USDA Natural Resources Conservation Service

Ecological site R078CY103TX
Loamy Bottomland 23-31" 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.

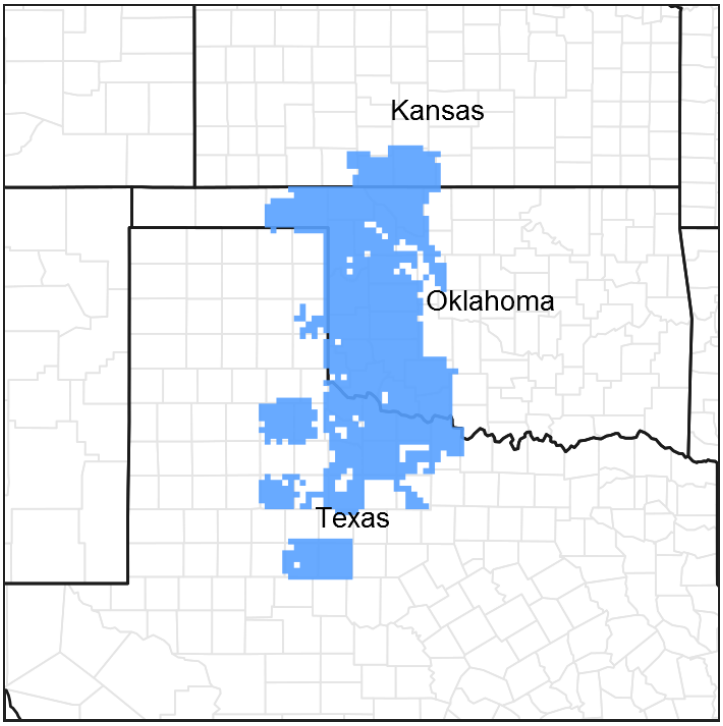


Figure 1. Mapped extent

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): 078C–Central Rolling Red Plains, Eastern Part

MLRA 78C is characterized by moderately dissected, rolling plains with prominent ridges and valleys and numerous terraces adjacent to dissecting streams. Loamy and clayey

soils are generally deep, well drained, and developed in calcareous and gypsiferous sediments of 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 on loamy floodplain soils. The reference vegetation consists of native tallgrasses, forbs, and few woody species. Bottomland hardwood trees will be found along the water courses, but overall canopy averages less than 10% across the landscape. Without brush management or prescribed fire, woody species may encroach and begin to dominate the ecological processes. Continuous abusive grazing may shift the plant community to a midgrass dominated plant community.

Similar sites

R078CY094TX	**Clayey Bottomland 23-30" PZ** Clayey Bottomland is found on similar physiographic position but with clayey soils and not as productive as loamy bottomland.
R078CY068OK	**Sandy Bottomland** Sandy Bottomland is found on similar physiographic position, but with sandy soils.

Table 1. Dominant plant species

Tree	(1) *Populus deltoides*
Shrub	Not specified
Herbaceous	(1) *Andropogon gerardii* (2) *Sorghastrum nutans*

Physiographic features

Soils of the Loamy Bottomland 23-31” PZ ecological site were formed in stratified calcareous silty and loamy alluvium. The site occurs in nearly level bottomlands and flood plains of streams, wide creeks and rivers that carry sediments from Permian and Triassic sandstone and siltstone in the sub-humid and semiarid regions of Texas and Oklahoma, and Kansas. Slopes range from 0 to 2 percent. Some areas have a ground water table

within 20 feet. Flooding is usually severe and occurs frequent to rarely, but is of short duration, usually 1 or more times per year to once in 50 years, unless protected. Elevation ranges from 1000 to 2900 feet.

Table 2. Representative physiographic features

Landforms	(1) River valley > Flood plain
Runoff class	Negligible to medium
Flooding duration	Very brief (4 to 48 hours) to brief (2 to 7 days)
Flooding frequency	Rare to frequent
Ponding frequency	None
Elevation	305–884 m
Slope	0–2%
Water table depth	183 cm
Aspect	Aspect is not a significant factor

Climatic features

MLRA 78C lies within the subtropical sub-humid climate regime, which typically has dry winters with hot and not as humid summers. MLRA 78C extends north and south from Coldwater, Kansas to just northeast of San Angelo, Texas (Ballinger, Texas), and east to west from Weatherford, Oklahoma to west of Shamrock, Texas. This regime is characterized by rapid changes in temperature; marked extremes, both daily and annual; and rather erratic rainfall. The weather is alternately influenced by cold dry air from the Arctic Circle, and warm moist air from the Gulf of Mexico.

Seasonal changes are gradual. Spring is a season of variable weather and relatively high precipitation with prevailing winds from the southwest. Summers are generally hot with low humidity. Fall has long periods of pleasant weather interspersed with moderate to heavy rains. Winter is open and moderate to cold with winds from the north and infrequent snows.

Wind speeds average more than eleven miles an hour with prevailing southern winds. Rather strong winds can occur in all months of the year. While strong gusty winds occur, severe dust storms are rare.

Approximately 75 percent of the rainfall occurs during the warm season, and much of it comes in storms of high intensity and short duration in May and June. These rains can be particularly erosive on sites where vegetation is sparse. Occasional droughts are to be expected. Lack of rainfall and hot, dry winds often curtail forage production during July and August.

Table 3. Representative climatic features

Frost-free period (characteristic range)	163-194 days
Freeze-free period (characteristic range)	192-214 days
Precipitation total (characteristic range)	660-711 mm
Frost-free period (actual range)	161-194 days
Freeze-free period (actual range)	191-215 days
Precipitation total (actual range)	660-737 mm
Frost-free period (average)	181 days
Freeze-free period (average)	203 days
Precipitation total (average)	686 mm

Climate stations used

- (1) COLDWATER [USC00141704], Coldwater, KS
- (2) MUTUAL [USC00346139], Mutual, OK
- (3) CLINTON SHERMAN AP [USW00003932], Dill City, OK
- (4) VERNON [USC00419346], Vernon, TX
- (5) SEYMOUR 3NW [USC00418221], Seymour, TX
- (6) ABILENE 2 [USC00410013], Abilene, TX

Influencing water features

These sites are subjected to periodic flooding as well as run-off from adjacent upland site.

