USDA Natural Resources Conservation Service

Ecological site R083AY024TX
Tight Sandy Loam

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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.

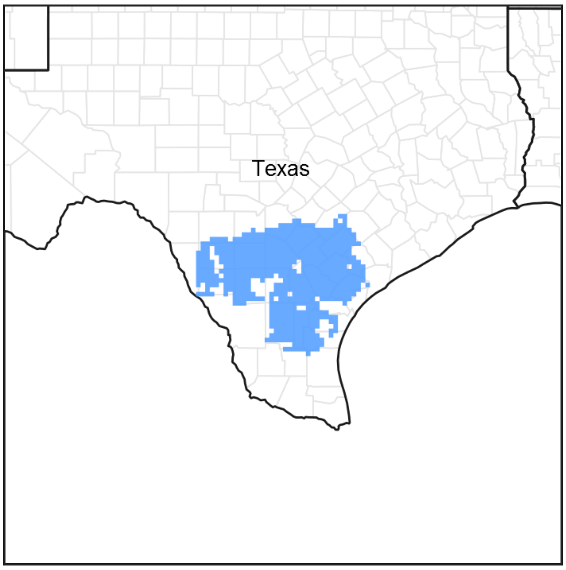

Figure 1. Mapped extent

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): 083A–Northern Rio Grande Plain

This area is entirely in Texas and south of San Antonio. It makes up about 11,115 square miles (28,805 square kilometers). The towns of Uvalde, Cotulla, and Hondo are in the western part of the area, and Beeville, Goliad, and Kenedy are in the eastern part. The town of Alice is just outside the southern edge of the area. Interstate Highways 35 and 37 cross this area. This area is comprised of inland, dissected coastal plains.

Classification relationships

USDA-Natural Resources Conservation Service, 2006.
-Major Land Resource Area (MLRA) 83A

Ecological site concept

The Tight Sandy Loam ecological sites typically have fine sandy loam and very fine sandy loam surface textures. Tight refers to the sandy clay or clay subsoil that begins about 10 inches below the surface.

Associated sites

R083AY002TX	**Shallow Ridge**
R083AY019TX	**Gray Sandy Loam**
R083AY003TX	**Gravelly Ridge**
R083AY005TX	**Shallow**
R083AY008TX	**Salty Prairie**
R083AY010TX	**Vega**
R083AY016TX	**Saline Clay Loam**
R083AY017TX	**Blackland**
R083AY021TX	**Sandy**
R083AY022TX	**Loamy Sand**
R083AY023TX	**Sandy Loam**

Similar sites

R083CY024TX	**Tight Sandy Loam**
R083DY024TX	**Tight Sandy Loam**
R083EY024TX	**Tight Sandy Loam**

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Aloysia gratissima* (2) *Celtis ehrenbergiana*
Herbaceous	(1) *Pappophorum bicolor* (2) *Schizachyrium scoparium*

Physiographic features

These nearly level to gently sloping soils are on broad stream terraces, ridges and interfluves of the Coastal Prairie. These soils were formed in loamy and clayey sediments of the Pleistocene and Pliocene ages. Slopes range from 0 to 5 percent but are mainly less than 3 percent. Elevation ranges from 200 to 1,000 feet. This area is comprised of inland, dissected coastal plains.

Table 2. Representative physiographic features

Landforms	(1) Coastal plain > Stream terrace (2) Coastal plain > Ridge (3) Coastal plain > Interfluve
Runoff class	Negligible to high
Elevation	50–1,000 ft
Slope	0–5%
Aspect	Aspect is not a significant factor

Climatic features

MLRA 83A is subtropical, subhumid on the western boundary and subtropical humid on the eastern boundary. Winters are dry and mild and the summers are hot and humid. Tropical maritime air masses predominate throughout spring, summer, and fall. Modified polar air masses exert considerable influence during winter, creating a continental climate characterized by large variations in temperature. Average precipitation for MLRA 83A is 20 inches on the western boundary and 35 inches on the eastern boundary. Peak rainfall, because of rain showers, occurs late in spring and a secondary peak occurs early in fall. Heavy thunderstorm activities increase in April, May, and June. July is hot and dry with little weather variations. Rainfall increases again in late August and September as tropical disturbances increase and become more frequent. Tropical air masses from the Gulf of Mexico dominate during the spring, summer, and fall. Prevailing winds are southerly to southeasterly throughout the year except in December when winds are predominately northerly.

Table 3. Representative climatic features

Frost-free period (characteristic range)	223-251 days
Freeze-free period (characteristic range)	263-365 days
Precipitation total (characteristic range)	25-32 in
Frost-free period (actual range)	208-263 days
Freeze-free period (actual range)	254-365 days
Precipitation total (actual range)	24-37 in
Frost-free period (average)	235 days
Freeze-free period (average)	314 days
Precipitation total (average)	29 in

Climate stations used

- (1) CARRIZO SPRINGS 3W [USC00411486], Carrizo Springs, TX
- (2) CUERO [USC00412173], Cuero, TX
- (3) HONDO [USC00414254], Hondo, TX
- (4) KARNES CITY 2N [USC00414696], Karnes City, TX
- (5) MATHIS 4 SSW [USC00415661], Mathis, TX
- (6) NIXON [USC00416368], Stockdale, TX
- (7) UVALDE 3 SW [USC00419268], Uvalde, TX
- (8) BEEVILLE 5 NE [USC00410639], Beeville, TX
- (9) GOLIAD [USC00413618], Goliad, TX
- (10) LYTLE 3W [USC00415454], Natalia, TX
- (11) HONDO MUNI AP [USW00012962], Hondo, TX
- (12) CHEAPSIDE [USC00411671], Gonzales, TX
- (13) DILLEY [USC00412458], Dilley, TX
- (14) FLORESVILLE [USC00413201], Floresville, TX
- (15) PLEASANTON [USC00417111], Pleasanton, TX
- (16) CHARLOTTE 5 NNW [USC00411663], Charlotte, TX
- (17) CROSS [USC00412125], Tilden, TX
- (18) FOWLERTON [USC00413299], Fowlerton, TX
- (19) PEARSALL [USC00416879], Pearsall, TX
- (20) POTEET [USC00417215], Poteet, TX
- (21) TILDEN 4 SSE [USC00419031], Tilden, TX
- (22) CALLIHAM [USC00411337], Calliham, TX

Influencing water features

Water enters the surface rapidly but perches on top of the argillic for brief periods.

