USDA Natural Resources Conservation Service

Ecological site R087BY005TX
Deep Sand

Last updated: 9/21/2023
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.

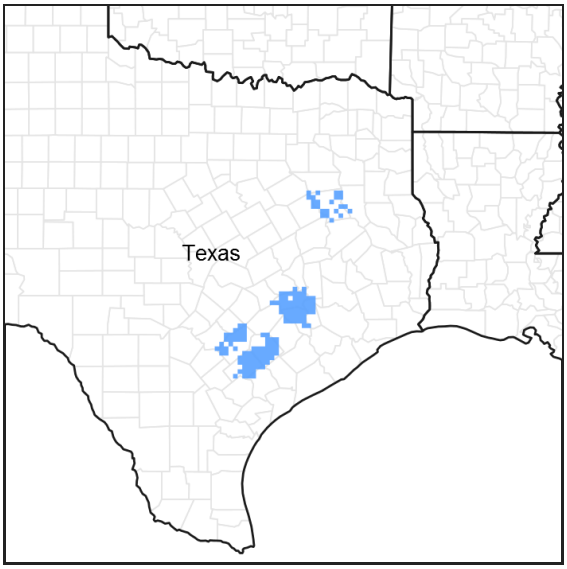


Figure 1. Mapped extent

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): 087B–Texas Claypan Area, Northern Part

This area is in northeastern Texas (79 percent) and southeastern Oklahoma (21 percent). It makes up about 4,480 square miles (11,610 square kilometers). The towns of Greenville, Sulphur Springs, Paris, Mount Vernon, Canton, and Athens, Texas, and Durant, Oklahoma, are in this MLRA. Interstates 30 and 20 and Highways 69, 70, 80, and 82 cross the area. The Caddo National Grasslands is in the north end of the area.

Classification relationships

USDA-Natural Resources Conservation Service, 2006.
-Major Land Resource Area (MLRA) 87B

Ecological site concept

The Deep Sand is characterized by very deep soils with a sand layer that extends at least 40 inches into the subsoil before any noticeable clay accumulations. This causes the site to be droughty.

Associated sites

R087BY006TX	**Very Deep Sand**
R087BY007TX	**Loamy Bottomland**
R087BY002TX	**Claypan Savannah**
R087BY004TX	**Sandy**

Similar sites

R087AY007TX	**Deep Sand**

Table 1. Dominant plant species

Tree	(1) *Quercus incana* (2) *Quercus marilandica*
Shrub	Not specified
Herbaceous	(1) *Schizachyrium scoparium* (2) *Eragrostis trichodes*

Physiographic features

This site occupies gently sloping to sloping ridges. The slope ranges from 0 to 15 percent, but is typically 1 to 8 percent.

Table 2. Representative physiographic features

Landforms	(1) Plains > Interfluve
Runoff class	Negligible
Flooding frequency	None
Ponding frequency	None
Elevation	76–229 m
Slope	1–8%
Water table depth	152–203 cm
Aspect	Aspect is not a significant factor

Table 3. Representative physiographic features (actual ranges)

Runoff class	Not specified
Flooding frequency	Not specified
Ponding frequency	Not specified
Elevation	Not specified
Slope	0–15%
Water table depth	Not specified

Climatic features

The average annual precipitation is 47 inches in most of this area, but it can be higher or lower depending on the exact location. Most of the rainfall occurs in spring and winter. The average annual temperature is 62 to 66 degrees F. The freeze-free period averages 235 days and frost-free period averages 210 days.

Table 4. Representative climatic features

Frost-free period (average)	210 days

Freeze-free period (average)	235 days
Precipitation total (average)	1,194 mm

Climate stations used

- (1) BONHAM 3NNE [USC00410923], Bonham, TX
- (2) BOSWELL 1 S [USC00340980], Boswell, OK
- (3) EMORY [USC00412902], Emory, TX
- (4) DURANT [USC00342678], Durant, OK
- (5) CLARKSVILLE 2NE [USC00411772], Clarksville, TX
- (6) MT PLEASANT [USC00416108], Mount Pleasant, TX
- (7) PARIS [USC00416794], Paris, TX
- (8) DENISON DAM [USC00412394], Cartwright, TX
- (9) LAKE FORK RSVR [USC00414976], Quitman, TX
- (10) MT VERNON [USC00416119], Mount Vernon, TX

Influencing water features

A stream does not influence the plant community of this site.

Wetland description

Wetlands are not associated with this site.

