# Ecological site R077DY046TX
# Sandy 12-17" PZ

Last updated: 9/11/2023
Accessed: 05/19/2024

## General information

**Provisional**. A provisional ecological site description has undergone quality control and quality assurance review. It contains a working state and transition model and enough information to identify the ecological site.


**Figure 1. Mapped extent**

Areas shown in blue indicate the maximum mapped extent of this ecological site. Other ecological sites likely occur within the highlighted areas. It is also possible for this ecological site to occur outside of highlighted areas if detailed soil survey has not been completed or recently updated.

## MLRA notes

Major Land Resource Area (MLRA): 077D–Southern High Plains, Southwestern Part

This MLRA 77D is characterized by nearly level to gently undulating plains with scattered playa depressions. Soil temperature regime is thermic and soil moisture regime is aridic bordering on ustic. Sandy and loamy soils are generally well drained and range from shallow to deep and medium- to coarse-textured. Native vegetation is short- to midgrasses and sandy sites support tallgrasses with sand shin oak and mesquite. Current land use is mainly rangeland, although irrigated cropland is expanding.

## 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

This site occurs on undulating, moderately deep and deep, sandy soils. The reference vegetation consists of tallgrasses, midgrasses, forbs and shrubs. Sand Shinoak is the major shrub species. Abusive grazing practices may lead to a shift in the species composition and alter the plant community. Without periodic fires, the canopy cover of the shrub species may increase.

## Associated sites

| | |
|---|---|
| R077DY039TX | **Draw 12-17" PZ**<br>Draw sites are sometimes associated with Sandy sites MLRA 77D. Draw sites may occur downslope and adjacent to sandy sites. Production is often higher than on the Sandy sites. |
| R077DY040TX | **High Lime 12-17" PZ**<br>High Lime sites are sometimes associated with Sandy sites MLRA 77D. High Lime sites may occur up slope and adjacent to sandy sites. Production is often higher than on the Sandy sites. |
| R077DY045TX | **Sand Hills 12-17" PZ**<br>Sand Hills sites can be associated with Sandy sites MLRA 77D. Sand Hills may occur as rolling dunes or hills scattered throughout and adjacent to sandy sites. Production is often lower than on the Sandy sites. |
| R077DY047TX | **Sandy Loam 12-17" PZ**<br>Sandy Loam sites are generally associated with Sandy sites MLRA 77D. Sandy Loam sites may occur as individual pockets of tighter soils within or near the outer edges of sandy sites. Production is often higher than on the Sandy sites. |

## Similar sites

| | |
|---|---|
| R077EY064TX | **Sandy 16-24" PZ**<br>Sandy sites (MLRA 77E) have similar forage plant communities with higher production due to higher mean annual production (16 - 24 inches). |
| R077CY035TX | **Sandy 16-21" PZ**<br>Sandy sites (MLRA 77C) have similar forage plant communities with higher production due to higher mean annual production (16 - 21 inches). |
| R077DY045TX | **Sand Hills 12-17" PZ**<br>Sand Hills are only similar to sandy sites in soil texture and the fact that both sites support a high percentage of tall grasses. Overall production will be considerably higher on sandy sites. |

**Table 1. Dominant plant species**

| | |
|---|---|
| Tree | Not specified |
| Shrub | (1) *Quercus havardii*<br>(2) *Artemisia filifolia* |
| Herbaceous | (1) *Andropogon hallii*<br>(2) *Schizachyrium scoparium* |

## Physiographic features

The Sandy site is composed of nearly level to undulating gently sloping plains, concave plains in broad, shallow basins and swales, and adjacent to natural drainage ways. Due to the sandy nature of this site, runoff is negligible to very low. Water movement is also dependant on amount of vegetative cover and intensity of precipitation events. Slope ranges from 0 to 8 percent. Elevation is 2,500 to 4,600 ft.

**Table 2. Representative physiographic features**

| | |
|---|---|
| Landforms | (1) Plateau > Plain |
| Runoff class | Negligible to low |
| Flooding frequency | None |
| Ponding frequency | None |
| Elevation | 762–1,402 m |
| Slope | 0–8% |
| Water table depth | 203 cm |
| Aspect | W, NW, N, NE, E, SE, S, SW |

## Climatic features

Continental Steppe climate is prevalent in MLRA 77D. This climate type is typical of interiors of continents and is characterized by large variations in the magnitude of ranges in daily temperature extremes, low relative humidity, and irregularly spaced rainfall of moderate amounts. This climate regime is also known for being semi-arid with mild winters.

Droughts occur with monotonous frequency although there will be years having excessive precipitation resulting in large accumulations of water that little benefit is obtained from the rainfall events. If good rains occur in the spring and summer months, annual production will be favorable even if the remainder of the year is not favorable. Most of the annual precipitation occurs as a result from spring and early summer thunderstorms. Due to the fact that the area is mainly flat, local flooding may occur but only of short duration. There is very little precipitation and infrequent snowfall amounts in the winter.

During the late winter and early spring months, dust storms occur very frequently. The flat plains of the area contribute very little resistance to the strong winds. Dust in many of these storms remains in the air for several days after the storms have passed.

Daytime temperatures are warm in the summer but there is a large diurnal range and most nights are comfortable. In summers, the normal daily maximum temperatures are in the low to mid 90s and the normal minimum temperatures are in the upper 60s and low 70s. Even though the temperatures may be high, the low humidity and high evaporation rates create a cooling effect during the nighttime hours. Fall months exhibit extremely variable weather. Winters are mild and are characterized by frequent cold fronts accompanied by strong, gusty, northerly winds. Most of the cold fronts are dry as they pass through the area.

