

Ecological site R078CY065OK Red Clay (North)

Last updated: 9/15/2023
Accessed: 05/12/2025

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.

MLRA notes

Major Land Resource Area (MLRA): 078C—Central Rolling Red Plains, Eastern Part

MLRA 78C is characterized by moderately dissected, rolling plains with prominent ridges and valleys and numerous terraces adjacent to dissecting streams. Loamy and clayey soils are generally deep, well drained, and developed in soft, calcareous sandstones, siltstones, and shales in red beds of Permian age. Characteristic red soils have formed in most of the area because of the underlying Permian red-bed sedimentary rocks. Current land uses are rangeland , pastureland, wildlife habitat, and cropland.

LRU notes

NA

Classification relationships

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

Ecological site concept

These sites occur on clay soils on uplands. The reference vegetation consist of a mixture of tall and midgrass species with a variety of forbs and few shrub species. This plant community evolved through periodic fires and grazing events. Without fire, brush species may encroach across the site and begin to dominate some ecosystem processes. Due to the nature of the fine textured soils, the vegetation in these sites may be more susceptible to periodic drought conditions.

Similar sites

R078CY112TX	Red Clay (South) 23-30" PZ Similar soils. Warmer climate.
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Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) <i>Schizachyrium scoparium</i> (2) <i>Bouteloua curtipendula</i>

Physiographic features

These sites are broad, gently sloping to steep ridgecrests, and sideslopes of hills, on dissected plains.

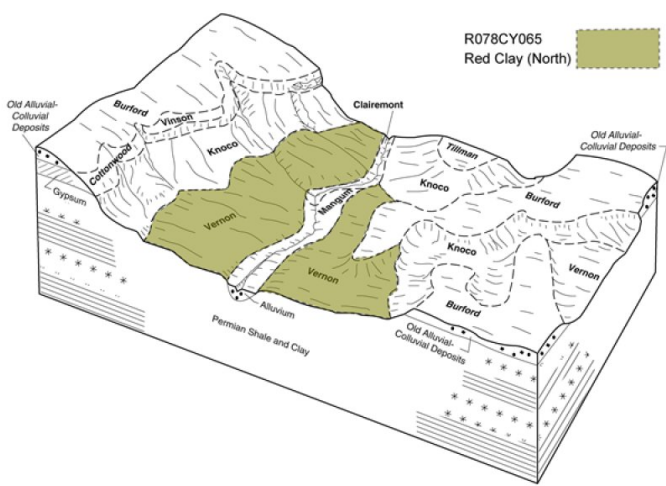


Figure 1. R078CY065OK

Table 2. Representative physiographic features

Landforms	(1) Plains > Hill
Runoff class	Low to very high
Flooding frequency	None
Ponding frequency	None
Elevation	1,000–2,500 ft
Slope	1–20%
Water table depth	80 in
Aspect	Aspect is not a significant factor

Climatic features

MLRA 78C lies within the subtropical sub-humid climate regime. This regime is characterized by rapid changes in temperature; marked extremes, both daily and annual; and rather erratic rainfall. The weather is alternately influenced by cold dry air from the Arctic Circle, and warm moist air from the Gulf of Mexico.

Seasonal changes are gradual. Spring is a season of variable weather and relatively high precipitation with prevailing winds from the southwest. Summers are generally hot with low humidity. Fall has long periods of pleasant weather interspersed with moderate to heavy rains. Winter is open and moderate to cold with winds from the north and infrequent snows.

Wind speeds average more than eleven miles an hour with prevailing southern winds. Rather strong winds can occur in all months of the year. While strong gusty winds occur, severe dust storms are rare.

Approximately 75 percent of the rainfall occurs during the warm season, and much of it comes in storms of high intensity and short duration in May and June. These rains can be particularly erosive on sites where vegetation is sparse. Occasional droughts are to be expected. Lack of rainfall and hot, dry winds often curtail forage production during July and August.

