

**INTERNATIONAL ECOLOGICAL  
CLASSIFICATION STANDARD:**

**TERRESTRIAL ECOLOGICAL CLASSIFICATIONS**

**Ecological Systems of Texas' Gulf Prairies and Marshes**

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by

NatureServe

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This subset of the International Ecological Classification Standard covers terrestrial ecological systems attributed to the Texas. This classification has been developed in consultation with many individuals and agencies and incorporates information from a variety of publications and other classifications. Comments and suggestions regarding the contents of this subset should be directed to [Judy Teague <judy\_teague@natureserve.org>].



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## FOREST AND WOODLAND

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### CES203.464 CENTRAL AND SOUTH TEXAS COASTAL FRINGE FOREST AND WOODLAND

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This system includes oak-dominated forests woodlands, shrublands and savannas occurring on deep sands of the Pleistocene-aged Ingleside barrier-strandplain of the central Texas coast and the Holocene-aged eolian sand deposits of the South Texas Sand Sheet. Topography varies from larger dunes to smaller ridges and swales. Vegetation of this physiognomically variable and dynamic system primarily includes patches (mottes) of forests, woodlands and shrublands dominated by *Quercus fusiformis*. Associated species vary in a north/south manner across the range of this system. Other canopy species in the vicinity of Aransas National Wildlife Refuge, at the northern end of the range, include *Quercus marilandica*, *Quercus hemisphaerica*, *Persea borbonia*, and *Celtis laevigata*. In this area, understory species include *Ilex vomitoria*, *Smilax bona-nox*, *Vitis mustangensis*, and/or *Morella cerifera*. Other canopy species on the South Texas Sand Sheet, at the southern end of the range, include *Prosopis glandulosa* var. *glandulosa*, *Zanthoxylum hirsutum*, *Condalia hookeri*, *Lantana urticoides* (= *Lantana horrida*), *Ziziphus obtusifolia* var. *obtusifolia*, and a very few other species. Many of the species found in the northern parts of the range of this system are absent in the southern occurrences. A characteristic component of the sparse ground cover within the mottes and forests across the entire range is *Malvaviscus arboreus* var. *drummondii*. Canopy openings are similar in composition to surrounding grasslands. In addition to *Schizachyrium littorale*, other herbaceous species common in canopy openings across the range of this system include *Paspalum plicatulum*, *Paspalum monostachyum*, *Andropogon gerardii*, *Sorghastrum nutans*, *Muhlenbergia capillaris*, *Helianthemum georgianum*, *Croton argyranthemus*, and *Froelichia floridana*. Minor changes in drainage can cause major differences in species composition. On the Ingleside barrier-strandplain, while *Paspalum monostachyum* may dominate slightly lower areas, deeper swales are typically dominated by *Panicum virgatum*, *Spartina patens*, *Fimbristylis* spp., *Hydrocotyle bonariensis*, *Rhynchospora* spp., *Fuirena* spp., *Eleocharis* spp., and *Cyperus* spp. On the backside of the dunes, the canopy becomes more open, and the forest supports a more diverse shrub and ground layer with the addition of *Vaccinium arboreum*, *Zornia bracteata*, *Helianthemum* sp., *Aeschynomene viscidula*, and *Croton argyranthemus*. Minor changes in drainage can cause major differences in species composition. Following heavy rains, small swales can be inundated for several weeks, but desiccate and draw down in drier periods. Structure and composition vary with depth of water (or depth to water table) and frequency of inundation, ranging from sparse cover of tufted annuals to complete coverage by rhizomatous perennials. Long-term drying due to natural succession or anthropogenic drainage can result in upland grassland types dominated by *Andropogon virginicus* and/or *Schizachyrium scoparium*. On the Ingleside barrier-strandplain, while *Paspalum monostachyum* may dominate slightly lower areas, deeper swales are typically dominated by *Panicum virgatum*, *Spartina patens*, *Fimbristylis caroliniana*, *Fimbristylis castanea*, *Hydrocotyle bonariensis*, *Rhynchospora* spp., *Fuirena* spp., *Eleocharis* spp., and *Cyperus* spp. In addition to *Fuirena scirpoides*, *Fuirena longa*, *Rhynchospora microcarpa*, and *Rhynchospora divergens*, other characteristic and common species include *Rhynchospora nitens*, *Cyperus oxylepis*, *Cyperus polystachyos* var. *texensis*, *Eleocharis geniculata*, *Eleocharis flavescens*, *Eleocharis montevidensis*, *Eleocharis parvula*, *Xyris jupicai*, *Agalinis fasciculata*, *Bacopa monnieri*, *Buchnera americana*, *Oldenlandia uniflora*, *Spiranthes vernalis*, *Drosera brevifolia*, and *Utricularia subulata*. On the South Texas Sand Sheet, swales are dominated by *Paspalum monostachyum*, *Andropogon gerardii*, *Muhlenbergia capillaris*, and *Sorghastrum nutans*. On the deep sands of the South Texas Sand Sheet, a fine mosaic of live oak mottes and midgrass grassland openings is present. The canopy of mature mottes is composed almost entirely of *Quercus fusiformis* (see comments on oak taxonomy above). *Prosopis glandulosa* var. *glandulosa* is present but generally occurs at a subcanopy level in light gaps or along margins. The shrub layer is very open in mature stands and is composed of *Zanthoxylum hirsutum*, *Condalia hookeri*, *Lantana urticoides*, *Ziziphus obtusifolia* var. *obtusifolia*, and a very few other species. Many of the species found in the northern parts of the range of this system (in the vicinity of Aransas NWR) are absent in these occurrences. The ground layer in deep shade is generally sparse; *Malvaviscus arboreus* var. *drummondii* is one of the few shade-tolerant herbaceous species present. Under more open mottes, grasses and forbs, more abundant in associated openings, may gain a foothold. Such openings are quite diverse and include various mid grasses, most notably *Schizachyrium scoparium*, *Paspalum plicatulum*, *Eragrostis* spp., and an abundance of forbs. Characteristic species include *Acalypha radians*, *Argythamnia mercurialina* var. *pilosissima*, *Chamaecrista flexuosa* var. *texana*, *Cnidocolus texanus*, *Croton argyranthemus*, *Dalea phleoides*, *Froelichia floridana*, *Galactia canescens*, *Gaura mckelveyae*, *Helianthemum georgianum*, *Monarda fruticulosa*, *Phlox cuspidata*, *Rhynchosia americana*, *Stillingia sylvatica*, and *Thelesperma nuceense*.

This system is endemic to Texas. It is found within 10 km of the coast on deep sands of ancient Pleistocene strandplains (the Ingleside barrier-strandplain) at its northern extent and within a much greater distance from the coast (100 km) on the Holocene-aged eolian sand deposits of the South Texas Sand Sheet (primarily Kenedy and Brooks counties but extending into adjacent Jim Hogg, Hidalgo, and Willacy counties) at its southern extent. This system occurs in patches (mottes) or as linear occurrences on sand ridges and dunes.