**Table 3. Representative climatic features**

| | |
|---|---|
| Frost-free period (characteristic range) | 154-191 days |
| Freeze-free period (characteristic range) | 181-194 days |
| Precipitation total (characteristic range) | 381-432 mm |
| Frost-free period (actual range) | 147-195 days |
| Freeze-free period (actual range) | 171-213 days |
| Precipitation total (actual range) | 381-432 mm |
| Frost-free period (average) | 167 days |
| Freeze-free period (average) | 190 days |
| Precipitation total (average) | 406 mm |

## Climate stations used

- (1) MELROSE [USC00295617], Melrose, NM
- (2) ELIDA [USC00292854], Elida, NM
- (3) CROSSROADS 2 [USC00292207], Crossroads, NM
- (4) CAPROCK [USC00291445], Caprock, NM
- (5) TATUM [USC00298713], Tatum, NM
- (6) HOBBS 13W [USC00294030], Lovington, NM
- (7) ANDREWS [USC00410248], Andrews, TX
- (8) ODESSA SCHLEMEYER FLD [USW00003031], Odessa, TX
- (9) K-BAR RCH [USC00414710], Odessa, TX

## Influencing water features

Non-stream characteristics: Sandy soils allow for rapid infiltration. In years with above average rainfall, some water may percolate beyond the root zone and recharge shallow aquifers. Maximum amounts of water are available to plants. Small rainfall events may have a visible effect on vegetation.

Stream characteristics: No streams are found within the site.

## Wetland description

None.

## Soil features

The Sandy site is made up of moderately deep to very deep, noncalcareous loamy sands and loamy fine sands on uplands and shallow swales. This site was formed from loamy eolian sediments and slopes range from 0 to 8 percent. These soils are well drained with moderate permeability. Fertility is moderate, water storage capacity is low, and runoff is slight to moderate, depending on slope and vegetative cover. Due to the loamy fine sand and fine sand surface texture, wind and water erosion is moderate without vegetative cover. Plant roots easily penetrate the soil.

The associated soils for this site include: Amarosa loamy fine sand, Delphos loamy fine sand, Douro loamy fine sand, Elida fine sand, Faskin loamy fine sand, Jalmar fine sand, and Triomas loamy fine sand.

**Table 4. Representative soil features**

| | |
|---|---|
| Parent material | (1) Eolian deposits–igneous, metamorphic and sedimentary rock |
| Surface texture | (1) Loamy fine sand<br>(2) Fine sand |
| Family particle size | (1) Coarse-loamy<br>(2) Fine-loamy<br>(3) Loamy |
| Drainage class | Well drained |
| Permeability class | Moderate to rapid |
| Depth to restrictive layer | 51–152 cm |
| Soil depth | 51–203 cm |
| Surface fragment cover <=3" | 0–3% |
| Surface fragment cover >3" | 0% |
| Available water capacity (0-101.6cm) | 5.08–17.78 cm |
| Calcium carbonate equivalent (0-101.6cm) | 0–50% |
| Electrical conductivity (0-101.6cm) | 0–2 mmhos/cm |
| Sodium adsorption ratio (0-101.6cm) | 0–2 |
| Soil reaction (1:1 water) (0-101.6cm) | 6.1–9 |
| Subsurface fragment volume <=3" (0-101.6cm) | 0–19% |
| Subsurface fragment volume >3" (0-101.6cm) | 0% |

## Ecological dynamics

The Sandy ecological site is found on nearly level to gently rolling sandy textured soils with convex slopes. Surface soils are primarily loamy fine sands, but some fine sands occur. The deep course textured soils are well drained and have moderate to rapid permeability. The soils have a good soil moisture relationship, but a calcium carbonate layer

sometimes limits plant growth. Because of the rainfall pattern, most plant growth takes place from late spring to fall favoring warm-season bunchgrasses. A good variety of tall and mid-grasses dominate the reference plant community.

The Reference Plant Community of the Sandy Ecological Site in MLRA 77D is presumed to have been Tall-Midgrass Grassland Community (1.1)1. It supported tall and midgrasses, widely scattered Havard oak and a good variety of forbs. Characteristic tall grasses include little, sand and cane bluestem and mesa, giant and spike dropseed. Midgrasses such as sideoats grama, sand dropseed, plains bristlegrass and three-awns contribute as much as 25 percent of the annual production. See the Plant Composition and Annual Production Table below for estimated composition and production of the species presumed to be present in the reference community.

Pre-settlement disturbances included grazing or browsing by endemic pronghorn antelope and migratory bison, re-occurring droughts and frequent fires. Wildfires re-occurred at frequent intervals (Frost 1998) suppressing woody species and forbs. Since settlement in the late 1800s, continuous overgrazing by livestock, and possibly climate change (Milchunas 2006), have interacted with reduced fire frequency and intensity to give the competitive advantage to woody plant species. Although continued overgrazing is most likely the major culprit, the interaction of these disturbances has changed the composition and structure of the plant community dramatically on most areas of this site. Most areas of the site are now shrub dominated unless brush management practices have been applied.

Continuous overgrazing causes a reduction of more palatable species, such as the bluestems, a decline in soil cover and organic matter and reduction in fire intensity. The shift in plant cover and decline in frequency and intensity of fires favors woody plant encroachment. The woody, and herbaceous, invaders are generally endemic species released from competition from grasses and fire suppression. As Havard oak, mesquite, sand sagebrush and yucca invade the site under continuous heavy grazing, the plant community shifts from a tall and midgrass dominated to a Midgrass/Shrubs Invading Community (2). Grasses still dominate annual herbage production in this plant type, but the encroaching woody species increase proportionally.

