USDA Natural Resources Conservation Service

Ecological site R078BY074TX
Draw 19-26" PZ

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General information

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

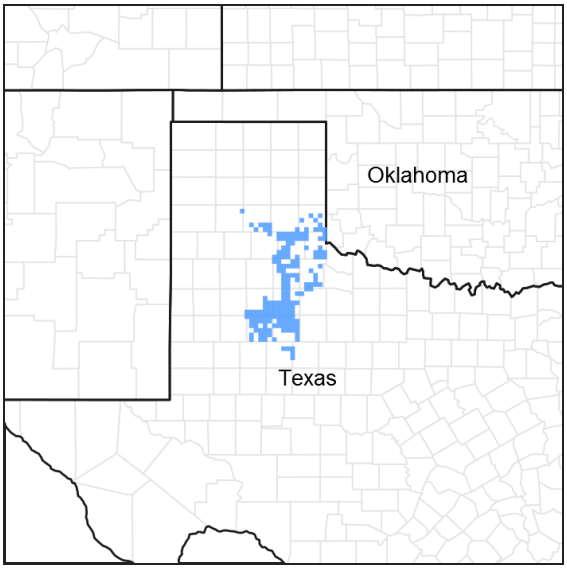


Figure 1. Mapped extent

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

MLRA notes

Major Land Resource Area (MLRA): 078B–Central Rolling Red Plains, Western Part

MLRA 78B is characterized by strongly dissected, rolling plains with prominent ridges and valleys and rolling to steep irregular topography. Loamy soils are generally well drained, range from shallow to deep, and developed in sediments of Triassic and Permian age.

LRU notes

NA

Classification relationships

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

Ecological site concept

These sites occur over deep loamy soils on drainageways. The reference vegetation consists of native tallgrasses, midgrasses, and forbs with scattered trees. Abusive grazing practices can lead to a shift in the plant community and

a decline in the palatable tallgrasses. Without periodic fire or alternative brush management, woody species may increase across the site.

Associated sites

R078BY072TX	**Clay Loam 19-26" PZ** Often adjacent and upslope of the draw site. Soils are not alluvial but have good plant-soil-moisture relationships. Plant communities are similar in terms of dominance of midgrasses but less tall grasses. Less productive than a draw site.
R078BY070TX	**Clayey Bottomland 19-26" PZ** Generally downslope of the draw site, occurring along stream floodplains as first bottoms. It receives more frequent overflows and sometimes has high watertables. It also has deep alluvial soils. Plant communities are somewhat similar but tallgrasses dominate the bottomland site and has significantly higher annual production.

Similar sites

R078BY070TX	**Clayey Bottomland 19-26" PZ** Generally downslope of the Draw Site, occurring along stream floodplains as first bottoms. It receives more frequent overflows and sometimes has high watertable. It also has deep alluvial soils. Plant communities are somewhat similar, but tallgrasses dominate the Bottomland Site, and it has significantly higher annual production.

Table 1. Dominant plant species

Tree	(1) *Celtis laevigata*
Shrub	Not specified
Herbaceous	(1) *Andropogon gerardii*

Physiographic features

The Draw Ecological Site generally occurs on nearly level valley floors and along stream floodplains as second bottoms or as wide gently concave drainageways with deep alluvial soils. Slopes are nearly level to very gently sloping (0 to 1 percent). The site is occasionally flooded by adjacent streams and receives additional water as runoff from adjacent slopes. The site may or may not be channeled, but draws with large drainage areas usually have defined channels. This site is associated with drainages such as the Concho River, Kickapoo Creek, Snake Creek, Lipan Creek, Ninemile Creek, Frog Pond Creek, Dry Hollow Creek, Hog Creek and other creeks and drainages in the area. Elevation ranges from 1000 to 3000 feet.

Table 2. Representative physiographic features

Landforms	(1) River valley > Flood plain
Runoff class	Negligible to low
Flooding duration	Very brief (4 to 48 hours)
Flooding frequency	Rare to occasional
Ponding frequency	None
Elevation	305–914 m
Slope	0–1%
Aspect	Aspect is not a significant factor

Climatic features

The climate of MLRA 78B is classified as subtropical subhumid since humidity tends to be higher than true semiarid. Summers are hot and dry while winters are mild and dry. The Precipitation is similar north to south throughout the area, but decreases slightly from east to west. Temperature is similar east to west, but warmer from

north to south. The area is clear to partly cloudy 80 percent of the time during the summer and 60 percent during the winter. Prevailing winds usually occur from a southerly to southwesterly direction and from north to northwest during passage of fall and winter cool fronts. March and April are the windiest months of the year. Average annual wind velocity is 11 miles per hour.

Most precipitation occurs during the warmer months from April to October, in the form of rainfall from convective showers or thunderstorms, often of short duration and high intensity, with considerable variation in amounts of rain and the geographic area covered. Lightening, strong winds and hail frequently often accompany the thunderstorms. Occasional tornadoes are not uncommon. Precipitation distribution is bimodal, with peaks occurring in May-June and September-October. The annual precipitation is about 19 to 25 inches. Timeliness and amount of rainfall are critical to plant growth. Rainfall events of one-fourth inch or less have limited effectiveness. High temperatures and dry winds reduce precipitation effectiveness. Snowfall represents only about 2.5 inches of the annual precipitation, although snowfall greater than one inch occurs only about one in ten years. Snow cover generally is of short duration, and remains on the ground for only a few hours to one or two days. Probability of snowfall is greater in the northern part of MLRA 78B.

Rainfall in the region is highly erratic, usually with more years below than above average. Periodic droughts of both temporary and prolonged duration are common to the area, although not predictable. Some of the more severe droughts of the past century in this region occurred during 1918-1919, early 1930’s, early to mid 1950’s, and mid to late 1990’s. High temperatures and dry winds accentuate the effects of drought. The extremes in climate have greater influence on plant communities than averages. Historic wet and dry cycles of extended duration likely influenced the evolution of drought hardiness and other survival traits in the endemic flora and fauna of the area.

Temperatures range from 31 degrees F in January to 96 degrees F in July, based on the 30-year average from 1971-2000, although considerably lower and higher temperatures for these months, respectively, have been recorded for some years. Periods of excessive heat, exceeding 100 degrees F, are not uncommon during July and August. Temperatures in the winter are generally mild, but abrupt and large drops in temperature can occur when polar air masses plunge southward across the area. The duration of freezing temperatures usually does not last more than three to five days. Temperatures in the spring are mild, both daytime and nighttime. Summer temperatures are hot, with highs generally in the 80’s to mid 90’s during the daytime, cooling down to the upper 70’s during the night. Fall is usually pleasant with mild, sunny days and crisp, cool nights, as cool northers periodically begin moving south this time of year. The area has a frost-free period of approximately 228 to 237 days and a freeze-free period of about 249 to 261 days. The primary growing season for warm-season plants is approximately about 232-240 days, increasing from north to south. The first frost generally occurs around November 13and the last frost occurs around March 24. These dates will vary from north to south and from year to year.

