Ecological site R080AY094OK
Wet Sandy Upland

Last updated: 9/19/2023
Accessed: 04/19/2024

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): 080A–Central Rolling Red Prairies

MLRA 80A is characterized by dark red Permian rocks that are exposed on gently sloping plains. These plains are dissected by rivers that flow from northwest to southeast. Major rivers of this MLRA include the Chikaskia and Bluff rivers in KS, the Salt Fork, Cimarron, North and South Canadian, Washita, Cache, Red River in OK, and branches of the Wichita River in TX. Soils are generally well drained, loamy or clayey deposits overlying Permian sandstones or shales.

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 occur on sand sheets between dunes and hummocks. They are unique due to the amount of plant available moisture. The water table on these sites may be as high as 24 inches below the soil surface. This available water in the soil profile allows for deep tooted tallgrasses to thrive as well as many forbs and legumes. Woody species may persist in small amounts. However, if these areas are subjected to abusive grazing practices, the more

palatable tallgrass species may decline and be replaced with less palatable midgrass species.

Associated sites

R080AY014OK	**Deep Sand** Rolling sandy sites adjacent to wet sandy sites.

Similar sites

R080AY025OK	**Depressional Upland** Wet interdunal sites. Higher clay content and pond with water.

Table 1. Dominant plant species

Tree	(1) *Salix nigra*
Shrub	Not specified
Herbaceous	(1) *Panicum virgatum*

Physiographic features

These sites occur on sand flats surrounded by sand hills.

These sites are non-flooded subirrigated sites located on nearly level valley floors, flats or depressions surrounded by sandhills or high terraces of the Central Rolling Red Prairies in MLRA 80A. These sites can also be found on the eastern side of MLRA 78C on very gently sloping to strongly sloping soils on side slopes that are parallel to drainageways and stream channels. When found on these side slopes, slope can range from 2 to 12 percent.

Table 2. Representative physiographic features

Landforms	(1) Plains > Sand sheet (2) Plains > Interdune
Runoff class	Negligible
Elevation	1,000–1,500 ft
Slope	0–2%
Water table depth	24–60 in
Aspect	Aspect is not a significant factor

Climatic features

The climate is characterized by moist, cool, springs; hot, often dry summers; mild autumns; and mild to cold winters. Variation in timing and amounts of precipition from year to year is quite common. Drought cycles range from three to five years duration with occasionally longer periods occurring at unpredictable intervals. Above normal rainfall cycles are usually just as random, but shorter in duration.

Table 3. Representative climatic features

Frost-free period (characteristic range)	173-187 days
Freeze-free period (characteristic range)	194-203 days
Precipitation total (characteristic range)	33-37 in
Frost-free period (actual range)	157-192 days
Freeze-free period (actual range)	191-208 days
Precipitation total (actual range)	32-39 in
Frost-free period (average)	179 days

Freeze-free period (average)	199 days
Precipitation total (average)	35 in

Climate stations used

- (1) WATONGA [USC00349364], Watonga, OK
- (2) PAULS VALLEY 4 WSW [USC00346926], Pauls Valley, OK
- (3) ANTHONY [USW00013980], Anthony, KS
- (4) STILLWATER 5 WNW [USW00053927], Stillwater, OK
- (5) OKEENE [USC00346629], Okeene, OK
- (6) WALTERS [USC00349278], Walters, OK
- (7) KINGFISHER [USC00344861], Kingfisher, OK
- (8) JEFFERSON [USC00344573], Medford, OK
- (9) CHEROKEE 4W [USC00341724], Cherokee, OK

Influencing water features

These site are subject to endosaturation or episaturation for long periods during the year as well as run off from adjacent sand hills.

Wetland description

NA

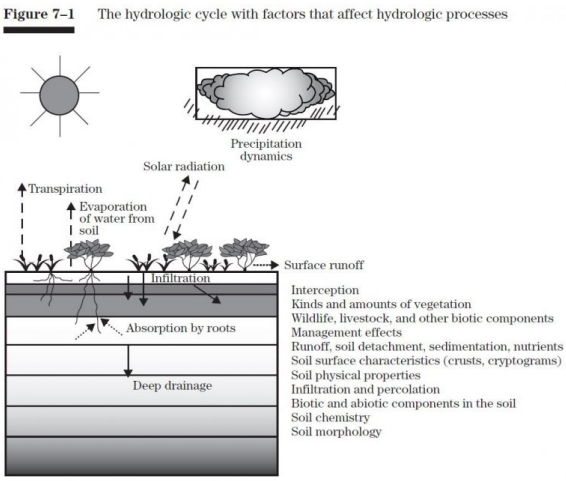


Figure 8.