With continued overgrazing, reduction of the frequency and intensity of fires and shrub invasion, the Midgrass/Shrubs Invading Grassland Community (2) transitions into one that is increasingly occupied by woody plants. Droughts, which occur at approximately 20-year intervals in this region, amplify this situation. During the transition the more grazing resistant grasses such as perennial three-awns, sand dropseed, lovegrasses, fringed signalgrass and less palatable forbs begin replacing the tall and midgrasses. As the grass cover declines, litter, mulch and soil organic matter decline and bare ground, erosion and other desertification processes increase. This trend can be reversed, or at least slowed under the present climate, with proper stocking and brush suppression practices, such as fire or individual plant treatments (IPT). Rest from grazing will generally not restore the grassland community, however, when the woody plant community exceeds 20 percent canopy on this site and/or the plants reach fire resistant age ( two years) and/or reproductive maturity. When this threshold is reached, the Midgrass/Shrubs Invading Community (2.1) transitions into a Mixed Shortgrass-Shrub Community (2.2). This threshold also marks the beginning of a new stable state, the Shrubland State where the shrubs dominate production and other ecological processes. Reversal of this transition is not possible without accelerating conservation and management practices that control the woody invaders. Once shrubs become dominant, prescribed burning is not an option because fine fuel quantity and continuity is limited.

Havard oak and mesquite dominate the Mixed Shortgrass-Shrub Community (2.2). Havard oak dominates in the deeper fine sand soils, while mesquite usually becomes dominant in the loamy fine sand soils. The grass component is a mixture of low palatability grasses, low quality forbs and annuals. With continued livestock overgrazing, the more palatable tall and midgrasses continue to decrease and are replaced by shortgrasses, such as hooded windmillgrass, sand dropseed and threeawns. In early stages (20-30% shrub cover) the increase of noxious species can be reversed with relatively inexpensive brush control practices such as chemical aerial applications and/or individual plant treatments along with good grazing management. Generally, prescribed burning is not an option once this site has reached phase 2.2. The lack of fine fuel and poor continuity will limit the effectiveness of prescribed burning. The high possibility of wind erosion generally excludes mechanical brush control treatments, but herbicide treatments can be effective. If these practices are not applied and overgrazing continues, the woody species will continue to increase in dominance. Once the brush canopy exceeds 50 percent, annual production for the herbaceous species is limited to low quality shortgrasses and annual grasses and forbs within shrub interspaces. This plant community, the Shrubs/Shortgrass/Annuals Community (4), becomes a stable shrubland, dominated by either Havard oak or mesquite, or both. Reversal of this plant type requires extensive

reclamation practices. Under extreme overgrazing and extended drought conditions dunes can form.

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

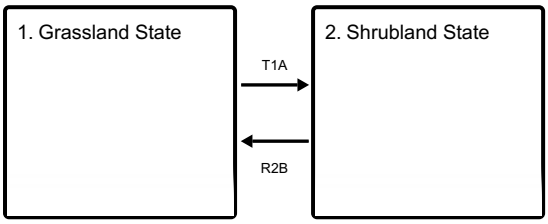
STATE AND TRANSITIONAL PATHWAYS: (DIAGRAM)

Narrative:

The following diagram suggests some pathways that the vegetation on this site might take. There may be other states not shown on the diagram. This information is intended to show what might happen in a given set of circumstances; it does not mean that this would happen the same way in every instance. Local professional guidance should always be sought before pursuing a treatment scenario.

## State and transition model

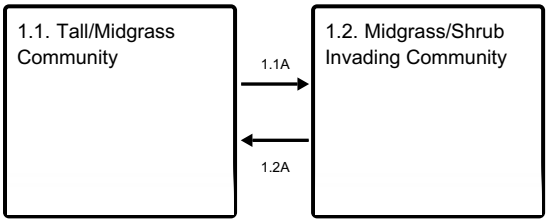
**Ecosystem states**



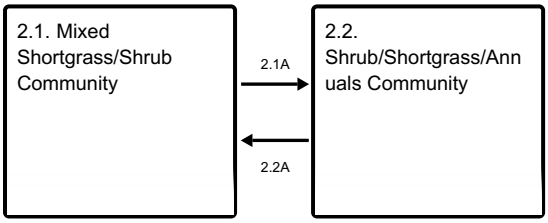

**T1A** - Absence of disturbance and natural regeneration over time, may be coupled with excessive grazing pressure

**R2A** - Adequate rest from defoliation and removal of woody canopy, followed by reintroduction of historic disturbance regimes

