USDA Natural Resources Conservation Service

Ecological site R078AY123TX
Rocky Hill 25-28" PZ

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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.

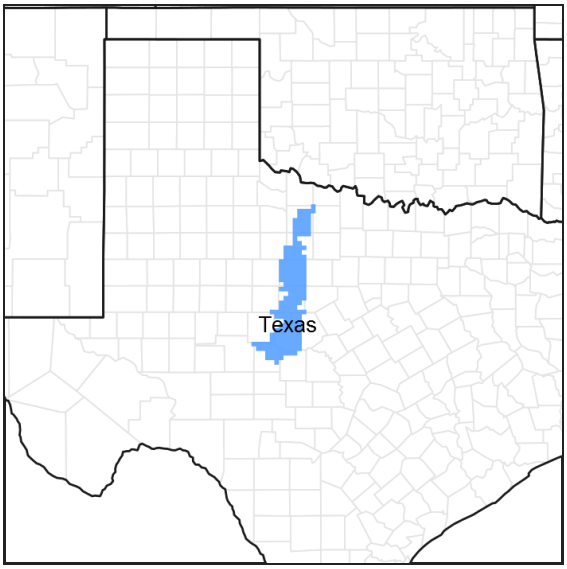


Figure 1. Mapped extent

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): 078A–Rolling Limestone Prairie

MLRA 78A is characterized by erosional plains with terraces adjacent to perennial and intermittent streams. Loamy and clayey soils range from shallow to deep over limestones and shales of Permian and Pennsylvanian age. Loamy soils are also associated with stream terraces.

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 stony and cobbly clay soils on hills. The reference vegetation consists of tallgrasses and midgrasses with forbs and woody species. Without fire or other brush management, woody species canopy may

increase. Abusive grazing practices may lead to a decline in the more palatable plant species and result in an altered plant community.

Associated sites

R078AY120TX	**Clay Slopes 25-28" PZ** Clay Slopes site has less slope, less rock on the soil surface, and is often located adjacent to the Rocky Hill site.
R078AY126TX	**Shallow Clay 25-28" PZ** Shallow Clay has less slope and occurs downslope of the Rocky Hill site.

Similar sites

R078AY126TX	**Shallow Clay 25-28" PZ** The Shallow Clay site has slightly less annual production potential because of the lack of more tallgrass species.

Table 1. Dominant plant species

Tree	(1) *Quercus virginiana*
Shrub	Not specified
Herbaceous	(1) *Schizachyrium scoparium*

Physiographic features

These gently to steep sloping soils in the Rocky Hill ecological site occur on hillslopes, plains, and footslopes of ridges in the Rolling Limestone Prairie. These soils were formed in residuum and slope wash from from claystone and siltstone. Slopes range from 5 to 30 percent. Elevation ranges from 1000 to 2400 feet.

Table 2. Representative physiographic features

Landforms	(1) Breaks > Hillslope (2) Breaks > Ridge
Runoff class	Medium to very high
Elevation	1,000–2,400 ft
Slope	5–30%
Water table depth	72 in
Aspect	Aspect is not a significant factor

Climatic features

The climate of MLRA 78A is subtropical subhumid, with hot, dry summers and mild, dry winters. The Precipitation is similar north to south throughout the area, but decreases slightly from east to west. Temperature is similar east to west, but warmer from north to south. The area is clear to partly cloudy 80 percent of the time during the summer and 60 percent during the winter. Prevailing winds usually occur from a southerly direction and from north to northwest during passage of fall and winter cool fronts. March and April are the windiest months of the year.

Most precipitation occurs during the warmer months from April to October, in the form of rainfall during thunderstorms, often of short duration and high intensity, with considerable variation in amounts of rain and the area covered. Lightening, strong winds and hail frequently accompany the thunderstorms. Occasional tornadoes are not uncommon. Precipitation distribution is bimodal, with peaks occurring in May-June and September-October. The annual precipitation is about 25 to 28 inches. Timeliness and amount of rainfall are critical to plant growth. Rainfall events of one-fourth inch or less have limited effectiveness. High temperatures and dry winds reduce precipitation effectiveness. Snowfall represents only a small part of the annual precipitation. Snowfall of one inch or more occurs about one in five years, while snowfall of greater than five inches occurs only about one in ten years. Snow cover

generally is of short duration (i.e. one to three days). Probability of snowfall is greater in the northern part of MLRA 78A.

Rainfall in the region is highly erratic, usually with more years below than above average. Periodic droughts of both temporary and prolonged duration are common to the area, although not predictable. Some of the more severe droughts of the past century in this region occurred during 1918-1919, early 1930's, early to mid 1950's, and mid to late 1990's. High temperatures and dry winds accentuate the effects of drought. The extremes in climate have greater influence on plant communities than averages. Historic wet and dry cycles of extended duration likely influenced the evolution of drought hardiness and other survival traits in the endemic flora and fauna of the area.

