USDA Natural Resources Conservation Service

Ecological site R080AY073OK
Sandy Loam Upland

Last updated: 9/19/2023
Accessed: 05/19/2024

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.

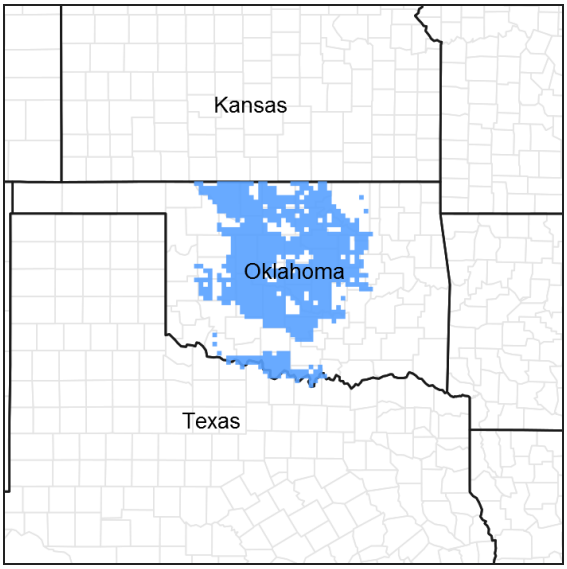


Figure 1. Mapped extent

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 Chickaskia 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

This site occurs on sandy loam soils on hills and paleoterraces. The soils have a favorable water holding capacity for plant growth. Many sites have been cultivated in the past or are still in crop productions. The vegetation of the reference state is dominated by tallgrasses with midgrasses and forbs. Sand Bluestem, Switchgrass, and Indiangrass are the most productive grasses. Sandplum and Leadplant may be scattered in small amounts,

however, most woody species were historically suppressed by periodic fires. If fire is removed, the site may be susceptible to invasion by woody species such as locusts, elm, and Eastern Redcedar.

Associated sites

R080AY014OK	**Deep Sand** Deep sandy soils. Eda & Aline Series.
R080AY056OK	**Loamy Upland** Loamy soils. Higher production.

Similar sites

R080AY056OK	**Loamy Upland** Fine loamy soils with a higher production potential.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Amorpha canescens*
Herbaceous	(1) *Andropogon hallii*

Physiographic features

Deep, moderately sandy uplands occuring on nearly level to strongly sloping rolling topography.

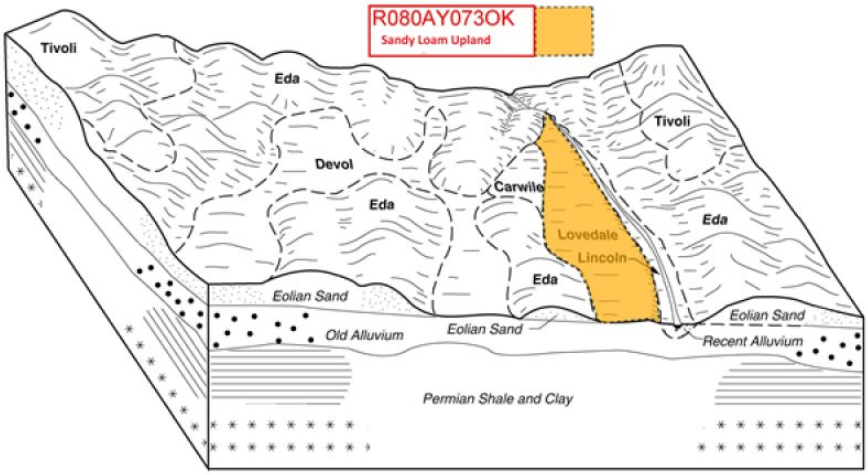


Figure 2. R080AY073OK

Table 2. Representative physiographic features

Landforms	(1) Plains > Hill (2) Alluvial plain remnant > Paleoterrace
Runoff class	Negligible to medium
Elevation	152–457 m
Slope	2–15%
Water table depth	152 cm
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)	838-940 mm
Frost-free period (actual range)	157-192 days
Freeze-free period (actual range)	191-208 days
Precipitation total (actual range)	813-991 mm
Frost-free period (average)	179 days
Freeze-free period (average)	199 days
Precipitation total (average)	889 mm

Climate stations used

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

Influencing water features

These upland site may shed some water via runoff during heavy rain events. They are not associated with wetland features. The presence of good ground cover and deep rooted grasses can help facilitate infiltration and reduce sediment loss.