Wetland description

N/A

Soil features

The soils of this site are moderately deep to very deep, moderately well to well drained, moderately slowly to very slowly permeable, and strongly acid to slightly alkaline. A typical pedon will exhibit an ochric epipedon, an argillic horizon beginning at 10 inches and depth to secondary carbonates ranging from 28 to 40 inches. The texture of the top of the argillic is sandy clay or clay. Some pedons may include elevated levels of sodium in the argillic. Soil series correlated to this site include: Ander, Batesville, Bryde, Czar, Floresville, Gillett, Griter, Miguel, Papalote, and Webb.

Table 4. Representative soil features

Parent material	(1) Residuum–sedimentary rock (2) Alluvium–sedimentary rock
Surface texture	(1) Fine sandy loam (2) Very fine sandy loam (3) Sandy clay loam
Family particle size	(1) Fine (2) Fine-loamy
Drainage class	Moderately well drained to well drained
Permeability class	Very slow to moderately slow
Soil depth	20–80 in
Surface fragment cover <=3"	0–1%
Surface fragment cover >3"	0–1%
Available water capacity (0-40in)	4–7 in
Calcium carbonate equivalent (0-40in)	0–10%
Electrical conductivity (0-40in)	0–8 mmhos/cm
Sodium adsorption ratio (0-40in)	0–10
Soil reaction (1:1 water) (0-40in)	5.1–8.4
Subsurface fragment volume <=3" (Depth not specified)	0–6%
Subsurface fragment volume >3" (Depth not specified)	0–2%

Ecological dynamics

The Tight Sandy Loam ecological site of the Northern Rio Grande Plain MLRA was a fire-influenced Midgrass Plant Community, interspersed with occasional perennial forbs and woody species. Improper grazing management will result in a reduction of midgrass dominance and an increase in composition of shortgrasses, unpalatable forbs, and woody species. Lack of brush control will result in shift in composition until shrubs dominate and reach a near closed canopy shrubland.

The climate experienced by this site is highly variable, particularly with respect to annual rainfall and winter temperatures. Part of this variation reflects the influence of infrequent, large rainfall events associated with tropical storms or hurricanes that inflate annual rainfall means. Because much of the water delivered in such events is lost as runoff, the site is drier than mean annual rainfall data would suggest. In addition, drought is a common occurrence. Freezing temperatures occur in many winters, but frosts are usually mild and of short duration. However, infrequent bouts of severe frost do occur. The effects on vegetation are not well documented, but observations indicate woody plants such as spiny hackberry (Celtis pallida) and lime pricklyash/colima (*Zanthoxylum fagara*) may experience substantial top-kill. Although hard freezes and severe drought may occur relatively infrequently, their effects may influence vegetation composition and productivity in ensuing years and magnify the effects of grazing and fire.

Climatic variation and topographic variability interact to influence vegetation responses to disturbances such as fire and grazing. Plants of the reference plant community evolved with and are generally well adapted to grazing and fire. Prior to European settlement, fires would likely have been frequent (approximately every 3 to 10 years) (Scifres and Hamilton 1993). These fires would have resulted from lightening during the hot, dry summer months or were set by Native Americans during other times of the year for various purposes. The fires promoted grasses while making it difficult for woody plants to achieve dominance. During the Pleistocene, significant populations of large-bodied grazers and browsers existed. Most of these went extinct, so that by the Holocene (about 10,000 years ago), only bison (Bos bison), white-tailed deer (Odocoileus virginianus), and antelope (Antilocarpa americana) remained. Archeological evidence indicates that bison occurred in the region, but there is also evidence of centuries of absence (Dillehay 1974). In addition, their numbers may have varied seasonally as herds migrated. When present, bison may have grazed certain areas heavily and then moved on. Activities of other native herbivores (termites, cutter ants, soil nematodes, kangaroo rats) also influenced vegetation productivity and dynamics. Presently, sites are largely grazed by cattle, sheep, and goats.

Accounts of earlier explorers and settlers suggest the Rio Grande Plains was likely a mosaic of grassland, savannah, shrubland, and woodland. Historical photographs show the nature of the vegetation structure then, as now, likely varied from place to place depending on topography, soil properties, and time since the last major disturbances. Grasses dominating Tight Sandy Loam uplands at the time of European settlement likely include little bluestem (*Schizachyrium scoparium*), false Rhodesgrass (Chloris crinita), multiflowered Rhodesgrass (Chloris pluriflora), Arizona cottontop (*Digitaria californica*), plains bristlegrass (*Setaria macrostachya*), and pink pappusgrass (*Pappophorum bicolor*). The composition and productivity of grass communities would have varied with annual rainfall, soil depth and the extent of argillic horizon development.

