USDA Natural Resources
Conservation Service

Ecological site R078CY017OK
Deep Sand Shrubland

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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.

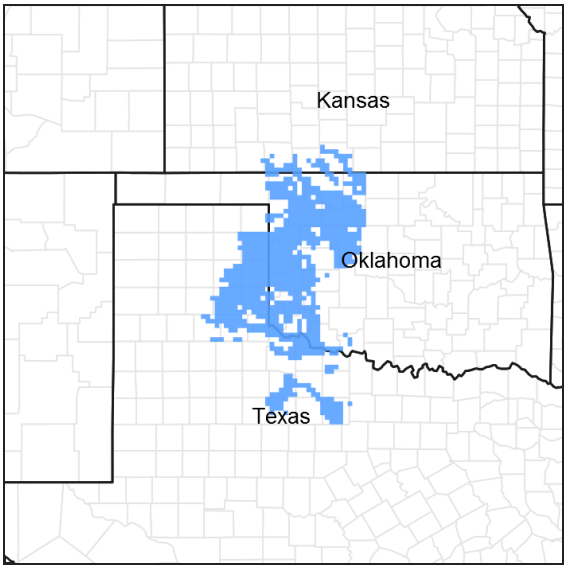


Figure 1. Mapped extent

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 on rolling to relatively flat, deep sandy soils. The reference vegetation consists of native tallgrass and midgrass species mixed with Shinnery Oak shrubs and forbs. This plant community evolved under periodic fire

and grazing events. The fires would remove top growth of the oaks and allow the tall and midgrass species to flourish. Without periodic fires, the woody species flourish and may begin to dominate some of the ecological functions of the site. Under abusive grazing practices, the more palatable tall and midgrass species may decline, giving way to species that are less desirable for grazing operations.

Associated sites

R078CY014OK	**Rolling Sands** Lamellic sands. Typically do not support Shinnery Oak. Rolling topography with some sand sagebrush and sand plum. Predominately grasses.

Table 1. Dominant plant species

Tree	(1) *Quercus havardii*
Shrub	Not specified
Herbaceous	(1) *Andropogon hallii*

Physiographic features

These sites are the shinnery oak grasslands located on the western side of MLRA 78C in six Oklahoma counties and three Texas panhandle counties. Oklahoma counties involved are Beckham, Blaine, Dewey, Ellis, Roger Mills and Woodward. Woodward is the northernmost boundary for shinnery oak grassland within the MLRA. The three Texas counties are Gray, Hemphill and Wheeler. These sites are deep sands that are nearly level to rolling uplands.

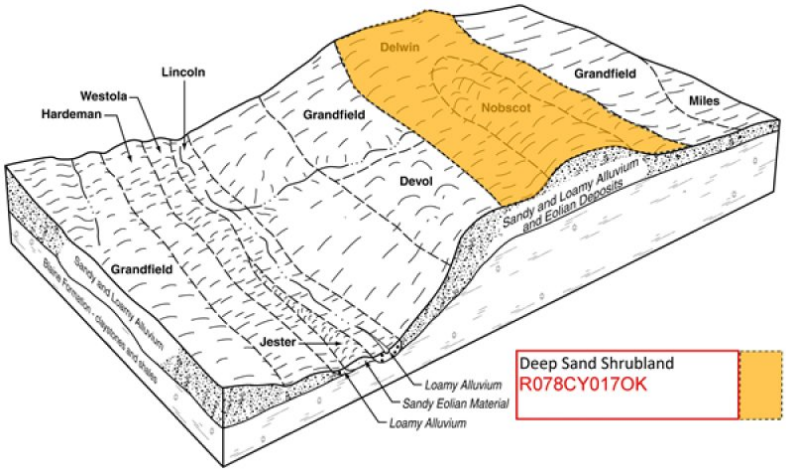


Figure 2. R078CY017OK

Table 2. Representative physiographic features

Landforms	(1) Alluvial plain > Dune (2) Alluvial plain > Terrace (3) Alluvial plain > Sand sheet
Runoff class	Negligible to medium
Flooding frequency	None
Ponding frequency	None
Elevation	1,000–3,200 ft
Slope	0–20%
Ponding depth	0 in
Water table depth	0 in
Aspect	Aspect is not a significant factor