**State 1 submodel, plant communities**




**State 2 submodel, plant communities**




## State 1
## Grassland State

The Tall/Midgrass Community (1.1) is the interpretive or "reference" plant community for the Sandy Ecological Site. Herbivory by migrating bison and indigenous antelope influenced the plant composition and structure, but not as much as frequent and intense wildfires and recurring long droughts, which kept woody species in check. Havard oak motts were widely scattered in protected areas, but probably made up less than ten percent of the plant canopy. Sand sagebrush, broom snakeweed and yucca were also typical, but infrequent, shrubs. Little and sand bluestem along with mesa and giant dropseeds were the dominant or co-dominant grasses throughout the site depending on variations in soils and water relations. Also occurring on the site, but in smaller amounts, were midgrasses cane and silver bluestems, black grama, sideoats grama, plains bristlegrass, and spike dropseed. Common forbs found on the site include prairie clover, dotted gayfeather, wild alfalfa, catclaw sensitivebriar and bundleflower. The Tall-Midgrass Grassland community produced from 1,000 to 2,500 pounds of biomass annually. The Midgrass/Shrubs Invading Community (1.2) is the result of the interaction of overgrazing, reduction in intensity and frequency of fires

and possibly climate change. The reduction in vegetative structure and ground cover resulting from continued overgrazing as well as reduction in fire frequency and intensity allows the shrubs to become established. Havard oak, mesquite, broom snakeweed and sand sagebrush increase in density and cover, varying from 10 to 20 percent ground cover. Sand dropseed, hooded windmillgrass and perennial three-awns begin replacing the more palatable tall and midgrasses found in the reference community. Most forbs such as gaura, groundsels, palofoxia and wild buckwheat persist in the Midgrass/Shrubs Invading Community. Annual yield ranges from 800 to 2,300 pounds.

**Dominant plant species**

- sand bluestem (*Andropogon hallii*), grass
- little bluestem (*Schizachyrium scoparium*), grass

## Community 1.1
## Tall/Midgrass Community

**Figure 8. 1.1 Tall/Midgrass Community**

The Tall/Midgrass Community (1.1) is the interpretive or "reference" plant community for the Sandy Ecological Site. It developed under the prevailing climate found by European settlers in the late 1800s. Herbivory by migrating bison and indigenous antelope influenced the plant composition and structure, but not as much as frequent and intense wildfires and recurring long droughts, which kept woody species in check. Havard oak motts were widely scattered in protected areas, but probably made up less than ten percent of the plant canopy. Sand sagebrush, broom snakeweed and yucca were also typical, but infrequent, shrubs. Little and sand bluestem along with mesa and giant dropseeds were the dominant or co-dominant grasses throughout the site depending on variations in soils and water relations. Also occurring on the site, but in smaller amounts, were midgrasses cane and silver bluestems, black grama, sideoats grama, plains bristlegrass, and spike dropseed. Perennial three-awns, hairy grama, fall witchgrass and thin paspalum were the most common shortgrasses. Common forbs found on the site include prairie clover, dotted gayfeather, wild alfalfa, catclaw sensitivebriar and bundleflower. The Tall/Midgrass Community produced from 1,000 to 2,500 pounds of biomass annually, depending upon soil property variation and the amount of precipitation. Severe extended drought conditions could reduce this even further. Grasses produced as much as 85 percent of the annual production. It is presumed that shrubs were limited in this state by an interaction of the competition from the herbaceous grassland component, recurring fires and periodic droughts. The good cover of grasses and mulch aided in the infiltration of rainfall into the moderately permeable soil and reduced runoff. Little runoff occurred and good soil-moisture relationships allowed for high vegetative production during good moisture years. The Tall/Midgrass Community furnished good habitat for grazing type wildlife such as bison and pronghorn antelope and, in recent times, sheep and cattle. This plant type is resilient and recovers well under good grazing management. However, with continuous overgrazing, decrease in intensity and frequency of fires and no brush management, this plant community transitions into a Midgrass/Shrubs Invading Community (1.2). The retrogression is reversible with good grazing management that gives the competitive advantage to the grass component and provides fine fuels for periodic prescribed fires.

**Table 5. Annual production by plant type**

| Plant Type | Low (Kg/Hectare) | Representative Value (Kg/Hectare) | High (Kg/Hectare) |
|---|---|---|---|
| Grass/Grasslike | 953 | 1429 | 2382 |
| Shrub/Vine | 112 | 168 | 280 |
| Forb | 56 | 84 | 140 |
| Microbiotic Crusts | – | – | – |
| Tree | – | – | – |
| **Total** | **1121** | **1681** | **2802** |

**Figure 10. Plant community growth curve (percent production by month). TX1251, Warm-season bunchgrasses w/ forbs & shrubs. Warm-season bunchgrasses with forbs and shrubs..**

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1 | 3 | 5 | 12 | 16 | 15 | 20 | 18 | 9 | 1 | 0 |

## Community 1.2
## Midgrass/Shrub Invading Community

**Figure 11. 1.2 Midgrass/Shrub Invading Community**

The Midgrass/Shrubs Invading Community (1.2) is the result of the interaction of overgrazing, reduction in intensity and frequency of fires and possibly climate change (Milchunas 2006). The reduction in vegetative structure and ground cover resulting from continued overgrazing reduces the competitive advantage of grasses and allows increases in indigenous shrubs and invasion of shrubs from adjacent sites. Reduction in fire frequency and intensity allows the shrubs to become established. The composition of the Midgrass/Shrubs Invading Community (1.2) varies with time and intensity of grazing. Most climax species are present, but the more palatable species decrease while less palatable species increase. Havard oak, mesquite, broom snakeweed and sand sagebrush increase in density and cover, varying from 10 to 20 percent ground cover. Litter and soil organic matter are lower than the reference community. Sand dropseed, hooded windmillgrass and perennial three awns begin replacing the more palatable tall and midgrasses found in the reference community. Most forbs such as gaura, groundsels, palofoxia and wild buckwheat persist in the Midgrass/Shrubs Invading type. Annual yields range from 800 to 2,300 pounds. Total herbage production is only slightly reduced, due primarily to fertility loss, but production by woody species and unpalatable forbs increases as their percentage composition increases. The community can be maintained and retrogression reversed by proper grazing, brush management and periodic prescribed burning. With continued overgrazing, however, the shrub component matures and starts to dominate. When woody plant cover reaches about 20 percent and the shrubs become resistant to fire this community transitions into a Mixed Shortgrass/Shrub Community (2.1).