The average relative humidity ranges from 35 to 45 percent in mid-afternoon as diurnal air temperature nears maximum. As nighttime air temperature drops, relative humidity rises, averaging 70 to 75 percent by morning.

Table 3. Representative climatic features

Frost-free period (characteristic range)	189-194 days
Freeze-free period (characteristic range)	204-222 days
Precipitation total (characteristic range)	584-610 mm
Frost-free period (actual range)	184-201 days
Freeze-free period (actual range)	202-223 days
Precipitation total (actual range)	559-635 mm
Frost-free period (average)	192 days
Freeze-free period (average)	213 days
Precipitation total (average)	584 mm

Climate stations used

- (1) WELLINGTON [USC00419565], Wellington, TX

- (2) PADUCAH [USC00416740], Paducah, TX
- (3) JAYTON [USC00414570], Jayton, TX
- (4) SNYDER [USC00418433], Snyder, TX
- (5) ROBERT LEE [USC00417669], Robert Lee, TX

Influencing water features

Non-stream characteristics – overflow from heavy rainfall events. The site receives runoff from surrounding areas. Overflows are usually over a broad area with large rainfall events and may be confined to channels during small events.

This site is not classified as a wetland.

Wetland description

NA

Soil features

This site has deep, well drained, alluvial soils occurring on nearly level to very gently sloping valley floors and flood plains adjacent to drainages. The soils do not usually have high water tables, as do wetter bottomland sites. Surface horizons are dark colored loams or clay loams and may be calcareous to the surface, ranging from slightly above neutral to alkaline. Permeability is moderate and available water capacity is high. The site typically has a deep rooting zone, easily penetrated by plant roots. Plant-soil-air-moisture relationships are good when soils are healthy. Soils with good ground cover of grasses and mulch can effectively control raindrop splash and the topsoil or organic matter are not lost to overland flow or soil blowing. These soils are arable and highly fertile with moderately high productive capacity, which increases the likelihood of conversion from natural plant communities to intensive agricultural communities such as cultivated annual crops or introduced pasture.

Soil surveys often delineate two or more kinds of soil in a single mapping unit due to their geographical association on the landscape. Such groupings of soils are referred to as either associations or complexes. Ecological sites may or may not correspond to the all soil series contained in the association or complex.

Soil series that characterize the site are Bippus, Colorado, Gageby, Loamy Alluvial land, depressed and Spur soil series.

Table 4. Representative soil features

Parent material	(1) Alluvium–sandstone and siltstone
Surface texture	(1) Clay loam (2) Loam (3) Silty clay loam
Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Moderate to moderately rapid
Soil depth	183 cm
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	12.7–20.07 cm
Calcium carbonate equivalent (0-101.6cm)	0–10%
Electrical conductivity (0-101.6cm)	0–2 mmhos/cm

Sodium adsorption ratio (0-101.6cm)	0–1
Soil reaction (1:1 water) (0-101.6cm)	7.4–8.4
Subsurface fragment volume <=3" (Depth not specified)	1–2%
Subsurface fragment volume >3" (Depth not specified)	0–1%

Ecological dynamics

The Draw Ecological Site contained numerous micro-sites, such as slight depressions, level areas, some moderately sloping areas, shaded areas, and open sunny areas, as well as others. The shady, cooler areas would have been more favorable for growth of cool-season grasses such as Texas wintergrass and Canada wildrye. The open, sunny areas would have been more favorable for the warm-season grasses such as little bluestem, sideoats grama, and big bluestem. Forbs such as Engelmann's daisy and halfshrub sundrop are also found at the site. In higher seral stages the shallow-rooted shortgrasses, such as buffalograss, curlymesquite, and halls panicum would have been relegated to the drier places and other less favorable areas unoccupied by the tallgrasses and midgrasses. Some plant species are either physiologically or morphologically adapted to withstand prolonged drought, extreme temperatures, heavy grazing pressure, fire, flooding, and other stresses.

Fire has played a major role in grassland ecology, based upon historical accounts and research on tree rings and charcoal remnants. Periodic fires perpetuated grasslands, by suppressing the increase and invasion of woody plants. Woody species escaped fires due to strategic locations in wet depressions, along stream channels, or in heavily grazed areas lacking sufficient fuel. Fires were started by lightning, as well as by early man, who used fire to attracted game animals and birds to the fresh regrowth of vegetation following the fires. Fires occur only at about 5 to 7 years intervals.

This plant community functioned under the influence of multi-species herbivory by endemic herbivores, including bison, elk, pronghorn, and white-tailed deer. Changes in patterns and degree of use by the various kinds of animals caused major changes in plant communities, as well as degree of competition among animal species for habitat requirements.

Large herds of bison migrated from the Northern Great Plains into this area annually. Some smaller, remnant herds may have remained in the area, while the major herds migrated. The bison often grazed an area heavily and then moved on to more abundant forage. A long deferment period allowed the preferred grasses of the bison to recover before their next migration into the area. Burned areas were strongly preferred by the bison. During the early 1800's, bison populations were greatly reduced through indiscriminate slaughter. According to historical records, very few bison remained in the area after 1860, and the major migrations ceased.

White-tailed deer occurred in significant numbers, as resident populations. They did not migrate and were more sedentary than the other large herbivores. White-tailed deer were primarily browsers, but they also preferred many of the forbs, including cool-season annuals. White-tailed deer populations have increased in the region since early settlement.

The black-tailed prairie dog often established large towns throughout the region. The prairie dog probably played a role in suppressing woody species in the vicinity of their towns. Herbaceous vegetation also was kept very short with large amounts of bare ground, which created major barriers to fire. Very few active prairie dog towns remain, and the relict towns are small and very sparsely dispersed throughout the region.

The Native Americans lived in harmony as a component of the natural ecosystem, which included the endemic flora and fauna. Under that regime the reference plant community was perpetuated and functioned as a dynamic entity within the ecosystem. Unfortunately, the historic climax plant community did not fare so well under the influence of Europeans who indiscriminately decimated or displaced endemic animal populations, introduced domestic livestock, and suppressed fire. These events were forerunners leading to degradation of the historic climax plant community, as a component of the larger ecosystem.