Climatic features

MLRA 78C extends north and south from Coldwater, Kansas to just northeast of San Angelo, Texas (Ballinger, Texas), and east to west from Weatherford, Oklahoma to west of Shamrock, Texas. 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. 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)	163-201 days
Freeze-free period (characteristic range)	192-223 days
Precipitation total (characteristic range)	26 in
Frost-free period (actual range)	161-205 days
Freeze-free period (actual range)	191-230 days
Precipitation total (actual range)	26-27 in
Frost-free period (average)	185 days
Freeze-free period (average)	208 days
Precipitation total (average)	26 in

Climate stations used

- (1) COLDWATER [USC00141704], Coldwater, KS
- (2) MUTUAL [USC00346139], Mutual, OK
- (3) CLINTON SHERMAN AP [USW00003932], Dill City, OK
- (4) LAKE KEMP [USC00414982], Seymour, TX
- (5) ANSON 3ESE [USC00410268], Anson, TX

Influencing water features

There are no influencing water features in this site.

Wetland description

NA

Soil features

Soils are deep, sandy, permeable soils that readily accept moisture and have minimal runoff under reference conditions,. These soils have deep sandy profiles with lamellic bands: very thin, clay bands containing small amounts of sand ranging from one-eighth inch to one half inch and rarely thicker, running through the profile at different depths. These lamellae bands are normally present where shinnery oak is found and also account for occurrence of Indiangrass within the sands. These soils are very suitable for high-quality root development. This excellent root development environment, coupled with readily available moisture, encourages shinnery oak growth. But, because these soils are low in fertility and moisture holding capacity, vegetation is always a mixture of shinnery oak and prairie grasses.

Representative soils: Delwin, Heatly and Nobscot.

Table 4. Representative soil features

Parent material	(1) Alluvium–sandstone
Surface texture	(1) Fine sand (2) Loamy fine sand
Family particle size	(1) Sandy
Drainage class	Well drained to somewhat excessively drained
Permeability class	Moderate to very rapid
Soil depth	80 in
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-40in)	1.8–5.4 in
Calcium carbonate equivalent (0-40in)	0–5%
Electrical conductivity (0-40in)	0–1 mmhos/cm
Sodium adsorption ratio (0-40in)	0–1
Soil reaction (1:1 water) (0-40in)	5.1–8.4
Subsurface fragment volume <=3" (Depth not specified)	0–2%
Subsurface fragment volume >3" (Depth not specified)	0%

Ecological dynamics

This is a unique, easily recognizable, site of short shinnery oak, usually around 3 feet tall, with tallgrasses usually growing up through the oak canopy. The Reference Plant Community of the Deep Sand Shrubland R078CY017OK site is primarily tallgrasses and midgrasses with an understory, or at times an overstory, of shinnery oak brush (also referred to as shinnoak brush, Quercus Havardii). Sometimes called Shinnoak Shrub Grassland this site is found on coarse deep sands including shallow sandsheet and dunes, and some soils with loamy components. These areas are typically associated with sand dropseed and little bluestem, but Shinnery oak grasslands are almost always co-dominated with shrubs and tallgrasses; and a fairly rich mix of forbs and non-dominant grasses. The co-dominant tallgrasses and s midgrasses are usually taller than the oak itself. Although shinnery oak may make up 80-90% of the ground cover, it only makes up 5%-25% of the plant composition. The appearance of shinnery oak stands that are ungrazed may resemble tallgrass or mixed grass prairie because the oak may be hidden by the taller grasses. Shinnery oak is found intermixed with shortgrasses, midgrasses and tallgrasses. Shortgrasses include blue, black, and hairy gramas, sandbur, windmillgrass, false buffalograss and three-awn. The midgrasses are little bluestem, sand dropseed, spike dropseed, fall witchgrass, sand paspalum, plains bristlegrass, sideoats grama, and red and sand lovegrasses. Tallgrasses include sand bluestem, big bluestem, switchgrass, Indiangrass and giant dropseed. These midgrass, tallgrass and oak components are well adapted to most fire regime variations. Thus, the shinnery oak ecosystem contained a diverse mix of grasses and forbs along with the prevalent shinnery oak. The denser forms of shinnery oak historically dominated 15% to 40% of the plant composition, with the exception of the small mottes of hybrids that could retain their dense canopies dependent up on fire return intervals. After a fire, the taller grasses would rise above the typical shin-high level of the oak and historic records indicate that frequent fires typically top killed the oak. This treatment was sufficient to allow grasses to be temporarily taller than the oak for 1-3 years after which the shinnery oak typically regains dominance over the understory grasses. In this way, the fires that historically occurred provided for a frequently changing vertical dominance by the grasses and oak.

