USDA Natural Resources Conservation Service

Ecological site R073XY115KS
Closed Upland Depression

Last updated: 5/05/2020
Accessed: 05/12/2025

General information

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

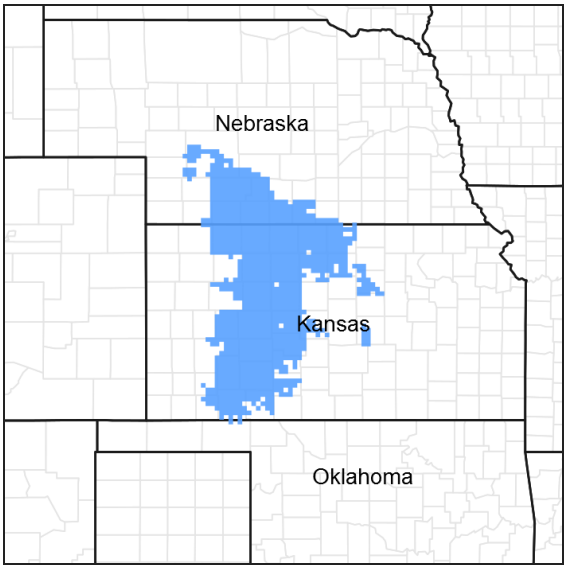


Figure 1. Mapped extent

Areas shown in blue indicate the maximum mapped extent of this ecological site. Other ecological sites likely occur within the highlighted areas. It is also possible for this ecological site to occur outside of highlighted areas if detailed soil survey has not been completed or recently updated.

MLRA notes

Major Land Resource Area (MLRA): 073X–Rolling Plains and Breaks

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

Classification relationships

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

Ecological site concept

The Closed Upland Depression ecological site occurs on the rolling plains landscape. This site occurs in small to large depressions called playas that have very slow to slow permeability classes and a range of low to high available water capacity. This site receives water runoff from areas higher on the landscape.

This site was formerly known as Closed Upland Depression (North) R072XA011KS, Closed Upland Depression (South) R072XB011KS, Lakebed (South), Kansas Range Site Description Lakebed and Lakebed ESD (March 2001) R072XY011KS. The 2016 ESD name and id is Closed Upland Depression R073XY115KS.

Associated sites

R073XY100KS	**Loamy Plains** The Loamy Plains ecological site is commonly located adjacent to or in coordination with the Closed Upland Depression site. The Loamy Plains ecological site occurs on relatively flat ridges, plains, and only occasionally on moderately steep side slopes. This site is located where extra moisture from drainage or overflow is not received, therefore produces runoff to areas lower on the landscape.

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	Not specified

Physiographic features

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

The principal parent material of the Closed Upland Depression site was formed in loess, clayey alluvium, and eolian sediments.

This site occurs in playas and depressions on the plains landscape. The Closed Upland Depression site receives runoff from areas higher on the landscape. The site is ponded for brief to long periods from run-in water, but is not subject to flooding.

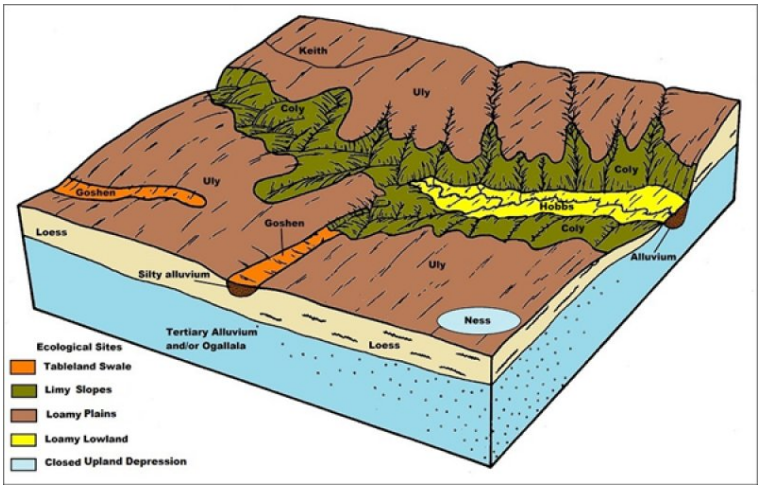


Figure 2. Ecological site block diagram.