Soil features

The soils of this site are very deep, well drained, moderately rapid permeable, fine sands. The soils are classified as grossarenic, meaning the sand continues to a depth of 40 inches until a noticeable amount of clay increases in the subsoil. Moisture enters the soil rapidly, and quickly passes through and out of the root zone. Moisture holding capacity and inherent fertility is low. Water erosion is generally not a hazard but the site is susceptible to wind erosion when the soil is exposed. The site is subject to erosion where adequate herbaceous cover is not maintained and on heavy use areas such as roads and livestock trails. Soils correlated to this site include: Catilla and Kenney.

Table 5. Representative soil features

Parent material	(1) Residuum–sandstone and shale (2) Alluvium–sandstone
Surface texture	(1) Fine sand
Family particle size	(1) Sandy
Drainage class	Well drained
Permeability class	Moderately slow
Soil depth	203 cm
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	10.16 cm
Calcium carbonate equivalent (0-101.6cm)	0%
Electrical conductivity (0-101.6cm)	0 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0

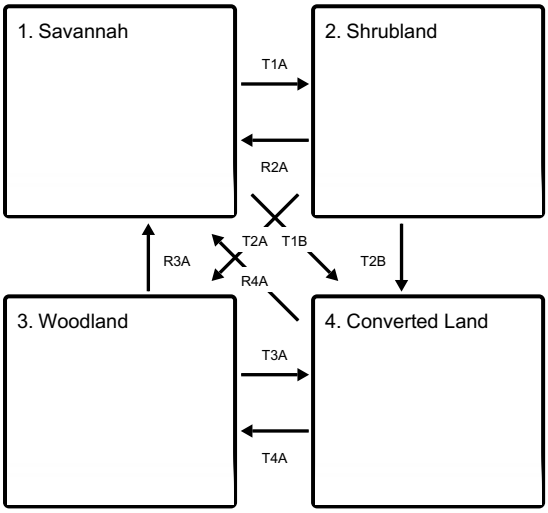
Soil reaction (1:1 water) (0-101.6cm)	4.5–7.3
Subsurface fragment volume <=3" (Depth not specified)	0–2%
Subsurface fragment volume >3" (Depth not specified)	0%

Ecological dynamics

The Deep Sand site evolved and was maintained by the grazing and herding effects of native wild large ungulates, periodic fires, and climatic fluctuations. Conversion of this site to cropland (watermelons, peanuts, etc.) and the subsequent abandonment of cropping removed the natural native vegetation, organic matter and fertility, and allowed woody species to dominate the site. Continuous grazing by confined domestic livestock and the suppression of fire on non-cropland sites removes little bluestem (*Schizachyrium scoparium*), Indiangrass (Sorghastrum spp.), and preferred forbs like tephrosia (Tephrosia spp.) and prairie clover (Dalea spp.). Less productive perennial and annual grasses and forbs will replace these plants. Years of continuous grazing generally lead to periods of prolonged rest for recovery of the perennial herbaceous plant component. These prolonged rest periods with no fire or brush management lead toward a community dominated by woody species such as winged elm (*Ulmus alata*), yaupon (*Ilex vomitoria*), post oak (*Quercus stellata*), and blackjack oak (*Quercus marilandica*).

State and transition model

Ecosystem states



T1A - Heavy continuous grazing, no brush management, abandonment

T1B - Brush management, crop cultivation, pasture planting

R2A - Brush management, prescribed grazing, prescribed burning

T2A - Heavy continuous grazing, no brush management, abandonment

T2B - Brush management, crop cultivation, pasture planting

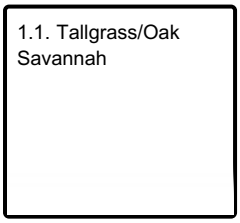
R3A - Brush management, range planting, prescribed grazing

T3A - Brush management, crop cultivation, pasture planting

R4A - Range planting, prescribed grazing, prescribed burning

T4A - Heavy continuous grazing, no brush management, abandonment

State 1 submodel, plant communities



State 2 submodel, plant communities

2.1. Oak Scrub/Shrubland

State 3 submodel, plant communities

3.1. Post Oak/Yaupon Woodland

State 4 submodel, plant communities

4.1. Converted Land

State 1
Savannah

One community exists in the Savannah State, the 1.1 Tallgrass/Oak Savannah Community. The State is dominated by warm season perennial grasses and the overstory canopy cover is less than 25 percent.

