

## Ecological site R081AY309TX Low Stony Hill 14-19 PZ

Last updated: 9/19/2023  
Accessed: 05/16/2024

### 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.

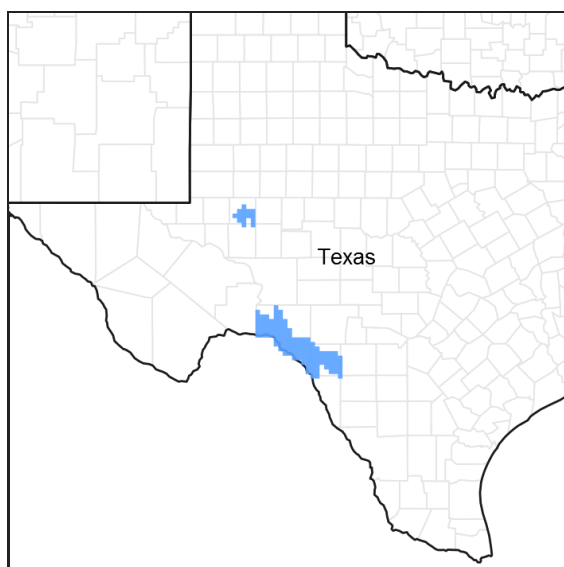


Figure 1. Mapped extent

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): 081A—Edwards Plateau, Western Part

This area is entirely in Texas. It makes up about 16,550 square miles (42,885 square kilometers). The cities of San Angelo and Fort Stockton and the towns of Big Lake, McCamey, Ozona, and Sheffield are in this MLRA. Interstate 20 crosses the northern part of the area, and Interstate 10 crosses the middle of the area. The eastern part of Amistad National Recreation Area is in this MLRA.

### Classification relationships

USDA-Natural Resources Conservation Service, 2006.  
-Major Land Resource Area (MLRA) 81A

### Ecological site concept

The Low Stony Hill are comprised of shallow soils with lithic contact. The sites are filled with gravels, cobbles, and flagstones and occur on undulating hills with less than 20 percent slopes.

### Associated sites

R081AY291TX	<b>Clay Loam 14-19 PZ</b> The Clay Loam ecological site has deeper soils lower in the landscape.
R081AY319TX	<b>Steep Rocky 14-19 PZ</b> The Steep Rocky ecological site are on slopes greater than 20 percent.
R081AY303TX	<b>Loamy 14-19 PZ</b> The Loamy ecological site have deeper soils without the fragments.

## Similar sites

R081AY319TX	<b>Steep Rocky 14-19 PZ</b> The Steep Rocky ecological site are on slopes greater than 20 percent.
R081AY296TX	<b>Gravelly 14-19 PZ</b> The Gravelly ecological site has mostly gravels with very few cobbles and stones.

**Table 1. Dominant plant species**

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) <i>Bouteloua curtipendula</i> (2) <i>Tridens muticus</i>

## Physiographic features

These sites are on undulating to hilly uplands. They exist on hills or ridges of plateaus. Slopes range from 0 to 20 percent.

**Table 2. Representative physiographic features**

Landforms	(1) Plateau > Hill (2) Plateau > Ridge
Runoff class	Medium to very high
Flooding frequency	None
Ponding frequency	None
Elevation	274–1,067 m
Slope	0–15%
Aspect	Aspect is not a significant factor

## Climatic features

The climate is semiarid and is characterized by hot summers and dry, relatively mild winters. The average relative humidity in mid-afternoon ranges from 25 to 50 percent. Humidity is higher at night, and the average at dawn is around 70 to 80 percent. The sun shines 80 percent of the time during the summer and 60 percent in winter. The prevailing wind is from the south-southwest. Approximately two-thirds of annual rainfall occurs during the May to October period. Rainfall during this period generally falls during thunderstorms, and fairly large amounts of rain may fall in a short time. The climate is one of extremes, which exert much more influence on plant communities than averages. Timing and amount of rainfall are critical. High temperatures and dry westerly winds have a tremendously negative impact on precipitation effectiveness, as well as length of time since the last rain. Records since the mid-1900's, as well as geological and archaeological findings, indicate wet and dry cycles going back many thousands of years and lasting for various lengths of time with enormous influence on the flora and fauna of the area.