Temperatures range from 31 degrees F in January to 96 degrees F in July, based on the 30-year average from 1971-2000, although considerably lower and higher temperatures for these months, respectively, have been recorded for some years. Periods of excessive heat, exceeding 100 degrees F, are not uncommon during July and August. Temperatures in the winter are generally mild, but abrupt and large drops in temperature can occur when polar air masses plunge southward across the area. The duration of freezing temperatures usually does not last more than three to five days. Temperatures in the spring are mild, both daytime and nighttime. Summer temperatures are hot, with highs generally in the 80's to mid 90's during the daytime, cooling down to the upper 70's during the night. Fall is usually pleasant with mild, sunny days and crisp, cool nights, as cool northers periodically begin moving south this time of year. The area has a frost-free period of approximately 225 to 233 days and a freeze-free period of about 248 to 259 days. The primary growing season for warm-season plants is approximately 233 to 246 days, increasing from north to south. The first frost generally occurs around November 15 and the last frost occurs around March 15. These dates will vary from north to south and from year to year.

The average relative humidity ranges from 35 to 50 percent in mid-afternoon as diurnal air temperature nears maximum. As nighttime air temperature drops, relative humidity rises, averaging 70 to 80 percent by dawn.

Table 3. Representative climatic features

Frost-free period (characteristic range)	197-210 days
Freeze-free period (characteristic range)	222-244 days
Precipitation total (characteristic range)	27-29 in
Frost-free period (actual range)	195-216 days
Freeze-free period (actual range)	221-260 days
Precipitation total (actual range)	27-30 in
Frost-free period (average)	204 days
Freeze-free period (average)	235 days
Precipitation total (average)	28 in

Climate stations used

- (1) CONCHO PK/IVIE RSVR [USC00411934], Millersview, TX
- (2) COLEMAN [USC00411875], Coleman, TX
- (3) PUTNAM [USC00417327], Baird, TX
- (4) ALBANY [USC00410120], Albany, TX
- (5) THROCKMORTON 7NE [USC00419016], Throckmorton, TX

Influencing water features

NA

Wetland description

NA

Soil features

The soil series in the Rocky Hill ecological site consist of moderately deep to deep, well drained, impermeable to very slowly permeable soils over claystone bedrock or dense clay.

Major Soil Taxonomic Units correlated to this site include: Owens and Throck.

Table 4. Representative soil features

Parent material	(1) Residuum–claystone
Surface texture	(1) Stony clay (2) Cobbly clay loam (3) Very stony clay
Family particle size	(1) Clayey
Drainage class	Well drained
Permeability class	Slow to very slow
Soil depth	7–30 in
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-40in)	1.2–6 in
Calcium carbonate equivalent (0-40in)	1–15%
Electrical conductivity (0-40in)	0–6 mmhos/cm
Sodium adsorption ratio (0-40in)	0–10
Soil reaction (1:1 water) (0-40in)	7.4–8.4
Subsurface fragment volume <=3" (Depth not specified)	10–15%
Subsurface fragment volume >3" (Depth not specified)	8–22%

Ecological dynamics

The reference plant community for the Rocky Hill ecological site is a mixed tallgrass and midgrass community with a diverse forb component and a significant population of shrubs and trees. Evidence of the historic vegetation can be found in the journals and records of explorers, military expeditions, and boundary survey teams.

Climate is a major factor influencing vegetation on the site. Long-term droughts lasting multiple years or growing seasons are infrequent, but when they do occur, they can have a negative impact on the vegetation. If abusive grazing occurs during or immediately following the drought period, the results can be devastating. The effects of erratic seasonal moisture and short-term dry spells lasting a few months are not as severe as those caused by long-term droughts. However, the lower the ecological status of the site, the greater the negative impact will be during drought periods regardless of duration.

Fire is also an important part of the ecosystem. Most ecosystems in the Rolling Limestone Prairie (MLRA 78A) developed in a 4 to 6 year regime of recurring fires. This site, like other steep, shallow sites probably had a longer recurring fire cycle of 7 to 12 years according to some historians. Many of these fires resulted from lightning strikes during thunderstorms. Native Americans frequently set fires to manipulate the movement of bison and other animals as well as a defensive or offensive technique when dealing with their enemies. These historic fires were usually severe because of the amount and volatility of fuel available to carry the fire. The intensity of fires kept shrubs and sapling trees suppressed and allowed grasses and forbs to flourish. Tallgrass species are fire tolerant and are

enhanced by periodic burning. Forbs usually increase for a year or two following these fires before the grasses become dominant again.

Absence of periodic fire allows herbaceous vegetation to become senescent and may eventually lead to the loss of the most desirable species. Seedlings of non-native brush species and invasive weeds may encroach on the site from adjacent sites

Prior to settlement, this site was subject to periodic grazing and browsing by vast herds of bison, wild cattle, wild horses, and deer. Because of the steep, rugged terrain, the Rocky Hill site was probably not grazed as frequently or as severely as other sites in the vicinity. However, at times the site was grazed heavily in conjunction with adjacent sites. These grazing and browsing episodes could be intense and severe, but periods of heavy use were followed by long periods of non-use as the herds migrated to fresh grazing areas before returning to previously grazed areas. The grazed areas had an opportunity to rest, regrow, regain vigor, and reproduce prior to the next grazing event. Intervals between grazing periods were frequently influenced by the amount of time that had elapsed since the last fire on the area.

As the region was settled, fire was reduced or eliminated and grasslands were fenced off to control movement and facilitate grazing by domestic livestock. As a result of abusive grazing or lack of grazing and/or the elimination of fire, in association with extreme climatic events, the tallgrass plant community has been eliminated or severely reduced on most Rocky Hill sites.

Further deterioration leads to the loss of the perennial warm-season midgrass and forb plant community and an increase in short grasses, annuals, and bare ground. This provides the opportunity for less desirable woody species such as mesquite and juniper to encroach from adjacent sites.

