USDA Natural Resources
Conservation Service

Ecological site R085BY098OK
Very Shallow 38-42 PZ

Last updated: 9/21/2023
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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): 085B–Arbuckle Uplift

The Grand Prairie MLRA is characterized by predominately loam and clay loam soils underlain by limestone and shale. Topography transitions from steeper ridges and summits of the Lampasas Cut Plain on the southern end to the more rolling hills of the Fort Worth Prairie to the north. The Arbuckle Mountain area in Oklahoma is also within this MLRA. In the structurally complex Arbuckle Mountains of southern Oklahoma, outcropping rocks are primarily limestone, sandstone, dolomite, quartzite, and chert. These units are exposed as alternating beds of Paleozoic rocks that have been faulted, tilted, and deformed to form a tombstone-like topography. This area has significant exposures of granite, rhyolite, and gabbro of Precambrian age.

Classification relationships

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

Ecological site concept

These sites occur on very shallow loam soils over sandstone and limestones on uplands. The reference vegetation includes Midgrasses and Shortgrasses with a variety of forbs and legumes. Few woody species occur when in reference condition. However, in the absence of fire or other brush management woody species will increase across the site. With these very shallow soils, some run off and drought susceptibility can be expected.

Associated sites

R085BY056OK	**Loamy Upland 38-42 PZ** Moderately deep to deep loamy soils on uplands

Similar sites

R085AY189TX	**Very Shallow 30-38" PZ** Similar soils in the southern portion of Grand Prairie

Table 1. Dominant plant species

Tree	Not specified

Shrub	Not specified
Herbaceous	(1) *Bouteloua curtipendula* (2) *Schizachyrium scoparium*

Physiographic features

This site occurs on nose slopes and side slopes of hillslopes and on crests of homoclinal ridges in the Arbuckle Uplift. This site is characteristically a water distributing site. Slopes are generally 5 to 15 percent.

Table 2. Representative physiographic features

Landforms	(1) Hills > Hillslope (2) Hills > Homoclinal ridge
Runoff class	Medium to very high
Elevation	198–396 m
Slope	5–15%
Aspect	Aspect is not a significant factor

Table 3. Representative physiographic features (actual ranges)

Runoff class	Not specified
Elevation	Not specified
Slope	3–25%

Climatic features

The climate is moist subhumid with average annual rainfall from 37 to 42 inches per year. The highest percentages in rainfall occur during April, May and June. More years of below average rainfall can be expected than those above average. Winters are characterized by mild temperatures with occasional “Northers” which can produce severe cold for short periods of time. Average wind velocities can be high in the Southern Great Plains during February, March and April causing erosion on unprotected surfaces.

Table 4. Representative climatic features

Frost-free period (characteristic range)	187-200 days
Freeze-free period (characteristic range)	204-224 days
Precipitation total (characteristic range)	991-1,067 mm
Frost-free period (actual range)	184-207 days
Freeze-free period (actual range)	201-225 days
Precipitation total (actual range)	965-1,067 mm
Frost-free period (average)	194 days
Freeze-free period (average)	212 days
Precipitation total (average)	1,041 mm

Climate stations used

- (1) CHICKASAW NRA [USC00341745], Sulphur, OK
- (2) ARDMORE [USC00340292], Ardmore, OK
- (3) ADA [USC00340017], Ada, OK
- (4) PAULS VALLEY 4 WSW [USC00346926], Pauls Valley, OK
- (5) MADILL [USC00345468], Madill, OK

Influencing water features

These sites are on uplands with no influence from wetlands.

Wetland description

NA

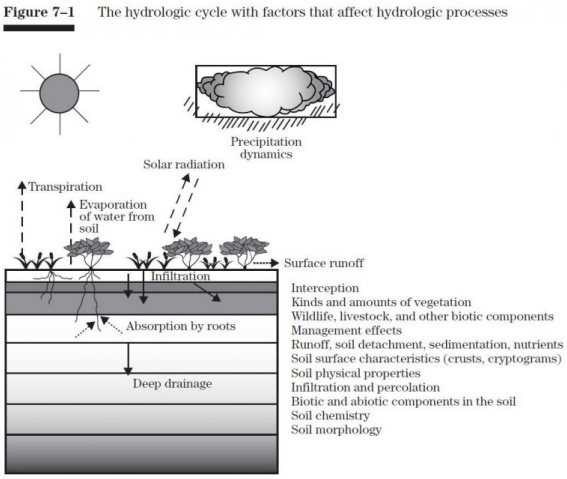


Figure 8.

