

## **Ecological site R085AY180TX Deep Redland 30-38" PZ**

Last updated: 9/21/2023  
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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): 085A–Grand Prairie

The Grand Prairie MLRA is characterized by predominately loam and clay loam soils underlain by limestone and shale. Topography transitions from steeper ridges and summits of the Lampasas Cut Plain on the southern end to the more rolling hills of the Fort Worth Prairie to the north. The Arbuckle Mountain area in Oklahoma is also within this MLRA.

### **Classification relationships**

This ecological site is correlated to soil components at the Major Land Resource Area (MLRA) level which is further described in USDA Ag Handbook 296.

### **Ecological site concept**

These sites occur on deep, neutral clay and clay loam soils over limestone bedrock. The reference vegetation includes native tallgrasses and forbs with scattered post oaks and other oak species. In the absence of fire or other brush management, woody species may increase and dominate the site. Many of these site have been or are still in crop production.

### **Associated sites**

|             |  |
|-------------|--|
| R085AY179TX | <b>Clayey Slope 30-38</b><br>Occurs adjacent to the Deep Redland ecological site. However, the Clay Loam site does not have any oak species growing on the site. |
|-------------|--|

### **Similar sites**

|             |  |
|-------------|--|
| R085AY183TX | <b>Redland 30-38" PZ</b><br>The Redland Ecological Site is shallower and has less production potential than the Deep Redland site. |
|-------------|--|

**Table 1. Dominant plant species**

|       |  |
|-------|--|
| Tree  | (1) <i>Quercus stellata</i><br>(2) <i>Quercus buckleyi</i> |
| Shrub | Not specified  |

|            |   |
|------------|---|
| Herbaceous | (1) <i>Andropogon gerardii</i><br>(2) <i>Sorghastrum nutans</i> |
|------------|---|

## Physiographic features

This site occurs on interfluvies of hillslopes and treads of stream terraces in the Grand Prairie. Slopes are typically 0 to 3 percent.

**Table 2. Representative physiographic features**

|              |   |
|--------------|---|
| Landforms    | (1) Hills > Hillslope<br>(2) Hills > Ridge<br>(3) Alluvial plain > Stream terrace |
| Runoff class | High to very high   |
| Elevation    | 500–1,900 ft  |
| Slope        | 0–3%  |
| Aspect       | Aspect is not a significant factor  |

## Climatic features

The climate is subhumid subtropical and is characterized by hot 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 should occur around November 5 and the last freeze of the season should occur around March 19.

The average relative humidity in mid-afternoon is about 60 percent. 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 south and highest windspeeds occur during the spring months.

Approximately two-thirds of annual rainfall occurs during the April to September period. Rainfall during this period generally falls during thunderstorms, and fairly large amounts of rain may fall in a short time. The driest months are usually July and August.

**Table 3. Representative climatic features**

|  |              |
|--|--------------|
| Frost-free period (characteristic range)   | 194-208 days |
| Freeze-free period (characteristic range)  | 216-243 days |
| Precipitation total (characteristic range) | 32-38 in     |
| Frost-free period (actual range)           | 190-209 days |
| Freeze-free period (actual range)          | 209-245 days |
| Precipitation total (actual range)         | 31-39 in     |
| Frost-free period (average)                | 201 days     |
| Freeze-free period (average)               | 230 days     |
| Precipitation total (average)              | 35 in        |

## Climate stations used

- (1) BENBROOK DAM [USC00410691], Fort Worth, TX
- (2) CLEBURNE [USC00411800], Cleburne, TX
- (3) WHITNEY DAM [USC00419715], Clifton, TX
- (4) DENTON MUNI AP [USW00003991], Ponder, TX
- (5) DECATUR [USC00412334], Decatur, TX

- (6) EVANT 1SSW [USC00413005], Evant, TX
- (7) BROWNWOOD 2ENE [USC00411138], Early, TX
- (8) LAMPASAS [USC00415018], Lampasas, TX

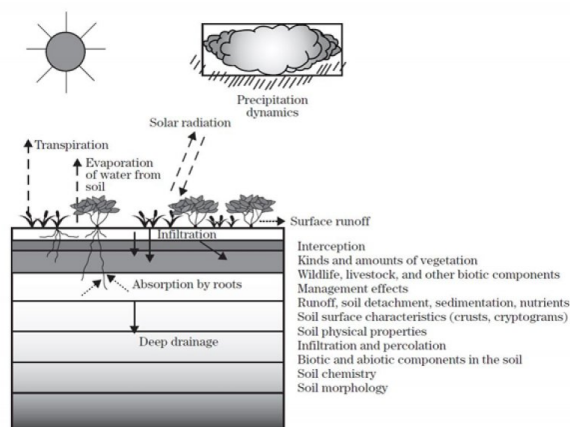
## Influencing water features

These sites both receive water from upland sites and shed water to lower areas. The presence of deep rooted tallgrass species helps to facilitate infiltration into the soil profile. They 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: Caradan, Crawford, Lindale, Lindy, and Mingo

The site is characterized by moderately deep to very deep, noncalcareous, loamy to clayey soils.

**Table 4. Representative soil features**

|                                       |  |
|---------------------------------------|--|
| Parent material                       | (1) Residuum–limestone<br>(2) Alluvium–mudstone<br>(3) Alluvium–limestone<br>(4) Residuum–mudstone |
| Surface texture                       | (1) Clay loam<br>(2) Loam<br>(3) Silty clay loam<br>(4) Clay<br>(5) Silty clay                     |
| Drainage class                        | Moderately well drained  |
| Permeability class                    | Very slow to slow  |
| Soil depth                            | 20–40 in   |
| Surface fragment cover ≤3"            | 0–2%   |
| Surface fragment cover >3"            | 0–1%   |
| Available water capacity (0-40in)     | 2–9 in   |
| Calcium carbonate equivalent (0-40in) | 0–20%  |

|  |              |
|--|--------------|
| Electrical conductivity<br>(0-40in)                      | 0–2 mmhos/cm |
| Sodium adsorption ratio<br>(0-40in)                      | 0–6          |
| Soil reaction (1:1 water)<br>(0-40in)                    | 6.1–8.4      |
| Subsurface fragment volume <=3"<br>(Depth not specified) | 0–30%        |
| Subsurface fragment volume >3"<br>(Depth not specified)  | 0–15%        |

## Ecological dynamics

The reference plant community for the Deep Redland site is a tallgrass savannah (1.1) and was inhabited by grassland wildlife species such as bison, grassland birds and small mammals. The grasses are primarily little bluestem (*Schizachyrium scoparium*), Indiangrass (*Sorghastrum nutans*), big bluestem (*Andropogon gerardii*) and switchgrass (*Panicum virgatum*). Smaller amounts of Eastern gamagrass (*Tripsacum dactyloides*), purpletop (*Tridens flavus*) and sideoats grama (*Bouteloua curtipendula*) occur as well. The savannah woody plants consist primarily of post oak (*Quercus stellata*) and blackjack oak (*Quercus marilandica*).

