USDA Natural Resources Conservation Service

Ecological site R078BY075TX
Gravelly 20-24" PZ

Last updated: 9/15/2023
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General information

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

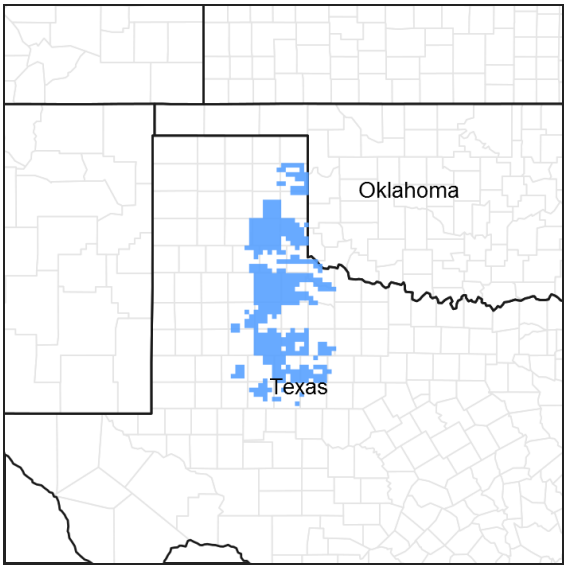


Figure 1. Mapped extent

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

MLRA notes

Major Land Resource Area (MLRA): 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 on deep gravelly loam soils on uplands. The reference vegetation consists of tallgrasses and midgrasses with forbs and few woody species. Abusive grazing practices may lead to a shift in the plant community

and a decline in the more palatable species. Without periodic fires or brush management, woody species may increase across the site. Aspect affects the plant community on these sites with north and east slopes often more diverse and productive.

Associated sites

R078BY088TX	**Sandy Loam 19-26" PZ** The sandy loam site is generally the primary grazing site in association with the gravelly site. The gravelly site seldom makes up a significant part of the landscape and is not a preferred site due to rolling to steep slopes and a very rocky soil surface.

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) *Schizachyrium scoparium* (2) *Bouteloua curtipendula*

Physiographic features

Gravelly soils are on moderately sloping to strongly sloping uplands. Slopes range from 4 to 20 percent. Ridge tops are narrow and discontinuous; surfaces are convex. Elevation ranges from 1499 to 2998 feet. No ponding, flooding or run-off is expected for this site.

Table 2. Representative physiographic features

Landforms	(1) Plains > Stream terrace
Runoff class	Medium
Elevation	411–488 m
Slope	4–20%
Water table depth	183 cm
Aspect	Aspect is not a significant factor

Climatic features

The climate of the western rolling plains is dry, sub-humid with hot summers and mild winters. Temperatures often reach 100 degrees F for several consecutive days during summer. Cold spells with temperatures less than 20 degrees F only last short periods of time. The soil is not frozen below the 3-inch depth for more than 2 to 3 days. Humidity is low during the winter and early spring months. Sometimes relative humidity is high enough to make summer days seem uncomfortable. Most of the precipitation comes in the form of rain and that in the spring and early summer principally. May is the wettest month followed by June. July and August are dryer and much hotter. Rainfall often comes as intense showers of relatively short duration. Rainfall rate per hour is often high and runoff is significant. Infiltration is diminished due to lack of opportunity time. The growing season begins in April and ends with the first killing frost in Nov.
There is little snowfall with the average being about 10 inches. Rainfall averages about 22 inches.

There is a 70% chance that yearly precipitation will fall between 16 and 24 inches. About 55% of the time, the yearly rainfall is below the mean. Dry spells during the growing season are common and long-term droughts occur in cycles of about 20 years. Native vegetation is principally warm season.

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

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. Not classified as a wetland.

Wetland description

NA

Soil features

Gravelly soils consist of deep, gravelly, well to excessively drained and moderately to moderately rapid permeable soils. The soils were formed in ancient gravelly or very gravelly loamy alluvium. The soils were developed in stratified outwash resting on clean sands or gravel beds. These areas usually occur along the rims of basins that are transitional between uplands and valleys associated with rivers or creeks.