Table 3. Representative climatic features

Frost-free period (characteristic range)	153-179 days
Freeze-free period (characteristic range)	187-193 days
Precipitation total (characteristic range)	26-30 in

Frost-free period (actual range)	148-183 days
Freeze-free period (actual range)	185-198 days
Precipitation total (actual range)	25-32 in
Frost-free period (average)	165 days
Freeze-free period (average)	191 days
Precipitation total (average)	28 in

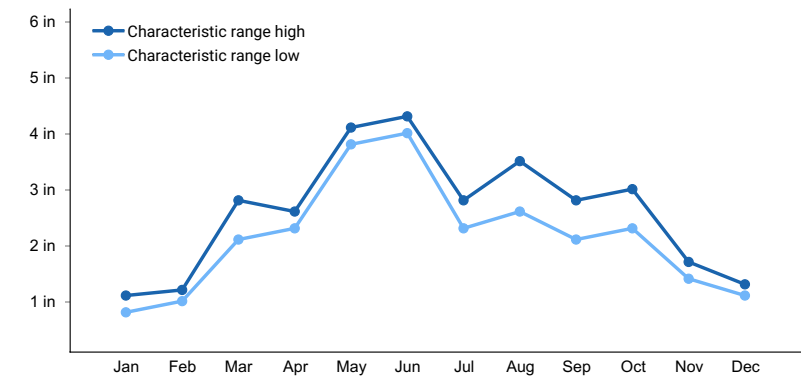


Figure 2. Monthly precipitation range

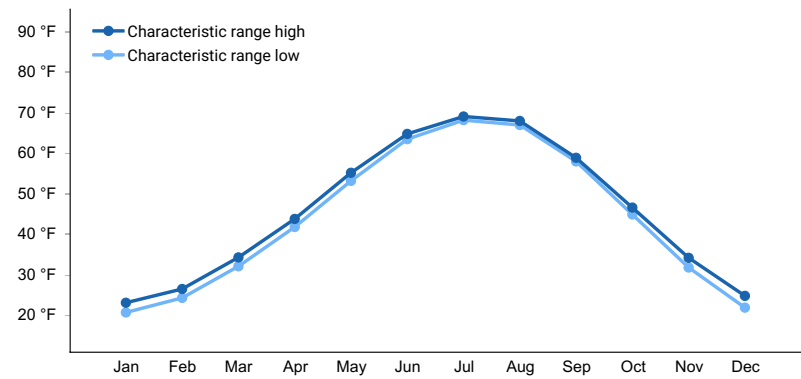


Figure 3. Monthly minimum temperature range

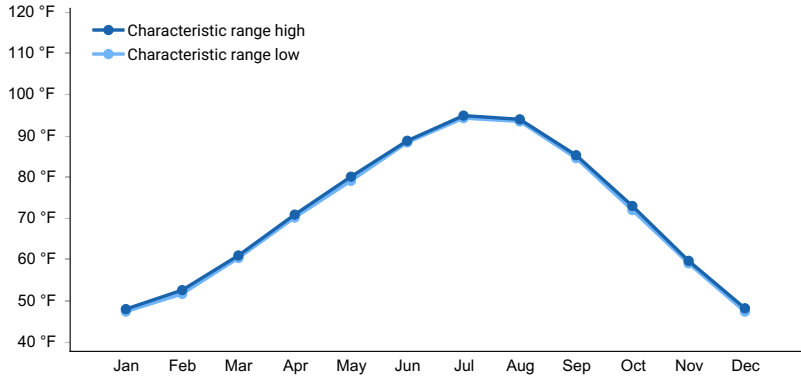


Figure 4. Monthly maximum temperature range

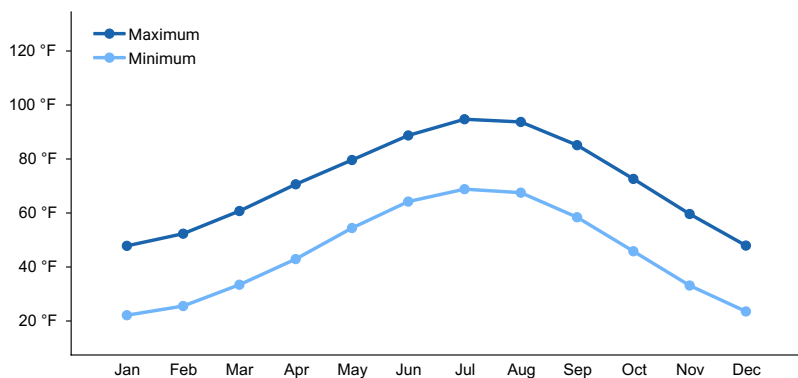


Figure 5. Monthly average minimum and maximum temperature

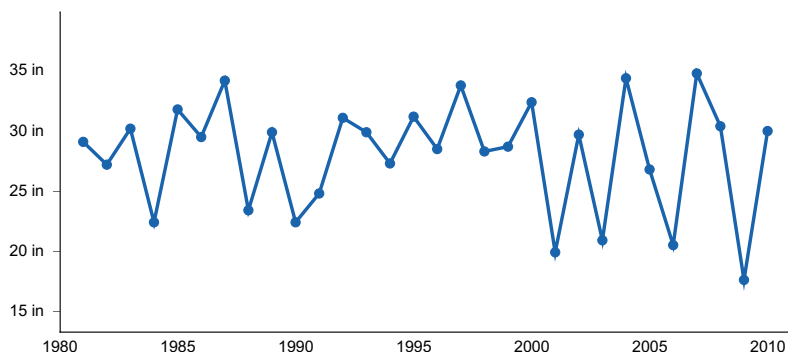


Figure 6. Annual precipitation pattern

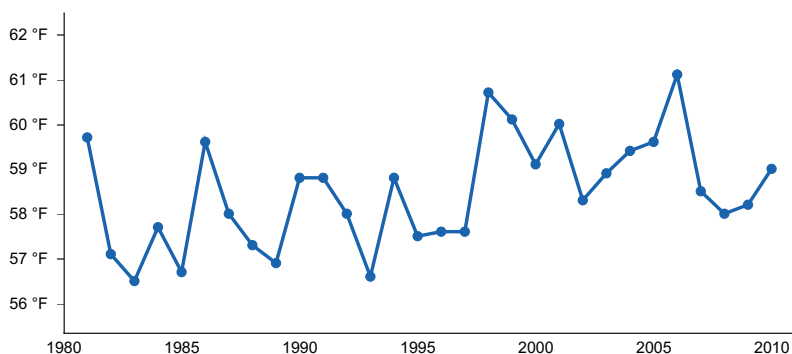


Figure 7. Annual average temperature pattern

Climate stations used

- (1) MUTUAL [USC00346139], Mutual, OK
- (2) BUFFALO 2 SSW [USC00341243], Buffalo, OK
- (3) WATONGA [USC00349364], Watonga, OK
- (4) ALVA 1W [USC00340193], Alva, OK
- (5) TALOGA [USC00348708], Taloga, OK

Influencing water features

None

Wetland description

NA

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:

Vernon

Surface soils are reddish brown clay 6 to 12 inches thick over red calcareous clay that grades to relatively un-weathered Permian clay beds at 10 to 40 inches below the surface. Surface soils are granular to fine blocky in structure. Permeability is very slow. Much moisture is lost through runoff and the soil is not normally moistened below 15 to 20 inches.

