USDA Natural Resources Conservation Service

Ecological site R080AY080OK
Shallow Clay Upland

Last updated: 9/19/2023
Accessed: 05/04/2024

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 sandstones or shales that are exposed on gently sloping plains. The dominant soil order in this MLRA is Mollisols. The soils in the area dominantly have a thermic soil temperature regime, an ustic soil moisture regime, and mixed, siliceous, or smectitic mineralogy. They generally are shallow to very deep, are well drained, and generally are loamy or clayey. 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.

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 found on convex knolls and strongly sloping, to steep, hillsides, or side slopes along drainageways on uplands in the Central Rolling Red Prairies. Slopes range from 3 to 30 percent. Rock may appear on the surface and cover 15 to 20 percent of the site. The site is well suited for herbaceous vegetation, however, the shallow clay

soils can limit productivity when compared to other sites. Vegetation is predominantly sideoats grama, blue grama, hairy grama, buffalograss, pricklypear, tall dropseed, switchgrass, and little bluestem. Abusive grazing may lead to denuding of the grasses and inevitable increases in bare ground. Removal of fire from the system may lead to an increase in woody plant encroachment.

Associated sites

R080AY083OK	**Shallow Upland** Shallow soils over sandstone.

Similar sites

R080AY083OK	**Shallow Upland** Shallow soils over sandstone.

Table 1. Dominant plant species

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

Physiographic features

These sites occur on hills on uplands. Slopes can range from 5 to 45 percent but are typically less than 25 percent.

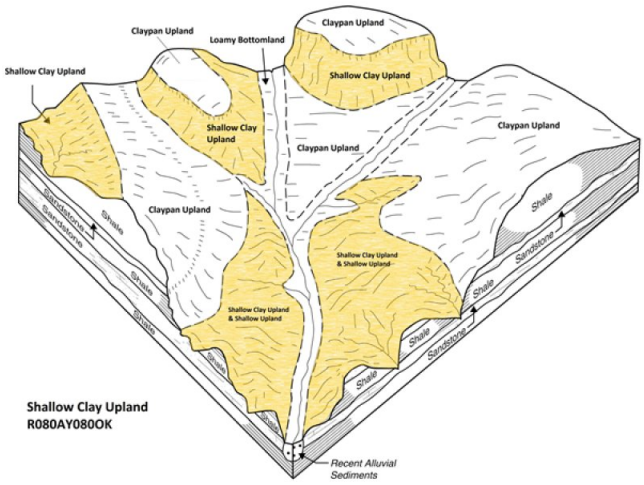


Figure 2. Shallow Clay Upland

Table 2. Representative physiographic features

Landforms	(1) Hills > Hillslope
Runoff class	Very high
Elevation	259–457 m
Slope	5–25%
Aspect	Aspect is not a significant factor

Table 3. Representative physiographic features (actual ranges)

Runoff class	Not specified
Elevation	Not specified
Slope	5–45%

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 4. Representative climatic features

Frost-free period (characteristic range)	173-186 days
Freeze-free period (characteristic range)	198-208 days
Precipitation total (characteristic range)	914-991 mm
Frost-free period (actual range)	157-188 days
Freeze-free period (actual range)	192-216 days
Precipitation total (actual range)	889-1,016 mm
Frost-free period (average)	178 days
Freeze-free period (average)	204 days
Precipitation total (average)	965 mm

Climate stations used

- (1) JEFFERSON [USC00344573], Medford, OK
- (2) MEEKER 5 W [USC00345779], Meeker, OK
- (3) PAULS VALLEY 4 WSW [USC00346926], Pauls Valley, OK
- (4) CHICKASHA EXP STATION [USC00341750], Chickasha, OK
- (5) CUSHING [USC00342318], Cushing, OK
- (6) EL RENO 1 N [USC00342818], El Reno, OK
- (7) NEWKIRK 1NW [USC00346278], Newkirk, OK

Influencing water features

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.