Selective individual removal of undesirable trees and shrubs is relatively easy and more practical when brush plants initially appear on the site. The increase of brush can be fairly rapid and the plants per acre will soon become too numerous for individual control to be feasible. Once woody plants become mature or develop into dense stands, control is expensive, uneconomical, impractical, and difficult to achieve. Brush management is most successful using a systems approach. Initial treatment by mechanical methods can be followed by using approved herbicides, and using prescribed fire as a maintenance technique. Prescribed grazing with a reasonable stocking rate can sustain the grass species composition and production at a near historic climax level.

Changes in plant communities and vegetation states on the Rocky Hill site are result of the combined influences of natural events (rainfall, temperature, droughts, etc.) and the accompanying management systems implemented on the area (prescribed fire, grazing management, and brush management).

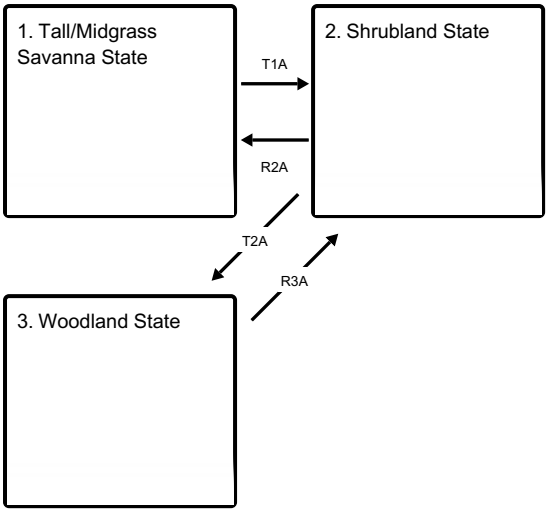
Rangeland Health Reference Worksheets have been posted for this site on the Texas NRCS website (www.tx.nrcs.usda.gov) in Section II of the eFOTG under (F) Ecological Site Descriptions.

State and Transition Model:

The State and Transition Diagram which follows provides information on some of the most typical pathways that the vegetation on this site can follow as the result of natural events, management inputs, and application of conservation treatments. There may be other plant communities that can exist on this site under certain conditions. Consultation with local experts and professionals is recommended prior to application of practices or management strategies in order to ensure that specific objectives will be met.

State and transition model

Ecosystem states



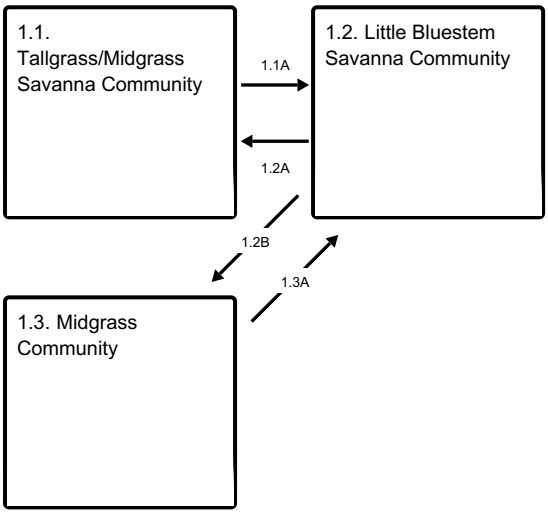
T1A - Absence of disturbance and natural regeneration over time, may be coupled with excessive grazing pressure

R2A - Adequate rest from defoliation, followed by reintroduction of historic disturbance regimes

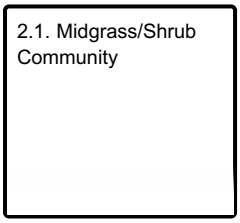
T2A - Absence of disturbance and natural regeneration over time, may be coupled with excessive grazing pressure

R3A - Adequate rest from defoliation and removal of woody canopy

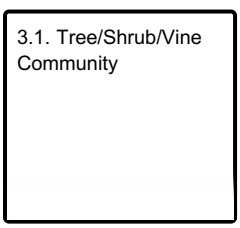
State 1 submodel, plant communities



State 2 submodel, plant communities



State 3 submodel, plant communities



State 1
Tall/Midgrass Savanna State

The reference plant community for the Rocky Hill ecological site is a Tallgrass/Midgrass Savanna Community with a diverse forb component and a significant population of shrubs and trees. This site is dominated by tallgrasses including Indiangrass, big bluestem, and little bluestem. Sideoats grama is the predominant midgrass species. The most common forbs are bushsunflower, Mexican sagewort, Engelmann daisy, gayfeather, basketflower, western ragweed, and gray goldaster. Trees and shrubs are an important of the historic plant community as well. The most common trees include live oak, elm, and hackberry. Shrubs such as flameleaf sumac, skunkbush sumac, bumelia, elbowbush, lotebush, catclaw acacia, and pricklypear are found on the site as well. The Little Bluestem Savanna Community occurs when little bluestem increases on the site, and becomes the dominant species as Indiangrass and big bluestem decrease. A viable population of the original tallgrasses is present. This is still a very productive plant community, but it has less diversity than the tallgrass savanna community. Midgrasses such as sideoats grama, Texas wintergrass, dropseeds, and silver bluestem occupy a significant part of the plant community. Species composition of forbs, shrubs, and trees remains stable in this phase. In the Midgrass Community, tallgrasses decline. They are being replaced by midgrasses such as sideoats grama, Texas cupgrass, dropseeds, and Texas wintergrass. Lower successional forbs begin to replace some of the original perennial forbs. Large rocks and boulders are obvious, but bare ground is minimal. Remaining tallgrasses are usually found adjacent to larger rocks or in protected areas, but some still occur in the open areas. Density and canopy of shrubby species such as lotebush, bumelia, sumacs, pricklypear and yucca begins to increase.

