

DRAFT DESCRIPTIONS OF SYSTEMS, MAPPING SUBSYSTEMS, AND VEGETATION TYPES FOR PHASE III

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The following descriptions cover the systems that have been identified for the legend for Phase III of the Ecological Systems Classification and Mapping Project in support of the Texas Comprehensive Wildlife Conservation Strategy for the Texas Parks and Wildlife Department. Many of these descriptions were drafted from System descriptions available from NatureServe (<http://www.natureserve.org/explorer/>). Most System descriptions were modified, and all Vegetation Type descriptions were generated from discussions regarding these cover types. These brief narratives generally focus on ‘typical’ type concepts, and mapped vegetation types often circumscribe more variation on the ground than what is described here. For each system, a number of cover types, or “Vegetation Types” were described. A common name is given for each Vegetation Type, and this name is used in the table of contents and for the map legend. Additionally, a second name is provided which more directly ties the Vegetation Type to the system of which it is a part. A numeric identifier is also provided. This identifier represents the identifier used by NatureServe for the system. For the Vegetation Type, a digit suffix is provided to distinguish the various cover types within the system. In parentheses directly following the common name of the Vegetation Type, a number is provided. This number represents the numeric code used to track the Vegetation Types during the mapping process.

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Forests, Woodlands and Savannas

West Gulf Coastal Plain Pine-Hardwood Forest

Identifier: CES203.378

Geology: This system is the matrix of the West Gulf Coastal Plain of Texas, but is limited in distribution to patchy occurrences in the northeastern portion of Phase 3. Here the type is found on the Beaumont surface, as well as the Willis and adjacent formations in Lavaca County.

Landform: The system occurs over a wide variety of landforms, with drier expressions occurring on hilltops and ridges. It occupies slopes and lower landscape positions, where conditions are more mesic, and composition of the system varies across these gradients.

Soils: Numerous soil types are occupied by this system, but in Phase 3 many of the occurrences occupy vertisols. In Lavaca County, the system is generally found on sandy soils.

Description: This upland system occurs as relatively small patches in Phase 3, representing the southwestern most expressions of the system, with about 1,300 ha (3,200 acres). Occurrences in Phase 3 lie outside the range of *Pinus palustris* (longleaf pine), with *Pinus taeda* (loblolly pine) representing the primary pine species (though *Pinus elliottii* (slash pine) may also be occasionally present). The system typically occurs as a mixed forest with *Pinus taeda* (loblolly pine), but often with considerable hardwood canopy, with species such as *Quercus nigra* (water oak), *Quercus virginiana* (live oak), *Quercus falcata* (southern red oak), *Liquidambar styraciflua* (sweetgum), and *Ulmus* species (elms). *Ilex vomitoria* (yaupon), saplings and seedlings of overstory species, *Cornus florida* (flower dogwood), *Morella cerifera* (wax-myrtle), and on sandy sites, *Callicarpa americana* (American beautyberry) and *Vaccinium arboreum* (farkleberry) commonly occupy the shrub layer, which may be well-developed, with canopy cover to 40% or more. Woody vines in this system may be conspicuous and often include *Smilax bona-nox* (saw greenbrier), *Vitis* spp. (grape, often *Vitis mustangensis* (mustang grape)), *Parthenocissus quinquefolia* (Virginia creeper), and *Toxicodendron radicans* (poison ivy). The herbaceous layer is generally sparse (often < 20% cover), with *Schizachyrium scoparium* (little bluestem), *Chasmanthium laxum* (slender woodoats), and *Chasmanthium sessiliflorum* (slender woodoats) sometimes present. Forests with dense tree cover (especially evergreen cover) have reduced shrub and herbaceous cover. Herbaceous cover may be additionally limited by dense litter accumulation. Few occurrences of this system can be considered old growth, and much of the system, as it is mapped, constitutes pine plantations or sites recovering from previous logging.

VEGETATION TYPES:

Pineywoods: Pine Forest or Plantation (3001)

West Gulf Coastal Plain Dry-Mesic Pine Forest

Identifier: CES203.378.1 **Phase 3 Code:** 3001

Description: This represents the less common expression of the system in Phase 3. Many sites actually represent pine plantations and managed forests, and discriminating between natural pine forest and plantation is problematic using our mapping methods.

Pineywoods: Pine / Hardwood Forest and Plantation (3003)

West Gulf Coastal Plain Dry-Mesic Pine-Hardwood Mixed Forest

Identifier: CES203.378.3 **Phase 3 Code:** 3001

Description: This type represents about 75% of the occurrences of this system in Phase 3, with mixed evergreen/deciduous canopy cover. Much of this type may represent sites recovering from previous logging, or managed forest with various hardwood species co-dominant in the canopy.

Edwards Plateau Limestone Savanna and Woodland

Identifier: CES303.660

Geology: Primarily found on Cretaceous limestones of the Edwards Plateau, as well as on Cretaceous chalk formations.

Landform: Rolling to level topography, often on plateau tops, but also on gentle slopes.

Soils: Generally loams, clay loams, or clays, often with limestone parent material apparent. Low Stony Hill, Adobe, Clay Loam, and Shallow Ecological Sites are commonly associated with this system.

Description: This upland system forms the matrix vegetation type of the Edwards Plateau, covering approximately 182,000 acres (73,700 ha.) of Phase 3. It is typified by a mosaic of evergreen oak and juniper forests, woodlands and savannas over shallow soils of rolling uplands and adjacent upper slopes within the Edwards Plateau and some adjacent ecoregions where limestone or chalk is present. Significant open areas dominated by grasses may resemble prairies, and such open occurrences may grade into blackland prairie types to the east. Species such as *Quercus fusiformis* (plateau live oak) or *Juniperus ashei* (Ashe juniper) often dominate the canopy of this system. Other canopy species may include *Quercus buckleyi* (Texas oak), *Ulmus crassifolia* (cedar elm), and *Quercus sinuata* var. *breviloba* (white shin oak). The shrub layer may be fairly well-developed, containing overstory species, as well as species such as *Diospyros texana* (Texas persimmon), *Mahonia trifoliolata* (agarito), *Sophora secundiflora* (Texas mountain-laurel), *Opuntia engelmannii* var. *lindheimeri* (Lindheimer pricklypear), and *Cylindropuntia leptocaulis* (tasajillo). Many uplands have mottes of *Quercus fusiformis* (plateau live oak) punctuating a generally grass dominated landscape, forming what has been referred to as a motte-savanna. Understory species can contain various grass species, including *Schizachyrium scoparium* (little bluestem), *Bouteloua curtipendula* (sideoats grama), *Bothriochloa barbinodis* (cane bluestem), *Bothriochloa laguroides* ssp. *torreyana* (silver bluestem), *Nassella leucotricha* (Texas wintergrass), *Sorghastrum nutans* (Indiangrass), *Hilaria belangeri* (curlmesquite), *Bouteloua dactyloides* (buffalograss), *Andropogon gerardii* (big bluestem), *Bouteloua hirsuta* (hairy grama), *Bouteloua rigidiseta* (Texas grama), *Muhlenbergia reverchonii* (seep muhly), *Muhlenbergia lindheimeri* (Lindheimer muhly), and/or *Carex planostachys* (cedar sedge). The composition of the grassland component is driven by grazing, fire, and climate. Shortgrass species such as *Bouteloua dactyloides* (buffalograss) and *Hilaria*

belangeri (curlymesquite) are favored under heavy continuous grazing and/or dry climate (to the west), while mid- and tallgrasses are favored under more mesic conditions, more well-developed soils, and well-managed grazing. The herbaceous stratum is often dominated by non-native grass species, especially *Bothriochloa ischaemum* var. *songarica* (King Ranch bluestem).

VEGETATION TYPES:

Edwards Plateau: Ashe Juniper Motte and Woodland (1101)

Edwards Plateau Limestone Ashe Juniper Motte and Woodland

Identifier: CES303.660.1

Phase 3 Code: 1101

Description: These relatively closed woodlands are very common on uplands on limestone in the Edwards Plateau and adjacent ecoregions. *Juniperus ashei* (Ashe juniper) is the clear dominant in the canopy and a conspicuous component of the shrub layer as well. Occurrences containing thick stands of juniper are sometimes referred to as “cedar breaks.” *Quercus fusiformis* (plateau live oak) is often a significant component in the canopy, and other species such as *Quercus buckleyi* (Texas oak), *Quercus sinuata* var. *breviloba* (white shin oak), *Ulmus crassifolia* (cedar elm), and *Celtis* spp. (hackberry) may also be common. The shrub layer may be dense and dominated by *Juniperus ashei* (Ashe juniper), but *Mahonia trifoliolata* (agarito), *Diospyros texana* (Texas persimmon), and other species may be present. Dense canopy cover often leads to a sparse to nearly absent herbaceous layer, sometimes with only *Carex planostachys* (cedar sedge) present.

Edwards Plateau: Live Oak Motte and Woodland (1102)

Edwards Plateau Limestone Live Oak Motte and Woodland

Identifier: CES303.660.2

Phase 3 Code: 1102

Description: These woodlands are common throughout the Edwards Plateau and adjacent ecoregions on limestone. *Quercus fusiformis* (plateau live oak) dominates the overstory, however other species such as *Quercus sinuata* var. *breviloba* (white shin oak), *Ulmus crassifolia* (cedar elm), *Quercus buckleyi* (Texas oak), *Celtis* spp. (hackberry), and *Quercus stellata* (post oak). *Juniperus ashei* (Ashe juniper) may be present in the canopy and shrub layer, but is not dominant. The shrub layer is generally patchy and may include species such as *Diospyros texana* (Texas persimmon), *Mahonia trifoliolata* (agarito), *Opuntia engelmannii* var. *lindheimeri* (Lindheimer pricklypear), and *Cylindropuntia leptocaulis* (tasajillo), as well as small individuals of the overstory species. The herbaceous layer may be sparse if canopy cover is high, with species including *Schizachyrium scoparium* (little bluestem), *Bouteloua* spp. (grama), *Nassella leucotricha* (Texas wintergrass), *Aristida* spp. (threeawn), and *Carex planostachys* (cedar sedge). Fires in this system tend to remove shrub species (especially *Juniperus ashei* (Ashe juniper)), but the overstory typically remains intact. Openings between mottes are typically grass dominated with the same species that occur as understory components in the woodlands.