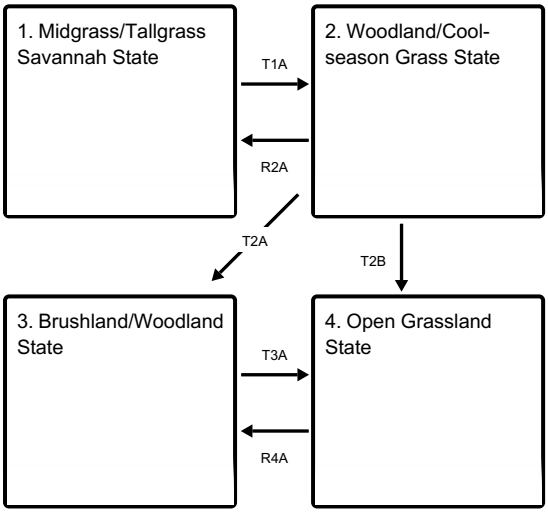
Grazing pressure on the plant community increased during the historic cattle drives of the mid to late 1800s, as large herds of longhorn cattle from South Texas passed through the area enroute to northern rail heads in Kansas and other points north. Sheep and goats were well established in the region by the late 1800's and exerted tremendous grazing pressure on rangelands, perhaps, greater than that of cattle. The introduction of fencing, windmills, and railroads had tremendous impacts on the condition of rangelands in the region. Fencing and water developments allowed livestock to be confined on the same area of land in a continuous grazing regime. With the coming of the railroad, better marketing capabilities encouraged landowners to increase their herds and flocks for short-term economic gain, resulting in still heavier grazing pressure on plant communities.

Palatability of plant species influences their susceptibility to grazing and browsing pressure. Excessive grazing or browsing of the more palatable species over prolonged periods results in loss of plant health and vigor, reduction of root mass, and eventually plant mortality. Under these conditions, other less palatable species within the community tend to increase their dominance. Overgrazing, droughts, extremes in temperature, lack of fire or untimely fire, are factors contributing to further degradation of the plant community. Woody plants increase or invade, replacing grasses and other herbaceous vegetation. In association with vegetation degradation, soil health also deteriorates, with an increase in bare ground, accelerated erosion, surface crusting, reduction in infiltration, excessive runoff, and loss of organic matter. At this point the integrity of the plant community is damaged or lost and may require supplemental energy to shift it back to the original plant community. Maintenance of a functional site or repair of a damaged site requires management focused on soil stability, nutrient cycling, and vegetation enhancement. This energy input may be in the form of reclamation practices, such as chemical or mechanical brush management, prescribed burning, or prescribed grazing.

The following state and transition diagram illustrates some of the more commonly recognized vegetative states and associated plant communities occurring on the Draw Ecological Site. There may be other vegetative states, not shown.

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, followed by reintroduction of historic disturbance regimes

T2A - Absence of disturbance and natural regeneration over time, may be coupled with excessive grazing pressure

T2B - Extensive soil disturbance followed by range planting

T3A - Extensive soil disturbance followed by range planting

R4A - Absence of disturbance and natural regeneration over time, may be coupled with excessive grazing pressure

State 1 submodel, plant communities

1.1. Midgrass/Tallgrass Savannah Community

State 2 submodel, plant communities

2.1. Woodland/Cool-Season Grass Community

State 3 submodel, plant communities

3.1. Mesquite/Juniper Woodland Community

State 4 submodel, plant communities

4.1. Seeded Native Range Planting Community

4.2. Introduced Seeding Community

State 1
Midgrass/Tallgrass Savannah State

The Midgrass/Tallgrass Savannah State is the reference plant community of the Draw Ecological Site. It is a savannah, with wide open areas dominated by primarily warm-season midgrasses such as little bluestem, sideoats grama, plains bristlegrass, and white tridens, along with a fair representation of tallgrasses such as big bluestem, Indiangrass, and switchgrass. The woody component of this savannah is about 10% intermittent woody canopy from species such as hackberry, western soapberry and occasional liveoak. Occasional honey mesquite also occurs on the site, where it grows into large trees with trunk diameters exceeding 15 inches. This site has a minor component of low growing shrubs such as elbowbush, whitebrush, and bumelia. The plant community also includes a good variety of perennial forbs. Cool-season annual forbs occupy bare areas following late fall or winter precipitation usually completing their life cycle by late spring. Productivity of the Draw Ecological Site is relatively high due to the deep, fertile soils and extra water received as runoff from adjacent sites.

Community 1.1
Midgrass/Tallgrass Savannah Community

Figure 8. 1.1 Midgrass/Tallgrass Savannah Community

The Midgrass/Tallgrass Savannah Community (1.1) is the reference plant community of the Draw Ecological Site. It is a savannah, with wide open areas dominated by primarily warm-season midgrasses such as little bluestem, sideoats grama, plains bristlegrass (*Setaria vulpiseta*), and white tridens (*Tridens albescens*), along with a fair representation of tallgrasses such as big bluestem, Indiangrass, and switchgrass (*Panicum virgatum*). Shortgrasses, such as buffalograss (*Bouteloua dactyloides*), curlymesquite, Texas grama (*Bouteloua rigidiseta*), and hall's panicum occur as a minor component of the plant community. The site also supports a fair component of cool-season plants including Texas wintergrass, western wheatgrass (*Pascopyrum smithii*), Canada wildrye, Texas bluegrass (*Poa arachnifera*), and sedges (Carex spp.). The woody component of this savannah is about 10% intermittent woody canopy from species such as hackberry (Celtis lavevigata), western soapberry (*Sapindus saponaria* var. drummondii) and occasional liveoak (*Quercus virginiana*). Other woody species such as pecan (Carya illionensis), cottonwood (Populus occidentalis) and black walnut (*Juglans nigra*) are found closer to the rivers and streams. Occasional honey mesquite (*Prosopis glandulosa* var. glandulosa) also occurrs on the site, where it grows into large trees with trunk diameters exceeding 15 inches. This site has a minor component of low growing shrubs such as elbowbush (*Forestiera pubescens*), whitebrush (*Aloysia gratissima*), bumelia (*Sideroxylon lanuginosum* var. oblongifolium), fourwing saltbush (*Atriplex canescens*), and agarito (*Mahonia trifoliolata*). Greenbriar (Smilax spp.) and oldman's-beard (Clematis drummondi) are common woody vines occurring on the site. The plant community also includes a good variety of perennial forbs such as Maximilian sunflower (*Helianthus maximiliani*), Engelmann's daisy (*Engelmannia peristenia*), bushsunflower (Simsa calva), heath aster (*Chaetopappa ericoides*), milkvetch (Astragalus spp.) and American vetch (Vicia spp.). Cool-season annual forbs occupy bare areas following late fall or winter precipitation usually completing their life cycle by late spring. The plant community is seasonally balanced, due to the presence of cool-season herbaceous plants and evergreen woody plants. Productivity of the Draw Ecological Site was relatively high due to the deep, fertile soils and extra water received as runoff from adjacent sites. In many respects, the Draw Ecological Site resembles the Clayey Bottomland Ecological Site in plant species composition, with the distinction being greater amounts of the tallgrass species and significantly greater productive capacity found at the bottomland sites. Also, the Clayey Bottomland Ecological Site is a wetter site influenced by more frequent overflows and sometimes higher water table. Retrogression occurs in the reference plant community when it was exposed to heavy, continuous, grazing over a period of many years. Major shifts occur in species composition as the more palatable species of tall and midgrasses, such as little bluestem, sideoats grama, and plains bristlegrass decrease. The less palatable species such as threeawns, curlymesquite, tobosa (Phleuraphis muticus), alkali sacaton (*Sporobolus airoides*), Texas grama, and red grama (*Bouteloua trifida*) increase. Woody species, especially mesquite, along with lotebush, agarito, and whitebrush also increase while juniper (Juniperus spp.) and pricklypear (Opuntia spp.) invade the site. In the absence of fire or brush management to suppress the increase and invasion of woody species, canopy cover of woody vegetation may increase to 20 to 30%. This dense canopy contributes to a shadier environment resulting in replacement of many warm-grass grasses by cool-season grasses in the understory. These major changes in vegetation type and structure will contribute to more bare soil, surface crusting, loss of organic matter, and initiation of some sheet and rill erosion, all of which will contribute to deterioration of rangeland health. Over a period of years in this state, depending upon prevailing climatic conditions, severity of grazing pressure, and degree of fire suppression, the plant community will lose its resistance and resilience to continue functioning as the reference plant community. A major threshold will have be crossed, and the character of the plant community shifted to a dominance of woody vegetation and cool-season grasses, resulting in a new vegetative state: the Woodland/Cool-season Grass Community (2.1).

