

# Ecological site R080BY164TX Tight Sandy Loam 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.

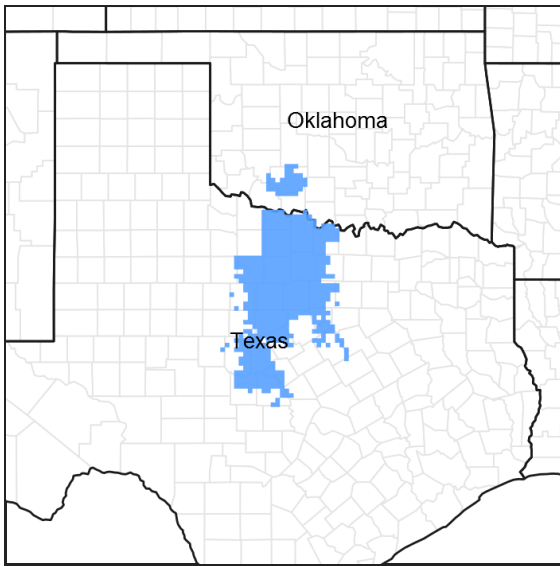


Figure 1. Mapped extent

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

These sites occur over moderately deep and deep sandy loam soils with a clayey subsoil. The reference vegetation consists of native perennial midgrasses with numerous forbs and scattered oaks. Without fire or other brush management, woody species may increase and dominate the site. These sites may be prone to invasion by mesquite.

## Associated sites

R080BY159TX	<b>Sandy Loam 26-33" PZ</b> Sandy loam soils without the clay subsoil.
R080BY161TX	<b>Shallow Clay 26-33" PZ</b> Shallow clay soils

## Similar sites

R080BY159TX	<b>Sandy Loam 26-33" PZ</b> Sandy loam soils without the clay subsoil.
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Table 1. Dominant plant species

Tree	(1) <i>Quercus stellata</i>
Shrub	Not specified
Herbaceous	(1) <i>Bouteloua curtipendula</i> (2) <i>Digitaria californica</i>

## Physiographic features

This site occurs on linear dip slopes and treads of stream terraces in the Texas North-Central Prairies. This site is characteristically a water distributing site. Slopes are typically less than 8 percent.

Table 2. Representative physiographic features

Landforms	(1) Hills > Dip slope (2) Hills > Structural bench (3) Alluvial plain > Stream terrace
Runoff class	Low to very high
Elevation	229–732 m
Slope	0–8%
Aspect	Aspect is not a significant factor

## 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 95oF 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 3. Representative climatic features**

Frost-free period (characteristic range)	184-200 days
Freeze-free period (characteristic range)	211-225 days
Precipitation total (characteristic range)	762-813 mm
Frost-free period (actual range)	183-204 days
Freeze-free period (actual range)	210-226 days
Precipitation total (actual range)	737-838 mm
Frost-free period (average)	193 days
Freeze-free period (average)	217 days
Precipitation total (average)	787 mm

### **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**

This being an upland site, it is not influenced by water from a wetland or stream.

This site often sheds water via surface runoff to areas downslope. However, the presence of good ground cover and deep rooted grasses can help facilitate water infiltration into the soil.

### **Wetland description**

NA

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

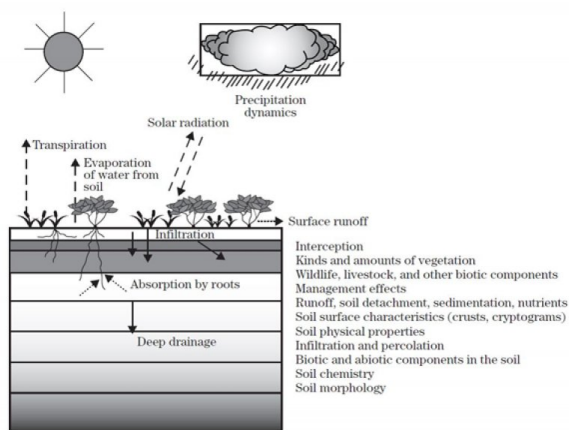


Figure 8.

## Soil features

Representative soil components for this ecological site include: Bluegrove, Truce, Weswind, Winters

The site is characterized by moderately deep to very deep loamy well drained soils.

Table 4. Representative soil features

Parent material	(1) Residuum–sandstone (2) Slope alluvium–sandstone (3) Alluvium–sandstone (4) Residuum–claystone (5) Slope alluvium–claystone (6) Alluvium–claystone
Surface texture	(1) Fine sandy loam (2) Loam
Drainage class	Moderately well drained to well drained
Permeability class	Very slow to moderately slow
Soil depth	51 cm
Surface fragment cover <=3"	0–2%
Surface fragment cover >3"	0–2%
Available water capacity (0-101.6cm)	7.62–22.86 cm
Electrical conductivity (0-101.6cm)	0–2 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0
Soil reaction (1:1 water) (0-101.6cm)	5.6–8.4
Subsurface fragment volume <=3" (Depth not specified)	0–10%
Subsurface fragment volume >3" (Depth not specified)	0–2%

## Ecological dynamics

The plant communities that can be found on this site range from a midgrass dominant post oak ( *Quercus stellata*, var. *stellata*) savannah to a mesquite (*Prosopis glandulosa* var. *glandulosa*) dominated site with bare ground. This

diversity in plant communities is in direct response to grazing management, fire, extermination of prairie dogs and drought.