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 soil components for this site include:
Goltry

Soils in these sites are non-flooded calcareous eolian sands, sandy alluvium and/or eolian deposits or, in the eastern portion of the MLRA, re-worked loamy eolian deposits. These sites are found on nearly level valley floors, flats, depressions surrounded by sandhills.

Table 4. Representative soil features

Parent material	(1) Alluvium–sandstone (2) Eolian sands–sandstone
Surface texture	(1) Loamy fine sand
Drainage class	Somewhat poorly drained
Permeability class	Moderately rapid to rapid
Soil depth	60 in
Surface fragment cover <=3"	0–1%
Surface fragment cover >3"	0–1%
Available water capacity (0-40in)	3–6 in
Electrical conductivity (0-40in)	0–1 mmhos/cm
Sodium adsorption ratio (0-40in)	0–1
Soil reaction (1:1 water) (0-40in)	5.5–7.5
Subsurface fragment volume <=3" (Depth not specified)	0–1%
Subsurface fragment volume >3" (Depth not specified)	0–1%

Ecological dynamics

The information contained in the State and Transition Diagram (STD) and the Ecological Site Description was developed using and historical data, professional experience, and scientific studies. The information presented is representative of a very 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.

Plants growing on this site are able to grow in soil that is wet and sometimes saturated. In many places throughout the site, hydrophytic species may be found. Available water for plant growth is very high, too high for many upland species to grow. Productivity on this site is high in comparison to other plains sites. Diversity is excellent and the site is a favorite for many species of wildlife. The mixture of grasses, forbs, and woody plants make it very valuable for wildlife habitat. There is a good variety of both cool-season and warm-season plants. This site was perhaps more widespread in pre-settlement times before pressure was placed on aquifers and other water sources by irrigation, wells, and other human needs. Stream characteristics were also changed by impoundments. Today, many of these subirrigated sites are in danger of being lost due to declining water tables and poor management. Many of these sites are smaller than they were 30 to 50 years ago. Natural fire played an important role in ecological functions of most plains sites, especially the tallgrass communities. Tallgrasses such as big bluestem (*Andropogon gerardii*), switchgrass (*Panicum virgatum*), Eastern gamagrass (*Tripsacum dactyloides*), and Indiangrass (*Sorghastrum nutans*) were dependent upon fire to stimulate them and remove old growth that would accumulate on the soil surface. Fire also kept shrubs and other woody species suppressed while, very importantly, removing old fallen timber from trees such as cottonwood (Populus spp.). Grasslikes such as rushes (Scirpus spp.) and cattails (Typha spp.) accumulate more growth than do most tallgrasses; and can sometimes become dominant in the wetter parts of the site. Fire was a very important factor in maintaining balances between the many different vegetation types on this site. Fire was also important in maintaining wildlife habitat by opening up canopy cover and removing barriers to movement. The wet soil acts as an insulator, protecting plant roots and lower stems from heat

damage, so, plant re-growth is rapid. The presence of water in the semi-arid plains attracts all kinds of grazers and predators as well as birds and small mammals. This site has an abundance of all habitat factors needed: water, nesting and escape cover, and a variety of food plants for turkey, quail, white tailed deer, as well as a multitude of other species of mammals and birds. Cattle find the site attractive as well and will spend too much time grazing and loafing in these areas if allowed to. The site can be grazed without damaging the plant community and the riparian characteristics if a time controlled grazing technique is used with proper stocking rates. However, this can be difficult to accomplish. Abusive grazing will see the taller grass species giving way to secondary succession species that are better adapted to cope with grazing pressure. There are many low order weedy species that also thrive in wet soils. These species will begin to dominate if improper management continues for extended periods of time. The unique characteristics of the site and the great differences from adjacent sites make special management necessary. Often, it may be beneficial to fence this site in such a way as to control and limit access by grazing animals. Occasionally, haying of the tallgrasses is a good alternative to grazing. Prescribed burning may be applicable in some cases to help sustain a diverse community.