Wetland description

NA

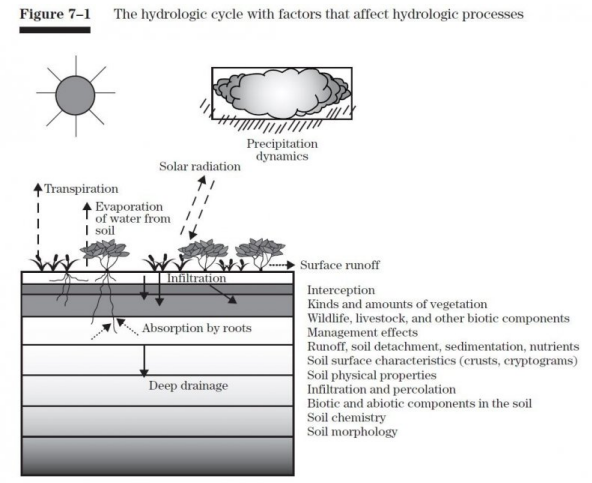


Figure 9.

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:
Lovedale, Waynoka, Wisby

The soils of this site are deep, permeable fine sandy loams occurring on gently rolling to steeply rolling uplands. The subsoils allow deep plant root and water penetration. Runoff is low and water holding capacity is fair to moderate.

Table 4. Representative soil features

Parent material	(1) Alluvium–sandstone (2) Eolian deposits–sandstone
Surface texture	(1) Fine sandy loam (2) Sandy loam
Drainage class	Well drained to somewhat excessively drained
Permeability class	Moderate to moderately rapid
Soil depth	102 cm
Surface fragment cover <=3"	0–4%
Surface fragment cover >3"	0–1%
Available water capacity (0-101.6cm)	10.16–25.4 cm
Electrical conductivity (Depth not specified)	0–1 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0–1
Soil reaction (1:1 water) (0-101.6cm)	6–7
Subsurface fragment volume <=3" (Depth not specified)	0–8%

Ecological dynamics

The information contained in the State and Transition Diagram (STD) and the Ecological Site Description was developed using 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.

The reference state may, because of location within the MLRA and climate, stay in a continuous flux between tallgrass/midgrass and midgrass/tallgrass prairie (The western side of the MLRA would tend to favor midgrasses more than tallgrasses because of drier conditions. This plant community is dominated by warm season, perennial tallgrasses and midgrasses. These grass species are intermixed and well distributed over the site. Some plants are

strongly rhizomatous and often form colonies six to ten feet across. Production is quite variable from year to year. This site can be very droughty when rainfall is below normal and, conversely, deep rooted tallgrasses respond well and vegetative production can be quite high during periods of normal or above normal precipitation. The reference plant commuity will contain tallgrasses little bluestem (sometimes considered a midgrass), big bluestem, sand bluestem, switchgrass and Indiangrass. The remaining community is made up of wildryes, Scribner''s panicum, sessilleaf tickclover, pitcher''s sage, sand paspalum, sideoats grama, blue grama, buffalograss, prairie clover, halfshrub sundrop, yucca, fall witchgrass, sand dropseed, tall dropseed, meadow dropseed, purple lovegrass, wild indigo, wild alfalfa, catclaw sensitive-brier and mat sandbur. Woodies will include prairie rose, poison ivy, elm, persimmon, hawthorn, sand plum, sumac, Jerseytea, grapes and skunkbush.

The plant community is well suited for domestic livestock grazing. This site’s soils are susceptible to wind erosion. As the site deteriorates from overgrazing, absence of fire, or both, other plant communities usually result. These communities include a midgrass/shortgrass community and a shrub dominant community. Heavy grazing usually results in a gradual decrease of tallgrasses. The tallgrasses lost to overgrazing are replaced by perennial midgrasses and shortgrasses along with varying amounts and species of annuals. Different species of shrubs may also encroach on the site as tallgrasses decrease. When deeper rooted tallgrasses are replaced, the shallower rooted replacement species usually do not have access to deep soil moisture, so forage production on the site is reduced.

This plant community evolved during large herbivore grazing and occasional natural fires. Fire tended to suppress the growth of woody plants. With the absence of fire, shrub species generally increase, and may eventually dominate the site, especially if the site is continuously overgrazed. A small scattering of annual plants are common on Sandy Prairie sites, but usually increase as the site deteriorates due to overgrazing. Annual plants may also appear on-site because of disturbances by rodents and other small digging mammals, or when normal rainfall patterns return after an extended periods of drought.