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### CES205.679 EAST-CENTRAL TEXAS PLAINS POST OAK SAVANNA AND WOODLAND

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This system is primarily found within eastern Texas, lying in a broad band west of the Upper West Gulf Coastal Plain and Gulf Coast Prairies and Marshes ecoregions, ranging from Live Oak and Atascosa counties in the south and trending in a northeasterly band to the

Red River along the Oklahoma-Texas border. It exhibits some floristic and physiognomic variation across this northeast-southwest gradient. Its range is roughly co-incident with (parts of) the "East Central Texas Plains" (Level III Ecoregion 33) of EPA (Griffith et al. 2004). It is distinguished from the surrounding prairie by the higher density of trees and diversity of woody species. The system differs from the floristically similar Crosstimbers Oak Forest and Woodland (CES205.682) in that it generally occurs on Tertiary (primarily Eocene) geologic formations on the East-Central Texas Plains, while the related Crosstimbers ecological system occupies Cretaceous and older formations of the interior plains (EPA Level III Ecoregion 29). Floristically, Post Oak Savanna (at least north of the Colorado River) contains species of more eastern affinities such as *Callicarpa americana*, *Sassafras albidum*, *Cornus florida*, *Vaccinium arboreum*, *Ulmus alata*, and particularly *Ilex vomitoria*, the latter species being absent from Crosstimbers Oak Forest and Woodland (CES205.682). Post Oak Savanna generally occurs on sandy or loamy soils, often underlain by a claypan subsoil. Rainfall ranges from about 120 cm in the northeastern part of the range to about 70 cm in the southwest, where it becomes increasingly erratic. Therefore moisture is often limiting during part of the growing season. The system was historically characterized as having significant areas of graminoid cover with species composition resembling that of nearby prairie systems, punctuated by short, stunted woodlands and forests dominated by *Quercus stellata* and *Quercus marilandica*. Other species, such as *Carya texana*, *Quercus incana* (on more xeric sites), *Quercus fusiformis*, *Ulmus alata*, *Juniperus virginiana*, and *Prosopis glandulosa*, can also be present. In some sites, particularly in the south, *Quercus fusiformis* may codominate the woodlands. Shrubs may attain significant cover in the understory, with species including *Ilex vomitoria* (often dominant), *Callicarpa americana*, *Vaccinium arboreum*, *Sideroxylon lanuginosum*, *Ilex decidua*, *Toxicodendron radicans*, and *Symphoricarpos orbiculatus*. Where light penetration allows the development of an herbaceous understory or in areas with reduced woody canopy, the understory contains species typical of the surrounding prairies, in particular *Schizachyrium scoparium*, but also including *Andropogon gerardii*, *Bothriochloa laguroides* ssp. *torreyana*, *Paspalum plicatulum* (to the south), *Sorghastrum nutans*, and *Sporobolus cryptandrus*. Drought, grazing, and fire are the primary natural processes that affect this system. Much of this system has been impacted by conversion to improved pasture or crop production. Overgrazing and fire suppression have led to increased woody cover on most extant occurrences and the invasion of some areas by problematic brush species such as *Juniperus virginiana* var. *virginiana* and *Prosopis glandulosa* in the southern part of the system's range. These factors have also led to decreases in native grass cover allowing for annual grasses and forbs to invade.

This system is located on irregular plains comprised of sandy to loamy Alfisols, generally associated with Tertiary (primarily Eocene) formations of the East Central Texas Plains (Level III Ecoregion 33) of EPA (Griffith et al. 2004). These soils range from shallow to moderately deep and are often underlain by claypan subsoils. Rainfall ranges from about 120 cm in the northeastern part of the range to about 70 cm in the southwest, where it becomes increasingly erratic.

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### **CES203.466 WEST GULF COASTAL PLAIN CHENIER AND UPPER TEXAS COASTAL FRINGE FOREST AND WOODLAND**

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This system includes a range of woody vegetation present along the northern Gulf of Mexico, from Louisiana to the upper Texas coast, including shell ridges along the coast and bay margins, coastal salt domes, stranded ancient barrier ridges (Ingleside barrier strandplain), and chenier ridges of the Chenier Plain. It is heterogeneous in physiognomy, including forests, woodlands and shrublands. The Chenier Plain is characterized by a prograding coastline replenished by sediments carried to the Gulf of Mexico initially by the Mississippi and subsequently the Atchafalaya and other rivers. It is void of barrier islands and shoreline, and sediments are reworked by waves into beach ridges, sometimes with a substantial shell component. This process has been continuing since the last glacial retreat, and as the coastline progrades, older beach ridges are left as interior ridges surrounded by marsh. These interior beach ridges are referred to as cheniers (French for oak) because they were historically dominated by *Quercus virginiana*. Ridges parallel the coast and are usually 3 meters above mean sea level. Today, very few remain vegetated by a live oak-dominated forest because many have been cleared for agriculture. Though not confined to coastal areas, salt domes are a distinctive feature along the Gulf Coast of upper Texas and Louisiana where they often form a drastic contrast to the low-lying Coastal Plain sediments surrounding them. Formed by the rise of salt masses which push up overlying strata, salt domes may rise 30 meters above the surrounding landscape. The natural vegetation of cheniers and salt domes are oak-dominated woodlands and forests. The Ingleside barrier strandplain is a Pleistocene barrier ridge that outcrops discontinuously along the Texas coast. One of these areas is located northeast of Galveston Bay and supports vegetation classes within this ecological system. Shell ridges located along coast and bay margins are typically dominated by halophytic shrubs. Similar vegetation may also be found on coastal dredge spoil. Vegetation structure and composition of occurrences of this system may be influenced by salt spray (on those shell ridges, salt domes and cheniers closest to the gulf), tropical storms and hurricanes, and the distinctive climate of the immediate coast. This system includes the Northern Gulf Coast Chenier Plain which extends from Vermillion Bay in Louisiana through Jefferson County, Texas; it also includes the upper Texas coast from the Chenier Plain south to Matagorda Bay.

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### **CES203.280 WEST GULF COASTAL PLAIN MESIC HARDWOOD FOREST**

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This ecological system is found in limited upland areas (especially ravines and sideslopes) of the Gulf Coastal Plain west of the Mississippi River. These areas are topographically isolated from historically fire-prone, pine-dominated uplands in eastern Texas, western Louisiana, and southern Arkansas. Sites are often found along slopes above perennial streams in the region. These sites have moderate to high fertility and moisture retention. Soils can be quite variable, ranging from coarse to loamy in surface texture. Most are

acidic in surface reactions and less commonly circumneutral. Vegetation indicators are mesic hardwoods such as *Fagus grandifolia*, *Quercus alba*, and *Ilex opaca*, although scattered, large-diameter pines (most often *Pinus taeda*) are also often present. Spring-blooming herbaceous species are typical in the understory of most examples. Sites are often found along slopes above perennial streams in the region. These sites have moderate to high fertility and moisture retention. Soils can be quite variable, ranging from coarse to loamy in surface texture. Most are acidic in surface reactions and less commonly circumneutral.

