

Ecological site R080BY156TX Rocky Hill 26-33" 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.

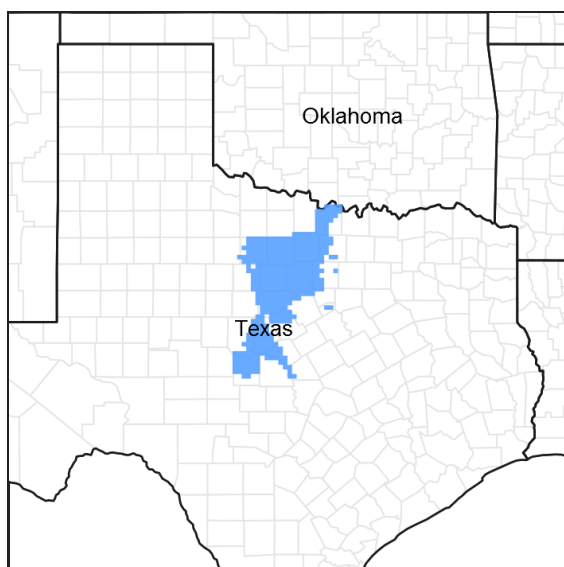


Figure 1. Mapped extent

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): 080B—Texas North-Central Prairies

MLRA 80B consists of gently rolling, dissected plains with very steep hillsides and sideslopes and narrow flood plains associated with small streams. Loamy and clayey soils range from very shallow to deep and developed in sandstones, shales, and limestones of Pennsylvanian age.

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

The site is characterized by extremely bouldery to rubbly, shallow to moderately deep, well drained clayey soils on uplands. The reference vegetation includes tall and midgrasses with a variety of forbs and scattered shrubs and trees. Without periodic fires or brush management, woody species may increase and dominate the site.

Associated sites

R080BY161TX	Shallow Clay 26-33" PZ Shallow Clay has less slope and occurs downslope of the Rocky Hill site.
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Similar sites

R080BY163TX	Steep Rocky 26-33" PZ Similar slopes and boulders, less clay content.
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Table 1. Dominant plant species

Tree	(1) <i>Quercus stellata</i> (2) <i>Quercus fusiformis</i>
Shrub	(1) <i>Rhus</i>
Herbaceous	(1) <i>Schizachyrium scoparium</i> (2) <i>Sorghastrum nutans</i>

Physiographic features

This site occurs on linear to convex nose slopes and side slopes of scarp slopes and ridges in the Texas North-Central Prairies. This site is characteristically a water distributing site. Slopes are typically between 20 to 40 percent.

Table 2. Representative physiographic features

Landforms	(1) Hills > Ridge (2) Hills > Scarp slope
Runoff class	Very high
Elevation	750–2,400 ft
Slope	20–40%
Aspect	Aspect is not a significant factor

Table 3. Representative physiographic features (actual ranges)

Runoff class	Not specified
Elevation	Not specified
Slope	5–45%

Climatic features

The climate is subtropical subhumid and is characterized by hot humid summers and relatively mild winters. Tropical maritime air controls the climate during spring, summer and fall. In winter and early spring, frequent surges of polar Canadian air cause sudden drops in temperatures and add considerable variety to the daily weather. The average first frost generally occurs about November 5 and the last freeze of the season usually occurs about March 19. The average frost free period ranges from 215 days in the northern counties, to 240 days in the south.

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

Approximately 75% of annual rainfall occurs between April 1 and October 31. Rainfall during the months of April through September typically occurs during thunderstorms which tend to be intense and brief, resulting in large amounts of rain in a short time. The wettest months of the year are May, June, September, and October. The driest months during the growing season are July and August. The winter months of November, December, January, and February are the driest months overall.

Average annual precipitation for the entire MLRA is approximately 28 inches. There is a noticeable difference in the average annual precipitation in the northern counties in comparison to the southern and western counties of this Major Land Resource Area. Jack, Clay, Young, and Palo Pinto Counties all have an average annual precipitation of more than 31 inches. Stephens, Eastland, McCulloch, and San Saba Counties all have an average annual precipitation of less than 28 inches.