Table 2. Representative physiographic features

Landforms	(1) Playa (2) Depression
Flooding frequency	None
Ponding duration	Brief (2 to 7 days) to long (7 to 30 days)
Ponding frequency	Occasional to frequent
Elevation	488–853 m
Slope	0–1%
Ponding depth	0–30 cm
Water table depth	152 cm

Climatic features

For MLRA 73 the average annual precipitation is 19 to 30 inches (48 to 76 centimeters). Most of the rainfall occurs as high-intensity, convective thunderstorms during the growing season. The maximum precipitation occurs from the middle of spring to the early autumn months. Precipitation in winter occurs as snow. The annual snowfall ranges from about 17 inches (45 centimeters) in the southern part of the area to 24 inches (60 centimeters) in the northern part. The average annual temperature is 48 to 56 degrees F (9 to 14 degrees C). The freeze-free period averages 180 days and ranges from 145 to 210 days, increasing in length from northwest to southeast. The following weather data originated from weather stations chosen across the geographical extent of the ecological site, and will likely vary from the data for the entire MLRA. The climate data derives from the Natural Resources Conservation Service (NRCS) National Water and Climate Center. The data set is from 1981-2010.

Table 3. Representative climatic features

Frost-free period (average)	149 days
Freeze-free period (average)	174 days
Precipitation total (average)	610 mm

Climate stations used

- (1) JETMORE 8NNW [USC00144087], Jetmore, KS
- (2) OBERLIN [USC00145906], Oberlin, KS
- (3) BEAVER CITY [USC00250640], Beaver City, NE
- (4) MEDICINE CREEK DAM [USC00255388], Moorefield, NE
- (5) WAKEENEY [USC00148495], Wakeeney, KS
- (6) MONTEZUMA [USC00145421], Montezuma, KS
- (7) BISON 3NW [USC00140865], Bison, KS
- (8) LARNED [USC00144530], Larned, KS
- (9) PHILLIPSBURG #2 [USC00146378], Phillipsburg, KS
- (10) MOOREFIELD [USC00255655], Moorefield, NE
- (11) DODGE CITY [USW00013985], Dodge City, KS

Influencing water features

The Closed Upland Depression ecological site has no surface drainage outlet. This site is located in a receiving position from runoff water. The water from this site escapes only by evaporation or subsurface drainage. The kinds and amounts of vegetation existing on this site are influenced by the amount and timing of precipitation events as well as the duration of ponding.

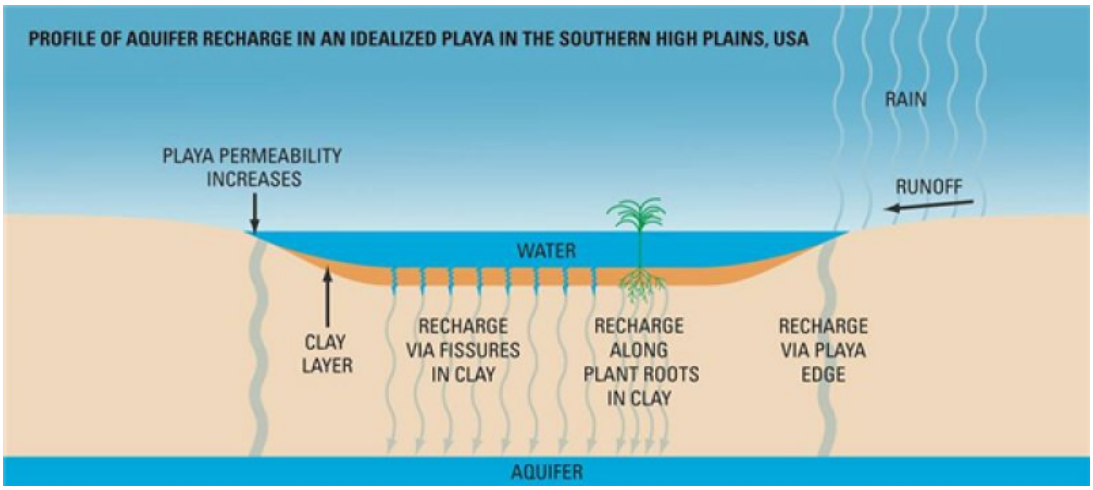


Figure 7. Recharge of a playa.