Edwards Plateau: Deciduous Oak / Evergreen Motte and Woodland (1103)

Edwards Plateau Limestone Deciduous-Evergreen Motte and Woodland

Identifier: CES303.660.4

Phase 3 Code: 1103

Description: These woodlands are intermediate between those strongly dominated by the evergreen components *Juniperus ashei* (Ashe juniper) and *Quercus fusiformis* (plateau live oak) and those dominated by deciduous components, particularly oaks such as *Quercus buckleyi* (Texas Oak), and *Quercus sinuata* var. *breviloba* (white shin oak). Other deciduous overstory species that may be present include *Ulmus crassifolia* (cedar elm) and *Celtis* sp. (hackberry). The understory of these sites is similar to that of the related woodlands, with shrub species such as *Diospyros texana* (Texas persimmon), *Mahonia trifoliata* (agarito), *Sophora secundiflora* (Texas mountain-laurel), and *Opuntia engelmannii* var. *lindheimeri* (Lindheimer pricklypear), and relatively sparse herbaceous layer typically dominated by graminoid species common to the surrounding upland sites such as *Bothriochloa ischaemum* var. *songarica* (King Ranch bluestem), *Schizachyrium scoparium* (little bluestem), *Bothriochloa laguroides* ssp. *torreyana* (silver bluestem), *Dichanthelium* sp. (rosette grass), *Bouteloua* sp. (grama), *Nassella leucotricha* (Texas wintergrass) and others.

Edwards Plateau: Oak / Hardwood Motte and Woodland (1104)

Edwards Plateau Limestone Deciduous Motte and Woodland

Identifier: CES303.660.5

Phase 3 Code: 1104

Description: While *Quercus buckleyi* (Texas oak) and *Ulmus crassifolia* (cedar elm) are significant elements of the canopy of nearby slope forests and woodlands, they may also dominate upland sites. Other deciduous species, such as *Quercus sinuata* var. *breviloba* (white shin oak), *Celtis laevigata* (sugar hackberry), *Prosopis glandulosa* (mesquite), and *Quercus stellata* (post oak), may also occupy the canopy, with lesser amounts of evergreen components, such as *Quercus fusiformis* (live oak) and *Juniperus ashei* (Ashe juniper), present. These sites with dominant deciduous canopies on upland Ecological Sites (such as Low Stony Hill, Shallow, and Adobe) are less commonly encountered than woodlands dominated by some mix of an evergreen canopy.

Edwards Plateau: Post Oak Motte and Woodland (1114)

Edwards Plateau Limestone Post Oak Motte and Woodland

Identifier: CES303.660.6

Phase 3 Code: 1114

Description: These woodlands and mottes tend to occur on Redland Ecological Sites, but may also be found on sandy benches. On the Edwards Plateau, Redland sites are often associated with cherty or siliceous members of limestone. These situations provide slightly more acidic conditions relative to the surrounding landscape. The overstory tends to be open and dominated by *Quercus stellata* (post oak), though *Quercus marilandica* (blackjack oak), *Quercus fusiformis* (plateau live oak), *Ulmus crassifolia* (cedar elm), *Juniperus ashei* (Ashe juniper), and *Quercus buckleyi* (Texas oak) may also be present. The shrub layer is patchy and may contain small individuals of the canopy species as well as other species. The herbaceous layer is often dominated by *Schizachyrium scoparium* (little bluestem), *Nassella leucotricha* (Texas wintergrass), *Bouteloua curtipendula* (sideoats grama), and other species, but may be dominated by the non-native *Bothriochloa ischaemum* var. *songarica* (King Ranch bluestem).

Edwards Plateau: Savanna Grassland (1107)

Edwards Plateau Limestone Savanna Grassland

Identifier: CES303.660.9 **Phase 3 Code:** 1107

Description: Uplands of the Edwards Plateau are frequently described as a mosaic of woodlands, shrublands, and grasslands. Areas with reduced woody cover may occupy sites of considerable size, depending on the land use history, management, and fire history. While these sites have sometimes been referred to as prairies, they are more appropriately considered a part of the savanna mosaic. Grasslands in areas transitioning to blackland prairie sites may closely resemble and be difficult to distinguish from these prairie types. *Schizachyrium scoparium* (little bluestem) and *Bouteloua curtipendula* (sideoats grama) are common dominants on these sites, but *Bothriochloa ischaemum* var. *songarica* (King Ranch bluestem) and/or *Cynodon dactylon* (Bermudagrass) frequently dominate or are significant components. Numerous other grass species, including *Aristida* sp. (threeawn), *Bothriochloa barbinodis* (cane bluestem), *Bothriochloa laguroides* ssp. *torreyana* (silver bluestem), *Sorghastrum nutans* (Indiangrass), *Bouteloua hirsuta* var. *pectinata* (tall grama), *B. trifida* (red grama), *B. rigidiseta* (Texas grama), *Bouteloua hirsuta* (hairy grama), *Erioneuron pilosum* (fluffgrass), *Hilaria belangeri* (curly mesquite), *Nassella leucotricha* (Texas wintergrass), and many others may be present or dominate these sites. Sites under heavy, continuous grazing, or sites with thin or xeric soils tend to be dominated by shortgrass species such as *Bouteloua dactyloides* (buffalograss), *Hilaria belangeri* (curly mesquite), or *Erioneuron pilosum* (fluffgrass). Numerous forb species may also be present in the herbaceous layer. Woody cover constitutes less than 25% of the canopy and is made up of various species including, but not limited to, *Prosopis glandulosa* (honey mesquite), *Juniperus ashei* (Ashe juniper), *Mahonia trifoliolata* (agarito), *Quercus sinuata* var. *breviloba* (white shin oak), *Quercus fusiformis* (plateau live oak), *Diospyros texana* (Texas persimmon), and/or *Sophora secundiflora* (Texas mountain-laurel).

Edwards Plateau Dry-Mesic Slope Forest and Woodland

Identifier: CES303.656

Geology: Found on limestone slopes within the Edwards Plateau and adjacent ecoregions, such as cuestas of cretaceous chalk in the Blackland Prairie.

Landform: Slopes greater than 20 percent.

Soils: Stones and boulders are conspicuous on the soil surface. Soils are generally dark clay to clay loam and shallow. Steep Rocky and Steep Adobe Ecological Sites may be associated with this system.

Description: This system occurs on dry to mesic, middle slopes of the rolling uplands and escarpments of the Edwards Plateau and similar sites. The canopy is typically dominated or co-dominated by deciduous trees, including *Quercus buckleyi* (Texas oak), *Quercus sinuata* var. *breviloba* (white shin oak), *Ulmus crassifolia* (cedar elm), and/or *Celtis laevigata* var. *reticulata* (netleaf hackberry). *Quercus fusiformis* (plateau live oak) and *Juniperus ashei* (Ashe juniper) are often present and are sometimes co-dominant with deciduous species of this system. Canopy closure is variable, and this system can be expressed as forests or woodlands. The shrub layer may be well-represented, especially where the overstory canopy is discontinuous. Species such as *Aesculus pavia* var. *flavescens* (red buckeye), *Cercis canadensis* var. *texensis* (Texas redbud),

Forestiera pubescens (elbowbush), *Ungnadia speciosa* (Mexican buckeye), *Ceanothus herbaceus* (Jersey tea), *Sophora secundiflora* (Texas mountain-laurel), *Rhus* spp. (sumac), and *Vitis* spp. (grape), and *Garrya ovata* (silktassel) may be present in the shrub layer. With the large amount of exposed rock, frequent accumulation of leaf litter, and significant canopy closure, herbaceous cover is generally sparse, with *Carex planostachys* (cedar sedge) often present. Woodland forbs such as *Tinantia anomala* (widow's tears), *Chaptalia texana* (silver-puff), *Nemophila phacelioides* (baby blue-eyes), *Salvia roemeriana* (cedar sage), *Lespedeza texana* (Texas lespedeza), and various ferns may also be present, if patchy.

VEGETATION TYPES:

Edwards Plateau: Ashe Juniper Slope Forest (901)

Edwards Plateau Ashe Juniper Dry-Mesic Slope Forest and Woodland

Identifier: CES303.656.1 **Phase 3 Code:** 901

Description: Forest or woodland of slopes generally greater than 20 percent on steep rocky sites with coniferous evergreen canopy cover. The canopy of these sites is dominated by *Juniperus ashei* (Ashe juniper), but usually with *Quercus fusiformis* (plateau live oak) and a deciduous component present (often *Quercus buckleyi* (Texas oak), or *Quercus sinuata* var. *breviloba* (white shin oak)). The canopy is usually relatively closed and the sites are rocky, resulting in a sparse and depauperate shrub and herbaceous layer. However, *Juniperus ashei* (Ashe juniper) may also form a somewhat dense layer to within a meter of the forest floor. *Sophora secundiflora* (Texas mountain-laurel), *Diospyros texana* (Texas persimmon), *Mahonia trifoliolata* (agarito), *Mimosa borealis* (fragrant mimosa), *Quercus sinuata* var. *breviloba* (white shin oak), and *Sideroxylon lanuginosum* (gum bumelia) may also be components of the shrub layer. These juniper dominated slopes tend to be drier, and may be more frequent on slopes with south and west aspects.

Edwards Plateau: Live Oak Slope Forest (902)

Edwards Plateau Live Oak Dry-Mesic Slope Forest and Woodland

Identifier: CES303.656.2 **Phase 3 Code:** 902

Description: Forest or woodland dominated by *Quercus fusiformis* (plateau live oak) and occupying generally rocky sites on slopes greater than 20 percent. *Juniperus ashei* (Ashe juniper) is typically present, and may be particularly conspicuous as an understory component. Deciduous species such as *Quercus buckleyi* (Texas oak), *Quercus sinuata* var. *breviloba* (white shin oak), *Ulmus crassifolia* (cedar elm), and others may also be present in the canopy. These sites tend to be drier than similar sites that are dominated by a mix of deciduous species in the canopy. The shrub layer is variable and may contain small individuals of the canopy species, as well as species such as *Sophora secundiflora* (Texas mountain-laurel), *Diospyros texana* (Texas persimmon), *Sideroxylon lanuginosum* (gum bumelia), and *Mahonia trifoliolata* (agarito). Relatively closed canopy, rocky substrate, and significant litter layer results in a sparse herbaceous layer.