Animal impacts and fire were a key to maintaining the open tallgrass with the broadly spaced oak trees. Large herds of buffalo were thought to intensely graze this site and then not come back to it for many months or even years usually following the fire frequency. The collective influence of large concentrated buffalo herds and natural fires prevented woody plant encroachment from occurring. Pre-settlement fires were anticipated to be severe and occurred anytime the grass was dry. These fires prevented the encroachment of Ashe juniper (*Juniperus ashei*) and other woody species, but usually did not produce much mortality in older oaks.

Indians inhabited the prairies for nearly three centuries prior to 1800 using mounted horses imported from Spanish explorers. These same explorers brought domesticated cattle as early as 1690 into Texas. By the late 1700's, especially in South Texas, these wild and free-ranging livestock began competing with the native ruminants such as buffalo, elk, pronghorn antelope and white-tailed deer for forage consumption. By 1845, European settlers stopped wild fires and at the same time many herds both wild and domestic began to populate streams and major rivers. These wild herds continued to expand especially after the extirpation of the buffalo in the 1870's. In 1867 a railhead was established in Abilene, Kansas which caused a thriving livestock industry to be born. By the early 1880's, the Texas prairies became more and more overstocked. By 1885 livestock were fenced, further concentrating livestock and causing a deterioration of the plant communities due to overgrazing and droughts. By the 1920's, large prairie land areas were already plowed and cultivated. Early farmers had to protect their crops from being burned, so controlling fire was even more important for them than for the livestock operators. With the cessation of fire, prairies soon gave way to woodland and shrubland in many areas. Overgrazing and drought reduced grass vigor and left little ground cover or litter to carry even an occasional fire.

Climate and soils are also important and limiting factors affecting grass vegetation on the site. Drought was a part of the original savannah as well. Fire, along with the incidental grazing, created diversity in this site for a year or two post-burn and by stimulating forbs if the timing was right. Some forbs respond to spring moisture which is also a major factor in creating diversity in the plant community.

With abusive grazing practices, the vigorous Indiangrass and big bluestem will become lower in vigor while little bluestem will increase then secondary successional species such as sideoats grama, silver bluestem (*Bothriochloa laguroides*), Texas wintergrass (*Nassella leucotricha*) and buffalograss (*Bouteloua dactyloides*) will begin to increase along with an increase of woody plants. At some point, the ground cover is opened up resulting in bare places where weedy species can establish which may signify that a threshold has been crossed. Plants such as Texas wintergrass, buffalograss, western ragweed (*Ambrosia psilostachya*), prairie coneflower (*Ratibida columnifera*), and cool-season annuals will quickly invade if the principal species are in a weakened condition. The site can be abused to the point that the perennial warm-season grasses thin out and lower successional grasses along with annual forbs begin to dominate. This process of degradation usually takes many years and is further exacerbated by summer drought and above average winter moisture. Once a state of brush and cool-season

annuals is reached, recovery to a perennial warm-season grass cover is unlikely without major input with brush management and reseeding.

Birds consume the seed of many woody species and help spread them in their droppings. This is an excellent environment for seedlings complete with moisture and nutrients. Grazing management with only cattle probably has minimal effect on the proliferation of woody plants, but they can also spread mesquite beans in droppings. Species like juniper can actually increase faster with a good cover of perennial grasses. However for mesquite, a good cover of grasses minimizes the seed-to-soil contact needed to establish. Prescribed grazing with a reasonable stocking rate can sustain the grass species composition and production at a near reference community level.

Long term droughts that occur only three to four times in a century can effect some change in historic plant communities, especially when coupled with abusive grazing. Short term droughts are common and usually do not have a lasting effect in changing stable plant communities, although production will be affected.

In summary, the change in states of vegetation depends on the climate and management applied over many years. The effects of seasonal moisture and short term dry spells become more pronounced after the site crosses a threshold to a lower ecological condition, Plant communities that consist of warm-season perennial grasses such as little bluestem and the associated species of the reference community are able to persist and withstand climatic extremes with only minor shifts in the overall plant community.