Major Soil Taxonomic Units correlated to this site include: Hilgrave and Polar soils.

Table 4. Representative soil features

Parent material	(1) Alluvium–quartzite
Surface texture	(1) Gravelly sandy loam (2) Very gravelly loam (3) Gravelly fine sandy loam
Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Moderate
Soil depth	152–191 cm
Surface fragment cover <=3"	30–60%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	5.08–8.89 cm
Calcium carbonate equivalent (0-101.6cm)	5–15%

Electrical conductivity (0-101.6cm)	0 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0
Soil reaction (1:1 water) (0-101.6cm)	7.9–8.4
Subsurface fragment volume <=3" (Depth not specified)	20–30%
Subsurface fragment volume >3" (Depth not specified)	0–2%

Ecological dynamics

The Gravelly Ecological Site usually occurs as rolling hills adjacent to major streams that traverse redbed formations. It is typically found as relatively small knolls or rolling hills with occasional rock outcrops on steeper slopes. Slope aspect, steepness and soil differences create considerable variability in the vegetation cover and composition. The south and west exposures have lower production and the species present are more drought tolerant. Basal density of the plants is lower on these exposures. The north and east exposures have more mesic conditions and the plant community is more productive. The presence of rock and gravel in the profile influences plant available moisture. A favorable plant-soil-moisture relationship favors tall grasses and makes the site responsive to precipitation and good management. There is an excellent variety and good balance of vegetation, but production is sparse because of low water holding capacity. The State and Transition Diagram in the next section illustrates the ecological dynamics of the Gravelly site.

The reference plant community of the Gravelly site was a Tallgrass/Midgrass Community (1.1). The dominant vegetation is a mixture of tall and midgrass species with short grasses being of minor importance. Sideoats grama and little bluestem dominate the site, a good variety of forbs add to the diversity of the grassland component, making up approximately 5% of the total production. The endemic woody plants make up approximately 10 percent of the total plant community. The woody plant species present are scattered throughout the site and generally occur either as small mottes, individual trees or shrubs. These woody plants are either resistant to fire or occupy rocky areas and steep slopes where fires are less frequent or intense.

The site, as found by European settlers in the mid 1800’s developed under the prevailing climate over time along with the soils in their topographic location. Periodic droughts, fire and grazing or browsing by endemic and nomadic wildlife influenced the plant community as well. The semiarid climate with low rainfall, coming primarily as convective storms during the warm season, favors deep-rooted grasses. Trees and shrubs occupied locations where soil moisture conditions were above average and fire frequency and intensity were below average.

The demise of the Native American Indians, arrival of the livestock husbandry and cessation of periodic intense fires changed the ecological dynamics of the vegetation on the Gravelly site. Although recent climatic warming trends and increases in atmospheric carbon dioxide may be enhancing vegetation change, the major forces influencing transition from the reference state to a shrubland state are continuous overgrazing by livestock and the decrease in frequency and intensity of fire. With European settlement in the 1800’s, the frequency and intensity of fires diminished and overgrazing by livestock became the norm.

Continuous heavy grazing by livestock and the decrease in intensity and frequency of fires in the last half of the ninetieth century began a transition from the reference community towards a shrubland state, with increasing woody species. As grazing use exceeds the plants ability to sustain defoliation, the more palatable and generally more productive species decline in stature, productivity and density. The more palatable mid and tallgrasses give way to less palatable species if overgrazing continues. The better quality forbs for grazing are replaced with low quality perennials and annuals.

The woody species that had been kept in check by fire and grass competition increase in number and density. The site may become open to increased invasion by broom snakeweed and mesquite. Once established the shrub encroachment will continue and the transition from a grassland state to a shrubland state has begun. The increase in density and stature of the woody vegetation brings about a new plant community, the Midgrass/Shortgrass/Shrub

Community (1.2). In this vegetation phase, shrubs have increased in density and size, but herbaceous vegetative production still dominates.