Edwards Plateau: Oak / Ashe Juniper Slope Forest (903)

Edwards Plateau Oak-Ashe Juniper Dry-Mesic Slope Forest and Woodland

Identifier: CES303.656.4 **Phase 3 Code:** 903

Description: Forests or woodlands on steep rocky slopes, co-dominated by *Juniperus ashei* (Ashe juniper) and deciduous species such as *Quercus buckleyi* (Texas oak), *Quercus muehlenbergii* (chinkapin oak), and *Quercus sinuata* var. *breviloba* (white shin oak). Other deciduous hardwood species such as *Ulmus crassifolia* (cedar elm), and *Celtis reticulata* (netleaf hackberry) may also be present to common. *Quercus fusiformis* (plateau live oak) is also frequently conspicuous in the canopy. These sites are intermediate in dryness between juniper dominated slopes and those dominated by deciduous hardwood species. *Juniperus ashei* (Ashe juniper) may reach large sizes on such slopes. The shrub layer is variable but may be well-developed within canopy gaps. Species in the shrub layer may include *Sophora secundiflora* (Texas mountain-laurel), *Forestiera pubescens* (elbowbush), *Ungnadia speciosa* (Mexican buckeye), *Diospyros texana* (Texas persimmon), *Aesculus pavia* var. *flavescens* (red buckeye), *Cercis canadensis* var. *texensis* (Texas redbud), *Sideroxylon lanuginosum* (gum bumelia), and others. The herbaceous layer is generally sparse and depauperate.

Edwards Plateau: Oak / Hardwood Slope Forest (904)

Edwards Plateau Deciduous Dry-Mesic Slope Forest and Woodland

Identifier: CES303.656.6 **Phase 3 Code:** 904

Description: Forest or woodland on slopes greater than 20 percent on steep rocky sites with significant deciduous canopy cover. These sites tend to be somewhat more mesic than similar sites dominated by evergreen canopy. The overstory may be diverse, with species such as *Quercus buckleyi* (Texas oak), *Quercus sinuata* var. *breviloba* (white shin oak), *Quercus muehlenbergii* (chinkapin oak), *Ulmus crassifolia* (cedar elm), *Celtis laevigata* var. *reticulata* (netleaf hackberry), and others. This system may occupy slopes on cretaceous limestone or chalk occurring east of the Edwards Plateau. *Quercus fusiformis* (plateau live oak) and *Juniperus ashei* (Ashe juniper) may be present, often reaching large size under these conditions. Species such as *Aesculus pavia* var. *flavescens* (red buckeye), *Cercis canadensis* var. *texensis* (Texas redbud), *Cornus drummondii* (rough-leaf dogwood), *Forestiera pubescens* (elbowbush), *Ungnadia speciosa* (Mexican buckeye), *Ceanothus herbaceus* (Jersey tea), *Frangula caroliniana* (Carolina buckthorn), *Vitis* spp. (grape), and *Garrya ovata* (silktassel) tend to occur in the shrub layer more frequently in this vegetation type than in the evergreen vegetation types of this system. Though dense canopy, rocky substrate, and significant litter accumulation results in a sparse herbaceous layer, forbs such as *Tinantia anomala* (widow's tears), *Chaptalia texana* (silver-puff), *Nemophila phacelioides* (baby blue-eyes), *Salvia roemeriana* (cedar sage), *Lespedeza texana* (Texas lespedeza), and various ferns may be present, if patchy.

East-Central Texas Plains Post Oak Savanna and Woodland

Identifier: CES205.679

Geology: Typical on sedimentary formations of Tertiary age. The system is best developed on the sandy Eocene formations such as Queen City, Sparta, and Carrizo Sands, and the Pliocene Willis Formation, but is common elsewhere.

Landform: This system occupies gently rolling to hilly topography. It is moderately dissected by drainages.

Soils: This system usually occurs on sandy to sandy loam soils, often with a marked clay subsurface horizon. Soils of this system are generally Alfisols, and are typically acidic to neutral. Typical Ecological Sites include Claypan Savannah, Claypan Prairie, Sandy Loam, Sandy, and Deep Sand.

Description: This system is generally found between the Blackland prairie and the coastal prairie, and is interrupted to some degree by the Fayette Prairie. It is mapped on almost 903,600 hectares (2,233,000 acres) within Phase 3. Savannas and woodlands are typically dominated by *Quercus stellata* (post oak), *Quercus marilandica* (blackjack oak), and *Carya texana* (black hickory). Large areas of woodland, particularly in the south and east, are dominated or co-dominated by *Quercus fusiformis* (plateau live oak) or (*Quercus virginiana*, coastal live oak, east of the Brazos River). Other species, such as *Quercus incana* (bluejack oak, on xeric sites), *Prosopis glandulosa* (mesquite), *Celtis laevigata* (sugar hackberry), *Ulmus crassifolia* (cedar elm), *Quercus nigra* (water oak), and *Juniperus virginiana* (eastern redcedar), can also be present in the overstory. Shrubs may attain significant cover in the understory, with species including *Ilex vomitoria* (yaupon), *Callicarpa americana* (American beautyberry), *Sideroxylon lanuginosum* (gum bumelia), *Crataegus* spp. (hawthorn), *Ilex decidua* (possumhaw), *Toxicodendron radicans* (poison ivy), *Smilax bona-nox* (saw greenbrier), and *Juniperus virginiana* (eastern redcedar). Southern expressions may have a well-developed shrub layer with species such as *Diospyros texana* (Texas persimmon), *Condalia hookeri* (brasil), and *Opuntia engelmannii* var. *lindheimeri* (Lindheimer pricklypear). To the east, *Vaccinium arboreum* (farkleberry), *Morella cerifera* (wax-myrtle), *Diospyros virginiana* (common persimmon), and *Cornus florida* (flowering dogwood) may be common components of the understory. On some sites, *Ilex vomitoria* (yaupon) can form a nearly continuous, dense shrub layer which may sometimes be nearly impenetrable. Where light penetration is adequate to support herbaceous cover, it is typically dominated by graminoids, including mid- and tallgrass species such as *Schizachyrium scoparium* (little bluestem), *Sorghastrum nutans* (Indiangrass), and *Panicum virgatum* (switchgrass) and *Carex* spp. (sedges). Graminoid dominated sites may also form prairie patches within the savanna, particularly on tighter soils. Other grasses present include *Andropogon gerardii* (big bluestem), *Bothriochloa laguroides* ssp. *torreyana* (silver bluestem), *Paspalum plicatulum* (brownseed paspalum), *Dichanthelium* spp. (rosette grasses), *Aristida* spp. (threeawns), *Nassella leucotricha* (Texas wintergrass), and *Sporobolus cryptandrus* (sand dropseed). Non-native grass species such as *Bothriochloa ischaemum* var. *songarica* (King Ranch bluestem), *Paspalum notatum* (bahiagrass), and *Cynodon dactylon* (Bermudagrass) may dominate some sites. Forbs are often conspicuous, and may include species such as *Croton capitatus* (hog croton), *Gaillardia pulchella* (Indian blanket), *Monarda punctata* (spotted beebalm), *Rudbeckia hirta* (blackeyed Susan), *Phlox drummondii* (Drummond phlox), *Commelina erecta* (erect dayflower), *Acalypha radicans* (cardinal's feather), *Verbesina virginica* (frostweed), *Aphanostephus skirrhobasis* (lazy daisy), *Froelichia gracilis* (slender snake-cotton), *Cnidoscolus texanus* (Texas bull-nettle), and many others.

To the south, this system grades into vegetation more characteristic of south Texas, with *Quercus fusiformis* (plateau live oak) and *Prosopis glandulosa* (honey mesquite) becoming the primary overstory components, and shrubs of south Texas such as *Acacia rigidula* (blackbrush), *Forestiera angustifolia* (desert olive), *Colubrina texensis* (Texas hogplum), *Eysenhardtia texana*

(Texas kidneywood), and *Diospyros texensis* (Texas persimmon) becoming increasingly conspicuous understory components.

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* (eastern redcedar) (to the north) and *Prosopis glandulosa* (mesquite) (to the south).

VEGETATION TYPES:

Post Oak Savanna: Live Oak Motte and Woodland (602)

East-central Texas Plains Live Oak Motte and Woodland

Identifier: CES205.679.2 **Phase 3 Code:** 602

Description: *Quercus fusiformis* (plateau live oak) (or *Quercus virginiana*, coastal live oak, east of the Brazos River) dominate the overstory on these sites. This type represents 15% of the area mapped as this system. *Quercus stellata* (post oak) may be present in these woodlands. *Ilex vomitoria* (yaupon), *Callicarpa americana* (American beautyberry), *Smilax bona-nox* (greenbrier), *Sideroxylon lanuginosum* (gum bumelia), *Vitis mustangensis* (mustang grape), and *Diospyros texana* (Texas persimmon) may be present in the shrub layer. To the south, *Acacia rigidula* (blackbrush), *Colubrina texensis* (Texas hogplum), *Eysenhardtia texana* (Texas kidneywood), *Forestiera angustifolia* (desert olive), and *Zanthoxylum fagara* (colima) may form a conspicuous shrub layer. *Schizachyrium scoparium* (little bluestem), *Bothriochloa laguroides* ssp. *torreyana* (silver bluestem), and *Nassella leucotricha* (Texas wintergrass) are among the many species of grass that may be present in the herbaceous layer, though many sites may have *Bothriochloa ischaemum* var. *songarica* (King Ranch bluestem), *Paspalum notatum* (bahiagrass), or *Cynodon dactylon* (Bermudagrass) as herbaceous dominants.

Post Oak Savanna: Post Oak / Redcedar Motte and Woodland (603)

East-central Texas Plains Post Oak-Eastern Redcedar Motte and Woodland

Identifier: CES205.679.3 **Phase 3 Code:** 603

Description: Occurrences of this woodland are dominated by *Quercus stellata* (post oak) and/or *Quercus fusiformis* (plateau live oak), with *Juniperus virginiana* (eastern redcedar) as either a co-dominant of the overstory or as a conspicuous dominant of the shrub layer. This vegetation type may be well-represented on disturbed sites, particularly where fire is excluded, but represents a small amount of the system as it is mapped. Dynamics described in Ecological Site Descriptions for Claypan Savannah, Sandy Loam, and Sandy sites in the Post Oak Savanna include this vegetation type in the Oak Scrub-Shrubland Community or the Post Oak - Elm Woodland Community. These communities result from the lack of fire and the presence of heavy continuous grazing. The type may sometimes be incorrectly mapped as Post Oak / Yaupon Motte and Woodland. The shrub layer may be dominated by *Juniperus virginiana* (eastern redcedar), but *Ilex vomitoria* (yaupon) may also be conspicuous to dominant. The herbaceous layer is often poorly developed, due to the closed nature of the canopy, resulting in the reduced potential for

the development of fine fuels and the consequent maintenance of the redcedar dominance through lack of fire.