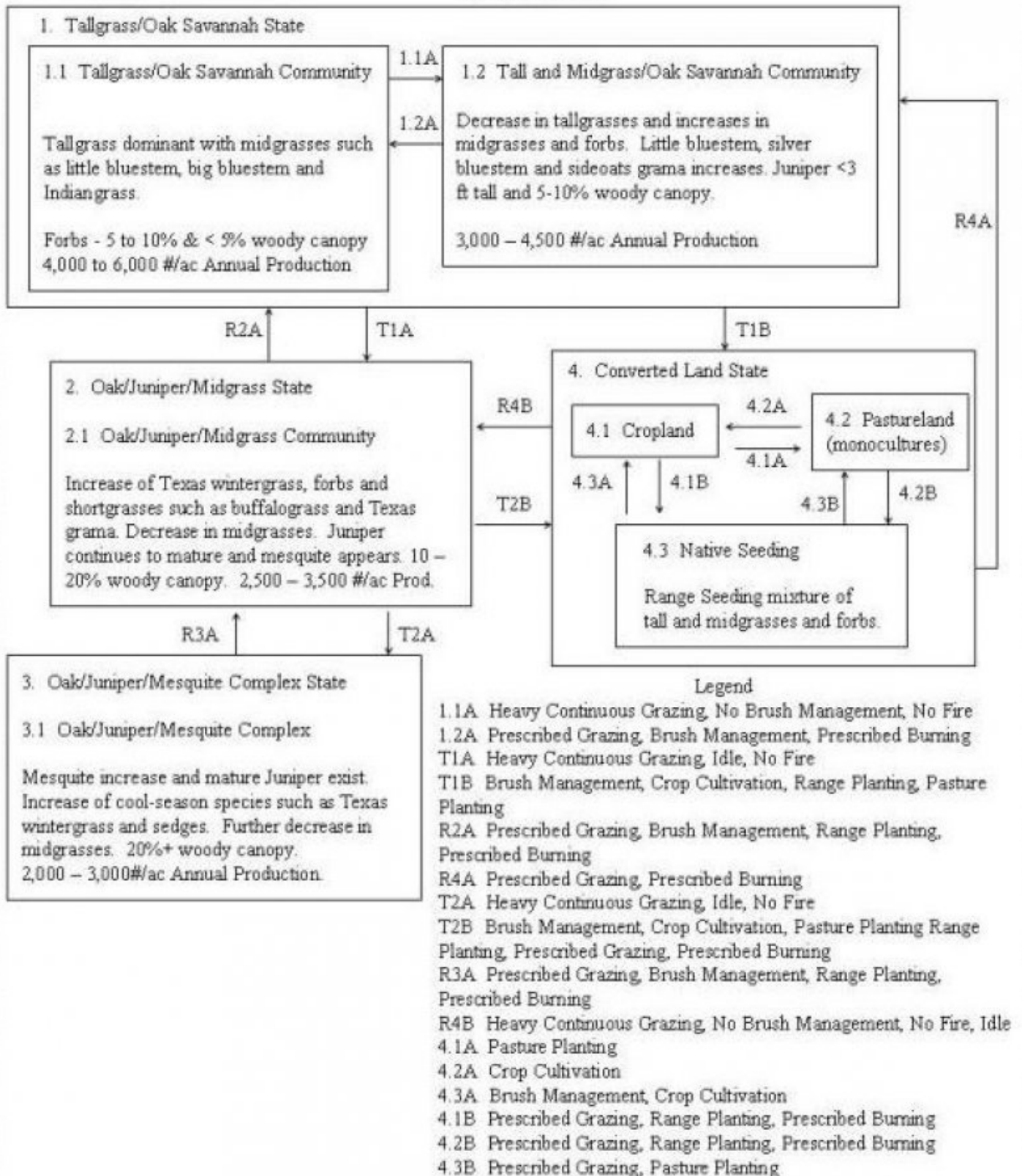
#### State and Transitional Pathways: Narrative

The following diagram suggests some pathways that the vegetation on this site might take in response to various treatments or natural stimuli over time. There may be other states that are not shown on this diagram. This information is to show that changes in plant communities do occur due to management and natural factors; and can be changed by implementing certain practices. The plant communities described are commonly observed on this site. Before making plans for plant community manipulation for specific purposes, consult local professionals.

As a site changes in plant community makeup, the changes may be due many factors. Change may occur slowly or in some cases, fairly rapidly. As vegetative changes occur, certain thresholds are crossed. This means that once a certain point is reached during the transition of one community to another, a return to the first state may not be possible without the input of some form of energy. This often means intervention with practices that are not part of natural processes. An example might be the application of herbicide to control some woody species in order to reduce its population and encourage more grass and forbs growth. Merely adjusting grazing practices would probably not accomplish any significant change in a plant community once certain thresholds are crossed. The amount of energy required to effect change in community would depend on the present vegetative state and the desired change.

#### State and transition model

Deep Redland 30-38" PZ  
R085XY180TX



## State 1 Tallgrass/Oak Savannah State - Reference

### Dominant plant species

- post oak (*Quercus stellata*), tree
- big bluestem (*Andropogon gerardii*), grass

Community 1.1  
Tallgrass/Oak Savannah Community

The interpretive plant community for this site is a Tallgrass/Oak Savannah Community (1.1). The community for the site is a fire-grazing climax savannah composed of warm-season perennial tallgrasses such as little bluestem, big bluestem and Indiangrass and scattered post oaks. The overstory shades less than a 10 percent of the site and consists primarily of post oak but may include Bigelow oak (*Quercus sinuata* var. *breviloba*), Texas oak (*Quercus buckleyi*), blackjack oak, and several associated species. Other major perennial tallgrass and midgrass species such as switchgrass, sideoats grama and silver bluestem are well dispersed through the site. Perennial forbs such as sunflowers (*Helianthus* spp.), prairie clovers (*Dalea* and *Pedimelum* spp.), bundleflowers (*Desmanthus* spp.), and daleas (*Dalea* spp.) are well represented throughout the community. Reoccurring fires and grazing by bison were natural processes that maintained this historic community in a tallgrass and oak savannah state. Likewise, the removal of these processes is a disturbance that began to cause change in the plant community. As fire is eliminated and overstocking becomes continual, this plant community begins to change from an oak savannah community to an oak-grassland community invaded by Ashe juniper and other woody species. Introduction of prescribed fire at appropriate time intervals and implementation of prescribed grazing can maintain the Tallgrass/Oak Savannah Community (1.1). Ashe juniper encroachment can be easily controlled with prescribed fire until the plant reaches approximately 3 to 4 feet in height. Without treatment, the Ashe juniper will continue to increase in density and stature and move towards the Oak/Juniper Midgrass Community (2.1). With heavy grazing pressure and the removal of fire, the historic community will change into a Tall and Midgrass/Oak Savannah Community (1.2), an Oak/juniper/Midgrass Community (2.1) or Oak/Juniper/Mesquite Complex (3.1). The changes within the grassland part of this community can change fairly rapid while the woody plants communities are somewhat slower. The Tallgrass/Oak Savannah State (1.1) can be converted to Cropland (4.1) Pastureland (4.2) or Native Seeding (4.3).

Table 5. Annual production by plant type

| Plant Type      | Low<br>(Lb/Acre) | Representative Value<br>(Lb/Acre) | High<br>(Lb/Acre) |
|-----------------|------------------|-----------------------------------|-------------------|
| Grass/Grasslike | 3600             | 4500                              | 5400              |
| Forb            | 200              | 250                               | 300               |
| Shrub/Vine      | 120              | 150                               | 180               |
| Tree            | 80               | 100                               | 120               |
| Total           | 4000             | 5000                              | 6000              |

Figure 10. Plant community growth curve (percent production by month). TX6020, Tallgrass Oak Savannah Community. The plant community is a fire climax savannah composed of warm-season perennial tallgrasses and scattered post oaks..