**Table 3. Representative climatic features**

Frost-free period (characteristic range)	210-240 days
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Freeze-free period (characteristic range)	240-280 days
Precipitation total (characteristic range)	381-483 mm
Frost-free period (actual range)	210-240 days
Freeze-free period (actual range)	240-280 days
Precipitation total (actual range)	381-584 mm
Frost-free period (average)	225 days
Freeze-free period (average)	255 days
Precipitation total (average)	457 mm

## Climate stations used

- (1) BAKERSFIELD [USC00410482], Iraan, TX
- (2) COPE RCH [USC00411974], Big Lake, TX
- (3) GARDEN CITY [USC00413445], Garden City, TX
- (4) MCCAMEY [USC00415707], Mc Camey, TX
- (5) PAINT ROCK [USC00416747], Paint Rock, TX
- (6) PANDALE 1 N [USC00416780], Comstock, TX
- (7) PANDALE 11 NE [USC00416781], Comstock, TX
- (8) SANDERSON [USC00418022], Dryden, TX
- (9) SHEFFIELD [USC00418252], Sheffield, TX
- (10) BIG LAKE 2 [USC00410779], Big Lake, TX

## Influencing water features

No wetlands or streams are part of this site.

## Wetland description

N/A

## Soil features

The soils consist of shallow, well drained, moderately permeable soils that formed in residuum from weathered limestone. Soils are typically 4 to 20 inches thick, underlain by bedrock. Soils may have modifiers of gravelly, very gravelly, cobbly, and flaggy. Soil series correlated to this site include: Amistad, Langtry, Noelke, and Zorra.

**Table 4. Representative soil features**

Parent material	(1) Residuum–limestone
Surface texture	(1) Very flaggy clay loam (2) Very cobbly silty clay loam (3) Very stony loam
Family particle size	(1) Loamy-skeletal
Drainage class	Well drained
Permeability class	Moderate
Depth to restrictive layer	10–51 cm
Soil depth	10–51 cm
Surface fragment cover <=3"	20–50%
Surface fragment cover >3"	10–40%
Available water capacity (0-50.8cm)	0.76–2.54 cm

Calcium carbonate equivalent (0-50.8cm)	40–60%
Electrical conductivity (0-50.8cm)	0–2 mmhos/cm
Sodium adsorption ratio (0-50.8cm)	0
Soil reaction (1:1 water) (0-50.8cm)	7.9–8.4
Subsurface fragment volume <=3" (10.2-50.8cm)	20–50%
Subsurface fragment volume >3" (10.2-50.8cm)	10–40%

## Ecological dynamics

The plant communities are dynamic entities. In pre-settlement times, the site would most likely be a savannah dotted with mesquite trees, occasional shrubs and, in some areas, live oaks. The surface would be mostly covered by mid-size bunch grasses and perennial forbs. This reference plant community was greatly influenced by grazing, climate (including periodic extended periods of drought) and, to a lesser degree, fire. Reference community plants developed ways to withstand periods of drought. The midgrasses and forbs shaded the ground, reduced soil temperature, improved infiltration of what little moisture might fall and maintained soil moisture longer. Their roots reached deeper into the soil, utilizing deep soil moisture no longer available to short-rooted plants. In extreme cases many species could go virtually dormant, preserving the energy stored in underground roots, crowns and stems until wetter weather arrived. Their seeds could stay viable in the soil for long periods, sprouting when conditions improved.

Extensive herds of pronghorns, large towns of black-tailed prairie dogs, as well as smaller populations of elk, white-tailed deer, and desert mule deer were present and had an impact on the plant community. Bison, a migratory herd animal, would come into an area, graze on the move, and not come back for many months or even years. This long deferment period allowed the plants to recover from the heavy grazing. Bison grazing on this site was probably intermittent, occurring during wetter periods. Very few bison were reported in the area after 1830. There were no recorded sightings after 1860. Fire has an influence on plant community structure and was probably a factor in maintaining the original savannah vegetation. Mesquite were present on the site, but not at the level seen today. Periodic fires may have helped keep mesquite as a scattered savannah and other woody species a small part of the composition. Grazing patterns by native herbivores and prairie dog activities were probably more significant factors in maintaining a well-balanced plant community.

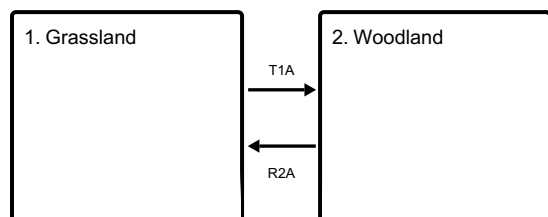
While grazing is a natural component of this ecosystem, overstocking and thus overgrazing by domesticated animals has had a tremendous impact on the site. Early settlers, accustomed to farming and ranching in more temperate zones of the eastern United States or even Europe, misjudged the capacity of the site for sustainable production and expected more than could be delivered. Moreover, there was a gap of time between the extirpation of bison and the introduction of domestic livestock which resulted in an accumulation of plant material. This may have given the illusion of higher production than was actually being produced. Overgrazing and fire suppression disrupted ecological processes that took hundreds or thousands of years to develop. Instead of grazing and moving on, domestic livestock were present on the site most of the time, particularly after the practice of fencing arrived. Another influence on grazing patterns was the advent of wells and windmills. They opened up large areas that were previously unused by livestock due to lack of natural surface water. The more palatable plants were selected repeatedly and eventually began to disappear from the ecosystem to be replaced by lower successional, less palatable species. As overgrazing continued, overall production of grasses and forbs declined, more bare ground appeared, soil erosion increased, and woody and succulent increasers began to multiply. The elimination of fire due to the lack of fine fuel or by human interference assisted the rapid encroachment of mesquite and other woody increasers and a concurrent reduction of usable forage.