Wetland description

NA

Soil features

Soils are mapped for each county within the MLRA. Mapunits are representations of the major soil series component(s) and named accordingly. Each Mapunit is spatially represented on a digital soils map as polygons of different shapes and sizes. Within these Mapunits, there are often minor soil series components included. These minor components are soils that occur within a Mapunit polygon but are of small extent (15% or less of the Mapunit area). However, it is difficult to separate these minor soils spatially due to the scale of soil mapping.

Ecological sites are correlated at the component level of the soil survey. Therefore, a single Mapunit may contain multiple Ecological Sites just as it may contain multiple soil components. This is important to understand when investigating soils and Ecological

Sites. A soil survey Mapunit may be correlated to a single Ecological Site based on the major component; however, there may be inclusional areas of additional Ecological Sites which are correlated to the minor components of that particular soil Mapunit.

Representative soil components for this site include:
Clairemont, Colorado, Wheatwood, Cyril, Spur, Port, Westola and Yomont.

The soils in the Loamy Bottomland Ecological Site are very deep and well drained. Permeability is moderate. Runoff is negligible on slopes less than 1 percent and very low on 1 to 3 percent slopes.

Table 4. Representative soil features

Parent material	(1) Alluvium–sandstone
Surface texture	(1) Loam (2) Silt loam (3) Silty clay loam
Family particle size	(1) Loamy
Drainage class	Moderately well drained to well drained
Permeability class	Very slow to moderate
Soil depth	152–203 cm
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	7.11–23.62 cm
Calcium carbonate equivalent (0-101.6cm)	0–15%
Electrical conductivity (0-101.6cm)	0–2 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0–4
Soil reaction (1:1 water) (0-101.6cm)	7.4–8.4
Subsurface fragment volume <=3" (Depth not specified)	0–2%
Subsurface fragment volume >3" (Depth not specified)	0–1%

Ecological dynamics

The information contained in the State and Transition Diagram (STD) and the Ecological

Site Description was developed using archeological and historical data, professional experience, and scientific studies. The information presented is representative of a very complex set of plant communities. Not all scenarios or plants are included. Key indicator plants, animals and ecological processes are described to inform land management decisions.

The Loamy Bottomland Ecological Site occurs on nearly level to gently sloping land adjacent to rivers and streams. The historic plant community (Reference) of the Loamy Bottomland Ecological Site developed under the prevailing subtropical, sub-humid climate over time along with the soils defining the site. The topographic position along streams, deep soil and occasional extra runoff water from surrounding uplands encouraged tall grass and woody plant production. The resulting plant community was a Tallgrass Grassland Community (1.1) characterized by tallgrasses plus midgrasses, forbs and scattered woody species . The trees and shrubs occupied locations protected from frequent and intense fires that occurred throughout the region before European settlement (Frost 1994). The endemic woody plants, which historically provided five to ten percent canopy cover, were either resistant to fire or occupied areas where fires were less frequent or intense.

The demise of the Native American Indians, expansion of the livestock industry and cessation of periodic intense fires changed the ecological dynamics of the vegetation on the Loamy Bottomland site. After European settlement in the late 1800’s, the frequency and intensity of fire diminished and continuous overgrazing by cattle and sheep began a transition from the reference plant community towards a woodland plant community. Although recent climatic warming trends and increases in atmospheric carbon dioxide may be enhancing vegetation change, the major forces influencing transition from the historic climax plant community to a woodland state are continuous overgrazing by livestock and the decrease in frequency and intensity of fire (Archer1998).

As livestock and wildlife numbers increase and grazing use exceeds the plants ability to sustain defoliation, the more palatable and generally more productive species decline in the composition, productivity and density. The more palatable and accessible tall grasses and forbs give way to midgrasses, such as sideoats grama , sand dropseed, tobosa, Texas wintergrass, blue grama and vine mesquite. The better quality forbs, such as Illinois bundleflower and Engelmann’s daisy, are replaced by less palatable species. The woody species that had been kept in check by fire and grass competition increase in size and density. The site also becomes open to invasion of species from adjacent sites. The change in density and stature of the woody vegetation brings about a new plant community, the Mixed-grass Community (1.2).

The Mixed-grass Community is characterized by increases in sideoats grama, little bluestem, Arizona cottontop and vine-mesquite and 10 to 20 percent woody plant cover. In the Mixed-grass Community (1.2) ecological processes have changed little and the pathway back to the reference community can be accomplished without major energy inputs. Good grazing management alone will not reverse the trend towards the woodland

state, however. Some form of woody plant control, such as prescribed burning and selective, mechanical brush control must accompany it. Due to the watershed location and occasional flooding, chemical brush control should be used with caution on the Loamy Bottomland site.

If the combination of abusive grazing by livestock and wildlife continues, as it did on most areas of this site through the middle of the twentieth century, less palatable grasses, forbs, shrubs and trees become dominant to the detriment of taller and more palatable species. Loss of herbaceous cover and increased bare ground precludes effective burning and encourages accelerated erosion. Soil and litter movement will occur during floods and water infiltration into the soil decreases. When woody plant canopy reaches 20 to 25 percent and the grass component provides less than 50 percent of the herbage production, the transition into a woodland state is complete. The first stage of the woodland state is the Shortgrass/Mixed-brush Community (2.1). Once this threshold is crossed, proper grazing management and prescribed burning alone cannot return the Shortgrass/Mixed-brush Community (2.1) to the Grassland state.

The endemic trees, such as pecan, cottonwood and hackberry, can dominate the overstory in the Shortgrass/Mixed-brush Community (2.1) type. However, mesquite, western soapberry and non-native species such as Chinese elm and salt cedar often invade and form thickets. Once established, the trees and shrubs can become dominant, even without grazing, if they are not controlled. Occasionally saline conditions are produced, resulting in increased amounts of alkali sacaton and inland saltgrass. Salt cedar is particularly invasive where saline conditions develop. Midgrass and forb diversity and production continues to decline while shrubs, shade-tolerant grasses and weedy annuals increase as the canopy becomes denser. The herbaceous component is further reduced through shading and competition from woody vegetation.