In the Midgrass/Shortgrass/Shrub Community (1.2), ecological processes have changed little and the pathway back to the reference community can be accomplished without major accelerating conservation practices. The transition to a shrubland can be reversed with introduction of fire, through prescribed burning and the implementation of a prescribed grazing management strategy. Although the site responds well to management, good grazing management alone will not reverse retrogression. Some form of woody plant control, such as prescribed burning along with mechanical or chemical brush management in the form of individual plant treatment (IPT) may be necessary.

If the combination of heavy continuous grazing and decrease in intensity and frequency of fires continues, the woody plants may become dominant to the detriment of the herbaceous species. Plants such as yucca, redberry juniper, and pricklypear may continue to increase in density. On some portions of the site, Havard oak may increase and broom snakeweed may invade the site. Short grasses such as hairy tridens, hairy grama, and threeawns along with numerous annuals may replace the midgrass dominants. Less desirable perennial and annual forbs replace the reference community forbs.

Loss of herbaceous cover and increased bare ground precludes effective burning and allows accelerated erosion. Soil organic matter and soils structure decline as less vegetative matter is added to the soil. Soil and litter movement will occur during flood producing rains and water infiltration decreases dramatically. When woody plant canopy reaches 20 to 25 percent and grasses provide less than 50 percent of the herbage production, the transition from the Midgrass/Shortgrass/Shrub Community (1.2) to the Shortgrass/Shrub Community (2.1) is complete. At this point, there is generally not enough fine fuel produced by the grassland component to sustain fires that will control the woody plants. Once this threshold is reached, proper grazing management and prescribed burning alone cannot reverse the transition to the shrubland state. Mechanical and/or chemical (aerial) brush and pest management will be necessary to remove the excessive woody and weedy canopies. Some re-seeding with adapted tall and midgrass species may be necessary if an adequate seed source is not available.

With time and continued overgrazing by livestock and deer, woody plants eventually become dominant in the Shortgrass/Shrub Community (2.1) phase. Mesquite, redberry juniper and broom snakeweed are the most common increasers and invaders. In the western portion of MLRA 78B, Havard oak motts may increase to >50% canopy. The understory and interspaces support remnants of reference vegetation, which is generally in low vigor and productivity due to shading and competition for water and nutrients. As the site deteriorates, interspaces between woody plants become increasingly bare and low quality shortgrasses and annuals provide most of the herbaceous production.

Increased bare ground results in increased evaporation and soil erosion. Desertification including erosion, loss of soil organic matter and more xeric microclimate conditions prevail until the shrubland matures. Restoring the Shortgrass/Shrub Community (2.1) back to grassland requires extensive brush management, range planting and prescribed grazing practices.

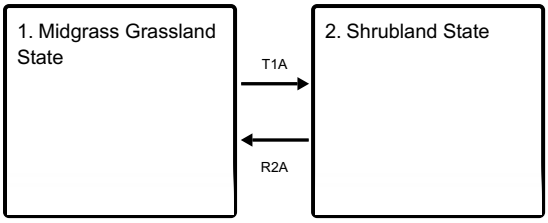
NOTE: Rangeland Health Reference Worksheets have been posted for this site on the Texas NRCS website (www.tx.nrcs.usda.gov) in Section II of the eFOTG under (F) Ecological Site Descriptions.

Plant Communities and Transitional Pathways (diagram) Narrative:
The following diagram depicts the vegetation pathways and states that will most likely occur with heavy livestock grazing/browsing under the prevailing climate. There may be alternative trajectories or states, depending on various natural or man-influenced disturbances, which are not shown on this diagram. Local professional guidance should always be sought before pursuing a treatment scenario.