Community 1.1
Tallgrass/Oak Savannah

The characteristic plant community of this site is the reference plant community. This site is an open savannah of bluejack oak (*Quercus incana*), blackjack oak (*Quercus marilandica*), and post oak (*Quercus stellata*) trees that shade up to 25 percent of the ground. The dominant understory shrubs include yaupon (*Ilex vomitoria*), hawthorn (Crataegus spp.), and American beautyberry (*Callicarpa americana*). The herbaceous plant community of tall and midgrasses is dominated by little bluestem (*Schizachyrium scoparium*) which makes up 50 to 65 percent of the total annual production. Sand lovegrass (*Eragrostis trichodes*), Indiangrass (*Sorghastrum nutans*), switchgrass (*Panicum virgatum*), and purpletop tridens (*Tridens flavus*) occur less frequently and in smaller amounts. Grazing prescriptions that permit acceptable grazing periods and allow adequate rest periods along with prescribed fire every five to seven years are important in the maintenance of the reference plant community and the savannah landscape structure. Continuous overgrazing or over rest and the absence of fire tend to allow a vegetative composition shift towards woody species. Without corrective measures, this shift will continue to the Shrubland State.

State 2
Shrubland

One community exists in the Shrubland State, the 2.1 Oak Scrub/Shrubland Community. The herbaceous production is not as great compared to the Savannah State, and overstory canopy has increased between 25 and 50 percent.

Community 2.1
Oak Scrub/Shrubland

This plant community is a transitional community between the Savannah and Woodland States. It develops in the

absence of fire or mechanical or chemical brush management treatments. It is usually the result of abandonment following either cropping or yearly continuous grazing. Trees and shrubs begin to encroach onto introduced pastureland or replace the grassland component of the savannah community. In addition to the naturally occurring oaks, other woody species such as eastern persimmon (*Diospyros virginiana*), winged elm, and eastern red cedar (*Juniperus virginiana*) increase in density and canopy coverage (25 to 50 percent). Remnants of little bluestem and Indiangrass may still occur but the herbaceous component of the community becomes dominated by lesser producing grasses and forbs. Initially, species such as brownseed paspalum (*Paspalum plicatulum*), tall dropseed (*Sporobolus compositus*), and fall witchgrass (*Digitaria cognata*) replace the taller grasses. As the site continues to transition, the plants which increase or invade on the site include sandbur (Cenchrus spp.), red lovegrass (*Eragrostis secundiflora*), Yankeeweed (*Eupatorium compositifolium*), bullnettle (*Cnidoscolus texanus*), croton (Croton spp.), snake cotton (Froelichia spp.), prickly pear (Opuntia spp.), queen's delight (*Stillingia texana*), beebalm (Monarda spp.), and baccharis (Baccharis spp.). Prescribed burning on a three to five year interval in conjunction with prescribed grazing may be a viable option for returning this community to the Savannah State provided the woody canopy cover is less than 50 percent and adequate herbaceous fine fuel still exists. When this threshold is exceeded, mechanical or chemical brush control becomes necessary to move back towards the reference community.

State 3
Woodland

One community exists in the Woodland State, the Post Oak/Yaupon Woodland Community. The site is characterized by little herbaceous production. The overstory canopy is over 50 percent and shrubs also limit light to the surface.

Community 3.1
Post Oak/Yaupon Woodland

This plant community is a closed overstory (50 to 80 percent) woodland dominated by bluejack oak (*Quercus incana*), blackjack oak (*Quercus marilandica*), and post oak (*Quercus stellata*). Yaupon is the dominant understory shrub. Woody vines also occur and include greenbriar (Smilax spp.) and grape (Vitis spp.). A herbaceous understory is almost nonexistent but shade tolerant species such as longleaf woodoats (*Chasmanthium sessiliflorum*), and cedar sedge (*Carex planostachys*) may occur in small amounts. Prescribed burning in conjunction with prescribed grazing may be used to convert this site back to the Savannah State but generally takes many consecutive years of burning due to light fine fuel loads comprised mainly of hardwood tree leaves. Chemical brush control on a large scale is usually not a treatment option on this site due to the resistance of yaupon to broadcast herbicide applications. Individual plant treatment with herbicides on small acreage is a viable option. Mechanical treatments for reducing woody plant canopies and densities is an option, but the low water holding capacity and low fertility of this site makes re-establishment of herbaceous species by seeding very difficult.

State 4
Converted Land

The Converted Land State contains one community, the 4.1 Converted Land Community. The state is characterized by the land manager farming crops or planted grasses.

Community 4.1
Converted Land

Conversion of this site to cropland occurred from the middle 1800's to the early 1900's. Some remains in cropland today, typically cotton (Gossypium spp.), corn (*Zea mays*), sorghum (Sorghum spp.), and soybeans (*Glycine max*). Specifically, this site is used for watermelons, peas, sweet potatoes, and peanuts. Ditching, land leveling, and levee construction has significantly changed the topography and hydrology on many acres of this site. While restoration of this site to a semblance of the reference plant community is possible with seeding and prescribed grazing, complete restoration of the reference community in a reasonable time is very unlikely. Following crop production, this site is often planted to native or introduced grasses and legumes for livestock grazing or hay production. Typical species planted include improved Bermudagrass varieties, bahiagrass, switchgrass, dallisgrass, eastern gamagrass, annual ryegrass (Lolium multiflorum), and white clover. Many of the introduced species (bahiagrass,

Bermudagrass, and dallisgrass) are invasive-moving by wind, water, and animals. Once established, they are extremely difficult to remove and will hinder the reestablishment of native species. The establishment and maintenance of these species requires cultivation, fertilization, weed control, and prescribed grazing management.