Post Oak Savanna: Post Oak / Live Oak Motte and Woodland (633)

East-central Texas Plains Post Oak – Live Oak Motte and Woodland

Identifier: CES205.679.33 **Phase 3 Code:** 633

Description: This mixed woodland type is typically dominated by *Quercus fusiformis* (plateau live oak) and *Quercus stellata* (post oak). *Prosopis glandulosa* (honey mesquite), *Celtis laevigata* (sugar hackberry), and *Ulmus crassifolia* (cedar elm) are also commonly encountered in the overstory. *Ilex vomitoria* (yaupon), *Callicarpa americana* (American beautyberry), *Prosopis glandulosa* (honey mesquite), and *Acacia farnesiana* (huisache) are commonly encountered in the shrub layer. Southern occurrences may have species such as *Condalia hookeri* (brasil), *Diospyros texana* (Texas persimmon), and *Opuntia engelmannii* var. *lindheimeri* (Lindheimer pricklypear) as significant components of the shrub layer. Herbaceous cover is typically low.

Post Oak Savanna: Post Oak / Live Oak Slope Forest (643)

East-central Texas Plains Post Oak – Live Oak Slope Forest and Woodland

Identifier: CES205.679.43 **Phase 3 Code:** 643

Description: This woodland of mixed broad-leaved evergreen and deciduous overstory is dominated by *Quercus stellata* (post oak) and *Quercus fusiformis* (plateau live oak) and occupies slopes greater than 20%.

Post Oak Savanna: Post Oak Motte and Woodland (604)

East-Central Texas Plains Post Oak Motte and Woodland

Identifier: CES205.679.4 **Phase 3 Code:** 604

Description: This vegetation type generally represents the deciduous woodland component of the system, and makes up about 14% of the system as it is mapped in Phase 3. The typical occurrence is dominated by *Quercus stellata* (post oak), with *Quercus marilandica* (blackjack oak) and/or *Quercus fusiformis* (plateau live oak) also present. *Carya texana* (black hickory) may be a significant component of the overstory, particularly on deep sands. Depending on site history and edaphic conditions, other species may be present in the overstory or may be better represented as shrubs. Such species as *Celtis laevigata* (sugar hackberry), *Prosopis glandulosa* (honey mesquite), *Quercus nigra* (water oak, in eastern occurrences), and *Ulmus crassifolia* (cedar elm) may be overstory components, and are often stunted (< 10 m in height). The shrub layer includes species such as *Ilex vomitoria* (yaupon), *Callicarpa americana* (American beautyberry), *Ilex decidua* (possumhaw), *Sideroxylon lanuginosum* (gum bumelia), *Smilax bona-nox* (greenbrier), *Condalia hookeri* (brasil), *Symphoricarpos orbiculatus* (coral-berry), *Vaccinium arboreum* (farkleberry), and *Zanthoxylum clava-herculis* (Hercules-club). Herbaceous components are often represented by components of the surrounding prairies, primarily *Schizachyrium scoparium* (little bluestem), but also *Sorghastrum nutans* (Indiangrass), *Andropogon gerardii* (big bluestem), and, to the south and east, *Paspalum plicatulum* (brownseed paspalum). Other grass species may include *Bothriochloa laguroides* ssp. *torreyana* (silver bluestem), *Elymus canadensis* (Canada wildrye), *Panicum virgatum* (switchgrass), *Paspalum floridanum* (Florida paspalum),

Paspalum setaceum (fringeleaf paspalum), *Sporobolus compositus* (tall dropseed), and *Tridens flavus* (purpletop).

Post Oak Savanna: Live Oak Shrubland (605)

East-central Texas Plains Live Oak Shrubland

Identifier: CES205.679.5 **Phase 3 Code:** 605

Description: These evergreen shrublands often occur on sandy soils in the vicinity of live oak woodlands. They are dominated by the shrub form of *Quercus fusiformis* (plateau live oak, often referred to locally as running live oak) that may represent clones forming dense, more or less continuous, shrub canopy with occasional emergent live oaks. Some sites may also have other shrub species such as *Ilex vomitoria* (yaupon), *Acacia rigidula* (blackbrush), and/or *Condalia hookeri* (brasil). The closed shrub canopy limits the development of the herbaceous layer.

Post Oak Savanna: Post Oak / Yaupon Motte and Woodland (613)

East-central Texas Plains Post Oak-Yaupon Motte and Woodland

Identifier: CES205.679.13 **Phase 3 Code:** 613

Description: Occurrences of this vegetation type may have an exceedingly dense shrub layer dominated by *Ilex vomitoria* (yaupon). Such occurrences are conspicuous and widespread where lack of fire and heavy continuous grazing has allowed this woody species to dominate. The overstory may be dominated by *Quercus stellata* (post oak), *Juniperus virginiana* (eastern redcedar) and/or, *Quercus fusiformis* (plateau live oak). Dynamics described in Ecological Site Descriptions for Claypan Savannah, Sandy Loam, and Sandy sites in the Post Oak Savanna include this mapping system in the Oak Scrub-Shrubland Community. The dense shrub layer is generally dominated by *Ilex vomitoria* (yaupon), almost to the exclusion of other shrub species, and the closed shrub canopy limits the development of a significant herbaceous layer.

Post Oak Savanna: Savanna Grassland (607)

East-central Texas Plains Post Oak Savanna Grassland

Identifier: CES205.679.7 **Phase 3 Code:** 607

Description: This vegetation type represents the herbaceous expression of the overall system, which is a mosaic of woody and herbaceous cover types as suggested by reference to a savanna. It constitutes about 65% of the area mapped as this system. These grasslands are often dominated by mid- and tallgrass species often present in the understory of woody expressions of the system. Dominant species include *Schizachyrium scoparium* (little bluestem), *Sorghastrum nutans* (Indiangrass), and *Panicum virgatum* (switchgrass). Other grasses present include *Andropogon gerardii* (big bluestem), *Bothriochloa laguroides* ssp. *torreyana* (silver bluestem), *Paspalum plicatulum* (brownseed paspalum) (to the south), *Nassella leucotricha* (Texas wintergrass), and *Sporobolus cryptandrus* (sand dropseed). Non-native grass species such as *Bothriochloa ischaemum* var. *songarica* (King Ranch bluestem), *Paspalum notatum* (bahiagrass), *Panicum coloratum* (kleingrass), *Dichanthium annulatum* (Kleberg bluestem), and *Cynodon dactylon* (Bermudagrass) may, and often do, dominate sites. These grasslands may be difficult to differentiate in areas of transition to Blackland Prairie or Coastal Prairie. Claypan Savannah and Claypan Prairie Ecological Sites may support occurrences

of this vegetation type, particularly where land management practices including prescribed fire and other forms of brush management are implemented. To the south, these grasslands grade into **South Texas: Sandy Mesquite Savanna Grassland**.

Post Oak Savanna: Live Oak Slope Forest (622)

East-central Texas Plains Live Oak Slope Forest and Woodland

Identifier: CES205.679.22 **Phase 3 Code:** 622

Description: This broad-leaved evergreen forest or woodland is mapped on slopes greater than 20% and is dominated by *Quercus fusiformis* (plateau live oak), though hardwood species may also occur in the canopy.

Post Oak Savanna: Oak / Hardwood Slope Forest (624)

East-central Texas Plains Deciduous Slope Forest and Woodland

Identifier: CES205.679.24 **Phase 3 Code:** 624

Description: This deciduous forest vegetation type is found on slopes greater than twenty percent. Slopes may be dominated by *Quercus stellata* (post oak), *Ulmus crassifolia* (cedar elm), *Ulmus americana* (American elm), *Quercus marilandica* (blackjack oak) and *Celtis laevigata* (sugar hackberry) and less commonly *Quercus shumardii* (Shumard oak). This vegetation type is poorly understood, and may be compositionally quite similar to surrounding woodlands. The greater topographic relief associated with this system results in more mesic conditions leading to the development of denser overstory canopy.

West Gulf Coastal Plain Chenier and Upper Texas Coast Fringe Forest and Woodland

Identifier: CES203.466

Geology: This system occupies Quaternary deposits associated with migrating shorelines, shell ridges, and coastal salt domes. The Ingleside Barrier strandplain, an ancient barrier ridge composed of deep sands and occurring well inland of the current Gulf shoreline, may have occurrences of this system associated with it.

Landform: Most occurrences occupy ridges formed from sediments deposited along ancient shorelines. These ridges, which often parallel the coast and are composed of coarse material such as sand or shell, may be up to 3 meters above mean sea level.

Soils: Soils are typically entisols of coarse textured material of either sand or shell. The Ecological Site which may be related to this system is the Coastal Sand Ecological Site where it occurs east of Galveston Bay.

Description: This woodland occupies sand and shell ridges which resulted from ancient abandoned beach ridges. Only a small area of this type is mapped in Phase 3. Typically these forests and woodlands are dominated by *Quercus virginiana* (coastal live oak); however other species such as *Celtis laevigata* (sugar hackberry) and *Quercus nigra* (water oak) may be present to co-dominant in the canopy. The understory is often patchy but may include species such as *Ilex vomitoria* (yaupon), *Callicarpa americana* (American beautyberry), *Zanthoxylum clava-herculis* (Hercules-club pricklyash), *Crataegus viridis* (green hawthorn), *Sabal minor* (dwarf

palmetto), *Morella cerifera* (wax-myrtle), and/or *Sideroxylon lanuginosum* (gum bumelia). Woody vines present in this system include *Vitis mustangensis* (Mustang grape), *Parthenocissus quinquefolia* (Virginia creeper), *Campsis radicans* (common trumpet-creeper), and *Toxicodendron radicans* (poison ivy). The two epiphytes, *Tillandsia usneoides* (Spanish moss) and *Pleopeltis polypodioides* (resurrection fern), may be commonly encountered in this system. The herbaceous layer is usually sparse, but may include species such as *Schizachyrium scoparium* (little bluestem), *Sanicula canadensis* (Canada snakeroot), *Malvaviscus arboreus* var. *drummondii* (Drummond's Turk's cap), *Elephantopus carolinianus* (leafy elephantfoot), and *Oplismenus hirtellus* (basketgrass). *Triadica sebifera* (Chinese tallow) and *Ligustrum sinense* (Chinese privet) may be important non-native invaders into this system.