Winters tend to be mild, with occasional periods of very cold temperatures which can be accompanied by strong northerly winds and freezing precipitation. Snow is infrequent and significant accumulations are rare. These periods of very cold weather are generally short-lived. Summers tend to be hot and dry. Drought conditions are common during most summers. Air temperatures of more than 95°F are common from mid-June through September. In the northern counties nearest to the Red River, temperatures are generally slightly cooler during winter months and slightly warmer during summer months than in the other counties in the North Central Prairie.

Table 4. Representative climatic features

Frost-free period (characteristic range)	184-200 days
Freeze-free period (characteristic range)	211-225 days
Precipitation total (characteristic range)	30-32 in
Frost-free period (actual range)	183-204 days
Freeze-free period (actual range)	210-226 days
Precipitation total (actual range)	29-33 in
Frost-free period (average)	193 days
Freeze-free period (average)	217 days
Precipitation total (average)	31 in

Climate stations used

- (1) SAN SABA 7NW [USC00417994], Richland Springs, TX
- (2) BROWNWOOD 2ENE [USC00411138], Early, TX
- (3) EASTLAND [USC00412715], Eastland, TX
- (4) MINERAL WELLS AP [USW00093985], Millsap, TX
- (5) BRECKENRIDGE [USC00411042], Breckenridge, TX
- (6) GRAHAM [USC00413668], Graham, TX
- (7) JACKSBORO [USC00414517], Jacksboro, TX

Influencing water features

These sites shed some water via runoff to adjacent sites downslope. However, the presence of good ground cover and deep rooted grasses can help facilitate water infiltration into the soil. These sites are not associated with wetlands.

Wetland description

NA

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

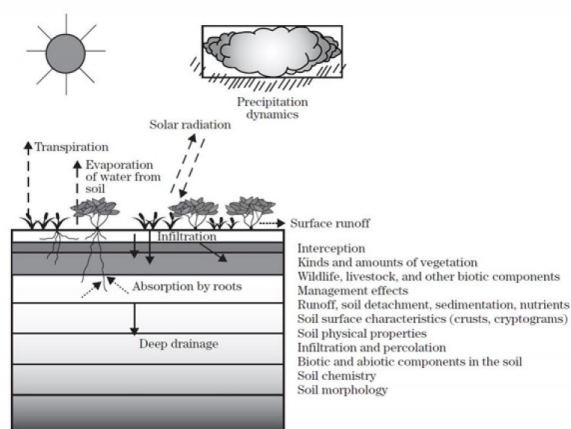


Figure 8.

Soil features

Representative soil components for this ecological site include: Owens, Harpersville

The site is characterized by extremely bouldery to rubbly, shallow to moderately deep, well drained clayey soils.

Table 5. Representative soil features

Parent material	(1) Residuum—claystone
Surface texture	(1) Stony clay (2) Clay
Drainage class	Well drained
Permeability class	Very slow
Soil depth	3–30 in
Surface fragment cover ≤3"	0–5%
Surface fragment cover >3"	5–50%
Available water capacity (0–40in)	2–4 in
Calcium carbonate equivalent (0–40in)	2–15%
Electrical conductivity (0–40in)	0–4 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)	0–12%
Subsurface fragment volume >3" (Depth not specified)	0–10%

Ecological dynamics

The reference plant community for the Rocky Hill ecological site is a mixed tallgrass and midgrass community with 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 was an important part of the ecosystem. Most ecosystems in the North Central Prairie 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 types of fires before the grasses become dominant again.

Lack of 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 were 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 shortgrasses, annuals, and bare ground. This provides the opportunity for less desirable woody species such as mesquite (*Prosopis glandulosa*) and juniper (*Juniperus* spp.) 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 reference community level.

Changes in plant communities and vegetation states on the Rocky Hill 26-33" PZ ecological 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).