Interruption of the natural fire regime likely had as much to do with modification of oak and sand sage in Oklahoma and mesquite in Texas and New Mexico as did long term overgrazing by domestic livestock. The fire return interval

for shinnery oak ecosystems is not well known; however, there are commonalities between the herbaceous compositions and fuel ignitions sources between shinnery oak and tallgrasses (Boyd and Bidwell 2002). This leads to the reasoning that the fire return interval would have been similar to that of the tallgrass, which is between 5-10 years (Wright and Bailey 1982).

Without any disturbance, shinnery oak may form near monotypic stands. Above-ground shinnery growth averages 1-3 feet in height with occasional hybrid mottes up to 5-12 feet high, that are hybridized with other oak species (Pettit 1994, Peterson and Boyd 1998, Dhillion et al 1999, Hoagland 2000). These dense stands tend to be lower in bare ground while having less stems per acre than those affected by disturbance like fire. (Boyd and Bidwell 2002) Other woody plants that can be present within the site include sand sagebrush, sand plum and fragrant sumac, whose densities react to return interval of fire like other woody plants.

Changes in structure of shinnery oak communities may relate to simultaneous alterations of fire regime and livestock grazing (Boyd and Bidwell 2002). Shinnery oak ecosystems have been historically grazed for the past century by domestic livestock and for thousands of years by bison and other large ungulates (USDA Forest Service 1999). Continuous overgrazing by domestic livestock and interruptions to the natural fire regime can reduce the grass and forb component within the shinnery.

Vegetation inventories conducted on the Black Kettle Grassland show that approximately 50-60% of the NFS lands on this Grassland are currently in the shinnery oak vegetation type. The Vegetation Dynamics Development Tool (VDDT) data indicates that approximately 80-90% of the Black Kettle may have been shinnery oak historically. There is still some scientific uncertainty about the cause for this discrepancy, although it was agreed that a portion of this discrepancy is attributable to the standard deviations, the inherent problems using satellite imagery, as well as differences in the methods used for the existing mid-scale vegetation inventory compared to those used for the potential natural vegetation inventory for the VDDT model. Resource management specialists from Black Kettle Grassland that have been studying and managing the shinnery oak ecosystem and the shinnery oak research study on the Black Kettle, attribute the disparity primarily to historical deep and repeated plowing of some of the shinnery oak ecosystem lands before they came into Forest Service management. Approximately 34% of the Black Kettle Grassland was plowed historically, and those appear to be the areas that are remaining grass-dominated, based on comparisons using the GIS Database Maps of Prescribed Burns, PNVT's, and Existing Vegetation. Some of the plowed units were not burned for over a decade and others were included in burns of varying cycles (3-9 year cycles). Plowed areas currently dominated by grasses have not recovered to shinnery oak under any fire regime. Although, managers have observed rapid recovery in shinnery oak where viable root systems are present in unplowed lands and these population regain dominance over grasses within about 3 years following application of a typical prescribed burn.

There was repetitive, deep plowing that began in the early 1900's and continues today to convert shinnery oak savannahs to farmland on some lands. As a result of this repeated deep plowing, shinnery oak roots and rhizomes were destroyed, preventing the shinnery oak from ever recovering. There is an apparent lack of shinnery oak regeneration after successive years of cultivation (Boyd and Bidwell 2002). Current communities of shinnery oak are not showing any signs of spread, so it is unlikely that there are treatments to promote spread of shinnery oak from the unplowed units to the plowed units (Boyd and Bidwell 2002).

STATE AND TRANSITIONAL PATHWAYS (DIAGRAM):

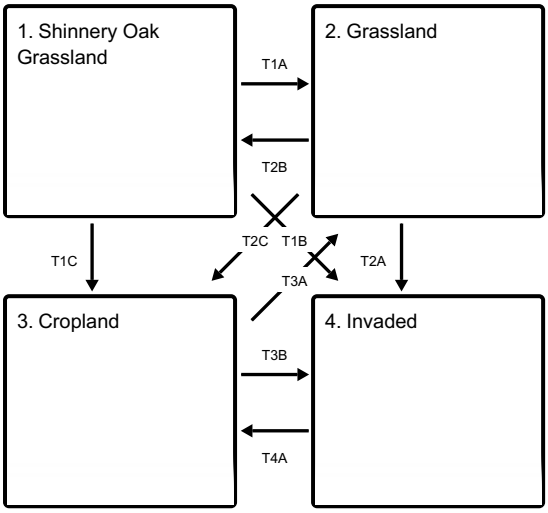
The following diagram suggests some pathways that the vegetation on this site might take. There may be other states not shown on the diagram. This information is intended to show what might happen in a given set of circumstances; it does not mean that this would happen the same way in every instance. Local professional guidance should always be sought before pursuing a treatment scenario.

