

Ecological site R150AY532TX Deep Sand

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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.

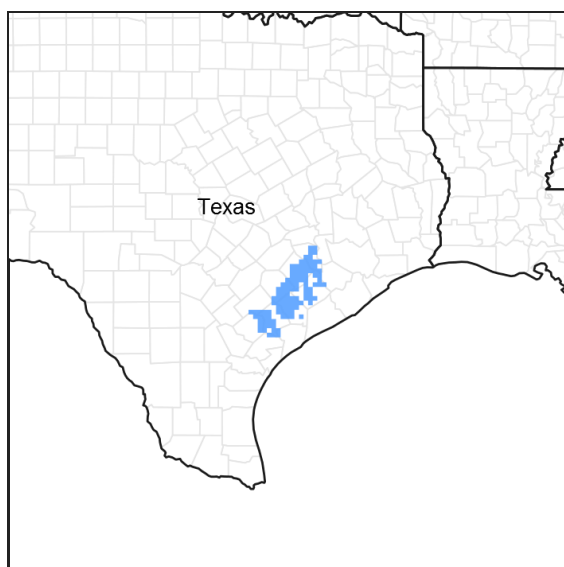


Figure 1. Mapped extent

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): 150A—Gulf Coast Prairies

MLRA 150A is in the West Gulf Coastal Plain Section of the Coastal Plain Province of the Atlantic Plain in Texas (83 percent) and Louisiana (17 percent). It makes up about 16,365 square miles (42,410 square kilometers). It is characterized by nearly level plains that have low local relief and are dissected by rivers and streams that flow toward the Gulf of Mexico. Elevation ranges from sea level to about 165 feet (0 to 50 meters) along the interior margin. It includes the towns of Crowley, Eunice, and Lake Charles, Louisiana, and Beaumont, Houston, Bay City, Victoria, Corpus Christi, Robstown, and Kingsville, Texas. Interstates 10 and 45 are in the northeastern part of the area, and Interstate 37 is in the southwestern part. U.S. Highways 90 and 190 are in the eastern part, in Louisiana. U.S. Highway 77 passes through Kingsville, Texas. The Attwater Prairie Chicken National Wildlife Refuge and the Fannin Battleground State Historic Site are in the part of the area in Texas.

Classification relationships

USDA-Natural Resources Conservation Service, 2006.
-Major Land Resource Area (MLRA) 150A

Ecological site concept

The Deep Sand site is characterized by soils with sandy surfaces and subsurfaces greater than 50 inches thick. This site is not similar in soils, landscape positions or vegetation to any other sites in MLRA 150A.

Associated sites

R150AY535TX	Southern Loamy Prairie The Southern Loamy Prairie is characterized by very deep loamy soils occurring on uplands. They are vegetatively productive and provide good grazing for livestock. This site is less wooded and more productive than the Deep Sand site.
R150AY543TX	Sandy Prairie The Sandy Prairie site has very deep soils on uplands. The soils are sandy in the upper part from 20 to 50 inches thick overlaying a loamy or clayey subsoil. This site is less wooded and more productive than the Deep Sand site.

Table 1. Dominant plant species

Tree	(1) <i>Quercus virginiana</i> (2) <i>Quercus stellata</i>
Shrub	Not specified
Herbaceous	(1) <i>Schizachyrium scoparium</i> (2) <i>Sorghastrum nutans</i>

Physiographic features

These soils are on gently sloping terrace positions near large streams along stream channels and drainageways. Slopes range from 0 to 5 percent, but most are 0 to 2 percent. The elevation is 40 to 250 feet. The soils formed in noncalcareous sandy alluvium that is somewhat modified by wind action.

Table 2. Representative physiographic features

Landforms	(1) Coastal plain > Terrace
Runoff class	Negligible to very low
Flooding frequency	None
Ponding frequency	None
Elevation	12–91 m
Slope	0–5%
Water table depth	152–183 cm
Aspect	Aspect is not a significant factor

Climatic features

The climate of MLRA 150A is humid subtropical with mild winters. The average annual precipitation in the northern two-thirds of this area is 45 to 63 inches. It is 28 inches at the extreme southern tip of the area and 30 to 45 inches in the southwestern third of the area. The precipitation is fairly evenly distributed, but it is slightly higher in late summer and midsummer in the western part of the area and slightly higher in winter in the eastern part. Rainfall typically occurs as moderate intensity, tropical storms that produce large amounts of rain during the winter. The average annual temperature is 66 to 72 degrees F. The freeze-free period averages 325 days and ranges from 290 to 365 days, increasing in length to the southwest.