Grazing and fire are two factors that critically influence the relative abundance of grasses and woody plants through time. By the early 1800's cattle and sheep numbers appear to have been quite high in the Rio Grande Plains, resulting in heavy, year-round grazing (Lehman 1969). The resulting reduction in abundance of late seral grasses lead to a decline in soil organic matter, a reduction in fire frequency/intensity (due to lack of fine fuels) and a shift from midgrass (e.g., multiflowered Chloris) domination to shortgrass (e.g., hooded windmillgrass (*Chloris cucullata*) and threeawn (Aristida spp.))/forb (e.g., orange zexmenia (Zexmenia hispida) and croton (Croton spp.) domination. These changes would have favored woody plants, most of which are unpalatable to livestock, and enabled them to establish and attain dominance. This would be especially true for leguminous shrubs such as mesquite, whose seeds are widely spread by livestock. This reduction of midgrasses and expansion of shortgrasses, along with concurrent suppression of fire, allowed woody plants to proliferate and eventually dominate the site. With their domination, they now captured the sunlight first and replaced the shortgrasses and remnant midgrasses. This indicates the site has crossed the threshold to the Shrubland State with a canopy of brush in excess of 20 percent.

The shift from grass to woody plant domination became the impetus for brush management practices. By the 1950's, large-scale mechanized clearing was common and by the 1970's, aerial herbicide applications were widespread. However, by the 1980's it was clear that brush management practices were often treating symptoms rather than underlying problems and having undesirable environmental consequences, including adverse effects on wildlife populations (Fulbright and Beasom 1987). Sites cleared of brush regenerated rapidly and often formed thickets that were denser and of lower diversity than the original stands. This realization, coupled with the fact that brush management treatments were typically short-lived (owing to woody plant regeneration via sprouting or seeds), lead to the development of Integrated Brush Management Systems (IBMS) (Scifres et.al. 1985). The IBMS approach takes a holistic, large-scale, long-term, whole-firm, ecosystem-based approach to brush management and recognizes multiple-use options for rangeland resources. Shrublands developing on former grasslands have other potential socioeconomic values that should be considered when contemplating brush management. These include alternate classes of livestock, lease hunting, white-tailed deer (Odocoileus virginianus), exotic game ranching, and ecotourism.

State and transition model

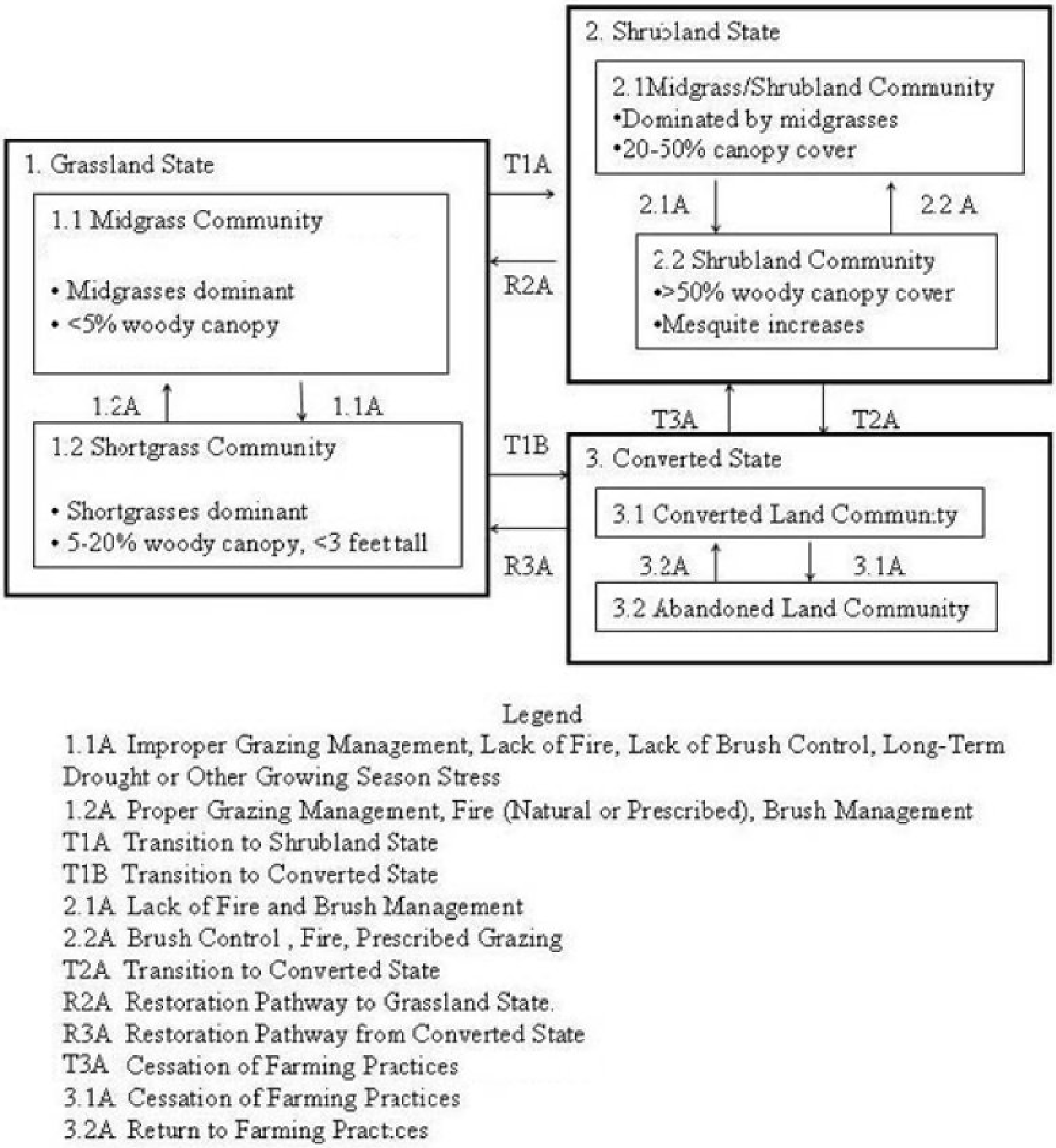

Figure 8. STM

State 1
Grassland

Dominant plant species

- little bluestem (*Schizachyrium scoparium*), grass
- false Rhodes grass (*Trichloris crinita*), grass