Dominant plant species

- live oak (*Quercus virginiana*), tree
- little bluestem (*Schizachyrium scoparium*), grass

Community 1.1
Tallgrass/Midgrass Savanna Community

Figure 8. 1.1 Tallgrass/Midgrass Savanna Community

Figure 9. 1.1 Tallgrass/Midgrass Savanna Community (2)

The reference plant community for the Rocky Hill ecological site is a tallgrass/midgrass savanna with a diverse forb component and a significant population of shrubs and trees. This is the reference plant community. In pristine

conditions, the site is dominated by tallgrasses including Indiangrass, big bluestem, and little bluestem. Switchgrass and Canada wildrye occur infrequently. Sideoats grama is the predominant midgrass species. Other midgrasses include Texas wintergrass, tall and meadow dropseed, silver bluestem, Texas cupgrass, and vine mesquite. Other midgrasses and shortgrasses found on this site include hairy grama, buffalograss, curlymesquite, slim and rough tridens, sedges, and threeawns. In its pristine state, the rocks and boulders on the soil surface are not generally evident because they are hidden among the tallgrasses. The most common forbs are bushsunflower, Mexican sagewort, Engelmann daisy, heath aster, daleas, gayfeather, basketflower, western ragweed, wild buckwheat, compassplant, eryngo, plains blackfoot, plains tetraneuris, and gray goldaster. Trees and shrubs are an important of the refeence plant community as well. The most common trees include live oak, elm, hackberry, ash, post oak, and Texas oak. Shrubs such as Mexican buckeye, flameleaf sumac, redbud, skunkbush sumac, bumelia, elbowbush, white honeysuckle, lotebush, catclaw acacia, pricklyash, yucca, and pricklypear are found on the site as well.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	1200	2050	2800
Forb	100	150	200
Shrub/Vine	200	200	200
Tree	100	100	100
Total	**1600**	**2500**	**3300**

Figure 11. Plant community growth curve (percent production by month). TX2520, Tall/Midgrass - Liveoak Savanna <10% Canopy. Warm-season perennial tallgrasses dominant with scattered trees and shrubs and a diverse forb community..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2	2	4	12	23	22	6	4	10	9	4	2

Community 1.2
Little Bluestem Savanna Community

Figure 12. 1.2 Little Bluestem Savanna Community

Figure 13. 1.2 Little Bluestem Savanna Community (2)

Little bluestem increases on the site, and becomes the dominant species as Indiangrass and big bluestem decrease. Little bluestem may comprise of 50% or more in this plant community. A viable population of the original tallgrasses is present. This is still a very productive plant community, but it has less diversity than the tallgrass savanna community. Midgrasses such as sideoats grama, Texas wintergrass, dropseeds, and silver bluestem occupy a significant part of the plant community. Species composition of forbs, shrubs, and trees remains stable in this phase. Because of the density of the tallgrasses and midgrasses in the Little Bluestem Savanna Community, surface rocks are not generally visible, and bare ground is minimal.

Table 6. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	1250	2150	2900
Shrub/Vine	200	200	200
Tree	100	100	100
Forb	50	50	100
Total	**1600**	**2500**	**3300**

Figure 15. Plant community growth curve (percent production by month). TX2520, Tall/Midgrass - Liveoak Savanna <10% Canopy. Warm-season perennial tallgrasses dominant with scattered trees and shrubs and a diverse forb community..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2	2	4	12	23	22	6	4	10	9	4	2

Community 1.3
Midgrass Community

Figure 16. 1.3 Midgrass Community

Figure 17. 1.3 Midgrass Community (2)

A number of temporary and often reversible factors can cause the reference plant community to shift from the original tallgrass dominated site to a midgrass dominant plant community. The shallow, droughty, and steep nature of the soils and topography can accelerate the change if uncontrolled grazing, lack of fire, and/or extended unfavorable climatic conditions exist. These events, by themselves or in combination, eventually cause the plant community to change from a tallgrass dominant to a midgrass dominant. As Indiangrass, big bluestem, and little bluestem decrease, they are replaced by sideoats grama, Texas cupgrass, dropseeds, Texas wintergrass, silver bluestem, and other midgrasses. Lower successional forbs begin to replace some of the original perennial forbs. Large rocks and boulders are obvious, but bare ground is minimal. There is still a sufficient population of Indiangrass, big bluestem, and little bluestem remaining to enable this site to recover to near its historic potential through proper grazing management and prescribed burning. Remaining tallgrasses are usually found adjacent to larger rocks or in protected areas, but some still occur in the open areas. Density and canopy of shrubby species such as lotebush, bumelia, sumacs, pricklypear and yucca begins to increase. Non-native forbs, shrubs and trees begin to encroach from adjacent sites.