As a site changes in the structure and makeup of the plant community, the changes may be due to management, or to natural occurrences, or both. At some point in time, thresholds may be crossed. This means that once plant community changes have progressed to a certain point, the balance of the community has been altered to the extent that a return to the former state is not possible, that is, not possible unless some form of outside energy is applied to make it happen. These changes take place on all ecological sites, but some sites support communities that are more resistant to change. Also, some sites are more resilient in general and tend to heal or restore themselves more quickly or easily than others. Changes in management practices alone, such as prescribed grazing, will not be sufficient to restore former plant communities. An example of an outside energy input might be

the implementation of prescribed chemical brush management to decrease the amount of woody shrubs and increase the amount of grasses and forbs. This shift in plant community balance could not be brought about with prescribed grazing alone. The amount of energy required to bring about a change in the plant community balance may vary greatly depending on the present plant community state and the desired community state.

State and transition model

Ecosystem states



T1A - Mechanical or chemical removal of woody species

T1C - Extensive soil disturbance followed by seeding

T1B - Absence of disturbance and natural regeneration over time, may be coupled with excessive grazing pressure

T2B - Natural regeneration overtime, followed by reintroduction of historic disturbance regimes

T2C - Extensive soil disturbance followed by seeding

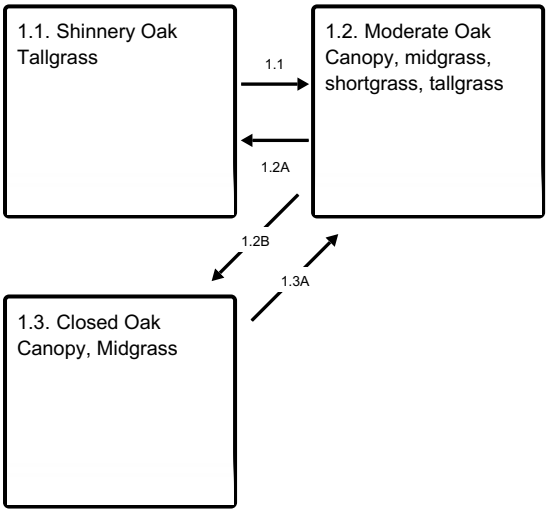
T2A - Absence of disturbance and natural regeneration over time, may be coupled with excessive grazing pressure

T3A - Rangeland seeding

T3B - Absence of disturbance and natural regeneration over time, may be coupled with excessive grazing pressure

T4A - Extensive soil disturbance followed by seeding

State 1 submodel, plant communities



State 1
Shinnery Oak Grassland

Dominant plant species

- sand bluestem (*Andropogon hallii*), grass

Community 1.1
Shinnery Oak Tallgrass

This plant community represents the reference plant community. It is easily recognized as tallgrasses, intermixed with a scattered understory of shinnery oak and occasional areas of sand sagebrush. Shinnery oak is usually one foot to three feet tall with occasional hybrid mottes whose height can reach from 3-8 feet tall in this state. Hybrid mottes respond to fire similar to shinnery and use of fire creates oak communities with grasses dominating throughout the landscape. Tallgrasses can reach heights from three feet to nine feet tall and usually cover the shinnery oak. The site, at a distance, may look like tallgrass prairie with consistent cover of tallgrasses throughout. Tallgrasses include little bluestem, sand bluestem, switchgrass, and Indiangrass. Shortgrasses include hairy grama, sandbur, windmillgrass, and three-awn. The midgrasses are sand dropseed, fall witchgrass, sand paspalum, sideoats grama, and red and sand lovegrasses. Forb and legume populations and densities are highly dependent or the timing of rainfall during the growing season, season of burn, burn return interval and grazing that would have created fluctuation in the plant community from year to year with the plants that dominated the site. Major forbs and legumes include queen's delight, annual sunflower, annual buckwheat, leadplant, sessile tickclover and catclaw sensitivebrier. Over the years, this plant community has been maintained by periodic fire and grazing events.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	1105	2015	2925
Shrub/Vine	250	463	675
Forb	120	230	340
Tree	80	153	225
Total	**1555**	**2861**	**4165**