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 1   | 2   | 2   | 18  | 23  | 17  | 6   | 4   | 16  | 6   | 3   | 2   |

Community 1.2  
Tall and Midgrass/Oak Savannah Community



Figure 11. 1.2 Tall and Midgrass/Oak Savannah Community

This transition state occurs without fire or brush management with heavy yearlong grazing. The tall grasses will start to disappear from the plant community and be replaced by midgrasses such as sideoats grama, which will increase. Invading brush species such as Ashe juniper appears and becomes established. Greenbriar (*Smilax bona-nox*), cedar elm (*Ulmus crassifolia*), bumelia (*Sideroxylon lanuginosum*), and hackberry (*Celtis* spp.) also start to increase. Texas wintergrass (*Nassella leucotricha*) increases as brush canopy increases. The plant community consists of less than 10 percent canopy of woody plants. Continuous grazing by domestic livestock and fire suppression has accelerated the shift towards the Oak/Juniper/Mesquite Complex (3.1). Selective individual removal of mesquite (*Prosopis glandulosa*) and/or juniper is easy and economical when a few plants begin to show up on the site. However, the increase of number of plants can be fairly rapid and the number of woody plants per acre will soon become too numerous for individual control to be feasible. The Tall and Midgrass/Oak Savannah Community (1.2) can revert back to the Tallgrass/Oak Savannah Community (1.1) with prescribed burning and/or prescribed grazing. Without prescribed burning and/or prescribed grazing, this plant community would continue to shift toward the Oak/Juniper/Midgrass Community (2.1) or the Oak/Juniper/Mesquite Complex (3.1). The Tallgrass and Midgrass/Oak Savannah Community (1.2) can be converted into Cropland (4.1), Pastureland (4.2) or Native Seeding (4.3). The seeded state with prescribed burning and prescribed grazing management practices could revert back to the Tall and Midgrass/Oak Savannah Community (1.2).

Table 6. Annual production by plant type

| Plant Type      | Low<br>(Lb/Acre) | Representative Value<br>(Lb/Acre) | High<br>(Lb/Acre) |
|-----------------|------------------|-----------------------------------|-------------------|
| Grass/Grasslike | 2100             | 2625                              | 3150              |
| Forb            | 450              | 565                               | 675               |
| Shrub/Vine      | 300              | 375                               | 450               |
| Tree            | 150              | 185                               | 225               |
| <b>Total</b>    | <b>3000</b>      | <b>3750</b>                       | <b>4500</b>       |

Figure 13. Plant community growth curve (percent production by month). TX6021, Tall & Midgrass/Oak Savannah Community. The tallgrasses will start to disappear and be replaced by midgrasses. Invader brush species appears and becomes established..

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 1   | 2   | 2   | 18  | 23  | 17  | 6   | 4   | 16  | 6   | 3   | 2   |

### Pathway 1.1A Community 1.1 to 1.2

With heavy continuous grazing, no brush management, and no fire, the Tallgrass/Oak Savannah Community would shift to the Tall/Midgrass/Oak Savannah Community.



Pathway 1.2A  
Community 1.2 to 1.1

With the implementation of Prescribed Grazing, Brush Management and Prescribed Burning conservation practices, the Tall & Midgrass/Oak Savannah Community can be reverted back to the Tallgrass/Oak Savannah Community.

Conservation practices

|                    |
|--------------------|
| Brush Management   |
| Prescribed Burning |
| Prescribed Grazing |

State 2  
Oak/Juniper/Midgrass State

Dominant plant species

- post oak (*Quercus stellata*), tree
- Ashe's juniper (*Juniperus ashei*), tree
- sideoats grama (*Bouteloua curtipendula*), grass
- Texas wintergrass (*Nassella leucotricha*), grass

Community 2.1  
Oak/Juniper/Midgrass Community



Figure 14. 2.1 Oak/Juniper/Midgrass Community

The Oak/Juniper/Midgrass Community (2.1) consists of mid grasses with 10 to 20 percent canopies of woody plants. As the plant community ages, brush canopy continues to increase and midgrasses such as sideoats grama decreases and Texas wintergrass and buffalograss (*Buchloe dactyloides*) increase. Without fire, Ashe juniper becomes the dominant invader plant while mesquite appears and becomes established. Warm-season perennial tall grasses such as Indiangrass and switchgrass have all but disappeared. Continuous grazing by domestic livestock has accelerated the shift. The shift to this state has occurred due to the absence of fire or other means of brush suppression coupled with heavy grazing by domestic livestock. The grass species are increasingly annual cool-season species. This state can still be reverted back to near historic condition by some means of brush suppression and good grazing management. Without these treatments, the site will continue to shift toward more dense stands of brush and become the Oak/Juniper/Mesquite Complex (3.1) state.

Table 7. Annual production by plant type

| Plant Type      | Low<br>(Lb/Acre) | Representative Value<br>(Lb/Acre) | High<br>(Lb/Acre) |
|-----------------|------------------|-----------------------------------|-------------------|
| Grass/Grasslike | 1500             | 1800                              | 2100              |
| Forb            | 500              | 600                               | 700               |
| Shrub/Vine      | 250              | 300                               | 350               |
| Tree            | 250              | 300                               | 350               |
| <b>Total</b>    | <b>2500</b>      | <b>3000</b>                       | <b>3500</b>       |

Figure 16. Plant community growth curve (percent production by month). TX6022, Oak/Juniper/Midgrass Community. Consists of midgrasses with ten to twenty percent canopy of woody plants..