The reference plant community is a midgrass post oak savannah with an overstory canopy of approximately 5 percent. The midgrasses are dominated by sideoats grama (*Bouteloua curtipendula*) with a mixture of Arizona cottontop (*Digitaria californica*), vine-mesquite (*Panicum obtusum*), cane bluestem (*Bothriochloa barbinoidis*), silver bluestem (*Bothriochloa laguroides* ssp. *torreyana*), and Texas wintergrass (*Nassella leucotricha*). On the east side of the land resource area, there is the potential for a small amount of little bluestem (*Schizachyrium scoparium*). Other shortgrasses found on the historic climax plant community are blue grama (*Bouteloua gracilis*), buffalograss (*Bouteloua dactyloides*), curlymesquite (*Hilaria belangeri*), sand dropseed (*Sporobolus cryptandrus*), hairy grama (*Bouteloua hirsuta*), slim tridens (*Tridens muticus*), rough tridens (*Tridens muticus* var. *elongatus*), purple (*Aristida purpurea* var. *purpurea*) and Wright's threeawn (*Aristida purpurea* var. *wrightii*). There are many forbs found on the site that include Western ragweed (*Ambrosia psilostachya*), Louisiana sagewort (*Artemisia ludoviciana*), erect dayflower (*Commelina erecta* var. *erecta*), catclaw sensitive-briar (*Mimosa nuttallii*), trailing ratany (*Krameria lanceolata*), Engelmann's daisy (*Engelmannia peristenia*), primrose (*Oenothera* sp.), dotted gayfeather (*Oenothera* sp.), heath aster (*Chaetopappa ericoides*), gaura (*Gaura* sp.), Dakota verbena (*Glandularia bipinnatifida* var. *bipinnatifida*) and Plains blackfoot (*Melampodium leucanthum*). Other woody species are pricklyash (*Zanthoxylum hirsutum*), lotebush (*Ziziphus obtusifolia* var. *obtusifolia*), skunkbush sumac (*Rhus trilobata* var. *trilobata*), catclaw acacia (*Acacia greggii*), bumelia (*Sideroxylon lanuginosum* ssp. *oblongifolium*), agarito (*Mahonia trifoliolata*), Texas colubrina (*Colubrina texensis*), and hackberry (*Celtis laevigata*). The site was maintained with grazing by bison, white tail deer, and turkey, with occasional fires set by lightning and the Native Americans. Prairie dogs occurred on the site in many instances and assisted in maintenance of the open prairie concept with the scattered large post oak. The site is a droughty site when compared to many in the area. The clay sub-soils over shale and/or sandstone cause the permeability to be moderately slow to slow. This causes much of the rainfall to leave the site in runoff. This causes the production on the site to be limited to 2000 to 4000 pounds per acre and, the site is fragile in that it can be severely impacted quickly with continuous overgrazing. If the post oaks are killed on this site, they seldom reestablish themselves due to the inherent dryness of the soil.

After settlement by European man, the area was fenced and in many instances stocked beyond its natural capacity with livestock. Fires were stopped by reduction of fine fuel due to over grazing and the zeal of the rancher to put out every fire that started to protect his investment in forage, livestock, facilities, and life. Prairie dogs were killed as they were competitive grazers and their dens were a trap for the unsuspecting foot or leg. The combination of these activities coupled with periodic drought natural to the area, caused the plant community to start making a change.

In the reference plant community, the midgrasses dominated the shortgrasses due to their ability to capture sunlight and shade the shorter grasses. The midgrasses also had deeper root systems that allowed them to capture the deep moisture while the shortgrasses had shorter root systems and could capture only the shallow moisture. Many of the deep-rooted grasses also have more root hairs that allow them to be more efficient at extracting moisture from very dry soil. Due to these differences, the midgrasses maintained their dominance over the shortgrasses as they could produce much more food and maintain a high state of health and vigor even in times of drought.

Fire occurred on a regular basis as there was normally sufficient fine fuel to carry a fire. When a fire started it burned for days as there was nothing but rivers or denuded low producing ecological sites to stop them. The fires maintained the woody component to a small percentage of the total production, as well as canopy. The large post oak and the shrubby root-sprouting shrubs could withstand these occasional fires. These fires assisted in maintaining a good component of perennial forbs on the site by opening the ground cover to allow their establishment and generation, and breaking the dormancy of the seeds.

Prairie dogs do not let shrubs stand in their towns. Because of this, they naturally had an impact on the woody species on the site. Mesquite (*Prosopis glandulosa* var. *glandulosa*) was kept under control by the combination of the prairie dog activity and wild fires.