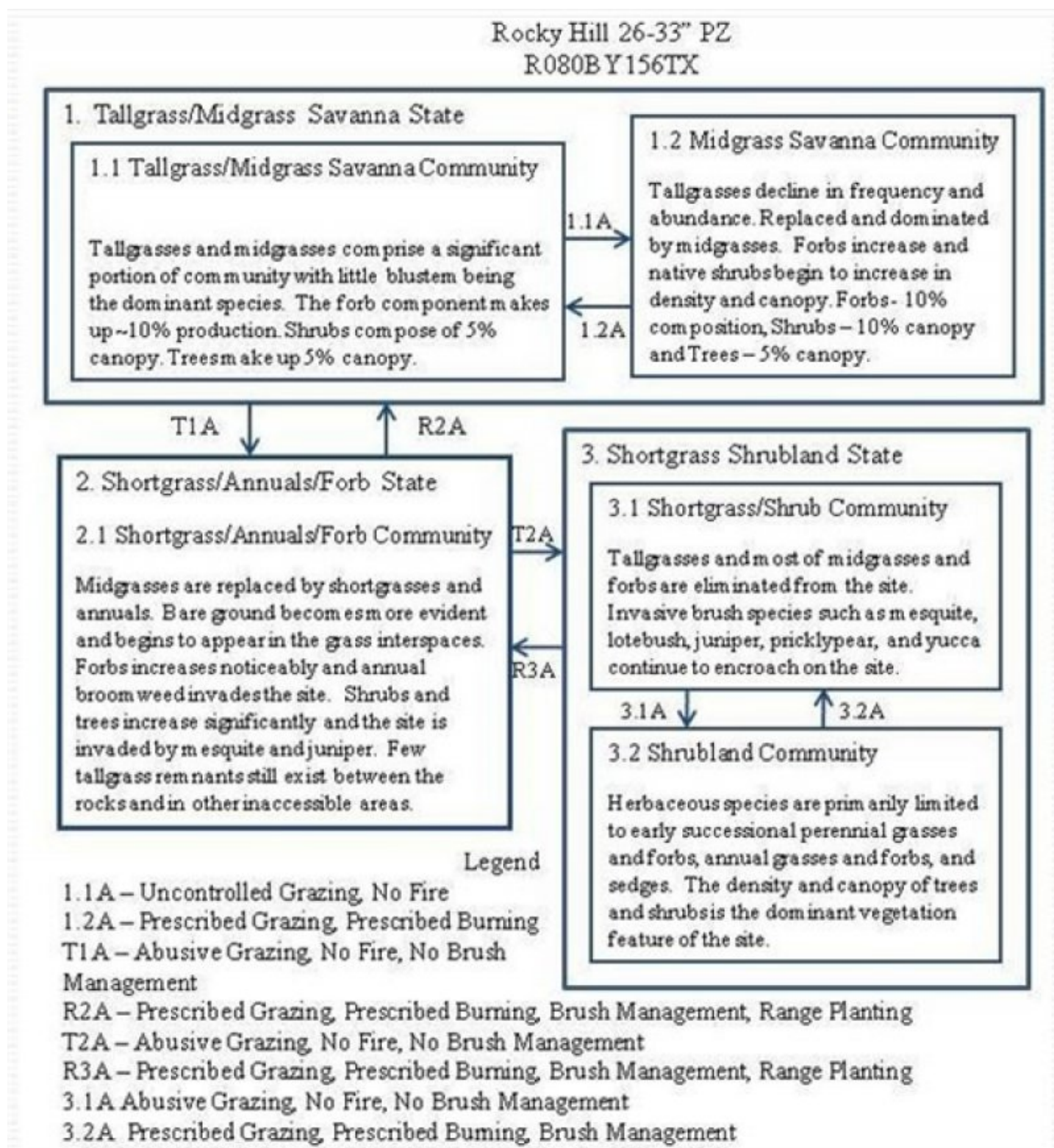
Rangeland Health Reference Worksheets have been posted for this site on the Texas NRCS website (www.tx.nrcs.usda.gov) in Section II of the eFOTG under (F) Ecological Site Descriptions.

State and Transitional Pathways:

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



State 1

Tallgrass/Midgrass Savanna State - Reference

The reference plant community for the Rocky Hill ecological site is a mixed tallgrass and midgrass community with a significant population of shrubs and trees. In reference conditions, the site is dominated by little bluestem with big bluestem and Indiangrass as major components of the herbaceous plant community. Forbs, trees and shrubs are an important part of the plant community as well. Annual production for this plant community ranges from 2100 to

3600 pounds per acre. The Midgrass Savanna Community is noted for the shift from a tallgrass dominant plant community to a midgrass dominant community. As little bluestem, big bluestem, and Indiangrass begin to decline, they are replaced by sideoats grama, dropseeds, cane and silver bluestem, Texas wintergrass, 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. Density and canopy of shrubby species such as lotebush, bumelia, sumacs, pricklypear and yucca begins to increase. Juniper and mesquite begin to encroach from adjacent sites. Annual production ranges from 1650 to 2800 pounds per acre.