State and Transition Diagram:
A State and Transition Diagram for the Wet Sandy Upland (R080AY094OK) is depicted below. Thorough descriptions of each state, transition, and pathway follow the model. Experts base this model on available experimental research, field observations, professional consensus, and interpretations. It is likely to change as knowledge increases.
Plant communities will differ across the MLRA because of the natural variability in weather, soils, and aspect. The Reference Plant Community is not necessarily the management goal; other vegetative states may be desired plant communities as long as the Range Health assessments are in the moderate and above category.

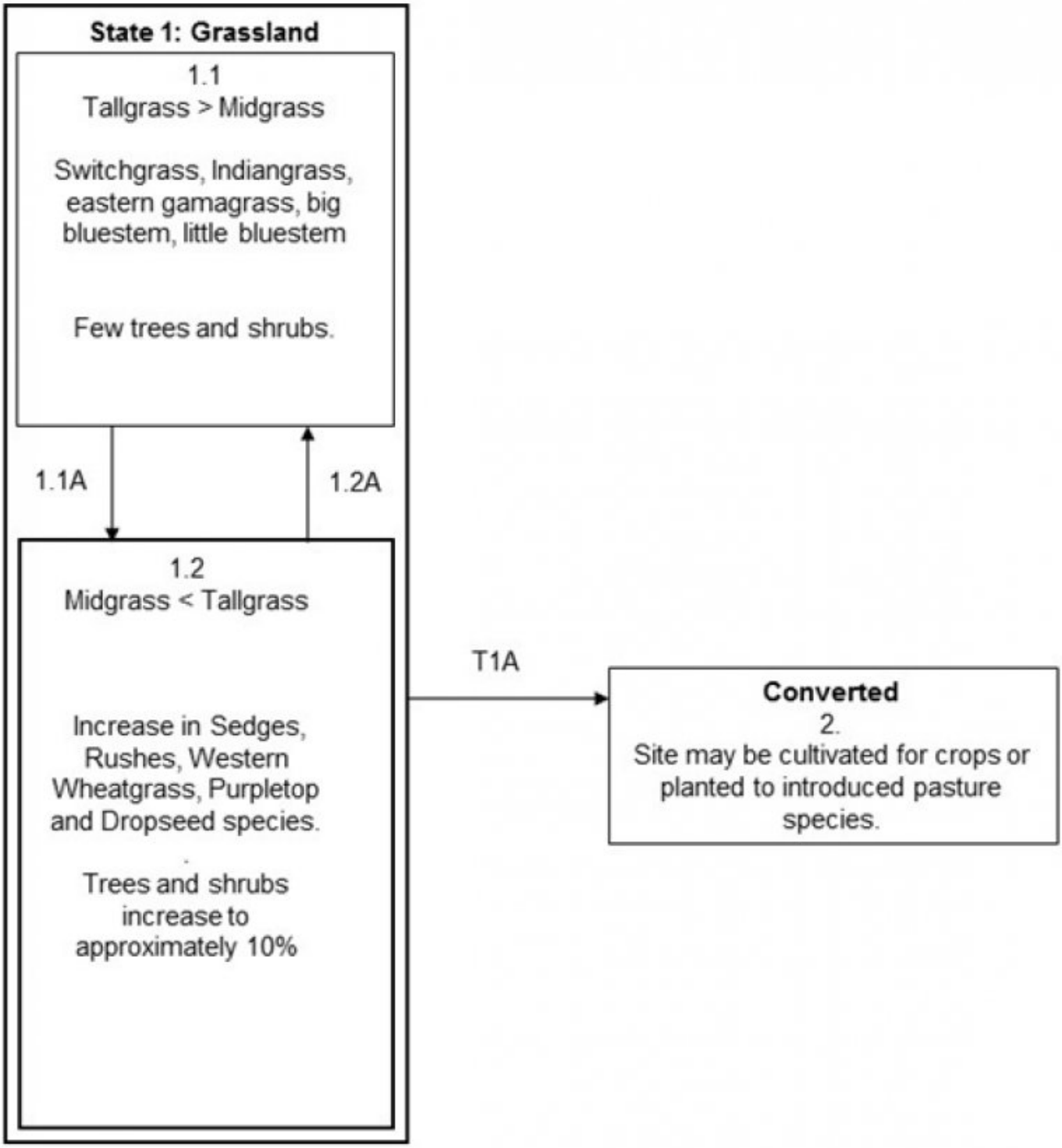
The biological processes on this site are complex. Therefore, representative values are presented in a land management context. The species lists are representative and are not botanical descriptions of all species occurring, or potentially occurring, on this site. They are not intended to cover every situation or the full range of conditions, species, and responses for the site.