Community 1.1
Midgrass

The representative plant Community for this ecological site is a diverse Midgrass Community (1.1) with less than five percent woody plant cover. Dominant grasses are two to four feet in tall. Bare ground is minimal. Little bluestem is prevalent in the eastern portion of the MLRA. Multiflower Rhodesgrass, false Rhodesgrass, and Arizona cottontop are more abundant in the drier western part of the MLRA. Subdominant grass species are feathery bluestem and pink pappusgrass. Most common woody species are mesquite, snakewood, and spiny hackberry. The woody species are typically small and obscured by grasses. The majority of production occurs in late spring and early summer when temperatures and moisture are typically most suitable for growth. As conditions become warmer and drier, grasses become dormant and substantial litter accumulation occurs, making the site prone to fire. Recurrent fire (every three to five years) favors persistence of the dominant grasses and keeps the cover of woody plants low. In years without fire, leaf litter decomposes and adds organic matter to the soil, thus enhancing its fertility and water holding capacity. The dominant grasses are also highly productive belowground and are relatively deeply rooted. Extensive root systems bind the soil to minimize erosion while enabling the dominant grasses to access stored soil moisture, thus stabilizing aboveground production. With their high ground cover and large root systems, the dominant grasses tend to monopolize light, water, nutrients, and competitively exclude other plants.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	1800	3200	4300
Shrub/Vine	100	175	250
Forb	100	175	250
Tree	0	0	0
Total	**2000**	**3550**	**4800**

Figure 10. Plant community growth curve (percent production by month). TX4525, Midgrass Dominant, 5% woodies. Midgrass plant community with less than a 5 percent canopy of woody plants. Growth occurs with peak in spring and fall seasons..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2	2	5	10	18	15	5	9	15	9	5	5

Community 1.2
Shortgrass

Figure 11. 1.2 Shortgrass Community

The Shortgrass Community (1.2) will return to the Midgrass Community (1.1) with brush management and proper grazing management that provides sufficient critical growing season deferment in combination with proper grazing intensity. Favorable moisture conditions will facilitate or accelerate this transition. The understory component may return to dominance by midgrasses in the absence of fire. Reduction of the woody component will require inputs of fire and/or brush control. The understory and overstory components can act independently when canopy cover is less than five percent, meaning, an increase in shrub canopy cover can occur while proper grazing management creates an increase in desirable herbaceous species. The driver for community shift 1.2A for the herbaceous component is proper grazing management, while the driver for the woody component is fire and/or brush control.

Table 6. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	1275	1850	2475
Shrub/Vine	125	175	225
Forb	125	175	225
Tree	0	0	0
Total	**1525**	**2200**	**2925**

Figure 13. Plant community growth curve (percent production by month). TX4526, Shortgrass Dominant with 5-10% woodies. Shortgrass savannah plant structure with the woody species canopy being as much as 10%, but being less than 3 feet tall..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2	2	5	10	18	15	5	9	15	9	5	5

Pathway 1.1A
Community 1.1 to 1.2

The Midgrass Community (1.1) requires fire and/or brush control to maintain woody species cover below five percent. This community will shift to the Shortgrass Community (1.2) when there is continued growing season stress on midgrasses. These stresses include long-term drought and/or improper grazing management that create insufficient critical growing season deferment and excess intensity of defoliation. Increaser species (shortgrasses and native woody species) are generally endemic species released by disturbance. Native woody species canopy exceeding 5 percent and/or dominance of midgrasses falling below 20 percent of species composition indicate a transition to the Shortgrass Community (1.2). The Midgrass Community (1.1) can be maintained through the implementation of fire, brush management, combined with properly managed grazing that provides adequate growing season deferment to allow establishment of midgrasses. The driver for community shift 1.1A for the herbaceous component is improper grazing management, while the driver for the woody component is lack of fire and/or brush control.

Pathway 1.2A
Community 1.2 to 1.1

With proper grazing management, midgrasses can regain dominance on the site and undesirable trends in soil organic matter, fertility, temperature, and erosion can be arrested and reversed. Growth of established woody plants will slow and will become more difficult for new plants to establish. Restoration of fine fuel biomass enable use of prescribed fire to reduce the stature and cover of established woody plants. The extent to which the original midgrass community can be re-established will depend on the extent to which soil physical and chemical properties were altered during retrogression (Heitschmidt and Stuth 1991).