Dominant plant species

- post oak (*Quercus stellata*), tree
- sumac (*Rhus*), shrub
- little bluestem (*Schizachyrium scoparium*), grass

Community 1.1

Tallgrass/Midgrass Savanna Community



Figure 9. 1.1 Tallgrass/Midgrass Savanna Community

The reference plant for the Rocky Hill ecological site is a mixed tallgrass and midgrass community with a significant population of shrubs and trees. In pristine conditions, the site is dominated by little bluestem (*Schizachyrium scoparium*) with big bluestem (*Andropogon gerardii*) and Indiangrass (*Sorghastrum nutans*) as major components of the herbaceous plant community. Switchgrass (*Panicum virgatum*) and Canada wildrye (*Elymus canadensis*) occur infrequently. Sideoats grama (*Bouteloua curtipendula*) is the predominant midgrass species. Other midgrasses include Texas wintergrass (*Nassella leucotricha*), tall (*Sporobolus compositus* var. *compositus*) and meadow dropseed (*Sporobolus compositus* var. *drummondii*), silver (*Bothriochloa laguroides*) and cane bluestem (*Bothriochloa barbinodis*), Texas cupgrass (*Eriochloa sericea*), vine mesquite (*Panicum obtusum*), and bristlegrass (*Setaria* spp.). Other midgrasses and shortgrasses found on this site are hairy grama (*Bouteloua hirsuta*), buffalograss (*Bouteloua dactyloides*), curlymesquite (*Hilaria belangeri*), slim (*Tridens muticus*) and rough tridens (*Tridens muticus* var. *elongatus*), white tridens (*Tridens albescens*), sedges (*Carex* spp.), and threeawns (*Aristida* spp.). The most common forbs are Maximilian sunflower (*Helianthus maximiliani*), Engelmann daisy (*Engelmannia peristenia*), heath aster (*Chaetopappa ericoides*), sagewort (*Artemisia* spp.), gaura (*Gaura* spp.), verbena (*Verbena* spp.), catclaw sensitivebriar (*Mimosa nuttallii*), yellow neptunia (*Neptunia lutea*), halfshrub sundrop (*Calyophus serrulatus*), prairie clover (*Dalea* spp.), bundleflower (*Desmanthus* spp.), trailing ratany (*Krameria lanceolata*), skullcap (*Scutellaria* spp.), daleas (*Dalea* spp.), gayfeather (*Liatris punctata*), basketflower (*Centaurea americana*), western ragweed (*Ambrosia psilostachya*), wild buckwheat (*Eriogonum* spp.), eryngo (*Eryngium* spp.), plains blackfoot (*Melapodium leucanthum*), plains tetraeneuris (*Tetraeneuris* spp.), and gray goldaster (*Heterotheca canescens*). Trees and shrubs are an important part of the plant community as well. The most common trees include post oak (*Quercus stellata*), live oak (*Quercus virginiana*), elm (*Ulmus* spp.), hackberry (*Celtis* spp.), ash (*Fraxinus* spp.), and Texas oak (*Quercus texana*). Shrubs such as flameleaf sumac (*Rhus lanceolata*), skunkbush sumac (*Rhus aromatica*), bumelia (*Sideroxylon* spp.), elbowbush (*Forestiera pubescens*), lotebush (*Ziziphus obtusifolia*), catclaw acacia (*Acacia greggii*), pricklyash (*Zanthoxylum* spp.), yucca (*Yucca* spp.), and pricklypear (*Opuntia* spp.) are found on the site as well. Annual production for this plant community ranges from 2100 to 3600 pounds per acre.

