

## Ecological site R078CY025OK Depressional Upland

Last updated: 9/15/2023  
Accessed: 05/12/2025

### General information

**Provisional.** A provisional ecological site description has undergone quality control and quality assurance review. It contains a working state and transition model and enough information to identify the ecological site.

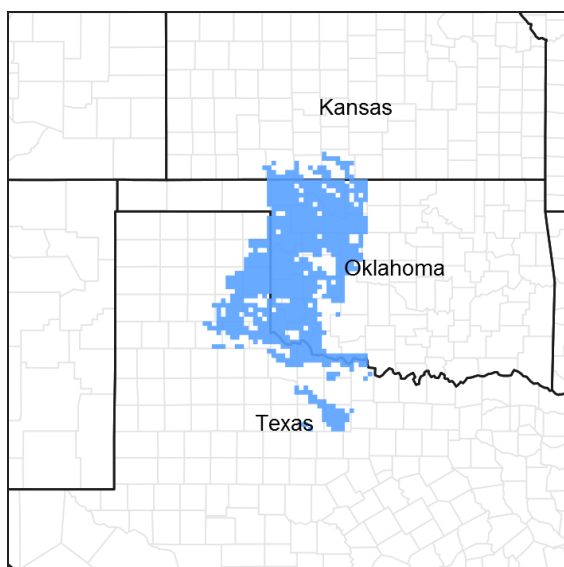


Figure 1. Mapped extent

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): 078C—Central Rolling Red Plains, Eastern Part

MLRA 78C is characterized by moderately dissected, rolling plains with prominent ridges and valleys and numerous terraces adjacent to dissecting streams. Loamy and clayey soils are generally deep, well drained, and developed in calcareous and gypsiferous sediments of Permian age.

### LRU notes

NA

### Classification relationships

This ecological site is correlated to soil components at the Major Land Resource Area (MLRA) level which is further described in USDA Ag Handbook 296.

### Ecological site concept

These sites are small depressional areas that often occur among the hummocky sands in the northern half of MLRA 78C. They are sometimes referred to as “Carwile Depressions” as the Carwile series is the soil that these sites

occur on. These soils are typically finer in texture than the surrounding soils and tend to perch water in the upper profile for periods during the year. A mixture of tallgrasses and Shortgrasses may dominate most areas in the reference state, while the lowest areas may support more hydrophytic vegetation. Brush encroachment can become an issue in the absence of fire and overutilization by grazing animals can lead to a change in the plant community toward less palatable mid and shortgrass species. In some areas, the soil may experience salt deposition and become dominated by salt tolerant species.

The distribution of these sites is primarily along the sand sheets that lie on the north side of the major rivers including the North and South Canadian, Cimarron, and Red rivers.

While these sites are often inclusional areas and can be quite small in extent, they may warrant special consideration when making management decisions.

## Associated sites

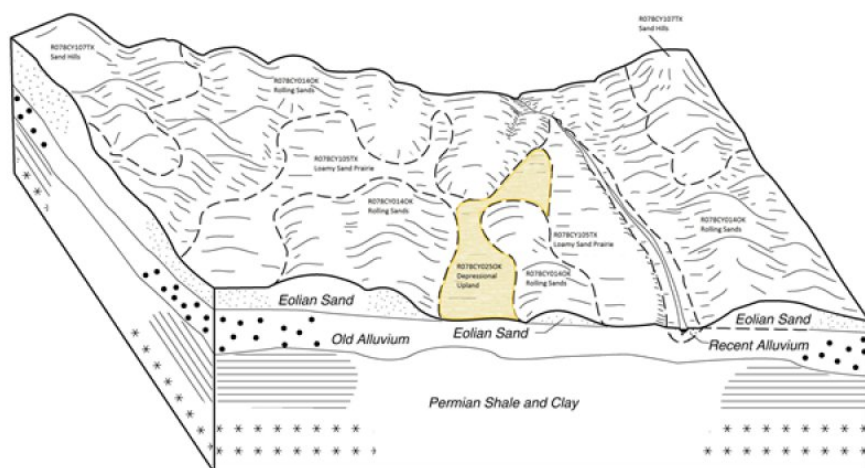
R078CY107TX	<b>Sand Hills 23-31" PZ</b> Adjacent sites. Course textured soils of higher relief. Not episaturated.
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**Table 1. Dominant plant species**

Tree	(1) <i>salix nigra</i>
Shrub	Not specified
Herbaceous	(1) <i>Panicum virgatum</i> (2) <i>Bouteloua gracilis</i>

## Physiographic features

These sites occur on nearly level or concave trends of stream terraces, or depressions of sand sheets on alluvial plains.