**Table 6. Annual production by plant type**

| Plant Type | Low (Kg/Hectare) | Representative Value (Kg/Hectare) | High (Kg/Hectare) |
|---|---|---|---|
| Grass/Grasslike | 717 | 1255 | 2062 |
| Shrub/Vine | 135 | 235 | 387 |
| Forb | 45 | 78 | 129 |
| Microbiotic Crusts | – | – | – |
| Tree | – | – | – |
| **Total** | **897** | **1568** | **2578** |

**Figure 13. Plant community growth curve (percent production by month). TX1251, Warm-season bunchgrasses w/ forbs & shrubs. Warm-season bunchgrasses with forbs and shrubs..**

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1 | 3 | 5 | 12 | 16 | 15 | 20 | 18 | 9 | 1 | 0 |

## Pathway 1.1A
## Community 1.1 to 1.2

**Tall/Midgrass Community**

**Midgrass/Shrub Invading Community**

With Heavy Continuous Grazing, No Fire, and Brush Invasion occurring, the Tall/Midgrass Community will convert into the Midgrass/Shrubs Invading Community.

## Pathway 1.2A
## Community 1.2 to 1.1

**Midgrass/Shrub Invading Community**

**Tall/Midgrass Community**

With the implementation of various conservation practices such as Prescribed Grazing, Brush Management, and Prescribed Burning, the Midgrass/Shrubs Invading Community can be reverted back to the Tall/Midgrass Community.

### Conservation practices

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

## State 2
## Shrubland State

The Mixed Shortgrass/Shrub Community supports a 20 to 45 percent woody canopy cover with mesquite, Havard oak, sand sagebrush, broom snakeweed and yucca the most common shrubs. Havard oak generally dominates on deep fine sand areas and mesquite on loamy fine sand portions. This plant type is the result of selective overgrazing

by livestock and the differential response of plants to defoliation over a long period of time. There is a continued decline in diversity of the grassland component and an increase in woody species and unpalatable forbs. The Shrub/Shortgrass/Annuals Community is the result of many years of overgrazing, lack of periodic fires and little brush management. Havard oak and mesquite dominate the Shrub/Shortgrass/Annuals Community, which is essentially a dense shrubland. Under extreme conditions of overgrazing and drought, the site deteriorates to active dunes and blowouts. Common understory shrubs are broom snakeweed, yucca and sand sagebrush. With continued heavy grazing and no brush control, the shrubs can approach 70 percent or more ground cover. Short-grasses and low quality annual and perennial forbs occupy the woody plant interspaces.

**Dominant plant species**

- honey mesquite (*Prosopis glandulosa*), shrub
- Havard oak (*Quercus havardii*), shrub
- sand sagebrush (*Artemisia filifolia*), shrub

## Community 2.1
## Mixed Shortgrass/Shrub Community

**Figure 14. 2.1 Mixed Shortgrass/Shrub Community**

The Mixed Shortgrass/Shrub Community (2.1) supports a 20 to 45 percent woody canopy with mesquite, Havard oak, sand sagebrush, broom snakeweed and yucca the most common shrubs. Havard oak generally dominates on deep fine sand areas and mesquite on loamy fine sand portions. This plant type is the result of selective overgrazing by livestock and the differential response of plants to defoliation over a long period of time. There is a continued decline in diversity of the grassland component and an increase in woody species and unpalatable forbs. Annual herbage production is reduced due to decline in soil fertility, structure and organic matter, and plant composition has shifted strongly toward the non-grass component. Mesquite is a strong invader throughout the site although it usually does not reach as high a density on this site as on more loamy soils of the MLRA. Remnants of palatable grasses and forbs and unpalatable invaders occupy the interspaces between shrubs. Cool-season grasses such as New Mexico feathergrass and bristlegrass, plus other grazing resistant climax species, can be found under and around woody plants. Because of grazing pressure, lowered fertility and competition for nutrients and water from the woody plants the grassland component shows general lack of plant vigor and productivity. Common herbaceous species include three-awns, sand dropseed, broom snakeweed, western ragweed, groundsel and grey goldaster. Total plant production declines somewhat, being approximately 600 to 2,000 pounds per acre, depending on precipitation. Annual production is balanced between herbaceous plants and woody plants. Browsing animals such as goats and deer can find fair food value. Forage quantity and quality for cattle is low. Unless brush management and good grazing management are applied at this stage, the transition toward the Shrub/Shortgrass/Annuals Community (2.2) will continue. The trend cannot be reversed with good grazing management alone. Accelerated brush management practices along with range planting and prescribed grazing is required to return this plant type to grassland.