Table 3. Representative climatic features

Frost-free period (characteristic range)	232-259 days
Freeze-free period (characteristic range)	289-365 days
Precipitation total (characteristic range)	1,092-1,270 mm

Frost-free period (actual range)	219-265 days
Freeze-free period (actual range)	210-365 days
Precipitation total (actual range)	1,041-1,422 mm
Frost-free period (average)	246 days
Freeze-free period (average)	328 days
Precipitation total (average)	1,194 mm

Climate stations used

- (1) HOUSTON HOOKS MEM AP [USW00053910], Tomball, TX
- (2) VICTORIA RGNL AP [USW00012912], Victoria, TX
- (3) BAYTOWN [USC00410586], Crosby, TX
- (4) HOUSTON SUGARLAND MEM [USW00012977], Sugar Land, TX
- (5) SEALY [USC00418160], Sealy, TX
- (6) COLUMBUS [USC00411911], Columbus, TX
- (7) NEW GULF [USC00416286], Boling, TX
- (8) DANEVANG 1 W [USC00412266], El Campo, TX
- (9) PIERCE 1 E [USC00417020], El Campo, TX
- (10) VICTORIA FIRE DEPT #5 [USC00419361], Victoria, TX

Influencing water features

This site is moderately well to somewhat excessively drained. Permeability is moderately slow to rapid.

Wetland description

These soils on this site are non-hydric. Some sites may have small areas that are hydric; these areas are depressional and may hold water for long periods of time. Onsite investigation is necessary to determine exact local conditions.

Soil features

The site is very deep, moderately well to somewhat excessively drained, and moderately to rapidly permeable sands. Soil reaction is moderately acid to neutral. Solum thickness is more than 80 inches. Runoff is negligible on slopes less than 1 percent, very low on 1 to 3 percent slopes, and low on 3 to 5 percent slopes. Soils correlated to this site include: Kuy, and Rupley.

Table 4. Representative soil features

Parent material	(1) Alluvium–igneous, metamorphic and sedimentary rock
Surface texture	(1) Loamy fine sand (2) Fine sand (3) Sand
Family particle size	(1) Sandy
Drainage class	Moderately well drained to somewhat excessively drained
Permeability class	Moderately slow to rapid
Soil depth	203 cm
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%

Available water capacity (0-152.4cm)	7.62–10.16 cm
Calcium carbonate equivalent (0-152.4cm)	0%
Electrical conductivity (0-152.4cm)	0–2 mmhos/cm
Sodium adsorption ratio (0-152.4cm)	0–2
Soil reaction (1:1 water) (0-152.4cm)	4.5–7.3
Subsurface fragment volume <=3" (0-152.4cm)	0–3%
Subsurface fragment volume >3" (0-152.4cm)	0%

Ecological dynamics

The Deep Sand ecological site is comprised of small acreage areas dotted across the landscape. They are primarily associated with uplands adjacent to small streams. The soils are very deep sands and are excessively drained. Because of this, they can be quite droughty. The reference plant community is a Tall/Midgrass Savannah Community (1.1) that was in dynamic equilibrium with the ecological forces that formed them. Those forces included grazing by native wild herbivores, natural and anthropogenic fire, and periodic drought and wet cycles. Historically, bison were the primary large ungulate that grazed the site. According to historical accounts, large numbers of bison grazed the Gulf Coast Prairie region. Weniger states, “when DeLeon came looking for LaSalle’s settlement in 1689, he wrote of the area now southern Victoria County as being all very pleasing; and we came across many buffalo.” When back in the same area in 1690 he reported, “we set out in the same direction over some plains which were covered with buffalo, to cross the arroyo of the French (Garcitas Creek).” The typical bison grazing pattern was short, but very intense followed by total deferment until the herds migrated back. Long deferments allowed the tallgrasses to recover carbohydrate reserves and produce a seed crop. A fire regime and frequency of 3 to 8 years, according to Lehmann, is probable and as important as grazing in shaping the plant community.