Figure 10. Plant community growth curve (percent production by month). OK0001, Native, Warm Season Grasses. Typically, the summer growing season for warm season grasses begins April 5 to 15 and ends October 15 to 25. Nearly three-fourths of the season production will occur before the first of July. This varies from year to year depending upon temperatures and precipitation..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	1	5	10	20	30	10	5	10	6	2	1

Community 1.2
Moderate Oak Canopy, midgrass, shortgrass, tallgrass

This plant community is composed of a moderately closed oak canopy with an understory of tallgrasses and midgrasses. The lack of fire within the system has allowed shinnery oak to increase in stature to three feet or slightly taller. When the canopy thickens the grasses are interspersed within the oak at much lower levels and the hybrid mottes also increase in height up to fifteen feet or more. They also begin to form a closed canopy forest where the understory is sparsely vegetated by all other components of the plant community. Other woody species may also encroach in the community and they will also increase in abundance and stature without the disturbance of fire or other management. The overstory tree canopy ranges from 50 to 70 percent. Shading and competition for moisture along with woody litter build up on the soil surface begins to shift the plant community away from a tallgrass component to one dominated by midgrasses and shortgrasses. Little bluestem is the dominant grass species of the plant community with sand lovegrass, sideoats grama and other s present in much lower quanitites. Other grasses present include sand bluestem, Indiangrass, switchgrass, purple lovegrass, Scribner's panicum and Canada wildrye. The more abundant legumes are lespedezas, tickclovers, prairieclovers, and trailing wildbean. Hairy sunflower, Fendler's aster, wildbuckwheats, fleabanes and goldenrods are the more common forbs. Shrub species such as aromatic sumac, greenbrier and vines including poison ivy and Virginia creeper are common in the understory. To restore the site to near historic conditions would require an extended plan of one or more of the following treatments: mechanical or chemical brush control, moderate grazing and prescribed burning.

Table 6. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Tree	680	1240	1800
Grass/Grasslike	595	1085	1575
Forb	255	465	675
Shrub/Vine	170	310	450
Total	**1700**	**3100**	**4500**

Figure 12. Plant community growth curve (percent production by month). OK0001, Native, Warm Season Grasses. Typically, the summer growing season for warm season grasses begins April 5 to 15 and ends October 15 to 25. Nearly three-fourths of the season production will occur before the first of July. This varies from year to year depending upon temperatures and precipitation..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	1	5	10	20	30	10	5	10	6	2	1

Community 1.3
Closed Oak Canopy, Midgrass

This plant community is characterized by oak trees forming an overstory canopy of 70 to 85 percent. Understory vegetation is composed primarily of shade tolerant grasses, forbs, shrubs and vines. Shinnery oak and the hybridized oaks are the dominant species. Grasses and grasslike plants are sparse and include Scribner’s panicum, Virginia wildrye, sedges, nimblewill, fringeleaf paspalum, little bluestem, and purpletop. Most shortgrasses are typically not evident in this state. Major forbs include goldenrods, pussytoes, Fendler’s aster, blackeyed susan, croton and showy partridge pea. Woody plants in the understory include greenbrier, buckbrush, dewberry, eastern redcedar, hackberry and chittamwood. Eastern redcedar can begin to seriously invade the open areas of the savannah. Forage production for cattle grazing is very limited. Deer, turkey and small mammals utilize the site for cover and benefit seasonally from acorn and berry production. To restore this community to near historic conditions requires a management plan including herbicide or mechanical brush control treatments, accompanied by a prescribed burning and prescribed grazing. When heavy stands of eastern redcedar or greenbrier occur in the understory a combination of control treatments is required. When the oaks are controlled with herbicides, cedar and greenbrier are released and flourish unless other control measures are employed. As redcedar reaches a height of six feet or more, control usually requires some form of mechanical means. Cedar, six feet or less in height, can often be controlled with fire. In most situations remnant tallgrasses and midgrasses are present in sufficient numbers to provide recovery following brush control treatment. Grazing deferment immediately following treatment of the management actions is essential to assure recovery of the desired plant community.

