USDA Natural Resources
Conservation Service

Ecological site R081BY349TX
Steep Rocky 19-23 PZ

Last updated: 9/19/2023
Accessed: 05/21/2025

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.

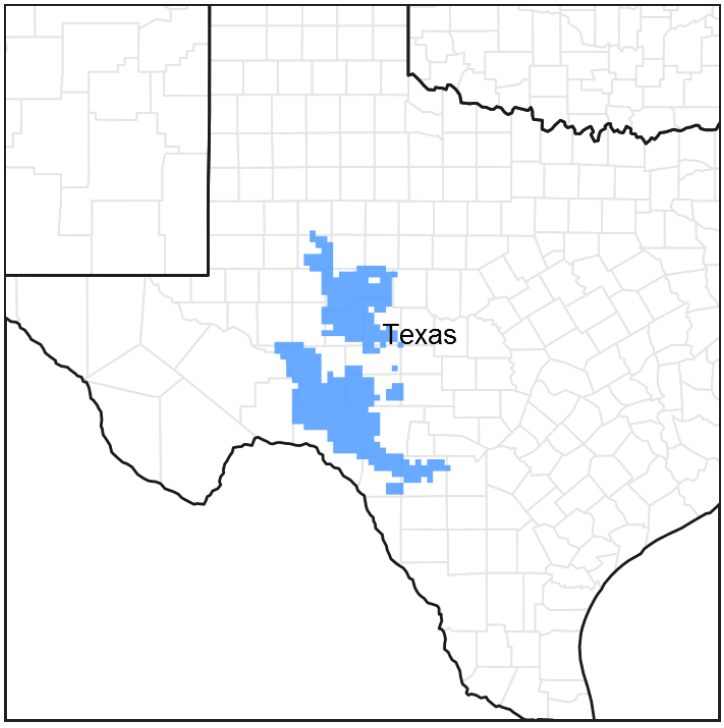


Figure 1. Mapped extent

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): 081B–Edwards Plateau, Central Part

This area is entirely in south-central Texas. It makes up about 11,125 square miles (28,825 square kilometers). The towns of Fredericksburg, Junction, Menard, Rocksprings,

and Sonora are in this MLRA. Interstate 10 crosses the middle part of the area. A few State parks and State historic sites are in this MLRA.

Classification relationships

USDA-Natural Resources Conservation Service, 2006.
-Major Land Resource Area (MLRA) 81B

Ecological site concept

The Steep Rocky sites are comprised of shallow soils with lithic contact. The sites are filled with gravels, cobbles, and flagstones and occur on steep slopes with greater than 20 percent slopes.

Associated sites

R081BY336TX	**Low Stony Hill 19-23 PZ** The Low Stony Hill site occurs on the flatter terrain on top as well as down slope from the Steep Rocky site.
R081BY342TX	**Shallow 19-23 PZ** The Shallow site occurs on the flatter terrain on top as well as downslope from the Steep Rocky site.

Similar sites

R081BY336TX	**Low Stony Hill 19-23 PZ** The Low Stony Hill site has the same soils just on slopes less than 20 percent.

Table 1. Dominant plant species

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

Physiographic features

The Steep Rocky are soils on uplands of the upper slopes and summits of hills. Sites are bordered by undulating to gently rolling limestone plateau. The hillsides and scarps may be 100 to 400 yards wide and several miles long. The landscape is characterized by broad ridges and shallow valleys. The elevation ranges from 1,200 feet to 2,800 feet above sea level. Slopes range from 20 to 60 percent. Runoff is high to very high.

Table 2. Representative physiographic features

Landforms	(1) Plateau > Ridge (2) Plateau > Hill (3) Plateau > Divide
Runoff class	High to very high
Flooding frequency	None
Ponding frequency	None
Elevation	366–853 m
Slope	20–60%
Aspect	Aspect is not a significant factor

Climatic features

The climate in the MLRA 81B is subtropical subhumid on the eastern portion and subtropical steppe on the western portion of the MLRA. Winters are dry, and the summers are hot and humid. The precipitation increases from west to east and the temperatures increase from north to south. The area usually receives 65 to 70 percent sunshine each year. The majority of the rainfall occurs during the warm months of April to October. Most precipitation comes from thunderstorms that vary in the amount of water received and the areas covered. Spring is characterized by fluctuating patterns, but mild temperatures prevail. July and August are relatively dry and hot with little weather variability day-to-day. As summer progresses through fall, an increase of precipitation usually occurs in the eastern portions while a decrease of precipitation occurs to the west. Winter temperatures are mild, but polar Canadian air masses bring rapid drops in temperature. These cold spells last 2 or 3 days. Prevailing winds are southerly with March and April the windiest months.