Soil features

Representative soil components for this ecological site include: Shidler, Woodford

The site is characterized by well drained, moderately permeable soils that are underlain by fractured limestone bedrock or tilted sandstone bedrock.

Table 5. Representative soil features

Parent material	(1) Residuum–limestone and sandstone
Surface texture	(1) Channery, flaggy, flaggy silt loam (2) Channery, flaggy, flaggy silty clay loam
Drainage class	Well drained
Permeability class	Moderate
Depth to restrictive layer	25 cm
Soil depth	10–25 cm
Surface fragment cover <=3"	0–5%
Surface fragment cover >3"	0–45%
Available water capacity (0-101.6cm)	2.54–5.08 cm
Calcium carbonate equivalent (0-101.6cm)	0–5%
Electrical conductivity (0-101.6cm)	0–2 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0–1
Soil reaction (1:1 water) (0-101.6cm)	6.1–8.4

Subsurface fragment volume <=3" (Depth not specified)	10–40%
Subsurface fragment volume >3" (Depth not specified)	10–45%

Table 6. Representative soil features (actual values)

Drainage class	Not specified
Permeability class	Not specified
Depth to restrictive layer	Not specified
Soil depth	10–51 cm
Surface fragment cover <=3"	Not specified
Surface fragment cover >3"	Not specified
Available water capacity (0-101.6cm)	Not specified
Calcium carbonate equivalent (0-101.6cm)	Not specified
Electrical conductivity (0-101.6cm)	Not specified
Sodium adsorption ratio (0-101.6cm)	Not specified
Soil reaction (1:1 water) (0-101.6cm)	Not specified
Subsurface fragment volume <=3" (Depth not specified)	0–40%
Subsurface fragment volume >3" (Depth not specified)	0–45%

Ecological dynamics

Like many sites across the Great Plains, changes in disturbance initiated by permanent settlements has had a profound impact on the ecological dynamics of these sites. Historically, the site was influenced by periodic fires during all seasons of growth. These fires were often the result of dry lightning strikes and/or anthropogenic fires set by Native Americans. The fire frequency during the period prior to settlement is estimated between 2-5 years for the southern Great Plains. These frequent fires were often followed by grazing of migratory bison herds attracted to the new growth of grass. This led to a shifting mosaic between burned/grazed and unburned and ungrazed landscapes.