Table 4. Representative soil features

Parent material	(1) Residuum—calcareous shale
Surface texture	(1) Clay loam (2) Silty clay loam (3) Clay
Family particle size	(1) Clayey
Drainage class	Well drained
Permeability class	Very slow to slow
Soil depth	15–40 in
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-40in)	1.6–6 in
Calcium carbonate equivalent (0-40in)	0–50%
Electrical conductivity (0-40in)	0–2 mmhos/cm
Sodium adsorption ratio (0-40in)	0–4
Soil reaction (1:1 water) (0-40in)	7.9–8.4
Subsurface fragment volume <=3" (Depth not specified)	0–12%
Subsurface fragment volume >3" (Depth not specified)	0–5%

Ecological dynamics

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

The reference plant community for this site is a midgrass/tallgrass community with a smaller component of shortgrasses. There is a moderate amount of forbs. Yucca was usually the primary woody species. The dominance or non-dominance of little bluestem reflects historical fire regimes, historical management practices, or both. The absence of fire and/or abusive grazing practices, or a substantial reduction of precipitation, or substantial changes in seasonal precipitation patterns leads to little bluestem dominance. The continuance of over grazing will eventually push the site to a midgrass/shortgrass community with remnant tallgrass seedstock present. All of these states can be managed back to the reference community with prescribed grazing, prescribed burning, or both. Without fire or brush management, the site gradually increase in woody species. However, these sites are usually not completely taken over by woody species. A substantial mix of midgrasses, shortgrasses, and bare ground will always be present.