Continued abusive grazing by livestock and deer, along with periodic droughts, eventually brings about a plant community in which woody plants are so dominant that only remnants of grassland vegetation remain in the interspaces. This plant community type is identifiable as the Mixed-brush/Annuals Woodland Community (2.2). The understory and interspaces support only remnants of reference vegetation, generally in low vigor and productivity due to shading and competition for water and nutrients. Eventually annual grasses and forbs dominate the herbaceous layer. Summer grazing followed by winter rest frequently encourages dominance of Texas wintergrass. The plant community is so degraded that it cannot reverse retrogression without extensive energy and management inputs.

Restoring the Mixed-brush/Annuals Woodland Community (2.2) to the grassland state requires extensive accelerated management practices, such as mechanical brush control, range planting, prescribed grazing and prescribed burning. The unique characteristics of the Loamy Bottomland Site and the great differences from adjacent sites make special management necessary. It also is important as part of the lands riparian zone and influences downstream water quantity and quality. Often it may be beneficial to fence this site to manage or limit access by grazing animals. Haying of the tallgrasses is an

alternative to grazing. With extensive accelerated practices, time and proper management, this plant community can again resemble the reference community in productivity and functioning of ecological processes. The closeness to which the plant community is managed depends upon the goals of management. Generally, the Mixed-grass (1.2) or Shortgrass/Mixed-brush (2.1) Communities will provide adequate habitat for livestock and wildlife.

State and Transition Diagram:
A State and Transition Diagram for the Loamy Bottomland (R078CY103TX) site is depicted below. Thorough descriptions of each state, transition, and pathway follow the model. Experts base this model on available experimental research, field observations, professional consensus, and interpretations. It is likely to change as knowledge increases. Plant communities will differ across the MLRA because of the natural variability in weather, soils, and aspect. The Reference Plant Community is not necessarily the management goal; other vegetative states may be desired plant communities as long as the Range Health assessments are in the moderate and above category.

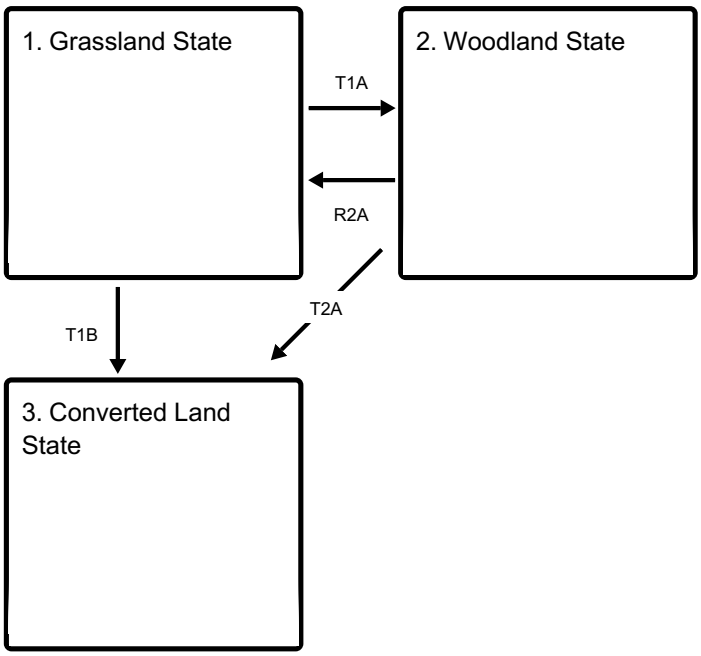
The biological processes on this site are complex. Therefore, representative values are presented in a land management context. The species lists are representative and are not botanical descriptions of all species occurring, or potentially occurring, on this site. They are not intended to cover every situation or the full range of conditions, species, and responses for the site.

Composition by dry weight and percent canopy cover are provided to describing the functional groups. Most observers find it easier to visualize or estimate percent canopy for woody species (trees and shrubs).

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

State and transition model

Ecosystem states



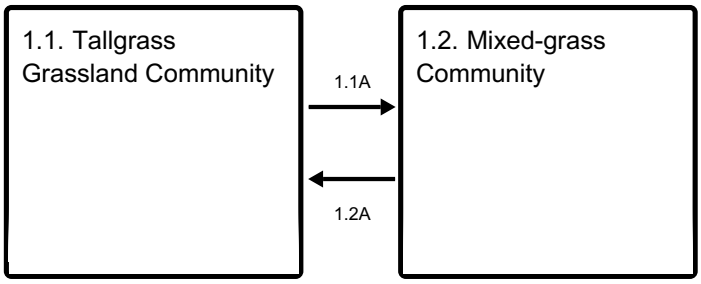
T1A - Absence of disturbance and natural regeneration over time, may be coupled with excessive grazing pressure

T1B - Extensive soil disturbance followed by seeding

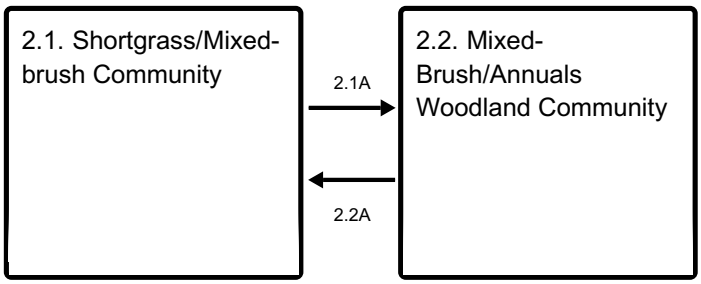
R2A - Adequate rest from defoliation and removal of woody canopy, followed by reintroduction of historic disturbance regimes

