Ecological site R084CY168TX
Claypan 37-43 PZ

Last updated: 9/21/2023
Accessed: 04/19/2024

General information

Provisional. A provisional ecological site description has undergone quality control and quality assurance review. It contains a working state and transition model and enough information to identify the ecological site.

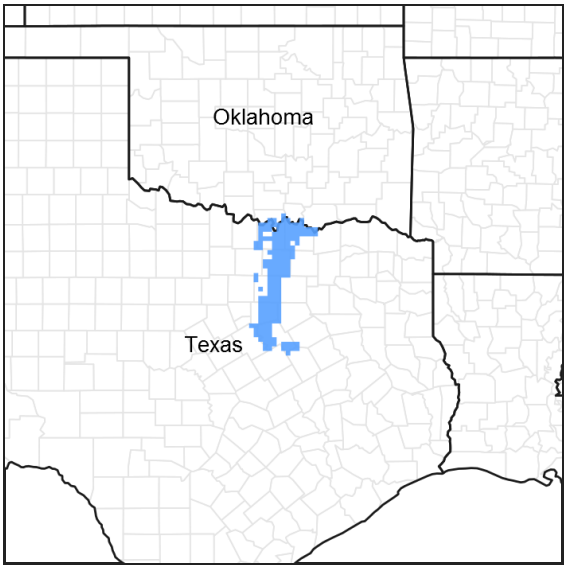


Figure 1. Mapped extent

Areas shown in blue indicate the maximum mapped extent of this ecological site. Other ecological sites likely occur within the highlighted areas. It is also possible for this ecological site to occur outside of highlighted areas if detailed soil survey has not been completed or recently updated.

MLRA notes

Major Land Resource Area (MLRA): 084C–East Cross Timbers

MLRA 84C is characterized by ridges, hillsides and valleys underlain by interbedded sandstone and shales of Cretaceous age. Most soils support oak savannah vegetation, however much of the area has been subject to fragmentation and urban sprawl.

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 over sandy loam to clay loam soils with dense clay subsoils (claypans). The reference vegetation includes a mixture of midgrasses and tallgrasses with various forbs and legumes. Under reference conditions, woody species are limited by periodic fire or other brush management. Many of these sites have been cultivated in the past and are now planted back to introduced forage species. These sites are very vulnerable to mesquite invasion.

Associated sites

R084CY195TX	**Tight Sandy Loam 37-43 PZ** Clay loam subsoils over sandstone/siltstone

Similar sites

R084CY195TX	**Tight Sandy Loam 37-43 PZ** Clay loam subsoils over sandstone/siltstone

Table 1. Dominant plant species

Tree	(1) *Ulmus*
Shrub	(1) *Rhus copallinum*
Herbaceous	(1) *Schizachyrium scoparium* (2) *Bouteloua curtipendula*

Physiographic features

This site occurs on treads of stream terraces and on base slopes of hillslopes in the East Cross Timbers MLRA. This site is transitory between a water distributing and a water receiving site. Slopes range from 0 to percent.

Table 2. Representative physiographic features

Landforms	(1) Alluvial plain > Stream terrace (2) Alluvial plain remnant > Paleoterrace (3) Hills > Ridge (4) Hills > Hillslope
Runoff class	High to very high
Elevation	400–1,000 ft
Slope	0–5%
Water table depth	20–80 in

Climatic features

The climate is subhumid subtropical and is characterized by hot summers and relatively mild winters. Tropical maritime air controls the climate during spring, summer and fall. In winter and early spring, frequent surges of polar Canadian air cause sudden drops in temperatures and add considerable variety to the daily weather. The average first frost should occur around November 5 and the last freeze of the season should occur around March 19.

The average relative humidity in mid-afternoon is about 60 percent. Humidity is higher at night, and the average at dawn is about 80 percent. The sun shines 75 percent of the time possible during the summer and 50 percent in winter. The prevailing wind direction is from the south and highest windspeeds occur during the spring months.

Approximately two-thirds of annual rainfall occurs during the April to September period. Rainfall during this period generally falls during thunderstorms, and fairly large amounts of rain may fall in a short time. The driest months are usually July and August.