VEGETATION TYPES:

Chenier Plain: Live Oak Fringe Forest (5502)

West Gulf Coastal Plain Chenier and Upper Texas Coastal Live Oak Fringe Forest and Woodland

Identifier: CES203.466.2 **Phase 3 Code:** 5502

Description: Occurrences of this type are dominated by *Quercus virginiana* (coastal live oak).

Chenier Plain: Mixed Live Oak / Deciduous Hardwood Fringe Forest (5503)

West Gulf Coastal Plain Chenier Upper Texas Coast Mixed Live Oak – Deciduous Fringe Forest and Woodland

Identifier: CES203.466.3 **Phase 3 Code:** 5503

Description: This represents the mixed deciduous – evergreen vegetation type for this system.

Texas Coastal Fringe Forest and Woodland

Identifier: CES203.464

Geology: This system occupies Holocene eolian sands of the South Texas Sand Sheet and sands of the Pleistocene Ingleside Barrier, which is mapped as Barrier Island and Beach Deposits of the Beaumont Formation.

Landform: Generally level to gently rolling landscape. Some dunes to a height of more than 15 meters (50 feet) occur, adding significant relief to the regions. Low swales and round pothole wetlands typify low landscape positions, and significant drainage systems (in the form of streams) are generally lacking.

Soils: Sands, particularly deep sands typify this system.

Description: This *Quercus fusiformis* (plateau live oak) dominated system occupies deep sands resulting from eolian deposits of Holocene and Pleistocene age. Ridge and swale topography characterizes these sites, with some large (up to 15 m tall) vegetated dunes present. In addition to forest and woodland, open stands grading into surrounding grasslands occur, as well as dense shrublands dominated (almost to the exclusion of other species) by running clones of *Quercus fusiformis* (plateau live oak). Northern expressions, occurring on Ingleside Barrier sands from

Calhoun to Kleberg County, differ somewhat from southern expressions, occurring on the South Texas Sand Sheet from southern Kleberg, Kenedy, and northern Willacy counties west to Brooks County. These latitudinal expressions differ somewhat in composition, but the transition is subtle and the general character of the system remains relatively unchanged. The association CEGLO07785 *Quercus fusiformis* – *Prosopis glandulosa* var. *glandulosa* / *Malvaviscus arboreus* var. *drummondii* Forest can be referred to the southern expression, while CEGLO02117 *Quercus fusiformis* – *Persea borbonia* Forest represents the northern expression. The system occurs within a matrix of deep sand grasslands, but also as large patch forests and woodlands. Depending on the overstory canopy and the development of the shrub layer, the herbaceous cover may resemble the surrounding grasslands, at least in composition. Herbaceous species present may include *Schizachyrium littorale* (seacoast bluestem), *Paspalum monostachyum* (gulfdune paspalum), *Paspalum plicatulum* (brownseed paspalum), *Andropogon gerardii* (big bluestem), *Sorghastrum nutans* (Indiangrass), *Elionurus tripsacoides* (Pan American balsamscale), *Trachypogon spicatus* (crinkleawn), *Acalypha radians* (cardinal's feather), *Argythamnia mercurialina* (tall wild-mercury), *Chamaecrista flexuosa* (partridge pea), *Cnidocolus texanus* (Texas bull-nettle), *Croton argyranthemus* (silverleaf croton), *Froelichia floridana* (Florida snake-cotton), *Galactia canescens* (hoary milkpea), *Eriogonum multiflorum* (heartsepal wildbuckwheat), *Rhynchosia americana* (American snoutbean), *Stillingia sylvatica* (queen's delight), *Helianthemum georgianum* (Georgia sunrose), *Zornia bracteata* (bracted zornia), and *Thelesperma nuecense* (Nueces greenthread). In northern expressions, *Persea borbonia* (redbay) is a conspicuous component of the subcanopy, and may reach the canopy, along with *Quercus hemisphaerica* (coastal laurel oak), *Quercus marilandica* (blackjack oak), and *Celtis laevigata* (sugar hackberry). A relatively continuous shrubby understory may be dominated by species such as *Callicarpa americana* (American beautyberry), *Malvaviscus arboreus* (Turk's cap), and, in the north *Ilex vomitoria* (yaupon), or the shrub layer may not be well-developed. Other woody species in the understory may include *Zanthoxylum hirsutum* (tickle-tongue), *Condalia hookeri* (brasil), *Ziziphus obtusifolia* (lotebush), *Zanthoxylum fagara* (colima), *Forestiera angustifolia* (desert olive), *Diospyros texana* (Texas persimmon), and in the north, *Vaccinium arboreum* (farkleberry), *Erythrina herbacea* (coralbean), and *Morella cerifera* (wax-myrtle). The epiphytes *Tillandsia recurvata* (ballmoss) and *Tillandsia usneoides* (Spanish moss) are commonly encountered, with *Tillandsia bailey* (Bailey's ballmoss) less commonly found, and only in the south. *Vitis mustangensis* (mustang grape) is a conspicuous woody vine throughout, while northern expressions may also contain *Ampelopsis arborea* (peppervine), *Smilax bona-nox* (saw greenbrier), and *Toxicodendron radicans* (poison ivy). The southern occurrences of this deep sand live oak woodland and forest have some woody and herbaceous species more characteristic of the south Texas plains. Most conspicuously, live oak woodland margins in the south have an open overstory co-dominated by *Prosopis glandulosa* (honey mesquite). Mesquite occurs, but to a less conspicuous extent, in the northern portions of the system. Pothole ponds and swales accumulate water through percolation from adjacent sands, and are characterized by the presence of numerous sedges including *Cyperus* spp. (flatsedges), *Eleocharis* spp. (spikerushes), *Fimbristylis caroliniana* (Carolina fimbry), *Fuirena scirpoidea* (southern umbrellasedge), *Fuirena simplex* (western umbrellasedge), *Rhynchospora* spp. (beaksedges), *Schoenoplectus erectus* ssp. *raynalii* (sharp-scale bulrush), *Schoenoplectus saximontanus* (Rocky Mountain bulrush), and *Schoenoplectus pungens* var. *longispicatus* (common threesquare). Other species commonly encountered in these wetlands include *Andropogon glomeratus* (bushy bluestem), *Spartina patens* (marshhay cordgrass), *Echinodorus*

berteroi (common burhead), *Hydrocotyle bonariensis* (largeleaf pennywort), *Juncus* spp. (rushes), *Mikania scandens* (climbing hemp-weed), *Nymphaea elegans* (tropical royalblue waterlily), *Phyla lanceolata* (lanceleaf frogfruit), *Sagittaria longiloba* (longlobe arrowhead), and *Typha domingensis* (southern cattail).

VEGETATION TYPES:

Coastal and Sandsheet: Deep Sand Live Oak Forest and Woodland (6402)

Texas Coastal Fringe Deep Sand Live Oak Forest and Woodland

Identifier: CES203.464.2 **Phase 3 Code:** 6402

Description: This broadleaf evergreen system makes up 69% of the system as it is mapped and is dominated by *Quercus fusiformis* (plateau live oak) in the overstory. This constitutes the typical woodland of the system and generally conforms to the system description.

Coastal and Sandsheet: Deep Sand Live Oak / Mesquite Woodland (6403)

Texas Coastal Fringe Deep Sand Live Oak–Mesquite Forest and Woodland

Identifier: CES203.464.3 **Phase 3 Code:** 6403

Description: *Quercus fusiformis* (plateau live oak) and *Prosopis glandulosa* (honey mesquite) share dominance in the canopy of this type. It is best developed on the South Texas Sandsheet where it occurs on the margin of live oak forest and woodland. Shrubs typical of South Texas, such as *Condalia hookeri* (brasil), *Zanthoxylum fagara* (colima), *Diospyros texana* (Texas persimmon), and *Ziziphus obtusifolia* (lotebush) are also commonly encountered in this type.

Coastal and Sandsheet: Deep Sand Live Oak Shrubland (6405)

Texas Coastal Fringe Deep Sand Live Oak Shrubland

Identifier: CES203.464.5 **Phase 3 Code:** 6405

Description: This evergreen shrubland is dominated by low-stature *Quercus fusiformis* (plateau live oak) which sometimes forms extensive clones locally known as running live oak. These shrublands are often found in juxtaposition with live oak forest and woodland. Other shrub species, such as *Morella cerifera* (wax-myrtle), *Ilex vomitoria* (yaupon), and *Baccharis* spp. (baccharis), may be present.

Coastal and Sandsheet: Deep Sand Live Oak Swale Marsh (6407)

Texas Coastal Fringe Deep Sand Live Oak Swale Marsh

Identifier: CES203.464.7 **Phase 3 Code:** 6407

Description: Potholes and swales within the **Deep Sand Live Oak Forest and Woodland** accumulate moisture seasonally, and are typically dominated by various sedge species, including *Cyperus* spp. (flatsedges), *Eleocharis* spp. (spikerushes), *Fimbristylis* spp. (fimbrys), *Fuirena* spp. (umbrellasedges), *Rhynchospora* spp. (beaksedges), and *Schoenoplectus* spp. (bulrushes).

Shrublands

Edwards Plateau Limestone Shrubland

Identifier: CES303.041

Geology: Often on massive limestone such as Edwards or related formations.

Landform: This system may occur on plateaus, or slopes, and may often form a discontinuous band around a plateau edge as it breaks into the adjacent slope.

Soils: Soils are characterized by Shallow or Very Shallow Ecological Sites, but may also be found on Low Stony Hill Ecological Sites.

Description: This system may be represented by extensive continuous shrub cover, or occur as a discontinuous shrubland, often with scattered emergent overstory trees. *Quercus sinuata* var. *breviloba* (white shin oak), *Quercus fusiformis* (plateau live oak), and/or *Juniperus ashei* (Ashe juniper) may be important components of the system. Shrub cover may be dominated by these species, or may be represented as an assemblage of a rather diverse array of species including *Rhus virens* (evergreen sumac), *Rhus lanceolata* (prairie sumac), *Cercis canadensis* var. *texensis* (Texas redbud), *Forestiera pubescens* (elbowbush), *Ungnadia speciosa* (Mexican buckeye), *Sophora secundiflora* (Texas mountain-laurel), *Diospyros texana* (Texas persimmon), *Salvia ballotiflora* (mejorana), *Mimosa borealis* (fragrant mimosa), *Condalia hookeri* (brasil), *Rhus trilobata* (skunkbush sumac), *Opuntia engelmannii* var. *lindheimeri* (Lindheimer pricklypear), and *Mahonia trifoliolata* (agarito). Herbaceous cover may be patchy and is generally graminoid with species including *Schizachyrium scoparium* (little bluestem), *Bouteloua curtipendula* (sideoats grama), *Bouteloua rigidisetata* (Texas grama), *Bouteloua trifida* (red grama), *Hilaria belangeri* (curlymesquite), *Bothriochloa laguroides* ssp. *torreyana* (silver bluestem), *Nassella leucotricha* (Texas wintergrass), *Erioneuron pilosum* (hairy tridens), *Aristida* spp. (three-awn grass), and others. Disturbances such as fire may be important processes maintaining this system. However, it appears to persist on thin-soiled sites.