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### **CES203.378 WEST GULF COASTAL PLAIN PINE-HARDWOOD FOREST**

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This West Gulf Coastal Plain ecological system consists of forests and woodlands dominated by *Pinus taeda* and/or *Pinus echinata* in combination with a host of dry to dry-mesic site hardwood species. This type was the historical matrix (dominant vegetation type) for large portions of the Upper West Gulf Coastal Plain (TNC ecoregion 40) where it replaced *Pinus palustris*-dominated vegetation. In this region of southern Arkansas, northwestern Louisiana, and parts of eastern Texas, this type was historically present on nearly all uplands in the region except on the most edaphically limited sites (droughty sands, calcareous clays, and shallow soil barrens/rock outcrops). Such sites are underlain by loamy to fine-textured soils of variable depths. These are upland sites on ridgetops and adjacent sideslopes, with moderate fertility and moisture retention. This type was also present in more limited areas of the West Gulf Coastal Plain (TNC ecoregion 41), where it was confined more typically to sideslopes and other locations not dominated by *Pinus palustris*. In southern Arkansas, northwestern Louisiana, and parts of eastern Texas, this type was historically present on nearly all uplands in the region except on the most edaphically limited sites (droughty sands, calcareous clays, and shallow soil barrens/rock outcrops). Such sites are underlain by loamy to fine-textured soils of variable depths. These are upland sites on ridgetops and adjacent sideslopes, with moderate fertility and moisture retention.

## SHRUBLAND

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### CES301.462 SOUTH TEXAS LOMAS

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This system occurs on well-drained portions of clay dunes (lomas) rising above surrounding coastal tidal flats. It is a xeric, subtropical shrubland dominated by thorny evergreen shrubs, generally 2-4 m tall. Composition of this system is extremely variable, and there is usually no clear dominant, except locally. Local dominants may include *Citharexylum berlandieri*, *Leucophyllum frutescens*, *Havardia pallens* (= *Pithecellobium pallens*), and *Ebenopsis ebano*. While there is often no clear dominant, *Yucca treculeana* is a constant and conspicuous emergent in many occurrences (Johnston 1952). Some lomas may be flooded by the sea during severe storm events. Vegetation in this system is sometimes influenced by salt spray, high winds, limited rooting depth, saline water table, and extreme xeric conditions. Soils are typically Point Isabel clay loam.

This coastal system is known from Aransas County, Texas, south to Mexico.

This system occurs on well-drained portions of clay dunes (lomas) rising above surrounding coastal tidal flats. At the time of formation, lomas were located on the leeward side of irregularly flooded lagoons and tidal flats that when dry provided the source for the wind-blown clayey sediments.

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### CES301.983 TAMAULIPAN MIXED DECIDUOUS THORNSCRUB

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This thornscrub ecological system occurs throughout much of northeastern Mexico and southern Texas. It occurs on a variety of substrates and landforms. Dominant species include *Acacia roemeriana*, *Leucophyllum frutescens*, and *Prosopis glandulosa*. Other species present to codominant include *Acacia berlandieri*, *Acacia farnesiana*, *Amyris madrensis*, *Amyris texana*, *Celtis pallida*, *Parkinsonia texana*, and cacti such as *Opuntia engelmannii* var. *lindheimeri*.

## STEPPE/SAVANNA

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### CES203.291 SOUTH-CENTRAL SALINE GLADE

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This system occurs in portions of the Coastal Plain west of the Mississippi River on soils with high saline content, which in the most extreme examples are generally not conducive to woody plant growth. Thus, the vegetation forms a mosaic primarily consisting of open herbaceous or shrubby plant communities. This type is most common, and best documented in Arkansas and western Louisiana, but also occurs in eastern Texas. At least one high-ranked plant species, *Geocarpon minimum*, occurs in this system. In Arkansas, the forested examples of this system are called "Alkali Post Oak Flat," and the herbaceous examples are called "Alkali Wet Prairie" (Arkansas Multi-Agency Wetland Planning Team 2001). This system is found in isolated areas of the Upper West and West Gulf Coastal Plain ecoregions, and along the boundary of the Gulf Coast Prairies and Marshes.

This system occurs on soils with high saline content, which in the most extreme examples are generally not conducive to woody plant growth. The soils on which this system is found have high pH and high levels of sodium or magnesium salts in or near the surface layer. They typically have very poor drainage and a shallow hardpan. The combination of impeded drainage and unusual soil chemistry restricts the potential plant communities and provides habitat for certain rare species. The forested community apparently occurs on soils with deeper hardpans than the prairie communities. Most sites with alkali soils are believed to be former (Pleistocene) lakebeds (Arkansas Multi-Agency Wetland Planning Team 2001).



## HERBACEOUS

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### CES301.538 SOUTH TEXAS SAND SHEET GRASSLAND

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This system occurs on the ridge-and-swale topography within 100 km of the Texas coast on the Holocene-aged eolian sand deposits of the South Texas Sand Sheet (primarily Kenedy and Brooks counties and extending into adjacent Jim Hogg, Hidalgo, and Willacy counties). While the vegetation of the ridges and swales is somewhat distinct, they are not separated here. In general, ridges are dominated by *Schizachyrium littorale* and a mixture of forbs, and swales are dominated by *Paspalum monostachyum*, *Andropogon gerardii*, *Muhlenbergia capillaris*, and *Sorghastrum nutans*. *Paspalum plicatulum* may be important in both environments. In addition to the dominants, common herbaceous components include *Eragrostis* spp., *Acalypha radians*, *Argythamnia mercurialina* var. *pilosissima*, *Chamaecrista flexuosa* var. *texana*, *Cnidocolus texanus*, *Croton argyranthemus*, *Dalea phleoides*, *Froelichia floridana*, *Galactia canescens*, *Gaura mckelveyae*, *Helianthemum georgianum*, *Monarda fruticulosa* (= *Monarda punctata* var. *fruticulosa*), *Phlox cuspidata*, *Rhynchosia americana*, *Stillingia sylvatica*, and *Thelesperma nuecense*. These grasslands occur intermixed with woodlands dominated by *Quercus fusiformis* and/or *Prosopis glandulosa* var. *glandulosa*.

This system is endemic to Texas. It is found within 100 km of the coast on the Holocene-aged eolian sand deposits of the South Texas Sand Sheet primarily Kenedy and Brooks counties and extending into adjacent Jim Hogg, Hidalgo, and Willacy counties.

This system occurs on deep sands of the Pleistocene-aged Ingleside barrier-strandplain and the Holocene-aged eolian sand deposits of the South Texas Sand Sheet. Topography varies from larger dunes to smaller ridges and swales.

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### CES301.989 TAMAULIPAN CALICHE GRASSLAND

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This ecological system is restricted to the Loreto Plain in Tamaulipas, Mexico. It occurs on shallow sandy loam soils with a caliche hardpan subhorizon. These small-patch grasslands are less than 40 ha in area and are dominated by perennial grasses often with sparse low shrubs within a mosaic of thornscrub. Dominant grasses may include *Aristida purpurea*, *Bouteloua hirsuta*, *Bouteloua radicata*, *Cenchrus spinifex*, *Paspalum setaceum*, and *Tridens muticus*. Perennial forbs may be abundant such as *Boerhavia coccinea*, *Chamaecrista flexuosa*, *Heliotropium confertifolium*, or *Rhynchosia americana*. Low shrubs are *Calliandra conferta* and *Krameria ramosissima*.