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	2018	3222	4035
Tree	252	420	504
Shrub/Vine	112	196	252
Forb	140	196	252
Total	**2522**	**4034**	**5043**

Figure 10. Plant community growth curve (percent production by month). TX2044, Midgrass/Tallgrass Savannah Community. Savannah composed of mid and tallgrasses..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2	3	5	10	24	20	5	5	12	10	2	2

State 2
Woodland/Cool-season Grass State

The Woodland/Cool-season Grass State is composed of cool-season grasses such as Texas wintergrass and western wheatgrass and has largely replaced the warm-season midgrasses and tallgrasses, which previously dominated the reference plant community. Some of the grasses remaining may include tobosa and alkali sacaton due to their lower palatability and competitive nature, buffalograss, which will tolerate some intermittent shade, silver bluestem, meadow dropseed, and white tridens. The more palatable forbs, such as Maximilian sunflower, Englemann’s daisy, and bushsunflower will be replaced by less preferred forb species, such as western ragweed, silverleaf nightshade, heath aster, and curlycup gumweed. Woody plants will increase strongly to dominate the overstory with total canopy cover approaching 15-20%. Low shrubs will be the first woody plants to increase and invade the community.

Community 2.1
Woodland/Cool-Season Grass Community

Figure 11. Woodland/Cool-Season Grass Community

The Woodland/Cool-season GrassCommunity (2.1) would replace the Midgrass/Tallgrass Savannah Community (1.1). Cool-season grasses, primarily Texas wintergrass and western wheatgrass, will have largely replaced the warm-season midgrasses and tallgrasses, which previously dominated the reference plant community. Some of the grasses remaining include tobosa and alkali sacaton due to their lower palatability and competitive nature, buffalograss, which will tolerate some intermittent shade, silver bluestem, meadow dropseed, and white tridens. Other shortgrasses, such as red grama, Texas grama, halls panicum, tumble windmillgrass (Chloris verticellata), and curlymesquite will occupy some of the open areas, but these will not contribute much to the total annual production. Remnants of some of the more resilient midgrasses and possibly a few tallgrasses will remain in

protected areas having adequate sunlight. The more palatable forbs, such as Maximilian sunflower, Englemann's daisy (Engelmania peristenia), bushsunflower (Simsa calva), purple prairieclover (*Dalea purpurea*), and gaura (Gaura spp.) will be replaced by less preferred species, such as western ragweed (*Ambrosia psilostachya*), sticky selloa (*Gymnosperma glutinosum*), silverleaf nightshade (*Solanum elaeagnifolium*), heath aster (*Chaetopappa ericoides*), and curlycup gumweed (*Grindelia squarrosa*). Woody plants will increase strongly to dominate the overstory with total canopy cover approaching 15-20%. Low shrubs will be the first woody plants to increase and invade the community. These include whitebrush, lotebush (*Ziziphus obtusifolia*), agarito, wolfberry (*Lycium berlandieri*) and succulents, including pricklypear (Opuntia spp.) and tasajillo (*Cylindropuntia leptocaulis*). In addition, honey mesquite and Texas persimmon (*Diospyros texana*) increase, while juniper may begin to invade the site. Texas wintergrass will co-dominate the understory, replacing many of the remaining warm-season midgrasses. Threeawns (Aristida spp.), alkali sacaton and tobosa, along with shortgrasses, such as red grama, Texas grama, and tumble windmillgrass also increase and become the major warm-season grasses in the community. Productivity will be much lower than the reference plant community. The site in this state would be producing only about 2000 to 3000 pounds (dry weight) biomass per acre, with woody plants making up a high percentage of total biomass. These vegetative conditions represent significant retrogression in the plant community. The site, however, still would have potential for high productivity, due to its strong resilience, deep soils, high soil water capacity and occasional extra run-on water. With supplemental energy inputs, including selective brush management, grazing deferment, and prescribed burning, this plant community has the potential to return to the Reference State, with a plant community similar to the Midgrass/Tallgrass Savannah Community (1.1). If the Woodland/Cool-season Grass Community (2.1) has deteriorated severely to the point of brush canopy exceeding 25%, and remnants of midgrasses and tallgrasses are scarce, it may be more feasible to convert the community to the Open Grassland State (4) through high-level energy inputs. The Draw Ecological Site would be one of the more suitable sites for such a conversion, due to its deep soils, nearly level slopes, good plant-soil-water relationships, and high productive capacity. This could be accomplished using mechanical brush management and range planting with adapted native grasses, followed by prescribed grazing. This vegetative transformation would result in the Native Seeded Range Planting Community (4.1).

Table 6. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	1457	1765	2186
Tree	336	420	504
Shrub/Vine	224	280	336
Forb	224	280	336
Total	**2241**	**2745**	**3362**

Figure 13. Plant community growth curve (percent production by month). TX2045, Woodland with Cool Season Component. Woodland community with cool season components..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2	3	5	10	24	20	5	5	12	10	2	2

State 3
Brushland/Woodland State

The Brushland/Woodland Vegetative State (3) is represented by the Mesquite/Juniper Woodland Community (3.1). Honey mesquite and juniper dominate the upper canopy layer of this plant community. This effect will allow the juniper to become a co-dominant woody species along with mesquite in the upper canopy layer of this plant community. The mid layer understory and interspaces among the larger trees are dominated by a wide array of low shrubs, including whitebrush, lotebush, Texas persimmon, pricklyash, catclaw, and agarito. Total woody canopy exceeds 50%. Large amounts of pricklypear and tasajillo occupied more sparse understory and openings among the woody plant. The understory herbaceous layer is dominated primarily by Texas wintergrass. Small openings are occupied primarily by shortgrasses, including red grama, Texas grama, threeawns, tumble windmillgrass, and sand dropseed. Tallgrasses are no longer present and about the only significant amounts of midgrasses include silver bluestem, tobosa, and alkali sacaton. Forbs include western ragweed, heath aster, silverleaf nightshade, sticky

selloa, and broom snakeweed (*Gutierrezia sarothrae*). A few shade-tolerant forbs also occur in the understory. Cool-season annual forbs such as filaree, plantain, tansymustard, pepperweed and bladderpod are prevalent following fall and occasional winter precipitation.