Table 7. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	700	1500	2300
Shrub/Vine	200	200	200
Tree	100	100	100
Forb	100	100	100
Total	**1100**	**1900**	**2700**

Figure 19. Plant community growth curve (percent production by month). TX2521, Midgrass - Oak Savanna <10% woody Canopy. Abundant warm-season midgrasses, with scattered warm-season tallgrasses, scattered trees

and shrubs, and a diverse forb community..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2	2	5	13	21	21	7	5	10	8	4	2

Pathway 1.1A
Community 1.1 to 1.2

Tallgrass/Midgrass Savanna Community

Little Bluestem Savanna Community

Abusive grazing practices and the elimination of fire from the ecosystem are the two primary factors that cause the reference tallgrass dominant plant community to shift toward a plant community that is totally dominated by little bluestem. Indiangrass and big bluestem are highly preferred forages on this site. As these plants are repeatedly selectively grazed by livestock, little bluestem plants become more and more competitive, and increase noticeably. Elimination or interruption of the natural fire cycle also contributes to an imbalance in the original plant community and tends to favor the more resilient little bluestem plants.

Pathway 1.2A
Community 1.2 to 1.1

Little Bluestem Savanna Community

Tallgrass/Midgrass Savanna Community

Individual Indiangrass and big bluestem plants are still present in remote or protected areas, and a viable seed source exists to enable the original plant community to recover if sound management practices are followed. Implementation of a prescribed grazing management strategy and re-introduction of fire into the ecosystem will reverse the shift away from the original tallgrass plant community. A reasonable and sustainable stocking rate, as well as utilizing a grazing system to control timing, frequency, and duration of livestock grazing can result in the re-establishment of the balanced and diverse tallgrass plant community. A strategically planned and implemented prescribed burning program will assist with the turnaround in the plant community, and is essential in maintaining the balanced and diverse tallgrass savanna plant community.

Conservation practices

Prescribed Burning
Prescribed Grazing

Pathway 1.2B
Community 1.2 to 1.3

Little Bluestem Savanna Community

Midgrass Community

Continued abusive grazing and lack of fire will eventually result in the little bluestem plant community shifting to a midgrass plant community. If stocking rates are not monitored and adjusted as needed, selective grazing and

overgrazing will lead to increased competition from more aggressive grasses and forbs and cause this vegetation change. This change will be accelerated if drought conditions occur.

Pathway 1.3A
Community 1.3 to 1.2

Midgrass Community

Little Bluestem Savanna Community

Implementation of a grazing management plan to insure proper stocking rates and to control the timing, frequency, and duration of livestock grazing will enable the midgrass community to revert back to a little bluestem dominated community. Prescribed burning will assist with the recovery and maintenance of the desired plant community. As non-native or undesired shrubs begin to encroach or increase on the site, individual plant treatment can be an effective and economical method of maintaining this plant community and preventing the transition to another vegetation state.

Conservation practices

Prescribed Burning
Prescribed Grazing

State 2
Shrubland State

The Midgrass/Shrub Community marks the drastic transition from a productive tallgrass and midgrass plant community to a site that is dominated by lower successional perennial grasses, shortgrasses, forbs, and annual species. Bare ground becomes more evident and begins to appear in the interspaces between the individual grass plants. This makes the site more susceptible to the invasion of undesirable brush and weed species from adjacent sites. Erosion becomes a concern, especially on the steeper slopes. Pricklypear, yucca, catclaw acacia, lotebush, and sumacs increase significantly and the site is invaded by mesquite. Due to the amount of rock on the soil surface, a few tallgrasses still exist between the rocks and in other inaccessible areas.

Dominant plant species

- honey mesquite (*Prosopis glandulosa*), shrub
- catclaw acacia (*Acacia greggii var. greggii*), shrub
- curly-mesquite (*Hilaria belangeri*), grass
- buffalograss (*Bouteloua dactyloides*), grass

Community 2.1
Midgrass/Shrub Community

Figure 20. 2.1 Midgrass/Shrub Community (2)

Figure 21. 2.1 Midgrass/Shrub Community

Abusive grazing, extended severe drought conditions, and lack of fire will eventually lead to a drastic transition from a productive tallgrass and midgrass plant community to a site that is dominated by lower successional perennial grasses, shortgrasses, forbs, and annual species. Bare ground becomes more evident and begins to appear in the interspaces between the individual grass plants. This makes the site more susceptible to the invasion of undesirable brush and weed species from adjacent sites. Erosion becomes a concern, especially on the steeper slopes. Pricklypear, yucca, catclaw acacia, lotebush, and sumacs increase significantly and the site is invaded by mesquite. Due to the amount of rock on the soil surface, a few tallgrasses still exist between the rocks and in other inaccessible areas. Because of the amount of tree and shrub canopy, and an insufficient seed source of higher successional grasses, this plant community cannot return to the reference plant community through implementation of management practices alone.

Table 8. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	350	700	1150
Shrub/Vine	300	300	300
Forb	150	200	250
Tree	100	100	100
Total	**900**	**1300**	**1800**

Figure 23. Plant community growth curve (percent production by month). TX2515, Shortgrass/Shrub Dominant Community. Shortgrasses and Shrubs dominate this plant community..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
3	4	10	10	20	20	5	5	10	8	2	3

State 3
Woodland State

As the site continues to deteriorate to the Woodland State because of mismanagement and/or extreme climatic conditions, tallgrasses, midgrasses, and perennial forbs continue to decline and are replaced by opportunistic species that are more tolerant of grazing and drought. Herbaceous species are primarily limited to early successional perennial grasses and forbs, annual grasses and forbs, and sedges. The density and canopy of trees and shrubs is the dominant vegetation feature of the site. Sparse herbaceous vegetation is scattered among the rocks on the soil surface.

