ericoides*	10–25	–
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	10–25	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	10–25	–
	Texas croton	CRTE4	*Croton texensis*	10–25	–
	purple prairie clover	DAPU5	*Dalea purpurea*	0–10	–
	silky prairie clover	DAVI	*Dalea villosa*	0–10	–
	Carolina larkspur	DECAV2	*Delphinium carolinianum ssp. virescens*	0–10	–
	Illinois bundleflower	DEIL	*Desmanthus illinoensis*	0–10	–
	Engelmann's daisy	ENPE4	*Engelmannia peristenia*	0–10	–
	annual buckwheat	ERAN4	*Eriogonum annuum*	0–10	–
	common sunflower	HEAN3	*Helianthus annuus*	0–10	–
	Maximilian sunflower	HEMA2	*Helianthus maximiliani*	0–10	–
	stiff sunflower	HEPA19	*Helianthus pauciflorus*	0–10	–
	hairy false goldenaster	HEVI4	*Heterotheca villosa*	0–10	–
	bush morning-glory	IPLE	*Ipomoea leptophylla*	0–10	–
	manystem pea	LAPO2	*Lathyrus polymorphus*	0–10	–
	common starlily	LEMO4	*Leucocrinum montanum*	0–10	–

	dotted blazing star	LIPU	*Liatris punctata*	0–10	–
	rush skeletonplant	LYJU	*Lygodesmia juncea*	0–10	–
	tenpetal blazingstar	MEDE2	*Mentzelia decapetala*	0–10	–
	chickenthief	MEOL	*Mentzelia oligosperma*	0–10	–
	Nuttall's sensitive-briar	MINU6	*Mimosa nuttallii*	0–10	–
	evening primrose	OENOT	*Oenothera*	0–10	–
	othake	PASP	*Palafoxia sphacelata*	0–10	–
	longbract spiderwort	TRBR	*Tradescantia bracteata*	0–10	–
	meadow deathcamas	ZIVE	*Zigadenus venenosus*	0–10	–
	slimflower scurfpea	PSTE5	*Psoralidium tenuiflorum*	0–10	–
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	0–10	–
	snowball sand verbena	ABFR2	*Abronia fragrans*	0–10	–
Shrub/Vine					
7	**Shrub and trees**			40–120	
	sand sagebrush	ARFI2	*Artemisia filifolia*	40–115	–
	western sandcherry	PRPUB	*Prunus pumila var. besseyi*	0–25	–
	soapweed yucca	YUGL	*Yucca glauca*	0–25	–
	leadplant	AMCA6	*Amorpha canescens*	0–20	–
	devil's-tongue	OPHU	*Opuntia humifusa*	0–20	–
	plains pricklypear	OPPO	*Opuntia polyacantha*	0–20	–
	eastern cottonwood	PODE3	*Populus deltoides*	0–15	–
	American plum	PRAM	*Prunus americana*	0–15	–
	Chickasaw plum	PRAN3	*Prunus angustifolia*	0–15	–
	prairie rose	ROAR3	*Rosa arkansana*	0–10	–
	willow	SALIX	*Salix*	0–10	–

Animal community

Wildlife Interpretations:

The Sandy Lowland ecological site can be found on nearly level to moderately sloping floodplains, upland drainageways, alluvial fans, and terraces along major streams. Much of this site occurs in narrow bands. The majority of this site has been converted to crop production, resulting in fragmentation and loss of habitat. Historically, the predominance of grasses and forbs on this site supported grazers and mixed feeders such as bison, elk and mule deer, and pronghorn and a variety of grassland-associated birds and small mammals. Due to the heterogeneity inherent in all landscapes, some areas were not uniformly grazed 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 upon a plant community diverse in species and structure. This need is evident in the variability of known habitat requirements of grassland-associated wildlife.

Sand sagebrush may be present and locally abundant on this site. Sagebrush offers escape and thermal cover for several species of wildlife, and a source of winter browse for other species. Since this site is located next to major streams where trees have either historically existed or recently encroached along the drainages, the presence of trees makes this site generally unsuitable for prairie chickens and other ground-nesting birds that require large expanses of non-woody habitat. Woody species, such as those commonly established in tree plantings, provide habitat for mid-sized mammals such as raccoons, opossums, and striped skunks, and can also be detrimental to ground-nesting birds native to grassland habitats. Trees also can increase the potential for nest parasitism by

brown-headed cowbirds when adjacent to grasslands. Trees of sufficient size adjacent to drainages do offer roosting habitat for wild turkeys, and nesting and perching habitat for raptors.

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 large number of insects will alter plant community diversity and structure, and associated wildlife species.