VEGETATION TYPES:

Edwards Plateau: Ashe Juniper / Live Oak Shrubland (1205)

Edwards Plateau Limestone Evergreen Shrubland and Shrub Motte

Identifier: CES303.041.7

Phase 3 Code: 1205

Description: This is a commonly encountered type of shrub cover on the Edwards Plateau. It is usually dominated by *Juniperus ashei* (Ashe juniper), often to the almost total exclusion of other species. If other species are present, *Quercus fusiformis* (plateau live oak), *Sophora secundiflora* (Texas mountain-laurel), *Mahonia trifoliolata* (agarito), and/or *Rhus virens* (evergreen sumac) contribute to the evergreen cover of this shrubland.

Edwards Plateau: Shin Oak Shrubland (1206)

Edwards Plateau Limestone Deciduous Shrubland and Shrub Motte

Identifier: CES303.041.8

Phase 3 Code: 1206

Description: *Quercus sinuata* var. *breviloba* (white shin oak) may be the significant dominant in these shrublands, sometimes forming nearly monotypic stands. *Quercus fusiformis* (plateau live oak), *Juniperus ashei* (Ashe juniper), and other broad-leaved evergreen shrub species may be common components, but are not dominant. Scattered individuals of these species may be emergent as trees (along with other species such as *Celtis* spp. (hackberry), *Prosopis glandulosa* (mesquite), *Quercus buckleyi* (Texas oak)) and form a sparse overstory canopy. At some sites, *Quercus sinuata* var. *breviloba* (white shin oak) is uncommon or lacking and other deciduous shrubs dominate. Such species as *Diospyros texana* (Texas persimmon), *Cercis canadensis* var. *texensis* (Texas redbud), *Prosopis glandulosa* (mesquite), *Mahonia trifoliolata* (agarito), *Forestiera pubescens* (elbowbush), *Rhus lanceolata* (prairie sumac), *Condalia hookeri* (brasil), *Rhus trilobata* (skunkbush sumac), *Ungnadia speciosa* (Mexican buckeye), and/or *Mimosa borealis* (fragrant mimosa) may be significant components. These shrublands may be surrounded by grassland, or may transition to adjacent woodland.

Edwards Plateau: Ashe Juniper / Live Oak Slope Shrubland (1225)

Edwards Plateau Limestone Evergreen Slope Shrubland

Identifier: CES303.041.17

Phase 3 Code: 1225

Description: This shrubland resembles the **Edwards Plateau: Ashe Juniper / Live Oak Shrubland**, but occurs on slopes of greater than twenty percent and often occupies Steep Rocky and Steep Adobe Ecological Sites. *Rhus virens* (evergreen sumac) and/or *Garrya ovata* var. *lindheimeri* (Lindheimer's silktassel) may be more commonly encountered in this vegetation type.

Edwards Plateau: Shin Oak Slope Shrubland (1226)

Edwards Plateau Limestone Deciduous Slope Shrubland

Identifier: CES303.041.18

Phase 3 Code: 1226

Description: This shrubland resembles **Edwards Plateau: Shin Oak Shrubland**, but occurs on slopes greater than twenty percent. As with the occurrences off of slopes, *Quercus sinuata* var. *breviloba* (white shin oak) may not be dominant. *Nolina texana* (Texas sacahuista), *Acacia roemeriana* (Roemer's acacia), *Salvia ballotiflora* (mejorana), *Ungnadia speciosa* (Mexican buckeye), and *Eysenhardtia texana* (Texas kidneywood) may be more commonly encountered on slopes than in non-slope deciduous shrublands.

Tamaulipan Calcareous Thornscrub

Identifier: CES301.986

Geology: Ridge or plateau forming hard calcareous substrates such as caliche of the Goliad Formation or Uvalde Gravel.

Landform: Typically ridges high on the landscape, sometimes rolling or relatively level plateaus.

Soils: Shallow, Shallow Ridge or Gravelly Ridge Ecological Sites.

Description: This shrubland typically occupies xeric, rocky uplands on calcareous substrates including limestone, caliche (such as those of the Goliad Formation), calcareous gravels, and calcareous sandstone of south Texas and northeastern Mexico. Soils are usually thin, and sites are most frequently dominated by shrubs between 0.5 and 2 m in height. Shrub canopy can be dense (to about 90%), or sparser where rocky exposures reduce substrate for rooting. A sparse overstory, usually <4 m in height, may be present and composed of species such as *Prosopis glandulosa* (honey mesquite) and, in the south, *Ebenopsis ebano* (Texas ebony), *Cordia boissieri* (anacahuita), and/or *Helietta parvifolia* (baretta). *Quercus fusiformis* (plateau live oak) may form a relatively open canopy in areas in the northeastern part of the South Texas Plains. The shrub layer may be heavily dominated by *Leucophyllum frutescens* (cenizo), *Acacia berlandieri* (guajillo), and/or *Acacia rigidula* (blackbrush). More commonly, a diverse array of shrubs is present, including these three in addition to several of the following species: *Salvia ballotiflora* (shrubby blue sage), *Eysenhardtia texana* (Texas kidneywood), *Guaiacum angustifolium* (guayacan), *Sophora secundiflora* (Texas mountain-laurel), *Mahonia trifoliolata* (agarito), *Ephedra antisyphilitica* (joint-fir), *Sideroxylon celastrinum* (la coma), *Jatropha dioica* (leatherstem), *Bernardia myricifolia* (oreja de raton), *Karwinskia humboldtiana* (coyotillo), *Aloysia macrostachya* (vara dulce), *Condalia spathulata* (knifeleaf condalia), *Croton incanus* (Torrey croton), *Koeberlinia spinosa* (allthorn), *Acacia schaffneri* (huisachillo), *Forestiera angustifolia* (desert olive), *Celtis ehrenbergiana* (granjeno), *Diospyros texana* (Texas persimmon), *Cylindropuntia leptocaulis* (tasajillo), *Krameria ramosissima* (calderona), *Yucca treculeana* (Spanish dagger), and others. More southerly occurrences may also contain *Lippia graveolens* (redbrush lippia), *Helietta parvifolia* (baretta), *Gochnatia hypoleuca* (chomonque), *Croton humilis* (low croton), *Ebenopsis ebano* (Texas ebony), and/or *Mortonia greggii* (afinador). The herbaceous layer may be somewhat well-developed, but often bare rock is easily visible through the layer. Many sites are now dominated by non-native grasses, particularly *Bothriochloa ischaemum* var. *songarica* (King Ranch bluestem) and/or *Pennisetum ciliare* (buffelgrass). Other grasses are often shortgrasses, with species such as *Bouteloua rigidiseta* (Texas grama), *Bouteloua hirsuta* (hairy grama), *Bouteloua dactyloides* (buffalograss), *Hilaria belangeri* (curlmesquite), *Aristida purpurea* (purple threeawn), *Bouteloua curtipendula* (sideoats grama), and *Setaria leucopila* (plains bristlegrass) present. Forbs and subshrubs are conspicuous in the herbaceous layer and include species such as *Tiquilia canescens* (oreja de perro), *Thamnosma texana* (Texas desert-rue), *Galphimia angustifolia* (narrowleaf thryallis), *Polygala alba* (white milkwort), *Cordia podocephala* (cluster cordial), *Acourtia runcinata* (peonia), *Dalea aurea* (golden dalea), *Calliandra conferta* (Rio Grande stickpea), *Chamaecrista greggii* (Gregg's senna), *Heliotropium torreyi* (Torrey heliotrope), *Melampodium cinereum* (blackfoot daisy), *Hymenopappus scabiosaeus* (old plainsman), *Desmanthus velutinus* (velvet bundleflower), *Calylophus hartwegii* (Hartweg evening primrose), *Simsia calva* (awnless bush sunflower), *Hermannia texana* (Mexican mallow), *Macrosiphonia lanuginosa* var. *macrosiphon* (plateau rocktrumpet), *Viguiera stenoloba* (skeletonleaf goldeneye), *Stenaria nigricans* (prairie bluets), *Thymophylla pentachaeta* (fire-hair dogweed), *Wedelia hispida* (hairy zexmania), and *Meximalva filipes* (violet sida). Down slope from these sites, soil development increases, soils tend to be tight, a more well-developed overstory of *Prosopis glandulosa* (honey mesquite) becomes prominent, and species such as *Castela erecta* (amargosa) and *Ziziphus obtusifolia* (lotebush) increase in cover relative to other species.

VEGETATION TYPES:

South Texas: Calcareous Live Oak Motte and Woodland (7202)

Tamaulipan Calcareous Live Oak Motte and Woodland

Identifier: CES301.986.2 **Phase 3 Code:** 7202

Description: Sites in the northern part of the South Texas Plains where *Quercus fusiformis* (plateau live oak) dominates the overstory. Various shrub species of the system may dominate the understory.

South Texas: Calcareous Shrubland (7204)

Tamaulipan Calcareous Shrubland

Identifier: CES301.986.4 **Phase 3 Code:** 7204

Description: Typical shrublands of ridges and caliche plateaus with moderate shrub cover and sometimes a sparse overstory canopy.

South Texas: Calcareous Dense Shrubland (7205)

Tamaulipan Calcareous Dense Shrubland

Identifier: CES301.986.5 **Phase 3 Code:** 7205

Description: Dense shrublands often dominated by species such as *Acacia rigidula* (blackbrush), *Leucophyllum frutescens* (cenizo), and *Acacia berlandieri* (guajillo).

South Texas: Calcareous Sparse Shrubland (7207)

Tamaulipan Calcareous Sparse Shrubland

Identifier: CES301.986.7 **Phase 3 Code:** 7207

Description: Sites on calcareous ridges and plateaus where shrub canopy is sparse. These sites are often managed pasture, with species such as *Pennisetum ciliare* (buffelgrass), *Bothriochloa ischaemum* var. *songarica* (King Ranch bluestem), or *Cynodon dactylon* (Bermudagrass).