State and Transition Diagram:
A State and Transition Diagram for the Clay Upland (R078CY065OK) 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.

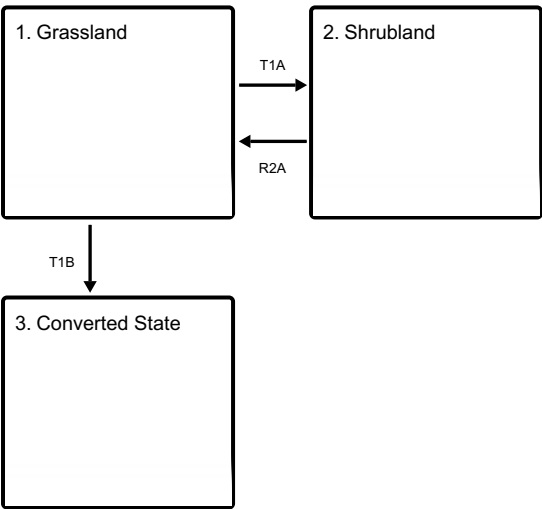
The biological processes on this site are complex. Therefore, representative values are presented in a land management context. The species lists are representative and are not botanical descriptions of all species occurring, or potentially occurring, on this site. They are not intended to cover every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

Composition by dry weight and percent canopy cover are provided to 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.

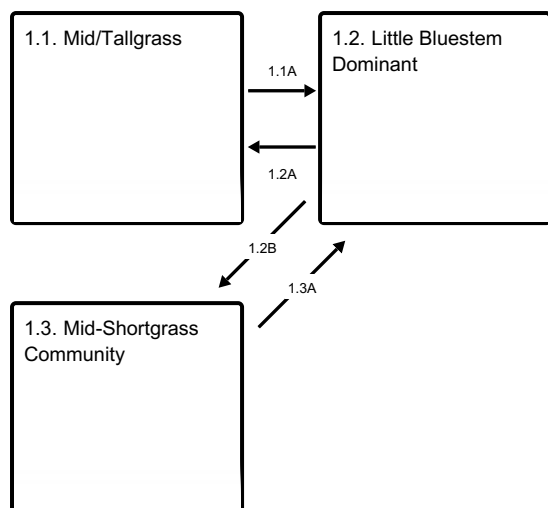
State and transition model

Ecosystem states



- T1A** - Absence of disturbance and natural regeneration over time, may be coupled with excessive grazing pressure
- T1B** - Extensive soil disturbance followed by seeding
- R2A** - Adequate rest from defoliation and removal of woody canopy, followed by reintroduction of historic disturbance regimes

State 1 submodel, plant communities



State 1 Grassland

Dominant plant species

- little bluestem (*Schizachyrium scoparium*), grass
- sideoats grama (*Bouteloua curtipendula*), grass

Community 1.1 Mid/Tallgrass



Figure 8. Clay Prairie, North, HPC, Mid/tallgrass

This is the reference or diagnostic community for the site. The description is based on early range site descriptions, clipping data, professional consensus of experienced range specialists, and analysis of field work. This midgrass/tallgrass plant community is presumed to closely resemble the natural vegetation during pre-european settlement. This site consists of an open midgrass/tallgrass prairie with some shortgrass species. Important grasses include sideoats grama, little bluestem, buffalograss, big bluestem, switchgrass, and Indiangrass. This site also supports a variety of forbs including catclaw sensitivebrier, heath aster, dotted gayfeather and others. The predominant increaser species is silver bluestem. Shrubs are generally non-existent on this site except for an pricklypear cactus and yucca. This plant community has evolved through the collective influence of fire, herbivory, drought, and extremes in temperature. Primary large animal herbivory occurred from seasonal migration of bison and elk. Continuous heavy grazing and absence of fire on this site will tend to decrease tallgrasses such as big bluestem, Indiangrass, and switchgrass as well as the palatable legumes. Usually, little bluestem will tend to replace the big bluestem and Indiangrass. The rate of development of the little bluestem dominant community is dependent upon stocking rate, fire frequency, precipitation and season. Prescribed grazing and prescribed burning using 3 to 5 year intervals will help restore and maintain a component of tallgrasses, legumes, and forbs. The absence of grazing and fire will result in litter build-up and some stagnation of the site's ecological functions.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	930	1460	1980
Shrub/Vine	20	50	110
Forb	50	90	110
Total	1000	1600	2200