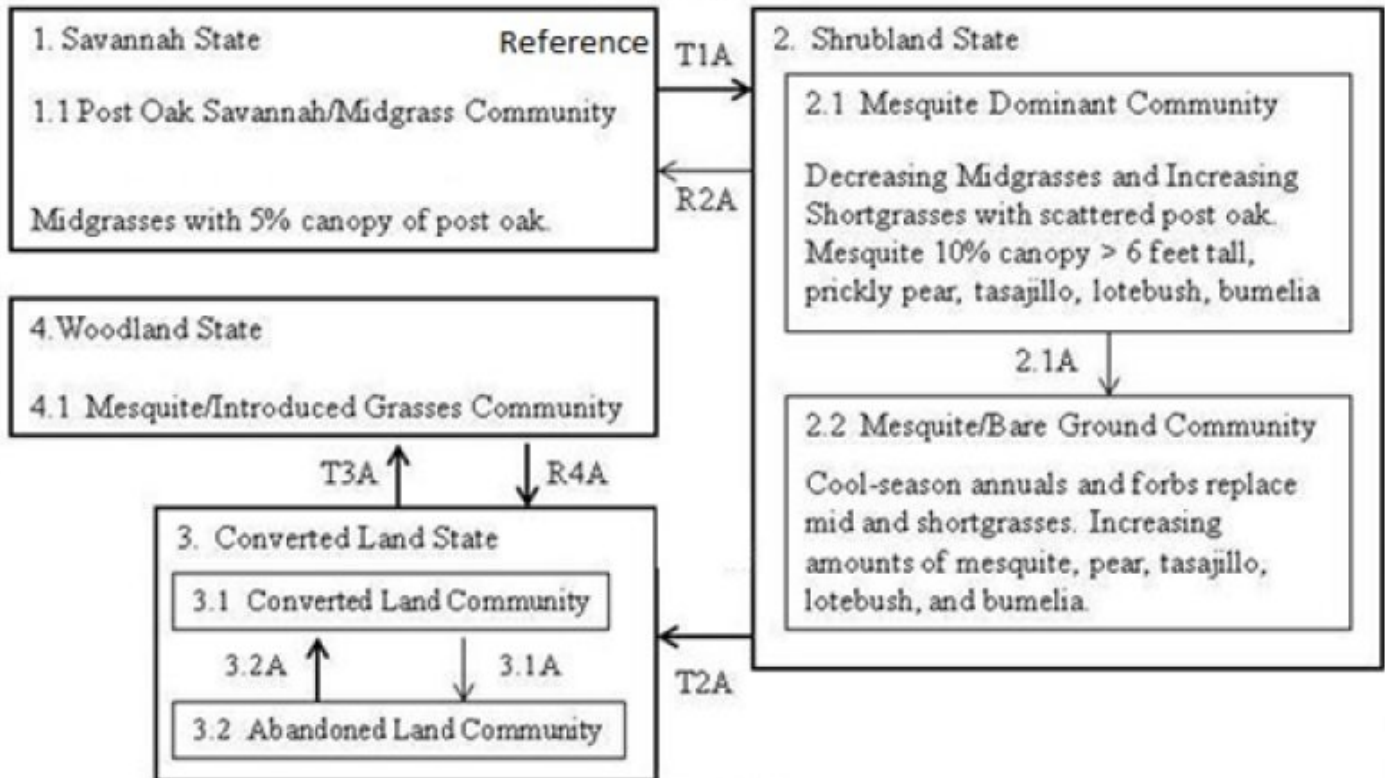
As the stocking rates exceeded the carrying capacity of the land and the natural graze-rest cycles were broken by continuous grazing, the palatable and highly selective midgrasses were grazed to the point that they could no longer produce sufficient food in their leaves to maintain their health and vigor. When they were grazed to the point that they had little leaf area left, they stopped supplying the root system with food, as all available food produced was going to grow more leaf area to enhance the food manufacturing process. If the overgrazing continued, the root system of the overgrazed plants continued to be used up and shrink, as respiration continued in the root system that

required energy. In time, with continued close grazing, the midgrasses would become not a deep rooted, healthy plant, but a very shallow rooted, small leaf area, weak plant that was set up for doom during the next drought. This process was intensified due to the droughtiness of this site. This midgrass functional group was now not in a dominant position to the shortgrasses, but in a position of being dominated by the shortgrasses on the site. This then led to the demise of the midgrasses and a spread of the shortgrasses on the site. These short grasses were Texas wintergrass, blue grama, buffalograss, curlymesquite, sand dropseed, hairy grama, slim and rough tridens, purple and Wright's three-awn. At the same time this was occurring with the grasses, the palatable forbs were being overgrazed and killed out of the plant community. Due to the lack of fire and removal of the prairie dog, woody shrubs increased in canopy as the site was invaded by mesquite, grassland prickly pear (*Opuntia macrorhiza* var. *macrorhiza*), and tasajillo (*Cylindropuntia leptocaulis*). If the trend continued, the site would deteriorate to much bare ground in the interspaces between the mesquite and shrubs with Texas wintergrass (*Nassella leucotricha*), Texas grama (*Bouteloua rigidisetata*), hairy tridens (*Erioneuron pilosum*), sand dropseed (*Sporobolus cryptandrus*), Japanese brome (*Bromus japonicus*), rescuegrass (*Bromus catharticus*), little barley (*Hordeum pusillum*), broom snakeweed (*Gutierrezia sarothrae*), evax (*Evax candida*, *Evax prolifera*, *Evax verna*) and many other annual forbs such as filaree (*Erodium texanum*), Dakota verbena (*Glandularia bipinnatifida* var. *bipinnatifida*), Lindheimer's croton (*Croton glandulosus* var. *lindheimeri*) growing under the mesquite, prickly pear, and tasajillo. Finally, the site in the worst case scenario can become bare ground with mesquite, prickly pear, tasajillo and the native shrubs that occur on the site surviving.

With the invasion of the mesquite, prickly pear, and tasajillo, the site has now changed to a new steady state that will maintain itself unless man applies energy in the form of dozing or herbicides into the system to remove the mesquite, prickly pear and tasajillo. This energy will have the impact of the natural fire and prairie dog that have been removed from the system.

## **State and transition model**

Tight Sandy Loam 26-33" PZ  
R080BY164TX



LEGEND

- T1A Heavy Continuous Grazing, No Fire, Prairie Dog Removal
- R2A Prescribed Grazing, Brush Management, Range Planting, Prescribed Burning
- 2.1A Heavy Continuous Grazing, No Fire, No Brush Management
- T2A Prescribed Grazing, Brush Management, Range Planting, Pasture Planting, Crop Cultivation
- 3.1A Idle, Abandonment, No Brush Management, No Fire, No Pest/Nutrient Management
- 3.2A Range Planting, Prescribed Grazing, Crop Cultivation, Prescribed Burning, Brush Management, Pest/Nutrient Management
- T3A Heavy Continuous Grazing, No Fire, No Brush Management
- R4A Prescribed Grazing, Brush Management, Prescribed Burning, Pest/Nutrient Management, Crop Cultivation

**State 1  
Savannah State - Reference**

This community represents the reference plant community for the Tight Sandy Loam Ecological Site. The plant community is a post oak savannah with midgrasses, forbs and shrubs. The dominant grass is sideoats grama with Arizona cottontop, vine-mesquite, cane and silver bluestem and Texas wintergrass. As a group, the midgrasses comprise approximately 70 percent of all the annual production. The site has numerous forbs associated with it. The shrubs were re-sprouting types that could respond to the fire. Fire being natural to the site kept the woody plants in check and prevented their spread on the site. Total annual production ranges from 2000 to 4000 pounds per acre.