The reference plant community is a Tall/Midgrass Savannah with a scattered large live oak (*Quercus virginiana*) and occasional post oak (*Quercus stellata*). Major tallgrass species included big bluestem (*Andropogon gerardii*), yellow Indiangrass (*Sorghastrum nutans*), switchgrass (*Panicum virgatum*), and Florida paspalum (*Paspalum floridanum*). Dominant midgrasses were characterized by little bluestem *Schizachyrium scoparium*), crinkle awn (*Trachypogon spicatus*), Texasgrass (*Vaseyochloa multinervosa*), and Pan American balsamscale (*Elionurus tripsacoides*). Perennial forbs included purple prairie clover (*Dalea purpurea*), golden prairie clover (*Dalea aurea*), snoutbeans (*Rhynchosia* spp.), sensitive briar (*Mimosa microphylla*), and woollywhite (*Hymenopappus* spp). Annual forbs occurred in relatively high numbers in wet years and following intense grazing events by bison. Woody plant encroachment was initially excluded by grassy competition and periodic intense fires.

With the introduction of wild longhorn cattle in the mid-to-late 1700’s, and domestic cattle in the 1820’s, an era of heavy, semi-continuous grazing began. During the Spanish Mission era of the 1600 to 1700’s, in the San Antonio, Goliad, Refugio areas, vast herds of cattle, horses, sheep, and goats were used for meat production for the missions. According to Weniger, “Mission Espiritu Santo, near present Goliad, had a total of 16,000 cattle by 1768.” With no fences, these were free-roaming herds which allowed for escape and population increase in adjacent areas. A further example of large numbers of cattle by Weniger states, “One packery was established at Fulton, Texas in the 1860’s, which slaughtered 40,000 head of cattle during its operation. In the year 1874 alone, 102 million pounds of tallow and over 2.5 million dollars worth of cow hides were shipped from the Texas Coast.” This heavy grazing was exacerbated with the introduction of barbed wire and windmills in the 1880’s. Excessive grazing reduced or eliminated the tallgrass component of the grassland and some midgrasses. As the site transitions, less palatable species such as Pan American balsamscale, brownseed paspalum (*Paspalum plicatulum*), panicums, and paspalums increased, as did both perennial and annual forbs.

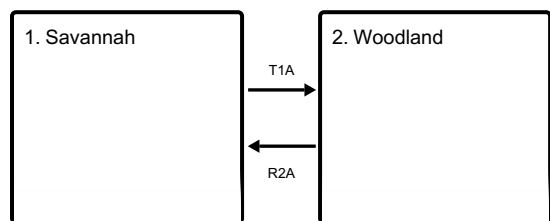
As the tall and midgrasses decrease in composition and biomass production decreases, fuel for fire decreases as well, resulting in less frequent and lower intensity fires. Continuous overuse by livestock and the reduction or

cessation of fire allows woody plants to invade. These woody plants include live oak, blackjack oak (*Quercus marilandica*), post oak, yaupon (*Ilex vomitoria*), American beautyberry (*Callicarpa americana*), green briar (*Smilax* spp.), and mustang grape (*Vitis mustangensis*). Annual and perennial weeds also increase significantly.

As state and transition thresholds are crossed, changes occur impacting plant composition, biomass production, litter accumulation, water infiltration, and water storage. These changes impact other natural ecological functions such as frequency and intensity of fire. The result converts the site from a true Tall/Midgrass Savannah to an Oak Woodland in most instances. In the heavily wooded state, canopy cover may exceed 100 percent due to the various layers of trees, shrubs, and woody vines. Herbaceous production may be totally eliminated. Once these thresholds have been crossed, restoration back to the reference plant community becomes much more difficult and expensive. Even though the plant community may be restored through the use of a combination of practices such as mechanical and herbicidal brush management, prescribed grazing and fire, this community cannot be maintained without the continuous use of these tools on a frequent basis.