Composition by dry weight and percent canopy cover are provided to describing the functional groups. Most observers find it easier to visualize or estimate percent canopy for woody species (trees and shrubs).

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

State and transition model

R080AY094OK
Wet Sandy Upland



Legend:

1.1A: Long term abusive grazing practices, lowered water table (below rooting zone)
1.2A: Prescribed grazing (including deferment)
T1A: Cultivation, land use conversion

Figure 9. R080AY094OK

State 1
Grassland

Dominant plant species

- black willow (*Salix nigra*), shrub
- switchgrass (*Panicum virgatum*), grass

Community 1.1
Tallgrass

The reference plant community is a mixture of tallgrasses, some grasslike plants, forbs, and a very small shrub and tree component. This plant community is about 75 to 85 percent grasses, 10 to 15 percent forbs and 0 to10 percent shrubs and trees. Switchgrass usually dominates the plant community making up 25 to 30 percent of the vegetation although big bluestem or sand bluestem can be co-dominants with switchgrass. Eastern gamagrass, if present, can also be a dominant or co-dominant species. Other grass species important to the site are Indiangrass, Scribner's panicum, purpletop, beaked panicum, and the wildryes. Important forbs include Illinois bundleflower, Maximillian sunflower, roundhead lespedeza and goldenrods. Common shrubs and trees found on site are cottonwoods, buttonbush, willow and indigobush. Because this site is subirrigated, and the water table is usually within 12 inches of the surface during the growing season, there is usually ample water for vegetation production. Annual production will vary from 4,000 pounds in unfavorable years to 7,000 pounds or more in favorable years. The production values in the following table are best estimates from limited clipping data and range observations. This site is one of the most consistent and most productive sites in MLRA 80A. The high range estimates of production give a good indication of each particular species' production in relationship to all other listed species. The zero in the low production data does not necessarily indicate zero production per se, but simply indicates that the production will be somewhere within the low-high range, and, will most likely be between the average and the high.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	3280	4510	5740
Forb	400	550	700
Shrub/Vine	200	275	350
Tree	120	165	210
Total	**4000**	**5500**	**7000**

Figure 11. 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
Midgrass

This plant community is dominated by a mixture of midgrasses, tallgrasses, and shortgrasses. The tallgrasses and midgrasses are becoming co-dominant. Midgrasses may temporarily dominate the tallgrasses during periods of prolonged overgrazing or drought, but will quickly recover as conditions and management improve. Sedges and rushes are increasing. Most importantly, woody species are increasing. The decrease of tallgrasses and increase in woody species indicates that the site is heading towards a threshold. If the soil and water becomes a little saline because of a lowering of the water table, alkali sacaton and other saline-tolerant herbaceous species may start to show in the plant community.

Pathway 1.1A
Community 1.1 to 1.2

If abusive grazing practices persist, the community may shift towards 1.2 as the less palatable species are able to dominate. Also, this shift could be the result of a lowering of the water table resulting in less plant available water.

Pathway 1.2A
Community 1.2 to 1.1

With the implementation of a prescribed grazing system that includes growing season deferment, the community may shift towards the reference community 1.1. Also, this shift could occur as the result of a restored water table.

State 2
Converted

These sites are sometimes subjected to land use conversion to farmland or pastureland. Once cultivation occurs, the soil structure and biotic community is altered. Please contact local NRCS office or County Extension service for information regarding suitable crops and potential yields.

Dominant plant species

- Bermudagrass (*Cynodon dactylon*), grass

Transition T1A
State 1 to 2

With cultivation and seeding, this site has been altered and has transitioned to an alternative ecological state. The soil properties have been altered significantly.