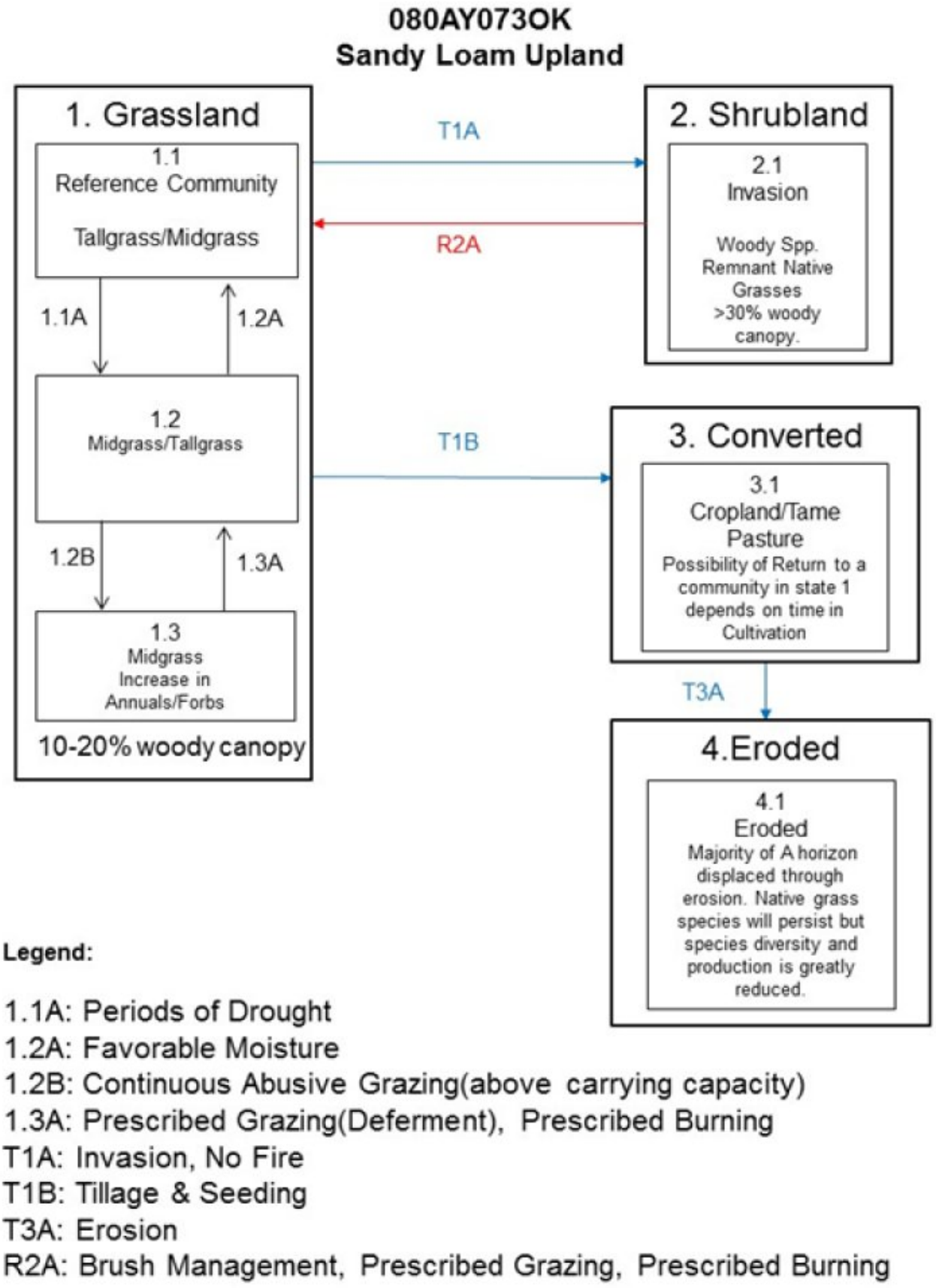
State and Transition Diagram:
A State and Transition Diagram for the Sandy Loam Upland (R080AY073OK) site is depicted below. Thorough descriptions of each state, transition, and pathway follow the model. Experts base this model on available experimental research, field observations, professional consensus, 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 describe 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



Legend:

1.1A: Periods of Drought
1.2A: Favorable Moisture
1.2B: Continuous Abusive Grazing(above carrying capacity)
1.3A: Prescribed Grazing(Deferment), Prescribed Burning
T1A: Invasion, No Fire
T1B: Tillage & Seeding
T3A: Erosion
R2A: Brush Management, Prescribed Grazing, Prescribed Burning

Figure 10. R080AY073OK

State 1
Grassland

Dominant plant species

- leadplant (*Amorpha canescens*), shrub
- sand bluestem (*Andropogon hallii*), grass

Community 1.1
Tallgrass/Midgrass

The Reference Plant Community is a tallgrass/midgrass community. Although this site is a tallgrass/midgrass community, it stays in a continuous flux between tallgrass/midgrass and midgrass/tallgrass prairie. It will contain tallgrasses little bluestem, sand bluestem, switchgrass and Indiangrass. Important midgrasses are sand dropseed, sideoats grama, thin paspalum, sand lovegrass, purple lovegrass, tall dropseed, purple lovegrass. The remaining community is made up of wildryes, Scribner's panicum, sessilleaf tickclover, pitcher's sage, sand paspalum, prairie clover, halfshrub sundrop, yucca, fall witchgrass, wild indigo, wild alfalfa, and mat sandbur. Scattered throughout this site is small amounts of shortgrasses, consisting primarily of blue grama, buffalograss, and hairy grama. Typically, a few shrubs such as leadplant, Jersey tea, soapweed yucca, skunkbush sumac and Chickasaw plum occur on the site.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	1793	2914	4035
Forb	336	547	757
Shrub/Vine	112	182	252
Tree	–	–	–
Total	**2241**	**3643**	**5044**

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 1.2
Midgrass/Tallgrass

A Sandy Prairie site that is located on the western side of MLRA 80A will naturally flucuate from Tallgrass/Midgrass to Midgrass/Tallgrass. There may be times however, because of extended droughty periods that the site will not show many, if any, tallgrasses for an extended period of time. This is pretty common in western Oklahoma MLRA's. Heavy continuous grazing will also drive the tallgrass community towards a midgrass community.

Figure 13. 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
Midgrass/Annuals

This community is usually the result of overgrazing, but can result from combinations of lesser factors such as unfavorable climate coupled with proper grazing when coincidental combination of factors cause stress on the plant

community. These types of combinations of factors usually result in a gradual decrease of tallgrasses. The tallgrasses lost to overgrazing/other factors are replaced by perennial midgrasses and shortgrasses along with varying amounts and species of annuals. Different species of shrubs may also encroach on the site as tallgrasses decrease. When deeper rooted tallgrasses are replaced, the replacement shallower-rooted species usually do not have access to deep soil moisture, so forage production on the site is reduced. Annual forbs and shrubs will usually increase in this community phase.

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 1.1A
Community 1.1 to 1.2

Due to the nature of the soils on the site, period of prolonged(multiyear) drought may cause the plant community to shift towards community 1.2.

Pathway 1.2A
Community 1.2 to 1.1

When favorable precipitation returns, the plant community may shift back towards the reference community. Proper grazing management is required to facilitate this shift.

Pathway 1.2B
Community 1.2 to 1.3

If abusive grazing practices persist for multiple years, the community may be shifted to 1.3. These abusive practices may include stocking above carrying capacity without adequate rest for multiple season.

Pathway 1.3A
Community 1.3 to 1.2

Through a well planned prescribed grazing system, this community may be shifted towards 1.2. This system should include some form of growing season deferment. Prescribed fire may also be necessary to keep the woody species suppressed.

State 2
Invasion, Shrubs/Trees

As the State and Transition Model shows, in this state, the site is not expressing shortgrasses, midgrasses or tallgrasses in any great quantity even though remnants of all still remain. The site has basically evolved into a shrub,tree and forb site. Invaders such as eastern redcedar and mesquite have begun their invasion of the site at this stage, but actually, their invasion may have started at any time in the model. But now, because a invader density threshold has been crossed (subjective), it will take considerable outside energy input to reverse and drive the system back towards the reference state. If woody invaders (i.e. eastern redcedar)are over 6 feet tall, the site may require herbicide and/or mechanical brush control treatments coupled with prescribed burning to achieve control. These woody controls coupled with the employment of proper stocking rates are required to push the plant community back from a woody dominated state threshold towards the more grassy and grass-like reference state.

Dominant plant species

- eastern redcedar (*Juniperus virginiana*), tree
- elm (*Ulmus*), tree

- sumac (*Rhus*), shrub
- dropseed (*Sporobolus*), grass

State 3
Converted

Within this ecological state, the site has been cultivated and worked up for farming. The soil structure, soil health, hydrology, and plant community has been significantly altered.