**Figure 2. R078CY025OK**

**Table 2. Representative physiographic features**

Landforms	(1) Alluvial plain > Depression
Runoff class	Negligible
Flooding frequency	None
Ponding duration	Long (7 to 30 days)
Ponding frequency	Frequent
Elevation	305–671 m
Slope	0–1%
Ponding depth	0–30 cm

Water table depth	0–91 cm
Aspect	Aspect is not a significant factor

## Climatic features

MLRA 78C lies within the subtropical sub-humid climate regime. This regime is characterized by rapid changes in temperature; marked extremes, both daily and annual; and rather erratic rainfall. The weather is alternately influenced by cold dry air from the Arctic Circle, and warm moist air from the Gulf of Mexico.

Seasonal changes are gradual. Spring is a season of variable weather and relatively high precipitation with prevailing winds from the southwest. Summers are generally hot with low humidity. Fall has long periods of pleasant weather interspersed with moderate to heavy rains. Winter is open and moderate to cold with winds from the north and infrequent snows.

Wind speeds average more than eleven miles an hour with prevailing southern winds. Rather strong winds can occur in all months of the year. While strong gusty winds occur, severe dust storms are rare.

Approximately 75 percent of the rainfall occurs during the warm season, and much of it comes in storms of high intensity and short duration in May and June. These rains can be particularly erosive on sites where vegetation is sparse. Occasional droughts are to be expected. Lack of rainfall and hot, dry winds often curtail forage production during July and August.

**Table 3. Representative climatic features**

Frost-free period (characteristic range)	148-177 days
Freeze-free period (characteristic range)	185-203 days
Precipitation total (characteristic range)	660-762 mm
Frost-free period (actual range)	144-191 days
Freeze-free period (actual range)	180-214 days
Precipitation total (actual range)	635-813 mm
Frost-free period (average)	164 days
Freeze-free period (average)	194 days
Precipitation total (average)	711 mm

## Climate stations used

- (1) FREDERICK [USC00343353], Frederick, OK
- (2) BUFFALO 2 SSW [USC00341243], Buffalo, OK
- (3) CHEROKEE 4W [USC00341724], Cherokee, OK
- (4) TALOGA [USC00348708], Taloga, OK
- (5) ARNETT 3NE [USC00340332], Arnett, OK
- (6) HOBART MUNI AP [USW00093986], Hobart, OK
- (7) FREEDOM [USC00343358], Freedom, OK

## Influencing water features

The Carwile soil series is listed on the national hydric soils list. There are sometimes areas of wetland vegetation found on these depressional upland sites due to the presence of ponded and/or saturated surface layers. Consult a trained specialist when attempting to delineate wetland areas.

## Soil features

Soils are mapped for each county within the MLRA. Mapunits are representations of the major soil series

component(s) and named accordingly. Each Mapunit is spatially represented on a digital soils map as polygons of different shapes and sizes. Within these Mapunits, there are often minor soil series components included. These minor components are soils that occur within a Mapunit polygon but are of small extent (15% or less of the Mapunit area). However, it is difficult to separate these minor soils spatially due to the scale of soil mapping.

Ecological sites are correlated at the component level of the soil survey. Therefore, a single Mapunit may contain multiple Ecological Sites just as it may contain multiple soil components. This is important to understand when investigating soils and Ecological Sites. A soil survey Mapunit may be correlated to a single Ecological Site based on the major component; however, there may be inclusional areas of additional Ecological Sites which are correlated to the minor components of that particular soil Mapunit.

Representative soils for this site include:

Carwile Loam

The Carwile series consists of very deep, poorly drained, slowly permeable soils that formed in loamy alluvium or eolian sediments of Pleistocene age. They are classified as Fine, mixed, superactive, thermic Typic Argiaquolls.

**Table 4. Representative soil features**

Parent material	(1) Alluvium—sandstone and shale
Surface texture	(1) Loam
Family particle size	(1) Loamy
Drainage class	Poorly drained
Permeability class	Slow to moderately rapid
Soil depth	203 cm
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	10.67–20.07 cm
Calcium carbonate equivalent (0-101.6cm)	0–5%
Electrical conductivity (0-101.6cm)	0 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0
Soil reaction (1:1 water) (0-101.6cm)	5.1–8.4
Subsurface fragment volume <=3" (Depth not specified)	0–1%
Subsurface fragment volume >3" (Depth not specified)	0%

## Ecological dynamics

The information in this ecological site description (ESD), including the state-and-transition model (STM), was developed using archeological and historical data, professional experience, and scientific studies. It is representative of a complex set of plant communities. Not all scenarios or plants are included. Key indicator plants, animals, and ecological processes are described to inform land management decisions.