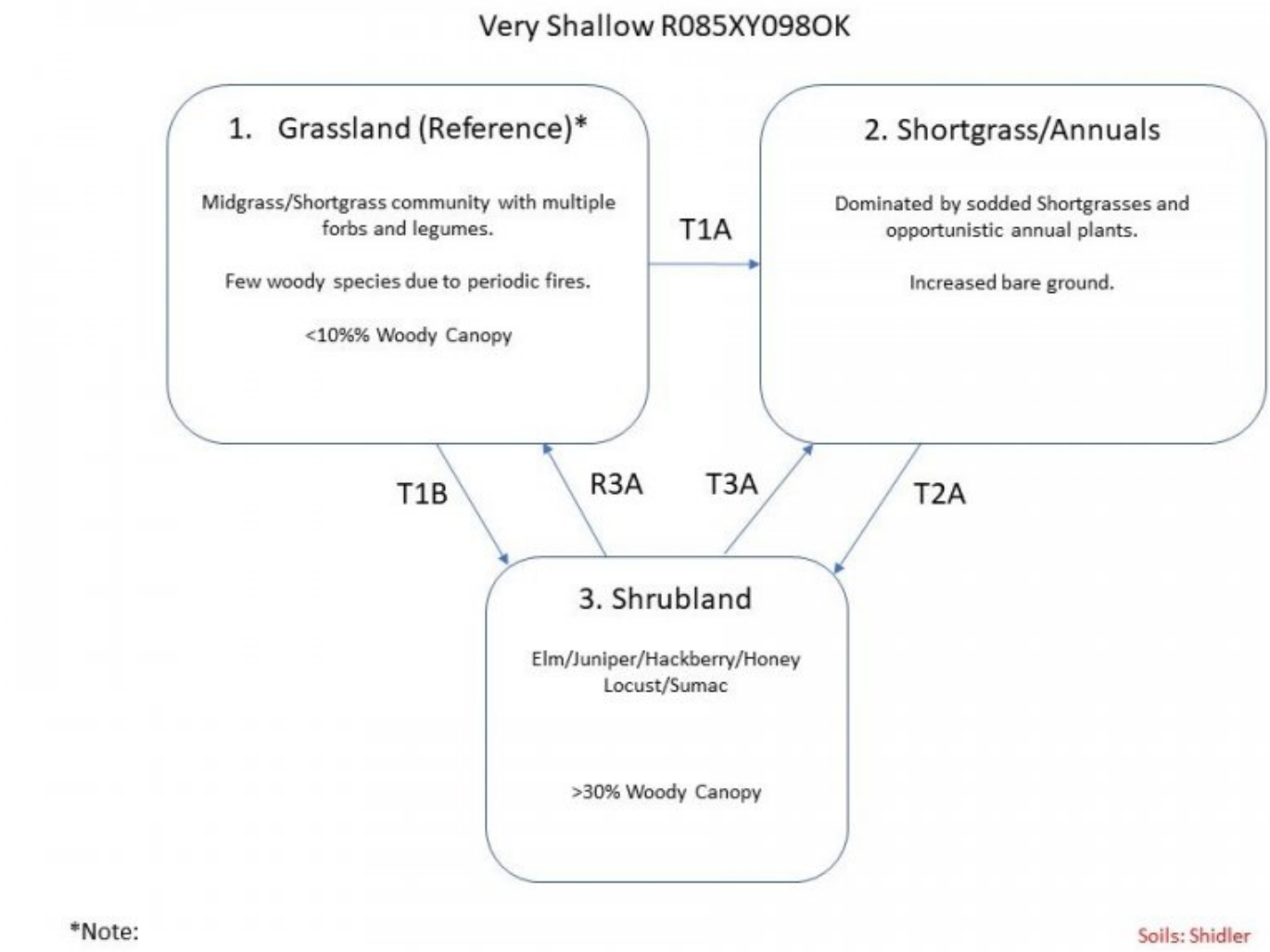
With the removal of fire and the introduction of conventional livestock fencing, the landscape began to change to more homogenous vegetation patterns and altered plant communities. This led to a highly fragmented, highly disturbed landscape we see today across much of the area.

Less fire tolerant woody species are more prevalent in many areas due to fire suppression and/or the use of strictly dormant season fires. Abusive grazing can shift the plant community to less palatable grass species and lead to an increase in opportunistic forbs. Heavy grazing can also reduce fine fuel load and limit the ability to conduct a prescribed fire.

State and Transitional Pathways:
The following diagram suggests some pathways that vegetation on the site might take in response to various treatments or natural stimuli over time. There may be other states that are not shown on this diagram. This information identifies the changes in plant communities that do occur due to management practices and natural factors. The plant communities described here are commonly observed on this ecological site. The local NRCS field office has information available to assist with planning and development of the plant community for specific purposes.

Changes in plant community makeup may be due to many factors. Change may occur slowly or in some cases, fairly rapidly. As vegetative changes occur, certain thresholds are crossed. A threshold means that once a certain point is reached during the transition of one community to another, a return to the previous state may not be possible without the input of some form of energy. This often means intervention with practices that are not part of natural processes. An example might be the application of herbicide to control some woody species to reduce their population and encourage more grass and forbs growth. Merely adjusting grazing practices would probably not accomplish any significant change in a plant community once certain thresholds are crossed. The amount of energy required to effect change in community would depend on the present vegetative state and the desired change.

State and transition model



*Note:

Soils: Shidler

State 1
Grassland - Reference

This is the reference state for the Very Shallow Upland ecological site. It represents the historic range of variability in the plant communities with the periodic disturbance of fire and grazing. It is dominated by herbaceous plants with few woody species. The dominant grasses are sideoats grama, big bluestem, Indiangrass, switchgrass and little bluestem. Other grasses include Texas cupgrass, dropseeds, silver bluestem, hairy grama, blue grama and Scribner's panicum. Dominant forbs include, western ragweed, heath aster, poppymallows and trailing ratany. Legumes include wild indigo, prairie clovers, scurfpea, and native lespedezas. Few woody species persist in reference condition but may include sumacs, sand plum, coralberry, persimmon and skunkbush. The Very Shallow site is estimated to produce between 500 – 2000 pounds of vegetative production per year in reference condition. Midgrasses Shortgrass Forbs Shrubs and Trees are a minor component of these sites.