Community 3.1
Mesquite/Juniper Woodland Community

Figure 14. Mesquite/Juniper Woodland Community

In the Mesquite/Juniper Woodland Community (3.1). Honey mesquite and juniper dominate the upper canopy layer of this plant community. Honey mesquite has increased greatly. Juniper will begin to have a significant invasion of the Woodland/Cool-season State (2) which will eventually increase in density and canopy. This effect will allow the juniper to become a co-dominant woody species along with mesquite in the upper canopy layer of this plant community. The mid layer understory and interspaces among the larger trees are dominated by a wide array of low shrubs, including whitebrush, lotebush, Texas persimmon, pricklyash, catclaw, and agarito. Total woody canopy exceeds 50%. Large amounts of pricklypear and tasajillo occupy more sparse understory and openings among the woody plant. The understory herbaceous layer is dominated primarily by Texas wintergrass. Small openings are occupied primarily by shortgrasses, including red grama, Texas grama, threeawns, tumble windmillgrass, and sand dropseed. Tallgrasses are no longer present and about the only significant amounts of midgrasses include silver bluestem, tobosa, and alkali sacaton. Forbs include western ragweed, heath aster, silverleaf nightshade, sticky selloa, and broom snakeweed (*Gutierrezia sarothrae*). A few shade-tolerant forbs also occur in the understory. Cool-season annual forbs such as filaree (Erodium spp.), plantain (Plantago spp.), tansymustard (Descurainia spp.), pepperweed (Lepidium spp.) and bladderpod (Lesquerella spp.) are prevalent following fall and occasional winter precipitation. Productivity of the Mesquite/Juniper Woodland Community (3.1) is much lower than other plant communities of the Draw Ecological Site due to loss of many of the warm-season midgrasses and tallgrasses and increase of woody plants and pricklypear. The site in this state is producing total annual biomass of only about 1975 to 2500 pounds (dry weight) per acre, including woody plants and pricklypear. This plant community could not be feasibly rejuvenated and returned to the previous natural vegetative states over a reasonable span of time, due to extreme dominance of woody vegetation, loss of principal grasses and perennial forbs, and lack of fine fuels for fire. However, with high-level energy inputs, including mechanical brush management, range planting with adapted native grasses, and prescribed grazing, the Mesquite/Juniper Woodland Community (3.1) could be converted to the Native Seeded Community (4.1).

Table 7. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	874	897	1121
Tree	729	757	925
Shrub/Vine	476	504	616
Forb	112	112	140
Total	**2191**	**2270**	**2802**

Figure 16. Plant community growth curve (percent production by month).

TX2046, Mesquite/Juniper Woodland Community. Mesquite and Juniper dominated Woodland community..

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

State 4
Open Grassland State

The Native Seeded Community (4.1) represents a management-induced vegetative state. This community is the result of artificial revegetation of a degraded natural plant community in an effort to speed vegetative transformation to a native Open Grassland State (4). Vegetative conversion generally is more applicable under conditions where rangeland plant communities have regressed severely, especially in association with heavy brush invasion, such as the Woodland/Cool-season Grass Community (2.1) or the Mesquite/Juniper Woodland Community (3.1). Cropland, deteriorated pastureland, or abandoned cropland also may be converted to the Native Seeded Community. Adapted native grass mixtures for revegetation of this site include midgrasses, such as sideoats grama, plains bristlegrass, and green sprangletop while tallgrass species might include switchgrass, big bluestem, Indiangrass and Eastern gamagrass (*Tripsacum dactyloides*). Forbs suitable for seeding this site would include Maximilian sunflower, bundleflower, bush sunflower, and prairieclover. Fourwing saltbush would be a suitable shrub to be included in the range seed mixture. Commercial seed sources of adapted forbs and shrubs generally are scarce. Annual production generally ranges from 2250 to 4500 pounds air-dry biomass per acre. Native grasses can successfully compete with the annual grasses and forbs, which often appear during initial establishment. Native grasses are somewhat slower in establishing viable stands through artificial revegetation, than some of the introduced pasture grasses. However, once established and with proper grazing management, native grasses have greater longevity and sustained productivity without high-level energy inputs. The Introduced Seeded Community (4.2) is a management-induced vegetative state. It is the result of intensive cultural practices designed to speed the vegetative transformation of a natural plant community, primarily to produce a more economically desired plant community. Seeded pasture usually consists of a monoculture of grasses, such as kleingrass (*Panicum coloratum*), old-world bluestem (Bothriochloa spp.), or weeping lovegrass (*Eragrostis curvula*), or a mixture of two or three compatible species. These are generally introduced or improved cultivars, having characteristics desired for forage, erosion control, water conservation, or wildlife habitat.

Community 4.1
Seeded Native Range Planting Community

Figure 17. Native Seeded Range Plant Community

The Native Seeded Range Plant Community represents a management-induced vegetative state. This community is the result of artificial revegetation of a degraded natural plant community in an effort to speed vegetative transformation to a native Open Grassland State. The community is produced through the application of mechanical brush management (BM), range planting (RP), and prescribed grazing (PG). Mechanical brush management is used to obtain more effective control of a broader spectrum of brush species and to facilitate seedbed preparation. In areas with significant amounts of pricklypear, mechanical treatments may be integrated with chemical treatment and/or post-seeding prescribed burning (PB) to reduce density of pricklypear. Any plant community can be converted to the Native Seeded Range Plant Community (3). However, it would not be logical to use this option for

a functional community of higher ecological status, such as the Midgrass/Tallgrass Hardwood Savannah (1). Vegetative conversion generally is more applicable under conditions where rangeland plant communities have regressed severely, especially in association with heavy brush invasion, such as the Woodland/Cool-season Grass Plant Community (2), the Mesquite/Juniper Woodland Plant Community (5). Cropland, deteriorated pastureland, or abandoned cropland also may be converted to the Native Seeded Range Plant Community. Adapted native grass mixtures for revegetation of this site include midgrasses, such as sideoats grama, plains bristlegrass, and green sprangletop while tallgrass species might include switchgrass, big bluestem, Indiangrass and Eastern gamagrass (*Tripsacum dactyloides*). Forbs suitable for seeding this site would include Maximilian sunflower, bundleflower, bush sunflower, and prairieclover. Fourwing saltbush would be a suitable shrub to be included in the range seed mixture. Commercial seed sources of adapted forbs and shrubs generally are scarce. Annual production generally ranges from 2250 to 4500 pounds air-dry biomass per acre. Native grasses can successfully compete with the annual grasses and forbs, which often appear during initial establishment. Native grasses are somewhat slower in establishing viable stands through artificial revegetation, than some of the introduced pasture grasses. However, once established and with proper grazing management, native grasses have greater longevity and sustained productivity without high-level energy inputs. The Native Seeded Range Plant Community (3) would produce an abundance of high quality forage for domestic livestock, especially cattle. The community also would provide suitable habitat for various wildlife species; especially those requiring open grassland habitat. By leaving about 5% woody cover in scattered mottes or strips, this site also could provide good cover and edge-effect for other wildlife such as whitetail deer, bobwhite quail, and some of the song birds. The Native Seeded Range Plant Community (3) requires less intensive cultural inputs for maintenance, than introduced seeded pastureland. The primary practices needed to maintain native seeded areas are prescribed grazing (PG), including initial deferment following seeding, subsequent periodic deferments or rotational grazing, and proper degree of utilization. Prescribed burning or brush management, using individual plant treatment (IPT) would be needed periodically to suppress brush and pricklypear invasion. Without maintenance, the Native Seeded Range Plant Community (3) would deteriorate, with loss of plant vigor, productivity, and general health. Woody species would invade, along with low successional perennial and annual plants. The community would eventually evolve to the Mesquite/Juniper Woodland Plant Community (5).