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### CES301.987 TAMAULIPAN CLAY GRASSLAND

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This Tamaulipan ecological system occurs on clay prairies near the Gulf Coast and drier sites further inland. Substrates are fine calcareous clays and clay loam. Occasional fires and root pruning from montmorillonitic clay limit shrub invasion, if the grassland is not overgrazed. If overgrazed the land will convert to stable thornscrub dominated by *Prosopis glandulosa* and *Celtis pallida*. Vegetation is dominated by perennial mid and short grasses such as *Schizachyrium scoparium*, *Paspalum* spp., *Chloris pluriflora*, *Buchloe dactyloides*, with other grasses such as *Bothriochloa saccharoides*, *Bouteloua curtipendula*, *Chloris andropogonoides*, *Nassella leucotricha*, *Schedonnardus paniculatus*, *Setaria leucopila*, and clumps of *Andropogon gerardii* on less clayey sites. *Prosopis glandulosa* or *Quercus fusiformis* are often present as scattered mottes or are restricted to drainages. *Opuntia engelmannii* var. *lindheimeri* is often present.

Occurs on clay prairies near the Gulf Coast and drier sites further inland.

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### CES301.985 TAMAULIPAN SAVANNA GRASSLAND

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This Tamaulipan ecological system is dominated by perennial grasses with sparse overstory of mesquite or oak trees and thornscrub. Dominant grasses are *Cynodon* spp. This system was once a common matrix system, but has largely been converted to desert scrub and exists as remnant patches. Degraded subtropical forests and woodlands may have similar structure but are not included in this system because different ecological processes maintain them.

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### CES301.988 TAMAULIPAN TALLGRASS GRASSLAND

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This ecological system occurs on the most favorable growing sites in the South Texas Plain where rainfall is highest or locally on lower slopes and near water. Substrates are deep sands and sandy loam soils. The vegetation is dominated by tall perennial grasses such as *Andropogon gerardii*, *Sorghastrum nutans*, and *Tripsacum dactyloides*.

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**CES205.684 TEXAS BLACKLAND TALLGRASS PRAIRIE**

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This system is found primarily in the Blackland Prairie region of Texas but can range into southern Oklahoma. It is typified by the presence of dark alkaline Vertisol soils over calcareous parent material interspersed with patches of acidic, sandy loam Alfisols and Mollisols. Microtopography such as gilgai and mima mounds can occur and are important microhabitats that lead to a high degree of plant diversity in this system. *Schizachyrium scoparium* and *Sorghastrum nutans* are the most frequent species with *Andropogon gerardii* as a possible associate, especially on the patches of Mollisol soils. *Tripsacum dactyloides* and *Panicum virgatum* are common associates on the Vertisol soils, especially on the gilgai microtopography. Fire and grazing constitute the major natural dynamics influencing this system. Infrequent, but intense, fires prevent woody species from establishing. Fire suppression and over grazing have allowed woody species to invade, and heavy grazing has allowed species such as *Buchloe dactyloides* and *Bouteloua rigidiseta* to invade.

This system is restricted to the Blackland Prairie region, part of the Crosstimbers and Southern Tallgrass Prairie Ecoregion, in Texas and possibly adjacent southern Oklahoma.

This system is typified by the presence of dark alkaline Vertisol soils over calcareous parent material interspersed with patches of acidic, sandy loam Alfisols and Mollisols. Microtopography such as gilgai and mima mounds can occur and are important microhabitats that lead to a high degree of plant diversity in this system.

The Main Belt of the Blackland Prairie is divided into Vertisol, Alfisol and Mollisol regions. The Vertisol region is characterized by the presence of dark clay alkaline soils over limestone marl parent material, while the Eastern Marginal prairies are characterized by variously textured Alfisols over sandstone parent material. Alkaline clay and clay loam Mollisols are found on the Austin Chalk formation on fragmented Cretaceous limestone. Two outlier prairies, the Fayette (EPA 32b) and San Antonio Prairies (EPA 33c), are underlain by both Vertisols and Alfisols. Each variation in soil texture and pH supports its characteristic community.

## WOODY WETLAND

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### CES205.710 SOUTHEASTERN GREAT PLAINS FLOODPLAIN FOREST

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This ecological system is found in the floodplains of medium and larger rivers of the East Central Texas Plains, Texas Blackland Prairie Regions, Crosstimbers, and the southeastern edge of the Central Great Plains (Level 3 Ecoregions 33, 32, 29 and 27 respectively, *sensu* Griffith et al. (2004)). Alluvial soils and sedimentation processes typify this system. Periodic, intermediate flooding and deposition (every 5-25 years) dominates the formation and maintenance of this system. Dominant communities within this system range from floodplain forests to wet meadows to gravel/sand flats; however, they are linked by underlying soils and the flooding regime. Canopy dominants may include *Carya illinoensis*, *Ulmus crassifolia*, *Ulmus americana*, *Celtis laevigata*, *Quercus nigra*, *Platanus occidentalis*, *Acer negundo*, *Quercus macrocarpa*, *Morus rubra*, *Fraxinus pennsylvanica*, *Salix nigra*, and *Sapindus saponaria* var. *drummondii* (= *Sapindus drummondii*). Overgrazing and/or overbrowsing may influence recruitment of overstory species and composition of the understory and herbaceous layers. Shrub species may include *Callicarpa americana*, *Ilex decidua*, *Ilex americana*, *Sideroxylon lanuginosum*, *Diospyros virginiana*, *Juniperus virginiana*, *Cornus drummondii*, and *Viburnum rufidulum*, which may occur as dense patches following disturbance, but are otherwise generally fairly sparse. Vines such as *Berchemia scandens*, *Campsis radicans*, *Vitis* spp., *Parthenocissus quinquefolia*, and *Ampelopsis arborea* may be conspicuous. Herbaceous cover includes *Elymus virginicus*, *Verbesina virginica*, *Chasmanthium latifolium*, *Chasmanthium sessiliflorum*, *Tripsacum dactyloides*, *Symphotrichum drummondii* var. *texanum*, *Geum canadense*, *Sanicula canadensis*, *Panicum virgatum*, *Galium* spp., and *Carex* sp. Herbaceous cover may be quite high, especially in situations where shrub cover is low. The environment and vegetation of this system become generally and correspondingly drier from east to west with moister representatives (such as communities containing *Quercus phellos*, *Quercus pagoda*, *Quercus alba*, and *Quercus lyrata*) occurring along the eastern and northeastern margins of the range. Representatives of this system may vary in the openness of the habitat and physiognomy.

This system occupies relatively broad flats at low topographic positions, along large streams where alluvial deposition dominates. It is found in the floodplains of medium and larger rivers of the East Central Texas Plains, Texas Blackland Prairie Regions, Crosstimbers, and the southeastern edge of the Central Great Plains (Level 3 Ecoregions 33, 32, 29 and 27 respectively, *sensu* Griffith et al. (2004)). Soils are primarily alluvial and range from sandy to dense clays.