Dominant plant species

- sideoats grama (*Bouteloua curtipendula*), grass

Community 1.1

State 2
Shortgrass

This state represents a change in the dominant plant community. Shortgrasses such as buffalograss, blue grama and hairy gramma have formed a sod-like plant community. There are many areas of bare ground and opportunistic annuals such as annual threewn and common broomweed are abundant. Precipitation runoff is high and infiltration is low which leads to low soil moisture and reduced production.

Dominant plant species

- buffalograss (*Bouteloua dactyloides*), grass

State 3
Shrubland

This state describes the invaded, woody dominated plant community of the Very Shallow site. The ecological processes are dominated by woody species including mesquite, honey locust, elm, and juniper species. Some herbaceous plants persist under the woody canopy or in interspaces. Usually, shade tolerant species like Texas wintergrass are prominent herbaceous components in this community. There may also be an increase in prickly pear in this state.

Dominant plant species

- Ashe's juniper (*Juniperus ashei*), tree
- Texas wintergrass (*Nassella leucotricha*), grass

Transition T1A
State 1 to 2

With years of abusive grazing, more palatable grasses and forbs will decline and lead to a shift towards a sodded shortgrass and annual dominated state.

Transition T1B
State 1 to 3

These sites are prone to invasion by juniper. Without brush management, brush invasion may increase to the point where the site transitions to the Shrubland state. At this point it will take significant inputs to remove woody species and restore the grass dominated community.

Transition T2A
State 2 to 3

These sites are prone to invasion by juniper. Without brush management, brush invasion may increase to the point where the site transitions to the Shrubland state. At this point it will take significant inputs to remove woody species and restore the grass dominated community.

Restoration pathway R3A
State 3 to 1

At this point it will take significant inputs to remove woody species and restore the grass dominated pasture. However, it may be achieved through brush management and a prescribed grazing plan which allows ample rest for the re-establishment of grasses.

Transition T3A
State 3 to 2

At this point it will take significant inputs to remove woody species and restore the grass dominated pasture. However, it may be achieved through brush management and a prescribed grazing plan which allows ample rest for the re-establishment of grasses.

Additional community tables

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 sites occur on upland and shed water to adjacent sites lower on the landscape. The shallow soils limit infiltration and permeability. The presence of deep rooted grasses can help facilitate percolation of water into the soil profile.

Recreational uses

NA

Wood products

NA

Other products

NA

Other information

NA

Inventory data references

Soil Survey Manuscripts Murray, Carter, Johnston counties in Oklahoma.
Range Site Descriptions, Oklahoma NRCS
Draft ESDs Oklahoma NRCS

References

. 2021 (Date accessed). USDA PLANTS Database. http://plants.usda.gov.

Frost, C.C. 1998. Presettlement Fire Frequency Regimes of the United States: A First Approximation. Plant Conservation Program. North Carolina Department of Agriculture and Consumer Services, Raleigh, NC.

Fuhlendorf, S.D., D.M. Engle, J. Kerby, and R. Hamilton. 2009. Pyric Herbivory: Rewilding Landscapes through the Recoupling of Fire and Grazing. Conservation Biology 23:588–598.

Other references

These site descriptions were developed as part a Provisional ESD project using historic soil survey manuscripts, available range site descriptions, and low intensity field traverse sampling.

Contributors

Colin Walden, Soil Survey Region 9

Approval

Bryan Christensen, 9/21/2023

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, and 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)	
Contact for lead author	
Date	05/13/2025
Approved by	Bryan Christensen
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

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

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

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

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

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

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

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

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):**

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

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

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

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12. **Functional/Structural Groups (list in order of descending dominance by above-ground annual-production or live foliar cover using symbols: >>, >, = to indicate much greater than, greater than, and equal to):**

    Dominant:

    Sub-dominant:

    Other:

    Additional:

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

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

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

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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:**

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17. **Perennial plant reproductive capability:**