State 2
Shrubland

Dominant plant species

- hooded windmill grass (*Chloris cucullata*), grass
- threeawn (*Aristida*), grass

Community 2.1
Midgrass/Shrubland

Proper grazing and stocking rates maintain the herbaceous layer in this community. However, lack of fire and/or brush management allows for an increase in woody canopy cover from 20 to 50 percent of mesquite, whitebrush, spiny hackberry, blackbrush, and brasil. Midgrasses such as multi-flowered Rhodesgrass, Arizona cottontop, pink pappusgrass, and other midgrasses will dominate this site. If properly managed and maintained, the understory and overstory will continue to work independently of each other. To return this community to a Midgrass Community (1.1) extensive brush management and energy is required to reduce the canopy layer greater than three feet. Reseeding of midgrasses is not necessary to return this state to a Midgrass Community because the plants are usually present in this state. If enough fine fuels exist, fire can be used to maintain the canopy cover and herbaceous layer of this site. A prescribed fire will help control mesquite less than three feet tall, preventing the site from transitioning to a Shrubland Community (2.2) with greater than 50 percent canopy cover. Fire must be conducted every three to five years to keep the woody species in check. Winter and summer fires will benefit this community. A winter prescribed fire will help to maintain the mesquite less than three feet tall while a summer prescribed fire tend to burn hotter and possibly opening up the canopy layer, and possibly transitioning it back to the Grassland State (1). Summer fires come with more risk, so careful planning is required for summer burns.

Table 7. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	1800	2200	2500
Shrub/Vine	150	200	250
Forb	50	125	250
Tree	0	0	0
Total	**2000**	**2525**	**3000**

Figure 15. Plant community growth curve (percent production by month). TX4545, Midgrass/Shrubland Community. Midgrasses and shrubs dominate the site..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2	2	5	10	20	15	5	9	13	9	5	5

Community 2.2
Shrubland

Figure 16. 2.2 Shrubland Community

In the absence of fire and brush management, a highly stable and resilient Shrubland Community develops as woody patches increase in abundance and coalesce. Mesquite and acacia overstory plants that dominate the preceding state may begin to die due to natural causes, leaving a diverse mixed-shrub community characterized by shrubs such as brasil, colima, and spiny hackberry. Ground cover and herbaceous production beneath shrub canopies is minimal. Aggressive brush management is required to affect transitions out of this state. Prescribed burning may not be possible until woody cover is reduced by herbicides or mechanical treatments to the point that grasses (fine fuels) can establish. Establishment of native grasses can be difficult and dependent upon natural seeding from remnant patches, as their seed banks in shrub patches may be depleted. Texas wintergrass, threeawns (Aristida spp.), and annuals increase in the shade of the trees. Unpalatable invaders may occupy the interspaces between trees and shrubs. Plant vigor and productivity of grass species is reduced due to shade. Shade is a driving factor for the understory plant community. Without brush control, tree canopy will continue to increase until canopy cover approaches 80 percent. In this plant community, annual production is dominated by woody species. Browsing animals, such as goats and deer, can find fair food value if browse plants have not been grazed excessively. Forage quantity and quality for cattle is low.

Table 8. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	600	1120	1440
Shrub/Vine	400	600	800
Forb	40	80	120
Tree	0	0	0
Total	**1040**	**1800**	**2360**

Figure 18. Plant community growth curve (percent production by month). TX4529, Shrub Woodland Community with >50% Woodies. Shrub Woodland Community with >50% Woodies.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2	2	5	10	18	15	5	9	15	9	5	5

Pathway 2.1A
Community 2.1 to 2.2

Improper grazing management and/or long-term drought (or other growing season stress) will accelerate this transition from a Midgrass/Shrubland Community (2.1) to a Shrubland Community (2.2). The understory may be a mix of short and midgrasses. Improper grazing, lack of fire, lack of brush management, or other long-term, growing-season stress can increase the composition of less productive grasses and low-growing (or unpalatable) forbs in the herbaceous component. Even with proper grazing, in the absence of fire the woody component will increase to the point that the herbaceous component will decline in production and shift in composition toward sedges, short grasses, cool-season grasses and forbs suited to growing in shaded conditions with reduced available soil moisture. The driver for community shift 2.2A is lack of fire and/or brush control, and improper grazing management.

Pathway 2.2A
Community 2.2 to 2.1

Extensive brush management can reduce the woody component of the Shrubland Community (2.2) below 50 percent woody canopy cover. It may be difficult to shift back to the Midgrass/Shrubland Community (2.1) with fire alone due to the lack of fuel provided by the understory and height of the canopy cover. Fire can reduce seedlings of brush species if the seedling is younger than two years or the budding zone has not transitioned below the soil surface (Kramp et al 1999). Fire and/or brush management will be required to maintain woody canopy cover below the 50 percent level. This is amplified if the understory transitions to cool-season grasses, which reduce opportunity for prescribed fire. If the herbaceous component has transitioned to shortgrasses and low forbs, proper grazing management (combined with favorable moisture conditions and adequate seed source) will be necessary to facilitate the shift of the understory component in the Shrubland Community (2.2) to the Midgrass/Shrubland Community (2.1). Range planting may accelerate the transition of the herbaceous community, particularly when combined with favorable growing conditions. Range planting is more commonly associated with restoration efforts associated with Restoration Pathway R2A. The driver for community shift 2.2A is fire and/or brush control.

State 3
Converted

Dominant plant species

- buffelgrass (*Pennisetum ciliare*), grass
- kleingrass (*Panicum coloratum*), grass