**Table 7. Annual production by plant type**

| Plant Type | Low (Kg/Hectare) | Representative Value (Kg/Hectare) | High (Kg/Hectare) |
|---|---|---|---|
| Shrub/Vine | 404 | 807 | 1345 |
| Grass/Grasslike | 202 | 404 | 673 |
| Forb | 67 | 135 | 224 |
| Microbiotic Crusts | – | – | – |
| Tree | – | – | – |
| **Total** | **673** | **1346** | **2242** |

**Figure 16. Plant community growth curve (percent production by month). TX1253, Mixed Shortgrass/Shrub Community. Spring and fall growth of mixed shortgrasses and shrubs..**

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1 | 4 | 6 | 10 | 16 | 15 | 20 | 15 | 12 | 1 | 0 |

## Community 2.2
## Shrub/Shortgrass/Annuals Community

**Figure 17. 2.2 Shrub/Shortgrass/Annuals Community**

The Shrub/Shortgrass/Annuals Community (2.2) is the result of many years of overgrazing, lack of periodic fires and little brush management. Havard oak and mesquite dominate the Shrub/Shortgrass/Annuals Community, which is essentially a dense shrubland. Under extreme conditions of overgrazing and drought, the site deteriorates to active dunes and blowouts. Common understory shrubs are broom snakeweed, yucca and sand sagebrush. With continued heavy grazing and no brush control, the shrubs can approach 70 percent or more ground cover. Short-grasses and low quality annual and perennial forbs occupy the woody plant interspaces. Characteristic grasses are bristlegrass, hairy grama, hooded windmillgrass, sand dropseed and three-awns. Grasses and forbs make up 25 percent or less of the annual herbage production. Forbs commonly found in this community include western ragweed, gray goldaster, silverleaf nightshade, catclaw and annuals. The Shrub/Shortgrass/Annuals Community provides good cover for wildlife, but only limited preferred forage, or browse, is available for livestock or wildlife. Major, high cost and high energy, accelerating practices are required to restore the Shrub/Shortgrass/Annuals Community (2.2) back to the grassland state. Generally, brush management practices such as aerial herbicide application, along with other conservation practices such as range planting, grazing deferment, prescribed grazing and prescribed burning are necessary to return the shrubland state the grassland state. This may not be practical or desirable depending on objectives of the land manager.

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

| Plant Type | Low (Kg/Hectare) | Representative Value (Kg/Hectare) | High (Kg/Hectare) |
|---|---|---|---|
| Shrub/Vine | 471 | 942 | 1569 |
| Grass/Grasslike | 135 | 269 | 448 |
| Forb | 67 | 135 | 224 |
| Microbiotic Crusts | – | – | – |
| Tree | – | – | – |
| **Total** | **673** | **1346** | **2241** |

**Figure 19. Plant community growth curve (percent production by month). TX1254, Shrub/Shortgrass/Annuals Community. Spring and fall growth of shortgrasses, annuals, and shrubs..**

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1 | 4 | 6 | 10 | 16 | 15 | 20 | 15 | 12 | 1 | 0 |

## Pathway 2.1A
## Community 2.1 to 2.2

**Mixed Shortgrass/Shrub Community**

**Shrub/Shortgrass/Annuals Community**

With Heavy Continuous Grazing pressure, No Fires, and No Brush Management practices implemented, the Mixed Shortgrass/Shrub Community will transition into the Shrub/Shortgrass/Annuals Community from the Mixed Shortgras/Shrub Community.

## Pathway 2.2A
## Community 2.2 to 2.1

**Shrub/Shortgrass/Annuals Community**

**Mixed Shortgrass/Shrub Community**

With Prescribed Grazing and Brush Management conservation practices, the Shrub/Shortgrass/Annuals Community can be shifted to the Mixed Shortgrass/Shrub Community.

### Conservation practices

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

## Transition T1A
## State 1 to 2

Heavy Continuous Grazing, No Fires, and No Brush Management practices cause the Grassland State to shift into the Shrubland State.

## Restoration pathway R2A

### State 2 to 1

The trend cannot be reversed from the Shrubland State (Mixed Shortgrass/Shrub) to the Grassland State with good grazing management alone. Accelerated brush management practices along with range planting and prescribed grazing is required to return this plant type to grassland (Midgrass/Shrubs Invading).

**Conservation practices**

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

## Restoration pathway R2B
### State 2 to 1

The trend cannot be reversed from the Shrubland State (Shrub/Shortgrass/Annuals) to the Grassland State with good grazing management alone. Accelerated reclamation practices, brush management practices along with range planting and prescribed grazing is required to return this plant type to grassland (Midgrass/Shrubs Invading).

**Conservation practices**

| |
|---|
| Brush Management |
| Prescribed Burning |
| Prescribed Grazing |
| Range Planting |
| Integrated Pest Management (IPM) |

## Additional community tables

**Table 9. Community 1.1 plant community composition**

| Group | Common Name | Symbol | Scientific Name | Annual Production (Kg/Hectare) | Foliar Cover (%) |
|---|---|---|---|---|---|
| **Grass/Grasslike** | | | | | |
| 1 | **Tall/Midgrasses** | | | 448–1121 | |
| | little bluestem | SCSCS | *Schizachyrium scoparium var. scoparium* | 112–280 | – |
| | sand bluestem | ANHA | *Andropogon hallii* | 112–280 | – |
| | mesa dropseed | SPFL2 | *Sporobolus flexuosus* | 112–224 | – |
| | giant dropseed | SPGI | *Sporobolus giganteus* | 112–224 | – |
| | giant sandreed | CAGI3 | *Calamovilfa gigantea* | 0–112 | – |
| 2 | **Midgrasses** | | | 392–981 | |
| | threeawn | ARIST | *Aristida* | 56–140 | – |
| | cane bluestem | BOBA3 | *Bothriochloa barbinodis* | 56–140 | – |
| | sideoats grama | BOCU | *Bouteloua curtipendula* | 56–140 | – |
| | hooded windmill grass | CHCU2 | *Chloris cucullata* | 56–140 | – |
| | large-spike bristlegrass | SEMA5 | *Setaria macrostachya* | 56–140 | – |
| | composite dropseed | SPCOC2 | *Sporobolus compositus var. compositus* | 56–140 | – |
| | sand dropseed | SPCR | *Sporobolus cryptandrus* | 56–140 | – |
| 3 | **Shortgrasses** | | | 112–280 | |
| | hairy grama | BOHI2 | *Bouteloua hirsuta* | 34–95 | – |