T2A - Extensive soil disturbance followed by seeding

State 1 submodel, plant communities



State 2 submodel, plant communities



State 3 submodel, plant communities

3.1. Converted Land Community

State 1
Grassland State

The reference community for the Loamy Bottomland Ecological Site was dominated by tallgrass species. The herbaceous component accounted for 75 to 80 percent of the site's primary annual production, with tallgrasses such as switchgrass, Indiangrass, big and sand bluestem and little bluestem accounting for 40 to 50 percent of the herbage production. Secondary grasses were sideoats grama, vine mesquite, Arizona cottontop, and plains bristlegrass. Canada wildrye, Texas wintergrass and western wheatgrass were common cool-season grasses. Common forbs included Maximilian sunflower, Illinois bundleflower, heath aster, gaura, prairie clover and Engelmann's daisy. Woody plants, primarily cottonwood, hackberry, pecan and American elm were widely scattered along the stream course and draws. Shrubs and vines such as bumelia, blackhaw, plum, and pricklyash were present but kept suppressed by periodic fires and grass competition. Annual primary production ranges from 3000 to 8000 pounds annually. The Mixed-grass Community (1.2) reflects the results of the suppression of fires and the effects of overgrazing on the more palatable species. Indigenous and invading woody plants have increased in density and stature. The endemic hardwoods, particularly plum, western soapberry, sumacs, and elm expand in size and density. Little bluestem, sideoats grama, vine-mesquite, are generally persistent in this phase, but most of the more palatable tall and midgrasses are being replaced by subdominants such as silver bluestem, tobosa, Texas wintergrass and less palatable forbs and annuals. Western ragweed, heath aster and Louisiana sagewort are common weeds. Forage production is not significantly affected but primary production is shifting to the less palatable or more grazing resistant species. Annual primary production ranges from 2500 to 7500 pounds.

Community 1.1
Tallgrass Grassland Community

Figure 8. 1.1 Tallgrass Grassland Community

The reference plant community for the Loamy Bottomland Ecological Site was dominated by tallgrass species when European settlers first arrived. This plant community evolved under the influence of grazing, periodic fire and a dry sub-humid climate. The frequent flooding and an occasional high water table influenced the plant community. Woody plants, primarily cottonwood, hackberry, pecan and American elm were widely scattered along the stream course and draws. Shrubs and vines such as bumelia, blackhaw, plum, pricklyash, hawthorn, redbud, greenbriar, ivy treebine and grape were present but kept suppressed by periodic fires and grass competition. The herbaceous component accounted for 75 to 80 percent of the site's primary annual production, with tallgrasses such as switchgrass, Indiangrass, big and sand bluestem and little bluestem accounting for 40 to 50 percent of the herbage production. Secondary grasses were sideoats grama, vine mesquite, Arizona cottontop, plains bristlegrass, Canada wildrye and dropseed. Alkali sacaton and inland saltgrass occurred in small amounts where saline conditions occurred. Canada wildrye, Texas wintergrass and western wheatgrass were common cool-season grasses. Common forbs included Maximilian sunflower, Illinois bundleflower, heath aster, gaura, greenthread, verbena, prairie clover and Engelmann's daisy. (See Plant Community Composition and Annual Production table below). The Tallgrass Plant Community is highly productive due to deep, fertile soils and water availability. Soil erosion was low due to the abundant plant cover, litter, and slow runoff. Runoff is reduced due to the dense tallgrass cover. The vegetative ground cover helped disperse and slow down runoff thus holding soil in place and enhancing infiltration into the slowly permeable soils. Concentrated water flow patterns were probably rare. Without proper grazing management that adjusts animal numbers, including deer, to annual forage production and judicious prescribed burning, the Tallgrass Grassland Community will transition (regress) to a Mixed-grass Community (1.2). Generally, the Loamy Bottomland is a preferred habitat for both livestock and wildlife so most areas of this site have received overgrazing by livestock and wildlife and have regressed to a lesser plant community type.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	2690	4483	7173
Forb	336	560	897
Tree	269	448	717
Shrub/Vine	67	112	179
Total	**3362**	**5603**	**8966**

Figure 10. Plant community growth curve (percent production by month). TX2286, Tallgrass Prairie Community. Tallgrass with warm-season growing season dominated site..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	3	3	8	20	18	8	10	17	9	2	1

Community 1.2
Mixed-grass Community

Figure 11. 1.2 Mixed-grass Community

The Mixed-grass Community (1.2) reflects the results of the suppression of fires and the effects of overgrazing on the more palatable species. Indigenous and invading woody plants have increased in density and stature. The endemic hardwoods, particularly plum, western soapberry, sumacs, and elm expand in size and density. Mesquite, redberry juniper, tasajillo, pricklypear wolfberry and lotebush are the more common woody invaders. Little bluestem, sideoats grama, vine-mesquite, are generally persistent in this phase, but most of the more palatable tall and midgrasses are being replaced by subdominants such as silver bluestem, tobosa, bristlegrass, Texas wintergrass and less palatable forbs and annuals. Western ragweed, heath aster and Louisiana sagewort are common weeds. Forage production is not significantly affected but primary production is

shifting to the less palatable or more grazing resistant species. Annual primary production ranges from 2500 to 7500 pounds annually with approximately 65 percent being produced by the grassland component. Nutrient cycling and water use is shifting toward the deeper-rooted woody perennials. Soil organic matter and litter are slightly less than were present in the reference community. The transition of the Mixed-grass Community toward a Woodland State is reversible with prescribed grazing management and prescribed burning practices until the woody canopy exceeds 20 to 25 percent. Once woody plant canopy exceeds 25 percent, the plant community crosses a threshold to the Shortgrass/Mixed-brush Community (2.1). Once the threshold into a Woodland State is crossed the transition is irreversible without considerable energy input in the form of mechanical or chemical brush control.