Community 3.1
Converted Land

The Converted Land Community (3.1) occurs when the site, either the Grassland State (1) or Shrubland State (2), is cleared and plowed for planting to cropland, hayland, native grasses, tame pasture, or use as non-agricultural land. The Converted State (3) includes cropland, tame pasture, hayland, rangeland, and go-back land. Agronomic practices are used with non-native forages in the Converted State and to make changes between the communities. The native component of the grassland is usually lost when seeding non-natives. Even when reseeding with natives, the ecological processes defining the past states of the site can be permanently changed. Cropland, pastureland, and hayland are intensively managed with annual cultivation and/or frequent use of herbicides, pesticides, and commercial fertilizers to increase production. Both crop and pasturelands require weed and shrub control because seeds remain present on the site, either by remaining in the soil or being transported to the site. Converted sites require continual fertilization for crops or tame pasture (particularly bermudagrass) to perform well. Common introduced species include hybrid bermudagrass, kleingrass, buffelgrass (*Pennisetum ciliare*), and Old World bluestems (Bothriochloa spp.), which are used in hayland and tame pastures. Newly-seeded stands are prone to invasion by annual weeds, perennial weeds, and woody plants, so proper grazing and brush/weed management are required for their maintenance. The rate of woody plant re-establishment will depend on the brush management practice used to initially clear the site, seedbed preparation technique, and proximity to undisturbed shrub stands. Wheat, oats, forage sorghum, grain sorghum, cotton, and corn are the major crop species. Cropland and tame pasture require repeated and continual inputs of fertilizer and weed control to maintain the Converted State. Production of these introduced forage grasses may exceed that of native grasses, especially when fertilized. However, the extent to which introduced grasses provide better forage than native grasses is debatable, especially when their adverse effects on wildlife are taken into account. Conversion of introduced pasture to native grassland is difficult and typically requires aggressive and costly management intervention. Given the potentially adverse long-term effects of exotic grasses on native grassland flora and fauna, their use should be critically and carefully considered.

Table 9. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	2700	3200	3700
Shrub/Vine	50	150	150
Forb	50	100	150
Tree	0	0	0
Total	**2800**	**3450**	**4000**

Figure 20. Plant community growth curve (percent production by month). TX4533, Cropland - Warm-season. Crops such as cotton, corn, and grain and forage sorghum are planted..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	5	10	20	20	5	10	15	10	5	0

Community 3.2
Abandoned Land

Figure 21. 3.2 Abandoned Land Community

The Abandoned Land Community (3.2) occurs when the Converted Land Community (3.1) is abandoned or mismanaged. Mismanagement can include poor crop or haying management. Pastureland can transition to the Abandoned Land Community when subjected to improper grazing management (typically long-term overgrazing). Heavily disturbed soils left alone will return to the Shrubland State (2). Abandoned croplands and land seeded with exotic or native grasses are prone to encroachment by woody plants. These areas will revert to shrublands with heavy grazing and no fire or brush management. These changes seem to be triggered by recruitment and growth of shrub plants in periods following drought. The shrubs that appear in pastures may be true seedlings established from natural dispersion to the site by wind, water, animals, or from seeds which persist in the soil seed bank long after woody cover has been reduced by brush management practices. Other seedlings may actually be sprouts arising from woody plant stems, roots, burls and lignotubers that remain following brush management. These resprouts tend to grow faster and have higher establishment rates than true seedlings. Nearly all shrubs on this site have this capability of vegetative regeneration; which allows plants to re-establish following brush management. Proper grazing and brush management are required to prevent woody plant seedlings from dominating the site. However, once established, grazing alone will not prevent the brush from overtaking. Goats may have some value in maintaining brush but even they may not browse on all species of the encroaching brush to the point of control. Long-term cropping can create changes in soil chemistry and structure that make restoration to the reference state very difficult and/or expensive. Return to native grassland communities in the Tight Sandy Loam State is more likely to be successful if soil chemistry, microorganisms, and structure are not heavily disturbed. Preservation of favorable soil microbes increases the likelihood of a return to reference, or near reference conditions. Restoration to native grassland will require seedbed preparation and seeding of native species. Protocols and plant materials for restoring grassland communities is a developing portion of restoration science.

Table 10. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	2700	3200	3700
Shrub/Vine	50	100	150
Forb	50	100	150
Tree	0	0	0
Total	**2800**	**3400**	**4000**

Figure 23. Plant community growth curve (percent production by month). TX4534, Converted Land - Woody Seedlings Encroachment. Woody seedling encroachment on converted lands such as abandoned cropland, native seeded land, and introduced seeding lands..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2	2	5	10	18	15	5	9	15	9	5	5

Pathway 3.1

Community 3.1 to 3.2

The Converted Land Community (3.1) will transition to the Abandoned Land Community (3.2) if improperly managed as cropland, hayland, or pastureland. Each of these types of converted land is unstable and requires constant management input for maintenance or improvement. This community requires inputs of tillage, weed management, brush control, fertilizer, and reseeding of annual crops. The driver of this transition is the lack of management inputs necessary to maintain cropland, hayland, or pastureland.

Pathway 3.2A
Community 3.2 to 3.1

The Abandoned Land Community (3.2) will transition to the Converted Land Community (3.1) with proper management inputs. The drivers for this transition are weed control, brush control, tillage, proper grazing management, and range or pasture planting.

Transition T1A
State 1 to 2

Shrubs and trees make up a portion of the Community in the Grassland State, hence woody propagules are present. Therefore, the Grassland State (1) is always at risk for shrub dominance and the transition to the Shrubland State (2) in the absence of fire. The driver for Transition T1A is lack of fire and/or brush control. The mean fire return interval in the Grassland State is three to five years. Most fires will burn only the understory. Even with proper grazing and favorable climate conditions, lack of fire will allow trees and shrubs to increase in canopy to reach the 20 percent threshold level. This transition can occur from any community within the Grassland State, it is not dependant on degradation of the herbaceous community, but on the lack of some form of brush control. Shrubs reaching three feet in height triggers the transition to the Shrubland State as this is the typical height for shrubs reaching the reproductive state. Improper grazing and prolonged drought will provide a competitive advantage to shrubs, which will accelerate this process.

Transition T1B
State 1 to 3

Land managers may want to utilize this site as cropland or pastureland. To achieve this transition from the Grassland State (1) brush management and heavy disking will be necessary to incorporate the vegetation into the soil. Prescribed burning can also be used prior to the disking operation to eliminate excessive vegetation. After the land has been cleared and an seedbed prepared the crop or pasture can be planted.