Gravelly – State & Transition Diagram:

State and transition model

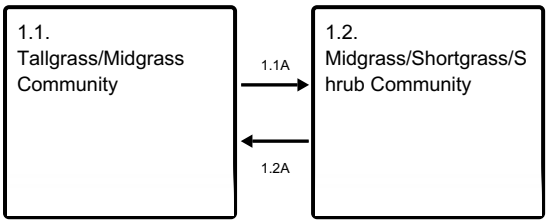
Ecosystem states



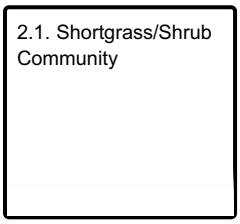
T1A - Absence of disturbance and natural regeneration over time, may be coupled with excessive grazing pressure

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

State 1 submodel, plant communities



State 2 submodel, plant communities



State 1
Midgrass Grassland State

The Tallgrass/Midgrass Community is a fire-influenced tall and midgrass plant community. Shrubs are widely scattered along the slopes and tops, but make up 10 percent, or less, of the total plant community. Recurring fires have kept woody and cacti species in check, but forbs are relatively abundant. Sideoats grama and little bluestem are the dominant or co-dominant grasses throughout the site. There are other tallgrasses occurring on the site, but in smaller amounts. Common shortgrasses include hairy grama, blue grama, buffalograss, and occasionally black grama. Characteristic forbs are catclaw sensitivebriar, plains actinea, dotted gayfeather, black Samson, baby white aster and golden dalea. The primary woody plant is catclaw mimosa with lesser amounts of feather dalea, skunkbush sumac, yucca, and redberry juniper. The Midgrass/Shortgrass/Shrubs Community developed due to the lack of fire along with overgrazing and has reduced the more palatable species and opened up the grass cover for the invasion of the woody species that had been held in check by competition and fire. Redberry juniper, yucca, pricklypear and occasionally mesquite may increase in number and size, but are not seriously impacting forage production at this point. The encroaching brushy species are generally less than four feet tall and provide less than 15 percent canopy. Less palatable grasses, such as hairy grama, hairy tridens, threeawns and sand dropseed along with forbs such as goldenaster, plains greenthread and Lamberts crazyweed are beginning to replace the dominants of the reference community.

Dominant plant species

- little bluestem (*Schizachyrium scoparium*), grass
- sideoats grama (*Bouteloua curtipendula*), grass

Community 1.1
Tallgrass/Midgrass Community

Figure 8. 1.1 Tallgrass/Midgrass Community

The interpretive or "reference" plant community for this site was a fire-induced tall and midgrass plant community. Shrubs are widely scattered along the slopes and tops, but made up 10 percent, or less, of the total plant community. Recurring fires have kept woody and cacti species in check, but forbs are relatively abundant. Sideoats grama and little bluestem are the dominant or co-dominant grasses throughout the site. Other tallgrasses occurring on the site, but in smaller amounts, are sand bluestem and Indiangrass. Common shortgrasses include hairy grama, blue grama, sand dropseed, buffalograss, threeawns and occasionally black grama. Characteristic forbs are catclaw sensitivebriar, plains actinea, dotted gayfeather, black Samson, baby white aster and golden dalea. The primary woody plant is catclaw mimosa with lesser amounts of feather dalea, skunkbush sumac, yucca, and redberry juniper. Herbage production varies from 1,100 to 1,800 pounds of biomass annually, depending upon the amount of precipitation. Considerable variability occurs within the site because of variation in slope percent and aspect; north and westerly facing slopes being most productive. Grasses make up to 85 percent of the species composition and production. The tall and midgrasses enhance the infiltration of rainfall into the highly permeable soil and reduce runoff. The tall and midgrass plant community furnishes good habitat for grazing type wildlife such as bison and pronghorn antelope. Due to the rolling to steep slopes and a rocky soil surface, this site is generally more suited to use by wildlife than by livestock. With continuous overgrazing by livestock, decrease in intensity and frequency of fires and no brush management, this plant community transitions into the Midgrass/Shortgrass/Shrubs Community (1.2) type. Proper grazing management and some form of woody plant control, such as prescribed burning along with mechanical or chemical brush management in the form of individual plant treatment (IPT) would be necessary to maintain the Tallgrass/Midgrass Community (1.1).