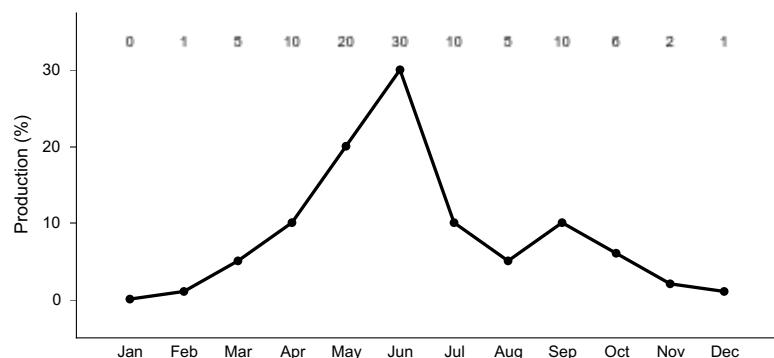


Figure 10. Plant community growth curve (percent production by month). OK0001, Native, Warm Season Grasses. Typically, the summer growing season for warm season grasses begins April 5 to 15 and ends October 15 to 25. Nearly three-fourths of the season production will occur before the first of July. This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

Community 1.2

Little Bluestem Dominant



Figure 11. Little Bluestem Dominant

This site is dominated by little bluestem, that makes up approximately 60 to 85 percent of the total annual vegetative production. The site also has a small percentage of other perennial grasses such as silver bluestem, sideoats grama, and buffalograss. Continuous grazing and absence of fire both contribute to the dominance of little bluestem. This dominance quickens as stocking rates increase. In years of dry summers followed by cool, mild winters, common broomweed may vividly demonstrate its presence on site.

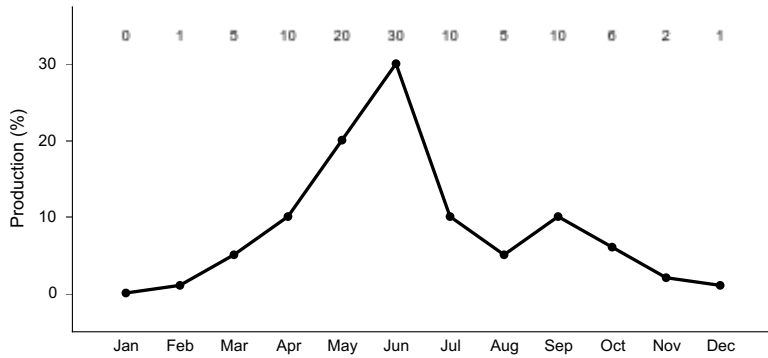


Figure 12. Plant community growth curve (percent production by month). OK0001, Native, Warm Season Grasses. Typically, the summer growing season for warm season grasses begins April 5 to 15 and ends October 15 to 25. Nearly three-fourths of the season production will occur before the first of July. This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

Community 1.3 Mid-Shortgrass Community

This plant community is predominately midgrasses with some little bluestem. The dominant grasses are sideoats grama, blue grama, buffalograss, and silver bluestem and some threeawn. This plant community is a result of long term heavy continuous grazing. There is usually a remnant of little bluestem and other grasses that will respond to prescribed grazing. The timeframe needed for this site to move to a "more favorable for cattle" little bluestem dominated community may be 5 to 10 years depending on rainfall, stocking rate and other factors.

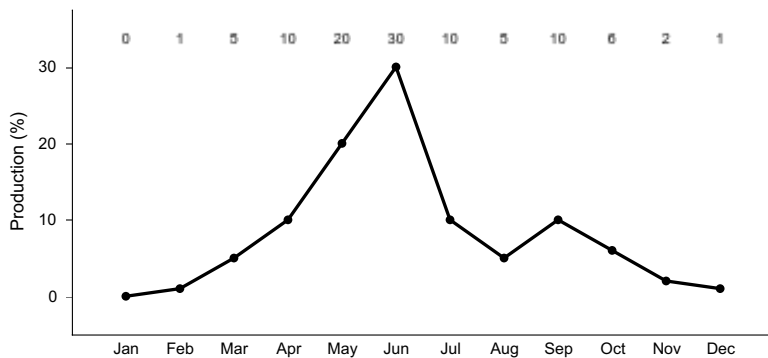


Figure 13. Plant community growth curve (percent production by month). OK0001, Native, Warm Season Grasses. Typically, the summer growing season for warm season grasses begins April 5 to 15 and ends October 15 to 25. Nearly three-fourths of the season production will occur before the first of July. This varies from year to year depending upon temperatures and precipitation..