Table 3. Representative climatic features

Frost-free period (characteristic range)	210-260 days
Freeze-free period (characteristic range)	240-280 days
Precipitation total (characteristic range)	483-610 mm
Frost-free period (actual range)	210-270 days
Freeze-free period (actual range)	240-290 days
Precipitation total (actual range)	483-635 mm
Frost-free period (average)	230 days
Freeze-free period (average)	260 days
Precipitation total (average)	559 mm

Climate stations used

- (1) CARTA VALLEY [USC00411492], Rocksprings, TX
- (2) ELDORADO [USC00412809], Eldorado, TX
- (3) SONORA [USC00418449], Sonora, TX
- (4) OZONA [USC00416734], Ozona, TX
- (5) BIG LAKE 2 [USC00410779], Big Lake, TX

Influencing water features

Wetlands or streams do not affect this ecological site.

Wetland description

N/A

Soil features

The soils are well drained, moderately permeable and underlain by limestone. The soils are moderate alkaline and calcareous throughout. The available water capacity is very low. Most areas of Steep Rocky are only suitable for rangeland since the topography is too steep and too shallow for cultivation. There are also up to 40 percent surface fragments and up to 65 percent subsurface fragments. The root zone is very shallow to shallow, and water erosion can be severe because of the steep slopes. Soil series correlated to this site include: Ector, Oplin, and Tarrant.

Table 4. Representative soil features

Parent material	(1) Residuum–limestone
Surface texture	(1) Very cobbly loam (2) Very gravelly clay loam (3) Very flaggy clay
Family particle size	(1) Loamy-skeletal (2) Clayey-skeletal
Drainage class	Well drained
Permeability class	Moderately slow to moderate
Depth to restrictive layer	10–51 cm
Soil depth	10–51 cm
Surface fragment cover <=3"	30–40%
Surface fragment cover >3"	10–30%

Available water capacity (0-50.8cm)	0.25–4.32 cm
Calcium carbonate equivalent (0-50.8cm)	2–70%
Electrical conductivity (0-50.8cm)	0–2 mmhos/cm
Sodium adsorption ratio (0-50.8cm)	0
Soil reaction (1:1 water) (0-50.8cm)	7.4–8.4
Subsurface fragment volume <=3" (10.2-50.8cm)	15–40%
Subsurface fragment volume >3" (10.2-50.8cm)	15–50%

Ecological dynamics

The vegetation, as was with the rest of the Edwards Plateau, developed as a mosaic of open grasslands, savannahs, and woodlands due to relatively frequent and intense fires. Lightning and Native Americans burned the hills and valleys repeatedly and prevented the development of woodlands. Research has postulated that the eastern part of the Edwards Plateau burned every 4 to 6 years and the western part burned every 7 to 12 years. Recurring severe drought compounded the effects of fire keeping trees and shrubs confined to drainages, escarpments, and other areas protected from fire. The Steep Rocky site, with its topography, rocks, and differential drainage, developed as a fire-dependent community. It supported a diverse grassland and woodland vegetation with a 15 to 20 percent canopy of woody plants. The woody plants were confined primarily to rough rocky areas on north and east slopes, which protected them from most fires. Fire and grazing by native fauna, however, were probably not as frequent, or influential, in the development of the reference plant community, due to the lack of fine fuels on the steep topography.

The Mixed-grass/Oak Savannah Community (1.1), developed in recent geologic times along with the soils under the influence of the prevailing semiarid/subtropical climate and relatively frequent fire. Tallgrasses, such a big bluestem (*Andropogon gerardii*) and Indiangrass (Sorgastrum nutans), trees such as live oak (*Quercus virginiana*), Texas red oak (*Quercus buckleyi*), Vasey shin oak (*Quercus pungens* var. vaseyana), Mohr’s oak (*Quercus mohriana*), Ashe juniper (*Juniperus asheï*), and redberry juniper (*Juniperus pinchotii*), and brush species are commonly found. Shrubs and midgrasses compete for nutrients and water in the open spaces between trees. The grassland component prevailed where the soils and moisture regime were unsuited for trees and shrubs, or fires and recurring droughts reduced woody plant growth. The herbaceous plant community is dominated by little bluestem with sideoats grama (*Bouteloua curtipendula*), green sprangletop (*Leptochloa dubia*), dropseeds (Sporobolus spp.), feathery bluestems

(Bothriochloa spp.), and plains lovegrass (Eragrostis trichloris), and numerous forbs. Important forbs were chalkhill woolly-white (Hymenopappus spp.), menodora (Menodora spp.), Engelmann's daisy (*Engelmannia peristenia*), awnless bushsunflower (*Simsia calva*), bundleflower (Desmanthus spp.), knotweed leafflower (*Phyllanthus polygonoides*), and milkpea (Galatia spp.). Important shrubby species include Texas kidneywood (*Eysenhardtia texana*), sumac (Rhus spp.), greenbriar (Smilax spp.), silktassel (Garryi spp.), and ephedra (Ephedra spp.).