Soil features

This site consists of very deep, poorly drained and somewhat poorly drained upland soils. These soils have loamy through clayey surface layers and a subsoil that is very slowly or slowly permeable. They occur in closed, concave depressions (playas) with negligible runoff, resulting in a ponded condition during some part of the growing season in most years. These soils are usually non-calcareous in the surface layer but may be calcareous in the subsoil and substratum. The soils are generally high in fertility; however, may be subject to wind erosion during dry periods.

The soils have a moderate to very slow infiltration rate. The soils crack when dry and heavy traffic can cause surface compaction when wet. This site should show no evidence of rills, wind-scoured areas, or pedestalled plants. Water flow paths are broken, irregular in appearance, or discontinuous with numerous debris dams or vegetative barriers. The soil surface is stable and intact.

Major soil series correlated to this ecological site include: Lodgepole, Ness, and Scott.

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

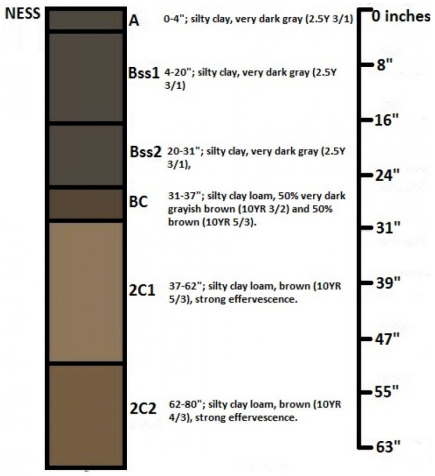


Figure 8. Ness soils series profile description.

Table 4. Representative soil features

Surface texture	(1) Clay (2) Silt loam (3) Loam
Family particle size	(1) Clayey
Drainage class	Somewhat poorly drained to poorly drained

Permeability class	Very slow to slow
Soil depth	152–203 cm
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	23.11–40.39 cm
Calcium carbonate equivalent (0-101.6cm)	0–6%
Electrical conductivity (0-101.6cm)	0–2 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	2–5
Soil reaction (1:1 water) (0-101.6cm)	6.3–7.9
Subsurface fragment volume <=3" (Depth not specified)	0%
Subsurface fragment volume >3" (Depth not specified)	0%

Ecological dynamics

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

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

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

This ecological site is made up of a Grassland State and a Tillage State. The Grassland State is characterized by non-broken land (no tillage), both warm- and cool-season bunchgrasses, sod-forming grasses, sedges, rushes, and forbs. The Tillage State has been mechanically disturbed (broken) by equipment and includes annual crops, or 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 MLRA 73. Variation in precipitation east and west is not as affected as is temperature north and south. The northern part of MLRA 73 is characterized by cooler temperatures and shorter growing season in respect to the southern end. As a result, cool-season bunchgrasses and sod-formers proliferate. Growth of native cool-season plants begins about April 15, and continues to about June 15. Native warm-season plants begin growth about May 15, and continue to about August 15. Green-up of cool-season plants may occur in September and October if adequate moisture is available (weather data from National Climate Data Center, 1980-2010).

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

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

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

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

The Closed Upland Depression ecological site occurs on depressional playas or swales on an upland position subject to ponding. The length of time these sites hold water depends on the size of the drainage area; infiltration rate, type, and amount of vegetative cover of surrounding soils; the frequency, intensity, and total accumulation of rainfall; and the depth of the depression. Wind erosion can be a hazard if water drowns out the vegetation and then dries up, leaving the soil surface bare.

Inundation is the driving force that controls the vegetative dynamics of the site. Vegetation shifts as a result of the depth, frequency, and duration of ponding. This site is rarely managed as a separate unit for livestock grazing. However, it is recognized as an important site for migratory waterfowl. In addition, many species of upland wildlife use this site as a seasonal water source.

At one time, the larger playas on this site may have been a significant source of water for the transient herbivores and early Americans who followed these herds, as evidenced by the flint tools found on higher landscapes that are in association with these playas.

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

Western wheatgrass is a preferred grass that responds as a decreaser or increaser depending on the time of grazing. When early and late season grazing is practiced annually, western wheatgrass tends to decrease. When cattle are put on late and pulled off early during the growing season, western wheatgrass tends to increase. Grazing systems with scheduled periodic rest are effective in maintaining and improving western wheatgrass and the overall production of the site.