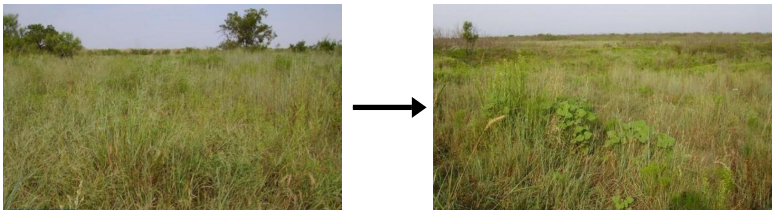
Table 6. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	1821	3643	5464
Tree	701	1401	2102
Forb	280	560	841
Total	**2802**	**5604**	**8407**

Figure 13. Plant community growth curve (percent production by month). TX2276, Mid/Shortgrasses with Forbs. Warm-season mid and shortgrasses, cool-season grasses, and forbs..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	2	4	8	25	25	14	6	8	5	2	1

Pathway 1.1A
Community 1.1 to 1.2



Tallgrass Grassland Community **Mixed-grass Community**

Without proper grazing management that adjusts animal numbers, including deer, to annual forage production and judicious prescribed burning, the Tallgrass Grassland Community will transition (regress) to a Mixed-grass Community (1.2).

Pathway 1.2A
Community 1.2 to 1.1

Mixed-grass Community

Tallgrass Grassland Community

With the implementation of Prescribed Grazing and Prescribed Burning conservation practices, the Mixed-grass Community can be reverted back to the Tallgrass Grassland Community.

Conservation practices

Prescribed Burning
Prescribed Grazing

State 2
Woodland State

The Shortgrass/Mixed-brush Community (2.1) supports a 20 to 35 percent woody plant cover dominated by various bottomland hardwoods plus invading mesquite and mixed-brush with a shortgrass dominated herbaceous layer. The diversity of the grassland component declines while unpalatable woody plants and forbs increase. All, but the more palatable woody species, have increased in size and density. The typical woody plant cover is mesquite dominated with pricklypear, lotebush, and ephedra. Pecan, cottonwood, western soapberry, hackberry and elm persist near the stream edge. Where present, tobosa remains the dominant grass, but as regression progresses under heavy grazing pressure, tobosa gives way to buffalograss and other less palatable shortgrasses and forbs. Gaura, western ragweed, verbena, greenthread and, prairie coneflower are commonly found in this community. Cool-season grasses, such as Texas wintergrass, Canada wildrye and western wheatgrass, are persistent under and around woody plants where shading occurs. Annual herbage production ranges from approximately 2,000 to 7,000 pounds per acre, depending on precipitation events, flooding events and dry cycles. The Mixed-brush/Annuals Woodland Community (2.2) is the result of continued overgrazing by livestock and no control of woody species. Several woody species may dominate the site. Cottonwood, hackberry and elm were the early dominants. Western soapberry, mesquite and salt cedar have increased tremendously in the past few decades. They often form dense woodlands on the site where grazing has been heavy and continuous and fires have been excluded. Salt cedar, along with baccharis, is particularly problematic where salinity has increased. Common understory shrubs are pricklypear, tasajillo and plum. Shortgrasses, cool-season grasses and low quality annual and perennial forbs occupy the tree interspaces. Characteristic grasses found in this plant community are Texas wintergrass, three-awns, annual panicum, tobosa, silver bluestem and sedges. With continued heavy grazing by livestock and deer, the brush canopy can increase to almost 100 percent cover.

Community 2.1
Shortgrass/Mixed-brush Community

Figure 14. 2.1 Shortgrass/Mixed-brush Community

The Shortgrass/Mixed-brush Community (2.1) supports a 20 to 35 percent woody plant cover dominated by various bottomland hardwoods plus invading mesquite and mixed-brush with a shortgrass dominated herbaceous layer. This community is the result of selective grazing by livestock, suppression of fire and the differential response of plants to defoliation. The diversity of the grassland component declines while unpalatable woody plants and forbs increase. All, but the more palatable woody species, have increased in size and density. The typical woody plant cover is mesquite dominated with pricklypear, wolfberry, lotebush, ephedra and greenbriar as common understory shrubs. Pecan, cottonwood, western soapberry, hackberry and elm persist near the stream edge. Where present, tobosa remains the dominant grass, but as regression progresses under heavy grazing pressure, tobosa gives way to buffalograss and other less palatable shortgrasses and forbs. Gaura, western ragweed, verbena, greenthread and, prairie coneflower are the commonly found forbs in this community. Cool-season grasses, such as Texas wintergrass, Canada wildrye and western wheatgrass, are persistent under and around woody plants where shading occurs. Texas filaree and Japanese brome are often abundant following wet winters. Alkali sacaton is abundant where saline soil conditions occur. Salt cedar may also invade these areas. Annual herbage production ranges from approximately 2000 to 7000 pounds per acre, depending on precipitation events, flooding events and dry cycles. Annual herbage production is less than in the Shortgrass/Mixed-brush Community (1.2) due to decline in soil structure and organic matter. Herbage production is balanced between the grassland component and woody species. As the grassland component declines, more soil is exposed to crusting and erosion. During the middle and end of this plant community phase, considerable soil becomes exposed. Water erosion is not a serious problem because of shallow slopes on the site. Higher interception loss of water by the increasing woody canopy combined with evaporation losses reduces the effectiveness of rainfall. Litter, soil organic matter and structure decline in the

interspaces reducing water infiltration, but hydrologic conditions improve under the woody plant cover. When the woody plant cover reaches 35 to 50 percent and the herbaceous component contributes less than 50 percent of the herbage production, the Shortgrass/Mixed-brush Community (2.1) transitions into a Mixed-Brush/Annuals Woodland Community (2.2).

Table 7. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Tree	1009	2270	3531
Grass/Grasslike	1009	2270	3531
Forb	224	504	785
Total	**2242**	**5044**	**7847**

Figure 16. Plant community growth curve (percent production by month). TX2285, Shortgrass/Mixedbrush Community. Shortgrasses, annual grasses and shrubs dominate the plant community..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	3	6	15	24	18	3	5	15	7	2	1