These sites are often quite small in extent. They are commonly represented on soils maps as minor components of the more dominant sandy soils. However, due the unique plant communities, ecological dynamics, and hydrology, they warrant identification and description.

This ecological site lies within the sand sheet areas predominately north of major river courses in Northern 78C. These eolian or “windblown” deposits are dominated by dune and hummocky sandhill topography with occasional

concave depressional areas. It is in the depressional areas where the Depressional Upland ecological site occurs. In contrast to the surrounding coarse textured soils of the rolling sand hills and dunes, these sites occur on the Carwile soils with a much higher clay content. Because of this increase in clay content, the vegetation can change abruptly. While Sand Sagebrush (*Artemisia filifolia*) thrives in the deep sandy soils, it rarely grows in these depressional areas of finer soil that tend to pond water. The presence of saturated soil conditions also allows for the growth of more hydrophytic plants not commonly seen in the adjacent sandy areas. Some of these include smartweed (*Polygonum* spp.), Frogfruit (*Phylla* spp.), and Willow (*Salix* spp.).

It is also the nature of the periodically saturated clay soils that influence the overall plant community. The reference plant community can vary season to season and year to year, depending on climatic patterns. In contrast to the deep rooted tallgrasses on the adjacent sandy soils, a large portion of the plant community consists of short grasses such as Blue Grama (*Bouteloua gracilis*) and Buffalograss (*Bouteloua dactyloides*) that can tolerate inundation for longer periods of time. However, there are mid and tallgrass species that also persist in these depressional areas. Switchgrass (*Panicum virgatum*), Western Wheatgrass (*Pascopyrum smithii*), and Vine Mesquite (*Panicum obtusum*) may all thrive in these areas also.

While woody species are not common in the reference state of this ecosite, some areas may be subjected to invasion by Black Willow, Willow Baccharis, or even Cottonwood if fire is excluded from the ecosystem. This type of woody invasion is more common as you move from west to east across the extent of the ecological site. In some instances these concave areas were farmed along with the adjacent sandy land and some areas have been put back to introduced pasture. Due to the topography and convenience, many of these sites are the chosen location for windmill and livestock watering tanks.

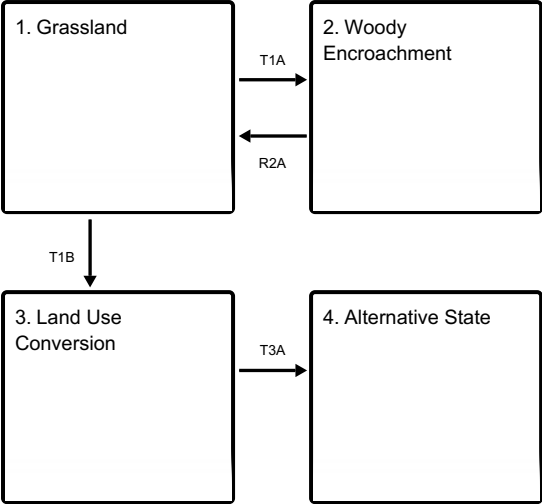
A state-and-transition model diagram for the Depressional Upland ecological site is shown after this narrative. The descriptions of each state, transition, community phase, and community pathway follow the model. The model is based on expert evaluation of available experimental research, field observations, professional consensus, and interpretations. It is likely to change as knowledge increases.

Plant community response differs across the MLRA because of the naturally occurring variability in weather, soils, and aspect. The reference community phase is not necessarily the management goal. Other vegetative states may be desired plant communities if range health assessments are in the moderate category and above. The biological processes on this site are complex. Representative values are therefore presented in a land management context. The species lists are representative. They are not botanical descriptions of all species occurring, or potentially occurring, on this site. They are not intended to cover every situation or the full range of conditions, species, and responses for the site.

Percent species composition by weight, percent canopy cover, and other metrics may be described. Most observers find it easier to visualize or estimate percent canopy for woody species (trees and shrubs) than to visualize or estimate production by weight. Because of the influence of shade and interception of rainfall, canopy cover can drive the transitions between communities and states. Species composition by dry weight is used for describing the herbaceous community and the community as a whole. Woody species are included in species composition for the site.