Wetland description

N/A

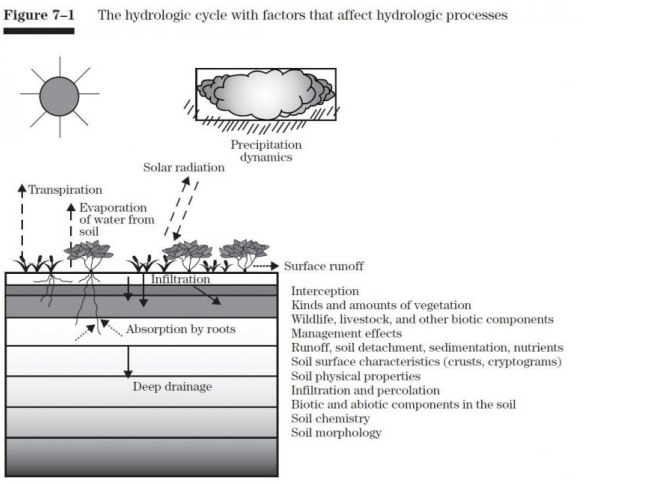


Figure 9.

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:
Masham & Highview

These soils consists of shallow, well drained soils on crests and side slopes of hillslopes on low hills. These very slowly permeable soils formed in material weathered from red or grey shales of Permian age. Permeability is slow and runoff can be high. The high clay content can restrict plant available water and reduce overall vegetative productivity.

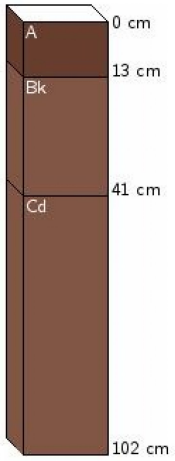


Figure 10.

Table 5. Representative soil features

Parent material	(1) Residuum–clayey shale
Surface texture	(1) Clay (2) Clay loam (3) Silty clay loam
Drainage class	Well drained
Permeability class	Very slow to slow
Soil depth	51 cm
Surface fragment cover <=3"	0–10%
Surface fragment cover >3"	0–4%
Available water capacity (0-101.6cm)	2.54–8.89 cm
Calcium carbonate equivalent (0-101.6cm)	0%

Electrical conductivity (0-101.6cm)	0 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0
Soil reaction (1:1 water) (0-101.6cm)	7.5–8.5
Subsurface fragment volume <=3" (Depth not specified)	0–10%
Subsurface fragment volume >3" (Depth not specified)	0–6%

Ecological dynamics

Like many sites across the Great Plains, this Shallow Clay Upland site evolved under periodic disturbances by fire, drought, and grazing(Frost 1998,Fuhlendorf 2009). The soils are well suited for herbaceous plant growth but are limited by their dense clay subsoil and depth to bedrock. The shallow clay soils and run-off upland position make the site susceptible to influence by drought. However, the reference state of this site is very resilient to natural disturbances. Alternative states include a woody encroached state and a eroded state.

The soils may vary from shallow clays to silty clays of varying thickness. Soils are typically shallow, ranging from seven to twenty inches in depth over shale. Because of slope, bare ground, and lower forage production, Shallow Clay Upland sites are not as well suited for grazing by domestic livestock as adjacent sites. Plant rooting depth is restricted and moisture holding capacity is low and often limits productivity. Occasional grazing will occur when slope and access are favorable. This site is characterized by low production when compared to surrounding sites and considerable bare ground which crusts easily. In areas where underlying bedrocks are fragmented, roots of perennial tallgrasses and other deep rooted plants can achieve deep penetration and survive.

The reference plant community is an open, mixed-grass prairie with a few forbs and scattered shrubs. Pre-settlement influences included grazing or browsing by endemic pronghorn antelope, deer and migratory bison, severe droughts and frequent wildfires. Wildfires, occurring through lightning strikes or intentionally set by Native Americans, had an impact on community structure. The wildfires favor grass vegetation and keep woody plant establishment low. Sparse fuels along this site may have reduced wildfire frequency when compared to other adjacent sites.

The herbaceous vegetation includes a mixture of midgrass and shortgrass along with a limited amount of forbs. The dominant species under reference conditions are sideoats grama, little bluestem, buffalograss, blue grama and silver bluestem. A limited and diverse amount of forbs are also common throughout the site.

In addition to the reference community, other plant communities can exist on this site and are usually the result of management practices. Following the absence of wildfire shrub and tree species will begin to increase. There are various transitional stages on this site, and transitional stage may result in a stable community for many years. While grazing may not lead to an increase in shrubs, it can reduce the fuel loads necessary to carry a wildfire that would restrict woody plant dominance.