| | | | | | |
|---|---|---|---|---|---|
| | fall witchgrass | DICO6 | *Digitaria cognata* | 34–95 | – |
| | thin paspalum | PASE5 | *Paspalum setaceum* | 45–95 | – |
| 4 | **Warm-season grasses** | | | 0–1 | |
| | black grama | BOER4 | *Bouteloua eriopoda* | 0–22 | – |
| | gummy lovegrass | ERCU | *Eragrostis curtipedicellata* | 0–22 | – |
| | red lovegrass | ERSEO | *Eragrostis secundiflora ssp. oxylepis* | 0–22 | – |
| | knotgrass | PADI6 | *Paspalum distichum* | 0–22 | – |
| | Havard's panicgrass | PAHA2 | *Panicum havardii* | 0–22 | – |
| | bristlegrass | SETAR | *Setaria* | 0–22 | – |
| | fringed signalgrass | URCI | *Urochloa ciliatissima* | 0–22 | – |
| | black grama | BOER4 | *Bouteloua eriopoda* | 0–1 | – |
| | gummy lovegrass | ERCU | *Eragrostis curtipedicellata* | 0–1 | – |
| | red lovegrass | ERSEO | *Eragrostis secundiflora ssp. oxylepis* | 0–1 | – |
| | fall panicgrass | PADI | *Panicum dichotomiflorum* | 0–1 | – |
| | Havard's panicgrass | PAHA2 | *Panicum havardii* | 0–1 | – |
| | bristlegrass | SETAR | *Setaria* | 0–1 | – |
| | fringed signalgrass | URCI | *Urochloa ciliatissima* | 0–1 | – |
| 5 | **Cool-season grasses** | | | 0–28 | |
| | needle and thread | HECOC8 | *Hesperostipa comata ssp. comata* | 0–22 | – |
| | New Mexico feathergrass | HENE5 | *Hesperostipa neomexicana* | 0–22 | – |
| **Forb** | | | | | |
| 6 | **Forbs** | | | 56–140 | |
| | Cuman ragweed | AMPS | *Ambrosia psilostachya* | 0–17 | – |
| | prairie clover | DALEA | *Dalea* | 0–17 | – |
| | buckwheat | ERIOG | *Eriogonum* | 0–17 | – |
| | beeblossom | GAURA | *Gaura* | 0–17 | – |
| | trailing krameria | KRLA | *Krameria lanceolata* | 0–17 | – |
| | dotted blazing star | LIPU | *Liatris punctata* | 0–17 | – |
| | evening primrose | OENOT | *Oenothera* | 0–17 | – |
| | palafox | PALAF | *Palafoxia* | 0–17 | – |
| | ragwort | SENEC | *Senecio* | 0–17 | – |
| | toothleaf | STILL | *Stillingia* | 0–17 | – |
| **Shrub/Vine** | | | | | |
| 7 | **Shrubs/Vines** | | | 112–280 | |
| | Havard oak | QUHA3 | *Quercus havardii* | 112–280 | – |
| 8 | **Shrubs/Vines** | | | 0–11 | |
| | sand sagebrush | ARFI2 | *Artemisia filifolia* | 0–11 | – |
| | broom snakeweed | GUSA2 | *Gutierrezia sarothrae* | 0–11 | – |
| | honey mesquite | PRGL2 | *Prosopis glandulosa* | 0–11 | – |
| | yucca | YUCCA | *Yucca* | 0–11 | – |

## Animal community

Many types of grassland insects, reptiles, birds and mammals used the historic climax plant community of the Sandy Ecological Site, either as their base habitat or from the adjacent sites. Mule deer, white-tailed deer, pronghorn antelope and peccary characterize the site. Many kinds of lagomorphs and rodents occupy the site. Predators include coyote, swift fox, badger, bobcat and occasionally mountain lion. Lesser prairie chicken, scaled quail, songbirds, and birds of prey were indigenous or frequent users. Most are still plentiful, except the lesser prairie chicken. Bison also are no longer present, but pronged-horn antelope, white-tailed deer and mule deer utilize the Sandy site in its various states. Deer and quail particularly favor the habitat provided by the Midgrass/Shrubs Invading Community (1.2) and Mixed Shortgrass/Shrub Community (2.1). The lesser prairie chicken prefers an open grassland presented by the Tall/Midgrass (1.1) or Midgrass/Shrub (1.2) Communities.

The site in reference condition was very suited to primary grass eaters such as bison and cattle. As retrogression occurs, and woody plants invade, it becomes better habitat for sheep, goats, deer and other wildlife because of the browse and cover. Predators, however, may preclude sheep and goats. Livestock should be stocked in proportion to the available grass, forb and browse forage, keeping deer competition for forbs and browse in mind. If the animal numbers are not kept in balance with herbage and browse production through grazing management and good wildlife population management, the late Shrub/Shortgrass/Annuals Community (2.2) will have little to offer as habitat except cover and mast.

## Hydrological functions

The Sandy Ecological Site is a moderately permeable sandy upland with nearly level to gentle slopes. Runoff is negligible. However, soil crusting can cause erosion from bare ground on steeper slopes if plant cover is removed, and wind erosion can be severe.