Dominant plant species

- oak (*Quercus*), tree
- elm (*Ulmus*), tree
- hackberry (*Celtis*), tree

Community 3.1
Tree/Shrub/Vine Community

Figure 24. 3.1 Tree/Shrub/Vine Community

Figure 25. 3.1 Tree/Shrub/Vine Community (2)

As the site continues to deteriorate because of mismanagement and/or extreme climatic conditions such as abusive grazing, extended long-term droughts, and lack of fire, tallgrasses, midgrasses, and perennial forbs continue to decline and are replaced by opportunistic species that are more tolerant of grazing and drought. Herbaceous species are primarily limited to early successional perennial grasses and forbs, annual grasses and forbs, and sedges. The density and canopy of trees and shrubs such as mesquite, lotebush, and Catclaw acacia is the dominant vegetation feature of the site. Sparse herbaceous vegetation is scattered among the rocks on the soil surface. Soil erosion hazard increases because of the amount of bare ground, especially on steeper slopes. Once the site has deteriorated to this point, it is not practical to implement brush management or range seeding on a

large scale. However, targeted areas can be treated to enhance wildlife habitat.

Table 9. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Shrub/Vine	300	300	300
Grass/Grasslike	100	200	300
Forb	100	200	300
Tree	200	200	200
Total	**700**	**900**	**1100**

Figure 27. Plant community growth curve (percent production by month). TX2515, Shortgrass/Shrub Dominant Community. Shortgrasses and Shrubs dominate this plant community..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
3	4	10	10	20	20	5	5	10	8	2	3

Transition T1A
State 1 to 2

Abusive grazing, resulting from overstocking and continuous grazing, leads to a drastic change in the herbaceous plant community. Higher successional midgrasses such as sideoats grama and Texas cupgrass are replaced by silver bluestem, dropseeds, buffalograss, and lower successional grasses including threeawns, Texas grama, red lovegrass, and annual grasses. Increased bare ground enables opportunistic forbs such as western ragweed, broomweed, and annuals to replace higher successional forbs. Elimination of fire from the ecosystem is a major cause of the significant increase in the frequency, density, and canopy of invasive shrubs such as mesquite, lotebush, pricklyash, catclaw acacia, pricklypear, and yucca.

Restoration pathway R2A
State 2 to 1

Once the site has deteriorated to this state, it is no longer capable of recovering to the reference plant community through the implementation of management practices alone. Brush Management practices are needed to eliminate non-native species, control undesired native species, and reduce overhead canopy to allow understory species to establish and produce. At this stage, there is not a viable population or seed source of the original plant community, so Range Planting is needed to re-establish native grasses and forbs that were components of the original plant community. However, Brush Management and Range Planting are difficult and very expensive on this site because of the rough, rocky, and steep terrain. Labor-intensive hand treatment methods or aerial application may be the only options available for brush management and range planting on this site in some instances. If the original plant community can be restored, Prescribed Grazing and Prescribed Burning are essential to the recovery and maintenance of the desired plant community.

Conservation practices

Brush Management
Prescribed Burning
Range Planting
Prescribed Grazing

Transition T2A
State 2 to 3

The combination of long-term overstocking, continuous abusive grazing, and elimination of fire can eventually result in this site being dominated by trees and shrubs. In many cases, overstory and midstory canopies may exceed

40%. The understory plant community is characterized by sparse herbaceous vegetation consisting primarily of low successional grasses and forbs, shade tolerant species, and annuals. Soil erosion hazard is increased by the amount of bare ground, especially on steeper slopes.

Restoration pathway R3A
State 3 to 2

Once the site has reached this stage, it is highly unlikely that the reference plant community can ever be restored in a reasonable time frame with the existing technology and management options. However, selected areas can be treated and managed to open up the canopy, establish beneficial vegetation, and manipulate the plant community to benefit wildlife habitat.

Conservation practices

Brush Management
Prescribed Burning
Range Planting
Prescribed Grazing

Additional community tables

Table 10. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	**Tallgrasses**			700–1600	
	big bluestem	ANGE	*Andropogon gerardii*	100–1600	–
	Indiangrass	SONU2	*Sorghastrum nutans*	100–1600	–
	little bluestem	SCSC	*Schizachyrium scoparium*	300–1000	–
	switchgrass	PAVI2	*Panicum virgatum*	0–200	–
	Canada wildrye	ELCA4	*Elymus canadensis*	0–100	–
2	**Midgrasses**			350–900	
	sideoats grama	BOCU	*Bouteloua curtipendula*	150–300	–
	Texas wintergrass	NALE3	*Nassella leucotricha*	50–200	–
	Texas cupgrass	ERSE5	*Eriochloa sericea*	0–150	–
	composite dropseed	SPCOC2	*Sporobolus compositus var. compositus*	0–150	–
	Drummond's dropseed	SPCOD3	*Sporobolus compositus var. drummondii*	0–100	–
	vine mesquite	PAOB	*Panicum obtusum*	0–100	–
	silver beardgrass	BOLAT	*Bothriochloa laguroides ssp. torreyana*	0–100	–
3	**Mid/Shortgrasses**			100–300	
	curly-mesquite	HIBE	*Hilaria belangeri*	0–200	–
	buffalograss	BODA2	*Bouteloua dactyloides*	0–200	–
	hairy grama	BOHI2	*Bouteloua hirsuta*	0–200	–
	cedar sedge	CAPL3	*Carex planostachys*	0–100	–
	tumble windmill grass	CHVE2	*Chloris verticillata*	0–100	–
	tumblegrass	SCPA	*Schedonnardus paniculatus*	0–100	–
	white tridens	TRAL2	*Tridens albescens*	0–100	–