Table 6. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	1450	2150	3000
Forb	300	350	400
Shrub/Vine	200	150	100
Tree	150	150	100
Total	2100	2800	3600

Figure 11. Plant community growth curve (percent production by month). TX3014, Tall and mid-grass Savannah, 10 % canopy. Tall and mid grass savannah with some forbs and woody species..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2	2	2	10	20	24	10	5	10	10	3	2

Community 1.2 Midgrass Savanna Community



Figure 12. 1.2 Midgrass Savanna Community

A number of temporary and often reversible factors can cause plant community 1.1 to shift from a tallgrass dominant plant community to a midgrass dominant 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 little bluestem, big bluestem, and Indiangrass begin to decline, they are replaced by sideoats grama, dropseeds, cane and silver bluestem, Texas wintergrass, 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. Density and canopy of shrubby species such as lotebush, bumelia, sumacs, pricklypear and yucca begins to increase. Juniper and mesquite begin to encroach from adjacent sites. There is still a sufficient population of little bluestem and tallgrasses remaining to enable this site to recover to near its historic potential through proper grazing management and prescribed burning. Annual production ranges from 1650 to 2800 pounds per acre.

Table 7. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	1000	1600	2200
Forb	200	250	300
Shrub/Vine	250	200	150
Tree	200	150	150
Total	1650	2200	2800

Figure 14. Plant community growth curve (percent production by month). TX3020, Midgrass Savannah, 10% canopy. Midgrass savannah with 10 percent canopy cover. Continuous overgrazing led to the decline of tall grasses and the rise of the midgrass species..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2	2	2	10	20	24	10	5	10	10	3	2

Pathway 1.1A Community 1.1 to 1.2



Tallgrass/Midgrass Savanna Community



Midgrass Savanna Community

With uncontrolled and abusive grazing pressure and no fires, the Tallgrass/Midgrass Savanna Community will shift to the Midgrass Savanna Community.

Pathway 1.2A Community 1.2 to 1.1



Midgrass Savanna Community



Tallgrass/Midgrass Savanna Community

With Prescribed Grazing and Prescribed Burning conservation practices, the Midgrass Savanna Community can be shifted back to the Tallgrass/Midgrass Savanna Community.

Conservation practices

Prescribed Burning
Prescribed Grazing

State 2 Shortgrass/Annuals/Forbs State

The Shortgrass/Annuals/Forb Community marks the transition from a tallgrass plant community to a plant community that is dominated by shortgrasses, lower successional perennial grasses and forbs, and annual species. Midgrasses are replaced by shortgrasses such as buffalograss, curlymesquite, Texas grama, and hairy tridens. Bare ground becomes more evident and begins to appear in the interspaces between the individual grass plants. Pricklypear, yucca, catclaw acacia, and sumacs increase significantly and the site is invaded by mesquite and juniper. Annual production ranges from 1150 to 1900 pounds per acre.

Dominant plant species

- Ashe's juniper (*Juniperus ashei*), tree
- post oak (*Quercus stellata*), tree
- sumac (*Rhus*), shrub
- buffalograss (*Bouteloua dactyloides*), grass

Community 2.1

Shortgrass/Annuals/Forb Community



Figure 15. 2.1 Shortgrass/Annuals/Forb Community

Abusive grazing, extended severe drought conditions, and lack of fire will eventually lead to a drastic transition from a tallgrass plant community to a plant community that is dominated by shortgrasses, lower successional perennial grasses and forbs, and annual species. Midgrasses are replaced by buffalograss, curlymesquite, Texas grama (*Bouteloua rigidisetata*), red grama (*Bouteloua trifida*), hairy tridens (*Erioneuron pilosum*), threeawns, and annuals. 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. Western ragweed increases noticeably and annual broomweed invades the site. Pricklypear, yucca, catclaw acacia, and sumacs increase significantly and the site is invaded by mesquite and juniper. 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	550	900	1250
Shrub/Vine	300	250	250
Tree	200	200	200
Forb	100	150	200
Total	1150	1500	1900

Figure 17. Plant community growth curve (percent production by month).
TX3039, Shortgrass/Annuals/Mesquite/Shrubs Community.
Shortgrass/Annuals/Mesquite and Shrubs – buffalograss, curlymesquite, broomweed, annual forbs and grasses, mesquite, lotebush.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
3	4	8	16	18	12	4	4	10	12	6	3

Shortgrass Shrubland State

The Shortgrass/Shrub Community is noted for tallgrasses, midgrasses, and perennial forbs continue to decline as opportunistic species that are more grazing and drought tolerant, take their place. The tree and shrub canopy continues to increase. Annual production ranges from 750 to 1300 pounds per acre. The Shrubland Community consists of herbaceous species that 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. Annual production ranges from 700 to 1100 pounds per acre.

