USDA Natural Resources Conservation Service

Ecological site R072XY115KS
Closed Upland Depression

Last updated: 5/05/2020
Accessed: 04/23/2024

General information

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

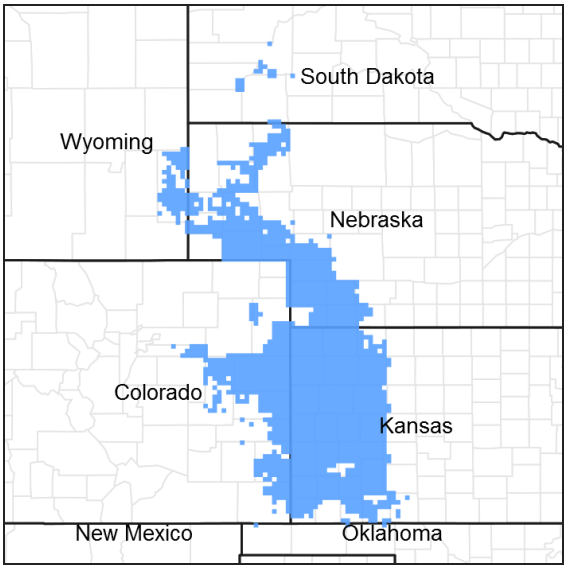


Figure 1. Mapped extent

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

MLRA notes

Major Land Resource Area (MLRA): 072X–Central High Tableland

Major Land Resource Area (MLRA) 72--Central High Tableland. This area is in Kansas (54 percent), Nebraska (25 percent), and Colorado (21 percent). A very small part of the area is in Wyoming. The area makes up about 34,550 square miles (89,535 square kilometers). It includes the towns of Garden City, Goodland, and Colby, Kansas; Imperial, North Platte, Ogallala, and Sidney, Nebraska; and Holyoke and Wray, Colorado. Interstate 70 bisects the area, and Interstates 76 and 80 follow the south side of the South and North Platte Rivers, respectively. The Cimarron National Grasslands occur in the southwest corner of the MLRA.

Classification relationships

Major land resource area (MLRA): 072-Central High Tableland

Ecological site concept

The Closed Upland Depression ecological site occurs on broad upland divides (Tablelands). 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 R072XY115.

Associated sites

R072XY100KS	**Loamy Tableland** The Closed Upland Depression ecological site occurs on the same landscape and landform as the Loamy Tableland site. The Loamy Tableland ecological is located on plains, rises, and hillslopes on tablelands. Soils correlated with this site are moderately deep to very deep and have a surface that is >7 (18cm) inches mollic color. Soil surface texture ranges are: silt loam, silty clay loam, loam, very fine sandy loam to clay loam. The majority of the site will have textures of silt loam and silty clay loam. Soils that are correlated to Loamy Tableland have free carbonates below 4 inches (10cm). This site is dominated by loess parent material.

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	Not specified

Physiographic features

This site occurs in playas and depressions on the tablelands. This 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.

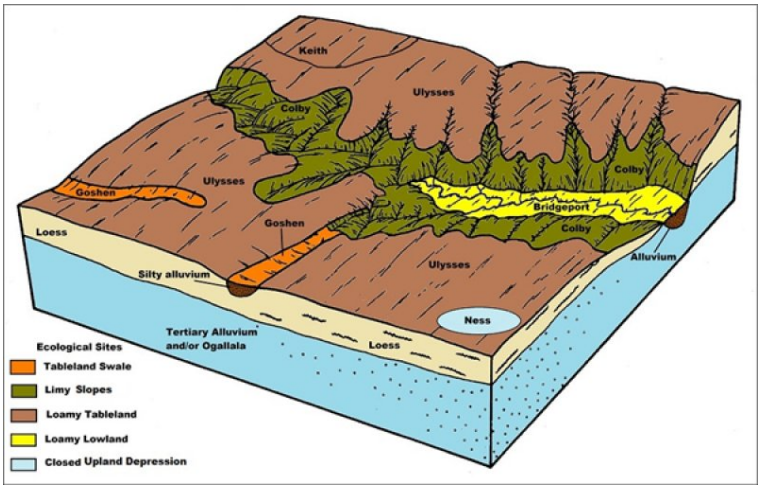


Figure 2. MLRA72 ESD block diagram

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	876–1,524 m
Slope	0–1%
Ponding depth	0–30 cm
Water table depth	152 cm