Under reference condition, the grassland vegetation intercepted and utilized much of the incoming rainfall in the soil solum. Only during extended rains or heavy thunderstorms was there much runoff. Litter and soil movement was slight. Standing plant cover, duff and soil organic matter decrease as the Tall-Midgrass Grassland Community (1.1) transitions to the Midgrass/Shrub Community (1.2). These processes continue in the interstitial spaces in the Mixed Shortgrass-Shrub Community (2.1). Evaporation and interception losses are higher, resulting in less moisture reaching the soil. If, overgrazing continues the plant community deteriorates further and soil fertility declines. Biomass production is reduced relative and production shifts from primarily grasses to primarily woody plants. The woody plants compete for moisture with the remaining grasses and forbs further reducing herbage production and ground cover in openings. An accumulation of nutrients occurs within the shrub canopy at the detriment of the inter-shrub space. Decreased litter and more bare ground allow erosion from soils in openings between shrubs. Once the Shrub/Shortgrass/Annuals (2.2) Community canopy surpasses 70 percent the hydrological and ecological processes, nutrient cycling and energy flow, stabilize within the woody plant canopy.

## Recreational uses

The site has little value from and aesthetic standpoint. The deep course textured soils make vehicle travel difficult except by 4-wheel drive vehicles. Hunting, camping, hiking, bird watching, photography and horseback riding are possibilities.

## Wood products

None.

## Other products

None.

## Other information

None.

## Inventory data references

NRCS FOTG – Section II of the FOTG Range Site Descriptions and numerous historical accounts of vegetative conditions at the time of early settlement in the area were used in the development of the original site description.

## Other references

1. Archer S. 1994. Woody plant encroachment into southwestern grasslands and savannas: rates, patterns and proximate causes. In Ecological implications of livestock herbivory in the West, pp.13-68. Edited by M. Vavra, W. Laycock, R. Pieper, Society for Range Management Publication. , Denver, CO.
2. Archer, Steve and F.E. Smeins.1991. Ecosystem-level Processes, Chapter 5 in: Grazing Management: An Ecological Perspective edited by R. K. Heitschmidt and J.W. Stuth. Timber Press, Portland, Oregon.
3. Brown, J. K. and J.K. Smith, Eds. 2000. Wildfire in Ecosystems: Effects of Fire on Flora. Gen. Tech. Rep. RMFRS-GTR-42-vol.2 Ogden, UT: USDA-FS Rocky Mtn. Res. Sta. 257pp.
4. Frost, C. C. 1998. Pre-settlement fire frequency regions of the United States: A first approximation. Tall Timbers Fire Ecology Conference Proceedings No. 20
5. Milchunas, D.G. 2006. Responses of Plant Communities to Grazing. USDA-Forest Service. Rocky Mountain Station, Report RMRS-GTR-169
6. Thurow T.L., 1991. Hydrology and erosion. Chapter 6 in: Grazing Management: An Ecological Perspective Edited by: R.K. Heitschmidt and J.W. Stuth. Timber Press, Portland, Oregon.
7. USDA/NRCS Soil Survey Manuals for Andrews and Midland Counties, Texas.
8. Vines, RA. 1990. Trees, Shrubs and Woody Vines of the Southwest. University of Texas Press. Austin, Texas.

NRCS FOTG – Section II - Range Site Descriptions

Other references:
J.R. Bell, USDA-NRCS Rangeland Management Specialist (retired)
Natural Resources Conservation Service – Sandy Range Site Description PE 19-25
USDA-Natural Resources Conservation Service – Andrews County Soil Survey

## Contributors

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## Approval

Bryan Christensen, 9/11/2023

## 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.

J.R. Bell, USDA-NRCS Rangeland Management Specialist (retired)
Natural Resources Conservation Service – Sandy Range Site Description PE 19-25
USDA-Natural Resources Conservation Service – Andrews County Soil Survey

## 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) | Stan Bradbury, Zone RMS, NRCS, Lubbock, Texas |
| Contact for lead author | 806-791-0581 |
| Date | 09/04/2007 |
| Approved by | Bryan Christensen |
| Approval date | |
| Composition (Indicators 10 and 12) based on | Annual Production |

## Indicators

1. **Number and extent of rills:** None to slight.

2. **Presence of water flow patterns:** None to slight.

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

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** 20 to 25%.

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

6. **Extent of wind scoured, blowouts and/or depositional areas:** Moderate.

7. **Amount of litter movement (describe size and distance expected to travel):** Slight to moderate.

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** Not resistant to surface erosion.

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Fine sanc single grain surface and very low SOM.

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Basal cover and density with moderate interspaces should make rainfall impact minimal. This site has rapid permeability, runoff is slow and available water holding capacity is low.

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

12. **Functional/Structural Groups (list in order of descending dominance by above-ground annual-production or live foliar cover using symbols: >>, >, = to indicate much greater than, greater than, and equal to):**

    Dominant: Warm-season tallgrasses >

    Sub-dominant: Warm-season midgrasses > Warm-season shortgrasses > Shrubs >

    Other: Forbs > Cool-season grasses

    Additional:

13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** Grasses due to their growth habits will exhibit some mortality and decadence, though minimal.

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

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 1,000 to 2,500 lbs/acre

16. **Potential invasive (including noxious) species (native and non-native). List species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicators, we are describing what is NOT expected in the reference state for the ecological site:** Sand sagebrush, Sand shinoak, Broom snakeweed, Yucca, and Mesquite can become invasive.

17. **Perennial plant reproductive capability:** All plant species should be capable of reproduction except during periods of prolonged drought conditions, heavy natural herbivory or intense wildfires.