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 1   | 3   | 8   | 20  | 25  | 19  | 5   | 3   | 10  | 4   | 1   | 1   |

### State 3

#### Oak/Juniper/Mesquite Complex State

##### Dominant plant species

- post oak (*Quercus stellata*), tree
- Ashe's juniper (*Juniperus ashei*), tree
- honey mesquite (*Prosopis glandulosa*), tree
- Texas wintergrass (*Nassella leucotricha*), grass

### Community 3.1

#### Oak/Juniper/Mesquite Complex



Figure 17. 3.1 Oak/Juniper/Mesquite Complex

This plant community is an Oak/ Juniper/ Mesquite Complex (3.1) having greater than 20% woody canopy dominated by Ashe juniper and honey mesquite. Other species present in small amounts are cedar elm, hackberry, and live oak (*Quercus virginiana*). The herbaceous understory is almost nonexistent. Shade tolerant species such as Texas wintergrass tends to dominate the site where mesquite is the major woody plant. When the juniper canopy increases toward a cedar breaks type community, grasses have almost disappeared. Continuous grazing by domestic livestock has accelerated the shift. The reference community can be restored by prescribed burning and grazing but will require many years of burning currently due to the light fuel load of fine fuel and the absence of a seed source for the tall grasses. In general, the uses of fire on mature (larger) or a dense stand of woody plants does not have the same positive effects as burning in tallgrass communities. Chemical control alone is usually a good option for treatment on a large scale especially where a seed source is present. Mechanical treatment of this site along with range planting is a good option when seeding is necessary. After brush has been controlled mechanically or with herbicides, fire can then be used to suppress re-growth. Fuel loads are often the most limiting factor for the effective use of prescribed fire on this site. Due to the presence of shade, the amount of grass cover is

greatly reduced which in turn reduces forage production.

**Table 8. Annual production by plant type**

| Plant Type      | Low<br>(Lb/Acre) | Representative Value<br>(Lb/Acre) | High<br>(Lb/Acre) |
|-----------------|------------------|-----------------------------------|-------------------|
| Grass/Grasslike | 450              | 565                               | 675               |
| Forb            | 250              | 315                               | 375               |
| Shrub/Vine      | 150              | 185                               | 225               |
| Tree            | 150              | 185                               | 225               |
| <b>Total</b>    | <b>1000</b>      | <b>1250</b>                       | <b>1500</b>       |

**Figure 19. Plant community growth curve (percent production by month).**  
TX6023, Oak/Juniper/Mesquite Complex. Oak/Juniper/Mesquite complex having greater than twenty percent woody canopy dominated by juniper and mesquite..

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 1   | 3   | 8   | 20  | 25  | 19  | 5   | 3   | 10  | 4   | 1   | 1   |

## State 4 Converted Land State

### Dominant plant species

- Bermudagrass (*Cynodon dactylon*), grass
- yellow bluestem (*Bothriochloa ischaemum*), grass

## Community 4.1 Cropland Community

Extensive conversion of the Deep Redland ecological site to cropland (primarily cotton and corn) occurred from the middle 1800s to the early 1900s. Some remains in cropland today – typically small grain production for stocker-cattle grazing. While restoration of this site to a semblance of the tallgrass savannah is possible with range planting, prescribed grazing, and prescribed burning - complete restoration of the reference community in a reasonable time is very unlikely due to deterioration of the soil structure and organisms. If cropping is abandoned, this land is usually planted to introduced grasses and forbs and managed as pastureland.

**Figure 21. Plant community growth curve (percent production by month).**  
TX6102, Cool-Season Annual Grasses & Legumes. Oats, Rye, Wheat, Ryegrass, Clover and Vetch planted..

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 11  | 13  | 19  | 21  | 19  | 0   | 0   | 0   | 0   | 0   | 8   | 9   |

**Figure 22. Plant community growth curve (percent production by month).**  
TX6103, Warm-Season Annual Grasses & Legumes. Forage Sorghum, Grain Sorghum, Haygrazer..

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 0   | 0   | 8   | 20  | 25  | 20  | 10  | 10  | 5   | 2   | 0   | 0   |

## Community 4.2 Pastureland Community

This state is usually the result of mechanical brush control and reseeding using one or more native grass species. Introduced species such as Kleingrass (*Panicum coloratum*) or one of the old world bluestems (*Bothriochloa* spp.) such as WW Spar and W B Dahl may also be a part of the seed mixture. Due to the lack of diversity of plant species and presence of introduced species, it will take a lot of time and expense for this state to reach the

reference state for the Deep Redland site.

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

| Plant Type      | Low<br>(Lb/Acre) | Representative Value<br>(Lb/Acre) | High<br>(Lb/Acre) |
|-----------------|------------------|-----------------------------------|-------------------|
| Grass/Grasslike | 3800             | 4700                              | 5600              |
| Forb            | 200              | 300                               | 400               |
| <b>Total</b>    | <b>4000</b>      | <b>5000</b>                       | <b>6000</b>       |

**Figure 24. Plant community growth curve (percent production by month).**  
**TX6104, Introduced Pasture Seeding.** Grass species such as bermudagrass, kleingrass, old world bluestems and other introduced grassland species are planted..

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 1   | 2   | 2   | 18  | 23  | 17  | 6   | 4   | 16  | 6   | 3   | 2   |

## Community 4.3

### Native Seeding Community

This community is usually the result of mechanical brush control and reseeding using one or more native grass species. Various native species such as switchgrass, eastern gamagrass, little bluestem and big bluestem may be a part of the seed mixture. The seeded state, if planted to natives with prescribed burning and prescribed grazing practices could after many years revert back into the Tall and Midgrass/Oak Savannah Community (1.2). However recruitment of oak may take as much as 50 years. Due to the lack of diversity of plant species compared to the historic climax it will take a long time if ever for this seeded state to again reach the historic community. If there are any introduced and invasive species that becomes established in this native seeding plant community, this will inhibit the return to the reference state.

**Table 10. Annual production by plant type**

| Plant Type      | Low<br>(Lb/Acre) | Representative Value<br>(Lb/Acre) | High<br>(Lb/Acre) |
|-----------------|------------------|-----------------------------------|-------------------|
| Grass/Grasslike | 3700             | 4625                              | 5550              |
| Forb            | 200              | 250                               | 300               |
| Shrub/Vine      | 60               | 75                                | 90                |
| Tree            | 40               | 50                                | 60                |
| <b>Total</b>    | <b>4000</b>      | <b>5000</b>                       | <b>6000</b>       |

**Figure 26. Plant community growth curve (percent production by month).**  
**TX6015, Open Seeded Grassland Community.** This state is usually the result of mechanical brush control and reseeding using one or more native grass species..

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 1   | 2   | 2   | 18  | 23  | 17  | 6   | 4   | 16  | 6   | 3   | 2   |

## Pathway 4.1A

### Community 4.1 to 4.2

The Cropland Community can be converted into the Pastureland Community (monocultures) with the use of Pasture Planting.