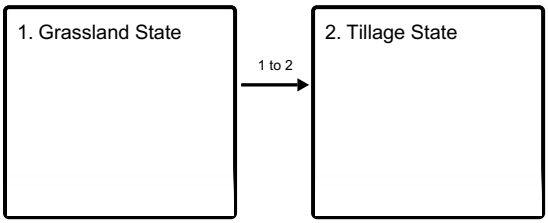
Grazing on the Closed Upland Depression ecological sites is limited, due to the ponding frequency and duration. These sites can be overgrazed by heavy, continuous grazing.

The use of grazing management that includes necessary distribution tools, proper stocking, and adequate recovery periods during the growing season helps to restore this site to its productive potential.

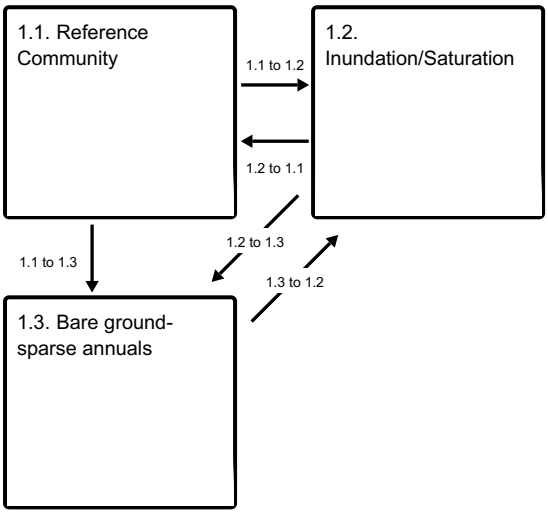
The following diagram illustrates pathways that the vegetation on this site may take, within the Grassland Reference State and beyond, as influencing ecological factors change. There may be other states or plant communities not shown in the diagram, as well as noticeable variations within those illustrated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

State and transition model

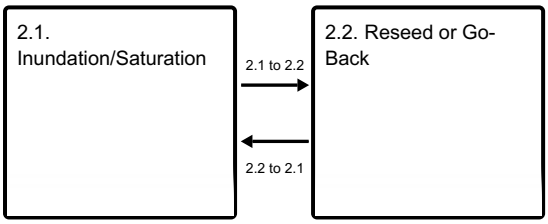
Ecosystem states



State 1 submodel, plant communities



State 2 submodel, plant communities



State 1
Grassland State

The Grassland State is supported by empirical data, historical data, local expertise, and photographs. This state is defined by three plant communities that are the results of periodic fire, drought, and grazing. These events are part of the natural disturbance regime and climatic process. The Reference Plant Community consists of cool-season sod-forming grasses, warm-season sod and bunchgrasses, and forbs. Plant community 1.2 Inundation/Saturation consists primarily of spikerush and western wheatgrass, with ragweed, smartweed, arrowhead, panicums, or water. Community 1.3 is made up of bare ground and/or annuals. Water has evaporated and/or percolated through the soil profile and early successional plants are establishing.

Community 1.1
Reference Community

The plant community upon which interpretations are primarily based is the Reference Plant Community. This community evolved with grazing by large herbivores, occasional prairie fires, and periodic flooding events, and can be found on areas that are properly managed with grazing and/or prescribed burning, and sometimes are on areas receiving occasional short periods of rest. The vegetation on this site is highly variable due to the fluctuation of ponding from one location to the next. The potential vegetation is approximately 85 percent grasses and grass-likes, and 15 percent forbs. Significant grasses and grass-likes present include western wheatgrass, blue grama, buffalograss, rushes, and sedges. Significant and most noticeable forbs include woolly burr ragweed, Pennsylvania smartweed, knotweed, and lanceleaf fogfruit. Individual species can vary greatly in production depending on growing conditions (timing and amount of precipitation and temperature). Community dynamics, nutrient cycle, water cycle, and energy flow are functioning at this site's potential in the Reference Plant Community. When present, plant litter is properly distributed with very little movement off-site. Natural plant mortality can be significant following periods of below average precipitation. The diversity in plant species allows for both the fluctuation of ponding as well as the occurrence of randomly occurring drought. The growth curve for this plant community varies. The total annual production (air-dry weight) of this plant community ranges from 1,600 to 2,400 pounds/acre and will average 2,000 pounds.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	1575	1905	2214
Forb	219	336	476
Total	**1794**	**2241**	**2690**