## State and transition model

Ecosystem states



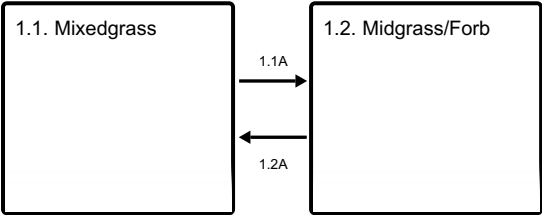
**T1A** - Absence of disturbance and natural regeneration over time, may be coupled with excessive grazing pressure

**T1B** - Extensive soil disturbance followed by seeding

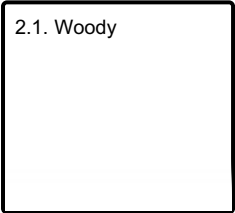
**R2A** - Removal of woody canopy, followed by reintroduction of historic disturbance regimes

**T3A** - Absence of disturbance and natural regeneration over time

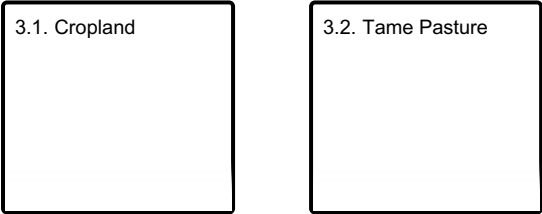
State 1 submodel, plant communities



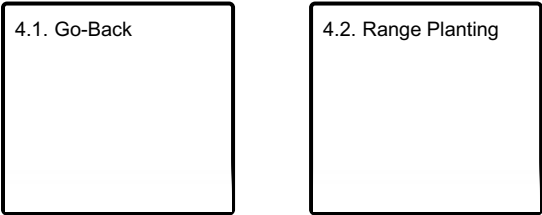
State 2 submodel, plant communities



State 3 submodel, plant communities



State 4 submodel, plant communities



State 1  
Grassland

This is the representative state for the Depressional Upland ecological site. It represents the natural variability in plant communities under the evolutionary disturbance regime. The plant communities within this state have been subjected to periodic fires and grazing events with varying lengths of rest periods. Woody species, if present, are generally less than 10 percent canopy cover. This is in contrast with the surrounding sand hills where sagebrush and sandplum may be 10 to 20 percent canopy in the reference state of the Rolling Sands ecosite. This ecological state supports a mixture of grasses and forbs and maintains a resilient plant community under natural conditions.

**Community 1.1**  
**Mixedgrass**



Figure 9. Community phase 1.1. Carwile Soils. Woodward County, OK 2015



Figure 10. Carwile Soils. Woodward County, OK 2015

This plant community is dominated by a mixture of grass and forb species adapted to periodically saturated growing conditions. Due to the concave topography of these sites, it is not uncommon to observe distinct changes in species across the site due to the changes in wetness. In the lowest points, hydrophytic species such as Frogfruit (*Phyla* spp.) smartweed (*Polygonum* spp.) and spikerush (*Eleocharis* spp.) are quite common as these areas stay wet for longer periods of time. Some shortgrass species adapted to periodic inundation may also persist in the wettest areas. Mid and tallgrass species including Switchgrass, Western Wheatgrass, and Canada Wildrye thrive in areas across the site. Major forbs may include Blanketflower (*Gaillardia* spp.), Golden Tickseed (*Coreopsis tinctoria*), Sagewort (*Artemisia ludoviciana*), and Western Ragweed (*Ambrosia psilostachya*). Woody species, if present, may include Black Willow (*Salix nigra*), Willow Baccharis (*Baccharis salcina*), and occasionally coralberry (*Symphoricarpos orbiculatus*) towards the eastern extent of the site. Like most sites in the Great Plains, this plant community evolved under periodic disturbances from fire and grazing. The woody species were restricted by a fire return interval of 2-5 years. After these fires, bison would often move in and graze the fresh new growth of the grasses and forbs before moving on across the landscape allowing the recently grazed areas to rest. This plant community represents the result of this rest period and the recovery of the plant community. Bare ground is typically less than 5 percent with litter residue covering 75 percent of the soil between plants.