The absence of wildfire will favor woody species, especially mesquite and/or eastern redcedar. Woody species will continue to increase in size and density until they dominate the community. This generally occurs when the woody plant cover exceeds 25 percent and shrubs dominate the ecological processes. Woody dominated sites lead to annual grass and forb species becoming more prevalent across the site. They will occupy many of the bare areas throughout the site during wet seasons, while only low vigor shortgrass will persist in shrub interspaces. When grass cover declines, litter, mulch, and soil organic matter also decline with consequential increases in bare ground, erosion and desertification occurring between shrubs.

Restoration from a woody grassland to a native prairie is possible, but can be prohibitively expensive. Dense brush cover and very limited seed sources will require brush control and re-seeding for restoration. The shallow, fine textured soils and steep slopes limit the types of mechanical treatments that can be utilized and care must be taken to not destroy the grass communities preventing erosion. Following brush management, re-seeding the site to a

native mixture will be arduous, but necessary. Several years of limited grazing will be necessary along with periodic prescribed fires. Severe erosion and fertility losses during retrogression may prohibit the site to returning to the reference state.

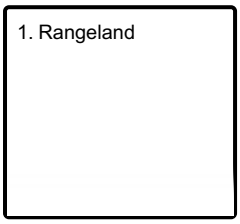
Historically, the focus of conservation efforts has been on restoring woody encroached sites across the Great Plains. However, new data suggests that a more effective strategy involves addressing woody plants in the seed dispersal stage prior to the change in ecological states. Preserving intact prairie for both agricultural production and ecosystem services must become a priority for land managers and conservationist alike.

State and Transition Diagram:

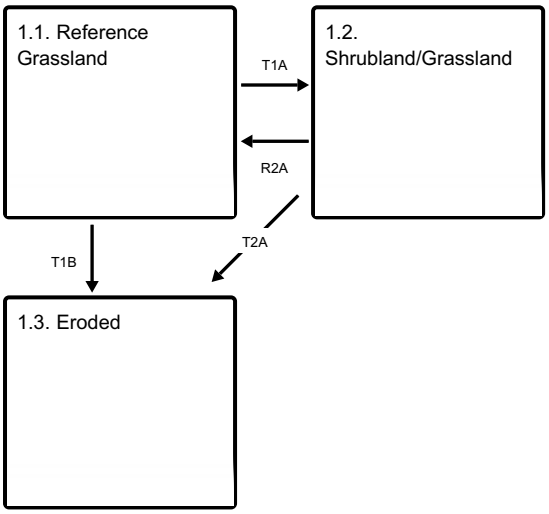
The following State and Transition Model suggests pathways vegetation might take depending on how ecological processes are changed. Local professional guidance should always be sought before pursuing a treatment scenario.

State and transition model

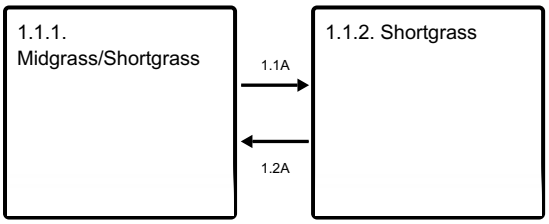
Land uses



Land use 1 submodel, ecosystem states



State 1 submodel, plant communities



Land use 1
Rangeland

While there is occasional evidence of prior cultivation, the dominant land use is rangeland on nearly all Shallow Clay Upland sites.

State 1.1
Reference Grassland

The reference state represents the range of variability on the site under the historic natural disturbances. Community composition may shift, but the ecological processes remain intact.

Characteristics and indicators. This site has characteristic shallow clay soils. Native vegetation is intact but production can be limited due to poor infiltration and available water capacity.

Resilience management. With a fire return interval of less than 4 years and managed grazing that is balanced with the carrying capacity, this state may be maintained as a grassland reference state.