**Dominant plant species**

- post oak (*Quercus stellata*), tree
- sideoats grama (*Bouteloua curtipendula*), grass

**Community 1.1**

## Post Oak Savannah/Midgrass Community

This community represents the reference plant community for the Tight Sandy Loam Ecological Site. The plant community is a post oak savannah with midgrasses, forbs and shrubs. The dominant grass is sideoats grama with Arizona cottontop, vine-mesquite, cane and silver bluestem and Texas wintergrass. As a group, the midgrasses comprise approximately 70 percent of all the annual production. On the eastern side of the area represented by this ecological site, little bluestem is found due to increased rainfall. Other grasses found on the site include blue grama, buffalograss, curlymesquite, sand dropseed, hairy grama, slim tridens, rough tridens, purple threeawn and Wright's threeawn. The site has numerous forbs associated with it. They are largely composed of Western ragweed, heath aster, Plains blackfoot daisy, Indian blanket, Louisiana sagewort, Englemann's daisy, primrose, dotted gayfeather, gaura and verbena. Natural fires and prairie dogs maintained the area as an open grassland with post oak and shrubs scattered throughout. The shrubs were re-sprouting types that could respond to the fire. Lotebush, Texas colubrina, hackberry, vine ephedra, agarito, catclaw acacia, and bumelia were scattered throughout the site. Fire being natural to the site kept the woody plants in check and prevented their spread on the site. As discussed in the Ecological Dynamics of the Site, the fire and the prairie dog kept the mesquite, prickly pear and tasajillo under control and prevented their spread throughout the site until the area was settled. Settlement brought many changes. Overgrazing by fenced livestock, fire prevention, and the eradication of the prairie dog all had a profound impact on the plant community and rapidly changed it to a brushland steady state of mesquite, prickly pear, tasajillo, mid and shortgrasses with numerous forbs. The recent introduction of prescribed burning and sound grazing management has begun to help in the management of this plant community if the mesquite does not exceed approximately 6 feet in height. Annual production ranges from 2000 to 4000 pounds per acre.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	2018	3026	4035
Forb	112	168	224
Shrub/Vine	67	101	135
Tree	45	67	90
<b>Total</b>	<b>2242</b>	<b>3362</b>	<b>4484</b>

Figure 10. Plant community growth curve (percent production by month). TX3015, Midgrass Post Oak Savannah with 5% canopy. Historic Climax Plant Community for Tight Sandy Loam. Midgrasses such as sideoats grama dominate the site along with numerous forbs, post oak, and scattered shrubs..

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

## State 2 Shrubland State

The Mesquite Dominant Community occurs with the removal of fire from the ecosystem, the eradication of the prairie dog, the introduction of fencing, and the constant overstocking of the rangeland. The midgrasses gave way to the shortgrasses and weedy forbs, and the site was invaded by mesquite, prickly pear, and tasajillo. The shrubs native to the site were released to spread untouched by fire and prairie dog. So a mixed midgrass/shortgrass shrubland developed along with scattered post oak throughout. After the mesquite grew to a height of approximately 6 feet, fire would no longer effectively control it. Annual production ranges from 1000 to 3000 pounds per acre. Continuous overgrazing, mesquite, prickly pear, tasajillo, lotebush and associated shrub species continue to increase in canopy and stature giving rise to the Mesquite/*Bare Ground* Community. They grow to dominate the site above ground and below. The woody species use practically all of the moisture, nutrients, and sunlight. Cool-season annual grasses and forbs such as little barley, rescuegrass, and filaree grow in the cool season when the woody plants have no leaves and do not compete for the sunlight and moisture as they do in the warm season. Annual production ranges from 250 to 1000 pounds per acre.

### Dominant plant species



- honey mesquite (*Prosopis glandulosa*), shrub
- lotebush (*Ziziphus obtusifolia*), shrub
- brome (*Bromus*), grass

## Community 2.1 Mesquite Dominant Community



Figure 11. 2.1 Mesquite Dominant Community

With the removal of fire from the ecosystem, the eradication of the prairie dog, the introduction of fencing, and the constant overstocking of the rangeland, the midgrasses gave way to the shortgrasses and weedy forbs, and the site was invaded by mesquite, prickly pear, and tasajillo. The shrubs native to the site were released to spread untouched by fire and prairie dog. So a mixed midgrass/shortgrass shrubland developed along with scattered post oak throughout. After the mesquite grew to a height of approximately 6 feet, fire would no longer effectively control it. So the mesquite grew thicker and thicker, competing with the grasses and forbs for the moisture, nutrients and sunlight. As this trend continued the site became droughtier. The interspaces between the mesquite evolved to mainly few grasses, few forbs, more mesquite and associated shrubs and much bare ground. The application of conservation practices such as Brush Management, Rangeland Planting, Prescribe Fire, and Prescribed Grazing can move this steady state back to the historical climax plant community. It would need to be determined if sufficient seed source of the desirable plants are available to determine if seeding is needed. Prescribed fire or some means of brush management would have to be applied on a continuing basis to insure that the brush species do not over take the site once more.