Table 7. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Tree	1258	2294	3330
Grass/Grasslike	255	465	675
Shrub/Vine	136	248	360
Forb	50	93	135
Total	**1699**	**3100**	**4500**

Figure 14. Plant community growth curve (percent production by month). OK0001, Native, Warm Season Grasses. Typically, the summer growing season for warm season grasses begins April 5 to 15 and ends October 15 to 25. Nearly three-fourths of the season production will occur before the first of July. This varies from year to year depending upon temperatures and precipitation..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	1	5	10	20	30	10	5	10	6	2	1

Pathway 1.1
Community 1.1 to 1.2

In the abscence of fire and continued overgrazing this community can shift to one more dominated by midgrasses with scattered tallgrasses.

Pathway 1.2A
Community 1.2 to 1.1

With the use of prescribed grazing and prescribed burning this site can return to the reference plant community that is dominated by tallgrasses species.

Pathway 1.2B
Community 1.2 to 1.3

In the absence of fire and repeated overgrazing this site will become dominated by a shinnery oak overstory with mostly midgrasses as the herbaceous component.

Pathway 1.3A
Community 1.3 to 1.2

With the use of prescribed fire and prescribed grazing this site can be returned to a site with less canopy of shinnery and an increase in the amount of tallgrasses. Brush Management can be used to accelerate the process when shinnery oak canopy is very closed and vegetation is sparse.

State 2
Grassland

This plant community results following brush control by use of herbicides and/or mechanical treatments. The vegetation is predominately tallgrasses and midgrasses including sand bluestem, little bluestem, Indiangrass, and switchgrass. Legumes such as slender lespedeza, roundhead lespedeza, and Sessile leaf tickclover and showy partridgepea are usually abundant on the site. These sites can be infested by eastern red cedar and other woody plants without proper management. Where above ground mechanical, or chemical treatments have been used to control shinnery oak, the plant persists through sprouting or possibly from seedlings. Follow-up treatment with fire or herbicides is necessary to maintain this plant community. It is productive and good for grazing cattle, but can be limited in species diversity based on the HPC. In areas where the land has been subjected to repeated deep plowing the shinnery seems to not re-establish in these sites.

Dominant plant species

- sand bluestem (*Andropogon hallii*), grass
- little bluestem (*Schizachyrium scoparium*), grass

State 3
Cropland

With plowing, brush clearing, mechanical preparation this site has been used for cropland. It is highly unlikely to return to the reference plant community once this site has been used for cropland due to the repeated plowing that removes shinnery from the site. With seeding or sprigging, this site can support a variety of introduced forages for supplemental pasture. Fertilization, weed control, grazing management and occasionally reseeding will be needed to maintain introduced plant communities. See Forage Suitability Group.

State 4

Invaded

This community is indicative of the absence of the shinnery oak as the major tree or shrub component. Invasion of plants like Eastern red cedar, sand sage brush and other brush species can dominate the landscape in response to some management practices aimed at the oak community, along with continuous overgrazing by cattle. This community can eventually develop into dense stands of brush species that would typically be found in minimal amounts within the communities above. Recovery of this community can be very costly along with periods of removal of grazing pressure through a prescribed grazing plan based on climactic conditions and historical management of the site.

Dominant plant species

- eastern redcedar (*Juniperus virginiana*), tree
- sand sagebrush (*Artemisia filifolia*), shrub

Transition T1A
State 1 to 2

Restoration pathway T1C
State 1 to 3

Transition T1B
State 1 to 4

Transition T2B
State 2 to 1

Transition T2C
State 2 to 3

Transition T2A
State 2 to 4

In the absence of prescribed burning or without the use of brush managment this site can become invaded with other woody species. Typically Eastern Red Cedar will not be present unless the shinnery has been removed from the plant community.

Transition T3A
State 3 to 2

Once cultivation has ended, the site may be left idle or planted to native species. This will transition the site to State 2.