### Conservation practices

|                             |
|-----------------------------|
| Forage and Biomass Planting |
|-----------------------------|

## **Pathway 4.1B**

### **Community 4.1 to 4.3**

The Cropland Community can be converted into the Native Seeding Community with the use of Prescribed Grazing, Range Planting, and Prescribed Burning.

#### **Conservation practices**

|                    |
|--------------------|
| Prescribed Burning |
| Prescribed Grazing |
| Range Planting     |

## **Pathway 4.2A**

### **Community 4.2 to 4.1**

The Pastureland Community (monocultures) can be shifted to the Cropland Community through the use of Crop Cultivation practices.

## **Pathway 4.2B**

### **Community 4.2 to 4.3**

The Pastureland Community (monocultures) can be converted into the Native Seeding Community through the use of Prescribed Grazing, Range Planting, and Prescribed Burning.

#### **Conservation practices**

|                    |
|--------------------|
| Prescribed Burning |
| Range Planting     |
| Prescribed Grazing |

## **Pathway 4.3A**

### **Community 4.3 to 4.1**

Brush Management and Crop Cultivation can assist in reverting the Native Seeding Community into the Cropland Community.

#### **Conservation practices**

|                  |
|------------------|
| Brush Management |
|------------------|

## **Pathway 4.3B**

### **Community 4.3 to 4.2**

Prescribed Grazing and Pasture Planting can shift the Native Seeding Community into the Pastureland (monocultures) Community.

#### **Conservation practices**

|                             |
|-----------------------------|
| Forage and Biomass Planting |
| Prescribed Grazing          |

## **Transition T1A**

### **State 1 to 2**

With the use of Heavy Continuous Grazing, Idle, and No Fire, the Tallgrass/Oak Savannah State can shift to the

Oak/Juniper/Midgrass State.

### **Transition T1B**

#### **State 1 to 4**

With the implementation of various practices such as Brush Management, Crop Cultivation, Range Planting, and Pasture Planting, The Savannah State shifts to the Converted Land State.

### **Restoration pathway R2A**

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

The Oak/Juniper/Midgrass State could be reverted back to the Tallgrass/Oak Savannah State through the implementation of Prescribed Grazing, Brush Management, Range Planting, and Prescribed Burning.

#### **Conservation practices**

|                    |
|--------------------|
| Brush Management   |
| Prescribed Burning |
| Prescribed Grazing |
| Range Planting     |

### **Transition T2A**

#### **State 2 to 3**

With heavy continuous grazing, land being idled, and no fires, the Oak/Juniper/Midgrass State can shift to the Oak/Juniper/Mesquite Complex State.

### **Transition T2B**

#### **State 2 to 4**

With various conservation practices such as Brush Management, Crop Cultivation, Pasture Planting, Range Planting, Prescribed Grazing, and Prescribed Burning applied, the Oak/Juniper/Midgrass State can shift to the Converted Land State.

### **Restoration pathway R3A**

#### **State 3 to 2**

Prescribed Grazing, Brush Management, Range Planting, and Prescribed Burning are some conservation practices that are necessary to shift the Oak/Juniper/Mesquite Complex State to the Oak/Juniper/Midgrass State.

#### **Conservation practices**

|                    |
|--------------------|
| Brush Management   |
| Prescribed Burning |
| Prescribed Grazing |
| Range Planting     |

### **Restoration pathway R4A**

#### **State 4 to 1**

With Prescribed Grazing and Prescribed Burning, the Converted Land State can be reverted back to the Tallgrass/Oak Savannah State.

#### **Conservation practices**

|                    |
|--------------------|
| Prescribed Burning |
| Prescribed Grazing |

## Restoration pathway R4B

### State 4 to 3

With heavy continuous grazing, no brush management, no fires, and land being idled, the Converted Land State can shift to the Oak/Juniper/Midgrass State.

## Additional community tables

Table 11. Community 1.1 plant community composition

| Group                  | Common Name                | Symbol | Scientific Name                                      | Annual Production (Lb/Acre) | Foliar Cover (%) |
|------------------------|----------------------------|--------|--|-----------------------------|------------------|
| <b>Grass/Grasslike</b> |                            |        |  |                             |                  |
| 1                      | <b>Tallgrasses</b>         |        |  | 2200–3300                   |                  |
|                        | big bluestem               | ANGE   | <i>Andropogon gerardii</i>                           | 350–3300                    | –                |
|                        | switchgrass                | PAVI2  | <i>Panicum virgatum</i>                              | 350–3300                    | –                |
|                        | little bluestem            | SCSC   | <i>Schizachyrium scoparium</i>                       | 350–3300                    | –                |
|                        | Indiangrass                | SONU2  | <i>Sorghastrum nutans</i>                            | 350–3300                    | –                |
|                        | eastern gamagrass          | TRDA3  | <i>Tripsacum dactyloides</i>                         | 350–3300                    | –                |
|                        | purpletop tridens          | TRFL2  | <i>Tridens flavus</i>                                | 350–3300                    | –                |
| 2                      | <b>Midgrasses</b>          |        |  | 600–900                     |                  |
|                        | cane bluestem              | BOBA3  | <i>Bothriochloa barbinodis</i>                       | 100–900                     | –                |
|                        | sideoats grama             | BOCU   | <i>Bouteloua curtipendula</i>                        | 100–900                     | –                |
|                        | silver beardgrass          | BOLAT  | <i>Bothriochloa laguroides</i> ssp. <i>torreyana</i> | 100–900                     | –                |
|                        | vine mesquite              | PAOB   | <i>Panicum obtusum</i>                               | 100–900                     | –                |
|                        | composite dropseed         | SPCOC2 | <i>Sporobolus compositus</i> var. <i>compositus</i>  | 100–900                     | –                |
|                        | Drummond's dropseed        | SPCOD3 | <i>Sporobolus compositus</i> var. <i>drummondii</i>  | 100–900                     | –                |
| 3                      | <b>Cool-season Grasses</b> |        |  | 400–600                     |                  |
|                        | sedge                      | CAREX  | <i>Carex</i>   | 100–600                     | –                |
|                        | Canada wildrye             | ELCA4  | <i>Elymus canadensis</i>                             | 100–600                     | –                |
|                        | Virginia wildrye           | ELVI3  | <i>Elymus virginicus</i>                             | 100–600                     | –                |
|                        | Texas wintergrass          | NALE3  | <i>Nassella leucotricha</i>                          | 100–600                     | –                |
| 4                      | <b>Midgrasses</b>          |        |  | 200–300                     |                  |
|                        | plains lovegrass           | ERIN   | <i>Eragrostis intermedia</i>                         | 50–300                      | –                |
|                        | Texas cupgrass             | ERSE5  | <i>Eriochloa sericea</i>                             | 50–300                      | –                |
|                        | white tridens              | TRAL2  | <i>Tridens albescens</i>                             | 50–300                      | –                |
| 5                      | <b>Shortgrasses</b>        |        |  | 200–300                     |                  |
|                        | purple threeawn            | ARPUP9 | <i>Aristida purpurea</i> var. <i>perplexa</i>        | 0–300                       | –                |
|                        | Wright's threeawn          | ARPUW  | <i>Aristida purpurea</i> var. <i>wrightii</i>        | 0–300                       | –                |
|                        | buffalograss               | BODA2  | <i>Bouteloua dactyloides</i>                         | 0–300                       | –                |
|                        | fall witchgrass            | DICO6  | <i>Digitaria cognata</i>                             | 0–300                       | –                |
|                        | Heller's rosette grass     | DIOL   | <i>Dichanthelium oligosanthes</i>                    | 0–300                       | –                |