State and transition model

Ecosystem states

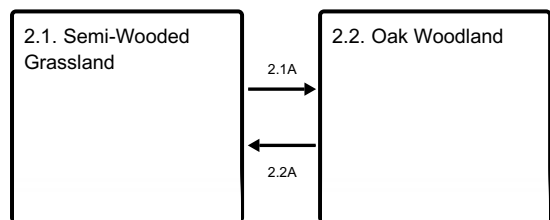


- T1A** - Absence of disturbance and natural regeneration over time
- R2A** - Reintroduction of fire and regular disturbance return intervals

State 1 submodel, plant communities



State 2 submodel, plant communities



State 1 Savannah

Dominant plant species

- live oak (*Quercus virginiana*), tree
- big bluestem (*Andropogon gerardii*), grass
- Indiangrass (*Sorghastrum nutans*), grass

Community 1.1 Tall/Midgrass Savannah

The reference plant community for the Deep Sand Site is a Tall/Midgrass Savannah Community (1.1) with a less than 15 percent canopy of primarily live oak trees. Tallgrasses most likely made up over 60 percent of herbaceous

production, followed by midgrasses, shortgrasses, and forbs. Dominant tallgrasses included big bluestem, yellow Indiangrass, and switchgrass. Midgrasses such as little bluestem, Texasgrass, crinkleawn, and Pan American balsamscale made up a significant portion of the herbaceous composition. Perennial forbs such as prairie clover, sensitive briar, and woollywhite are important contributors. Annual forbs occur differing amounts in response to grazing intensity, fire, drought, or excessive precipitation. This savannah site was periodically heavily grazed by bison and both wild and domestic livestock. Continuous heavy grazing came with the advent of barbed wire and windmills in the mid to late 1800's. Overgrazing initially resulted in the reduction and then loss of the tallgrass component, creating loss of total biomass, reduced litter accumulations and reduction of fire frequency and intensity. If overgrazing continues, midgrasses replace tallgrasses, and some shortgrasses and annual forbs begin to dominate the community resulting in the Mid/Shortgrass 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	1625	3250	4708
Forb	112	168	224
Tree	112	168	224
Shrub/Vine	56	84	112
Total	1905	3670	5268

Figure 9. Plant community growth curve (percent production by month). TX7606, Tall/Midgrass Prairie Community. Prairie Community composed of warm-season tall and midgrasses..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	2	4	12	24	23	8	5	12	4	3	2

Community 1.2

Mid/Shortgrass Savannah

This community is still a part of the reference state because remnants of some of the tallgrasses remain. However, this is now a midgrass dominant community, with higher amounts of shortgrasses and forbs. This community will be dominated by such species as little bluestem, Texasgrass, brownseed paspalum, broomsedge bluestem (*Andropogon virginicus*), and Pan American balsamscale. The perennial and annual forb community will be more evident because of reduced competition for sunlight and moisture. Forbs like purple and golden prairie clover, woollywhite, snoutbeans, and sensitive briars will be much more common. Woody species such as post oak and blackjack oak, American beautyberry, and yaupon also begin to increase.

Pathway 1.1A

Community 1.1 to 1.2

Heavy grazing, lack of fire, and no brush management transition this site to Community 1.2.

Pathway 1.2A

Community 1.2 to 1.1

This community develops as a result of heavy grazing. The litter accumulation is reduced along with fine-fuel loads resulting in reduced fire intensity. This community can be converted relatively easily back to community 1.1 through the use of prescribed grazing, brush management, and prescribed burning. Brush management associated with restoration back to community 1.1 would typically be individual plant treatment (IPT).