	slim tridens	TRMUE	*Tridens muticus var. elongatus*	0–100	–
	slim tridens	TRMUM	*Tridens muticus var. muticus*	0–100	–
	purple threeawn	ARPU9	*Aristida purpurea*	0–50	–
	Wright's threeawn	ARPUW	*Aristida purpurea var. wrightii*	0–50	–
	red lovegrass	ERSE	*Eragrostis secundiflora*	0–50	–
	Texas grama	BORI	*Bouteloua rigidiseta*	0–50	–
Forb					
4	**Forbs**			100–200	
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	0–50	–
	awnless bushsunflower	SICA7	*Simsia calva*	0–50	–
	compassplant	SILA3	*Silphium laciniatum*	0–50	–
	white heath aster	SYERE	*Symphyotrichum ericoides var. ericoides*	0–50	–
	white sagebrush	ARLUM2	*Artemisia ludoviciana ssp. mexicana*	0–50	–
	American star-thistle	CEAM2	*Centaurea americana*	0–50	–
	Engelmann's daisy	ENPE4	*Engelmannia peristenia*	0–50	–
	buckwheat	ERIOG	*Eriogonum*	0–50	–
	Leavenworth's eryngo	ERLE11	*Eryngium leavenworthii*	0–50	–
	curlycup gumweed	GRSQ	*Grindelia squarrosa*	0–50	–
	hoary false goldenaster	HECA8	*Heterotheca canescens*	0–50	–
	plains blackfoot	MELE2	*Melampodium leucanthum*	0–50	–
	Nuttall's sensitive-briar	MINU6	*Mimosa nuttallii*	0–25	–
	smartweed leaf-flower	PHPO3	*Phyllanthus polygonoides*	0–25	–
	Drummond's skullcap	SCDR2	*Scutellaria drummondii*	0–25	–
	flax	LINUM	*Linum*	0–25	–
	Texas stork's bill	ERTE13	*Erodium texanum*	0–25	–
	pygmy cudweed	EVAX	*Evax*	0–25	–
	Dakota mock vervain	GLBI2	*Glandularia bipinnatifida*	0–25	–
	wavyleaf thistle	CIUN	*Cirsium undulatum*	0–25	–
	prairie clover	DALEA	*Dalea*	0–25	–
	stemmy four-nerve daisy	TESC2	*Tetraneuris scaposa*	0–25	–
	germander	TEUCR	*Teucrium*	0–25	–
	Texas vervain	VEHA	*Verbena halei*	0–25	–
	silverleaf nightshade	SOEL	*Solanum elaeagnifolium*	0–25	–
	queen's-delight	STSY	*Stillingia sylvatica*	0–25	–
	bluestem pricklypoppy	ARAL3	*Argemone albiflora*	0–25	–
	Texas Indian mallow	ABFR3	*Abutilon fruticosum*	0–25	–
Shrub/Vine					
5	**Shrubs/Vines**			100–200	
	plum	PRUNU	*Prunus*	0–100	–
	Mohr oak	QUMO	*Quercus mohriana*	0–100	–
	prairie sumac	RHLA3	*Rhus lanceolata*	0–100	–
	skunkbush sumac	RHTR	*Rhus trilobata*	0–100	–
	gum bully	SILA20	*Sideroxylon lanuginosum*	0–100	–

	Mexican buckeye	UNSP	*Ungnadia speciosa*	0–100	–
	Texas Hercules' club	ZAHI2	*Zanthoxylum hirsutum*	0–50	–
	lotebush	ZIOB	*Ziziphus obtusifolia*	0–50	–
	stretchberry	FOPU2	*Forestiera pubescens*	0–50	–
	western white honeysuckle	LOAL	*Lonicera albiflora*	0–50	–
	algerita	MATR3	*Mahonia trifoliolata*	0–50	–
	catclaw acacia	ACGRG3	*Acacia greggii var. greggii*	0–50	–
	Texas redbud	CECAT	*Cercis canadensis var. texensis*	0–25	–
	Jersey tea	CEHE	*Ceanothus herbaceus*	0–25	–
	Carolina coralbead	COCA	*Cocculus carolinus*	0–25	–
	Christmas cactus	CYLE8	*Cylindropuntia leptocaulis*	0–25	–
	clapweed	EPAN	*Ephedra antisyphilitica*	0–25	–
	pricklypear	OPUNT	*Opuntia*	0–25	–
	honey mesquite	PRGL2	*Prosopis glandulosa*	0–25	–
	greenbrier	SMILA2	*Smilax*	0–25	–
	yucca	YUCCA	*Yucca*	0–25	–
Tree					
6	**Trees**			0–100	
	live oak	QUVI	*Quercus virginiana*	0–100	–
	cedar elm	ULCR	*Ulmus crassifolia*	0–100	–
	hackberry	CELTI	*Celtis*	0–100	–
	post oak	QUST	*Quercus stellata*	0–50	–
	Nuttall oak	QUTE	*Quercus texana*	0–50	–
	Texas mulberry	MOMI	*Morus microphylla*	0–25	–

Animal community

Historically, the Rocky Hill site was inhabited permanently and intermittently by a wide variety of mammals, reptiles, and birds. Several historical references and journals written in the 18th and 19th century by explorers, survey parties, and military expeditions refer to herds of bison, wild cattle, wild horses, deer, and antelope roaming freely across the Rolling Limestone Prairie and adjacent regions.