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)	143 days
Freeze-free period (average)	161 days
Precipitation total (average)	508 mm

Climate stations used

- (1) LODGEPOLE 8N [USC00254903], Lodgepole, NE
- (2) OGALLALA [USC00256200], Ogallala, NE
- (3) IDALIA [USC00054242], Idalia, CO
- (4) GARDEN CITY EXP STN [USC00142980], Garden City, KS
- (5) SYRACUSE 1NE [USC00148038], Syracuse, KS
- (6) BREWSTER 4W [USC00141029], Brewster, KS
- (7) TRENTON DAM [USC00258628], Trenton, NE
- (8) SCOTT CITY [USC00147271], Scott City, KS
- (9) ULYSSES 3NE [USC00148287], Ulysses, KS
- (10) WALLACE 2W [USC00258920], Wallace, NE

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.

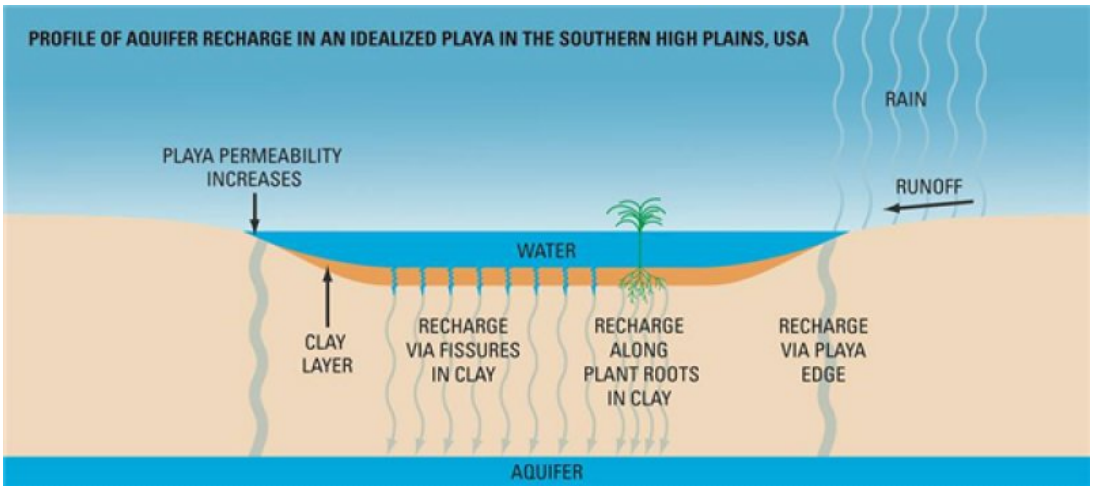


Figure 7. Recharge of a playa

Soil features

This site consists of very deep upland soils that have loamy through clayey surface layers. These soils have a

subsoil that is very slowly or slowly permeable resulting in a ponded condition during some part of the growing season in most years and occur in closed, concave depressions (playas) with negligible runoff. 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.

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, Scott.

Other soil series that have been correlated to this site include: Feterita, Lofton (Finney County), Pleasant.

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

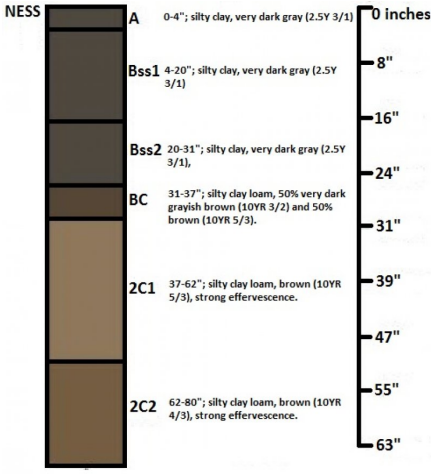


Figure 8. Ness soil series profile description

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)	11.43–22.1 cm
Calcium carbonate equivalent (0-101.6cm)	0–10%
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)	6.1–8.4

Subsurface fragment volume <=3" (Depth not specified)	0%
Subsurface fragment volume >3" (Depth not specified)	0%

Ecological dynamics

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, rhizomatous, bunch, and sod-forming grasses, and forbs. The tillage state has been mechanically disturbed (broken) by equipment and includes either a variety of early successional plants, water, or planted to an annual crop.