Extremes in climate exerted tremendous influence on the site long before European man arrived. Geologic formations, archeological findings, and rainfall records since the mid-1900's show wide variations in precipitation with cycles of long, dry periods going back thousands of years with corresponding variations in kind and amount of

flora and fauna species. The mineral content and reaction of the soils enable the site to produce diverse, highly nutritious forage. Loss of cover and soil robs the site the site of this capability and promotes rapid water shed, erosion and crusting. Pedestalling, terracetes, and water flow patterns are range health indicators that will be present if the site begins to deteriorate.

## State and transition model

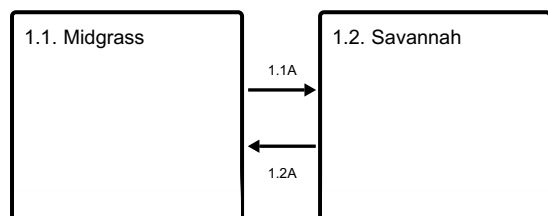
### Ecosystem states



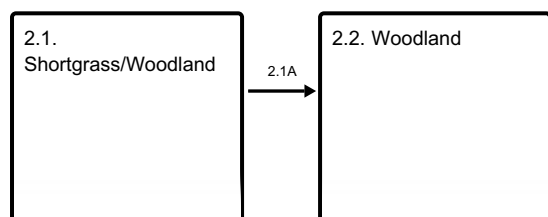
**T1A** - Absence of wildfire and natural regeneration overtime. Maybe be coupled with prolonged excessive grazing.

**R2A** - Reintroduction of historic disturbance return intervals

### State 1 submodel, plant communities



### State 2 submodel, plant communities



## State 1 Grassland

### Dominant plant species

- sideoats grama (*Bouteloua curtipendula*), grass
- slim tridens (*Tridens muticus*), grass

## Community 1.1 Midgrass

The reference community is a fire-dependent open grassland reflecting the influence of frequent fires on vegetation development. Scattered trees and shrubs make up the woody overstory. Woody plants only occupy up to 10 percent of the canopy cover. The grassland vegetation provides a continuous cover of grasses and forbs. Midgrasses like little bluestem and sideoats grama, are the most abundant and productive grasses. There are a wide diversity of grasses and many forb species. Most energy and nutrient cycling are contained in the narrow grass/soil interface and evapotranspiration was minimal. Water percolation below the grass-rooting zone was minimal and occurred only at rock outcrops and fissures in the limestone layer. Overland flow of water is minimal. Ground cover of standing vegetation, litter, and rock is near 100 percent. Water and wind erosion are negligible due to the dense ground cover. The plant community reflects the influence of the climate, soils, and topography.

## Community 1.2

## **Savannah**

The Savannah community is the first phase of transition towards the Woodland State. Woody species, especially juniper and mesquite, are invading but not seriously impacting forage production. Overgrazing and fire suppression has reduced the more palatable species and opened the grass cover for the invasion of less palatable or more aggressive species. The oaks, junipers, mesquite, and other shrubby species increase in density and size. Less palatable grasses and forbs are replacing the reference species. Midgrasses reduce in frequency, while shortgrasses begin increasing. Nutrient and energy cycling is shifting toward woody plants and evapotranspiration losses are increasing. Proper grazing and brush management can easily reverse the transition toward the Woodland State (2). Without brush management and proper grazing, the woody species will continue to thicketize until the woody species dominate.

### **Pathway 1.1A Community 1.1 to 1.2**

Heavy abusive grazing, no fire, and no brush management transitions the reference community to the Savannah Community (1.2).

### **Pathway 1.2A Community 1.2 to 1.1**

With the application of conservation practices such as prescribed grazing and prescribed burning, the Savannah Community (1.2) can revert to the Midgrass Community (1.1).

