

# Ecological site R084CY192TX Sandstone Hill 37-43 PZ

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Accessed: 04/23/2024

## 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.

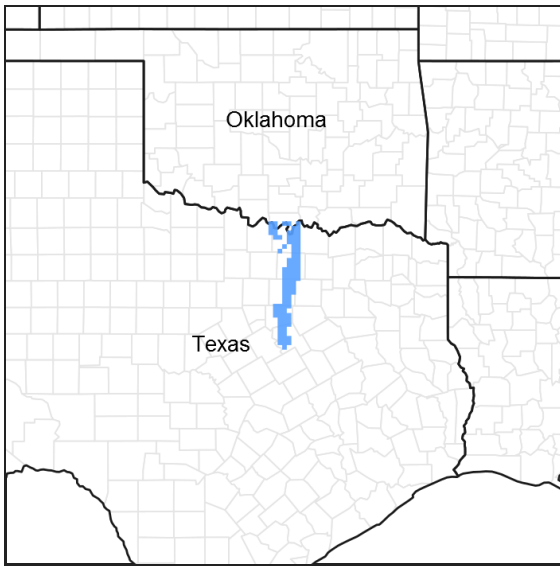


Figure 1. Mapped extent

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 sandstones 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 on shallow soils over hard sandstone. The reference vegetation includes a mosaic of mid and tallgrasses and oak trees with various forbs and legumes. Without periodic fire or brush management, woody canopy cover will increase and lead to a significant shift in the plant community. Production is often limited by the shallow soil resources.

## Associated sites

|             |   |
|-------------|---|
| R084CY195TX | <b>Tight Sandy Loam 37-43 PZ</b><br>Savannah site with clayey subsoils. |
|-------------|---|

## Similar sites

|             |  |
|-------------|--|
| R084AY088OK | <b>Shallow Savannah</b><br>Similar site in Northern Cross Timbers. |
|-------------|--|

Table 1. Dominant plant species

|            |   |
|------------|---|
| Tree       | (1) <i>Quercus marilandica</i><br>(2) <i>Quercus stellata</i> |
| Shrub      | Not specified   |
| Herbaceous | (1) <i>Schizachyrium scoparium</i>                            |

## Physiographic features

This site occurs on crests, nose slopes, and side slopes of hillslopes in the East Cross Timbers MLRA. This site is characteristically a water shedding site. Slopes are typically less than 20 percent.

Table 2. Representative physiographic features

|              |  |
|--------------|--|
| Landforms    | (1) Hills > Hillslope<br>(2) Hills > Ridge |
| Runoff class | High to very high                          |
| Elevation    | 122–305 m                                  |
| Slope        | 5–20%                                      |
| Aspect       | Aspect is not a significant factor         |

## 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 wind speeds 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) | 940-1,041 mm |
| Frost-free period (actual range)           | 203-221 days |
| Freeze-free period (actual range)          | 221-258 days |
| Precipitation total (actual range)         | 914-1,092 mm |

|                               |          |
|-------------------------------|----------|
| Frost-free period (average)   | 210 days |
| Freeze-free period (average)  | 237 days |
| Precipitation total (average) | 991 mm   |

## 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 upland sites 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

NA

Figure 7-1 The hydrologic cycle with factors that affect hydrologic processes

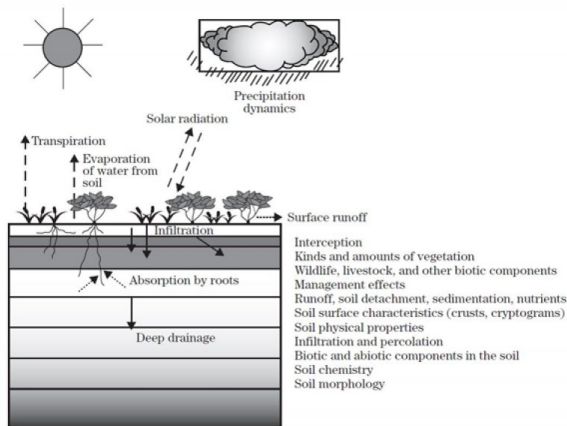


Figure 8.

## Soil features

Representative soil components for this ecological site include: Rayex

The site is characterized by shallow, slightly gravelly to stony, acid soils with low water holding capacity.

Table 4. Representative soil features

|                 |   |
|-----------------|---|
| Parent material | (1) Residuum–sandstone and shale              |
| Surface texture | (1) Stony, gravelly, gravelly fine sandy loam |
| Drainage class  | Well drained                                  |

|  |                 |
|--|-----------------|
| Permeability class                                       | Moderately slow |
| Soil depth   | 25–51 cm        |
| Surface fragment cover <=3"                              | 0–15%           |
| Surface fragment cover >3"                               | 0–10%           |
| Available water capacity<br>(0-101.6cm)                  | 2.54–5.08 cm    |
| Calcium carbonate equivalent<br>(0-101.6cm)              | 0%              |
| Electrical conductivity<br>(0-101.6cm)                   | 0–2 mmhos/cm    |
| Sodium adsorption ratio<br>(0-101.6cm)                   | 0               |
| Soil reaction (1:1 water)<br>(0-101.6cm)                 | 4.5–7.3         |
| Subsurface fragment volume <=3"<br>(Depth not specified) | 2–30%           |
| Subsurface fragment volume >3"<br>(Depth not specified)  | 0–15%           |

## 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 Sandstone Hill 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 of 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 were often broken 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.