Dominant plant species

- sideoats grama (*Bouteloua curtipendula*), grass

Community 1.1.1
Midgrass/Shortgrass

Figure 11. Shallow Clay. Community 1.1. Masham soils. Noble County, OK

Community 1.1 is the Midgrass/Shortgrass. Recurring fires and occasional long-term droughts keep shrubs in check and favor a mixture of midgrasses and shortgrasses. Fire frequency was historically every two to five years. The clay soils and droughty conditions can keep forb diversity and production low. Little bluestem and sideoats grama are co-dominant grasses. Also occurring on the site, but in smaller amounts, are meadow dropseed, silver bluestem, and a number of shortgrasses. Common shortgrasses included buffalograss, blue grama, threeawns, tridens and sand dropseed. Characteristic forbs include catclaw sensitivebriar, western ragweed, dotted gayfeather, and dalea spp. Pricklypear was a common woody plant. Limited varieties of shrub species may occur in sparse amounts. After the absence of fire for five or more years, shrub species usually begin to appear. There are various transitional stages on this site. Heavy grazing usually does not, by itself, lead to an increase in shrubs or shrub canopy cover. Increases in shrubs and shrub canopy are more directly related to climate and lack of fire. The Midgrass/Shortgrass community can produce from 1000 to 2300 pounds of biomass annually, depending upon the amount of precipitation. Grasses make up to 90 to 95 percent of species composition and production. The midgrasses aided in the infiltration of rainfall into the slowly permeable soil and reduced runoff, although considerable bare ground existed. The droughty characteristics of the site may keep forage production and forb diversity low. This plant community furnishes good habitat for grazing type wildlife such as bison and pronghorn antelope. With abusive grazing, decrease in intensity and frequency of fires, and no brush management, this plant community may transition to the Shortgrass Plant Community (1.2). The plant community responds to selective grazing by differential responses of the plants to defoliation and selective use of the individual species. Sideoats grama and little bluestem although generally preferred by cattle are initially resistant to grazing and persist, but in weakened condition. The shortgrasses, although they might be preferentially grazed also are generally more resistant to grazing because of their short stature and lower growing points. This allows them to replace species that are weakened by excessive grazing. At the same time those species, generally called weeds, that are avoided or only grazed when the more palatable species are depleted will increase in density and stature. The resulting reduction in plant cover allows indigenous noxious species to increase or others to invade from off-site. Mesquite and juniper are common invaders.

Table 6. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	1048	1670	2242
Forb	56	89	224
Shrub/Vine	22	73	123
Total	**1126**	**1832**	**2589**

Community 1.1.2
Shortgrass

As abusive grazing continues, or as climate becomes dry for long periods, this site gradually moves towards a shortgrass plant community. In this phase (1.2), the vegetation will be mainly shortgrasses and forbs, with maybe a few woody species. Abusive grazing reduces the more palatable species and reduces fine fuel loads. The dominant species in the reference community are replaced by less palatable grasses or grasses that are better adapted to heavy grazing pressure. Less palatable forbs such as dalea, dotted gayfeather and western ragweed are resilient under these conditions. Grasses, such as sideoats grama, little bluestem, and dropseed persist in this phase, but make up a smaller part of the plant composition. Nutrient cycling and energy flow are shifting toward woody plants. The herbaceous component still dominates production. Litter and ground cover are beginning to decrease, however, exposing more soil to erosion and plant encroachment by previously suppressed species, such as annuals. Proper grazing and prescribed burning can easily improve or maintain this plant community. Without brush management and proper grazing, the woody species will continue to encroach until the woody species dominate. This threshold occurs when woody plant cover exceeds 15 to 20 percent and/or limited grass production will not allow effective prescribed burning. When this occurs the transition to a Shrubland/Grassland (2) is complete and irreversible without extensive accelerating cultural practices followed by prescribed grazing and proper stocking.

Pathway 1.1A
Community 1.1.1 to 1.1.2

If abusive grazing practices persist, the plant community may shift towards 1.2. This may also occur as the result of long term(multiyear) drought.

Pathway 1.2A
Community 1.1.2 to 1.1.1

With a carefully planned prescribed grazing system including some type of growing season deferment, this community may be shifted back to 1.1. This shift is more likely to be achieved during periods of favorable precipitation.