## **State 2 Woodland**

### **Dominant plant species**

- oak (*Quercus*), tree
- juniper (*Juniperus*), tree

### **Community 2.1 Shortgrass/Woodland**

The Shortgrass/Woodland Community (2.1) is comprised of 30 to 40 percent woody plant canopy cover. Oak, juniper, and/or mesquite, are the dominants in the overstory with many species of shrubs appearing in the understory. Few of the original grasses and forbs are present. Little bluestem and/or sideoats grama provide little of the forage base compared to reference conditions. Annual grasses and forbs are the majority of the forage resource. The moisture regime is more xeric than normal because of evapotranspiration losses. There is little ground water recharge or overland flow except during heavy rainfall events. Major energy and economic inputs are required to change the Shortgrass/Woodland Community back to the reference state. Brush management, prescribed grazing, prescribed burning, and perhaps range seeding will be necessary at a major expense. Planned land use will dictate the practices applied and their intensity. Unless brush management and grazing management is applied, the woodland canopy continues to thicken. Once the canopy exceeds 50 percent very little herbaceous biomass is produced and only shade tolerant species survive in the understory. Greater than 50 percent canopy cover marks the transition to the Woodland Community (2.2).

### **Community 2.2 Woodland**

Overgrazing and absence of fires continues the transition to the Woodland Community (2.2). The woody canopy cover exceeds 50 percent and little herbaceous production is evident. Only shade-tolerant species exist in the understory. Juniper and/or mesquite often dominate the overstory, although live oak is sometimes common. Shrubs have continued to increase and make up a large part of the understory, if not all. Soil erosion is taking place in the interstitial spaces, especially on steeper slopes. The microclimate is more xeric due to increased interception losses and surface runoff. During the transition, erosion occurs, fertility decreases, microbial populations declines, and infiltration is lowered. Restoration of this state requires major brush management, range seeding, and grazing

management.

### **Pathway 2.1A**

#### **Community 2.1 to 2.2**

Continued heavy grazing and lack of brush management will transition the Shortgrass/Woodland Community (2.1) into the Woodland Community (2.2).

### **Transition T1A**

#### **State 1 to 2**

Heavy abusive grazing, no brush management, and no fire transitions the Grassland State to the Woodland State.

### **Restoration pathway R2A**

#### **State 2 to 1**

Prescribed Grazing, prescribed burning, range planting, and brush management are several conservation practices that may be implemented in order to revert back to the Grassland State from the Woodland State. If enough damage has been done to soil properties through continued abuse, the full restoration to reference conditions may not be attainable.

## **Additional community tables**

### **Animal community**

This site is suitable for the production of domestic livestock and to provide habitat for native wildlife. Cow-calf, stocker cattle, sheep, and goats can utilize this site. Carrying capacity has declined drastically over the past 100 years due to deterioration of the reference plant community. An assessment of vegetation is needed to determine the site's current carrying capacity. Calculations used to determine livestock stocking rate should be based on forage production remaining after determining use by resident wildlife, then refined by frequent and careful observation of the plant community's response to animal foraging.

A large diversity of wildlife is native to this site. In the historic plant community, migrating bison, grazing primarily during wetter periods, resident pronghorns, and smaller populations of white-tailed deer, desert mule deer, quail and prairie chickens were the more predominant species. With the subsequent transformation of the plant community, due primarily to the influence of man and climate change, the kind and proportion of wildlife species have been altered.

With the eradication of the screwworm fly, increase in woody vegetation, and man-suppressed natural predation, deer numbers have increased and are often in excess of carrying capacity. Where deer numbers are excessive, overbrowsing and overuse of preferred forbs causes deterioration of the plant community. Progressive management of deer populations through hunting can keep populations in balance and provide an economically important ranching enterprise. Achieving a balance between brushy cover and more open plant communities on this and adjacent sites is important to deer management. Competition among deer, sheep, and goats must be a consideration in livestock and wildlife management to prevent damage to preferred vegetation.

Smaller mammals include many kinds of rodents, jackrabbit, cottontail rabbit, raccoon, skunks, possum and armadillo. Mammalian predators include coyote, red fox, gray fox, bobcat, and mountain lion. Wolves were common in earlier times, bears resided in some areas and an occasional jaguar was encountered. Many species of snakes and lizards are native to the site.

Many species of birds are found on this site including game birds, songbirds and birds of prey. Major game birds that are economically important are bobwhite quail, scaled (blue) quail and mourning dove. Quail prefer a combination of low shrubs, bunch grass (critical for nesting cover), bare ground and low successional forbs. Turkeys visit the site to feed. The different species of songbirds vary in their habitat preferences. Habitat on this site that provides a large diversity of grasses, forbs and shrubs will support a good variety and abundance of songbirds. Birds of prey are important to keep the numbers of rodents, rabbits and snakes in balance.

## Inventory data references

Information provided here has been derived from limited NRCS clipping data, and from field observations of range trained personnel.

## Other references

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## **Approval**

Bryan Christensen, 9/19/2023

## **Acknowledgments**

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## **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	05/16/2024
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:

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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):
- 

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:**
-