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	1048	1379	1715
Shrub/Vine	123	163	202
Forb	62	82	101
Tree	–	–	1
Microbiotic Crusts	–	–	–
Total	**1233**	**1624**	**2019**

Figure 10. Plant community growth curve (percent production by month). TX2019, Tall/Midgrass prairie with trees, shrubs and forbs. Tall and midgrasses with trees, small shrubs and forbs in near historic climax..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	3	5	10	25	25	10	5	8	5	2	1

Community 1.2
Midgrass/Shortgrass/Shrub Community

Figure 11. 1.2 Midgrass/Shortgrass/Shrub Community

This community represents the first phase in the transition of the Tallgrass/Midgrass Community toward a shrubland state. The lack of fire along with overgrazing has reduced the more palatable species and opened up the grass cover for the invasion of the woody species that had been held in check by competition and fire. Redberry juniper, yucca, pricklypear and occasionally mesquite may increase in number and size, but are not seriously impacting forage production at this point. The encroaching brushy species are generally less than four feet tall and provide less than 15 percent canopy. This stage may, in fact, present more desirable conditions for wildlife and recreational use than the reference community. Forage production for browsing animals is enhanced. Less palatable grasses, such as hairy grama, hairy tridens, threeawns and sand dropseed along with forbs such as goldenaster, plains greenthread and Lamberts crazyweed are beginning to replace the dominants of the reference community. Nutrient and energy cycling is shifting toward woody plants. Herbage production is slightly less than reference, averaging from 900 to 1,600 pounds of annual production. The herbaceous component still dominates herbage production. Litter and ground cover are beginning to decrease, exposing more soil to erosion and encroachment by previously suppressed species. Proper grazing, prescribed burning and mechanical and/or chemical brush management along with some pest management can easily improve or maintain this plant community. Without brush management, fire and proper grazing, the woody species will continue to encroach until the woody species dominate. When the canopy of the woody plants becomes dense enough (15-20 %) and large enough (>4 feet) to suppress grass growth or resist fire damage, a threshold in ecological succession is crossed. The Midgrass/Shortgrass/Shrubs Community (1.2) transitions into the Shrubland State (2).

Table 6. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	757	1051	1345
Shrub/Vine	151	211	269
Tree	50	71	90
Forb	50	71	90
Total	**1008**	**1404**	**1794**

Figure 13. Plant community growth curve (percent production by month). TX2058, Midgrass/Shortgrass/Shrub Community. Warm-season mid and shortgrasses with increasing amounts of annual forbs and shrubs with primary production in April through October..

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

Pathway 1.1A
Community 1.1 to 1.2

Tallgrass/Midgrass Community

Midgrass/Shortgrass/Shrub Community

With heavy continuous grazing pressure and no fires, the Tallgrass/Midgrass Community will shift to the Midgrass/Shortgrass/Shrubs Community.

Pathway 1.2A
Community 1.2 to 1.1

Midgrass/Shortgrass/Shrub Community

Tallgrass/Midgrass Community

With the application of various conservation practices such as Prescribed Grazing, Prescribed Burning, Brush Management, and Individual Plant Treatment, the Midgrass/Shortgrass/Shrubs Community may be able to revert back to the Tallgrass/Midgrass Community.

Conservation practices

Brush Management
Prescribed Burning
Prescribed Grazing

State 2
Shrubland State

The Shrubland State on the Gravelly site is the result of long-term overgrazing by livestock accompanied by the decrease in intensity and frequency of fires. Redberry juniper, yucca, pricklypear, broom snakeweed, mesquite and occasionally Havard oak may become the dominant woody species. There are several Gravelly site areas in western MLRA 78B that are dominated by Havard oak (>50%). On other Gravelly sites, mesquite was an early invader, but juniper has increased considerably the past few decades and often dominates the plant community. The most common woody invader of this site is broom snakeweed. Common understory shrubs and herbaceous vegetation in the interspaces include catclaw mimosa, feather dalea, and skunkbush sumac with low quality shortgrasses and annuals replacing the tall and midgrass species. Characteristic grasses are hairy tridens, hairy grama, threeawns, and sand dropseed. As the brush canopy increases in density and thickens, and the percent bare ground increases. Only sparse stands of hairy tridens, threeawns, Texas grama and annuals will occupy the interspaces between the woody plants or motts.