The Rocky Hill site provides excellent habitat for many species of wildlife due to the rough, steep terrain and the diversity of plant species, growth forms, distribution, and structure of the vegetation that occurs. The site provides shelter, escape cover, and nesting habitat, as well as a variety of browse, mast, seeds, and fruit that are important to the diets of various wildlife species. Currently, the site is utilized by deer, wild turkey, numerous species of birds, and a variety of small fur-bearing mammals. Animal species and populations fluctuate as the vegetation cycles through temporary phases and different ecological

Because of the tree and shrub component and the topography, the Rocky Hill site is well suited for grazing and browsing by goats. Grazing by cattle is most common on the lower slopes and benches of this site. Most European breeds of cattle and small statured cattle are not well suited to the steeper slopes on this site. Some of the hardier breeds of cattle are better suited to the slopes, but are still not well adapted for the steepest terrain and lack of water sources on the site. Livestock grazing and distribution can be improved by providing water sources, providing supplemental feed in strategic locations, and by implementing grazing management systems that incorporate frequent and timely deferment periods.

Hydrological functions

The Rocky Hill site has a good soil-water-air-plant relationship because of the amount of rock on the soil surface and in the upper portions of the soil profile. Showers and light rains can be very effective on this site. Surface rocks retain moisture and release it slowly to the soil and vegetation following showers and light rainfall. Rocks and fragments in the soil provide pockets for oxygen, moisture, and plant roots.

When herbaceous vegetation and ground cover are maintained in a healthy and vigorous status, water infiltration into the soil profile is increased significantly, resulting in less runoff. A healthy grass cover results in improved water quality because it serves as a filter or trap to reduce sediments and pollutants before the water flows offsite. Surface runoff is rapid during heavy rainfall events due to the rough, steep topography, slowly permeable soils, and numerous limestone outcrops.

Recreational uses

These scenic areas offer outdoor activities including photography, shaded picnic areas, bird watching, hiking, camping, horseback riding, and off-road vehicle use. The Rocky Hill site is a prime site for wildlife habitat. Where it is managed properly, it provides outstanding opportunities for hunting deer and turkey. The tree foliage of this site produces outstanding fall colors.

Wood products

Oaks and some of the other hardwood trees can be used for firewood. Some of the woody species may be used for specialty products and crafts.

Other products

Plums, agarito berries and pricklypear tunas can be eaten or used to make jelly.

Other information

None.

Inventory data references

Vegetation data for this site was obtained from existing Range Site Descriptions, SCS-RANGE -417 Production and Composition Records for Native Grazing Lands, and on-site inventories by the author and local experts including ranchers, natural resource specialists from federal and state agencies, and personnel from cooperating agencies and organizations. A total of 15 SCS-RANGE-417’s containing data collected from 4 counties during the period 10/30/1979 to 12/12/1986 were reviewed for this site.

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Bryan Christensen, 9/12/2023

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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)	Lem Creswell, RMS, NRCS, Weatherford, Texas
Contact for lead author	817-596-2865
Date	10/28/2008
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:** Deposition or erosion is uncommon during normal rainfall events, but may occur in limited areas during intense rainfall events.

3. **Number and height of erosional pedestals or terracettes:** None.

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Expect no more than 20% bare ground scattered randomly throughout the site.

5. **Number of gullies and erosion associated with gullies:** Few rills and no gullies should occur.

6. **Extent of wind scoured, blowouts and/or depositional areas:** None.

7. **Amount of litter movement (describe size and distance expected to travel):** Little or no litter movement or deposition during normal rainfall events.

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** Soil surface in HCPC is resistant to wind erosion. Stability range is expected to be 5-6.

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** 0-4 inches of brown stony clay. Limestone, ironstone, and sandstone rock covers as much as 45% of the soil surface. Rocks greater than 48 inches across are scattered across the site. SOM is 1-4%. See soil survey for more information.

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** The tallgrass/midgrass savanna with abundant forbs, adequate litter, and little bare ground provides for maximum infiltration and negligible runoff.

11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):** None.

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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: Warm-season tallgrasses >>

    Sub-dominant: Warm-season midgrasses > Perennial forbs >

    Other: Shrubs/Vines > Trees > Warm-season shortgrasses > Cool-season grasses

    Additional:

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** Perennial grasses will naturally exhibit a minor amount (less than 5%) of senescence and some mortality every year.

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14. **Average percent litter cover (%) and depth (in):** Litter is primarily herbaceous.

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 1600 to 3300 pounds per acre.

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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:** Mesquite, pricklypear, yucca, pricklyash, catclaw acacia, lotebush, King Ranch bluestem, annual broomweed.

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17. **Perennial plant reproductive capability:** All perennial species should be capable of reproducing every year unless disrupted by extended drought, overgrazing, wildfire, insect damage, or other events occuring immediately prior to, or during the reproductive phase.