Tamaulipan Mixed Deciduous Thornscrub

Identifier: CES301.983

Geology: Well-represented on the Eocene Claiborne and Jackson Groups and the Pleistocene Beaumont Formation, but also found on various other formations.

Landform: On gently rolling to nearly level sites, sometime interdigitated with calcareous ridges and low lying drainages and bottomlands.

Soils: Clay, Clay Flat, and Clay Loam Ecological Sites are the typical soils for this system, though it may occur on a variety of other tight soils.

Description: This shrubland is differentiated from **Tamaulipan Savanna Grassland** as it occupies tighter soils, as opposed to the sandier soils of the savanna grassland. The sites are often lower in the landscape compared to nearby savanna grassland or **Tamaulipan Calcareous Shrubland**, but would be considered uplands as they are distant from bottomland soils and drainages, and are not well-developed woodlands typical of the lowest landscape positions. To a large degree, all of these systems share numerous shrub species, but show subtle differences in relative dominance. However, this system generally occurs as a closed shrubland or low woodland, usually lacking a purely open herbaceous component. Soils are clays, clay loams, and

clay flats and are often calcareous or alkaline to varying degrees. Some sites are highly saline, and these sites are occupied by **Tamaulipan Saline Shrubland**, but transitions between the systems may be subtle. *Prosopis glandulosa* (honey mesquite) is very often a conspicuous component of the canopy, sometimes reaching to 6 m in height. This canopy may be dense, but given the open nature of the canopy of individual *Prosopis glandulosa* (honey mesquite), significant solar radiation reaches the lower strata. *Acacia farnesiana* (huisache), *Celtis ehrenbergiana* (granjeno), *Ebenopsis ebano* (Texas ebony), and *Celtis laevigata* (sugar hackberry) may also be components of the canopy, but *Prosopis glandulosa* (honey mesquite) usually dominates. The overstory canopy may be open with only scattered emergent trees over a dense shrub layer at 1 to 3 m in height. Depending on land use history, the shrub understory may be limited to a few species such as *Opuntia engelmannii* var. *lindheimeri* (Lindheimer pricklypear), *Ziziphus obtusifolia* (lotebush), or *Celtis ehrenbergiana* (granjeno) on relatively recently cleared sites. On more mature sites, a diverse assemblage of species such as *Acacia rigidula* (blackbrush), *Castela erecta* (amargosa), *Malpighia glabra* (Barbados cherry), *Opuntia engelmannii* var. *lindheimeri* (Lindheimer pricklypear), *Cylindropuntia leptocaulis* (tasajillo), *Ziziphus obtusifolia* (lotebush), *Celtis ehrenbergiana* (granjeno), *Lycium berlandieri* (Berlandier wolfberry), *Forestiera angustifolia* (desert olive), *Guaiacum angustifolium* (guayacan), *Diospyros texana* (Texas persimmon), *Amyris texana* (Texas torchwood), *Karwinskia humboldtiana* (coyotillo), *Havardia pallens* (tenaza), *Phaulothamnus spinescens* (snake-eyes), *Schaefferia cuneifolia* (desert yaupon), *Condalia hookeri* (brasil), and *Zanthoxylum fagara* (colima) may occur. *Leucophyllum frutescens* (cenizo) and *Acacia berlandieri* (guajillo) may be present, but occur as scattered individuals as opposed to dominating the aspect of the community as they sometimes do on some shallow-soiled calcareous sites. However, like some shallow-soiled calcareous sites, *Acacia rigidula* (blackbrush) is the aspect dominant of the shrub layer. The herbaceous layer is usually fairly sparse. Currently, the herbaceous layer may actually be dense with the non-native grass *Urochloa maximum* (guineagrass). Other non-native species, such as *Pennisetum ciliare* (buffelgrass), *Cynodon dactylon* (Bermudagrass), *Bothriochloa ischaemum* var. *songarica* (King Ranch bluestem), and *Dichantherium annulatum* (Kleberg bluestem), may also be present to dominant. Native grasses, such as *Bothriochloa laguroides* ssp. *torreyana* (silver bluestem), *Trichloris* spp. (false Rhodes grasses), and *Pappophorum bicolor* (pink pappusgrass), may be present.

VEGETATION TYPES:

South Texas: Clayey Live Oak Motte and Woodland (7002)

Tamaulipan Clayey Live Oak Motte and Woodland

Identifier: CES301.983.2 **Phase 3 Code:** 7002

Description: Sites along the northern edge of the South Texas Plains on clayey substrates where *Quercus fusiformis* (plateau live oak) dominates the overstory. The understory is often dominated by numerous shrub species.

South Texas: Clayey Mesquite Mixed Shrubland (7004)

Tamaulipan Clayey Mesquite Mixed Shrubland

Identifier: CES301.983.4 **Phase 3 Code:** 7004

Description: Sites often with a sparse to dense overstory of *Prosopis glandulosa* (honey mesquite). Numerous shrub species occupy the understory, including *Acacia farnesiana*

(huisache), *Acacia rigidula* (blackbrush), *Opuntia engelmannii* var. *lindheimeri* (Lindheimer pricklypear), and *Celtis ehrenbergiana* (granjeno).

South Texas: Clayey Blackbrush Mixed Shrubland (7005)

Tamaulipan Clayey Blackbrush Mixed Shrubland

Identifier: CES301.983.5

Phase 3 Code: 7004

Description: Sites are typically dominated by a dense canopy of *Acacia rigidula* (blackbrush), but these sites may have numerous species in the canopy, including *Prosopis glandulosa* (honey mesquite), *Celtis ehrenbergiana* (granjeno), *Condalia hookeri* (brasil), and *Opuntia engelmannii* var. *lindheimeri* (Lindheimer pricklypear). These shrublands may be tall (to 2 or more meters in height) making them resemble dense woodlands.

Tamaulipan Savanna Grassland

Identifier: CES301.985

Geology: On thinner eolian sands on the western side of the South Texas Sand Sheet, and other sandy sites such as those of the Eocene sands of the Carrizo, Queen City, and Sparta Formations. Also found associated with other formations, such as Oakville Sandstone and other formations producing sandy residuum.

Landform: Level to gently rolling sites.

Soils: Sandy to sandy loam sites, such as those of the Sandy, Loamy Sand and Sandy Loam Ecological Sites.

Description: This system occurs on sandy soils, including sandy, sandy loam, and loamy sands. It is typically dominated by *Prosopis glandulosa* (honey mesquite) in the overstory, and the overstory may be sparse, giving the aspect of an open grassland, with scattered trees and shrubs. Or, more commonly, the system occurs as shrub-dominated patches within a grassy matrix, with an emergent canopy to about 6 or more meters in height of *Prosopis glandulosa* (honey mesquite) and sometimes other species, such as *Ebenopsis ebano* (Texas ebony) or *Celtis ehrenbergiana* (granjeno). Sometimes the overstory canopy is well-developed and would be considered woodland. These patches often coalesce to form significant expanses of shrubland. Sites with somewhat tighter soils tend to have a denser shrub stratum, while deep sands and sandy sites tend to be more open, often with sizeable areas lacking significant shrub cover and dominated by a primarily graminoid herbaceous layer. The shrub component of woody patches or shrublands is commonly dominated by species such as *Zanthoxylum fagara* (Colima), *Condalia hookeri* (brasil), *Celtis ehrenbergiana* (granjeno), *Opuntia engelmannii* var. *lindheimeri* (Lindheimer pricklypear), *Diospyros texana* (Texas persimmon), *Colubrina texensis* (Texas hogplum), *Cylindropuntia leptocaulis* (tasajillo), and *Acacia farnesiana* (huisache). *Prosopis glandulosa* (honey mesquite) is almost always present, and is often dominant to co-dominant and occupies the highest canopy position (sometimes sharing that position with few other species), sometimes to 6 m in height. Numerous other species may also occur in the shrub layer, including but not limited to *Schaefferia cuneifolia* (desert yaupon), *Mahonia trifoliolata* (agarito), *Forestiera angustifolia* (desert olive), *Lycium berlandieri* (Berlandier wolfberry), *Aloysia gratissima* (whitebrush), *Salvia ballotiflora* (shrubby blue sage), and *Ziziphus obtusifolia*

(lotebush). The diversity of the shrub layer is significantly influenced by land use history, with recently cleared areas sometimes being represented by a near monoculture of *Prosopis glandulosa* (honey mesquite) in the overstory, *Pennisetum ciliare* (buffelgrass) in the herbaceous layer, and *Opuntia engelmannii* var. *lindheimeri* (Lindheimer pricklypear) as the most conspicuous component of the shrub layer. The herbaceous layer is typically dominated by graminoids and may be quite dense (60 to 100% cover). Grasses, such as *Schizachyrium scoparium* (little bluestem), *Schizachyrium littorale* (seacoast bluestem), *Chloris cucullata* (hooded windmillgrass), *Paspalum monostachyum* (gulfdune paspalum), *Paspalum plicatulum* (brownseed paspalum), *Elionurus tripsacoides* (Pan American balsamscale), *Bouteloua rigidiseta* (Texas grama), *Urochloa ciliatissima* (fringed signalgrass), *Heteropogon contortus* (tanglehead), *Eragrostis secundiflora* (red lovegrass), *Bothriochloa laguroides* ssp. *torreyana* (silver bluestem), *Trichloris pluriflora* (multiflower false Rhodes grass), *Aristida* spp. (threeawns), *Sporobolus cryptandrus* (sand dropseed), and/or *Dichantherium* spp. (rosette grasses) commonly dominate or co-dominate the herbaceous layer. Forbs are also common, including species such as *Gaillardia pulchella* (Indian blanket), *Eriogonum multiflorum* (heartsepal wildbuckwheat), *Croton* spp. (croton), *Cnidoscolus texana* (Texas bull-nettle), *Aphanostephus skirrhobasis* (lazy daisy), *Rudbeckia hirta* (blackeyed Susan), *Verbesina encelioides* (cowpen daisy), *Clematis drummondii* (old man's beard), *Cynanchum barbigerum* (bearded shallow-wort), *Thymophylla pentachaeta* (parralena), *Justicia pilosella* (hairy tubetongue), *Nama jamaicense* (fiddleleaf nama), *Monarda punctata* (spotted beebalm), *Palafoxia texana* (Texas palafoxia), *Florestina tripteris* (white palafoxia), *Zornia bracteata* (bracted zornia), *Croptilon divaricatum* (scratch-daisy), *Rhynchosia americana* (American snoutbean), and *Wedelia texana* (hairy zexmania), though some of these species are restricted to the sandiest sites.