Dominant plant species

- redberry juniper (*Juniperus coahuilensis*), shrub
- yucca (*Yucca*), shrub
- pricklypear (*Opuntia*), shrub
- buffalograss (*Bouteloua dactyloides*), grass

Community 2.1
Shortgrass/Shrub Community

Figure 14. 2.1 Shortgrass/Shrub Community

Figure 15. 2.1 Shortgrass/Shrub Community (2)

The Shortgrass/Shrub Community (2.1) stage on the Gravelly site is the result of long-term overgrazing by livestock accompanied by the decrease in intensity and frequency of fires. Redberry juniper, yucca, pricklypear, broom snakeweed, mesquite and occasionally Havard oak may become the dominant woody species. There are several Gravelly site areas in western MLRA 78B that are dominated by Havard oak (>50%). On other Gravelly sites, mesquite was an early invader, but juniper has increased considerably the past few decades and often dominates the plant community. The most common woody invader is broom snakeweed. Common understory shrubs and herbaceous vegetation in the interspaces include catclaw mimosa, feather dalea, and skunkbush sumac with low quality shortgrasses and annuals replacing the tall and midgrass species. Characteristic grasses are hairy tridens, hairy grama, threeawns, and sand dropseed. As the brush canopy increases in density and thickens, and the percent bare ground increases. Only sparse stands of hairy tridens, threeawns, Texas grama and annuals will occupy the interspaces between the woody plants or motts. Annual primary production varies from 450 to 1200 pounds per acre. Grasses and forbs make up 25 percent or less of the annual herbage production. The woody canopy can reach 40 to 50 percent ground cover and produce 70 percent or more of the annual production. Although this state provides cover for wildlife, only limited preferred forage or browse is available for livestock or wildlife. The increasing woody plant canopy acts to intercept rainfall and increase evapotranspiration losses, creating a more xeric microclimate. Soil fauna and litter are reduced exposing more soil surface to erosion in the interspaces. However, within the woody canopy, hydrologic processes stabilize and soil organic matter and mulch begin to increase and eventually stabilize in the mature shrubland state. This process takes many years. Without major brush control and management inputs, this plant community cannot be reversed. Brush will continue to thicken until it stabilizes with the climate and soil. Returning the Shortgrass/Shrubland Plant Community back to grassland requires extensive and expensive reclamation practices. Mechanical brush management and re-seeding will be difficult with the steep nature of some of the slopes. Chemical brush and pest management practices will be limited to aerial applications due to slope and the high percent canopy. Once this site reaches this stage, it may be more practical and economical to maintain these sites as wildlife and recreational areas. Domestic livestock do not prefer the site for grazing and the cost to return this site to reference condition may not be economically feasible. Land use other than livestock production might dictate alternative reclamation approaches to create the plant community that best fits the landowner’s intended use.

Table 7. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Shrub/Vine	157	314	628
Tree	135	269	538
Grass/Grasslike	112	224	336
Forb	45	90	179
Microbiotic Crusts	–	–	–
Total	**449**	**897**	**1681**

Figure 17. Plant community growth curve (percent production by month). TX2022, Shortgrasses/Annual grasses/Shrubs . Shortgrasses, shrubs, and annuals having low production and being degraded..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	5	16	27	25	7	4	10	5	1	0

Transition T1A
State 1 to 2

With heavy continuous grazing pressure, brush invasion, no fires, no brush management, and no pest management, the Midgrass Grassland State will transition into the Shrubland State.

Restoration pathway R2A
State 2 to 1

Prescribed Grazing, Prescribed Burning, Brush Management, Pest Management, Range Planting (by hand due to slopes) are various conservation practices required to restore the Shrubland State back into the Midgrass Grassland State.