Figure 10. Plant community growth curve (percent production by month). KS7201, Cool-season/warm-season co-dominant.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	2	10	20	30	20	10	5	3	0	0

Community 1.2
Inundation/Saturation

This plant community dominates the site during and immediately after prolonged inundation. As ponding increases, the amount of perennial grasses decreases and water-tolerant forbs, sedges, and annuals increase. Grasses and grass-likes commonly occurring include spikerush, western wheatgrass, little barley, rushes, and sedges. The forbs commonly found include Pennsylvania smartweed, knotweed, arrowhead species, panicums, and other hydrophytic forbs. Livestock usually favors this site during hot summer days. With excessive use by livestock these areas will become trampled and vegetation will decrease. Ponded water void of Reference Plant Community vegetation is included in plant community 1.2. The vegetative growth curve, diversity, and total annual production for this site is highly variable.

Community 1.3
Bare ground-sparse annuals

When these sites pond water long enough to drown out vegetation, they end up leaving bare soil during dry cycles or sparse annual vegetation. This condition can also develop from heavy, continuous grazing and hoof action on moist soil. Bare ground dominates the site. Lower successional perennials and annuals are present. Total production is highly variable and is dependent on precipitation, ponding frequency, duration, and management of livestock to these areas.

Pathway 1.1 to 1.2
Community 1.1 to 1.2

Management that includes heavy, continuous grazing and/or periods of ponding water.

Pathway 1.1 to 1.3
Community 1.1 to 1.3

Management that includes long-term heavy grazing, no forage and animal balance, inadequate rest recovery of dominant reference plants, and/or long periods of ponding water.

Pathway 1.2 to 1.1
Community 1.2 to 1.1

Grazing management to include a forage and animal balance, periodic rest and recovery, and/or short periods of ponding water.

Pathway 1.2 to 1.3
Community 1.2 to 1.3

This pathway occurs as a result of long periods of ponding water and dry up.

Pathway 1.3 to 1.2
Community 1.3 to 1.2

Periods of dry up; management to include a forage and animal balance, periodic rest and recovery.

State 2
Tillage State

The Tillage State consists of abandoned cropland that has been naturally revegetated (go-back), planted/seeded to grassland or annual crops. Many reseeded plant communities were planted with a local seeding mix under the Conservation Reserve Program (CRP), or were planted to a monoculture of sideoats grama. Go-back communities are difficult to define due to the variability of plant communities that exist. Many of these communities are represented by the genus Aristida (three-awns). This is an alternative state because the ecological functions (i.e.

dynamic soil properties) and plant communities are not fully restored to that of the Reference State. Tillage can destroy soil aggregation. Soil aggregates are an example of dynamic soil property change. Aggregate stability is critical for infiltration, root growth, and resistance to water and wind erosion (Brady and Weil, 2008).

Community 2.1
Inundation/Saturation

Many of the playas or closed upland depression sites occur in cropland fields, and if these sites are not ponded they are planted to an annual crop. These sites are significant habitat for various kinds of wildlife species. As ponding increases, the amount of perennial grasses decrease and water-tolerant forbs, sedges, and annuals increase.