Restoration pathway R2A
State 2 to 1

Prescribed fire alone is not a viable treatment option for conversion of this site back to a semblance of the Midgrass Community (1.1). Chemical brush control on a large scale may not be a treatment option however, individual plant treatment with herbicides on small acreages may be feasible. Mechanical treatment of this site, along with seeding, is the best option although it may not be economical.

Transition T2A
State 2 to 3

Land managers may want to utilize this site as cropland or pastureland. To achieve this, practices such as dozing and raking will be necessary. After the land has been cleared and an appropriate seedbed prepared the crop or pasture can be planted.

Transition T3A
State 3 to 2

In time, this site will revert to State 2 on its own with the cessation of agricultural management. Without chemically or mechanically removing brush species, woody species will encroach and eventually grow into the overstory.

Additional community tables

Table 11. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	**Warm-season midgrasses**			1200–3300	
	pink pappusgrass	PABI2	*Pappophorum bicolor*	750–1800	–
	little bluestem	SCSCS	*Schizachyrium scoparium var. scoparium*	750–1800	–
	large-spike bristlegrass	SEMA5	*Setaria macrostachya*	750–1800	–
	plains bristlegrass	SEVU2	*Setaria vulpiseta*	750–1800	–
	false Rhodes grass	TRCR9	*Trichloris crinita*	750–1800	–
	multiflower false Rhodes grass	TRPL3	*Trichloris pluriflora*	750–1800	–
	southwestern bristlegrass	SESC2	*Setaria scheelei*	500–1500	–
	silver beardgrass	BOLAT	*Bothriochloa laguroides ssp. torreyana*	500–1500	–
	Arizona cottontop	DICA8	*Digitaria californica*	500–1500	–
	plains lovegrass	ERIN	*Eragrostis intermedia*	600–1500	–
	tanglehead	HECO10	*Heteropogon contortus*	500–1500	–
	big sandbur	CEMY	*Cenchrus myosuroides*	400–1000	–
2	**Warm-season shortgrasses**			200–750	
	threeawn	ARIST	*Aristida*	175–400	–
	buffalograss	BODA2	*Bouteloua dactyloides*	175–400	–
	slender grama	BORE2	*Bouteloua repens*	175–400	–
	red grama	BOTR2	*Bouteloua trifida*	175–400	–
	hooded windmill grass	CHCU2	*Chloris cucullata*	175–400	–
	fall witchgrass	DICO6	*Digitaria cognata*	175–400	–
	curly-mesquite	HIBE	*Hilaria belangeri*	175–400	–
	Hall's panicgrass	PAHA	*Panicum hallii*	175–400	–
3	**Cool-season grasses**			50–250	
	Texas wintergrass	NALE3	*Nassella leucotricha*	50–250	–
4	**Grasslikes**			0–100	
	sedge	CAREX	*Carex*	35–85	–
Forb					
4	**Forbs**			100–250	
	Forb, annual	2FA	*Forb, annual*	75–200	–
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	75–200	–
	white sagebrush	ARLUM2	*Artemisia ludoviciana ssp. mexicana*	75–200	–
	croton	CROTO	*Croton*	75–200	–
	bundleflower	DESMA	*Desmanthus*	75–200	–
	Engelmann's daisy	ENPE4	*Engelmannia peristenia*	75–200	–
	sensitive plant	MIMOS	*Mimosa*	75–200	–
	awnless bushsunflower	SICA7	*Simsia calva*	75–200	–
Shrub/Vine					

5	**Shrubs/Vines**			100–250	
	whitebrush	ALGR2	*Aloysia gratissima*	75–200	–
	spiny hackberry	CEEH	*Celtis ehrenbergiana*	75–200	–
	snakewood	CONDA	*Condalia*	75–200	–
	Texan hogplum	COTE6	*Colubrina texensis*	75–200	–
	vine jointfir	EPPE	*Ephedra pedunculata*	75–200	–
	Texas lignum-vitae	GUAN	*Guaiacum angustifolium*	75–200	–
	pricklypear	OPUNT	*Opuntia*	75–200	–
	mesquite	PROSO	*Prosopis*	75–200	–
	oak	QUERC	*Quercus*	75–200	–
	desert yaupon	SCCU4	*Schaefferia cuneifolia*	75–200	–
	gum bully	SILAL3	*Sideroxylon lanuginosum ssp. lanuginosum*	50–150	–
	western soapberry	SASAD	*Sapindus saponaria var. drummondii*	50–150	–
	algerita	MATR3	*Mahonia trifoliolata*	50–150	–
	Texas kidneywood	EYTE	*Eysenhardtia texana*	50–150	–
	Texas persimmon	DITE3	*Diospyros texana*	50–150	–
	blackbrush acacia	ACRI	*Acacia rigidula*	50–150	–

Animal community

As a historic tall/midgrass prairie, this site was occupied by bison, antelope, deer, quail, turkey, and dove. This site was also used by many species of grassland songbirds, migratory waterfowl, and coyotes. This site now provides forage for livestock and is still used by quail, dove, migratory waterfowl, grassland birds, coyotes, and deer.

Feral hogs (Sus scrofa) can be found on most ecological sites in Texas. Damage caused by feral hogs each year includes, crop damage by rutting up crops, destroyed fences, livestock watering areas, and predation on native wildlife, and ground-nesting birds. Feral hogs have few natural predators, thus allowing their population to grow to high numbers.