Table 5. Annual production by plant type



Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	1876	2627	3378
Forb	897	1255	1614
Tree	15	20	26
Shrub/Vine	15	20	26
<b>Total</b>	<b>2803</b>	<b>3922</b>	<b>5044</b>

**Table 6. Ground cover**

Tree foliar cover	0-5%
Shrub/vine/liana foliar cover	0-5%
Grass/grasslike foliar cover	60-90%
Forb foliar cover	10-40%
Non-vascular plants	10-40%
Biological crusts	0-5%
Litter	60-80%
Surface fragments >0.25" and <=3"	0%
Surface fragments >3"	0%
Bedrock	0%
Water	0-10%
Bare ground	0-10%

**Figure 12. Plant community growth curve (percent production by month).**  
**OK0009, Native Warm-Season Grasses.** The growing season for warm season(C4) grasses in this region runs from last frost to first frost with peak production from mid April through mid July. The curve listed below is intended to be a representative of normal growing conditions. The monthly production percentages can vary from year to year depending upon temperature and rainfall variations..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	3	9	25	28	15	5	10	5	0	0

## Community 1.2 Midgrass/Forb



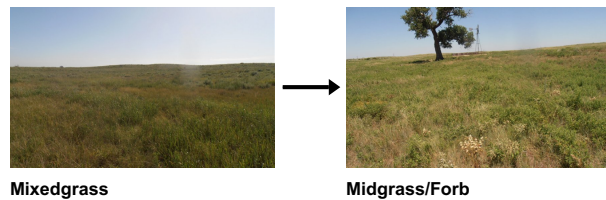
**Figure 13. Plant community 1.2. Carwile soils. Woodward County, OK.**

This plant community phase is usually the result of abusive grazing practices that exceed the carrying capacity for



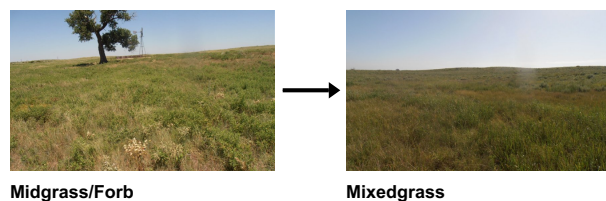
the given site. The plant community has shifted to favor the less palatable plants and the plants that are more resilient under heavy grazing. Litter coverage may be reduced. Hydrophytic plants still occupy the lowest, wettest areas. Threeawn (*Aristida* spp.), Little Barley (*Hordeum pusillum*), and Western Ragweed have increased in abundance due to the increased disturbance. This plant community is often found around watering facilities where cattle loiter after drinking. This community phase may be at an increased risk of woody plant encroachment due to the lack of fuel load and continuity for effective prescribed burning.

### Pathway 1.1A Community 1.1 to 1.2



Under conditions of abusive grazing above the carrying capacity, the plant community may shift towards the less palatable mid and shortgrass species. Species such as Switchgrass and Vine Mesquite may give way to Sand Dropseed (*Sporobolus cryptandrus*), Silver Bluestem (*Bothriacloa laguroides*), and many opportunistic forbs.

### Pathway 1.2A Community 1.2 to 1.1



With adequate rest the shortgrass/forb plant community may be shifted back towards the community described in 1.1. The amount of rest required for this shift depends on the remaining plants and precipitation patterns.

## State 2 Woody Encroachment

In this vegetative state, woody species have encroached at levels above 30 percent canopy coverage. These species can intercept rainfall and can begin to shade out some of the herbaceous vegetation. As woody species increase, they can alter the energy flow and hydrology of the site. Again, the encroachment of woody species will be more prevalent on the eastern side of MLRA 78C which receive more annual precipitation.

### Community 2.1 Woody



Figure 14. Carwile soils with encroaching woody species

The plant community has transitioned from the reference state and has been influenced by the dominance of woody species. These species may include Black Willow, Willow Baccharis, Eastern Cottonwood, and Eastern Redcedar(during dry periods). Due to the periodically wet conditions, this site may be vulnerable to the invasion by Saltcedar (Tamarix spp.) if a seed source is introduced. The increasing woody cover has a negative impact on the herbaceous plant community by shading sunlight and impacting hydrologic flow. These woody species also make suitable perched for avian predators and may reduce the wildlife habitat potential for some species.

### **State 3**

#### **Land Use Conversion**

This ecological state is the result if a conversion in land use from rangeland to cropland or tame pasture. The site has been plowed and much of the soil structure in the top six to twelve inches has been compromised. Within this state, soil microbial activity is often decrease and both the energy flow and hydrology have been altered from the reference state.

#### **Community 3.1**

##### **Cropland**

This plant community can vary from site to site depending on the production system. Most sites in production are planted to small grains with the rare exception of canola or sorghum. Refer to Ag extension publications or Soil Survey crop production reports for soil specific crop yield data.

#### **Community 3.2**

##### **Tame Pasture**

This plant community is often a monoculture of an introduced species. Species diversity is low along with potential for wildlife habitat. Consult the local soil survey manuscript or web soil survey for potential yields of introduced species.