Transition T3B
State 3 to 4

Transition T4A
State 4 to 3

Additional community tables

Table 8. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	**Tall Grasses**			820–2400	
	sand bluestem	ANHA	*Andropogon hallii*	325–800	

	sand bluestem	ANHA	*Andropogon hallii*	325–600	–
	little bluestem	SCSC	*Schizachyrium scoparium*	300–750	–
	Indiangrass	SONU2	*Sorghastrum nutans*	100–600	–
	switchgrass	PAVI2	*Panicum virgatum*	130–525	–
2	**Mid Grasses**			100–400	
	thin paspalum	PASE5	*Paspalum setaceum*	40–120	–
	sideoats grama	BOCU	*Bouteloua curtipendula*	40–105	–
	sand lovegrass	ERTR3	*Eragrostis trichodes*	10–65	–
	silver bluestem	BOSA	*Bothriochloa saccharoides*	10–50	–
	California waterwort	ELCA	*Elatine californica*	0–30	–
	Canada wildrye	ELCA4	*Elymus canadensis*	0–30	–
	purple lovegrass	ERSP	*Eragrostis spectabilis*	0–30	–
	cane bluestem	BOBA3	*Bothriochloa barbinodis*	0–30	–
3	**Other Grasses**			0–125	
	lespedeza	LESPE	*Lespedeza*	88–110	–
	goldenrod	OLIGO3	*Oligoneuron*	88–110	–
	white heath aster	SYER	*Symphyotrichum ericoides*	88–110	–
	Baldwin's ironweed	VEBAB	*Vernonia baldwinii ssp. baldwinii*	88–110	–
	hairy grama	BOHI2	*Bouteloua hirsuta*	0–40	–
	fall witchgrass	DICO6	*Digitaria cognata*	0–40	–
	Scribner's rosette grass	DIOLS	*Dichanthelium oligosanthes var. scribnerianum*	0–40	–
	tumblegrass	SCPA	*Schedonnardus paniculatus*	0–40	–
	purpletop tridens	TRFL2	*Tridens flavus*	0–40	–
Forb					
4	**Legumes**			120–340	
	buckbrush	CECU	*Ceanothus cuneatus*	88–110	–
	Virginia creeper	PAQU2	*Parthenocissus quinquefolia*	88–110	–
	American plum	PRAM	*Prunus americana*	88–110	–
	dwarf chinquapin oak	QUPR	*Quercus prinoides*	88–110	–
	sumac	RHUS	*Rhus*	88–110	–
	greenbrier	SMILA2	*Smilax*	88–110	–
	western poison ivy	TORY	*Toxicodendron rydbergii*	88–110	–
	grape	VITIS	*Vitis*	88–110	–
	slimflower scurfpea	PSTE5	*Psoralidium tenuiflorum*	0–80	–
	Virginia tephrosia	TEVI	*Tephrosia virginiana*	0–70	–
	sessileleaf ticktrefoil	DESE	*Desmodium sessilifolium*	0–70	–
	roundhead lespedeza	LECA8	*Lespedeza capitata*	0–40	–
	purple prairie clover	DAPU5	*Dalea purpurea*	0–40	–
5	**Forbs**			120–340	
	queen's-delight	STSYS2	*Stillingia sylvatica ssp. sylvatica*	20–50	–
	white heath aster	SYER	*Symphyotrichum ericoides*	10–30	–
	common sunflower	HEAN3	*Helianthus annuus*	10–30	–
	annual buckwheat	ERAN4	*Eriogonum annuum*	10–30	–
	Indian blanket	GAPU	*Gaillardia pulchella*	0–15	