Table 3. Representative climatic features

Frost-free period (characteristic range)	204-217 days
Freeze-free period (characteristic range)	225-246 days
Precipitation total (characteristic range)	37-41 in
Frost-free period (actual range)	203-221 days
Freeze-free period (actual range)	221-258 days

Precipitation total (actual range)	36-43 in
Frost-free period (average)	210 days
Freeze-free period (average)	237 days
Precipitation total (average)	39 in

Climate stations used

- (1) ARLINGTON SIX FLAGS [USC00410337], Arlington, TX
- (2) GAINESVILLE 5 ENE [USC00413420], Gainesville, TX
- (3) GRAPEVINE DAM [USC00413691], Grapevine, TX
- (4) PILOT POINT ISL DU BOI [USC00417028], Pilot Point, TX
- (5) DALLAS FT WORTH AP [USW00003927], Dallas, TX
- (6) DENISON DAM [USC00412394], Cartwright, TX
- (7) WHITNEY DAM [USC00419715], Clifton, TX
- (8) BURLESON [USC00411246], Burleson, TX
- (9) CLEBURNE [USC00411800], Cleburne, TX
- (10) DENTON 2 SE [USC00412404], Denton, TX
- (11) HILLSBORO [USC00414182], Hillsboro, TX

Influencing water features

These sites are in water shedding upland positions. However, they may also receive some run-on water from adjacent sites. The dense clay subsoils may limit water infiltration. The presence of adequate ground cover and deep-rooted tallgrass species can help facilitate water infiltration into the soil profile.

Wetland description

NA

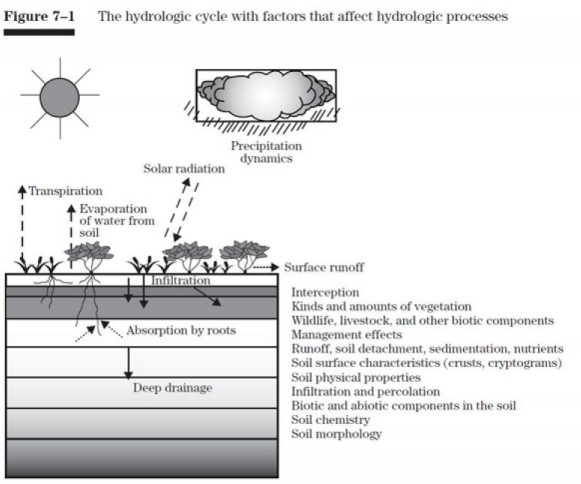


Figure 8.

Soil features

Representative soil components for this ecological site include: Crockett, Hassee, Mabank, and Navo

The site is characterized by deep soils with a loamy surface and hard setting clayey subsoil.

On a soils map, map units are representations of the major soil series component(s) and named accordingly. Each map unit is spatially represented on a digital soils map as polygons of different shapes and sizes. Within these map units, there are often minor soil series components included. These minor components are soils that occur within a map unit polygon but are of small extent (15 percent 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 map unit 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 map unit 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 map unit.

Table 4. Representative soil features

Parent material	(1) Alluvium–shale (2) Residuum–shale
Surface texture	(1) Fine sandy loam (2) Loam (3) Clay loam
Drainage class	Moderately well drained
Permeability class	Very slow
Depth to restrictive layer	40 in
Soil depth	40 in
Surface fragment cover <=3"	0–1%
Surface fragment cover >3"	0–1%
Available water capacity (Depth not specified)	7–9 in
Calcium carbonate equivalent (Depth not specified)	0–15%
Electrical conductivity (Depth not specified)	0–4 mmhos/cm
Sodium adsorption ratio (Depth not specified)	0–8
Soil reaction (1:1 water) (Depth not specified)	5.6–8.4
Subsurface fragment volume <=3" (Depth not specified)	0–10%
Subsurface fragment volume >3" (Depth not specified)	0–2%

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 the Claypan ecological site. Historically, the site was influenced by periodic fires during all seasons of growth. These fires were often the result of dry lightning strikes or anthropogenic fires set by Native Americans. The fire frequency during the period prior to settlement is estimated between 2 to 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 and grazed and unburned and ungrazed landscapes.