### **State 4**

#### **Alternative State**

This state represents plant communities that follow cultivation or other soil disturbing activities (pipelines, etc.). The sites may have been replanted to native species or abandoned to let whatever seed source remained take over.

#### **Community 4.1**

##### **Go-Back**



**Figure 15. Carwile soils revegetated after soil disturbance. Woodward County, OK**

This plant community is the result of abandonment after cultivation or other soil disturbing event. There is a large amount of variability in plant species and amounts depending on many factors including length of time in cultivation, remnant seedstock, and precipitation patterns. Often, there are large amounts of Silver Bluestem, Little Barley, and

Brome species.

Community 4.2  
Range Planting



Figure 16. Carwile soils planted to Native CRP mix. Woods County, OK

Often, when managers wish to convert cropland back to native vegetation, they will develop a seeding mix of desired species. This process of re-establishing native plants may take several years. The species of a reseeded community will vary depending on the planting mix and conditions after the planting. While a successful range planting can re-establish most of the plants of the reference state, soil properties have been altered significantly and the site may not ever regain the full ecological function.

Transition T1A  
State 1 to 2

With the removal of fire from the ecosystem, woody plants may increase in abundance. These woody species may continue to encroach and begin to impact the energy flow and hydrology of site if left uncontrolled through prescribed fire or other brush management practices.

Transition T1B  
State 1 to 3

In many cases, the Depressional Upland site has been plowed and farmed with the adjacent sandy or sandy loam areas. Once the site has been cultivated, the soil structure has been changed and the microbiology of the soil has been altered from that of the reference state.

Restoration pathway R2A  
State 2 to 1

In most instances, a brush management program will need to be implemented to decrease the woody plant density. Following control of the larger woody species, a program of periodic prescribed fire should be implemented in order to control sapling growth and prevent future encroachment.

Transition T3A  
State 3 to 4

Once cultivation has ceased on the site, the site may be reseeded to native vegetation or abandoned and left to revegetate naturally.

Additional community tables

Table 7. Community 1.1 plant community composition

				Annual Production	
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Group	Common Name	Symbol	Scientific Name	(Kg/Hectare)	Foliar Cover (%)
<b>Grass/Grasslike</b>					
1	<b>Tallgrasses</b>			448–2018	
	switchgrass	PAVI2	<i>Panicum virgatum</i>	168–2018	–
	little bluestem	SCSC	<i>Schizachyrium scoparium</i>	0–101	–
	Indiangrass	SONU2	<i>Sorghastrum nutans</i>	0–101	–
	Grass, perennial	2GP	<i>Grass, perennial</i>	0–50	–
	sand bluestem	ANHA	<i>Andropogon hallii</i>	0–50	–
2	<b>Cool Season Grass/Grasslike</b>			448–897	
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	112–252	–
	Canada wildrye	ELCA4	<i>Elymus canadensis</i>	84–168	–
	Texas bluegrass	POAR	<i>Poa arachnifera</i>	56–140	–
	sedge	CAREX	<i>Carex</i>	28–84	–
	flatsedge	CYPER	<i>Cyperus</i>	28–84	–
	bulrush	SCIRP	<i>Scirpus</i>	0–45	–
	spikerush	ELEOC	<i>Eleocharis</i>	0–45	–
	Heller's rosette grass	DIOL	<i>Dichanthelium oligosanthos</i>	0–45	–
3	<b>Shortgrass/Midgrass</b>			560–2242	
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	560–2018	–
	vine mesquite	PAOB	<i>Panicum obtusum</i>	112–280	–
	thin paspalum	PASE5	<i>Paspalum setaceum</i>	84–224	–
	sand dropseed	SPCR	<i>Sporobolus cryptandrus</i>	84–224	–
	buffalograss	BODA2	<i>Bouteloua dactyloides</i>	84–168	–
	gummy lovegrass	ERCU	<i>Eragrostis curtipedicellata</i>	0–84	–
	Grass, perennial	2GP	<i>Grass, perennial</i>	0–84	–
	sand lovegrass	ERTR3	<i>Eragrostis trichodes</i>	0–45	–
	red lovegrass	ERSE	<i>Eragrostis secundiflora</i>	0–17	–
	composite dropseed	SPCO16	<i>Sporobolus compositus</i>	0–17	–
	purple lovegrass	ERSP	<i>Eragrostis spectabilis</i>	0–17	–
	purple threeawn	ARPU9	<i>Aristida purpurea</i>	0–17	–
	silver beardgrass	BOLA2	<i>Bothriochloa laguroides</i>	0–17	–
	sideoats grama	BOCU	<i>Bouteloua curtipendula</i>	0–17	–
	tumble windmill grass	CHVE2	<i>Chloris verticillata</i>	0–17	–
	fall witchgrass	DICO6	<i>Digitaria cognata</i>	0–17	–
	hairy grama	BOHI2	<i>Bouteloua hirsuta</i>	0–17	–
4	<b>Annual Grass</b>			19–34	
	sandbur	CENCH	<i>Cenchrus</i>	0–17	–
	little barley	HOPU	<i>Hordeum pusillum</i>	0–11	–
	sixweeks fescue	VUOC	<i>Vulpia octoflora</i>	0–11	–
	threeawn	ARIST	<i>Aristida</i>	0–11	–
<b>Forb</b>					
5	<b>Forbs/Legumes</b>			897–1614	
	Cuman ragweed	AMPS	<i>Ambrosia psilostachya</i>	45–112	–
	Forb, perennial	2FP	<i>Forb, perennial</i>	0–50	–