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### CES205.709 SOUTHEASTERN GREAT PLAINS RIPARIAN FOREST

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This ecological system occurs in various situations along small and intermittent streams in the East Central Texas Plains, Texas Blackland Prairie Regions, Crosstimbers, and the southeastern edge of the Central Great Plains (Level 3 Ecoregions 33, 32, 29 and 27, respectively, *sensu* Griffith et al. (2004)). Some trees that may be present in stands of this system include *Celtis laevigata* var. *laevigata*, *Celtis laevigata* var. *reticulata*, *Platanus occidentalis*, *Quercus nigra*, *Quercus phellos*, *Amorpha fruticosa*, *Forestiera acuminata*, *Acer saccharinum*, *Sapindus saponaria*, *Salix nigra*, *Fraxinus pennsylvanica*, *Gleditsia triacanthos*, *Carya illinoensis*, and *Ulmus crassifolia*. The environment and vegetation of this system become generally and correspondingly drier from east to west with moister representatives (such as communities containing *Quercus nigra*) occurring in the eastern parts of the range. Representatives of this system typically occur in stream-scoured situations and vary in the openness of the habitat and physiognomy.

This system occurs on minor intermittent streams and tributaries throughout the East Central Texas Plains, Texas Blackland Prairie Regions, Crosstimbers, and the southeastern edge of the Central Great Plains (Level 3 Ecoregions 33, 32, 29 and 27 respectively, *sensu* Griffith et al. (2004)). It is found along medium to very small, intermittent to ephemeral drainages. This type is ubiquitous throughout, but species composition and flood regimes are variable and are thought to be dependent on soil and geologic substrates. Generally, these are less thick alluvium than in floodplain terraces. These are flashy streams, and flooding rather than fire will be the dominant process in this system. Fuels in this system are variable, and fire-return interval is partially determined by that of the adjacent and surrounding matrix upland system, where fuels are present.

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### CES301.992 TAMAULIPAN ARROYO SHRUBLAND

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This Tamaulipan riparian shrubland system is restricted to drainages in upland areas or ramaderos that are intermittently flooded. The dense shrub canopy is a mix of species often dominated by *Acacia farnesiana*, *Celtis pallida*, *Haematoxylum brasiletto*, *Prosopis glandulosa*, or *Tecoma stans*. The Ramadero of Jahrsdoerfer and Leslie (1988) is equivalent to this system concept, but could be considered narrower if more information on how it occurs elsewhere in Mexico can be obtained. Not much more information is likely to be found because this system is not sampled very often. Intermittent drainages (arroyos and ramaderos) are not sampled that often because of scale and variability issues. More information is needed to fully characterize this system.

This Tamaulipan riparian shrubland system is restricted to drainages in upland areas or ramaderos (isolated strips of dense brush associated with arroyos) that are intermittently flooded.

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### **CES301.990 TAMAULIPAN FLOODPLAIN**

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This ecological system is limited to riparian areas of the lower Rio Grande Valley and Rio Corona in southern Texas and northeastern Mexico. Stands occur on riverbanks, floodplains and deltas. These woodlands are a unique mix of species from southeastern North America and subtropical Central America and are often dominated by *Acacia farnesiana*, *Carya ovata*, *Celtis laevigata*, *Diospyros texana*, *Ebenopsis ebano*, *Ehretia anacua*, *Fraxinus berlandieriana*, *Populus deltoides*, or *Ulmus crassifolia*, and many other tree species present to locally dominant, with *Carya illinoensis*, *Carya texana*, *Quercus stellata*, and *Quercus fusiformis* more common in the northern extent. The highly variable understory is dependent on canopy density and may include dense shrub or herbaceous layers. Riparian areas of the lower Rio Grande Valley and Rio Corona in southern Texas and northeastern Mexico.

Stands of this ecological system occur on riverbanks, floodplains, deltas and other riparian areas of the lower Rio Grande Valley and Rio Corona in southern Texas and northeastern Mexico.

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### **CES301.991 TAMAULIPAN PALM GROVE RIPARIAN FOREST**

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This ecological system is limited to riparian areas along the lower Rio Grande and Rio Corona in southern Texas and northeastern Mexico. Stands occur on riverbanks and floodplains. The characteristic species are the neotropical *Sabal mexicana* with *Ebenopsis ebano*, *Ehretia anacua*, *Leucaena pulverulenta*, and many other riparian species such as *Acacia farnesiana*, *Carya ovata*, *Celtis laevigata*, *Diospyros texana*, *Fraxinus berlandieriana*, *Populus deltoides*, or *Ulmus crassifolia*. The understory is dominated by neotropical species. Palm groves were once common in the lower Rio Grande Valley 80 miles from the Gulf, but have since largely been converted to agriculture. This ecological system is limited to riparian areas along the lower Rio Grande and Rio Corona in southern Texas and northeastern Mexico.

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### **CES203.542 TEXAS-LOUISIANA COASTAL PRAIRIE SLOUGH**

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This ecological system includes small streams and sloughs that course through the coastal prairie in Louisiana and Texas. They are typically wooded, in contrast to the adjacent prairie. Species composition varies with latitude and longitude, with eastern species being replaced by western ones in drier landscapes. This system is found in the coastal prairie region of Louisiana and Texas.

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### **CES203.547 WEST GULF COASTAL PLAIN FLATWOODS POND**

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This system represents predominantly graminoid-dominated flatwoods ponds of the West Gulf Coastal Plain of eastern Texas and western Louisiana. These ponds are generally circular or elliptical, flat-bottomed depressions on flat terraces in the Outer Coastal Plain. The slowly permeable soils trap local runoff and precipitation resulting in higher water tables than surrounding areas. Water depth may be 3-5 feet in the winter and even deeper toward the center of some examples (Bridges 1988, Bridges and Orzell 1989a). Examples range from shallow to several meters in depth; the large and deeper examples may exhibit distinct vegetation zonation. Most examples have a layer of tall wetland grasses and sedges above a layer of semi-aquatic herbs. Many lack a significant woody layer due in part to periodic fires originating in the pine savanna matrix. However, scattered, often stunted *Nyssa biflora* and stems of *Cephalanthus occidentalis* may be present. The following species are characteristic of this type: *Eriocaulon compressum*, *Xyris fimbriata*, *Eleocharis equisetoides*, *Eleocharis quadrangulata*, as well as two additional species, *Carex verrucosa* and *Rhynchospora cephalantha*, which are more frequent in other pond types. Some other species frequently found in this type include *Eriocaulon compressum*, *Rhynchospora corniculata*, *Panicum hemitomon*, *Ludwigia sphaerocarpa*, *Xyris laxifolia* var. *iridifolia* (= *Xyris iridifolia*), and *Sagittaria graminea*. Other herbaceous species may include *Gratiola brevifolia*, *Hydrolea ovata*, *Proserpinaca pectinata*, *Pluchea rosea*, *Ludwigia pilosa*, *Bacopa caroliniana*, *Xyris* sp., and *Rhynchospora capitellata*.

This system tends to occur as inclusions within wetland pine savannas in depression ponds or ancient stream channels and sloughs. Local runoff and rainfall collect in these depressions with slowly permeable soils. Resulting water tables persist for long periods after rain, at higher levels than surrounding parts of the landscape. Water in this pond type is often 3-5 feet deep in winter, and even deeper areas (with floating aquatic vegetation) may occur in the center of some sites (Bridges 1988, Bridges and Orzell 1989a). They tend to occur as inclusions within wetland pine savannas, but may also be bordered by upland depression swamps. The depressions are typically closed, with no surface outlet. Water collects from local rainfall and runoff from small watersheds. There is typically no input from streamflow and little or no outflow (Bridges and Orzell 1989a).