Table 6. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	729	1457	2186
Tree	168	336	504
Forb	112	224	336
Shrub/Vine	112	224	336
<b>Total</b>	<b>1121</b>	<b>2241</b>	<b>3362</b>

Figure 13. Plant community growth curve (percent production by month). TX3016, Mesquite Invasion with Other Shrubs. Mesquite dominated the site. Fewer warm season grasses and increase of shrubby species..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
3	3	5	9	23	19	4	5	12	10	4	3

## Community 2.2 Mesquite/Bare Ground Community



Figure 14. 2.2 Mesquite/Bare Ground Community

Continuous overgrazing, mesquite, prickly pear, tasajillo, lotebush and associated shrub species continue to increase in canopy and stature. They grow to dominate the site above ground and below. The woody species use practically all of the moisture, nutrients, and sunlight. Cool-season annual grasses and forbs such as little barley, rescuegrass, and filaree grow in the cool season when the woody plants have no leaves and do not compete for the sunlight and moisture as they do in the warm season. The area is very barren in the summer. Extreme heat radiates from the soil making the area very uncomfortable for animals and man. The soil crust and is very hard and limits water infiltration.

Table 7. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Shrub/Vine	196	588	785
Tree	41	126	168
Forb	28	84	112
Grass/Grasslike	15	43	56
<b>Total</b>	<b>280</b>	<b>841</b>	<b>1121</b>

Figure 16. Plant community growth curve (percent production by month). TX3017, Mesquite Dominant and Bare Ground. Mesquite with increase in bare ground and cool season annuals. The vegetation is barren..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2	3	10	20	20	30	0	0	5	5	3	2

### Pathway 2.1A Community 2.1 to 2.2



Mesquite Dominant Community



Mesquite/Bare Ground Community

With continuous heavy grazing, no fires and no brush management, the Mesquite Dominant Community shifts to the Mesquite/Bare Ground Community.

### State 3 Converted Land State

This site was cultivated into cool-season small grain cropland. There are other plant communities in the cultivated

state where range planting of native plants can be used to manage toward the Converted Land Community. Each of these steady states has lost the seed source of the native plants that inhabited the site as they were destroyed by farming. The Abandoned or Go Back Land will have some of the native plants back, but will need to be seeded in most instances to establish plants such as big bluestem, Indiangrass, switchgrass, little bluestem and sideoats grama.

### Dominant plant species

- Bermudagrass (*Cynodon dactylon*), grass

## Community 3.1

### Converted Land Community

Much of this Ecological Site has had the brush cleared from it and converted to cropland. It is planted mostly to small grain such as wheat for grazing and/or harvest. The site is very droughty so cool-season plants are normally all it will grow as warm-season crops would perish from the lack of sufficient water to make a crop. On the steeper slopes, the soil is very susceptible to sheet and rill erosion. Due to its inherent low production capability, many times the cropland is no longer farmed, but turned out as Go Back land to evolve back to a rangeland plant community or it is planted to a native grass mixture or an introduced grass or mixture. Each of these situations creates a different plant community. As cropland, the plant community and the growth curve is totally dependent on what crop is planted and how it is managed. There are three plant communities where range planting of native plants can be used to manage toward the Native Seeding community. They are Mesquite/*Bare Ground* Community (2.2), Cropland (3.1), and Go Back Land (3.2). Each of these plant communities has lost the seed source of the native plants that inhabited the site. Mesquite/*Bare Ground* Community (2.2) will still have some of the native species on the site, but when mechanical brush management is applied, much of the remaining perennial plants will be destroyed. The activity of the machinery will assist in preparing a seedbed for the seeding. The cultivated state has had all of the native plants destroyed by farming. The Go Back Land will have some of the native plants back, but will need to be seeded in most instances to establish plants such as sideoats grama, Arizona cottontop, buffalograss, cane bluestem, vine-mesquite, and blue grama. Forbs such as Englemann's daisy, and Illinois bundleflower, should be included in the seeding mix. Other forbs should be included if seed are available. If seed are available, desirable shrubs should be planted depending on the objectives of the manager. A Prescribed Grazing plan must be developed and applied that meets the needs of the plants, the animals, and the objectives of the manager. Prescribed Burning or some form of Brush Management must be applied on a regular basis to maintain the site in the state that meets the objectives of the manager. If these things are not done, the seeding will be a failure, mesquite and associated shrubs will take over the site once more, and the time and money expended will be lost. Seeding the site to introduced grasses creates a plant community that most likely will not return to the reference state. It is created when the manager decides to plant introduced grasses such as KR bluestem, Kleingrass, or Old World bluestem in the place of or with native plants. This can occur when seeding plant communities such as Mesquite/*Bare Ground* Community (2.2), Cropland (3.1), and Go Back Land (3.2). Other plant communities could have introduced grasses to invade or be planted on the sites. These grasses must be managed with a Prescribed Grazing Plan that meets the plants needs, as well as the needs of the animals and the manager's needs. Prescribed Burning or Brush Management must be applied or the site will be overcome with mesquite, prickly pear, and tasajillo. Some managers plant a monoculture of introduced plants and then manage them with agronomic practices such as fertilizing and weed control.

Table 8. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	1009	2522	3531
Forb	112	280	392
Shrub/Vine	–	–	–
Tree	–	–	–
<b>Total</b>	<b>1121</b>	<b>2802</b>	<b>3923</b>

Figure 18. Plant community growth curve (percent production by month). TX3001, Introduced Grasses - Old World Bluestems. Introduced grasses such as Old World bluestems, Kleingrass, or King Ranch bluestem being

planted for grazing or hay..