Community 2.2
Mixed-Brush/Annuals Woodland Community

Figure 17. 2.2 Mixed-brush/Annuals Woodland Community

The Mixed-brush/Annuals Woodland Community (2.2) is the result of continued overgrazing by livestock and no control of woody species. Several woody species may dominate the site. Cottonwood, hackberry and elm were the early dominants. Western soapberry, mesquite and salt cedar have increased tremendously in the past few

decades. They often form dense woodlands on the site where grazing has been heavy and continuous and fires have been excluded. Salt cedar, along with baccharis, is particularly problematic where salinity has increased. Common understory shrubs are pricklypear, tasajillo and plum. Shortgrasses, cool-season grasses and low quality annual and perennial forbs occupy the tree interspaces. Characteristic grasses found in this plant community are Texas wintergrass, threeawns, annual panicum, tobosa, silver bluestem and sedges. Representative forbs include heath aster, western ragweed, prairie coneflower, annual broomweed and croton. With continued heavy grazing by livestock and deer, the brush canopy can increase to almost 100 percent cover. With dense cover shortgrasses, such as three-awns, Japanese brome, annual panicum and sedges are the dominant grasses. Texas wintergrass persists where mesquite is dominant and can become abundant following above normal rainfall. The woody species will continue to thicken until the community stabilizes with the climate and soil. The woody overstory can reach 80 to 90 percent ground cover with less than 25 percent of the herbage being produced by a weakened grassland component. With continued livestock grazing, the mature phase of the Mixed-brush/Annuals Woodland Community provides cover for wildlife, but only limited amounts of preferred forage or browse is available for livestock or wildlife. Returning the Mixed-brush/Annuals Woodland Community back to the Grassland state requires extensive and expensive reclamation practices. Without major brush control and management inputs, this plant community cannot be returned to grassland. Range planting, prescribed grazing and prescribed burning, must follow intensive mechanical brush control. Land use other than livestock production might dictate alternative reclamation approaches to create the plant community that best fits the intended use.

Table 8. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Tree	1569	3531	5492
Grass/Grasslike	560	1261	1961
Forb	112	280	392
Total	**2241**	**5072**	**7845**

Figure 19. Plant community growth curve (percent production by month). TX2288, Mixed-Brush/Annuals/Woodland Community. Spring and summer growth of shortgrasses, cool-season grasses, shrubs, and annual grasses & forbs..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	3	6	15	24	18	3	5	15	7	2	1

Pathway 2.1A
Community 2.1 to 2.2

Shortgrass/Mixed-brush Community

Mixed-Brush/Annuals Woodland Community

With heavy continuous grazing pressure, no fires, and no brush management practices implemented, the Shortgrass/Mixed-brush Community can be shifted to the Mixed-brush/Annuals Woodland Community.

Pathway 2.2A
Community 2.2 to 2.1

Mixed-Brush/Annuals Woodland Community

Shortgrass/Mixed-brush Community

With Brush Management and Prescribed Grazing, the Mixed-brush/Annuals Woodland Community can be shifted back to the Shortgrass/Mixed-brush Communities.

Conservation practices

Brush Management
Prescribed Grazing

State 3
Converted Land State

The Converted Land Community has been cultivated for cropland or pastureland purposes. Small grain or forage sorghum may be cropped. Permanent native and introduce pasture may also be planted. Sometimes the community may be abandoned and let “go back” to native species encroached by woody species.

Community 3.1
Converted Land Community

The Loamy Bottomland Ecological Site is often cultivated and planted to crops. The deep fertile soils and occasional extra runoff make it a productive cropland site. Many acres have been put to plow. Technical advice as to adapted crops, cropping systems, production, and cultivation practices are available from local NRCS or Extension Service offices. When cropping is abandoned the site should be re-vegetated with adapted native

plant mixtures, which include reference species. Cultivation and erosion may have reduced soil productivity but near reference forage production may be obtained with a native plant mix that approximates reference species composition. Introduced species often require more care, but can also be productive as pasture. In any case brush management is required to prevent brush invasion from adjacent areas. Weedy grasses, forbs and shrubs will be the first species in secondary succession if fields are abandoned and let re-vegetate naturally. They often persist for many years. Even without grazing, woody species will encroach and eventually dominate unless brush management practices and prescribed burning are applied.

Figure 20. Plant community growth curve (percent production by month). TX2252, Small Grains. Cool-season small grain crops..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
5	5	10	10	5	0	0	0	20	25	15	5

Figure 21. Plant community growth curve (percent production by month). TX2264, Warm-season Pasture Grasses. warm-season pasture grasses having nutrient management, pest management, and prescribed grazing..

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, no brush management, and no fires to keep the brush species in check, the Grassland State will transition into the Shrubland State.

Transition T1B
State 1 to 3

The transition to the Converted Land State occurs when crop cultivation practices, plowing, range planting, pasture planting, pest management, and nutrient management are applied to cropland, pastureland or go back land.

Restoration pathway R2A
State 2 to 1

Converting the Woodland State back to the Grassland state requires extensive and expensive reclamation practices. Without major brush control and management inputs, this plant community cannot be returned to grassland. Range planting, prescribed grazing and prescribed burning, must follow intensive mechanical brush control.

Conservation practices

Brush Management
Prescribed Burning
Prescribed Grazing
Range Planting

Transition T2A
State 2 to 3

The transition to the Converted Land State occurs when crop cultivation practices, plowing, range planting, pasture planting, pest management, and nutrient management are applied to cropland, pastureland or go back land.

Additional community tables

Table 9. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Tallgrasses**			1681–4483	
	Indiangrass	SONU2	*Sorghastrum nutans*	336–897	–
	eastern gamagrass	TRDA3	*Tripsacum dactyloides*	336–897	–
	big bluestem	ANGE	*Andropogon gerardii*	336–897	–
	sand bluestem	ANHA	*Andropogon hallii*	336–897	–
	Florida paspalum	PAFL4	*Paspalum floridanum*	336–897	–
	switchgrass	PAVI2	*Panicum virgatum*	336–897	–
	little bluestem	SCSC	*Schizachyrium scoparium*	224–673	–
2	**Midgrasses**			504–1345	
	sideoats grama	BOCU	*Bouteloua curtipendula*	50–135	–
	silver beardgrass	BOLAT	*Bothriochloa laguroides ssp. torreyana*	50–135	–
	Arizona cottontop	DICA8	*Digitaria californica*	50–135	–
	lovegrass	ERAGR	*Eragrostis*	50–135	–
	vine mesquite	PAOB	*Panicum obtusum*	50–135	–
	tobosagrass	PLMU3	*Pleuraphis mutica*	50–135	–
	large-spike bristlegrass	SEMA5	*Setaria macrostachya*	50–135	–