State 2

Woodland

Dominant plant species

- live oak (*Quercus virginiana*), tree
- post oak (*Quercus stellata*), tree

Community 2.1

Semi-Wooded Grassland

This community is created by excessive continuous grazing which removes the tallgrass component and greatly reduces the midgrass community. Big bluestem, yellow Indiangrass, and other tallgrasses are non-existent. Little bluestem, crinkleawn, and brownseed paspalum are found only in isolated scattered clumps. Shade tolerant species such as Texasgrass and purpletop (*Tridens flavus*) are present. Once canopy cover approaches 30 percent shade becomes a major driver to the herbaceous plant composition. The canopy will continue to increase regardless of grazing management. Litter and plant biomass are greatly reduced, thus significantly reducing fire frequency and intensity and allowing woody plants to increase. The grass community is dominated by Chloris species, fringleaf paspalum (*Paspalum setaceum*), Scribner's rosettegrass (*Dicanthelium oligasanthos*), purple three-awn (*Aristida purpurea*), panicums, and paspalums. Within the woody canopy such shade tolerant species as purpletop and Texasgrass still remain. Both perennial and annual forbs such as prairie clovers, snoutbean, woollywhite, sensitive briar, croton (*Croton* spp.), partridgepea (*Chamaecrista fasciculata*), frostweed (*Helianthemum* spp.), and many others become much more prevalent. Trees, shrubs, and vines have increased drastically and, in some places, form dense mottes. Blackjack and post oak now co-habit with live oak and understory/overstory shrubs and vines such as American beautyberry, yaupon, mustang grape, and poison ivy (*Toxicodendron radicans*) are very common.

Community 2.2

Oak Woodland

This community is now a closed canopy of hardwood trees, shrubs, and woody vines. It is a result of continued heavy grazing, no fire, and no brush management. At this point, there is almost no herbaceous production on the soil surface due to lack of sunlight. Oaks, yaupon, beautyberry, mustang grape, and poison ivy dominate. Fire is no longer an option unless leaf litter is burned following leaf fall. Multiple burns over time will be needed to restore grasses back into this plant community. Grazeable herbaceous forage in this community is non-existent.

Pathway 2.1A

Community 2.1 to 2.2

Continued heavy grazing, lack of brush management, and lack of fire transition this site to Community 2.2.

Pathway 2.2A

Community 2.2 to 2.1

This community can be restored back to community 2.1 or 1.2 with massive inputs of capital and labor. Mechanical and/or herbicidal brush management must be employed followed by prescribed burning and prescribed grazing. Due to residual woody seed sources and introduction of seed from adjacent sites by wildlife, continual inputs of herbicide and fire must be utilized to maintain this site once initial brush management is completed.

Transition T1A

State 1 to 2

Continued heavy grazing, lack of fire, and lack of brush management transition the site to State 2. This is evident once the woody canopy is greater than 30 percent.

Restoration pathway R2A

State 2 to 1

State 2 can be taken back to community 1.2 or possibly 1.1, but not without major inputs of energy and capital in the form of brush management, prescribed fire, and prescribed grazing. Once in this state, continual input will be required to convert to community 1.2 in order to maintain a Savannah State (1).

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					
0	Tallgrass			448–785	
1	Tallgrasses			897–4427	
	big bluestem	ANGE	<i>Andropogon gerardii</i>	560–2018	–
	switchgrass	PAVI2	<i>Panicum virgatum</i>	897–1065	–
	Indiangrass	SONU2	<i>Sorghastrum nutans</i>	448–785	–
	Florida paspalum	PAFL4	<i>Paspalum floridanum</i>	280–673	–
2	Tall/midgrasses			392–616	
	Pan American balsamscale	ELTR4	<i>Elionurus tripsacoides</i>	112–392	–
	purpletop tridens	TRFL2	<i>Tridens flavus</i>	112–280	–
	Texasgrass	VAMU	<i>Vaseyochloa multinervosa</i>	112–280	–
	spiked crinkleawn	TRSP12	<i>Trachypogon spicatus</i>	84–224	–
3	Midgrasses			224–448	
	brownseed paspalum	PAPL3	<i>Paspalum plicatulum</i>	84–224	–
	longspike tridens	TRST2	<i>Tridens strictus</i>	56–168	–
	broomsedge bluestem	ANVI2	<i>Andropogon virginicus</i>	56–168	–
	purple threeawn	ARPU9	<i>Aristida purpurea</i>	28–84	–
4	Shortgrasses			112–224	
	hooded windmill grass	CHCU2	<i>Chloris cucullata</i>	56–84	–
	windmill grass	CHLOR	<i>Chloris</i>	28–56	–
	Scribner's rosette grass	DIOLS	<i>Dichanthelium oligosanthos</i> var. <i>scribnerianum</i>	28–56	–
	thin paspalum	PASE5	<i>Paspalum setaceum</i>	6–56	–
	fall witchgrass	DICO6	<i>Digitaria cognata</i>	6–28	–
	crowgrass	PASPA2	<i>Paspalum</i>	6–22	–
	panicgrass	PANIC	<i>Panicum</i>	6–22	–
	red grama	BOTR2	<i>Bouteloua trifida</i>	0–17	–
Forb					
5	Forbs			112–224	
	Kairn's sensitive-briar	MILA15	<i>Mimosa latidens</i>	6–17	–
	powderpuff	MIST2	<i>Mimosa strigillosa</i>	6–17	–
	Carolina woollywhite	HYSC	<i>Hymenopappus scabiosaeus</i>	6–17	–
	hogwort	CRCA6	<i>Croton capitatus</i>	0–11	–
	golden prairie clover	DAAU	<i>Dalea aurea</i>	6–11	–
	purple prairie clover	DAPU5	<i>Dalea purpurea</i>	6–11	–
	Cuman ragweed	AMPS	<i>Ambrosia psilostachya</i>	6–11	–
	bluestem pricklypoppy	ARAL3	<i>Argemone albiflora</i>	6–11	–
	purple poppymallow	CAIN2	<i>Callirhoe involucrata</i>	6–11	–
	partridge pea	CHFA2	<i>Chamaecrista fasciculata</i>	6–11	–
	Texas bullnettle	CNTE	<i>Cnidoscolus texanus</i>	6–11	–