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

**Figure 19. Plant community growth curve (percent production by month). TX3246, Native Seeding at Degraded sites. Seeding of native plants that have occurred due to changes in thresholds of plant communities. Examples of areas being seeded with native grasses include mesquite invaded savannah, cropland, or go back land..**

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 3.2 Abandoned Land Community

Go-back land evolves through secondary succession. The plants that grow on the site are dependent upon what is growing in the area around the field. Annual grass and forb seeds are in the field from the cropping system that has been applied prior to turn out. Usually, sand dropseed, oldfield three-awn, little barley, Japanese brome, rescuegrass, filaree, and annual broomweed will be the first to grow on the site. In a few years, perennial grasses that make much seed that is transported by the wind and animals start to spread across the field. These are usually Texas wintergrass, silver bluestem, purple and Wright’s three-awn, and buffalograss. Soon, mesquite, tasajillo, prickly pear, and lotebush start to grow as the seed is spread by cattle and wild animals such as coyotes, raccoons, fox, and rabbits. In a few years, the site will be dominated by the mesquite, prickly pear, tasajillo and lotebush with the perennial and annual grasses and forbs growing in the interspaces. If Prescribed Burning is used on a regular basis, and grazing management applied properly, the invasion of mesquite, prickly pear, and tasajillo can be held in check and the midgrasses such as silver bluestem, Arizona cottontop, Texas wintergrass, and shortgrasses such as buffalograss will dominate the site. Forbs such as Western ragweed, annual broomweed, evax, Lindheimer’s croton, primrose and woolly plaintain will make up a major component of the plant community. Post oak will not likely return to the plant community.

**Table 9. Annual production by plant type**

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Shrub/Vine	252	605	1009
Forb	168	404	673
Grass/Grasslike	140	336	560
Tree	–	–	–
<b>Total</b>	<b>560</b>	<b>1345</b>	<b>2242</b>

**Figure 21. Plant community growth curve (percent production by month). TX3248, Secondary Succession - Annuals/forbs. Plants growing on site are dependent on what is growing in and around the field. Typically low end cool and warm season grasses and forbs invade the site before increase of perennial grasses..**

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 3.1A Community 3.1 to 3.2

When the land is left idled and/or abandonment along with no brush management, the Converted Land Community will shift to the Abandoned Land Community (3.2).

### Pathway 3.2A

## Community 3.2 to 3.1

With the implementation of Range Planting, Pasture Planting, Crop Cultivation, Pest Management, Nutrient Management, Prescribed Grazing, Prescribed Burning, Brush Management, the Abandoned Land Community reverts back to the Converted Land Community.

### Conservation practices

Brush Management
Conservation Crop Rotation
Prescribed Burning
Forage and Biomass Planting
Prescribed Grazing
Range Planting
Nutrient Management
Integrated Pest Management (IPM)

## State 4

### Woodland State

If the introduced grasses steady state is not managed to control the invasion of mesquite and associated prickly pear and tasajillo, they will invade the site and impact the plant community composition and production. The woody species can produce up to 30 percent of the annual production with forbs making up about 20 percent. This leaves only 50 percent of the production being grass. Annual Production ranges from 750 to 3000 pounds per acre.

### Dominant plant species

- honey mesquite (*Prosopis glandulosa*), shrub

## Community 4.1

### Mesquite/Introduced Grasses Community

If the introduced grasses steady state is not managed to control the invasion of mesquite as well as associated prickly pear and tasajillo, they will invade the site and impact the plant community composition and production. The woody species can produce up to 30 percent of the annual production with forbs making up about 20 percent. This leaves only 50 percent of the production being grass. This site can be managed then by removing all or a portion of the mesquite and associated woody species depending upon the objectives of the land manager. Prescribed burning and mechanical or herbicide brush management can be used to accomplish these goals. A Prescribed Grazing Plan must be developed and applied to insure the health of the plants, the needs of the animals and meet the objectives of the land manager. Annual production ranges from 750 to 3000 pounds per acre.

Table 10. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	420	981	1681
Shrub/Vine	252	588	1009
Forb	168	392	673
Tree	–	–	–
<b>Total</b>	<b>840</b>	<b>1961</b>	<b>3363</b>

Figure 23. Plant community growth curve (percent production by month). TX3019, Mesquite and Introduced Grasses. Mesquite overtaking pastures being planted with introduced species..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
5	5	5	10	15	15	10	5	10	10	5	5

**Transition T1A**  
**State 1 to 2**

With heavy continuous grazing, no fires, and prairie dog removal, the Savannah State will transition into the Shrubland State.

**Restoration pathway R2A**  
**State 2 to 1**

With the implementation of Prescribed Grazing, Brush Management, Range Planting, and Prescribed Burning conservation practices, the Shrubland State can be restored into the Savannah State.

**Conservation practices**

Brush Management
Prescribed Burning
Prescribed Grazing
Range Planting

**Transition T2A**  
**State 2 to 3**

With the use of Prescribed Grazing, Brush Management, Range Planting, Pasture Planting, and Crop Cultivation conservation practices, the Shrubland State can transition into the Converted Land State.

**Transition T3A**  
**State 3 to 4**

With heavy continuous grazing, no fires and no brush management, the Converted Land State will transition into the Woodland State.

**Restoration pathway R4A**  
**State 4 to 3**

With Prescribed Grazing, Brush Management, and Prescribed Grazing, the Woodland State can be restored to the Converted Land State.