Transition T1A
State 1 to 2

The Savannah State will transition to the Shrubland State when continued heavy grazing pressure, no brush management, and/or field abandonment continues. The transition is evident when woody species canopy cover exceeds 25 percent and grasses shift composition to more shade-tolerant species.

Transition T1B
State 1 to 4

The transition to the Converted State occurs when the site is plowed for planting crops or pasture. The driver for the transition is the land manager's decision to farm the site.

Restoration pathway R2A
State 2 to 1

Restoration back to the Savannah State requires brush management, prescribed grazing and/or prescribed fire. Mechanical or chemical controls can be used to remove the woody overstory species and shrubs. Prescribed grazing may require destocking and/or deferment.

Transition T2A
State 2 to 3

The Shrubland State will transition to the Woodland State when continued heavy grazing pressure, no brush management, and/or field abandonment continues. The transition is evident when woody species canopy cover exceeds 50 percent and grasses shift composition to more shade-tolerant species.

Transition T2B
State 2 to 4

The transition to the Converted State occurs when the site is plowed for planting crops or pasture. The driver for the transition is the land manager's decision to farm the site.

Restoration pathway R3A
State 3 to 1

Restoration back to the Savannah State requires substantial energy inputs. Brush management and prescribed grazing will be needed to shift the community back to the reference state. Mechanical or chemical controls can be used to remove the woody overstory species back below 25 percent. Prescribed grazing may require destocking and/or deferment to manage the understory grasses back to those found in the reference community.

Transition T3A
State 3 to 4

The transition to the Converted State occurs when the site is plowed for planting crops or pasture. The driver for the transition is the land manager's decision to farm the site.

Restoration pathway R4A
State 4 to 1

The restoration to State 1 can occur when the land manager ceases agronomic practices. Range planting of native species found in the reference community will be required to bring back a similar community as the State 1 plant composition. Proper grazing and brush management will be required to ensure success.

Transition T4A
State 4 to 3

The Converted Land State will transition to the Woodland State when continued heavy grazing pressure, no brush management, and/or field abandonment continues. The transition is evident when woody species canopy cover exceeds 50 percent and grasses shift composition to more shade-tolerant species.

Additional community tables

Animal community

The historic savannah provided habitat to bison, deer, turkey, migratory birds and large predators such as wolves, coyotes, mountain lions, and black bear. White-tailed deer, turkey, coyotes, bobcats, and resident and migratory birds find suitable habitat in these savannahs today. Domestic livestock and exotic ungulates are the dominant grazers and browsers of this site. As the savannah transitions through the various vegetative states towards woodlands, 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

Peak rainfall periods occur in May and June from frontal passage thunderstorms and in September and October from tropical systems as well as frontal passages. Rainfall amounts may be high (three to five inches per event) and events may be intense. The site is subject to erosion where adequate herbaceous cover is not maintained and on heavy use areas such as roads and livestock trails. Gullies following livestock trails to water are common on this site where continuous grazing is practiced and adequate herbaceous cover is not maintained. Extended periods (60 days) of little to no rainfall during the growing season are common. The hydrology of this site may be manipulated through management to yield higher runoff volumes or greater infiltration to groundwater. Management for less herbaceous cover will favor higher surface runoff while dense herbaceous cover and litter will favor ground water recharge. Potential pollution from sediment, pesticides, and both organic and inorganic fertilizers should always be considered when managing for higher volumes of surface runoff.

Recreational uses

Hunting, camping, bird watching, equestrian are common activities.

Wood products

Post oak and blackjack oak are used for firewood. Yaupon is used for landscaping.

Other products

Fruit from dewberries, grapes, and plums are harvested.

Inventory data references

These site descriptions were developed as part a Provisional Ecological Site project using historic soil survey manuscripts, available site descriptions, and low intensity field traverse sampling. Future work to validate the information is needed. This will include field activities to collect low, medium, and high-intensity sampling, soil correlations, and analysis of that data. A final field review, peer review, quality control, and quality assurance review of the will be needed to produce the final document.

Other references

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Contributors

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Approval

Bryan Christensen, 9/21/2023

Rangeland health reference sheet

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

Author(s)/participant(s)	
Contact for lead author	
Date	05/12/2025
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):**

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

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

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:**

17. **Perennial plant reproductive capability:**