Wildlife habitat is a complex of many different plant communities and ecological sites across the landscape. Most animals use the landscape differently to find food, shelter, protection, and mates. Working on a conservation plan for the whole property, with a local professional, will help managers make the decisions that allow them to realize their goals for wildlife and livestock.

Grassland State (1): This state provides the maximum amount of forage for livestock such as cattle. It is also utilized by deer, quail and other birds as a source of food. When a site is in the reference plant community phase (1.1) it will also be used by some birds for nesting, if other habitat requirements like thermal and escape cover are near.

Shrubland State (2): This state can be maintained to meet the habitat requirements of cattle and wildlife. Land managers can find a balance that meets their goals and allows them flexibility to manage for livestock and wildlife. Forbs for deer and birds like quail will be more plentiful in this state. There will also be more trees and shrubs to provide thermal and escape cover for birds as well as cover for deer.

Converted Land State (3): The quality of wildlife habitat this site will produce is extremely variable and is influenced greatly by the timing of rain events. This state is often manipulated to meet landowner goals. If livestock production is the main goal, it can be converted to pastureland. It can also be planted to a mix of grasses and forbs that will benefit both livestock and wildlife. A mix of forbs in the pasture could attract pollinators, birds and other types of wildlife. Food plots can also be planted to provide extra nutrition for deer.

This rating system provides general guidance as to animal preference for plant species. It also indicates possible competition between kinds of herbivores for various plants. Grazing preference changes from time to time, especially between seasons, and between animal kinds and classes. Grazing preference does not necessarily reflect the ecological status of the plant within the plant community. For wildlife, plant preferences for food and plant suitability for cover are rated. Refer to habitat guides for a more complete description of a species habitat needs.

Hydrological functions

The Midgrass Community (1.1) water cycle functions well with good infiltration and deep percolation of rainfall. The water cycle functions best in the Midgrass Community (1.1) and degrades as the vegetation community declines. Rapid rainfall infiltration, high soil organic matter, and good soil structure and good porosity accompany high bunchgrass cover. Surface runoff quality will be high and erosion and sedimentation rates will be low. High rates of infiltration will allow water to move below the rooting zone during periods of heavy rainfall.

Due to the accumulation of clay in the B-horizon, root growth and water movement is restricted from downward movement. This physical characteristic makes this site more drought prone that other sites, such as a similar Sandy Loam site. Overall, this site would have less available water in the soil profile, therefore reducing plant biomass production when compared to a similar Sandy Loam site.

A shift to the Shortgrass Community (1.2) means reduced plant and litter cover, which impairs the water cycle. Infiltration will decrease and runoff will increase due to reduced ground cover, rainfall splash, soil capping, reduced organic matter, and poor structure. With a combination of a sparse ground cover and intensive rainfall, this site can contribute to an increased frequency and severity of flooding within a watershed. As soil erosion is accelerated the quality of surface runoff is poor and sedimentation increases.

Domination of the site by woody species further degrades the water cycle in the Shrubland State (2). Interception of rainfall by tree canopies increases, which reduces the amount reaching the surface for availability to understory plants. Increased stem flow, due to the funneling effect of the canopy, increases soil moisture at the base of trees, especially on mesquite. Increases in woody canopy create declines in grass cover, which creates similar impacts as those described for improper grazing above. Return of the Shrubland State (2) to the Midgrass Community (1.1) through brush management and good grazing management can help improve hydrologic function of the site.

Recreational uses

Recreational uses include recreational hunting, hiking, camping, equestrian, and bird watching.

Wood products

Mesquite and some oak are used for posts, firewood, charcoal, and other specialty wood products.

Other products

Jams and jellies are made from many fruit bearing species, such as agarito. Seeds are harvested from many plants for commercial sale. Many grasses and forbs are harvested by the dried-plant industry for sale in dried flower arrangements. Honeybees are utilized to harvest honey from many flowering plants.

Inventory data references

Information presented was derived from the revised Range Site, literature, limited NRCS clipping data (417s), field observations, and personal contacts with range-trained personnel.

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Rangeland health reference sheet

Interpreting Indicators of Rangeland Health is a qualitative assessment protocol used to determine ecosystem condition based on benchmark characteristics described in the Reference Sheet. A suite of 17 (or more) indicators are typically considered in an assessment. The ecological site(s) representative of an assessment location must be known prior to applying the protocol and must be verified based on soils and climate. Current plant community cannot be used to identify the ecological site.

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Date	05/14/2009
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Approval date	

Composition (Indicators 10 and 12) based on	Annual Production

Indicators

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

2. **Presence of water flow patterns:** None, except following extremely high intensity storms when short flow patterns may appear.

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

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** 0 to 5 percent bare ground. Small and non-connected areas.

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

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

7. **Amount of litter movement (describe size and distance expected to travel):** Minimal and short under normal rainfall intensity.

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** Stability class ranges 5 to 6 at the surface.

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Ten inches thick, brown (7.5YR 5/4) fine sandy loam; weak, fine, medium subangular blocky and granular structure; hard, friable; neutral. Soil organic matter is 0 to 3 percent.

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** High canopy, basal cover and density with small interspaces should make rainfall impact negligible. This site has deep, well drained soils with level to gently sloping (0 to 3 percent slopes) which produces negligible runoff and erosion.

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 midgrasses >

Sub-dominant: Warm-season shortgrasses > Warm-season tallgrasses >

Other: Forbs > Shrubs/Vines > Trees.

Additional: Forbs make up five percent of species composition, shrubs and trees compose up to five percent species composition.

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

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

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 2,000 to 4,800 pounds per acre.

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

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17. **Perennial plant reproductive capability:** All species should be capable of reproducing except for periods of prolonged drought conditions, heavy natural herbivory and fires.