State 1.2
Shrubland/Grassland

The Shrubland/Grassland State occurs when fire is removed from the landscape for many years and woody plants are not controlled. The shrub canopy acts to intercept rainfall and increase evapotranspiration losses, creating a more xeric microclimate. Soil fauna and organic mulch are reduced exposing more soil surface to erosion in the shortgrass interspaces between the shrubs and trees. The exposed soil crusts readily and erosion can be a problem. However, within the woody canopy hydrologic processes stabilize and soil organic matter and mulch begin to increase and ecological processes eventually stabilize under the shrub canopy. Fires may be intermittent across this site because of sparse vegetation and bare ground. So, when woody species invasion begins, the site very slowly degrades as woody vegetation increases. The increase in bare ground ultimately leads to erosion. Eastern redcedar, ashe juniper, or mesquite, usually dominate the Shrubland/Grassland Plant Community production. Even though the shrub canopy cover may remains relatively constant at approximately 25 percent, the trees and shrubs can account for 65 percent of the annual production. A common understory shrub is pricklypear. Shortgrasses and low quality annual grasses and forbs occupy the woody plant interspaces. Characteristic grasses are buffalograss, rough tridens, threeawns, hairy grama, and blue grama. Forbs found in this community include dotted gayfeather, croton, western ragweed, gaura and common broomweed. Annual forbs and grasses invade the bare ground if

moisture is available in spring and summer. Grasses and forbs make up 35 percent or less of the annual biomass production. Production can vary considerably with seasonal moisture. The Shrubland/Grassland Plant Community provides good habitat cover for wildlife, but limited preferred forage, or browse, is available for livestock or wildlife. The woody plants are generally of low value as browse and forage production being mostly annuals is highly variable. Without considerable energy inputs in brush control and proper grazing management, the shrubland will continue to thicken until the site stabilizes with the climate and soil factors.

Dominant plant species

- eastern redcedar (*Juniperus virginiana*), tree
- honey mesquite (*Prosopis glandulosa*), shrub

State 1.3
Eroded

This state is the result of water erosion over bare soil. Most of the "A" horizon of the soil profile has been displaced. The remaining subsoil is very low in fertility. Some native grasses and forbs will persist in this state, however, production is greatly reduced.

Dominant plant species

- threeawn (*Aristida*), grass

Transition T1A
State 1.1 to 1.2

In the absence of fire or other brush management strategies, woody species may begin to encroach on the site. If left unchecked, some woody species will begin to dominate the ecological functions of the site such as nutrient cycling and hydrologic cycle.

Transition T1B
State 1.1 to 1.3

If these soils are subjected to sever disturbance by animals or equipment, they are prone to soil erosion. The site with higher slopes are particularly vulnerable. Once a significant amount of the soil surface is displaced, the site will transition to an eroded state.

Restoration pathway R2A
State 1.2 to 1.1

Through the implementation of a prescribed burning program or alternative forms of brush management, the site may be restored to the reference state. Careful grazing management is often required to ensure proper fuel loads and allow for the recovery of herbaceous species.

Transition T2A
State 1.2 to 1.3

If these soils are subjected to sever disturbance by animals or equipment, they are prone to soil erosion. The site with higher slopes are particularly vulnerable. Once a significant amount of the soil surface is displaced, the site will transition to an eroded state.