	Texas lupine	LUTE	<i>Lupinus texensis</i>	6–11	–
	wax mallow	MAARD	<i>Malvaviscus arboreus</i> var. <i>drummondii</i>	6–11	–
	groundcherry	PHYSA	<i>Physalis</i>	6–11	–
	queen's-delight	STSY	<i>Stillingia sylvatica</i>	1–11	–
	stemless spiderwort	TRSU	<i>Tradescantia subacaulis</i>	6–11	–
	Texas vervain	VEHA	<i>Verbena halei</i>	1–6	–
	American snoutbean	RHAM	<i>Rhynchosia americana</i>	2–6	–
	Texas snoutbean	RHSE4	<i>Rhynchosia senna</i>	2–6	–
	fanpetals	SIDA	<i>Sida</i>	1–6	–
	evening primrose	OENOT	<i>Oenothera</i>	0–6	–
	woodsorrel	OXALI	<i>Oxalis</i>	1–6	–
	phlox	PHLOX	<i>Phlox</i>	1–6	–
	Texas bindweed	COEQ	<i>Convolvulus equitans</i>	0–6	–
	low silverbush	ARHU5	<i>Argythamnia humilis</i>	0–6	–
	cardinal's feather	ACRA	<i>Acalypha radians</i>	2–6	–
	Engelmann's daisy	ENPE4	<i>Engelmannia peristenia</i>	0–6	–
	buckwheat	ERIOG	<i>Eriogonum</i>	2–6	–
	slender dwarf morning-glory	EVAL	<i>Evolvulus alsinoides</i>	1–6	–
	Texas croton	CRTE4	<i>Croton texensis</i>	0–6	–
	Torrey's tievine	IPCOT	<i>Ipomoea cordatotriloba</i> var. <i>torreyana</i>	0–6	–
	sand phacelia	PHPA4	<i>Phacelia patuliflora</i>	1–4	–
	viperina	ZOBR	<i>Zornia bracteata</i>	1–3	–
	coastal indigo	INMI	<i>Indigofera miniata</i>	1–3	–
	hoary milkpea	GACA	<i>Galactia canescens</i>	1–3	–
	geranium	GERAN	<i>Geranium</i>	0–2	–
	bristly nama	NAHI	<i>Nama hispidum</i>	0–2	–

Shrub/Vine

6	Shrubs/Vines			56–112	
	mustang grape	VIMU2	<i>Vitis mustangensis</i>	56–112	–
	American beautyberry	CAAM2	<i>Callicarpa americana</i>	11–56	–
	yaupon	ILVO	<i>Ilex vomitoria</i>	11–56	–
	eastern poison ivy	TORAR	<i>Toxicodendron radicans</i> ssp. <i>radicans</i>	28–56	–
	pricklypear	OPUNT	<i>Opuntia</i>	6–17	–
	blackberry	RUBUS	<i>Rubus</i>	6–17	–
	greenbrier	SMILA2	<i>Smilax</i>	6–11	–
	Carolina coralbead	COCA	<i>Cocculus carolinus</i>	6–11	–
	yucca	YUCCA	<i>Yucca</i>	0–11	–