Vegetation changes are expected within this ecological site and will be dependent upon the site's geographical location inside Major Land Resource Area (MLRA) 72. Variation in precipitation east and west is not as affected as is temperature north and south. The northern part of MLRA 72 is characterized by cooler temperatures and shorter growing season in respect to the southern end. As a result, cool season bunchgrasses and sod formers proliferate. Growth of native cool season plants begins about April 15, and continues to about June 15. Native warm season plants begin growth about May 15, and continue to about August 15. Green up of cool season plants may occur in September and October if adequate moisture is available (weather data from National Climate Data Center 1980-2010).

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 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.

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

Drought cycles were part of the natural range of variability within the site and have historically had a major impact upon the vegetation. The species composition changes according to the duration and severity of the drought cycle (Albertson and Weaver 2000).

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.

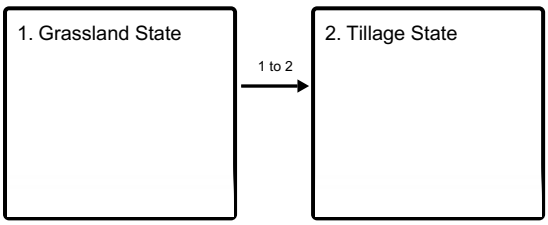
Grazing on the Closed Upland Depression ecological sites is limited, due to the ponding frequency and duration. These sites can be overgrazed by heavy, continuous grazing.

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

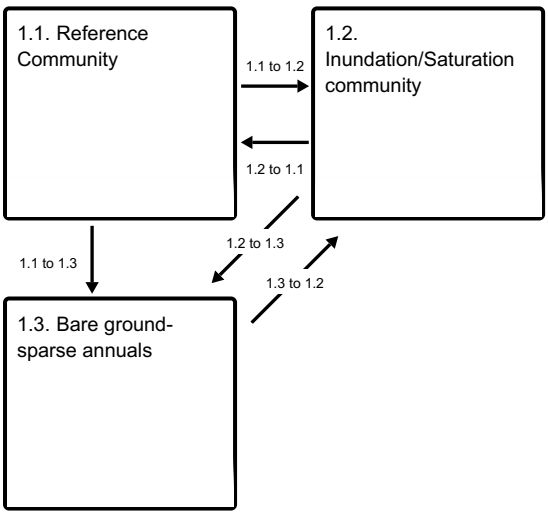
The following diagram illustrates pathways that the vegetation on this site may take from the Reference Plant Community as influencing ecological factors change. There may be other states or plant communities not shown in the diagram, as well as noticeable variations within those illustrated and described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

State and transition model

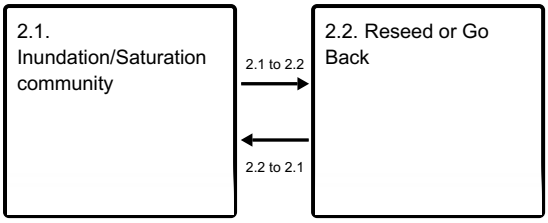
Ecosystem states



State 1 submodel, plant communities



State 2 submodel, plant communities



State 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 a result of periodic fire, drought and grazing. These events are part of the natural disturbance regime and climatic process. The Reference Plant Community consists of cool-season sod-forming grasses, warm-season sod and bunchgrasses, and forbs. Plant community 1.2 Inundation/Saturation consists primarily of spikerush and barnyardgrass, with little barley 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, vine mesquite, buffalograss, blue grama, and sedges. Significant and most noticeable forbs include smartweed, burr ragweed,

buffalobur, and curly dock. 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	1524	1905	2287
Forb	269	336	404
Total	**1793**	**2241**	**2691**

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 community

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, barnyard grass, little barley, rushes, and sedges. The forbs commonly found include smartweed, curly dock, knotweed, arrowhead species, 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 community