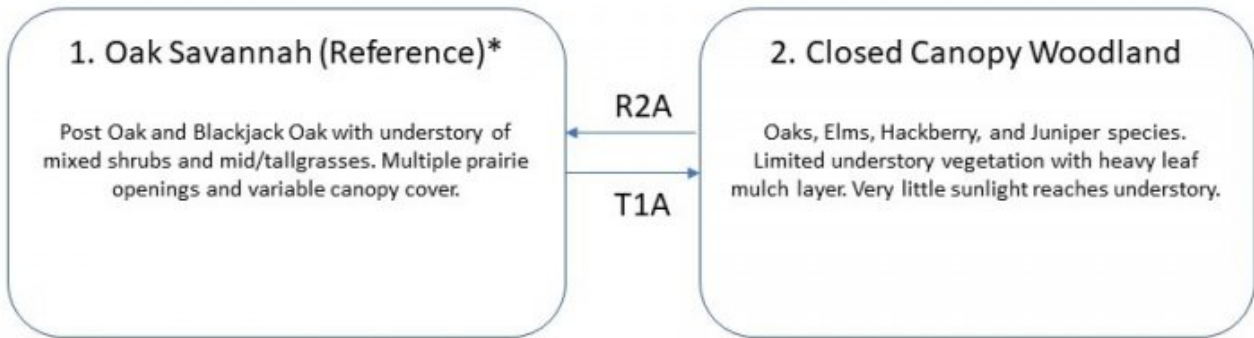
### State and Transitional Pathways:

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

## Sandstone Hill R084CY192TX



### Legend

T1A : No Brush Management; No Fire  
 R2A : Brush Management(Selective Thinning);  
 Prescribed Fire

**\*Note:** The extent of this MLRA has received a high degree of disturbance the last two centuries. Therefore, reference condition is based on limited data and expert opinion based on historical accounts.

## State 1

### Oak Savannah - Reference

This is the reference state for the Sandstone Hill ecological site. It represents the historic range of variability in the plant communities with the periodic disturbance of fire and grazing. It is a mosaic of herbaceous plants, oak species and woody understory vines and shrubs.. The dominant trees are post oak and black jack oak with a mixture of tall and midgrasses, forbs and shrubs in the understory and canopy interspaces. Dominant herbaceous plants include little bluestem, big bluestem, Indiangrass, switchgrass, beaked panicum, purpletop tridens, sand lovegrass, and wildryes. Other grasses include dropseeds, sedges, and Scribner's panicum. Forbs include Sunflowers, tickclover, lespedezas, wildbeans, yellow Neptune, and sagewort. Other woody plants include elms, greenbriar, plums, grapes, hawthorn, American beautyberry, coralberry, and Carolina snailseed. These woody species will increase in ground cover with the absence of fire. Woody canopy in the reference state is complex with some areas having dense oak canopy mixed with multiple prairie openings. For planning and management purposes, the average woody canopy in reference condition can be described as less than 40 percent. The Sandstone Hill site is estimated to produce between 1,500 – 3,500 pounds of vegetative production per year in reference condition. Tallgrasses = Midgrasses greater than Trees greater than Forbs & Shrubs

### Dominant plant species

- post oak (*Quercus stellata*), tree
- blackjack oak (*Quercus marilandica*), tree
- little bluestem (*Schizachyrium scoparium*), grass

## Community 1.1

Table 5. Annual production by plant type

| Plant Type      | Low<br>(Kg/Hectare) | Representative Value<br>(Kg/Hectare) | High<br>(Kg/Hectare) |
|-----------------|---------------------|--------------------------------------|----------------------|
| Grass/Grasslike | 1177                | 1961                                 | 2746                 |
| Tree            | 252                 | 420                                  | 588                  |
| Forb            | 168                 | 280                                  | 392                  |
| Shrub/Vine      | 84                  | 140                                  | 196                  |
| <b>Total</b>    | <b>1681</b>         | <b>2801</b>                          | <b>3922</b>          |

## State 2 Closed Canopy Woodland



Figure 10. Rayex soils, Denton County, TX

This state represents the shift to a woody dominated plant community with woody canopy exceeding 60 percent. Trees and shrubs dominate the ecological processes on the site and the herbaceous grasses and forbs are limited to shade-tolerant species. There is an abundance of leaf litter build up which further limits herbaceous plant germination and production.

### Dominant plant species

- post oak (*Quercus stellata*), tree
- blackjack oak (*Quercus marilandica*), tree
- Ashe's juniper (*Juniperus ashei*), tree
- Texas wintergrass (*Nassella leucotricha*), grass
- wildrye (*Elymus*), grass

### Transition T1A

#### State 1 to 2

Without periodic fire or brush management the reference state will transition to the Closed Canopy Woodland state. Woody species will continue to increase and lead to mesophication of the plant community with increased woody canopy and increase in shade-tolerant species.

### Restoration pathway R2A

#### State 2 to 1

At this point it will take significant inputs to remove woody species and restore the savannah state. This will require some selective thinning of woody species and the re-introduction of fire to the ecosystem. This process may take 5 years or more depending on woody canopy and past management. Grazing management including some deferment will be required to help reestablish the herbaceous plant community.

### 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. Due to the coarse textured soils, infiltration should be fairly rapid depending on total overstory canopy. Some sites may also receive some run-on water. The presence of deep rooted tallgrasses 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 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  | 04/23/2024        |
| Approved by                                 | Bryan Christensen |
| Approval date                               |                   |
| Composition (Indicators 10 and 12) based on | Annual Production |

## Indicators

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

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

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

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

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

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

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

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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:

---

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:**

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