The vegetative composition of the reference community changed after European settlement in the 1800's because of animal husbandry and the arrival of fencing and windmills. Continuous overgrazing by livestock beginning by 1820's and the concomitant reduction of range fires brought about ecological retrogression and the increase of less palatable woody plants and weedy herbaceous plants. Overstocking the area with domesticated livestock has caused the vegetation to decline due to the plant community's inability to sustain heavy, long-term grazing pressure. As retrogression occurs on the Steep Rocky site, the late seral tall and midgrasses give way to shortgrasses, brush, and weeds. The resulting community is identified as the Midgrass/ Oak/ Mixed-Brush Community (1.2). When retrogression is cattle induced, big bluestem, Indiangrass, and the more palatable forbs give way to less palatable midgrasses, such as green sprangletop, sideoats grama, feathery bluestems, tall dropseeds, Texas wintergrass (*Nassella leucotricha*), tridens (Tridens spp.), and less palatable forbs. Plant biomass production shifts from mostly grass to a mixture of grass, forb, and woody plant production. There is little change in soil moisture, runoff, or evapotranspiration in this phase.

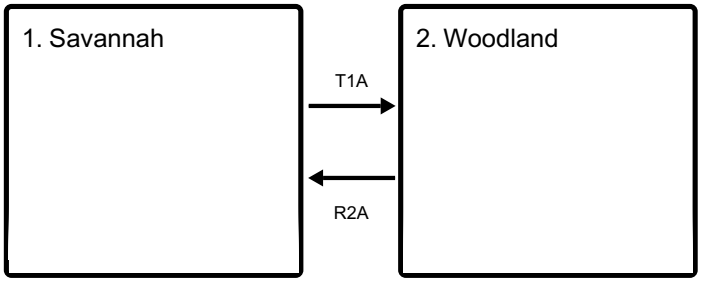
With continued overgrazing and absence of fire, oaks, juniper, Texas persimmon (*Diospyros texana*), shin oak, sumac (Rhus spp.), and other woody and weedy species increase in size and frequency. They will eventually form dense thickets and mottes if grazing management, brush control, and fire are not initiated. The woody increasers begin to compete for nutrients, water, and space. In this stage, herbaceous forage production begins to transition towards shade-tolerant species such as tall grama, Texas wintergrass, and shrubby vegetation. The hydrology of the site begins to reflect more arid conditions due to evapotranspiration changes benefiting woody vegetation and accelerated erosion might take place. If grazing management and brush control are not applied, the woody canopy will reach 30 to 40 percent canopy cover, indicating a threshold has been crossed where the site is no longer a savannah and cannot return through natural ecological processes alone. At this threshold, the site transitions into the Oak/Juniper Woodland Community (2.1).

At maturity, the Oak/Juniper Woodland Community (2.1) represents 40 to 70 percent canopy of woody plants with few grasses and forbs. Ashe juniper (*Juniperus asheii*) and/or redberry juniper (*Juniperus pinchotii*) generally makes up 50 to 60 percent of the canopy due to their morphology and aggressive colonization in the absence of fire and brush management. The oaks, primarily live oak and Texas red oak, are co-dominant, but there are numerous other tree and shrubby species as well. Escarpment black cherry

(*Prunus serotina* var. eximia) and pinyon pine (*Pinus edulis*) are rather unique species on the Steep Rocky site finding refuge in the deep soil pockets and rock outcrops on north slopes. Primary production has shifted to woody vegetation and evapotranspiration losses have created a more arid microclimate, which reduces water percolation and runoff. The dense oaks and junipers, with evergreen foliage, depress production of shade-intolerant species. Brushy species are also reduced, as is the food portion of the habitat for deer, goat and sheep. In its mature stage, the habitat of the Oak/Juniper Woodland Community (2.1) is suited primarily to songbirds, small mammals, and predators for escape cover. Reclamation of the site in this state requires extensive brush management and, in many cases, may not be feasible except for management practices such as individual plant treatment (IPT) to reduce juniper, oak and brush density.

State and transition model

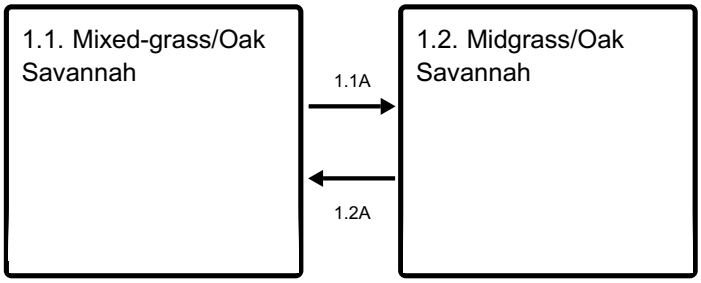
Ecosystem states



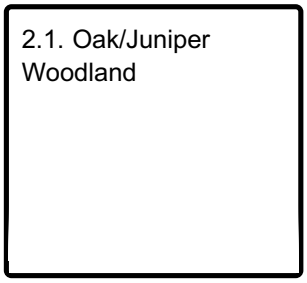
T1A - Absence of disturbance and natural regeneration over time, may be coupled with excessive grazing pressure