Table 8. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	2410	–	4792
Forb	140	–	252
Total	**2550**	**–**	**5044**

Figure 19. Plant community growth curve (percent production by month). TX2005, Native Seeding Plant Community. Range Planting of native seed mix of big bluestem, switchgrass, indiangrass, and sideoats grama..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	2	5	12	25	20	5	5	14	8	2	1

Community 4.2
Introduced Seeding Community

Figure 20. Introduced Seeding Community

The Introduced Seeded Community is a management-induced vegetative state. It is the result of intensive cultural practices designed to speed the vegetative transformation of a natural plant community, primarily to produce a more economically desired plant community. Seeded pasture usually consists of a monoculture of grasses, such as kleingrass, old-world bluestem, or weeping lovegrass, or a mixture of two or three compatible species. These are generally introduced or improved cultivars, having characteristics desired for forage, erosion control, water conservation, or wildlife habitat. In most cases seeded pastureland is management-oriented for forage production, but may have secondary benefits. Such plant communities usually provide higher levels of production than degraded natural plant communities on this site. Although this vegetative state may provide productive and seasonally nutritious forage for livestock, it may lack the biodiversity of natural plant communities, more essential to many wildlife species. However, management practices have been developed to integrate seeded pastureland in juxtaposition with native rangeland to enhance wildlife habitat, while still providing other resource benefits. Native rangeland of any vegetative state may be converted to Seeded Pastureland. However, the energy inputs required for such conversions generally do not justify the conversion of functional native plant communities of the higher seral stages, such as those in the Grassland State. The Introduced Seeded Community (4) can be converted into a Mesquite/Juniper/Woodland community (5) if the site becomes idled.

Table 9. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	2578	–	5100
Forb	140	–	280
Total	**2718**	**–**	**5380**

Figure 22. Plant community growth curve (percent production by month). TX2006, Introduced Grasses - Pastureland. Seeded pastureland into introduced species such as kleingrass, old world bluestems or weeping lovegrass..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	2	5	12	25	20	5	5	14	8	2	1

Transition T1A
State 1 to 2

Due to heavy continuous grazing pressure, no brush management, brush invasion of shrubs and woody species, and no fires, the Midgrass/Tallgrass Savannah State will transition into the Woodland/Cool-season Grass State.

Restoration pathway R2A
State 2 to 1

With the implementation of various conservation practices such as Prescribed Grazing, Brush Management, and

Prescribed Burning, the Woodland/Cool-season Grass State can be restored to the Midgrass/Tallgrass Savannah State.

Conservation practices

Brush Management
Prescribed Burning
Prescribed Grazing
Integrated Pest Management (IPM)

Transition T2A
State 2 to 3

With heavy continuous grazing, no brush management, no fires, and brush invasion of woody species, the Woodland/Cool-season Grass State will transition into the Brushland/Woodland State.

Transition T2B
State 2 to 4

With Prescribed Grazing, Brush Management, Range Planting, Pasture Planting, Pest Management, and Crop Cultivation conservation practices, the Woodland/Cool-season Grass State will transition into the Open Grassland State.

Transition T3A
State 3 to 4

With the application of various conservation practices including Prescribed Grazing, Brush Management, Prescribed Burning, Range Planting, Pasture Planting, Seedbed Preparation, and Pest Management, the Brushland/Woodland State can be transitioned into the Open Grassland State of Native or Introduced Seeding Communities.

Restoration pathway R4A
State 4 to 3

With Heavy Continuous Grazing pressure, No Brush Management, Brush Invasion, and no fires, the Open Grassland State will revert back to the Brushland/Woodland State.

Additional community tables

Table 10. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Tallgrasses**			631–1261	
	big bluestem	ANGE	*Andropogon gerardii*	157–1261	–
	bulb panicgrass	PABU	*Panicum bulbosum*	157–1261	–
	switchgrass	PAVI2	*Panicum virgatum*	157–1261	–
	Indiangrass	SONU2	*Sorghastrum nutans*	157–1261	–
2	**Tall/midgrasses**			1134–2270	
	cane bluestem	BOBA3	*Bothriochloa barbinodis*	82–2270	–
	sideoats grama	BOCU	*Bouteloua curtipendula*	82–2270	–
	silver beardgrass	BOLAT	*Bothriochloa laguroides ssp. torreyana*	82–2270	–
	Arizona cottontop	DICA8	*Digitaria californica*	82–2270	–

	plains lovegrass	ERIN	*Eragrostis intermedia*	82–2270	–
	green sprangletop	LEDU	*Leptochloa dubia*	82–2270	–
	vine mesquite	PAOB	*Panicum obtusum*	82–2270	–
	tobosagrass	PLMU3	*Pleuraphis mutica*	82–2270	–
	little bluestem	SCSC	*Schizachyrium scoparium*	82–2270	–
	plains bristlegrass	SEVU2	*Setaria vulpiseta*	82–2270	–
	alkali sacaton	SPAI	*Sporobolus airoides*	82–2270	–
	composite dropseed	SPCOC2	*Sporobolus compositus var. compositus*	82–2270	–
	Drummond's dropseed	SPCOD3	*Sporobolus compositus var. drummondii*	82–2270	–
	white tridens	TRAL2	*Tridens albescens*	82–2270	–
3	**Mid/shortgrasses**			126–252	
	threeawn	ARIST	*Aristida*	0–252	–
	buffalograss	BODA2	*Bouteloua dactyloides*	0–252	–
	Texas grama	BORI	*Bouteloua rigidiseta*	0–252	–
	red grama	BOTR2	*Bouteloua trifida*	0–252	–
	tumble windmill grass	CHVE2	*Chloris verticillata*	0–252	–
	fall witchgrass	DICO6	*Digitaria cognata*	0–252	–
	hairy woollygrass	ERPI5	*Erioneuron pilosum*	0–252	–
	curly-mesquite	HIBE	*Hilaria belangeri*	0–252	–
	Hall's panicgrass	PAHA	*Panicum hallii*	0–252	–
	tumblegrass	SCPA	*Schedonnardus paniculatus*	0–252	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	0–252	–
	slim tridens	TRMU	*Tridens muticus*	0–252	–
	slim tridens	TRMUE	*Tridens muticus var. elongatus*	0–252	–
4	**Cool Season Grasses**			252–504	
	sedge	CAREX	*Carex*	64–504	–
	Canada wildrye	ELCA4	*Elymus canadensis*	64–504	–
	Texas wintergrass	NALE3	*Nassella leucotricha*	64–504	–
	Texas bluegrass	POAR	*Poa arachnifera*	64–504	–
5	**Annual Grasses**			0–1	
	Grass, annual	2GA	*Grass, annual*	0–1	–
Forb					
6	**Forbs**			127–252	
	pelotazo	ABIN	*Abutilon incanum*	0–252	–
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	0–252	–
	white sagebrush	ARLUL2	*Artemisia ludoviciana ssp. ludoviciana*	0–252	–
	aster	ASTER	*Aster*	0–252	–
	milkvetch	ASTRA	*Astragalus*	0–252	–
	purple prairie clover	DAPU5	*Dalea purpurea*	0–252	–
	bundleflower	DESMA	*Desmanthus*	0–252	–
	Engelmann's daisy	ENPE4	*Engelmannia peristenia*	0–252	–
	beeblossom	GAURA	*Gaura*	0–252	–