	Indian blanket	GAPU	*Gaillardia pulchella*	0–15	–
	kisses	GASUS	*Gaura suffulta ssp. suffulta*	0–15	–
	crested pricklypoppy	ARPO2	*Argemone polyanthemos*	0–15	–
	antelopehorns	ASASC	*Asclepias asperula ssp. capricornu*	0–15	–
	blue wild indigo	BAAUM	*Baptisia australis var. minor*	0–15	–
	yellow sundrops	CASE12	*Calylophus serrulatus*	0–15	–
	Canadian horseweed	COCAC3	*Conyza canadensis var. canadensis*	5–15	–
	whitemouth dayflower	COER	*Commelina erecta*	0–15	–
	Texas croton	CRTE4	*Croton texensis*	0–15	–
	common yarrow	ACMI2	*Achillea millefolium*	0–15	–
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	5–15	–
	bush morning-glory	IPLE	*Ipomoea leptophylla*	0–15	–
	dotted blazing star	LIPU	*Liatris punctata*	0–15	–
	spotted beebalm	MOPU	*Monarda punctata*	5–15	–
	cutleaf evening primrose	OELA	*Oenothera laciniata*	0–15	–
	prairie spiderwort	TROC	*Tradescantia occidentalis*	0–15	–
	Baldwin's ironweed	VEBA	*Vernonia baldwinii*	5–15	–
	upright prairie coneflower	RACO3	*Ratibida columnifera*	0–15	–
	Missouri goldenrod	SOMI2	*Solidago missouriensis*	0–15	–
	woolly plantain	PLPA2	*Plantago patagonica*	0–10	–
	white sagebrush	ARLUL2	*Artemisia ludoviciana ssp. ludoviciana*	0–10	–
Shrub/Vine					
6	**Shrubs**			250–675	
	Havard oak	QUHA3	*Quercus havardii*	170–500	–
	sand sagebrush	ARFI2	*Artemisia filifolia*	30–85	–
	leadplant	AMCA6	*Amorpha canescens*	0–80	–
	New Jersey tea	CEAM	*Ceanothus americanus*	0–40	–
	fragrant sumac	RHAR4	*Rhus aromatica*	0–40	–
	twistspine pricklypear	OPMA2	*Opuntia macrorhiza*	0–30	–
	Gurney's yucca	YUGLG	*Yucca glauca var. gurneyi*	0–30	–
	saw greenbrier	SMBO2	*Smilax bona-nox*	0–20	–
	western poison ivy	TORY	*Toxicodendron rydbergii*	0–10	–
	grape	VITIS	*Vitis*	0–10	–
	Virginia creeper	PAQU2	*Parthenocissus quinquefolia*	0–10	–
	littleleaf sumac	RHMI3	*Rhus microphylla*	0–10	–
Tree					
7	**Trees**			80–225	
	netleaf hackberry	CELAR	*Celtis laevigata var. reticulata*	35–100	–
	Chickasaw plum	PRAN3	*Prunus angustifolia*	0–50	–
	Oklahoma plum	PRGR	*Prunus gracilis*	0–50	–
	western soapberry	SASAD	*Sapindus saponaria var. drummondii*	0–50	–

Table 9. Community 1.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)

Table 10. Community 1.3 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)

Animal community

As brush canopy increases, forage production for cattle decreases. Deer and other wildlife species use the site for some mast. Cover is the main attribute benefitting wildlife. However, with the encroachment of eastern redcedar, wildlife species such as wild turkey leave the site due to vulnerability to predators. In severe cases with thick cedar, there is an overabundance of cover and many wildlife species will avoid the area. Cattle will avoid the site because of flies and the fact that there are limited summer breezes. Dense cedar will limit grazing accessibility as well. In the winter time, cattle will use the area for thermal cover.

Hydrological functions

This ecological site is contained to course permeable soils that allow for rapid infiltration. Loss of water to percolation during heavy rainfall events is common and there is little to no runoff on this site even on slopes up to 20 percent. Plant composition is important to infiltration and these soils are important recharge areas for local aquifers.

Recreational uses

Deep Sand Savannah sites offer scenic opportunities for outdoor recreation including photography, trail rides, camping, and hunting.

Wood products

Wood products include firewood, fence posts and cedar products (mulch and lumber).

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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.

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)	Mark Moseley, Jack Eckroat
Contact for lead author	100 USDA Suite 206, Stillwater, OK 74074
Date	12/04/2007
Approved by	Brandon Reavis
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

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

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

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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):** Variable but should average about 5 - 15%.

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):** Not much litter movement due to high infiltration rates. Twelve inches maximum, and only with strong winds.

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** Stability score 4 – 6. Stability scores based on a minimum of 6 samples tested.

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

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Runoff and infiltration are not affected by changes in plant community composition due to rapidly permeable soils with a plant cover of trees, shrubs, tall and midgrasses.

11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):** None.

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: Tallgrasses

    Sub-dominant: midgrasses (little bluestem)

    Other: Trees/shrubs > shortgrasses > forbs > cool season grasses and grasslikes.

    Additional: Tallgrasses > midgrasses (little bluestem) > Trees/shrubs > shortgrasses > forbs > cool season grasses and grasslikes.

13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** There can be some plant loss due to droughty nature of the site, especially after severe drought, but should be less than 10%.

14. **Average percent litter cover (%) and depth (in):** Litter cover should average 85% at a depth not more than 1 inch, depending upon the location of leaf litter.

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 1555 – 4100#/acre

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:** Invasives might include: eastern redcedar, annuals and non-natives.

17. **Perennial plant reproductive capability:** All plants capable of reproducing at least every 2 – 3 years.