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	**Dominant grasses 43%**			527–964	
	western wheatgrass	PASM	*Pascopyrum smithii*	415–661	–
	vine mesquite	PAOB	*Panicum obtusum*	112–319	–
2	**Subdominant shortgrasses 26%**			493–583	
	blue grama	BOGR2	*Bouteloua gracilis*	269–314	–
	buffalograss	BODA2	*Bouteloua dactyloides*	224–297	–
3	**Subdominant other grasses 16%**			101–359	
	sedge	CAREX	*Carex*	101–196	–
	composite dropseed	SPCOC2	*Sporobolus compositus var. compositus*	0–157	–
	squirreltail	ELEL5	*Elymus elymoides*	0–22	–
	Fendler threeawn	ARPUL	*Aristida purpurea var. longiseta*	0–22	–
Forb					
4	**Subdominant Forbs 15%**			95–336	
	woollyleaf bur ragweed	AMGR5	*Ambrosia grayi*	22–84	–
	Pennsylvania smartweed	POPE2	*Polygonum pensylvanicum*	17–56	–
	knotweed	POLYG4	*Polygonum*	11–34	–
	lanceleaf fogfruit	PHLA3	*Phyla lanceolata*	6–22	–
	waterclover	MARSI	*Marsilea*	6–17	–
	evening primrose	OENOT	*Oenothera*	6–17	–
	wedgeleaf	PHCU3	*Phyla cuneifolia*	6–17	–
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	6–17	–
	lambsquarters	CHAL7	*Chenopodium album*	6–17	–
	curly dock	RUCR	*Rumex crispus*	6–17	–
	Kansas arrowhead	SAAM4	*Sagittaria ambigua*	6–17	–
	buffalobur nightshade	SORO	*Solanum rostratum*	0–11	–
	white heath aster	SYER	*Symphyotrichum ericoides*	0–6	–
	Texas croton	CRTE4	*Croton texensis*	0–6	–
	Dakota mock vervain	GLBI2	*Glandularia bipinnatifida*	0–6	–

Animal community

Wildlife Interpretations

When properly maintained this site provides excellent habitat for upland wildlife and wetland wildlife during periods of saturation. Well-maintained sites generally have a more abundant and dependable supply of quality forbs which wildlife prefer.

Small rodents prefer this site when it is near its potential. Generally, the better the condition of the site, the more small rodents are present. It is also a preferred hunting area for many predators including hawks, owls, and coyotes.

During migration periods, if these sites are inundated, they provide a key source of food and cover for many species of migratory waterfowl.

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.

Grazing Interpretations
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.

Future work (for an approved ESD) includes field visits to verify ES site concepts with field staff. Field staff include but not limited to project office leader, area soil scientist, state soil scientist, ecological site specialist, state

rangeland conservationist, area rangeland management specialist, and local field personnel. Field visits are to be determined by spatial extent of the site as well as personal knowledge of the site. Activity during field visits will include, but not be 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 was used extensively to develop this ecological site description.

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

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

Range Site Description for Kansas, Lakebed, USDA-Soil Conservation Service, September, 1983

Ecological Site Description for Kansas, Closed Upland Depression North (R072XA011KS) and South (R072XB011KS), located in Ecological Site Information System (ESIS), 2007

Other references

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Contributors

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Approval

David Kraft, 5/05/2020

Acknowledgments

The ecological site development process is a collaborative effort, conceptual in nature, dynamic and is never considered complete. I thank all those who set the foundational work in the early 2000s in regards to this ESD. I thank all those who contributed to the development of this site. In advance, I thank those who would provide insight, comments and questions about this ESD in the future.

Rangeland health reference sheet

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

Author(s)/participant(s)	Chris Tecklenburg Revision 8-25-2016 David Kraft, John Henry, Doug Spencer and Dwayne Rice Original Authors 2-2005 Harvey Sprock, Dan Nosal, Blake Hendon 01/19/05 Closed Upland Depression (formerly Plains Swale), Colorado
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Date	08/25/2016
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.

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8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** Stability class rating anticipated to be 5-6 in interspace at soil surface.

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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.

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Diverse grass/forb 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 grasses 43%; western wheatgrass 370-590, vine mesquite 100-285

    Sub-dominant: Group 2 Subdominant shortgrasses 26%; blue grama 240-280, buffalograss 200-265
    Group 3 Subdominant other grasses 16%; sedge 90-175, composite dropseed 0-140, squirreltail 0-20, Fendler threeawn 0-20.

    Other: Group 4 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 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.

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