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**CES203.488 WEST GULF COASTAL PLAIN LARGE RIVER FLOODPLAIN FOREST**

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This system represents a geographic subset of Kuchler's (1964) Southern Floodplain Forest found west of the Mississippi River. Examples may be found along large rivers of the West Gulf Coastal Plain and Upper West Gulf Coastal Plain, especially the Trinity, Neches, Sabine, and others. Several distinct plant communities can be recognized within this system that may be related to the array of different geomorphic features present within the floodplain. Some of the major geomorphic features associated with different community types include natural levees, point bars, meander scrolls, oxbows, and sloughs. Vegetation generally includes forests dominated by bottomland hardwood species and other trees tolerant of flooding, including bald-cypress and water tupelo. However, herbaceous and shrub vegetation may be present in certain areas as well.

Some of the major geomorphic features associated with different community types within this system include natural levees, point bars, meander scrolls, oxbows, and sloughs (Sharitz and Mitsch 1993).

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**CES203.459 WEST GULF COASTAL PLAIN NEAR-COAST LARGE RIVER SWAMP**

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These swamp forests are found along rivers flowing through the Gulf Coast Prairies and Marshes region of the Outer Coastal Plain of western Louisiana and adjacent Texas. Included are areas where the rivers enter bays and estuaries along the northern Gulf of Mexico that are somewhat tidally influenced. This is restricted to EPA 34g (Texas-Louisiana Coastal Marshes) from Vermillion Bay in Louisiana west to, and including Galevston Bay and Trinity Bay in Texas (EPA 2004).

This system is found along rivers flowing through the Gulf Coast Prairies and Marshes (TNC Ecoregion 31) of the Outer Coastal Plain of western Louisiana and adjacent Texas. This is restricted to EPA 34g (Texas-Louisiana Coastal Marshes) from Vermillion Bay in Louisiana west to, and including Galevston Bay and Trinity Bay in Texas (EPA 2004).

The environment of this system consists of rivers flowing through the Gulf Coast Prairies and Marshes ecoregion of the Outer Coastal Plain of western Louisiana and adjacent Texas. This includes somewhat tidally influenced areas where the rivers enter bays and estuaries along the northern Gulf of Mexico.

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**CES203.487 WEST GULF COASTAL PLAIN SMALL STREAM AND RIVER FOREST**

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This is a predominantly forested system of the West Gulf Coastal Plain associated with small rivers and creeks. In contrast to West Gulf Coastal Plain Large River Floodplain Forest (CES203.488), examples of this system have fewer major geomorphic floodplain features. Those features that are present tend to be smaller and more closely intermixed with one another, resulting in less obvious vegetational zonation. Bottomland hardwood tree species are typically important and diagnostic, although mesic hardwood species are also present in areas with less inundation, such as upper terraces and possibly second bottoms. As a whole, flooding occurs annually, but the water table usually is well below the soil surface throughout most of the growing season. Areas impacted by beaver impoundments are also included in this system. This system is associated with small rivers and creeks in the West Gulf Coastal Plain.

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**CES203.191 WEST GULF COASTAL PLAIN WET LONGLEAF PINE SAVANNA AND FLATWOODS**

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This system was the historical matrix vegetation of the outer portions of the West Gulf Coastal Plain in Louisiana and eastern Texas, occurring most frequently on relatively recent geologic formations within the range of longleaf pine. These areas are characterized by poorly drained upland soils with high water tables (Bridges and Orzell 1990). In natural condition, monospecific stands of *Pinus palustris* and species-rich herbaceous layers characterize this system. Widespread alterations following European settlement, including changes to natural fire regimes, have produced drastic changes to this system, and few large examples are extant. Examples appear to be somewhat more common in western Louisiana than eastern Texas. In Louisiana, two Natural Heritage communities (variants) of this system are recognized (Smith 1996b). These two variants are the longleaf pine flatwoods (which are mesic to dry-mesic [non-wetland] stands) and the true pine savannas which occupy poorly drained and seasonally saturated/flooded depressional areas and low flats. These two types form an interdigitated mosaic (Smith 1996b), which constitutes this system as here described and defined.

This system represents the presumed matrix vegetation of the outer (seaward) portions of the West Gulf Coastal Plain in Louisiana and eastern Texas, on relatively recent (Pleistocene) geologic formations within the range of longleaf pine. In Louisiana, these are mapped as the Intermediate Terrace and the upper Prairie Terrace (Snead and McCulloh 1984), and in Texas as the Lissie Formation and the upper Beaumont Formation (Sellards et al. 1932). The Intermediate Terrace of Snead and McCulloh (1984) includes terraces formerly designated as the Montgomery, Irene, and most of the Bentley. Within the range of longleaf pine, this system is bounded on the landward side by West Gulf Coastal Plain Upland Longleaf Pine Forest and Woodland (CES203.293).

## HERBACEOUS WETLAND

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### CES203.472 CENTRAL AND UPPER TEXAS COAST FRESH AND OLIGOHALINE TIDAL MARSH

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This ecological system includes tidal marshes strongly influenced by freshwater producing a fresh to oligohaline chemistry. These areas typically represent small patches along bay margins near the mouths of inflowing rivers from Galveston Bay in Chambers County, Texas, south to approximately Corpus Christi Bay.

This fresh and oligohaline marsh system of the central and upper coast of Texas ranges from Galveston Bay in Chambers County, Texas, south to approximately Corpus Christi Bay.

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### CES203.473 CENTRAL AND UPPER TEXAS COAST SALT AND BRACKISH TIDAL MARSH

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This ecological system encompasses the brackish to salt intertidal marshes of the central and upper coast of Texas. These marshes typically occur on the bay side of barrier islands. It also includes extensive irregularly flooded tidal flats and salt pannes, some vegetated by succulent herbs such as *Sarcocornia*, *Salicornia*, and *Batis*; some are nonvegetated. This system ranges from Galveston Bay in Chambers County, Texas, south to approximately Corpus Christi Bay.

This salt and brackish marsh system of the central and upper coast of Texas ranges from Galveston Bay in Chambers County, Texas, south to approximately Corpus Christi Bay.

These marshes typically occur on the bay side of barrier islands. This system also includes extensive irregularly flooded tidal flats and salt pannes.

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### CES203.467 GULF COAST CHENIER PLAIN FRESH AND OLIGOHALINE TIDAL MARSH

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This system includes large expanses of tidal marshes, strongly influenced by freshwater, along the Chenier Plain of Louisiana and Texas. Fresh marsh is the most common marsh type of the Chenier Plain because of the unique geomorphology of the area. The Chenier Plain is characterized by a prograding coastline replenished by sediments carried to the Gulf of Mexico by the Atchafalaya and other rivers. It is void of barrier islands, and shoreline sediments are reworked by waves into beach ridges. This process has been continuing since the last glacial retreat, and as the coastline progrades, older beach ridges are left as interior ridges surrounded by marsh. Historically, there were very few natural connections between the marshes and the ocean, resulting in fresh to oligohaline salinity. In more recent times, with the increase of dredged canals connecting the marsh system to the gulf, an increase in salinity has occurred, to the detriment of plants adapted to freshwater environments. Significant fresh marsh loss has occurred. Increases in salinity levels may be caused by saltwater intrusion and freshwater diversion. As salinity increases fresh marsh composition shifts to species more tolerant of salinity, ultimately losing species diversity and resulting in open saline waters. Oligohaline marshes range in salinity from 3-4 ppt. Species richness is typically higher in oligohaline marshes than in brackish marshes. A declining component of freshwater communities is sawgrass. This is a highly threatened system in coastal Louisiana.