Community 2.2
Reseed or Go-Back

Local seeding mix This plant community is created when the soil is tilled or farmed (sodbusted) and abandoned. All of the native plants are killed, soil organic matter and carbon reserves are reduced, soil structure is changed, and a plow pan or compacted layer can be formed, which decreases water infiltration. Synthetic chemicals may remain as a residuals in the soil from farming operations. In early successional stages, this community is not stable. Wind and water erosion is a concern. 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. A forage and animal balance with adequate recovery periods will be needed to maintain productivity and desirable species. Selection of grass species by grazing animals on seeded rangeland sites can be significantly different from native range sites. Typically there is a reduced production level on seeded sites compared to native sites with similar species composition. Species diversity is lower and forb species generally take longer to re-establish. Seeded rangeland should be managed separately due to the natural ecological differences. Go-Back This plant community is created when the soil is tilled or farmed (sodbusted) and abandoned. Generally land that has been used for purposes other than rangeland or hayland will start to revegetate when left undisturbed. Due to tillage activity there are no native plants, soil organic matter and carbon reserves are reduced, soil structure is changed and a plow pan or compacted layer can be formed, which decreases water infiltration. Many times, synthetic chemicals remain as a residuals from farming operations. Erosion is a concern. The initial ground cover will primarily consist of kochia, annual bromes, pigweed, foxtail (bristlegrass), Russian thistle, witchgrass, and tumblegrass as well as other annuals. These plants give some protection from erosion and start to rebuild organic matter. The next succession of plants will be grasses such as sand dropseed, threeawn, silver bluestem, and annuals. Eventually blue grama and buffalograss will come back. These species will not regain in proportions to that of the Reference State. Soil structure, aggregate stability, and organic matter will not recover to levels of the Reference Community. Range seeding can accelerate the process of species composition and possibly production, but will be at a high cost. Bare ground When these sites pond water long enough to drown out vegetation they end up leaving bare soil during dry cycles or sparse annual vegetation. This condition can also develop from heavy, continuous grazing and hoof action on moist soil. Bare ground dominates the site. Lower successional perennials and annuals are present.

Pathway 2.1 to 2.2
Community 2.1 to 2.2

This pathway is a result of a dry up period, a rangeland seeding, or the land was abandoned and let go-back to successional plants.

Pathway 2.2 to 2.1
Community 2.2 to 2.1

This pathway is a result of long periods of ponding water or a planting of annual crops.

Transition 1 to 2
State 1 to 2

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

Additional community tables

Table 6. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Cool-season Dominant 40%**			560–897	
	western wheatgrass	PASM	*Pascopyrum smithii*	560–897	–
	little barley	HOPU	*Hordeum pusillum*	11–28	–
	squirreltail	ELEL5	*Elymus elymoides*	0–11	–
2	**Sedges and rushes Subdominant 23%**			224–516	
	spikerush	ELEOC	*Eleocharis*	336–448	–
	rush	JUNCU	*Juncus*	56–112	–
	sedge	CAREX	*Carex*	56–112	–
3	**Shortgrasses Subdominant 20%**			224–448	
	blue grama	BOGR2	*Bouteloua gracilis*	224–336	–
	buffalograss	BODA2	*Bouteloua dactyloides*	112–224	–
4	**Other grasses Trace component 2%**			0–45	
	fall panicgrass	PADI	*Panicum dichotomiflorum*	6–28	–
	tumblegrass	SCPA	*Schedonnardus paniculatus*	6–28	–
	Fendler threeawn	ARPUL	*Aristida purpurea var. longiseta*	0–11	–
Forb					
5	**Forbs Subdominant component 15%**			168–336	
	woollyleaf bur ragweed	AMGR5	*Ambrosia grayi*	140–336	–
	Pennsylvania smartweed	POPE2	*Polygonum pensylvanicum*	84–196	–
	knotweed	POLYG4	*Polygonum*	28–140	–
	lanceleaf fogfruit	PHLA3	*Phyla lanceolata*	22–112	–
	eared redstem	AMAU2	*Ammannia auriculata*	0–28	–
	hairy waterclover	MAVE2	*Marsilea vestita*	0–28	–
	evening primrose	OENOT	*Oenothera*	6–28	–
	wedgeleaf	PHCU3	*Phyla cuneifolia*	6–28	–
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	2–28	–
	lambsquarters	CHAL7	*Chenopodium album*	6–28	–
	prostrate sandmat	CHPR6	*Chamaesyce prostrata*	0–28	–
	curly dock	RUCR	*Rumex crispus*	0–28	–
	Kansas arrowhead	SAAM4	*Sagittaria ambigua*	0–28	–
	golden tickseed	COTI3	*Coreopsis tinctoria*	0–17	–
	Texas croton	CRTE4	*Croton texensis*	0–11	–
	white heath aster	SYERE	*Symphyotrichum ericoides var. ericoides*	0–11	–

Animal community

Wildlife Interpretations

This ecological site is found on nearly level uplands and is characterized by slight depressions or swales that have slow permeability due to a compact clay layer. Most of these upland depressions have been farmed because of the productivity of the adjacent soils and, as a result, are subject to sedimentation which can alter their hydrology. Pits are often dug in these sites in an attempt to enhance them by ponding water for longer periods of time. This practice can be detrimental to the proper functioning of these systems, altering the hydrology to the extent that the beneficial plant community structure and diversity is greatly diminished.