	bristlegrass				
	alkali sacaton	SPAI	*Sporobolus airoides*	50–135	–
	composite dropseed	SPCOC2	*Sporobolus compositus var. compositus*	50–135	–
	Drummond's dropseed	SPCOD3	*Sporobolus compositus var. drummondii*	50–135	–
	white tridens	TRAL2	*Tridens albescens*	50–135	–
	purpletop tridens	TRFL2	*Tridens flavus*	50–135	–
3	**Shortgrasses**			168–448	
	purple threeawn	ARPU9	*Aristida purpurea*	17–50	–
	Wright's threeawn	ARPUW	*Aristida purpurea var. wrightii*	17–50	–
	buffalograss	BODA2	*Bouteloua dactyloides*	17–50	–
	blue grama	BOGR2	*Bouteloua gracilis*	17–50	–
	panicgrass	PANIC	*Panicum*	17–50	–
	tumblegrass	SCPA	*Schedonnardus paniculatus*	17–50	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	17–50	–
	slim tridens	TRMU	*Tridens muticus*	17–50	–
	slim tridens	TRMUE	*Tridens muticus var. elongatus*	17–50	–
4	**Cool-season Grasses**			336–897	
	sedge	CAREX	*Carex*	56–157	–
	Canada wildrye	ELCA4	*Elymus canadensis*	56–157	–
	Texas wintergrass	NALE3	*Nassella leucotricha*	56–157	–
	western wheatgrass	PASM	*Pascopyrum smithii*	56–157	–
	Texas bluegrass	POAR	*Poa arachnifera*	56–157	–
5	**Cool-season grasses**			336–897	
	sedge	CAREX	*Carex*	56–157	–
	Canada wildrye	ELCA4	*Elymus canadensis*	56–157	–
	Texas wintergrass	NALE3	*Nassella leucotricha*	56–157	–
	western wheatgrass	PASM	*Pascopyrum smithii*	56–157	–
	Texas	POAR	*Poa arachnifera*	56–157	–

	Texas bluegrass	POAR	*Poa arachnifera*	336–897	
Forb					
6	**Forbs**			336–897	
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	17–56	–
	anemone	ANEMO	*Anemone*	17–56	–
	white sagebrush	ARLUM2	*Artemisia ludoviciana ssp. mexicana*	17–56	–
	poppymallow	CALLI3	*Callirhoe*	17–56	–
	rose heath	CHER2	*Chaetopappa ericoides*	17–56	–
	smallflower fumewort	COMIA2	*Corydalis micrantha ssp. australis*	17–56	–
	Illinois bundleflower	DEIL	*Desmanthus illinoensis*	17–56	–
	Engelmann's daisy	ENPE4	*Engelmannia peristenia*	17–56	–
	beeblossom	GAURA	*Gaura*	17–56	–
	Indian rushpea	HOGL2	*Hoffmannseggia glauca*	17–56	–
	littleleaf sensitive-briar	MIMI22	*Mimosa microphylla*	17–56	–
	evening primrose	OENOT	*Oenothera*	17–56	–
	beardtongue	PENST	*Penstemon*	17–56	–
	groundcherry	PHYSA	*Physalis*	17–56	–
	sage	SALVI	*Salvia*	17–56	–
	globemallow	SPHAE	*Sphaeralcea*	17–56	–
	white heath aster	SYERE	*Symphyotrichum ericoides var. ericoides*	17–56	–
	greenthread	THELE	*Thelesperma*	17–56	–
	prairie spiderwort	TROC	*Tradescantia occidentalis*	17–56	–
	vervain	VERBE	*Verbena*	17–56	–
Tree					
7	**Trees/Shrubs/Vines**			336–897	
	heartleaf peppervine	AMCO2	*Ampelopsis cordata*	0–897	–
	pecan	CAIL2	*Carya illinoinensis*	0–897	–
	Texas redbud	CECAT	*Cercis canadensis var.*	0–897	–

			texensis		
	hackberry	CELTI	*Celtis*	0–897	–
	chicory	CIIN	*Cichorium intybus*	0–897	–
	sorrelvine	CITR2	*Cissus trifoliata*	0–897	–
	Carolina coralbead	COCA	*Cocculus carolinus*	0–897	–
	Christmas cactus	CYLE8	*Cylindropuntia leptocaulis*	0–897	–
	green ash	FRPE	*Fraxinus pennsylvanica*	0–897	–
	Osage-orange	MAPO	*Maclura pomifera*	0–897	–
	pricklypear	OPUNT	*Opuntia*	0–897	–
	honey mesquite	PRGL2	*Prosopis glandulosa*	0–897	–
	plum	PRUNU	*Prunus*	0–897	–
	oak	QUERC	*Quercus*	0–897	–
	fragrant sumac	RHAR4	*Rhus aromatica*	0–897	–
	littleleaf sumac	RHMI3	*Rhus microphylla*	0–897	–
	western soapberry	SASAD	*Sapindus saponaria var. drummondii*	0–897	–
	greenbrier	SMILA2	*Smilax*	0–897	–
	elm	ULMUS	*Ulmus*	0–897	–
	rusty blackhaw	VIRU	*Viburnum rufidulum*	0–897	–
	grape	VITIS	*Vitis*	0–897	–
	pricklyash	ZANTH	*Zanthoxylum*	0–897	–
	lotebush	ZIOB	*Ziziphus obtusifolia*	0–897	–
	heartleaf peppervine	AMCO2	*Ampelopsis cordata*	6–34	–
	Texas redbud	CECAT	*Cercis canadensis var. texensis*	6–34	–
	sorrelvine	CITR2	*Cissus trifoliata*	6–34	–
	Carolina coralbead	COCA	*Cocculus carolinus*	6–34	–
	Christmas cactus	CYLE8	*Cylindropuntia leptocaulis*	6–34	–
	pricklypear	OPUNT	*Opuntia*	6–34	–
	plum	PRUNU	*Prunus*	6–34	–
	fragrant sumac	RHAR4	*Rhus aromatica*	6–34	–
	littleleaf sumac	RHMI3	*Rhus microphylla*	6–34	–

	bully	SIDER2	*Sideroxylon*	6–34	–
	greenbrier	SMILA2	*Smilax*	6–34	–
	rusty blackhaw	VIRU	*Viburnum rufidulum*	6–34	–
	grape	VITIS	*Vitis*	6–34	–
	pricklyash	ZANTH	*Zanthoxylum*	6–34	–
	lotebush	ZIOB	*Ziziphus obtusifolia*	6–34	–