This system extends from Vermillion Bay, Louisiana, through Jefferson County, Texas. It does not extend into Galveston Bay.

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### CES203.468 GULF COAST CHENIER PLAIN SALT AND BRACKISH TIDAL MARSH

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This system includes brackish to salt intertidal marshes in the Chenier Plain of Louisiana and Texas. Because of the unique geomorphology of the area, salt and brackish marshes were historically less common than fresh marsh in the Chenier Plain. This area is characterized by a prograding coastline replenished by sediments carried to the Gulf of Mexico by the Atchafalaya and other rivers. It is void of barrier islands, and shoreline sediments are reworked by waves into beach ridges. This process has been continuing since the last glacial retreat, and as the coastline progrades, older beach ridges are left as interior ridges surrounded by marsh. Historically, there were very few natural connections between the marshes and the ocean, resulting in fresh to oligohaline salinity. In more recent times, with the increase of dredged canals connecting the marsh system to the gulf, an increase in salinity has occurred, to the detriment of plants adapted to freshwater environments. Significant fresh marsh loss has occurred in this area. Increases in salinity levels may be caused by saltwater intrusion and/or freshwater diversion. Both water level and salinity influence species composition. Salt marshes (about 16 ppt) receive regular daily tides and are typically dominated by *Spartina alterniflora*. Brackish marshes (about 8 ppt), under slightly less tidal influence and moderately influenced by freshwater, are typically dominated by *Spartina patens*, and

degraded by saltwater intrusion. More brackish occurrences may be found along tidal creeks and the upper reaches of daily tides or in areas more influenced by wind tides. Inclusions of *Juncus roemerianus* and other brackish species are found in small to large patches. This system extends from Vermillion Bay, Louisiana, through Jefferson County, Texas. It does not extend into Galveston Bay.

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### **CES203.258 SOUTHEASTERN COASTAL PLAIN INTERDUNAL WETLAND**

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This system encompasses the wettest dune swales and basins on barrier islands and coastal areas, supporting pond or marsh-like vegetation, from the Coastal Plain of Texas to southern Virginia. Most examples are permanently or semipermanently flooded with freshwater but are affected by salt spray or overwash during periodic storm events. It is broadly defined in terms of floristic composition and is wide-ranging throughout the southeastern Coastal Plain of the United States. This system is currently defined with a much broader geographic range than most other coastal systems in the Southeast. The extreme variability within even a limited geographic range limits the ability to find broader vegetational patterns. Examples may vary regionally with regard to the amount of wind or salt spray and the texture of the sand. The northern end of the range is not clearly defined.

Occurs on barrier islands and similar immediate coastal areas, in dune swales or other basins. The ponds have standing water well into the growing season, and most are permanently flooded. The water is from rainfall or the local water table and is fresh, except perhaps during storm events that produce overwash. Soils are sand, sometimes with a thin layer of muck accumulated in the pond.

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### **CES203.474 TEXAS COASTAL BEND SEAGRASS BED**

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This system includes seagrass beds occurring along the Texas Coast south of San Antonio Bay. Dominants may include, individually or in admixtures with other seagrasses, *Cymodocea filiformis*, which is restricted in Texas to this ecological system, *Halophila engelmannii* or *Halodule beaudettei*, which occupy thousands of acres of the Laguna Madre, and *Thalassia testudinum*. This system includes Texas' largest occurrences of *Thalassia testudinum* and *Halophila engelmannii*. Other dominants may include *Ruppia maritima*.

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### **CES203.543 TEXAS SALINE COASTAL PRAIRIE**

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This system encompasses grassland vegetation occurring on saline soils that are often saturated by local rainfall and periodically flooded by saline waters during major storm events. It is located along the Gulf Coast of Texas. Saline prairie continues to occupy extensive areas, though quality of the system is often degraded by the invasion of woody shrubs due to the absence of regular fire. Fire is an important ecological process needed to maintain this system, though periodic submersion with saltwater during storm events also helps to control the invasion of woody species. This system is characteristically dominated by *Spartina spartinae*; other dominants may include *Schizachyrium littorale* and *Muhlenbergia capillaris*. This system includes depressions often dominated by *Spartina patens*. This system occurs on saline soils that are often saturated by local rainfall and periodically flooded by saline waters during major storm events.

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### **CES203.541 TEXAS-LOUISIANA COASTAL PRAIRIE POND SHORE**

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This ecological system includes small to moderately large ponds and swales in the coastal prairie of southeastern Texas and adjacent Louisiana. These wetlands contain surface water during much of the year, desiccating only in the driest summer months. They are often fed by water runoff but may result from percolation from adjacent sandy areas. Soils in the basins are finer-textured than surrounding areas and may be underlain by pans that enhance perched water tables in the winter. These wetlands occur within the coastal prairie matrix of southeastern Texas and Louisiana and are wetter than wet prairie dominated by *Tripsacum dactyloides* and *Panicum virgatum*. These wetlands may be dominated by *Eleocharis quadrangulata*. Other species that may be present include *Sagittaria papillosa*, *Sagittaria longiloba*, *Steinchisma hians*, *Panicum virgatum*, *Cyperus haspan*, *Cyperus virens*, *Ludwigia glandulosa*, *Ludwigia linearis*, *Fuirena squarrosa*, *Xyris jupicai*, *Leersia hexandra*, *Centella erecta*, *Symphyotrichum subulatum* (= *Aster subulatus*), *Sesbania* spp., and *Rhynchospora* spp. Open areas in the ponds may contain floating and submersed aquatic vegetation, including *Stuckenia pectinata*, *Ceratophyllum demersum*, *Brasenia schreberi*, *Nymphoides aquatica*, *Nuphar advena*, and *Nelumbo lutea*.

Examples of this system are often fed by water runoff but may result from percolation from adjacent sandy areas. Soils in the basins are finer-textured than surrounding areas and may be underlain by pans that enhance perched water tables in the winter.

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### **CES203.511 TEXAS-LOUISIANA FRESH-OLIGOHALINE SUBTIDAL AQUATIC VEGETATION**

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This system includes subtidal beds of aquatic vegetation in fresh to oligohaline tidal waters of the Gulf of Mexico in Louisiana and Texas. Species composition may include *Stuckenia pectinata* (= *Potamogeton perfoliatus*), *Zannichellia palustris*, *Vallisneria*

*americana*, *Najas guadalupensis*, and *Ruppia maritima*. It is found in the Trinity Bay portion of the Galveston Bay complex along the upper coast of Texas. Although the substrate of most Texas bays is sand, this system occurs on mud-dominated substrates (Adair et al. 1994). This system is also distinguished by the prevalence of oligohaline waters, whereas other Texas bays are considerably more saline. As a consequence, the predominant species, *Najas guadalupensis* and *Vallisneria americana*, which are salt intolerant, are able to attain dominance here. Both species are largely restricted to the northeastern portions of the bay where they are protected by a sand bar system which restricts wave action and turbidity. The extent and quality of this system have been heavily reduced by shoreline development and associated draining and filling, bulkheading, and channelization. Seagrass communities are declining in many bays along the Texas coast. This system occurs primarily from Trinity Bay in Texas north along the Gulf of Mexico into Louisiana.