**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 (Kg/Hectare)	Foliar Cover (%)
<b>Grass/Grasslike</b>					
1	<b>Midgrass</b>			560–1121	
	sidestate grass	BOCH	<i>Bouteloua curtipendula</i>	500–1100	

	sideoats grama	BOCU	<i>Bouteloua curtipendula</i>	300-1121	-
2	<b>Midgrasses</b>			1009-2018	
	cane bluestem	BOBA3	<i>Bothriochloa barbinodis</i>	0-504	-
	silver beardgrass	BOLAT	<i>Bothriochloa laguroides</i> ssp. <i>torreyana</i>	0-504	-
	Arizona cottontop	DICA8	<i>Digitaria californica</i>	0-504	-
	Texas wintergrass	NALE3	<i>Nassella leucotricha</i>	0-504	-
	little bluestem	SCSC	<i>Schizachyrium scoparium</i>	0-504	-
3	<b>Shortgrasses</b>			224-448	
	buffalograss	BODA2	<i>Bouteloua dactyloides</i>	0-448	-
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	0-448	-
	curly-mesquite	HIBE	<i>Hilaria belangeri</i>	0-448	-
4	<b>Shortgrasses</b>			112-224	
	hairy grama	BOHI2	<i>Bouteloua hirsuta</i>	0-224	-
	sand dropseed	SPCR	<i>Sporobolus cryptandrus</i>	0-224	-
	slim tridens	TRMU	<i>Tridens muticus</i>	0-224	-
	slim tridens	TRMUE	<i>Tridens muticus</i> var. <i>elongatus</i>	0-224	-
5	<b>Shortgrasses</b>			112-224	
	purple threeawn	ARPUP6	<i>Aristida purpurea</i> var. <i>purpurea</i>	0-224	-
	Wright's threeawn	ARPUW	<i>Aristida purpurea</i> var. <i>wrightii</i>	0-224	-
<b>Forb</b>					
6	<b>Forbs</b>			112-224	
	Cuman ragweed	AMPS	<i>Ambrosia psilostachya</i>	0-56	-
	white sagebrush	ARLU	<i>Artemisia ludoviciana</i>	0-56	-
	aster	ASTER	<i>Aster</i>	0-56	-
	whitemouth dayflower	COERE	<i>Commelina erecta</i> var. <i>erecta</i>	0-56	-
	Engelmann's daisy	ENGEL	<i>Engelmannia</i>	0-56	-
	Indian blanket	GAPU	<i>Gaillardia pulchella</i>	0-56	-
	beeblossom	GAURA	<i>Gaura</i>	0-56	-
	Dakota mock vervain	GLBIB	<i>Glandularia bipinnatifida</i> var. <i>bipinnatifida</i>	0-56	-
	trailing krameria	KRLA	<i>Krameria lanceolata</i>	0-56	-
	dotted blazing star	LIPU	<i>Liatris punctata</i>	0-56	-
	plains blackfoot	MELE2	<i>Melampodium leucanthum</i>	0-56	-
	Nuttall's sensitive-briar	MINU6	<i>Mimosa nuttallii</i>	0-56	-
	evening primrose	OENOT	<i>Oenothera</i>	0-56	-
<b>Shrub/Vine</b>					
7	<b>Shrubs/Vines</b>			67-135	
	catclaw acacia	ACGR	<i>Acacia greggii</i>	0-34	-
	sugarberry	CELA	<i>Celtis laevigata</i>	0-34	-
	Texan hogplum	COTET	<i>Colubrina texensis</i> var. <i>texensis</i>	0-34	-
	clapweed	EPAN	<i>Ephedra antisiphilitica</i>	0-34	-
	algerita	MATR3	<i>Mahonia trifoliolata</i>	0-34	-
	gum bully	SILAO	<i>Sideroxylon lanuginosum</i> ssp. <i>oblongifolium</i>	0-34	-

	lotebush	ZIOBO	<i>Ziziphus obtusifolia</i> var. <i>obtusifolia</i>	0–34	–
<b>Tree</b>					
8	Tree			45–90	
	post oak	QUST	<i>Quercus stellata</i>	45–90	–

## Animal community

Bison and prairie dog were inhabitants of this site when the area was settled by European man. They have been removed from the site as explained in the Ecological Dynamics portion of this site description.

This site is used for the production of domestic livestock and to provide habitat for native wildlife. Cow-calf and stocker operations are the primary livestock enterprises. Sheep and goat operations have been used in the past, but currently are very few. Sustainable stocking rates have declined over the years due to a change in the plant community. As the midgrasses have been removed by continuous overgrazing and the invasion of mesquite, prickly pear and tasajillo, the production of plants desired by cattle have been drastically reduced in some situations.

Determining the stocking rate for an area is very site specific. Therefore, to determine the correct stocking rate, an on site evaluation must be made. Forage production by the different plant species must be determined. This is then evaluated to determine the harvestable forage per acre by calculating the amount of forage produced that is desired and harvested by the livestock and wildlife on the site.

REMEMBER! Wildlife present gets first choice. They are always there and you can only control their numbers by hunting. You cannot move them from pasture to pasture like livestock, except as they relate to your livestock movements. So, when calculating stocking rates, calculate the forage used by the wildlife first and then calculate the stocking rate for the livestock based on what desired forage is left. Also, the manager's objectives for managing the plant community as well as meeting the needs of his livestock and wildlife must be considered in the forage inventory and Prescribed Grazing Plan. (See guidance in the NRCS National Range and Pasture Handbook on calculating safe starting stocking rates.)

As the plant community changes, the stocking rate for one animal species may decrease while the amount of desired forage for other animals may increase. For instance, as grass production decreases, and the forbs and shrub/vine production increases, the production for food and cover for quail and whitetail deer are increasing. Therefore, the early stages of (2) Mesquite, Prickly pear, Tasajillo, Lotebush, Bumelia steady state may be outstanding for quail and deer. In the manager's scheme, he or she may desire to maintain all or part of their land in this steady state to meet their overall wildlife and domestic livestock plan.