|                   |                               |        |   |         |   |
|-------------------|-------------------------------|--------|---|---------|---|
|                   | curly-mesquite                | HIBE   | <i>Hilaria belangeri</i>                              | 0–300   | – |
| <b>Forb</b>       |                               |        |   |         |   |
| 6                 | <b>Forbs</b>                  |        |   | 190–290 |   |
|                   | Cuman ragweed                 | AMPS   | <i>Ambrosia psilostachya</i>                          | 0–290   | – |
|                   | sagebrush                     | ARTEM  | <i>Artemisia</i>                                      | 0–290   | – |
|                   | yellow sundrops               | CASE12 | <i>Calylophus serrulatus</i>                          | 0–290   | – |
|                   | whitemouth dayflower          | COER   | <i>Commelina erecta</i>                               | 0–290   | – |
|                   | prairie clover                | DALEA  | <i>Dalea</i>  | 0–290   | – |
|                   | purple prairie clover         | DAPU5  | <i>Dalea purpurea</i>                                 | 0–290   | – |
|                   | Illinois bundleflower         | DEIL   | <i>Desmanthus illinoensis</i>                         | 0–290   | – |
|                   | blacksamson echinacea         | ECAN2  | <i>Echinacea angustifolia</i>                         | 0–290   | – |
|                   | Engelmann's daisy             | ENPE4  | <i>Engelmannia peristenia</i>                         | 0–290   | – |
|                   | beeblossom                    | GAURA  | <i>Gaura</i>  | 0–290   | – |
|                   | Maximilian sunflower          | HEMA2  | <i>Helianthus maximiliani</i>                         | 0–290   | – |
|                   | bluet                         | HOUST  | <i>Houstonia</i>                                      | 0–290   | – |
|                   | coastal indigo                | INMI   | <i>Indigofera miniata</i>                             | 0–290   | – |
|                   | trailing krameria             | KRLA   | <i>Krameria lanceolata</i>                            | 0–290   | – |
|                   | dotted blazing star           | LIPU   | <i>Liatris punctata</i>                               | 0–290   | – |
|                   | Nuttall's sensitive-briar     | MINU6  | <i>Mimosa nuttallii</i>                               | 0–290   | – |
|                   | yellow puff                   | NELU2  | <i>Neptunia lutea</i>                                 | 0–290   | – |
|                   | beardtongue                   | PENST  | <i>Penstemon</i>                                      | 0–290   | – |
|                   | groundcherry                  | PHYSA  | <i>Physalis</i>                                       | 0–290   | – |
|                   | snoutbean                     | RHYNC2 | <i>Rhynchosia</i>                                     | 0–290   | – |
|                   | wild petunia                  | RUELL  | <i>Ruellia</i>  | 0–290   | – |
|                   | pitcher sage                  | SAAZG  | <i>Salvia azurea</i> var. <i>grandiflora</i>          | 0–290   | – |
|                   | Texas star                    | SACA3  | <i>Sabatia campestris</i>                             | 0–290   | – |
|                   | false gaura                   | STLI2  | <i>Stenosiphon linifolius</i>                         | 0–290   | – |
|                   | white heath aster             | SYERE  | <i>Symphyotrichum ericoides</i> var. <i>ericoides</i> | 0–290   | – |
| 7                 | <b>forbs</b>                  |        |   | 10–20   |   |
|                   | American star-thistle         | CEAM2  | <i>Centaurea americana</i>                            | 0–20    | – |
|                   | croton                        | CROTO  | <i>Croton</i>   | 0–20    | – |
|                   | Leavenworth's eryngo          | ERLE11 | <i>Eryngium leavenworthii</i>                         | 0–20    | – |
|                   | snow on the mountain          | EUMA8  | <i>Euphorbia marginata</i>                            | 0–20    | – |
|                   | hoary false goldenaster       | HECA8  | <i>Heterotheca canescens</i>                          | 0–20    | – |
|                   | groundcherry                  | PHYSA  | <i>Physalis</i>                                       | 0–20    | – |
|                   | upright prairie<br>coneflower | RACO3  | <i>Ratibida columnifera</i>                           | 0–20    | – |
|                   | Texas star                    | SACA3  | <i>Sabatia campestris</i>                             | 0–20    | – |
|                   | twoleaf senna                 | SERO8  | <i>Senna roemeriana</i>                               | 0–20    | – |
|                   | fanpetals                     | SIDA   | <i>Sida</i>   | 0–20    | – |
| <b>Shrub/Vine</b> |                               |        |   |         |   |
| 8                 | <b>Shrubs/Vines</b>           |        |   | 120–180 |   |
|                   | Texas redbud                  | CECAT  | <i>Cercis canadensis</i> var. <i>texensis</i>         | 0–180   | – |
|                   | jointfir                      | EDHER  | <i>Ehretia</i>  | 0–180   | – |



|  | Common                    | Acronym | Scientific Name             | Height | Notes |
|--|---------------------------|---------|-----------------------------|--------|-------|
|  | stretchberry              | FOPU2   | <i>Forestiera pubescens</i> | 0–180  | –     |
|  | western white honeysuckle | LOAL    | <i>Lonicera albiflora</i>   | 0–180  | –     |
|  | algerita                  | MATR3   | <i>Mahonia trifoliolata</i> | 0–180  | –     |
|  | plum                      | PRUNU   | <i>Prunus</i>               | 0–180  | –     |
|  | fragrant sumac            | RHAR4   | <i>Rhus aromatica</i>       | 0–180  | –     |
|  | winged sumac              | RHCO    | <i>Rhus copallinum</i>      | 0–180  | –     |
|  | saw greenbrier            | SMBO2   | <i>Smilax bona-nox</i>      | 0–180  | –     |