With the removal if fire and the introduction of conventional livestock fencing, the landscape began to change to more homogeneous vegetation patterns and altered plant communities. Gently sloping sites like the Claypan site were often broke out for crop production also. This led to a highly fragmented, highly disturbed landscape we see today across much of MLRA 84C.

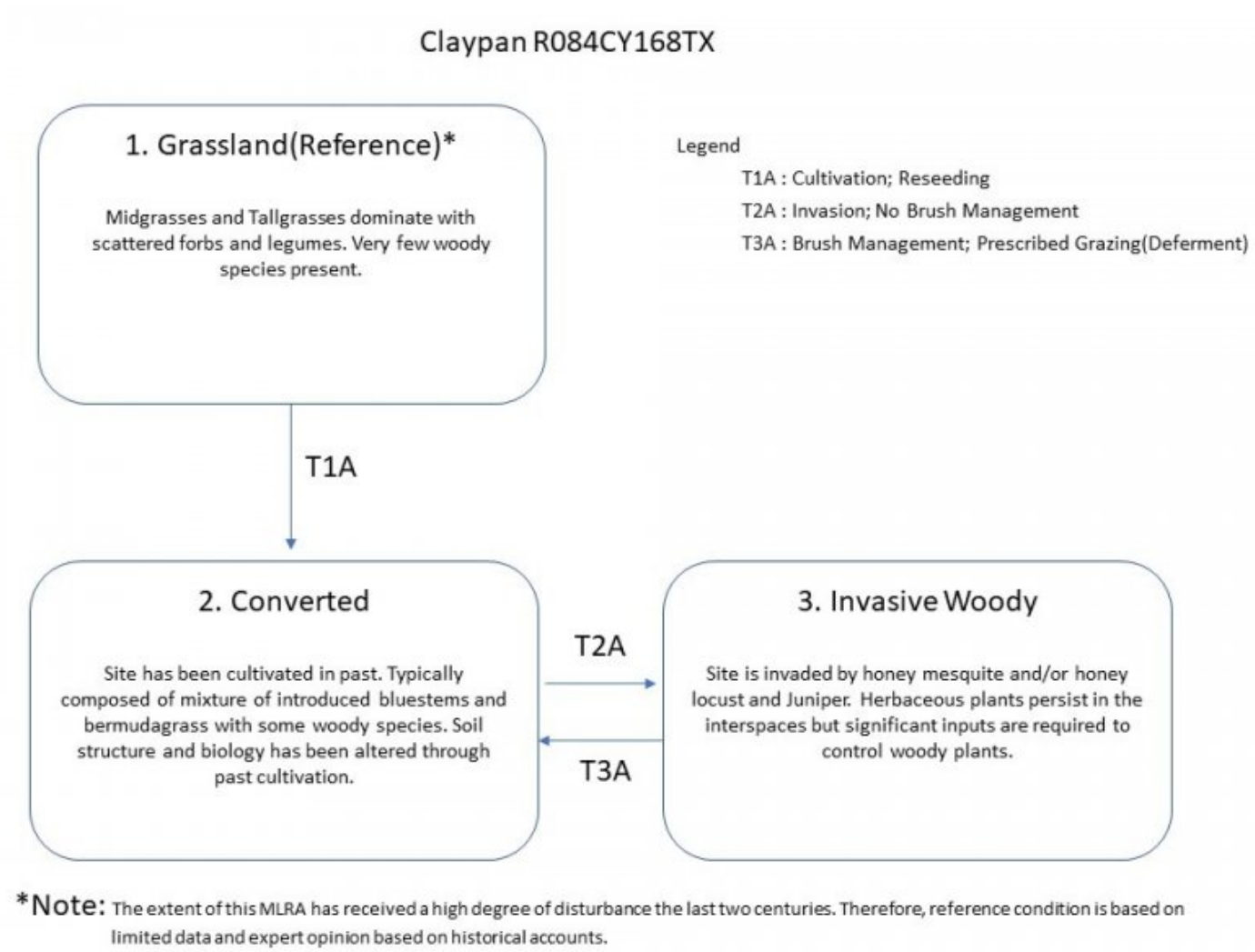
While parts of the MLRA are still intact prairie, they often lack the evolutionary fire and grazing interactions that help shape the historic reference plant communities.