Pathway 1.1A Community 1.1 to 1.2



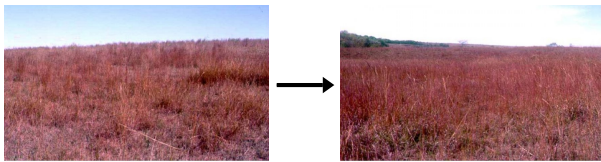
Mid/Tallgrass



Little Bluestem Dominant

If abusive grazing practices persist for multiple growing seasons, the site may shift to community phase 1.2. Lack of fire may also contribute to this shift, though not as much as abusive grazing.

Pathway 1.2A Community 1.2 to 1.1



Little Bluestem Dominant

Mid/Tallgrass

With adequate rest from grazing and adequate growing season moisture, the site may be shifted back to community phase 1.1. The use of prescribed fire can also help facilitate this shift by suppressing woody species and stimulating fire tolerant tallgrasses.

Pathway 1.2B Community 1.2 to 1.3

If abusive grazing practices persist for multiple growing seasons, the site may shift to community phase 1.3. Lack of fire may also contribute to this shift, though not as much as abusive grazing.

Pathway 1.3A Community 1.3 to 1.2

With adequate rest from grazing and adequate growing season moisture, the site may be shifted back to community phase 1.2. The use of prescribed fire can also help facilitate this shift by suppressing woody species and stimulating fire tolerant tallgrasses. This shift may take multiple growing seasons.

State 2 Shrubland

This plant community is predominately midgrasses with some little bluestem. The dominant grasses are sideoats grama, blue grama, buffalograss, silver bluestem and some threeawn. This plant community is the result of long term heavy continuous grazing. There is usually a remnant of little bluestem and other grasses that will respond to prescribed grazing. The time needed to return to a little bluestem dominated community can be 5 to 10 years depending on rainfall, stocking rate, and other factors.

Dominant plant species

- blue grama (*Bouteloua gracilis*), grass
- buffalograss (*Bouteloua dactyloides*), grass

State 3 Converted State

Some of these sites were farmed at some point. Some have been abandoned as "go back" pastures. Principal crops/pasture grasses are wheat, sorghum, bermudagrass, and old world bluestem.

Dominant plant species

- wheat (*Triticum*), grass

Transition T1A State 1 to 2

Without fire or other brush management, the site may be invade by woody species. Once these species begin to dominate the ecological functions on the site, the site will transition to the Shrubland state(2).

Transition T1B State 1 to 3

Through tillage and planting for crop production or introduced pasture, this site will be transitioned to the converted state(3).

Restoration pathway R2A

State 2 to 1

Through the implementation of brush management and prescribed fire, the site may be restored to the grassland state(1). Careful grazing management is also essential to the recovery of the grassland.

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				392–857	
	little bluestem	SCSC	<i>Schizachyrium scoparium</i>	298–652	–
	sideoats grama	BOCU	<i>Bouteloua curtipendula</i>	93–204	–
2				280–613	
	big bluestem	ANGE	<i>Andropogon gerardii</i>	140–307	–
	switchgrass	PAVI2	<i>Panicum virgatum</i>	93–204	–
	Indiangrass	SORGH	<i>Sorghastrum</i>	47–102	–
3				140–307	
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	93–204	–
4				76–165	
	vine mesquite	PAOB	<i>Panicum obtusum</i>	37–81	–
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	19–42	–
	Canada wildrye	ELCA4	<i>Elymus canadensis</i>	19–42	–
5				47–102	
	silver bluestem	BOSA	<i>Bothriochloa saccharoides</i>	47–102	–
Forb					
6				50–108	
	prairie broomweed	AMDR	<i>Amphiachyris dracunculoides</i>	8–18	–
	groundplum milkvetch	ASCR2	<i>Astragalus crassicaupus</i>	8–18	–
	purple dalea	DALA4	<i>Dalea lasiathera</i>	8–18	–
	Illinois bundleflower	DEIL	<i>Desmanthus illinoensis</i>	8–18	–
	dotted blazing star	LIPU	<i>Liatris punctata</i>	8–18	–
	littleleaf sensitive-briar	MIMI22	<i>Mimosa microphylla</i>	8–18	–
	white heath aster	SYERE	<i>Symphyotrichum ericoides</i> var. <i>ericoides</i>	8–18	–
Shrub/Vine					
7				20–110	
	pricklypear	OPUNT	<i>Opuntia</i>	20–110	–