R2A - Reintroduction of historic disturbance return intervals

State 1 submodel, plant communities



State 2 submodel, plant communities



State 1
Savannah

Dominant plant species

- Texas red oak (*Quercus buckleyi*), tree
- live oak (*Quercus virginiana*), tree
- little bluestem (*Schizachyrium scoparium*), grass
- sideoats grama (*Bouteloua curtipendula*), grass

Community 1.1
Mixed-grass/Oak Savannah

Figure 8. Mixed-grass/Oak Savannah Community

The reference plant community for the site is dominated by little bluestem, sideoats grama, Nealley grama (*Bouteloua uniflora*), and several other midgrasses. There is a canopy of 10 to 20 percent oaks and understory shrubs. The composition is highly variable, depending on the geologic formations. The trees often follow ridges and fissures. The woody component consists primarily of Texas red oak and live oak, but may include Mohr's shin oak, Vasey shin oak, Texas kidneywood (*Eysenhardtia texana*), greenbriar (Smilax spp.) sumac species, silver mountain mahogany (*Cercocarpus montanus* var. argenteus), Texas redbud (*Cercis canadensis* var. texensis), and the unique Texas madrone (*Arbutus xalapensis*). Early explorers report some instances of dense juniper depending upon the fire frequency. Tall and midgrasses dominate much of the site, though a portion of the site always supported fairly large shrub and tree mottes. Northerly slopes supported as much as a 35 percent canopy of trees. Occasional fires and limited grazing by bison and other grazers were natural processes that maintained the mosaic pattern of the plant community. Nutrient cycling, as expressed by vegetative production, litter accumulation, and soil organic matter development, is postulated to have been at near maximum for the climate, soils, and topography. The density and frequency of woody vegetation are strongly dependent on the presence or absence of fractured limestone. Where non-fractured limestone parent material exists, short rooted plants were common and large deep-rooted tree vegetation rare. The integrity of the reference plant community can be maintained with limiting grazing and browsing by all classes of herbivores and

brush management practices such as burning and individual plant treatment (IPT). Due to the steep topography and erosion hazards, only a few management practices are applicable. Hand cutting of seedling, or re-growth, juniper is an example of a viable practice. When overgrazing occurs, brush management is not practiced and/or fire is excluded, the site transitions toward a woodland community. This phase is identified as the Midgrass/Oak/Savannah Community (1.2).

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	673	1429	1681
Tree	135	286	336
Forb	45	95	112
Shrub/Vine	45	95	112
Total	**898**	**1905**	**2241**

Figure 10. Plant community growth curve (percent production by month). TX3604, Mixed-grass/Oak Savannah Community, 10-20% canopy. Growth is predominantly tall and midgrasses from late March through October with peak growth in May and June..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2	3	7	8	18	18	5	7	16	7	5	4

Community 1.2
Midgrass/Oak Savannah

Figure 11. Midgrass/Oak Savannah Community

As grazing and browsing pressure increases, secondary herbaceous species of shrubs

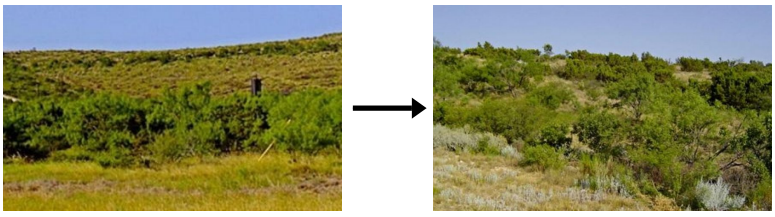
and tree seedlings begin replacing the more palatable grasses and forbs. The plant community develops into grassland with increased presence of trees and shrubs. In this phase tree and shrub canopy can be high as 35 percent. However, midgrasses such as little bluestem, sideoats grama, plains lovegrass, tall (*Sporobolus compositus* var. compositus), meadow dropseed (Sporobolus asper var. drummondii), and feathery bluestems still dominate forage production. Sumacs, Texas persimmon, elbowbush, acacias, mesquite, and juniper are increasing in density and canopy. Less palatable forbs such as bushsunflower, scurfpea (Pedimodium spp.), trailing ratany (Krameria spp.), menodora (Menodora spp.) and dalea (Dalea spp.) flourish. This phase is highly productive for multi-species livestock and wildlife husbandry. The balance of forage is still herbaceous, and the increasing shrub component furnishes browse and cover. The hydrologic functions and ecological processes are normal for the site. Water runoff is rapid due to slope, but sediment load is very low. Maintenance of this condition, however, requires careful grazing management and maintenance brush control. Individual plant treatments and fire are the best brush management methods. Unless grazing management and brush management are practiced this phase will transition into the Oak/Juniper Woodland Community (2.1).