These sites are found in areas susceptible to drought and as a result offer an unpredictable, yet highly important source of water for wildlife, especially waterfowl. The amount of water and length of inundation will also depend on the drainage area, the frequency of rainfall, and the depth of the depression.

Historically these sites were often utilized for extended periods by large grazers such as elk and bison during wet periods because of their high forage production and ample water supply. It is no less true today that these sites are often overutilized during wet periods causing the plant communities to vary in species composition. Other species of wildlife also utilized these sites during periods of inundation. Mammals such as raccoons, coyotes, and badgers took advantage of the abundant small mammal prey, as did raptors such as short-eared owls and northern harriers. These areas also provided excellent habitat for ground-nesting birds native to grassland habitats.

These depressions remain critically important to migratory birds. The aquatic vegetation and associated invertebrates such as fairy shrimp, tadpole shrimp, and clam shrimp provide a high energy source for several groups of migratory birds such as shorebirds, ducks, and geese during their stops in the spring and fall. These sites also provide important breeding habitat for many species of amphibians during periods of inundation in the spring.

Tree invasion is a potential problem on these sites due to the decreased threat of wildfires resulting from fragmentation of the grasslands surrounding these depressions. Once tree invasion begins, one should expect to see wildlife species favoring this type of habitat replacing traditional grassland and wetland species.

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

Western Wheatgrass, Blue Grama Reference Plant Community

The Reference Plant Community has the potential to provide excellent habitat for a variety of wildlife, especially under wet conditions. Several small mammal species will thrive under these conditions. Due to the abundance of these small mammals, these sites are often favorite hunting areas for predators including coyotes, short-eared owls, red-tailed hawks, and northern harriers. Whitetail and mule deer will both use these depressions for water when present, and as a food source, mainly utilizing a wide diversity of forbs. These sites are of critical importance to many species of water birds, especially when their inundated periods coincide with spring and fall migrations. Shorebirds take advantage of the abundant invertebrates like fairy shrimp, whose eggs can remain viable in the soil for up to 15 years until a rainfall event. Ducks, geese, and cranes will use these sites as roosting areas as well as feeding areas, taking advantage of a high energy food source supplied by seeds from wetland plants such as annual smartweed. Waterfowl will often winter on these sites until they freeze. Ring-necked pheasants may use this site for nesting, brood-rearing, and roosting if adequate cover and forbs are present.

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 upon 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 grazeability factors (such as steep slopes, site inaccessibility, or distance to drinking water).

Often the current plant community does not entirely match any particular Community Phase as described in this

Ecological Site Description. Because of this, a resource inventory is necessary to document plant composition and production. Proper interpretation of inventory data will permit the establishment of a safe initial stocking rate.

No two years have exactly the same weather conditions. For this reason, year-to-year and season-to season fluctuations in forage production are to be expected on grazing lands. Livestock producers must make timely adjustments in the numbers of animals or in the length of grazing periods to avoid overuse of forage plants when production is unfavorable, and to make advantageous adjustments when forage supplies are above average.

Initial stocking rates should be improved through the use of vegetation monitoring and actual use records that include number and type of livestock, the timing and duration of grazing, and utilization levels. Actual use records over time will assist in making stocking rate adjustments based on the variability factors.

Hydrological functions

Water is the principal factor limiting herbage production on this site. The site is dominated by soils in hydrologic groups D. Infiltration varies from moderate to very slow, and the site is a depression without any runoff potential. In many cases, areas with greater than 75 percent ground cover have the greatest potential for high infiltration and lower runoff. An exception would be where short grasses form a dense sod and dominate the site. Normally, areas where ground cover is less than 50 percent have the greatest potential to have reduced infiltration and higher runoff. (Refer to Section 4, NRCS National Engineering Handbook for runoff quantities and hydrologic curves).

Recreational uses

The Closed Upland Depression ecological site provides hunting opportunities for both waterfowl and upland game species. The wide varieties of plants that bloom from spring until fall have an esthetic value that appeals to visitors. The site exhibits some visual contrast and presents a panoramic view of the wide open spaces cherished by many in the Great Plains states.