Animal community

Many types of wildlife use Loamy Bottomland Ecological Site. Being associated with flood plains and water courses, it probably received concentrated animal use at times. Bison probably utilized the site heavily during migrations prior to European settlement. Grassland insects, reptiles, birds and mammals frequent the site, either as their base habitat or from the adjacent sites. Small mammals include many kinds of rodents, jackrabbit, cottontail rabbit, raccoon, skunk, opossum and armadillo. Predators include coyote, fox and bobcat. Game birds, songbirds, and birds of prey were indigenous or frequent users. Most are still plentiful. Bison and pronghorn antelope, however, are no longer present. White-tailed deer utilize the Loamy Bottomland site in its various states. Deer, turkey and quail particularly favor the habitat provided by the Shortgrass/Mixed-brush (2.1) plant community.

The site in or near reference condition is very suited to primary grass eaters such as cattle. As retrogression occurs and woody plants invade it becomes better habitat for a mixture of cattle, sheep, goats, deer and other wildlife because of the browse and cool season grasses. Sheep and goats are seldom pastured in the MLRA, however. Any livestock should be stocked in proportion to the available grass, forb and browse forage, keeping deer competition for forbs and browse in mind. If the animal numbers are not kept in balance with herbage and browse production through grazing management and good wildlife population management, the late Mixed-brush/Annuals Woodland phase will have little to offer as wildlife habitat except cover.

Hydrological functions

The Loamy Bottomland Ecological Site is well-drained, moderately permeable and found on nearly level flood plains. It may receive water from surrounding soils and the site may be covered with by water during flooding events. Soil moisture holding capacity is high and percolation is slow. The deep soils, with moderate to good water holding capacity, are conducive to high herbage production during above average moisture years.

In reference condition, the grassland vegetation probably intercepted and utilized much of the incoming rainfall in the soil profile. Litter and soil movement was slight. Standing plant cover, duff and organic matter decrease as the Tallgrass Grassland Community (1.1) transitions to the Mixed-grass Community (1.2). These processes continue in the spaces

between woody plants in the Shortgrass/Mixed-brush Community (2.1) and the Mixed-brush/Annuals Woodland Community (2.2). Once the woodland matures, the hydrologic and ecological processes, nutrient cycling and energy flow stabilize within the woody plant canopy. Evaporation and interception losses are higher, however, resulting in less moisture reaching the soil.

Recreational uses

The Loamy Bottomland site, in conjunction with surrounding sites, is well suited for many outdoor recreational uses including recreational hunting, hiking, camping, equestrian and bird watching. This site along with adjacent upland sites provides diverse scenic beauty and many opportunities for recreation and hunting.

Wood products

Mesquite and Osage-orange are sometimes used for posts and charcoal. Wood from all the trees can be used for furniture or specialty products.

Other products

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

Other information

None.

Inventory data references

Information presented has been derived from RSDs for Loamy Bottomland PE 36-46 (3-1-74) and PE 32-40 (11-2-71) , an undated NRCS draft Ecological Site Description for Loamy Bottomland PE 31-44, 78C, literature, personal experience, field observations and personal contacts with range-trained personnel.
Photos by: J.L. Schuster. Photos 1, 2 and 3 taken on Waggoner Ranch, Baylor County, TX.; Photo 4 location was on sheet # 68 of Jones County Soil Survey Manual.

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Approval

Bryan Christensen, 9/15/2023

Acknowledgments

Site Development and Testing Plan
Future work, as described in a Project Plan, to validate the information in this Provisional Ecological Site Description is needed. This will include field activities to collect low, medium and high intensity sampling, soil correlations, and analysis of that data. Annual

field reviews should be done by soil scientists and vegetation specialists. A final field review, peer review, quality control, and quality assurance reviews of the ESD will be needed to produce the final document.
Annual reviews of the Project Plan are to be conducted by the Ecological Site Technical Team.

Rangeland health reference sheet

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

Author(s)/participant(s)	Lem Creswell, Zone RMS, NRCS, Weatherford, Texas
Contact for lead author	817-596-2865
Date	12/20/2007
Approved by	Bryan Christensen
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

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

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2. **Presence of water flow patterns:** Water flow patterns are common and follow old stream meanders. Deposition or erosion is uncommon for normal rainfall but may occur during intense rainfall events.

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3. **Number and height of erosional pedestals or terracettes:** Pedestals or terracettes would have been uncommon for this site when occupied by the natural HCPC.

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4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen,**

moss, plant canopy are not bare ground): Expect no more than 20% bare ground randomly distributed throughout.

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5. **Number of gullies and erosion associated with gullies:** Some gullies may be present on side drains into perennial and intermittent streams. Gullies should be vegetated and stable.

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

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7. **Amount of litter movement (describe size and distance expected to travel):** This is a flood plain with occasional out of bank flow. Under normal rainfall, little litter movement should be expected, however, litter of all sizes may move long distances depending on obstructions under intense storm events.

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

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** 0-64" thick reddish brown silty loam to silty clay loam that has moderate, medium, coarse blocky structure. SOM is 1-6%. See soil survey for specific soils information.

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** The savanna of tallgrasses, shortgrasses and trees and shrubs provides excellent soil protection and infiltration. This should essentially eliminate runoff except during very intense storm events or flooding.

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11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):** No evidence of compaction under HCPC.

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

    Dominant: Warm-season tallgrasses >>

    Sub-dominant: Warm-season midgrasses >

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

    Additional:

---

13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** There should be little mortality or decadence for any functional group.

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

---

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 3000 - 8000 #/ac

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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, plum, skunkbush sumac, pecan, western soapberry, bumelia, salt cedar

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