Pathway 1.1A
Community 1.1 to 1.2

Mixed-grass/Oak Savannah **Midgrass/Oak Savannah**

Heavy abusive grazing, no fire, and no brush management will transition to the Midgrass/Oak Savannah Community (1.2).

Pathway 1.2A
Community 1.2 to 1.1



Midgrass/Oak Savannah **Mixed-grass/Oak Savannah**

Prescribed grazing, return of fire, and brush management, in the form of IPT or hand cutting, will restore the Mixed-grass/Oak Savannah Community (1.1).

State 2
Woodland

Dominant plant species

- Ashe's juniper (*Juniperus ashei*), tree
- Pinchot's juniper (*Juniperus pinchotii*), tree

Community 2.1
Oak/Juniper Woodland

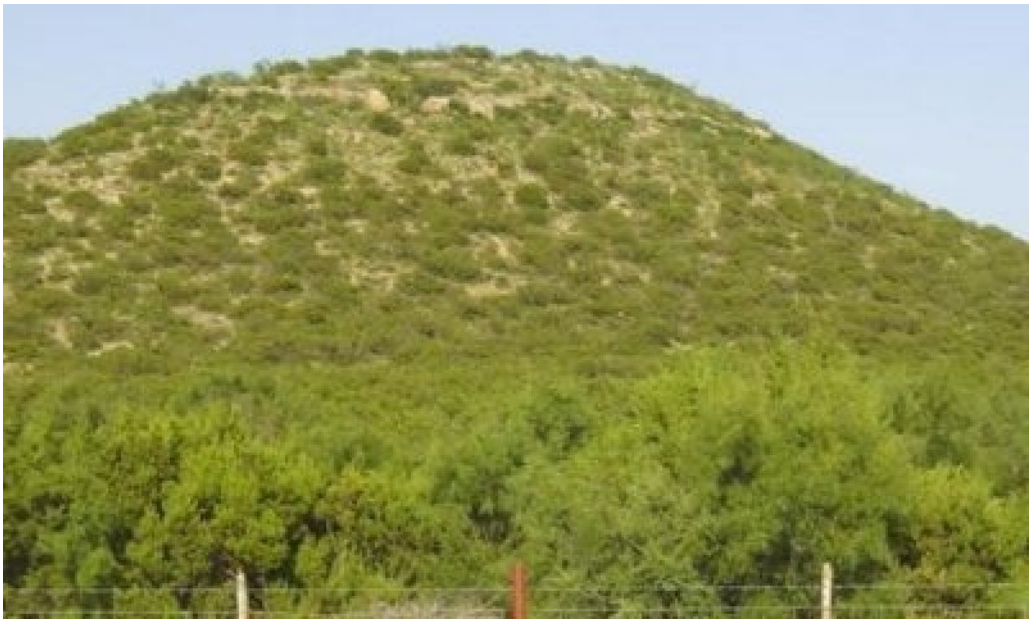


Figure 12. Oak/Juniper Woodland Community

In this state, the woody canopy, especially juniper species, dominates. This state begins when woody plant canopy exceeds 35 percent and increases with maturity. At maturity the canopy approaches or exceeds 70 percent with junipers occupying 35 to 45 percent. The oak species have also expanded their position and stature along ridges, crevices, and limestone outcrops. Grassland vegetation and low stature shrubs, such as Texas persimmon (*Diospyros texana*), pricklypear (Opuntia spp.), algerita (Mahonia trifoliata), elbowbush, and sumacs occupy the non-fractured areas, especially on south slopes. Oak, Ashe juniper, and sometimes redberry juniper, are co-dominant if fire or appropriate brush management control is not practiced. The tallgrasses, midgrasses, and shade-intolerant forbs give way to lesser, shade-tolerant species. Low-quality forbs such as sagewort (Artemisia spp.), groundsels (Senecio spp.), abutilon (*Abutilon incanum*), twinleaf senna (Senna roemariana), and grasses such as three-awns, hairy tridens (*Erioneuron pilosum*), sedge (Carex spp.), Texas wintergrass, hairy grama (*Bouteloua hirsuta*) are common in the understory and interstitial spaces. Desertification is ongoing and groundwater recharge is reduced. With its depauperate forage base, the mature Oak/Juniper Woodland Community (2.1) provides only cover and low-quality food for livestock and deer. Only expensive brush management, grazing management, and range planting will reverse this state. The rockiness and steep slopes on the site will preclude all but hand methods of plant control and range planting. This state is vulnerable to severe wildfires during extreme drought conditions.

Transition T1A
State 1 to 2

Continued heavy abusive grazing, lack of fire, and lack of brush management will transition the site to the Oak/Juniper Woodland Community. This is evidenced by over 35 percent canopy cover by woody species and an overall reduction in production by herbaceous species.