Additional community tables

Table 7. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Dominant Midgrass**			336–1009	
	sideoats grama	BOCU	*Bouteloua curtipendula*	224–897	–
	little bluestem	SCSC	*Schizachyrium scoparium*	224–897	–
2	**Shortgrass**			224–560	
	blue grama	BOGR2	*Bouteloua gracilis*	56–336	–
	hairy grama	BOHI2	*Bouteloua hirsuta*	56–336	–
	buffalograss	BODA2	*Bouteloua dactyloides*	56–336	–
	Texas grama	BORI	*Bouteloua rigidiseta*	0–22	–
	hairy woollygrass	ERPI5	*Erioneuron pilosum*	0–22	–
3	**Tallgrass**			224–560	
	big bluestem	ANGE	*Andropogon gerardii*	0–336	–
	Indiangrass	SONU2	*Sorghastrum nutans*	0–336	–
	switchgrass	PAVI2	*Panicum virgatum*	0–336	–
4	**Cool Season**			56–112	
	Heller's rosette grass	DIOL	*Dichanthelium oligosanthes*	0–56	–
	western wheatgrass	PASM	*Pascopyrum smithii*	0–56	–
	Canada wildrye	ELCA4	*Elymus canadensis*	0–56	–
5	**Other Grass**			56–336	
	composite dropseed	SPCO16	*Sporobolus compositus*	11–112	–
	silver beardgrass	BOLA2	*Bothriochloa laguroides*	11–112	–
	lovegrass	ERAGR	*Eragrostis*	11–112	–
	vine mesquite	PAOB	*Panicum obtusum*	0–56	–
Forb					
6	**Forbs**			56–224	
	prairie clover	DALEA	*Dalea*	11–112	–
	Illinois bundleflower	DEIL	*Desmanthus illinoensis*	11–112	–
	fourvalve mimosa	MIQU2	*Mimosa quadrivalvis*	11–112	–
	sunflower	HELIA3	*Helianthus*	11–112	–
	white heath aster	SYER	*Symphyotrichum ericoides*	11–112	–
	milkvetch	ASTRA	*Astragalus*	0–56	–
	blazing star	LIATR	*Liatris*	11–56	–
	prairie broomweed	AMDR	*Amphiachyris dracunculoides*	11–56	–
	yellow sundrops	CASE12	*Calylophus serrulatus*	0–56	–
	trailing krameria	KRLA	*Krameria lanceolata*	0–56	–
Shrub/Vine					
7	**Shrubs**			0–168	
	sumac	RHUS	*Rhus*	0–168	–
	pricklypear	OPUNT	*Opuntia*	0–22	–

Animal community

Domestic livestock and white-tail deer are the dominant grazers and browsers of the site. Various songbirds and

small mammals are also common at these sites. As the site changes towards a woody dominated community the habitat may favor some species over others. Management decisions should favor a vegetative state that creates quality habitat for desired animal species.

Hydrological functions

These sites occur on uplands and shed water to adjacent sites lower on the landscape. The presence of deep rooted tallgrasses can help facilitate percolation of water into the soil profile. Minimizing bare ground is very important in reducing soil erosion by water movement.

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

N/A

Other information

N/A

Inventory data references

The original information presented here was derived from Soil Conservation Service field observations of trained range personnel as well as clipping data done in Oklahoma. Range -417 clipping data is housed at the NRCS Stillwater state office and should be associated with vegplot data records in NASIS.

Type locality

Location 1: Payne County, OK	
Township/Range/Section	T18N R1W S1
General legal description	NE 1-T18N-R1W OSURR "Pasture 9"

References

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

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)	Mark Moseley
Contact for lead author	100 USDA Suite 206, Stillwater, OK 74074
Date	05/21/2004
Approved by	Bryan Christensen
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

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

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2. **Presence of water flow patterns:** Distinct, particularly on steeper slopes. Not usually more than 1 foot deep.

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3. **Number and height of erosional pedestals or terracettes:** Some, around small rocks and around bunchgrasses, but rarely more than 1 inch depth.

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4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Up to 35%.

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5. **Number of gullies and erosion associated with gullies:** Shallow soil limits formation of anything but small gullies. Usually these are on steeper slopes, are rounded, less than 1 – 2 feet deep and 2 – 3 feet wide.

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

7. **Amount of litter movement (describe size and distance expected to travel):** Litter can move 6 inches after a high intensity rainfall event.

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** Stability score 5 – 6.

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Reddish brown 0 – 5 inches, strong sub-angular blocky structure, hard.

   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:** Tall, mid-grass, and sod grass community randomly dispersed. Slopes and very slowly permeable soils result in high runoff.

11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):** No compaction layer but fine texture and hard structure can be mistaken for 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: MIdgrass Shortgrass

    Sub-dominant: Tallgrasses Perennial Forbs

    Other: Cool Season Grass/Grasslikes; Woodies

    Additional:

13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** Due to the droughty nature of this site, some mortality will occur, especially with three-awns, sideoats grama and little bluestem. Death loss could be around 5%, higher in extremely dry, hot years.

14. **Average percent litter cover (%) and depth (in):** Litter cover 30 - 50%. Less than .5 inches deep.

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

production): Reference production is 1,200 – 2,400 lb/acre, annually.

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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:** Main invasives are eastern redcedar unless the site is exposed to fire.

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