Dominant plant species

- post oak (*Quercus stellata*), tree
- Ashe's juniper (*Juniperus ashei*), tree
- sumac (*Rhus*), shrub
- sideoats grama (*Bouteloua curtipendula*), grass

Community 3.1
Shortgrass/Shrubs Community



Figure 18. 3.1 Shortgrass/Shrubs Community

As the site continues to deteriorate because of mismanagement and/or extreme climatic conditions, tallgrasses, midgrasses, and perennial forbs continue to decline as opportunistic species that are more grazing and drought tolerant, take their place. The tree and shrub canopy continues to increase. Bare ground becomes more apparent, and soil erosion becomes a potential hazard. Annual production ranges from 750 to 1300 pounds per acre.

Table 9. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	100	400	700
Shrub/Vine	350	300	300
Tree	200	200	200
Forb	100	100	100
Total	750	1000	1300

Figure 20. Plant community growth curve (percent production by month).
TX3039, Shortgrass/Annuals/Mesquite/Shrubs Community.
Shortgrass/Annuals/Mesquite and Shrubs – buffalograss, curlymesquite,
broomweed, annual forbs and grasses, mesquite, lotebush.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
3	4	8	16	18	12	4	4	10	12	6	3

Community 3.2 Shrubland Community



Figure 21. 3.2 Shrubland Community

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. Soil erosion potential is increased 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. Annual production ranges from 700 to 1100 pounds per acre.

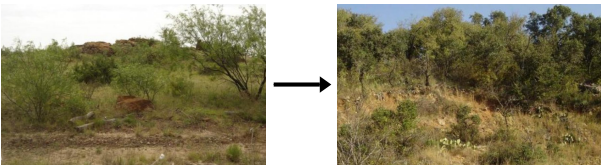
Table 10. Annual production by plant type

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

Figure 23. Plant community growth curve (percent production by month). TX3051, Shrubland Community. Shrub dominant (over 35% woody canopy) with warm-season shortgrasses, annual forbs and grasses..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
3	4	6	15	18	16	4	5	11	10	5	3

Pathway 3.1A Community 3.1 to 3.2



Shortgrass/Shrubs
Community

Shrubland Community

With abusive grazing pressure, no fires, and no brush management, the Shortgrass/Shrub Community will shift to the Shrubland Community.

Pathway 3.2A

Community 3.2 to 3.1



Shrubland Community



Shortgrass/Shrubs
Community

With the implementation of various conservation practices such as Prescribed Grazing, Prescribed Burning, and Brush Management, the Shrubland Community may be able to be restored to the Shortgrass/Shrub Community.

Conservation practices

Brush Management
Prescribed Burning
Prescribed Grazing
Range Planting

Transition T1A

State 1 to 2

With the continuation of abusive grazing pressure, no fires, and no brush management practices, the Tallgrass/Midgrass Savanna State will transition into the Shortgrass/Annuals/Forb State.

Restoration pathway R2A

State 2 to 1

The Shortgrass/Annuals/Forb State can be restored to the Tallgrass/Midgrass Savanna State by the use of various conservation practices including Prescribed Grazing, Prescribed Burning, Brush Management and Range Planting.

Conservation practices

Brush Management
Prescribed Burning
Prescribed Grazing
Range Planting

Transition T2A

State 2 to 3

With continued abusive grazing, no fires, and no brush management, the Shortgrass/Annuals/Forb State will transition into the Shortgrass Shrubland State.

Restoration pathway R3A

State 3 to 2

The Shortgrass Shrubland State can be restored to the Shortgrass/Annuals/Forb State by the use of conservation practices such as Prescribed Grazing, Prescribed Burning, Brush Management, and Range Planting.