Restoration pathway R2A
State 2 to 1

Grazing management, prescribed fire, and brush management can potentially restore the reference community. The steep sloping nature of the site often causes difficulty with mechanical brush management. Therefore, individual plant treatments and hand cutting may be the only considerations. Range planting of native seeds can quicken the sites ability to assimilate towards the reference community.

Additional community tables

Table 6. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**tallgrass**			179–493	
	little bluestem	SCSC	*Schizachyrium scoparium*	179–493	–
2	**tallgrasses**			146–370	
	big bluestem	ANGE	*Andropogon gerardii*	146–370	–
	Indiangrass	SONU2	*Sorghastrum nutans*	146–370	–
3	**midgrasses**			135–370	
	sideoats grama	BOCU	*Bouteloua curtipendula*	135–370	–
	black grama	BOER4	*Bouteloua eriopoda*	135–370	–
	plains lovegrass	ERIN	*Eragrostis intermedia*	135–370	–
	green sprangletop	LEDU	*Leptochloa dubia*	135–370	–
4	**midgrasses**			90–247	
	cane bluestem	BOBA3	*Bothriochloa barbinodis*	90–247	–
	tall grama	BOHIP	*Bouteloua hirsuta var. pectinata*	90–247	–
	silver beardgrass	BOLAT	*Bothriochloa laguroides ssp. torreyana*	90–247	–
	Drummond's	SPCOD3	*Sporobolus compositus var.*	90–247	

	Drummond's dropseed	SPCOD3	*Sporobolus compositus var. drummondii*	90–247	–
	slim tridens	TRMUE	*Tridens muticus var. elongatus*	90–247	–
5	**shortgrasses**			45–123	
	threeawn	ARIST	*Aristida*	45–123	–
	fall witchgrass	DICO6	*Digitaria cognata*	45–123	–
	hairy woollygrass	ERPI5	*Erioneuron pilosum*	45–123	–
	Hall's panicgrass	PAHA	*Panicum hallii*	45–123	–
	Reverchon's bristlegrass	SERE3	*Setaria reverchonii*	45–123	–
	slim tridens	TRMU	*Tridens muticus*	45–123	–
6	**cool-season grasses**			45–123	
	cedar sedge	CAPL3	*Carex planostachys*	45–123	–
	Scribner's rosette grass	DIOLS	*Dichanthelium oligosanthes var. scribnerianum*	45–123	–
	Canada wildrye	ELCA4	*Elymus canadensis*	45–123	–
	Texas wintergrass	NALE3	*Nassella leucotricha*	45–123	–
Forb					
7	**forbs**			90–247	
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	90–247	–
	white sagebrush	ARLUM2	*Artemisia ludoviciana ssp. mexicana*	90–247	–
	yellow sundrops	CASE12	*Calylophus serrulatus*	90–247	–
	prairie clover	DALEA	*Dalea*	90–247	–
	bundleflower	DESMA	*Desmanthus*	90–247	–
	ticktrefoil	DESMO	*Desmodium*	90–247	–
	blacksamson echinacea	ECAN2	*Echinacea angustifolia*	90–247	–
	Engelmann's daisy	ENPE4	*Engelmannia peristenia*	90–247	–
	milkpea	GALAC	*Galactia*	90–247	–
	beeblossom	GAURA	*Gaura*	90–247	–
	Maximilian sunflower	HEMA2	*Helianthus maximiliani*	90–247	–
	trailing krameria	KRLA	*Krameria lanceolata*	90–247	–
	dotted blazing star	LIPU	*Liatris punctata*	90–247	–
	hoary blackfoot	MECIH	*Melampodium cinereum var. hirtellum*	90–247	–

			var. filifolium		
	menodora	MENOD	*Menodora*	90–247	–
	Nuttall's sensitive-briar	MINU6	*Mimosa nuttallii*	90–247	–
	narrowleaf Indian breadroot	PELI10	*Pediomelum linearifolium*	90–247	–
	leafflower	PHYLL	*Phyllanthus*	90–247	–
	snoutbean	RHYNC2	*Rhynchosia*	90–247	–
	awnless bushsunflower	SICA7	*Simsia calva*	90–247	–
	vetch	VICIA	*Vicia*	90–247	–
	creepingoxeye	WEDEL	*Wedelia*	90–247	–
Shrub/Vine					
8	**shrubs/vines**			90–247	
	guajillo	ACBE	*Acacia berlandieri*	90–247	–
	catclaw acacia	ACGR	*Acacia greggii*	90–247	–
	Havana snakeroot	AGHA4	*Ageratina havanensis*	90–247	–
	alderleaf mountain mahogany	CEMO2	*Cercocarpus montanus*	90–247	–
	snakewood	CONDA	*Condalia*	90–247	–
	featherplume	DAFO	*Dalea formosa*	90–247	–
	Texas persimmon	DITE3	*Diospyros texana*	90–247	–
	jointfir	EPHED	*Ephedra*	90–247	–
	Texas kidneywood	EYTE	*Eysenhardtia texana*	90–247	–
	stretchberry	FOPU2	*Forestiera pubescens*	90–247	–
	Carolina buckthorn	FRCA13	*Frangula caroliniana*	90–247	–
	Goldman's silktassel	GAOVG	*Garrya ovata ssp. goldmanii*	90–247	–
	western white honeysuckle	LOAL	*Lonicera albiflora*	90–247	–
	algerita	MATR3	*Mahonia trifoliolata*	90–247	–
	Texas sacahuista	NOTE	*Nolina texana*	90–247	–
	pricklypear	OPUNT	*Opuntia*	90–247	–
	creeper	PARTH3	*Parthenocissus*	90–247	–
	fragrant sumac	RHAR4	*Rhus aromatica*	90–247	–
	winged sumac	RHCO	*Rhus copallinum*	90–247	–
	littleleaf sumac	RHMI3	*Rhus microphylla*	90–247	–