Conservation practices

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

Additional community tables

Table 8. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Midgrasses**			555–908	
	sideoats grama	BOCU	*Bouteloua curtipendula*	370–605	–
	little bluestem	SCSC	*Schizachyrium scoparium*	185–303	–
2	**Tallgrasses**			247–404	
	sand bluestem	ANHA	*Andropogon hallii*	135–258	–
	Indiangrass	SONU2	*Sorghastrum nutans*	135–258	–
3	**Mid/Shortgrasses**			185–303	

	sand dropseed	SPCR	*Sporobolus cryptandrus*	185–303	–
	blue grama	BOGR2	*Bouteloua gracilis*	56–224	–
	hairy grama	BOHI2	*Bouteloua hirsuta*	56–168	–
	black grama	BOER4	*Bouteloua eriopoda*	56–168	–
	fall witchgrass	DICO6	*Digitaria cognata*	28–84	–
4	**Shortgrasses**			62–101	
	buffalograss	BODA2	*Bouteloua dactyloides*	22–78	–
	Texas grama	BORI	*Bouteloua rigidiseta*	17–56	–
	Wright's threeawn	ARPUW	*Aristida purpurea var. wrightii*	22–50	–
	hairy woollygrass	ERPI5	*Erioneuron pilosum*	17–34	–
	slim tridens	TRMU	*Tridens muticus*	17–34	–
Forb					
5	**Forbs**			62–101	
	rose heath	CHER2	*Chaetopappa ericoides*	11–34	–
	golden prairie clover	DAAU	*Dalea aurea*	11–34	–
	prairie clover	DALEA	*Dalea*	11–34	–
	Illinois bundleflower	DEIL	*Desmanthus illinoensis*	11–34	–
	blacksamson echinacea	ECANA	*Echinacea angustifolia var. angustifolia*	11–34	–
	beeblossom	GAURA	*Gaura*	11–34	–
	hoary false goldenaster	HECA8	*Heterotheca canescens*	11–34	–
	trailing krameria	KRLA	*Krameria lanceolata*	11–34	–
	dotted blazing star	LIPU	*Liatris punctata*	11–34	–
	Nuttall's sensitive-briar	MINU6	*Mimosa nuttallii*	11–34	–
	purple locoweed	OXLA3	*Oxytropis lambertii*	11–34	–
	white milkwort	POAL4	*Polygala alba*	11–34	–
	Drummond's skullcap	SCDR2	*Scutellaria drummondii*	11–34	–
	stemmy four-nerve daisy	TESC2	*Tetraneuris scaposa*	11–34	–
	stiff greenthread	THFI	*Thelesperma filifolium*	11–34	–
	Rocky Mountain zinnia	ZIGR	*Zinnia grandiflora*	11–34	–
Shrub/Vine					
6	**Shrubs/Vines**			123–202	
	Havard oak	QUHA3	*Quercus havardii*	56–112	–
	fragrant sumac	RHAR4	*Rhus aromatica*	22–84	–
	featherplume	DAFO	*Dalea formosa*	22–84	–
	soapweed yucca	YUGL	*Yucca glauca*	34–67	–
	jointfir	EPHED	*Ephedra*	22–56	–
	plains pricklypear	OPPO	*Opuntia polyacantha*	11–56	–
Tree					
8	**Tree**			0–112	
	redberry juniper	JUCO11	*Juniperus coahuilensis*	0–112	–

Animal community

Many types of grassland insects, reptiles, birds and mammals frequented the Gravelly Site in pre-settlement times, either as their base habitat or in conjunction with adjacent sites. Small mammals included rodents, jackrabbits, raccoon, skunk, opossum and armadillo. Predators included coyote, red fox, gray fox, bobcat and occasionally mountain lion. 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. Native mule deer utilize the Gravelly site in its various states. Their numbers must be included along with livestock and native wildlife in any conservation plan. Feral hogs may also be present on the site. They can be damaging to the plant community if their numbers are not managed

This site is not preferred by primary grass eaters such as cattle due to the rolling to steep slopes and the rocky soil surface. When rock cover approaches 30%, accessibility for cattle is greatly reduced. As retrogression occurs and woody plants invade, the community becomes better habitat for deer and other wildlife because of the browse and increased cover. Deer and quail particularly favor the habitat provided by the Midgrass/Shortgrass/Shrubs Community (1.2) with encroaching woody shrubs. Deer populations must also be managed within limits of the habitat sustainability. If the animal numbers are not kept in balance with herbage and browse production through good wildlife population management, the late Shortgrass/Shrub Community (2.1) will have little to offer as habitat on a sustained basis except cover.