	Spanish gold	GRPA8	<i>Grindelia papposa</i>	0–45	–
	vente conmigo	CRGL2	<i>Croton glandulosus</i>	0–45	–
	Texas croton	CRTE4	<i>Croton texensis</i>	0–45	–
	woolly plantain	PLPA2	<i>Plantago patagonica</i>	0–45	–
	hogwort	CRCA6	<i>Croton capitatus</i>	0–45	–
	Palmer's spectaclepod	DICA31	<i>Dimorphocarpa candicans</i>	0–45	–
	knotweed	POLYG4	<i>Polygonum</i>	0–45	–
	sidebeak pencilflower	STBI2	<i>Stylosanthes biflora</i>	0–34	–
	sessileleaf ticktrefoil	DESE	<i>Desmodium sessilifolium</i>	0–34	–
	fourvalve mimosa	MIQU2	<i>Mimosa quadrivalvis</i>	0–34	–
	coastal indigo	INMI	<i>Indigofera miniata</i>	0–34	–
	purple poppymallow	CAIN2	<i>Callirhoe involucrata</i>	0–34	–
	amberique-bean	STHE9	<i>Strophostyles helvola</i>	0–34	–
	partridge pea	CHFA2	<i>Chamaecrista fasciculata</i>	0–34	–
	Indian rushpea	HOGL2	<i>Hoffmannseggia glauca</i>	0–34	–
	milkweed	ASCLE	<i>Asclepias</i>	0–34	–
	cutleaf geranium	GEDI	<i>Geranium dissectum</i>	0–34	–
	prairie clover	DALEA	<i>Dalea</i>	0–34	–
	Virginia tephrosia	TEVI	<i>Tephrosia virginiana</i>	0–34	–
	hairy false goldenaster	HEVI4	<i>Heterotheca villosa</i>	0–34	–
	white heath aster	SYER	<i>Symphyotrichum ericoides</i>	0–34	–
	hoary false goldenaster	HECA8	<i>Heterotheca canescens</i>	0–34	–
	Illinois bundleflower	DEIL	<i>Desmanthus illinoensis</i>	0–34	–
	Indian blanket	GAPU	<i>Gaillardia pulchella</i>	0–28	–
	whitemouth dayflower	COER	<i>Commelina erecta</i>	0–28	–
	fogfruit	PHYLA	<i>Phyla</i>	0–28	–
	lemon beebalm	MOCI	<i>Monarda citriodora</i>	0–28	–
	azure blue sage	SAAZ	<i>Salvia azurea</i>	0–28	–
	silverleaf nightshade	SOEL	<i>Solanum elaeagnifolium</i>	0–28	–
	crested pricklypoppy	ARPO2	<i>Argemone polyanthemus</i>	0–28	–
	white sagebrush	ARLU	<i>Artemisia ludoviciana</i>	0–28	–
	aster	SYMPH4	<i>Symphyotrichum</i>	0–28	–
	bush morning-glory	IPLE	<i>Ipomoea leptophylla</i>	0–28	–
	scarlet beeblossom	GACO5	<i>Gaura coccinea</i>	0–28	–
	annual buckwheat	ERAN4	<i>Eriogonum annuum</i>	0–22	–
	skullcap	SCUTE	<i>Scutellaria</i>	0–17	–
	prairie groundcherry	PHHI8	<i>Physalis hispida</i>	0–17	–
	narrowleaf four o'clock	MILI3	<i>Mirabilis linearis</i>	0–17	–
	plains snakecotton	FRFL	<i>Froelichia floridana</i>	0–11	–
	pepperweed	LEPID	<i>Lepidium</i>	0–11	–
	Hooker's scratchdaisy	CRHO7	<i>Croptilon hookerianum</i>	0–11	–
	soapweed yucca	YUGL	<i>Yucca glauca</i>	0–11	–
	camphorweed	HESU3	<i>Heterotheca subaxillaris</i>	0–11	–
	Carolina horsenettle	SOCA3	<i>Solanum carolinense</i>	0–11	–