	evergreen sumac	RHVI3	*Rhus virens*	90–247	–
	gum bully	SILAR2	*Sideroxylon lanuginosum ssp. rigidum*	90–247	–
	greenbrier	SMILA2	*Smilax*	90–247	–
	grape	VITIS	*Vitis*	90–247	–
	yucca	YUCCA	*Yucca*	90–247	–
	soapweed yucca	YUGL	*Yucca glauca*	90–247	–
Tree					
9	**trees**			90–247	
	Texas madrone	ARXA80	*Arbutus xalapensis*	90–247	–
	hackberry	CELTI	*Celtis*	90–247	–
	Ashe's juniper	JUAS	*Juniperus ashei*	90–247	–
	Pinchot's juniper	JUPI	*Juniperus pinchotii*	90–247	–
	twoneedle pinyon	PIED	*Pinus edulis*	90–247	–
	Texas red oak	QUBU2	*Quercus buckleyi*	90–247	–
	Mohr oak	QUMO	*Quercus mohriana*	90–247	–
	bastard oak	QUSIB	*Quercus sinuata var. breviloba*	90–247	–
	sandpaper oak	QUVA5	*Quercus vaseyana*	90–247	–
	live oak	QUVI	*Quercus virginiana*	90–247	–
	bully	SIDER2	*Sideroxylon*	90–247	–
	elm	ULMUS	*Ulmus*	90–247	–

Animal community

This site is used to produce domestic livestock and to provide habitat for native wildlife. Cow-calf operations are the primary livestock enterprise, although stocker cattle are also grazed. Sheep, Angora goats, and Spanish goats were formerly raised in large numbers. Sheep are still present in reduced numbers, while meat goats are now present in fairly high numbers. Boer goats have been introduced, either purebred or crossed with Spanish goats, to obtain a larger meat animal. Reports indicate that Boers do not browse as heavily as earlier breeds.

Sustainable stocking rates have declined drastically over the past 100 years due to the deterioration of the reference plant community. An assessment of vegetation is needed to determine the site’s current carrying capacity. Calculations used to determine livestock stocking rate should be based on forage production remaining after determining use by resident wildlife, then refined by frequent careful observation of the plant community’s

response to animal foraging.

A large diversity of wildlife is native to this site. In the reference plant community, migrating bison, grazing primarily during wetter periods, pronghorn, white-tailed deer and turkey were the more predominant herbivore species. With the subsequent transformation of the plant community, due primarily to the influence of man and climate change, the kind and proportion of wildlife species have been altered.

Except for a few domestic herds, bison have been eliminated. With the eradication of the screwworm fly, increase in woody vegetation and man-suppressed natural predation, deer numbers have increased and are often in excess of carrying capacity. Where deer numbers are excessive, overbrowsing and overuse of preferred forbs causes deterioration of the plant community. Progressive management of deer populations through hunting can keep populations in balance and provide an economically important ranching enterprise. Achieving a balance between brushy cover and more open plant communities on this and adjacent sites is important to deer management. Competition among deer, sheep, and goats must be a consideration in livestock and wildlife management to prevent damage to the plant community.

Various species of exotic wildlife have been introduced on the site, including deer such as axis, sika, fallow, and red; antelope such as sable, oryx, blackbuck, and nilgai, and sheep such as barbados (mouflon) and aoudad with various degrees of success. Their numbers must be included along with livestock and native wildlife, primarily white-tailed deer, in any management plan. Feral hogs may feed on the site. They can be damaging to the plant community if their numbers are not managed. Smaller mammals include many kinds of rodents, jackrabbit, cottontail, raccoon, ringtail, skunk, and armadillo. Mammalian predators include coyote, red fox, gray fox, bobcat, and mountain lion. Wolves were common in earlier times, bears resided in some areas, and an occasional jaguar or ocelot was encountered. Many species of snakes and lizards are native to the site.