	Maximilian sunflower	HEMA2	*Helianthus maximiliani*	0–252	–
	spotted beebalm	MOPU	*Monarda punctata*	0–252	–
	turkey tangle fogfruit	PHNO2	*Phyla nodiflora*	0–252	–
	upright prairie coneflower	RACO3	*Ratibida columnifera*	0–252	–
	snoutbean	RHYNC2	*Rhynchosia*	0–252	–
	wild petunia	RUELL	*Ruellia*	0–252	–
	awnless bushsunflower	SICA7	*Simsia calva*	0–252	–
	globemallow	SPHAE	*Sphaeralcea*	0–252	–
	vervain	VERBE	*Verbena*	0–252	–
	American vetch	VIAM	*Vicia americana*	0–252	–
7	**Annual Forbs**			0–1	
	Forb, annual	2FA	*Forb, annual*	0–1	–
Shrub/Vine					
8	**Shrubs/Vines**			140–252	
	whitebrush	ALGR2	*Aloysia gratissima*	0–252	–
	California saltbush	ATCA	*Atriplex californica*	0–252	–
	Drummond's clematis	CLDR	*Clematis drummondii*	0–252	–
	Texas persimmon	DITE3	*Diospyros texana*	0–252	–
	stretchberry	FOPU2	*Forestiera pubescens*	0–252	–
	desert-thorn	LYCIU	*Lycium*	0–252	–
	algerita	MATR3	*Mahonia trifoliolata*	0–252	–
	pricklypear	OPUNT	*Opuntia*	0–252	–
	plum	PRUNU	*Prunus*	0–252	–
	littleleaf sumac	RHMI3	*Rhus microphylla*	0–252	–
	skunkbush sumac	RHTRT	*Rhus trilobata var. trilobata*	0–252	–
	bully	SIDER2	*Sideroxylon*	0–252	–
	greenbrier	SMILA2	*Smilax*	0–252	–
	Texas Hercules' club	ZAHI2	*Zanthoxylum hirsutum*	0–252	–
	lotebush	ZIOB	*Ziziphus obtusifolia*	0–252	–
Tree					
9	**Trees**			252–504	
	pecan	CAIL2	*Carya illinoinensis*	0–504	–
	netleaf hackberry	CELAR	*Celtis laevigata var. reticulata*	0–504	–
	black walnut	JUNI	*Juglans nigra*	0–504	–
	cottonwood	POPUL	*Populus*	0–504	–
	honey mesquite	PRGL2	*Prosopis glandulosa*	0–504	–
	chokecherry	PRVI	*Prunus virginiana*	0–504	–
	live oak	QUVI	*Quercus virginiana*	0–504	–
	western soapberry	SASAD	*Sapindus saponaria var. drummondii*	0–504	–

Animal community

The animal community changed dramatically from the early 1800s to early 1900s, as a result of overexploitation of various wildlife species through unregulated market hunting, trapping, poisoning, and wanton destruction. Some of

the most drastic changes in animal communities include the extinction of populations, species, and subspecies, changes in geographical distribution, and the introduction of non-endemic species. In the past century, changes in animal populations have been more related to loss or fragmentation of critical habitat. Loss of habitat is usually the major cause of population declines or even extinction of some species. Cultivation has been the demise of many wildlife species, such as the prairie chicken and certain kinds of waterfowl, while still other species, such as the pronghorn, have been displaced geographically. However, the problem does not always result from total destruction of habitat, but often involves the loss of one or more critical habitat components, such as mating and nesting habitat for certain birds, or in other cases the reduction in area or continuity of desirable habitat.

The reference plant community of the Draw Ecological Site was used by a diversity of indigenous wildlife, which preferred grassland habitat. The larger grazing and browsing herbivores included bison, elk, pronghorn and white-tailed deer. The smaller mammals included prairie dog, badger, cottontail rabbit, skunk, ground squirrel and various other species of small rodents. Transient species, such as bats, occasionally used the site intermittently or incidental to more preferred or associated sites. Carnivores included the wolf, coyote, bobcat, fox, black-footed ferret, ocelot and mountain lion. Birds included lesser prairie chicken, wild turkey, bobwhite quail, doves, nighthawk and numerous species of sparrows, eagles, hawks and vultures. Various snakes, lizards and tortoise also occur.

The migratory bison was the largest herbivore grazing the historic climax plant community. Bison probably grazed the Draw Ecological Site intermittently in association with surrounding sites. They were selective grazers, preferring primarily grasses, while utilizing only a few forbs and very little woody browse. Bison often grazed an area heavily but it was primarily during winter dormancy of the warm-season prairie grasses and long deferment periods occurred before the next migration into the area. Unlike bison grazing, earlier domestic livestock grazing was both heavy and continuous. Domestic cattle eventually replaced the endemic bison and became the principal larger grazing herbivore after 1860.

White-tailed deer was another non-migratory herbivore with a considerably smaller home range than the antelope. The white-tailed deer is considered to be primarily a browser but also utilizes large quantities of forbs, including cool-season annuals, and some cool-season grasses in winter and early spring, while using very limited amounts of warm-season grasses in any season. The Draw Ecological Site provided a wide variety of preferred food items of the white-tailed deer including liveoak acorns and other woody mast, while scattered woody shrubs and motes provided edge-effect and screening cover. Since European settlement, the white-tailed deer population has increased dramatically. The increase in the white-tailed deer population may be attributed to extirpation of the wolf and mountain lion, which were the primary predators of deer, increase of woody vegetation, eradication of the screwworm fly, and intensive predator control, as well as early regulatory restrictions on harvest of does. During the past three decades (1970-2004), great progress has been made in wildlife management, through habitat improvement, as well as selective population controls (primarily through hunting), including harvest of does and manipulation of buck:doe ratios. The white-tailed deer has become the most popular large game species in the region and contributes immensely to local economies.