Wood products

No appreciable wood products are present on the site.

Other products

None noted.

Other information

Site Development and Testing Plan.

This site went through the approval process.

Inventory data references

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

NRCS individuals involved in developing the Closed Upland Depression MLRA72 (South) ESD in 2001 include: Tim Watson, Amanda Shaw, Susan Francis, Jon Deege, and Robert Schiffner from Kansas; and Josh Saunders and Harvey Sprock from Colorado.

NRCS individuals involved in developing the Closed Upland Depression MLRA72 (North) ESD in 2001 include: Harvey Sprock from Colorado. Carol Eakins, Chuck Markley, Jeff Nichols, and Mary Schrader from Nebraska; and Joan Gienger and Ted Houser from Kansas.

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Contributors

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Approval

David Kraft, 5/05/2020

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Rangeland health reference sheet

Interpreting Indicators of Rangeland Health is a qualitative assessment protocol used to determine ecosystem condition based on benchmark characteristics described in the Reference Sheet. A suite of 17 (or more) indicators are typically considered in an assessment. The ecological site(s) representative of an assessment location must be known prior to applying the protocol and must be verified based on soils and climate. Current plant community

cannot be used to identify the ecological site.

Author(s)/participant(s)	Chris Tecklenburg Revision 3-15-2017 David Kraft, John Henry, Doug Spencer and Dwayne Rice Original Authors 2-2005
Contact for lead author	Chris Tecklenburg (chris.tecklenburg@ks.usda.gov)
Date	10/02/2019
Approved by	David Kraft
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** None

2. **Presence of water flow patterns:** None

3. **Number and height of erosional pedestals or terracettes:** None

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** 2 percent or less bare ground, with bare patches generally less than 2-3 inches in diameter. Extended drought or long-term ponding can cause bare ground to increase to 10-20 percent or more with bare patches reaching to 6-12 inches in diameter or more.

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

6. **Extent of wind scoured, blowouts and/or depositional areas:** None

7. **Amount of litter movement (describe size and distance expected to travel):** Minimal to short.

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 5-6 in interspace at soil surface.

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Average SOM is 2-5%. A-horizon ranges from 0-4 inches. Surface texture is silty clay. Soils are typically deep to very deep, very dark gray (2.5Y 3/1) moist, moderate medium granular and weak medium angular blocky structure; very firm, very hard, moderately sticky, moderately plastic.

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Diverse grass/forb canopy and root structure reduces raindrop impact, providing increased time for infiltration to occur. This site receives runoff from adjacent sites. Infiltration is regulated more by soil texture and landscape position rather than plant community composition.

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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):** Typically none. Physical impact during wet or ponded periods may cause some compaction.

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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: Group 1 Dominant cool-season grass 40%; western wheatgrass 500-800, little barley 10-25, squirreltail 0-10.

    Sub-dominant: Group 2 Sedges and Rushes subdominant 23%; sedge 50-100, rush 50-100, spikerush 300-400.
    Group 3 Shortgrasses subdominant 20%; blue grama 200-300, buffalograss 100-200.
    Group 3 warm-season shortgrasses Subdominant 20%; blue grama 200-300, buffalograss 100-200
    Group 4 Other grasses Trace amount 2%

    Other: Group 4 Warm-season midgrasses trace 2%; Fall panicgrass 10-25, tumblegrass 10-25, Fendler threeawn 0-10.
    Group 5 Subdominant Forbs 15%; 300 lbs

    Additional:

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** Typically minimal. Expect some mortality during and following extended drought or extended inundation. Ponding depth, frequency, and duration dictates vegetation composition.

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14. **Average percent litter cover (%) and depth (in):** 50-65 percent litter cover at 0.25-0.50 inch depth. Litter cover during and following extended drought or inundation ranges from 20-40 percent.

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 1600 lbs/ac low precipitation years, 2000 lbs/ac average precipitation years, 2400 lbs/ac above average precipitation years. After extended drought or the first growing season following wildfire, production may be significantly reduced by 400–700 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 The Reference Plant Community. However, cheatgrass, Russian thistle, kochia, other non-native annuals may invade following extended drought assuming a seed source is available. Blue grama, buffalograss, red threeawn, little barley, buffalobur, and hairy goldaster are the major native (non-invasive) increasers on this site.

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