Sand bluestem, little bluestem, switchgrass, and sideoats grama 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 generally will 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, western hognose snakes, and six-lined racerunners are common reptiles on the site. Areas with high forb diversity, and large insect populations, coupled with nearby roost trees, offer suitable brood habitat for wild turkeys. Burrowing mammals such as thirteen-lined ground squirrels and kangaroo rats are common. Several species of pocket mice are common, and provide prey for raptors such as red-tailed hawks and great-horned owls throughout the year, and prey for northern harriers and rough-legged hawks during the winter. Small mammals provide prey for coyotes and other predators.

Sand sagebrush, blue grama Plant Community

With reduced cover of the taller native bunch grasses and a decrease in residual plant cover that is usually associated with the degradation of the Reference Plant Community, quail and other ground-nesting bird habitat begins to decline. Areas with scattered growths of sand sagebrush offer nesting habitat for Cassin’s sparrow and lark buntings, and winter habitat for bob-white quail. Areas with a canopy cover of 20-30 percent sand sagebrush with an understory of grasses and forbs offer nesting, winter, brood-rearing, and foraging habitat for greater prairie chickens. Sand sagebrush offers a winter food source for mule deer and pronghorn. Species composition of small mammals can shift rapidly in response to changes in the plant community structure that occur due to overgrazing or other disturbances such as wildfire.

Go-back and Seeded Rangeland:

The wildlife species expected on seeded rangeland and go-back communities are those listed for the plant community the seeding most resembles.

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 grazability 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 upon the variability factors.

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

Hydrological functions

Progressive work on this section continues.

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 are not limited to, project office leader, area soil scientist, state soil scientist, ecological site specialist, state rangeland conservationist, area rangeland management specialist, and local field personnel. Field visits are to be determined by spatial extent of the site as well as personal knowledge of the site. Activities during field visits will include but are 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 extensively used to develop this ecological site description.

Those NRCS individuals involved in developing the sandy lowland ecological sites North and South in the early 2000s include Carol Eakins, Chuck Markley, Jeff Nichols, and Mary Schrader from Nebraska; Joan Gienger, Ted Houser, Tim Watson, Amanda Shaw, Susan Francis, Jon Deege, and Robert Schiffner from Kansas. Josh Saunders and Harvey Sprock from Colorado.

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MLRA 72 Workshop: Quality control review, comments, and field verification of ecological sites, Wray Colorado, April 26-27, 2016. Those individuals include Julie Elliot, Kimberly Diller, Clark Harshbarger, Kristi Gay, Josh Saunders, Tom Nadgwick, and Mike Moore from Colorado. Chuck Markley, Jeff Nichols, Kristin Dickinson, and Dan Shurtliff from Nebraska. David Kraft, Michelle Bush, Tom Cochran, Roger Tacha, Ted Houser, and Chris Tecklenburg (current ESI specialist MLRA72) from Kansas.

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

Contributors

Chris Tecklenburg

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Rangeland health reference sheet

Interpreting Indicators of Rangeland Health is a qualitative assessment protocol used to determine ecosystem condition based on benchmark characteristics described in the Reference Sheet. A suite of 17 (or more) indicators

are typically considered in an assessment. The ecological site(s) representative of an assessment location must be known prior to applying the protocol and must be verified based on soils and climate. Current plant community cannot be used to identify the ecological site.

Author(s)/participant(s)	Chris Tecklenburg Revision 5-16-2016 David Kraft, John Henry, Doug Spencer and Dwayne Rice Original Authors 2-2005
Contact for lead author	Chris Tecklenburg (chris.tecklenburg@ks.usda.gov) David Kraft (david.kraft@ks.usda.gov)
Date	05/16/2016
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 Glenberg series; 0-6 inches sandy loam, dark grayish brown (10YR 4/2) moist; moderate fine granular structure; soft, very friable; moderately alkaline (ph 8.0); gradual smooth boundary. OSD from Bankard; 0 to 2 inches, sand, brown (10YR 4/3) moist, 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:** 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, 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: Tall and mid warm season grasses 55%: sand bluestem >> little bluestem = switchgrass >> sideoats grama

    Sub-dominant: Tall warm season grasses 10%: indiangrass > prairie sandreed > ginat sandreed > sand lovegrass
    Cool and warm season mix 10%: needle and thread = vine mesquite = western wheatgrass
    Forbs 10%

    Other: Group 4 (short and tall warm season) 5 (cool and warm season mix) and group 7 shrub and trees all minor components at 5%.

    Additional:

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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):** 1300 pounds of production per ac/yr for a below average year, 3000 pounds of production per ac/yr for an above average year. Relative value is 2400 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:** Plants on site exhibit the required vigor and growth to be able to reproduce vegetatively or by seed.