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**CES203.545 UPPER TEXAS COAST SEAGRASS BED**

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This system includes seagrass communities occurring in bays along the upper Texas coast north of and including San Antonio Bay. It includes vegetation dominated by *Thalassia testudinum*, *Halophila engelmannii*, *Ruppia maritima*, or *Halodule beaudettei*. Many of these occurrences have declined in extent. Seagrass communities are declining in many bays along the Texas coast.

This system is found in bays along the upper Texas coast north of and including San Antonio Bay.



## MIXED UPLAND AND WETLAND

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### **CES203.465 CENTRAL AND UPPER TEXAS COAST DUNE AND COASTAL GRASSLAND**

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This system consists of wetland and upland herbaceous and shrubland vegetation of barrier islands and near-coastal areas in the northern Gulf of Mexico along the upper Texas coast, at least to Galveston Bay. Plant communities of primary and secondary dunes, interdunal swales and adjacent mainland are included. Salt spray, saltwater overwash, and sand movement are important ecological forces.

There is one barrier strand plain that is present northeast of Galveston Bay (Mapzone 37) that could potentially have some of this grassland - or it could just be considered coastal prairie. I originally only attributed TX because, to the best of my recollection, LA doesn't have any dunes or barrier spits until you get northeast of the Atchafalaya. The reason this covers both dune and coastal grasslands is because there are some barrier strand plains that are "inland" that have similar grasslands to the interior of barrier islands, but this is not the case for LA where there are old islands, but they are wooded, i.e., cheniers.

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### **CES301.460 SOUTH TEXAS DUNE AND COASTAL GRASSLAND**

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This ecological system includes non-tidal maritime grasslands occurring on barrier islands and mainland areas near the coast of southern Texas, from Matagorda Island and Padre Island south along the northern Gulf of Mexico. This includes grasslands of primary and secondary dunes, interdune swales, barrier flats, and the mainland. Some examples of this system naturally occurred as an open matrix of midgrass species within native mesquite - acacia shrublands dominated by *Prosopis glandulosa*, *Acacia farnesiana*, and *Acacia rigidula* but have become shrub-dominated due to the lack of fire. In many areas this system has been virtually eliminated due to conversion to tame pasture, cropland, or due to lack of burning. This system ranges from Matagorda Island south along the northern Gulf of Mexico.

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### **CES203.550 TEXAS-LOUISIANA COASTAL PRAIRIE**

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This system encompasses non-saline tallgrass prairie vegetation ranging along the coast of Louisiana and Texas. This vegetation is found on Vertisols and Alfisols which developed over Pleistocene terraces flanking the Gulf Coast. It is often characterized by a ridge-and-swale or mound-and-intermound microtopography and encompasses both upland and wetland plant communities. Upland dominants include *Schizachyrium scoparium*, *Paspalum plicatulum*, *Sorghastrum nutans*, and *Andropogon gerardii*. Wetland dominants in undisturbed occurrences include *Panicum virgatum* and *Tripsacum dactyloides*; disturbed occurrences may be dominated by *Andropogon glomeratus*. Some estimates state that 99% of coastal prairie has been lost through conversion to other uses and environmental degradation due to the interruption of important ecological processes, such as fire, needed to maintain this system. In the absence of regular fire, this system will be invaded by woody shrubs and trees.

## BARREN

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### CES301.461 SOUTH TEXAS SALT AND BRACKISH TIDAL FLAT

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This system includes regularly to irregularly flooded hypersaline tidal flats (often exceeding a thousand acres in size). Dominants include a variety of vascular and nonvascular species. The cyanobacteria (blue-green algae) *Lyngbea* spp. may dominate thousands of acres. Total vegetative cover is quite variable, from near total absence of vascular plants to a dense cover of one of several dominant species including *Batis maritima*, *Monanthochloe littoralis*, *Spartina spartinae*, *Borrchia frutescens*, and *Sarcocornia perennis*. In addition to the dominants, other halophytic plants of this system include *Atriplex matamorensis*, *Distichlis spicata*, *Sarcocornia perennis*, *Sporobolus virginicus*, *Maytenus phyllanthoides*, *Prosopis reptans*, *Borrchia frutescens*, *Suaeda linearis*, *Suaeda conferta*, *Monanthochloe littoralis*, *Lycium carolinianum* var. *quadrifidum*, *Spartina spartinae*, *Sesuvium portulacastrum*, *Rayjacksonia phyllocephala*, and *Blutaparon vermiculare*. In addition to dominating non-vegetated areas, algal mats of blue-green and sometimes green algae are characteristically present, visible even in densely vegetated pannes. Blue-green algae may contribute significantly more biomass than vascular species. Widely scattered *Avicennia germinans* (and, less frequently, other mangroves) may occur. This system ranges south of Corpus Christi Bay along the northern Gulf of Mexico.

This system occurs in tidal and other hypersaline situations along upper marsh edges and in tidal flats ranging in scale from narrow bands to hundreds of hectares along the Gulf Coast of southern Texas and Mexico. It is regularly to irregularly flooded by shallow brackish waters as a result of lunar, wind and storm tides. As these waters evaporate, high concentrations of salt accumulate, producing hypersaline conditions, forming "salt pannes." It is found along barrier island and mainland shores of hypersaline lagoons and bays where evaporation often exceeds freshwater input.

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### CES203.463 TEXAS COASTAL BEND BEACH

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This system includes sparsely vegetated ocean beaches constituting the outermost zone of coastal vegetation ranging from and including Matagorda Island south to include Padre Island in Texas. These beaches are located on accretionary barrier islands, and they are generally well-developed with a stable dune system behind them. Examples generally extend seaward from foredunes but may include flats behind breached foredunes. Although these habitats are situated just above the mean high tide limit, they are constantly impacted by wind and salt spray and may be flooded by storm surges. Characteristic dominants are xerophytes and include the perennials *Ipomoea pes-caprae* and *Ipomoea imperati* and the annual *Cakile geniculata*. Outermost zone of coastal vegetation ranging from and including Matagorda Island south to include Padre Island in Texas.

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### CES203.544 UPPER TEXAS COAST BEACH

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This ecological system includes sparsely vegetated ocean beaches of the upper Texas coast, from the mainland shores of the Chenier Plain of Louisiana to the barrier islands and spits of central Texas north of Matagorda Island. These beaches are generally eroding and narrow, and constitute the outermost zone of coastal vegetation in this area. Although these habitats are situated just above the mean high tide limit, they are constantly impacted by waves and may be flooded by storm surges. Dynamic disturbance regimes largely limit the vegetation to pioneering, salt-tolerant, succulent annuals or perennial vines (e.g. *Ipomoea* spp.). These beaches are generally unstable and highly impacted by attempts to limit the natural erosional processes. Beach accumulation is limited by the lack of sediments entering the gulf because most rivers in this area enter bays and their sediments do not reach the gulf. This system ranges from the mainland shores of the Chenier Plain of Louisiana to the barrier islands to the spits of central Texas north of Matagorda Island.