#### Tree

|   |                |        |                                   |        |   |
|---|----------------|--------|-----------------------------------|--------|---|
| 9 | <b>Trees</b>   |        |                                   | 80–120 |   |
|   | hackberry      | CELT1  | <i>Celtis</i>                     | 0–120  | – |
|   | Texas red oak  | QUBU2  | <i>Quercus buckleyi</i>           | 0–120  | – |
|   | Texas live oak | QUFU   | <i>Quercus fusiformis</i>         | 0–120  | – |
|   | blackjack oak  | QUMA3  | <i>Quercus marilandica</i>        | 0–120  | – |
|   | post oak       | QUST   | <i>Quercus stellata</i>           | 0–120  | – |
|   | bully          | SIDER2 | <i>Sideroxylon</i>                | 0–120  | – |
|   | elm            | ULMUS  | <i>Ulmus</i>                      | 0–120  | – |
|   | Hercules' club | ZACL   | <i>Zanthoxylum clava-herculis</i> | 0–120  | – |

## Animal community

The Tallgrass/Oak Savannah Community (1) is habitat for migratory bison herds. Deer and turkey were mostly found along the wooded streams occasionally feeding on the open savannah. Large predators such as wolves, coyotes, mountain lions and black bears roamed throughout the area. White-tailed deer, turkey, bobcats and coyotes along with resident and migratory birds and small mammals can find suitable habitat today. Domestic livestock is the dominant grazer of the site. As the savannah changes through the various vegetative states towards the shrubland state, the quality of the habitat may improve for some species and decline for others. Management must be applied to maintain a vegetative state in optimum habitat quality for the desired animal species. Prescribed fire is sometimes used as a tool to promote diversity, mainly for wildlife.

## Hydrological functions

Peak rainfall periods occur in April, May, June, September and October. Rainfall amounts may be high (3 to 10 inches per event) and events may be intense. The soils of this site are deep. Periods of 60 plus days of little or no rainfall during the growing season are common. During periods of good rainfall with good grass cover, water infiltrates to the limestone rock below and moves to lower elevations and emerges as seeps and springs. The hydrology of this site may be manipulated with management to yield higher runoff volumes or greater infiltration to groundwater. Management for less herbaceous cover will favor higher surface runoff while dense herbaceous cover improves the water cycle. Potential movement of soil (erosion), pesticides and both organic and inorganic nutrients (fertilizer) should always be considered when managing for higher volumes of surface runoff.

## Recreational uses

Hunting, hiking, camping, equestrian, bird watching and off road vehicle use.

## Wood products

None.

## Other products

None.

## Other information

None.

## Inventory data references

Information presented here has been derived from NRCS clipping data and field observations of range trained personnel: James Luton RMS, Montague; William Donham, DC, Weatherford; Kent Ferguson RMS, Weatherford; Dan Caudle

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### Approval

Bryan Christensen, 9/21/2023

### 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.

|   |  |
|---|--|
| Author(s)/participant(s)                    | Lem Creswell, Zone RMS, NRCS, Weatherford, Texas |
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| Date  | 02/20/2006                                       |
| Approved by                                 | Bryan Christensen                                |
| Approval date                               |  |
| Composition (Indicators 10 and 12) based on | Annual Production                                |

## Indicators

- 1. Number and extent of rills:** Matched what is expected for the site; minimal evidence of past or current rills; vegetation common and no signs of erosion.  

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- 2. Presence of water flow patterns:** This site has minimal flow patterns and minimal evidence of past or current soil deposition or erosion.  

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- 3. Number and height of erosional pedestals or terracettes:** Some very minor pedestalling may occur. Rarely should they be over 1/4 inch height.  

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- 4. Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** 0 to 10 percent bare ground. Small and non-connected areas.  

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- 5. Number of gullies and erosion associated with gullies:** None.  

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

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- 7. Amount of litter movement (describe size and distance expected to travel):** Minimal and short. < 6 inches. Only

associated with water flow patterns following extremely high intensity rainfall.

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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 surface is stabilized by organic matter, decomposition products and/or a biological crust.
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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Very dark grayish brown clay surface 8 to 20 inches thick with very strong very fine subangular blocky and granular structure. Fragments of gravels, cobbles, and stones range from 10 to 80 percent in the soil profile. SOM is 1 to 4 percent.
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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** High canopy and basal cover and density with small interspaces make rainfall impact negligible. This site has well drained soils, slowly permeable, negligible runoff and erosion.
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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):** None.
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12. **Functional/Structural Groups (list in order of descending dominance by above-ground annual-production or live foliar cover using symbols: >>, >, = to indicate much greater than, greater than, and equal to):**
- Dominant: Warm-season tallgrasses >>
- Sub-dominant: Warm-season midgrasses >
- Other: warm-season shortgrasses > forbs = trees > shrubs/vines
- Additional:
- 
13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** Minimal under normal weather conditions. Grasses almost always show some decadence and mortality.
- 
14. **Average percent litter cover (%) and depth ( in):** Litter is dominantly herbaceous and covers most all plant and rock interspaces.
- 
15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 4000 to 6000 #/acre. 4000 pounds in below average moisture years, 5000 pounds in "normal" years and 6000 pounds in above average moisture years.
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16. **Potential invasive (including noxious) species (native and non-native). List species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not**

**invasive plants. Note that unlike other indicators, we are describing what is NOT expected in the reference state for the ecological site:** Ashe juniper, prickly pear, and mesquite are the primary invaders.

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17. **Perennial plant reproductive capability:** All perennial plants are capable of reproducing except during periods of prolonged drought conditions, heavy natural herbivory and intense wildfires.
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