Dominant plant species

- Bermudagrass (*Cynodon dactylon*), grass

State 4
Eroded

If the site is eroded to the point that it will never get back to something resembling one of the first state rangeland plant communities, short of hauling in topsoil, the site is something different than the original and will never function anything like the reference state. The soil resource is the primary limiting factor.

Dominant plant species

- silver beardgrass (*Bothriochloa laguroides*), grass
- threeawn (*Aristida*), grass

Additional community tables

Table 6. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1				–	
	little bluestem	SCHIZ4	*Schizachyrium*	–	–
	big bluestem	ANGE	*Andropogon gerardii*	–	–
	sand bluestem	ANHA	*Andropogon hallii*	–	–
	switchgrass	PAVI2	*Panicum virgatum*	–	–
	Indiangrass	SORGH	*Sorghastrum*	–	–
	sideoats grama	BOCU	*Bouteloua curtipendula*	–	–
	buffalograss	BODA2	*Bouteloua dactyloides*	–	–
	dropseed	SPORO	*Sporobolus*	–	–
	witchgrass	PACA6	*Panicum capillare*	–	–
	panicgrass	PANIC	*Panicum*	–	–
Forb					
2				–	
	yucca	YUCCA	*Yucca*	–	–
	wild indigo	BAPTI	*Baptisia*	–	–
	alfalfa	MEDIC	*Medicago*	–	–
	mat sandbur	CELO3	*Cenchrus longispinus*	–	–
Shrub/Vine					
3				–	
	prairie rose	ROAR3	*Rosa arkansana*	–	–
	eastern poison ivy	TORA2	*Toxicodendron radicans*	–	–
	elm	ULMUS	*Ulmus*	–	–
	Texas persimmon	DITE3	*Diospyros texana*	–	–
	hawthorn	CRATA	*Crataegus*	–	–
	sumac	RHUS	*Rhus*	–	–
	Jersey tea	CEHE	*Ceanothus herbaceus*	–	–
	riverbank grape	VIRI	*Vitis riparia*	–	–

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 upland site may shed some water via runoff during heavy rain events. The presence of good ground cover and deep rooted grasses can help facilitate infiltration and reduce sediment loss.

Recreational uses

NA

Wood products

NA

Other products

NA

Other information

NA

Inventory data references

Soil Survey Manuscripts in Oklahoma.
Range Site Descriptions, Oklahoma NRCS
Draft ESDs Oklahoma NRCS

Type locality

Location 1: Alfalfa County, OK	
General legal description	Alfalfa County, Oklahoma; approximately 3 miles east and 3.5 miles north of Helena; 2300 feet west and 300 feet south of the northeast corner of sec. 1, T. 24 N., R. 10 W.
Location 2: Woods County, OK	
General legal description	Woods County, Oklahoma. About .75 miles north of Dacoma; 180 feet north and 360 feet east of the southwest corner of sec. 1, T. 25 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 ESD was approved under guidance found in the ESIS user guide that pre-dates the current NESH guidance. It is in need if updates including plant community data collections and validation of past data. It should be included in an upcoming ESD Development Project within the next five years. For further information please contact your local NRCS office.

This site description was included in a format update project during 2013. The State & Transition model was re-formatted 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

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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)	Mark Moseley, Harry Fritzler, Steve Glasgow, Jack Eckroat
Contact for lead author	100 USDA Suite 206 Stillwater, OK 74074
Date	04/01/2005
Approved by	Colin Walden
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** There are none on this site due to high infiltration rates

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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 some variability, but it should average 5-15% 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.

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.

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.

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Ap horizon: 0 to 14 inches; light brown loamy fine sand, single grained structure. Bt horizon: 14 to 27 inches; reddish brown sandy loam, reddish brown medium prismatic structure.

   Refer to specific description for component sampled.

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. (Bunchgrass/ Tallgrass dominant).

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.

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 Midgrasses

    Sub-dominant: Shortgrasses Cool Season Perrenial Grasses

    Other: Forbs, Shrubs

    Additional:

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%.

14. **Average percent litter cover (%) and depth (in):** Litter should cover 50 - 75% of the area between plants with accumulations of .5 - 1 inch deep.

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** Annual production is 2,000 to 4,500 pounds per 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:** No invasive species. Invasives might include: eastern redcedar, annuals and non-natives.

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