Hydrological functions

The climate affecting the hydrology of the Gravelly Ecological Site is dry sub-humid with approximately two-thirds of annual rainfall occurring during the April to September period. Rainfall during this period generally falls during thunderstorms and fairly large amounts of rain may fall in a short time. Due to topography and vegetation quality of surface runoff is high with low erosion and sedimentation levels. The soils are deep, gravelly, well drained and moderately permeable. Although slopes are sometimes steeply sloping, little runoff occurs with good vegetative cover. The deep gravelly soils facilitate water movement to deeper root zones and below, contributing to the recharge of aquifers and sustained stream flow.

Under reference condition, the grassland vegetation intercepted and utilized much of the incoming rainfall in the soil solum. Only during extended rains or heavy thunderstorms was there much runoff, if any. Litter and soil movement was slight. Standing plant cover, duff and organic matter decrease and surface runoff increase as the HCPC transitions to the Midgrass/Shortgrass/ Shrubs Community (1.2). These processes continue in the interstitial spaces in the early Shortgrass/Shrub Community (2.1). As the woody plant canopy surpasses 50%, competition for moisture with the remaining grasses and forbs further reduces herbaceous plant production. Decreased litter and high percent bare ground allows soil erosion in openings between shrubs, evaporation and interception losses are higher. The hydrology and ecological processes, nutrient cycling and energy flow has been severely reduced.

Recreational uses

The Gravelly Site is well suited for many outdoor recreational uses including recreational hunting, hiking, camping, equestrian and bird watching. This site along with adjacent sites provides diverse scenic beauty and many opportunities for recreation and hunting.

Wood products

Mesquite and juniper are sometimes used for specialty wood products.

Other products

Jelly or jam can be made from pricklypear and mesquite.

Other information

None.

Inventory data references

Information presented here has been derived from the Gravelly Range Site Description (Rolling Plains PE 26-34), literature, limited NRCS clipping data (417s), field observations and personal contacts with range-trained personnel. Photos by J.L. Schuster and Clint Rollins.

Other references

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Technical Reviewers:
Clint Rollins, NRCS, RMS, Amarillo, Texas
Justin Clary, NRCS, RMS, Temple, Texas
James Gillespie, NRCS, Natural Resource Manager, Matador, Texas

Contributors

Dr. Joseph Schuster, Range & Wildlife Habitat Consultants, Bryan, Texas
Joe B. Norris, NRCS, RMS, Abilene, Texas
PES Edits by Tyson Morley, MLRA Soil Scientist, Altus, Oklahoma

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

Indicators

1. **Number and extent of rills:** Due to percent slopes, rills will be common.

2. **Presence of water flow patterns:** Due to percent slopes, water flow patterns will be common.

3. **Number and height of erosional pedestals or terracettes:** Due to percent slopes, pedestals/terracettes will be common.

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** 10-15% mineral soil. Low percentage due to rock fragments scattered throughout soil profile.

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):** Very gravelly loam; friable; low SOM.

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Basal cover, density and rock fragments should make rainfall impact minimal. This site has moderately permeable soils, runoff is medium, and available water holding capacity is medium.

11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be**

mistaken for compaction on this site): None.

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

    Dominant: Warm-season tallgrasses >>

    Sub-dominant: Warm-season midgrasses >

    Other: Shrubs/Vines > Forbs > Trees

    Additional:

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** Plant mortality and decadence is minimal.

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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):** 700 to 1,600 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 juniper 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.