Smaller mammals on the site include rodents, jackrabbit, cottontail rabbit, raccoon skunks, opossum, and armadillo. Mammalian predators include coyote, red fox, gray fox, and bobcat. Species of snakes and lizards are native to the site.

Many species of birds are found on this site including game birds, song birds and birds of prey. Major game birds that are economically important are Rio Grande turkey, bobwhite quail, and mourning dove. Turkey prefers plant communities with substantial amounts of shrubs and trees interspersed with grassland. Quail prefer plant communities with a combination of low shrubs, bunch grass, bare ground and low successional forbs. The different song birds vary in their habitat preferences. In general, habitat that provides a large variety of grasses, forbs, shrubs, vines and trees and a complex of grassland, savannah, shrubland and woodland 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. The different plant communities of the site will sustain different species of raptors.

Feral hogs are present on this site in many instances. They can cause much damage to the site as they up root the desirable plants. They can be controlled by trapping and hunting.

## Hydrological functions

The land form is a plain that ranges in elevation from 700 to 1800 feet above sea level. The hydrologic group is C and the runoff class is medium to high. The drainage class is well drained. Permeability class is slow to very slow.



The soil is underlain by shale and/or sandstone at approximately 20 to 60 inches. There is no water table within 6 feet of the surface. Site does not pond water and the area does not flood.

The soils of this site have a fine sandy loam surface texture to a depth of approximately 4 to 8 inches. It is underlain by a sandy clay, clay or clay loam subsoil that is 20 to 40 inches thick which lays on shale and/or sandstone.

This site is one of the driest ecological sites in the 80B Major Land Resource Area. Due to its inherent dryness, it can be severely damaged by continuous overgrazing and the invasion of mesquite, prickly pear and tasajillo and other shrubs. As the midgrasses are removed and replaced by shortgrasses, annual forbs, mesquite, prickly pear, tasajillo and bare ground, the topsoil becomes very hard and what appears to be cemented together. During the summer, the bare soil becomes extremely hot and radiates much heat that is detrimental to the establishment and growth of plants. Infiltration of rainfall is severely limited and much of it evaporates due to the high temperatures of the soil. If the post oak is removed from the site, it normally will not reestablish due to this droughtiness. Care in grazing management should be used to maintain a cover of the mid-grasses in order that the hydrological processes may function as well as possible.

A research study is currently on going to determine why the topsoil becomes so hard and cemented when it loses its vegetation cover.

### **Recreational uses**

This site has the appeal of the wide open spaces. In the spring, it has an abundance of wild flowers that makes the site very showy. The area is used for hunting of quail, white tail deer, and turkey as it provides food and cover for all three. In its bare ground state, it provides a striking scene that is different from its surroundings. This is looked upon by some as being unique, picturesque, and very western due to its desert like appearance. So, in the realms of eco-tourism, this site could be targeted for photography of the site and its plants and animals.

### **Wood products**

Mesquite can be harvested from this site for cooking wood. Prickly pear and algerita can be harvested for landscaping purposes.

### **Other products**

None.

### **Other information**

None.

### **Inventory data references**

417 data collected on the site with emphasis from 1979 until 1985.

### **References**

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### **Other references**

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## Contributors

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 PES edits by Colin Walden, Stillwater Soil Survey Office

## Approval

Bryan Christensen, 9/19/2023

## Acknowledgments

Site Development and Testing Plan:

Future work, as described in a Project Plan, to validate the information in this Provisional Ecological Site Description is needed. This will include field activities to collect low, medium and high intensity sampling, soil correlations, and analysis of that data. Annual field reviews should be done by soil scientists and vegetation specialists. A final field review, peer review, 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.

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Contact for lead author	colin.walden@ok.usda.gov
Date	02/21/2018
Approved by	Bryan Christensen
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

## Indicators

1. **Number and extent of rills:** Minimal evidence of current or past rill formation.  

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2. **Presence of water flow patterns:** Few water flow patterns on steep areas. Short and stable, not incising.  

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3. **Number and height of erosional pedestals or terracettes:** No pedestals or terracettes present.  

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4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Bare ground less than 10 percent. Bare areas small and not connected.  

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5. **Number of gullies and erosion associated with gullies:** No gullies present.  

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6. **Extent of wind scoured, blowouts and/or depositional areas:** No wind scoured areas.  

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7. **Amount of litter movement (describe size and distance expected to travel):** Litter movement less than 3 feet. Vegetative cover should restrict litter movement over long distances. Only herbaceous litter less than .25 inches expected to move.  

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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):** Soil stability scores of 5 or greater expected.  

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Truce soil : A--0 to 8 cm (0 to 3 in); brown (10YR 4/3) fine sandy loam, dark brown (10YR 3/3) moist; weak fine subangular blocky structure when moist; hard and massive when dry; hard, friable;  
  
See official description for specific soil component.  

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Presence of perennial midgrasses help to facilitate percolation into the soil. Some runoff expected on steeper slopes during moderate precipitation events.  

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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):** No compaction under reference conditions. Beware texture change of Bt horizon not product of compaction.  

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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: Midgrasses (groups 1,2)

Sub-dominant: Shortgrasses (3,4,5)

Other: All other groups

Additional:

---

13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** Possible mortality only during prolonged drought. Less than 5%.
- 

14. **Average percent litter cover (%) and depth ( in):** Litter expected to be at 75% cover at average .25 inch depth.
- 

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** Annual production 3,000 lb/acre. Ranging from 2,000 to 4,000 lbs.
- 

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 and Juniper( Ashe juniper/eastern redcedar) most common invaders.
- 

17. **Perennial plant reproductive capability:** Plants should be capable of reproducing every year with exception of prolonged growing season drought.
-