Tree

7	Trees			112–224	
	live oak	QUVI	<i>Quercus virginiana</i>	56–224	–
	post oak	QUST	<i>Quercus stellata</i>	28–56	–
	blackjack oak	QUMA3	<i>Quercus marilandica</i>	28–56	–
	water oak	QUNI	<i>Quercus nigra</i>	6–45	–

	honey mesquite	PRGL2	<i>Prosopis glandulosa</i>	1–45	–
	wingleaf soapberry	SASA4	<i>Sapindus saponaria</i>	6–34	–
	lime pricklyash	ZAFA	<i>Zanthoxylum fagara</i>	1–34	–
	sweet acacia	ACFA	<i>Acacia farnesiana</i>	0–34	–

Animal community

The Coastal Prairie communities support a wide array of animals. Cattle and many species of wildlife make extensive use of the site. White-tailed deer may be found scattered across the prairie and are found in heavier concentrations where woody cover exists. Feral hogs are present and at times abundant. Coyotes are abundant and fill the mammalian predator niche. Rodent populations rise during drier periods and fall during periods of inundation. Attwater's pocket gophers are abundant and have an important impact on the ecology of the site. The badger is present but not abundant in locations at the southern extent of the site. Locally unique species alligators and bullfrogs.

The region is a major flyway for waterfowl and migrating birds. Hundreds of thousands of ducks, geese, and sandhill cranes abound during winter. Two important endangered species occur in the area, the whooping crane and Attwater's prairie chicken. Many other species of avian predators including northern harriers, ferruginous hawks, red-tailed hawks, white-tailed kites, kestrels, and, occasionally, swallow-tailed kites utilize the vast grasslands. Many species of grassland birds use the site, including blue grosbeaks, dickcissels, eastern meadowlarks, several sparrows, including, vesper sparrow, lark sparrow, savannah sparrow, grasshopper sparrow, and Le Conte's sparrow.

Hydrological functions

The Savannah and Woodland States use all the water from rainfall events that occur. Research has shown that the evapotranspiration rate on the across all communities is nearly the same.

Recreational uses

White-tailed deer, Rio Grande turkey, and feral hogs are hunted on the site. This site may also be used for bird watching. In the wooded state, this site makes ideal campgrounds if a limited amount of woody vegetation is removed.

Wood products

In the Woodland State, this site produces an abundance of oak firewood.

Inventory data references

This site description was developed as part of the provisional ecological site initiative using historic soil survey manuscripts, available range site descriptions, and low intensity field sampling.

Other references

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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.

Author(s)/participant(s)	Vivian Garcia, Zone RMS, NRCS, Corpus Christi, TX
Contact for lead author	361-241-0609
Date	03/27/2008
Approved by	Bryan Christensen
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

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

2. **Presence of water flow patterns:** Uncommon.

3. **Number and height of erosional pedestals or terracettes:** Uncommon.

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Expect no more than 30 percent bare ground distributed in small patches.

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):** This site has highly permeable soils with high infiltration rates. Only small-sized litter will move short distances during intense storms.

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 2 to 3.

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** 40 to 78 inches thick with light brownish gray to very pale brown loamy fine sand, weak medium subangular blocky structure, loose, very friable, common fine roots, and clear smooth boundary. SOM is 0.5 to 1.0 percent.

-
10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Under reference conditions, the savannah of trees, shrubs, vines, grasses, and forbs along with adequate litter and little bare ground provides for maximum infiltration and little runoff under normal rainfall events.
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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.
-
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 Trees
- Other: Shrubs/Vines Forbs
- 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 of the reference community.
-
14. **Average percent litter cover (%) and depth (in):** Litter is primarily herbaceous.
-
15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 2,000 to 4,500 pounds per acre.
-
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:** Bahiagrass, post oak, blackjack oak, American beautyberry, and yaupon.
-
17. **Perennial plant reproductive capability:** All plants should be capable of reproduction except during periods of prolonged drought conditions, heavy natural herbivory, or intense wildfires.
-