Transition T1A
State 1 to 2

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Additional community tables

Table 6. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	**Tallgrass**			1960–3430	
	switchgrass	PAVI2	*Panicum virgatum*	1000–1750	–
	sand bluestem	ANHA	*Andropogon hallii*	800–1400	–
	Indiangrass	SONU2	*Sorghastrum nutans*	400–700	–
	eastern gamagrass	TRDA3	*Tripsacum dactyloides*	0–560	–
	little bluestem	SCSC	*Schizachyrium scoparium*	0–560	–
	prairie cordgrass	SPPE	*Spartina pectinata*	0–450	–
2	**Cool Season**			200–350	
	Canada wildrye	ELCA4	*Elymus canadensis*	0–180	–
	western wheatgrass	PASM	*Pascopyrum smithii*	0–180	–
	Texas bluegrass	POAR	*Poa arachnifera*	0–100	–
	Heller's rosette grass	DIOL	*Dichanthelium oligosanthes*	0–100	–
3	**Mid/Shortgrasses**			1000–1750	

	sideoats grama	BOCU	*Bouteloua curtipendula*	0–100	–
	blue grama	BOGR2	*Bouteloua gracilis*	0–100	–
	silver beardgrass	BOLA2	*Bothriochloa laguroides*	0–100	–
	fall witchgrass	DICO6	*Digitaria cognata*	0–100	–
	foxtail barley	HOJU	*Hordeum jubatum*	0–100	–
	marsh muhly	MURA	*Muhlenbergia racemosa*	0–100	–
	vine mesquite	PAOB	*Panicum obtusum*	0–100	–
	thin paspalum	PASE5	*Paspalum setaceum*	0–100	–
	Carolina canarygrass	PHCA6	*Phalaris caroliniana*	0–100	–
	marsh bristlegrass	SEPA10	*Setaria parviflora*	0–100	–
	alkali sacaton	SPAI	*Sporobolus airoides*	0–100	–
	composite dropseed	SPCO16	*Sporobolus compositus*	0–100	–
	purpletop tridens	TRFL2	*Tridens flavus*	0–100	–
4	**Grasslike**			120–210	
	sedge	CAREX	*Carex*	120–210	–
Forb					
5	**Forbs**			400–700	
	Maximilian sunflower	HEMA2	*Helianthus maximiliani*	0–180	–
	roundhead lespedeza	LECA8	*Lespedeza capitata*	0–180	–
	pepperweed	LEPID	*Lepidium*	0–100	–
	lemon beebalm	MOCI	*Monarda citriodora*	0–100	–
	Missouri goldenrod	SOMI2	*Solidago missouriensis*	0–100	–
	stenosiphon	STENO2	*Stenosiphon*	0–100	–
	queen's-delight	STSY	*Stillingia sylvatica*	0–100	–
	white heath aster	SYER	*Symphyotrichum ericoides*	0–100	–
	prairie spiderwort	TROC	*Tradescantia occidentalis*	0–100	–
	Baldwin's ironweed	VEBA	*Vernonia baldwinii*	0–100	–
	hoary verbena	VEST	*Verbena stricta*	0–100	–
	camphorweed	HESU3	*Heterotheca subaxillaris*	0–100	–
	annual marsh elder	IVAN2	*Iva annua*	0–100	–
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	0–100	–
	Indianhemp	APCA	*Apocynum cannabinum*	0–100	–
	wavyleaf thistle	CIUN	*Cirsium undulatum*	0–100	–
	whitemouth dayflower	COER	*Commelina erecta*	0–100	–
	Illinois bundleflower	DEIL	*Desmanthus illinoensis*	0–100	–
	fleabane	ERIGE2	*Erigeron*	0–100	–
	American licorice	GLLE3	*Glycyrrhiza lepidota*	0–100	–
Shrub/Vine					
6	**Shrub**			200–350	
	false indigo bush	AMFR	*Amorpha fruticosa*	0–270	–
	common buttonbush	CEOC2	*Cephalanthus occidentalis*	0–270	–
	willow baccharis	BASA	*Baccharis salicina*	0–100	–
Tree					
7	**Tree**			120–210	

	eastern cottonwood	PODE3	*Populus deltoides*	0–210	–
	black willow	SANI	*Salix nigra*	0–210	–
	American elm	ULAM	*Ulmus americana*	0–100	–
	common hackberry	CEOC	*Celtis occidentalis*	0–100	–
	roughleaf dogwood	CODR	*Cornus drummondii*	0–100	–

Animal community

Domestic livestock and white-tail deer are the dominant grazers and browsers of the site. Various songbirds and small mammals may also find use of these areas. As the site changes towards the woody dominated community, the quality of the habitat may improve for some species and decline for others. Management must be applied to maintain a vegetative state in optimum habitat quality for the desired animal species.