Many species of birds are found on this site including game birds, songbirds, and birds of prey. Major game birds that are economically important are turkey, bobwhite quail, scaled (blue) quail, and mourning dove. Turkeys prefer plant communities with substantial amounts of shrubs and trees interspersed with grassland. Quail prefer a combination of low shrubs, bunch grass (critical for nesting cover), bare ground, and low successional forbs. The different species of songbirds vary in their habitat preferences. Habitat on this site that provides a large diversity of grasses, forbs, and shrubs will support a good variety and abundance of songbirds. Birds of prey are important to keep the numbers of rodents, rabbits, and snakes in balance. Different species of raptors benefit from a diverse plant community as well.

Hydrological functions

Showers and light rainfall are very effective on this site in reference conditions because the rocks concentrate the water into the soil pockets. However, as the canopy of woody

plants, especially juniper, increases, interception, and evaporation of rainfall increases, reducing the percentage of rainfall reaching the ground during light rains. This effectively reduces rainfall and underground storage. Because of steep slopes, the site is doughtier than the climatic zone would indicate, especially on southerly facing slopes. The rough steep topography, in combination with slowly permeable soils and limestone outcrops, causes rapid runoff from the site. Although, the site produces relatively sediment free runoff due to soil structure, plant cover, and rockiness. Localized fractures, crevices, and caverns in the underlying limestone increase infiltration rates making the site an important source of groundwater recharge. Higher evapotranspiration losses occur as the site transitions from mainly grassland to dense woodland and then stabilize with the water cycle as the woodland reaches maturity. The rapid runoff from the steep slopes is often the cause for flooding downstream. North and northeast slopes have the best soil moisture relations and often support denser stands of oaks and other vegetation.

Recreational uses

The site is suited for all kinds of outdoor related recreation, such as hunting, hiking, picnicking, and camping. Its scenic beauty and topography make it a unique site for which the Edwards Plateau is known. In addition to steep, rocky slopes with vistas, colorful forbs dot the landscape throughout most of the year. Brilliant fall colors from oaks, sumac, and escarpment black cherry blend with evergreen sumac, live oaks, and juniper in the fall.

Wood products

Juniper, mesquite, oak, and other trees are used for posts, firewood, and specialty products.

Other products

Native Americans and early settlers used many of the acorns, fruits, and berries for food. Jams and jellies are made from many fruit-bearing species. Seeds and plants are harvested from many plants for landscaping and commercial sale. Many grasses and forbs are harvested by the dried-plant industry for sale in dried flower arrangements. Honeybees are utilized to harvest honey from the many flowering plants. Cedar oil is extracted from old dead juniper heartwood for use in the perfume industry.

Inventory data references

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

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Rangeland health reference sheet

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

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Contact for lead author	325-944-0147
Date	12/01/2005
Approved by	Bryan Christensen
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** None to few. Steep slopes preclude some soil movement but should be minimal for site. Deposition or erosion is uncommon for normal rainfall but may occur during intense rainfall events.

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2. **Presence of water flow patterns:** None to few. Flow patterns follow old stabilized drainages and would have occurred only if intense rainstorms occurred during extended droughts or shortly after an intense wildfire.

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3. **Number and height of erosional pedestals or terracettes:** Few to uncommon.

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4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Less than 15 percent bare ground. Small and non-connected areas.

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5. **Number of gullies and erosion associated with gullies:** None to few. Drainages are stable with adequate vegetative cover to reduce erosive action of runoff. Rare gullies would be vegetated and stabilized.

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6. **Extent of wind scoured, blowouts and/or depositional areas:** None to slight. Wind erosion hazard of soil is slight. Minimal evidence of past wind scoured areas.

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7. **Amount of litter movement (describe size and distance expected to travel):** None to slight. Minimal movement of fine and medium size litter under normal rainfall with considerable movement of all sizes during intense rainfall 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 moderately resistant to water erosion. Stability class 4 to 6. Runoff due to steep slopes but clear, erosion-free runoff would be expected.

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Soils are dark grayish brown, very cobbly clay to about five inches thick and has 40 percent limestone fragments. SOM is medium.

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Mid and tallgrasses are in good distribution and ground cover provide excellent infiltration. Runoff is rapid due to steep slopes but clear erosion free runoff would be expected.

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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):** 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:

    Sub-dominant: Warm-season tallgrass

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

    Additional:

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** None to slight. Minimal mortality in any functional group. Grasses almos always show some decadence and mortality.

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14. **Average percent litter cover (%) and depth (in):** Interspaces between plant canopies essentially covered with various sizes of litter and mulch. Wildfires, natural herbivory and/or extended drought might reduce litter to none. Recovery will take two to five years.

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 800 pounds per acre in years with below average moisture, 1,700 pounds per acre in average moisture years and 2,200 pounds per acre in above average moisture years.

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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, pricklypear, agarito, acacia, sumacs, junipers, and condalia.

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17. **Perennial plant reproductive capability:** Good, all species should be capable of reproducing except during periods of prolonged drought, heavy natural herbivory or intense fire. Recovery from these disturbances will take two to five years.