Conservation practices

Brush Management
Prescribed Burning
Prescribed Grazing

Additional community tables

Table 11. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	Tallgrass			350–1250	
	little bluestem	SCSC	<i>Schizachyrium scoparium</i>	350–1250	–
2	Tallgrasses			350–700	
	big bluestem	ANGE	<i>Andropogon gerardii</i>	100–700	–
	Indiangrass	SONU2	<i>Sorghastrum nutans</i>	350–700	–
	Canada wildrye	ELCA4	<i>Elymus canadensis</i>	0–200	–
	Virginia wildrye	ELVI3	<i>Elymus virginicus</i>	0–200	–
	switchgrass	PAVI2	<i>Panicum virgatum</i>	0–200	–
3	Midgrasses			350–650	
	sideoats grama	BOCU	<i>Bouteloua curtipendula</i>	150–500	–
	silver beardgrass	BOLAT	<i>Bothriochloa laguroides</i> ssp. <i>torreyana</i>	50–350	–
	cane bluestem	BOBA3	<i>Bothriochloa barbinodis</i>	0–350	–
	Texas wintergrass	NALE3	<i>Nassella leucotricha</i>	50–350	–
	vine mesquite	PAOB	<i>Panicum obtusum</i>	0–300	–
	Reverchon's bristlegrass	SERE3	<i>Setaria reverchonii</i>	0–200	–
	composite dropseed	SPCOC2	<i>Sporobolus compositus</i> var. <i>compositus</i>	0–200	–
	Drummond's dropseed	SPCOD3	<i>Sporobolus compositus</i> var. <i>drummondii</i>	0–200	–
	Texas cupgrass	ERSE5	<i>Eriochloa sericea</i>	0–200	–
4	Mid/Shortgrasses			100–200	
	buffalograss	BODA2	<i>Bouteloua dactyloides</i>	0–200	–
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	0–200	–
	hairy grama	BOHI2	<i>Bouteloua hirsuta</i>	0–200	–
	curly-mesquite	HIBE	<i>Hilaria belangeri</i>	0–200	–
	tumblegrass	SCPA	<i>Schedonnardus paniculatus</i>	0–100	–
	white tridens	TRAL2	<i>Tridens albescens</i>	0–100	–
	slim tridens	TRMUE	<i>Tridens muticus</i> var. <i>elongatus</i>	0–100	–
	slim tridens	TRMUM	<i>Tridens muticus</i> var. <i>muticus</i>	0–100	–
	cedar sedge	CAPL3	<i>Carex planostachys</i>	0–100	–
	tumble windmill grass	CHVE2	<i>Chloris verticillata</i>	0–100	–
	fall witchgrass	DICO6	<i>Digitaria cognata</i>	0–100	–
	hairy woollygrass	ERPI5	<i>Erioneuron pilosum</i>	0–100	–
	tumble lovegrass	ERSE2	<i>Eragrostis sessilispica</i>	0–100	–
	purple threeawn	ARPU9	<i>Aristida purpurea</i>	0–100	–
	Wright's threeawn	ARPUW	<i>Aristida purpurea</i> var. <i>wrightii</i>	0–100	–
Forb					