	Gordon's bladderpod	LEGO	<i>Lesquerella gordonii</i>	0–11	–
	prairie broomweed	AMDR	<i>Amphiachyris dracunculoides</i>	0–11	–
	clammy groundcherry	PHHE5	<i>Physalis heterophylla</i>	0–11	–
	spurge	EUPHO	<i>Euphorbia</i>	0–11	–
	golden tickseed	COTI3	<i>Coreopsis tinctoria</i>	0–11	–
	wavyleaf thistle	CIUN	<i>Cirsium undulatum</i>	0–6	–
	tarragon	ARDR4	<i>Artemisia dracunculus</i>	0–6	–
	common yellow oxalis	OXST	<i>Oxalis stricta</i>	0–6	–
	shaggy dwarf morning-glory	EVNU	<i>Evolvulus nuttallianus</i>	0–6	–
	prairie spiderwort	TROC	<i>Tradescantia occidentalis</i>	0–6	–
<b>Shrub/Vine</b>					
6	<b>Shrub</b>			0–28	
	willow baccharis	BASA	<i>Baccharis salicina</i>	0–17	–
	Chickasaw plum	PRAN3	<i>Prunus angustifolia</i>	0–6	–
	sand sagebrush	ARFI2	<i>Artemisia filifolia</i>	0–6	–
<b>Tree</b>					
7	<b>Tree</b>			0–28	
	black willow	SANI	<i>Salix nigra</i>	0–16	–
	eastern cottonwood	PODE3	<i>Populus deltoides</i>	0–10	–

## Animal community

The plant communities of the reference state have good value for grazing by domestic animals. It also has good value as food and cover for numerous species of wildlife. It provides excellent habitat for northern bobwhite quail. White-tailed deer and wild turkey may frequent the site. A great variety of song birds utilize this site for summer habitat. For more specific guidance, refer to Wildlife Habitat Appraisal Guides that are species specific.

## Hydrological functions

These sites exhibit much different hydrology than the surrounding sandhills. They are subjected to runoff from the adjacent areas by both surface movement and subsurface lateral movement of water. This run-on hydrology coupled with the slowly permeable, fine textured subsoil, creates episaturation (perched water table) of the upper soil horizons. Therefore, while the surface may stay wet for extended periods, it actually takes much longer for the water to infiltrate these soils as opposed to the adjacent sandy soils.

## Recreational uses

Areas around these sites are well known in Oklahoma for its quail hunting. A multitude of mammals and birds frequent this site, so it is a great area to observe and study Oklahoma animal and plant life. This site is used for many common recreational activities such as hiking, camping, bird watching, hunting and horseback riding.

## Other information

The concepts and descriptions presented in this ESD are the product of a combination of historical descriptions, previous drafts, field work, and professional consensus. This report is not intended serve as a complete botanical description, or cover every possible management scenario. It should be considered a working draft and any analysis, input, or constructive critique is welcomed.

## Other references



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## Approval

Bryan Christensen, 9/15/2023

## Acknowledgments

Site Development and Testing Plan

Future work, as described in a Project Plan, to validate the information in this Provisional Ecological Site Description is needed. This will include field activities to collect low, medium and high intensity sampling, soil correlations, and analysis of that data. Annual field reviews should be done by soil scientists and vegetation specialists. A final field review, peer review, quality control, and quality assurance reviews of the ESD will be needed to produce the final document.

Annual reviews of the Project Plan are to be conducted by the Ecological Site Technical Team.

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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)	
Contact for lead author	
Date	11/23/2021
Approved by	Bryan Christensen
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production



## Indicators

1. **Number and extent of rills:**

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2. **Presence of water flow patterns:**

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3. **Number and height of erosional pedestals or terracettes:**

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4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):**

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5. **Number of gullies and erosion associated with gullies:**

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6. **Extent of wind scoured, blowouts and/or depositional areas:**

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

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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):**

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):**

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and 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):**

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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:

Sub-dominant:

Other:

Additional:

- 
13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):**
- 

14. **Average percent litter cover (%) and depth ( in):**
- 

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):**
- 

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:**
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17. **Perennial plant reproductive capability:**
-