Many other species of birds still inhabit the Draw site. Wild turkey, bobwhite quail and scaled quail now occur in the one or more of the plant communities, but the lesser prairie chicken has been extirpated. Many species of grassland passeriformes, including songbirds such as larks and sparrows, have been displaced due to increase in woody cover and cacti. The roadrunner is a unique bird from the past, which thrives in vegetative states with abundance of woody vegetation and cacti. It feeds upon a variety of items including lizards, snakes, insects, and pricklypear tunas, common to such plant communities. The roadrunner nests in thorny shrubs. Birds of prey associated with the Draw Ecological Site include eagles, hawks, falcons and owls.

The animal component of the plant community has changed drastically since settlement and the introduction of domestic livestock, including cattle, sheep, and goats, which have largely replaced most endemic large herbivores (i.e. bison, elk, and pronghorn), while still supporting whitetail deer and many of the smaller herbivores.

The Rio Grande turkey prefers to locate in the vicinity of roost trees, especially near streams, but the habitat ranges over large areas while feeding. The Draw Ecological Site in higher ecological status would provide a wide variety of preferred foods, good roost trees, and excellent nesting cover for the wild turkey. The wild turkey feeds upon seeds and mast, of many plants occurring on the Draw Ecological Site. Turkeys would nest among the taller midgrasses of this site when it is in a higher stage of plant succession.

Bobwhite quail prefer edge-effect, and scattered shrubs with underspace, such as fourwing saltbush, lotebush, and

littleleaf sumac, which provide loafing areas and cover from raptors. Combinations of bunch grasses and low shrubs provide good nesting cover. Many of the annual forbs also produce desirable foods of the bobwhite quail. The scaled (blue) quail prefers the more regressed plant communities of this site to higher seral stages of dense grass cover. It prefers openness in the understory, bare ground, and shortgrasses, which facilitates their running nature and their preference or tolerance for more woody cover and cacti.

Hydrological functions

The reference plant community of the Draw Ecological Site, with its abundance of deep-rooted bunchgrasses, dense surface mulch, high soil organic matter, and limited erosion, contributes to optimum hydrologic functions, within limitations of the prevailing climate, geology, and soils. Infiltration and percolation of water to plant root zones is good, and runoff is low.

Soil permeability is moderately slow to very slow. The soils are well drained and have high available water capacity. The site receives additional water from adjacent site runoff. Overall the site has very good plant-soil-moisture relationships. Unlike some of the other droughty sites in the area, precipitation effectiveness is very good on the Draw Ecological Site when it is in good rangeland health. The deep-rooted bunches are very effective in limiting raindrop impact, reducing runoff and holding water on-site to enhance infiltration and percolation. Deep percolation beyond the root zone is limited, due to low annual precipitation. Deep penetrating tree roots provide channels, which enhance deeper percolation on this site. However, deep percolation by root channels of some woody species, such as mesquite, is probably offset by the plants heavy demand for water in its life cycle. Spring flows have been revived after many years of dormancy, following removal of mesquite and juniper over large areas of the contributing watershed, which included the Draw Ecological Site.

Loss of herbaceous vegetative cover, especially the larger bunchgrasses, accompanied by loss of mulch and soil organic matter, reduces infiltration and increase runoff. This occurs under heavy continuous grazing, prolonged drought and cessation of fire or untimely fire. As the deep-rooted midgrasses and tallgrasses, including little bluestem, sideoats grama, big bluestem and Indiangrass decrease, the shortgrasses, such as buffalograss, curlymesquite and threeawns, increase. Shallow-rooted, sod-forming grasses, such as buffalograss and curlymesquite, are less effective than bunchgrasses in promoting good water infiltration and reducing runoff. Increased runoff results in less infiltration, less water for plant growth, and accelerated soil erosion. Under high intensity rainfall, a degraded site will contribute to down slope flooding, sedimentation, and poor water quality in streams and rivers. As degradation of the plant community and soil becomes increasingly more severe, water dynamics are more negatively impacted, resulting in impairment of the normal water cycle associated with this site.

Brush management and prescribed grazing will help improve hydrologic function over a period of several years, through increase of deep-rooted bunchgrasses and surface cover, which will improve water infiltration and percolation to the root zone; also reduce raindrop splash and soil erosion. Woody plants use larger amounts of water than grasses per unit of biomass produced and usually out-compete grasses for available water. Reduction of woody plants through chemical versus mechanical methods will avoid soil disturbance and give grasses a competitive advantage for limited moisture. Reduction of brush canopy also will reduce evaporation of precipitation intercepted by woody canopies, especially juniper, thus allowing more water to reach the surface and infiltrate to replenish soil moisture for plant growth. Hydrologic function generally can be improved, along with improvement in the ecological status plant communities. Neither may return to that of the reference plant community, if excessive soil loss has occurred in association with site degradation, leading to the crossing of ecological thresholds.

The mineral soils of this site are in Hydrologic Group B.

Recreational uses

The Draw Ecological Site is used for hunting, birding, hiking, camping, and horseback riding. The site offers aesthetic appeal from its large trees, in association with appealing prairie grasses, colorful wildflowers, and wildlife diversity.

Wood products

Mesquite from the Draw Ecological Site can be used as firewood and for specialty wood work, including furniture and flooring. Blueberry juniper occurring in more regressed communities can be used for fence posts and stays, but

redberry juniper is less desirable.

Other products

The Draw Ecological Site may be used for honey production from some of the woody plants, such as whitebrush (beebrush) and mesquite, which produce blooms favored by honeybees. The site produces pecans which can be marketed or used for home consumption.

Other information

None.

Inventory data references

The information in this document is based on observation of range sites over many years and knowledge of where well managed rangelands are found. It is also based on the review of data such as NRCS 417 data, old range inventories going back many years, and from range site descriptions prepared by NRCS specialists. Many historical accounts of pre-settlement times have been reviewed.

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Site Development and Testing Plan:

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

Annual reviews of the Project Plan are to be conducted by the Ecological Site Technical Team.

Rangeland health reference sheet

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

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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.

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

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):** 20-25% bare ground.

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):** None to slight.

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** Very resistant to surface erosion.

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Loam to clay loam; friable; high 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 small interspaces should make rainfall impact minimal. This site has moderate permeability, runoff is slow to medium, and available water holding capacity is high.

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 shortgrasses >

Sub-dominant: Warm-season midgrasses >

Other: Cool-season grasses = Forbs = Shrubs/Vines = Trees

Additional:

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** Mortality and decadence is moderate due to high herbaceous vegetative canopy.

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

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 2,750 to 4,500 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:** Yucca and willow baccharis. Broom snakeweed can become invasive.

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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.