5	Forbs			100–350	
	Texas vervain	VEHA	<i>Verbena halei</i>	0–200	–
	awnless bushsunflower	SICA7	<i>Simsia calva</i>	0–200	–
	white heath aster	SYERE	<i>Symphotrichum ericoides</i> var. <i>ericoides</i>	0–200	–
	Cuman ragweed	AMPS	<i>Ambrosia psilostachya</i>	0–200	–
	white sagebrush	ARLUM2	<i>Artemisia ludoviciana</i> ssp. <i>mexicana</i>	0–200	–
	American star-thistle	CEAM2	<i>Centaurea americana</i>	0–200	–
	Engelmann's daisy	ENPE4	<i>Engelmannia peristenia</i>	0–200	–
	buckwheat	ERIOG	<i>Eriogonum</i>	0–200	–
	Leavenworth's eryngo	ERLE11	<i>Eryngium leavenworthii</i>	0–200	–
	beeblossom	GAURA	<i>Gaura</i>	0–200	–
	hoary false goldenaster	HECA8	<i>Heterotheca canescens</i>	0–200	–
	Maximilian sunflower	HEMA2	<i>Helianthus maximiliani</i>	0–200	–
	Texas skeletonplant	LYTE	<i>Lygodesmia texana</i>	0–100	–
	Nuttall's sensitive-briar	MINU6	<i>Mimosa nuttallii</i>	0–100	–
	yellow puff	NELU2	<i>Neptunia lutea</i>	0–100	–
	Drummond's skullcap	SCDR2	<i>Scutellaria drummondii</i>	0–100	–
	trailing krameria	KRLA	<i>Krameria lanceolata</i>	0–100	–
	partridge pea	CHFA2	<i>Chamaecrista fasciculata</i>	0–100	–
	prairie clover	DALEA	<i>Dalea</i>	0–100	–
	purple prairie clover	DAPU5	<i>Dalea purpurea</i>	0–100	–
	Illinois bundleflower	DEIL	<i>Desmanthus illinoensis</i>	0–100	–
	Berlandier's sundrops	CABE6	<i>Calylophus berlandieri</i>	0–100	–
	purple poppymallow	CAIN2	<i>Callirhoe involucrata</i>	0–100	–
	stemmy four-nerve daisy	TESC2	<i>Tetraneuris scaposa</i>	0–100	–
	fanpetals	SIDA	<i>Sida</i>	0–100	–
	queen's-delight	STSY	<i>Stillingia sylvatica</i>	0–100	–
	Texas Indian mallow	ABFR3	<i>Abutilon fruticosum</i>	0–100	–
Shrub/Vine					
6	Shrubs/Vines			100–200	
	catclaw acacia	ACGRG3	<i>Acacia greggii</i> var. <i>greggii</i>	0–200	–
	stretchberry	FOPU2	<i>Forestiera pubescens</i>	0–200	–
	western white honeysuckle	LOAL	<i>Lonicera albiflora</i>	0–200	–
	algerita	MATR3	<i>Mahonia trifoliolata</i>	0–200	–
	plum	PRUNU	<i>Prunus</i>	0–200	–
	fragrant sumac	RHAR4	<i>Rhus aromatica</i>	0–200	–
	prairie sumac	RHLA3	<i>Rhus lanceolata</i>	0–200	–
	littleleaf sumac	RHMI3	<i>Rhus microphylla</i>	0–200	–
	gum bully	SILA20	<i>Sideroxylon lanuginosum</i>	0–200	–
	Texas Hercules' club	ZAH12	<i>Zanthoxylum hirsutum</i>	0–200	–
	lotebush	ZIOB	<i>Ziziphus obtusifolia</i>	0–200	–
	honey mesquite	PRGL2	<i>Prosopis glandulosa</i>	0–100	–

	greenbrier	SMILA2	<i>Smilax</i>	0–50	–
	yucca	YUCCA	<i>Yucca</i>	0–50	–
	pricklypear	OPUNT	<i>Opuntia</i>	0–50	–
	Carolina coralbead	COCA	<i>Cocculus carolinus</i>	0–50	–
	clapweed	EPAN	<i>Ephedra antisiphilitica</i>	0–50	–
Tree					
7	Trees			100–250	
	hackberry	CELT1	<i>Celtis</i>	0–250	–
	Texas red oak	QUBU2	<i>Quercus buckleyi</i>	0–250	–
	Texas live oak	QUFU	<i>Quercus fusiformis</i>	0–250	–
	post oak	QUST	<i>Quercus stellata</i>	0–250	–
	cedar elm	ULCR	<i>Ulmus crassifolia</i>	0–250	–

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 North Central 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 usually limited to the lower slopes and benches on this site. Most European breeds of cattle and small statured cattle are not well suited to 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.

Wood products

Ashe juniper is often used for fence posts. 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 8 SCS-RANGE-417's containing data collected from 3 counties during the period 12/30/1981 to 12/12/1986 were reviewed for this site.

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Acknowledgments

Site Development and Testing Plan:

Future work, as described in a Project Plan, to validate the information in this Provisional Ecological Site Description is needed. This will include field activities to collect low, medium and high intensity sampling, soil correlations, and analysis of that data. Annual field reviews should be done by soil scientists and vegetation specialists. A final field review, peer review, 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, Zone RMS, NRCS, Weatherford, Texas
Contact for lead author	817-596-2865
Date	12/04/2007
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):** 0-6 inches of light olive brown 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.
-
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 > Warm-season midgrasses >
- Sub-dominant: Forbs > Trees > Shrubs/Vines >
- Other: Warm-season shortgrasses > Cool-season grasses
- Additional:
-
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.
-
14. **Average percent litter cover (%) and depth (in):** Litter is primarily herbaceous.
-
15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-**

production): 1500 to 3600 pounds per acre.

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, Ashe juniper, pricklyash, lotebush, King Ranch bluestem, annual broomweed
-

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 occurring immediately prior to, or during the reproductive phase.
-