State and Transitional Pathways:
The following diagram suggests some pathways that vegetation on the ecological 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 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



State 1
Grassland - Reference

This is the reference state for the Claypan 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. Dominant grasses include little bluestem, sideoats grama, big bluestem, Indiangrass, and switchgrass. Other grasses include dropseeds, silver bluestem, Texas cupgrass and Texas wintergrass. Forbs and legumes include englemann daisy, sunflowers, heath aster, yellow neptune, catclaw sensitive-briar and prairie clovers. Woody species are limited with periodic fires and include elms, hackberry, sumacs and plums. Mesquite is a prominent invader on these Claypan sites. The Claypan site is estimated to produce between 3,000 to 6,000

pounds of vegetative production per year in reference condition. Tallgrasses = Midgrasses greater than Forbs ,Shrubs and Trees are a minor component of these sites.

Dominant plant species

- elm (*Ulmus*), tree
- winged sumac (*Rhus copallinum*), shrub
- little bluestem (*Schizachyrium scoparium*), grass

Community 1.1

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	2550	3825	5100
Forb	300	450	600
Shrub/Vine	90	135	180
Tree	60	90	120
Total	**3000**	**4500**	**6000**

State 2
Converted

This state represents a change in land use from rangeland to pastureland. The soil structure and biology has been altered and the site is dominated by introduced species. Management of introduced forages requires more inputs than native grasses. Careful consideration should be taken prior to planting to ensure the result meets the desired use. Ratings for forage yields can be found under the Non-irrigated Crop Yield section in Web Soil Survey. As with any fertility management program, current soil tests should be taken before planting and subsequent fertilization of introduced pastures. The most common forage species on these sites include bermudagrass and Old World bluestems(eg. King Ranch bluestem). Without brush management, woody species such as mesquite, juniper, elm, or honey locust may invade these sites. There may be opportunities to plant native grass species on these sites to restore the reference plant communities. The success of this type of restoration is highly variable and depends on the remaining soil resources and past management. This type of endeavor often requires site specific planning and evaluation. However, the species described in the reference state are a good resource for initial planning of any restoration project.

Dominant plant species

- Bermudagrass (*Cynodon dactylon*), grass

State 3
Invasive Woody

Figure 10. Crockett soils. Cooke County, TX

This state describes the invaded, woody dominated plant community of the Claypan 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

- honeylocust (*Gleditsia triacanthos*), tree
- elm (*Ulmus*), tree
- Ashe's juniper (*Juniperus ashei*), tree
- Bermudagrass (*Cynodon dactylon*), grass
- Texas wintergrass (*Nassella leucotricha*), grass

Transition T1A
State 1 to 2

Most of these sites were cultivated for crop production during the settlement of the area. Many of them have been planted to monocultures of introduced forage grasses in recent years. When these sites are cultivated, the soil properties are significantly altered from the reference state. Soil structure, hydrology and biology have been impacted and the site is transitioned to the Converted State.

Transition T2A
State 2 to 3

These sites are prone to invasion by mesquite and honey locust. Without brush management, brush invasion may increase to the point where the site transitions to the Invasive Woody State. At this point it will take significant inputs to remove woody species and restore the grass dominated pasture.

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 claypan areas. As the site changes towards the Invasive Woody State, 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 uplands and shed water to adjacent sites lower on the landscape. Some sites may also receive some run-on water. However, the clay subsoils slow infiltration and permeability. The presence of deep-rooted tallgrasses can help facilitate percolation of water into the soil profile. While these claypan sites can be a productive site, they may become quite droughty during dry periods as the clay subsoils tend to hold available water where it is not available for plant growth.

Recreational uses

NA

Wood products

NA

Other products

NA

Other information

NA

Inventory data references

Soil Survey Manuscript Tarrant County, TX
Soil Survey Manuscript Denton County, TX

References

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

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	04/19/2024
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):**

_____

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

_____

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:**