Animal community

This site is useful for cattle. The presence of mesquite provides moderate habitat for whitetail deer in the form of cover. Quail utilize the low growing mesquite limbs to hide from aerial predators and for thermal cover. Mesquite seeds are a food source for wildlife species such as squirrel, coyote, skunk, etc. The beans are also relished by

livestock, which contributes to its spread. Beans that drop on the ground under the mesquite do not germinate as successfully as do those seeds that pass through the digestive tract of an animal. The bunchgrass, little bluestem, is a preferred nesting plant for bobwhite quail. Bobwhite quail benefit from common broomweed during years when it is present, however this makes the site less desirable for cattle grazing.

Hydrological functions

The soils that make up this ecological site are shallow and somewhat excessively drained, with slow permeability. Runoff is rapid.

Recreational uses

Hunting, camping, horseback riding, fishing, camping, bird watching, and many other outdoor activities.

Wood products

None

Other products

None

Other information

None

Inventory data references

Information presented here has been derived from limited NRCS clipping data and the field observations of rangeland trained personnel. Additionally, range scientists from Oklahoma State University and the Agricultural Research Service have contributed scientific data.

Type locality

Location 1: Woodward County, OK	
General legal description	Site Genealogy; This site was previously called Red Clay Prairie.

Other references

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

USDA-NRCS (Formerly Soil Conservation Service) Ag Handbook 296 (2006)

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Approval

Bryan Christensen, 9/15/2023

Acknowledgments

Site Development and Testing Plan
Future work, as described in a Project Plan, to validate the information in this Provisional Ecological Site

Description is needed. This will include field activities to collect low, medium and high intensity sampling, soil correlations, and analysis of that data. Annual field reviews should be done by soil scientists and vegetation specialists. A final field review, peer review, quality control, and quality assurance reviews of the ESD will be needed to produce the final document.

Annual reviews of the Project Plan are to be conducted by the Ecological Site Technical Team.

Rangeland health reference sheet

Interpreting Indicators of Rangeland Health is a qualitative assessment protocol used to determine ecosystem condition based on benchmark characteristics described in the Reference Sheet. A suite of 17 (or more) indicators are typically considered in an assessment. The ecological site(s) representative of an assessment location must be known prior to applying the protocol and must be verified based on soils and climate. Current plant community cannot be used to identify the ecological site.

Author(s)/participant(s)	Mark Moseley
Contact for lead author	100 USDA Suite 102 Stillwater, OK 74074
Date	07/09/2004
Approved by	Bryan Christensen
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

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

2. **Presence of water flow patterns:** Some, usually only after high intensity rains.

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

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Bare ground 10 – 15%.

5. **Number of gullies and erosion associated with gullies:** Some rare in drains but probably were limited to less than 1 – 2 foot overfalls and less than 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):** Less than 12 inches, and usually only after high intensity rainfall.

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):** A: 0 to 5 inches; red clay, moderate fine subangular blocky structure. Bk: 5 to 25 inches; dark red clay, moderate fine and medium subangular blocky structure.
-
10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Mid grass and shortgrass community. Tall grasses random, occurring in drains. Slow permeability and moderate cover can 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):** None, fine textured, hard soils can be mistaken for compaction.
-
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: Mid-grass (little bluestem) > shortgrasses > tall grasses
- Sub-dominant: warm-season perennial forbs > cool season grasses and grasslikes
- Other:
- Additional:
-
13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** There can be some plant loss due to droughty nature of the site, especially after severe drought, but should be less than 5%.
-
14. **Average percent litter cover (%) and depth (in):** Litter cover should average 60% at a depth not more than 1 inch.
-
15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 1000 – 2200 lbs./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:** Eastern redcedar with a lack of regular burning.
-
17. **Perennial plant reproductive capability:** All plants capable of reproducing at least every 2 – 3 years.