Hydrological functions

These site are subject to endosaturation or episaturation for long periods during the year as well as run off from adjacent sand hills.

Recreational uses

Camping, fishing, hunting, hiking, bird watching, horseback riding and many other outdoor recreational practices.

Wood products

There are no significant wood produts from this site.

Other products

NA

Other information

NA

Inventory data references

USDA-NRCS (Formerly Soil Conservation Service) Range Site Descriptions (1960s)
USDA-NRCS draft ESDs (2000s)

Type locality

Location 1: Woods County, OK	
General legal description	Woods County, Oklahoma; approximately 17 miles east and 12 miles south of Waynoka; 1850 feet north and 1500 feet east of the southwest corner of sec. 2, T. 22 N., R. 13 W

References

Anderson, R.C. 1982. An evolutionary model summarizing the roles of fire, climate, and grazing animals in the origin and maintenance of grasslands. Pages 297–308 in , , and , editors. Grasses and grasslands: systematics and ecology.

Other references

This site was included in an update project during 2013. The State &Transition model was re-formatted and the

ESD was edited to fit the new ESIS format. The concepts and vegetative data contained therein was not altered. The entire ESD will be reviewed, updated, and subjected to the QC/QA processes as part of a future project. CW

USDA-NRCS (Formerly Soil Conservation Service) Range Site Descriptions (1960s)
USDA-NRCS (Formerly Soil Conservation Service) Ag Handbook 296 (2006)

Contributors

Dr. Jack Eckroat, Grazing Lands Specialist, NRCS, Oklahoma
Edits by Colin Walden, Soil Survey Office, Stillwater, OK

Approval

Bryan Christensen, 9/19/2023

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)	Kay Anderson, David Kraft, Mark Moseley, Jack Eckroat, Harry Fritzler, Steve Glasgow
Contact for lead author	
Date	04/01/2005
Approved by	Bryan Christensen
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** This site usually has flatter slopes and sandier soils. There are few, if any, rills.

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2. **Presence of water flow patterns:** There is little, if any, evidence of soil deposition or erosion (some possibly apparent after significant rain events). Water generally flows evenly over the entire landscape.

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3. **Number and height of erosional pedestals or terracettes:** There should not be any evidence of erosional pedestals or terracettes on this site.

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4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** There is <5% bare ground on this site. Bare areas are small and not connected.

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5. **Number of gullies and erosion associated with gullies:** None, drainages are represented as natural stable channels; vegetation is common with no signs of erosion.

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

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7. **Amount of litter movement (describe size and distance expected to travel):** Uniform distribution of litter. Litter rarely moves >6 inches on flatter slopes and may be as much as doubled on steeper slopes, then only during high intensity storms.

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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):** Surface soil is stabilized (Stability Score 5-6). Stability scores based on a minimum of 6 samples tested.

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Soil surface horizon intact. A horizon: 0 to 12 inches; brown fine sand, granular structure. B horizon: 12 to 30 inches; light yellowish brown. Loose.

   Refer to specific description for component sampled.

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Infiltration and runoff are not affected by any changes in plant community composition and distribution. (Tallgrass/Midgrass dominated). Any changes in infiltration and runoff can be attributed to other factors (e.g. compaction

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11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):** There is usually no compaction layer.

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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: Tallgrasses

    Sub-dominant: Midgrasses, Cool-Season Perennial Grasses

    Other: Forbs, Shrubs

Additional:

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** There is some plant mortality and decadence on the perennial grasses, especially in the absence of fire and herbivory, but usually <5%.

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14. **Average percent litter cover (%) and depth (in):** Litter should cover 50 - 75% of the area between plants with accumulations of <1inches deep.

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** Reference production is 4,000 to 7,000 pounds/acre per year.

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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:** No invasive species. Invasives might include: eastern redcedar, locust, annuals and non-natives.

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17. **Perennial plant reproductive capability:** All plants capable of reproducing at least every year.