VEGETATION TYPES:

South Texas: Sandy Live Oak Motte and Woodland (7102)

Tamaulipan Sandy Live Oak Motte and Woodland

Identifier: CES301.985.2 **Phase 3 Code:** 7102

Description: Sandy sites along the northern edge of the South Texas Plains where *Quercus fusiformis* (plateau live oak) dominates the canopy. *Prosopis glandulosa* (honey mesquite), *Celtis ehrenbergiana* (granjeno), *Zanthoxylum fagara* (colima), and various other species may dominate the understory and/or shrub layer.

South Texas: Sandy Mesquite / Evergreen Woodland (7103)

Tamaulipan Sandy Mesquite–Evergreen Woodland

Identifier: CES301.985.3 **Phase 3 Code:** 7103

Description: Woodlands on sandy sites in the southern part of the South Texas Plains where the canopy is co-dominated by *Prosopis glandulosa* (honey mesquite) and *Ebenopsis ebano* (Texas ebony). A diverse shrub layer is often present.

South Texas: Sandy Mesquite Woodland and Shrubland (7104)

Tamaulipan Sandy Mesquite Woodland

Identifier: CES301.985.4 **Phase 3 Code:** 7104

Description: Woodlands or shrublands on sandy substrate where *Prosopis glandulosa* (honey mesquite) and *Acacia farnesiana* (huisache) dominate the overstory. Other species, including *Celtis ehrenbergiana* (granjeno) may also occur in the canopy. A diverse shrub layer may also be present, with species such as *Diospyros texana* (Texas persimmon), *Zanthoxylum fagara* (colima), *Condalia hookeri* (brasil), *Acacia rigidula* (blackbrush) and others.

South Texas: Sandy Mesquite Dense Shrubland (7105)

Tamaulipan Sandy Mesquite Dense Shrubland

Identifier: CES301.985.5 **Phase 3 Code:** 7105

Description: Dense shrublands on sandy substrates. These shrublands may have *Prosopis glandulosa* (honey mesquite) in the overstory, though the height of the upper layer is typically less than 5 m in height. Numerous other shrub species form the dense shrub canopy.

South Texas: Sandy Mesquite Savanna Grassland (7107)

Tamaulipan Savanna Grassland

Identifier: CES301.985.7 **Phase 3 Code:** 7107

Description: Grass dominated sandy sites, sometimes with a sparse or patchy overstory of *Prosopis glandulosa* (honey mesquite) or other species. *Schizachyrium scoparium* (little bluestem), *Schizachyrium littorale* (seacoast bluestem), *Bothriochloa laguroides* ssp. *torreyana* (silver bluestem), and other native species may dominate these grasslands, or non-native species such as *Cynodon dactylon* (Bermudagrass), *Bothriochloa ischaemum* var. *songarica* (King Ranch bluestem), or *Pennisetum ciliare* (buffelgrass) may dominate.

Tamaulipan Saline Thornscrub

Identifier: Previously Undescribed System

Geology: Frequently associated with the Yegua Formation or the Jackson Group in Phase 3.

Landform: Gently rolling to low flats, sometimes dissected by minor drainages.

Soils: Most saline sites within the Saline Clay and Saline Clay Loam Ecological Site.

Description: This system is an open shrubland on sites where soil salinity is particularly high on saline clays such as Montell saline clays, Maverick, and Catarina soils. Soils mapped as saline clay or saline clay loam, but where soil salinity is not extreme, will be occupied by **Tamaulipan Mixed Deciduous Shrubland**. Often, **Tamaulipan Calcareous Shrubland** occurs upslope of this system. This system is often on level flats to gently rolling landscapes, and soils may have a veneer of gravel over the clay. *Prosopis glandulosa* (honey mesquite) usually forms a scattered emergent canopy less than 5 m in height, creating an overstory canopy cover of around 10%. Shrubs and subshrubs, such as *Varilla texana* (saladillo), *Castela erecta* (amargosa), *Acacia rigidula* (blackbrush), *Atriplex canescens* (four-wing saltbush), *Isocoma coronopifolia* (goldenweed), *Condalia spathulata* (knifeleaf condalia), *Jatropha dioica* (leatherstem), *Suaeda* spp. (seepweeds), *Opuntia engelmannii* var. *lindheimeri* (Lindheimer prickly pear), *Cylindropuntia leptocaulis* (tasajillo), *Xylothamia palmeri* (South Texas ericameria), *Tiquilia*

canescens (oreja de perro), and *Prosopis reptans* (tornillo), are conspicuous elements of the relatively open shrubland (20 to 70% canopy cover). Patchy grasses typify the herbaceous layer, with such species as *Hilaria belangeri* (curly mesquite), *Sporobolus pyramidatus* (whorled dropseed), *Pappophorum bicolor* (pink pappusgrass), *Bouteloua dactyloides* (buffalograss), *Bouteloua trifida* (red grama), and occasionally *Monanthochloe littoralis* (shoregrass). Forbs such as *Billieturnera helleri* (Billieweed), *Chamaesyce albomarginata* (white-lip matspurge), *Heliotropium curassavicum* (seaside heliotrope), and *Thymophylla pentachaeta* (parralena), may be present and conspicuous. Cacti are sometimes well-represented in the ground layer, including species such as *Echinocereus reichenbachii* var. *fitchii* (Fitch's hedgehog cactus), *Escobaria emskoetteriana* (Robert's foxtail-cactus), *Mammillaria heyderi* (Heyder's nipple-cactus), *Sclerocactus scheeri* (fishhook cactus), *Echinocactus texensis* (horse crippler), and *Thelocactus setispinus* (twisted rib cactus).

VEGETATION TYPE:

South Texas: Salty Thornscrub (6806)

Tamaulipan Saline Thornscrub

Identifier:

Phase 3 Code: 6806

Description: As described for system.

Tamaulipan Lomas

Identifier: CES301.462

Geology: Quaternary windblown deposits identified as clay dunes (Qcd).

Landform: Round, elliptic, or crescent-shaped topographic highs, often within a matrix of low flats influenced by wind-driven tides.

Soils: Often associated with the Coastal Ridge Ecological Site, such as Point Isabel clay loam and Lalinda fine sandy loam.

Description: This system occupies clay dunes (lomas) along the lower Texas coast (and somewhat inland) and adjacent Mexico. These often develop from deposition of windblown fine sediments, resulting in elevated landforms within a matrix of tidal flats. These are typically fairly dense to extremely dense shrublands, often 2-4 meters in height, and dominated by species such as *Ebenopsis ebano* (Texas ebony), *Citharexylum berlandieri* (negrito), *Leucophyllum frutescens* (cenizo), *Yucca treculeana* (Spanish dagger), *Jatropha dioica* (leatherstem), *Acacia rigidula* (blackbrush), *Opuntia engelmannii* var. *lindheimeri* (Lindheimer prickly pear), *Prosopis glandulosa* (honey mesquite), *Sideroxylon celastrinum* (la coma), *Forestiera angustifolia* (desert olive), *Celtis ehrenbergiana* (granjeno), *Guaiacum angustifolium* (guayacan), *Karwinskia humboldtiana* (coyotillo), *Castela erecta* (amargosa), *Zanthoxylum fagara* (colima), *Phaulothamnus spinescens* (snake-eyes), and *Ziziphus obtusifolia* (lotebush). There may be scattered emergent trees of *Ebenopsis ebano* (Texas ebony) and *Prosopis glandulosa* (honey mesquite) forming a sparse woodland. Within these shrublands, the herbaceous layer is typically not well-developed, however the non-native *Urochloa maximum* (guineagrass), may be conspicuous. A grassland, often dominated by *Sporobolus wrightii* (big sacaton), occupies the margins of these clay dunes, as they grade downslope into the surrounding salty flats. These

margins may also contain *Sporobolus pyramidatus* (whorled dropseed), *Monanthochloe littoralis* (shoregrass), and *Spartina spartinae* (Gulf cordgrass). Other somewhat halophytic species, such as *Maytenus phyllanthoides* (gutta-percha) and *Prosopis reptans* (tornillo) may also occupy these dunes. The proximity of many of these dunes to active tidal fluctuations and salt spray also influences species composition at these sites.

VEGETATION TYPES:

South Texas: Loma Evergreen Shrubland (7305)

Tamaulipan Loma Evergreen Shrubland

Identifier: CES301.462.5 **Phase 3 Code:** 7305

Description: Clay dunes where the shrub layer is dense and may contain a preponderance of evergreen shrubs such as *Ebenopsis ebano* (Texas ebony), *Yucca treculeana* (Spanish dagger), and *Opuntia engelmannii* var. *lindheimeri* (Lindheimer pricklypear). However, in this subtropical region, many species retain their leaves throughout the winter and only lose their leaves during drought.

South Texas: Loma Deciduous Shrubland (7306)

Tamaulipan Loma Deciduous Shrubland

Identifier: CES301.462.6 **Phase 3 Code:** 7306

Description: Clay dunes where the shrub layer is less dense and has a reduced amount of evergreen components.

South Texas: Loma Grassland (7307)

Tamaulipan Loma Grassland

Identifier: CES301.462.6 **Phase 3 Code:** 7307

Description: These grass dominated sites often occupy the edges of shrublands and are frequently dominated by *Sporobolus wrightii* (big sacaton), *Spartina spartinae* (Gulf cordgrass), *Setaria leucopila* (plains bristlegrass), *Monanthochloe littorale* (shoregrass), and/or others. *Urochloa maximum* (guineagrass) may be a conspicuous non-native.

Barrens

Texas Coastal Beach

Identifier: CES203.463

Geology: Recent sands deposited by Gulf currents and distributed by on-shore winds. These sands are redistributed by waters of bays interior to the barrier islands.

Landform: Very gently sloping and restricted to the margins of the Gulf of Mexico as well as interior bays. This type may be mapped into the unvegetated portions of the foredunes.

Soils: Recently deposited sands.

Description: This system represents unvegetated to sparsely vegetated sandy shorelines adjacent to the Gulf of Mexico and bays interior to the barrier islands. Species such as *Ipomoea pes-caprae* (goat-foot morning-glory), *Ipomoea imperati* (beach morning-glory), *Cakile* spp. (searockets), and *Tidestromia lanuginosa* (espanta vaquero) provide sparse vegetative cover. These areas generally lie near mean sea level and are often found between foredunes and tidal waters. In the case of beaches along bay margins, an active dune system is generally lacking and beaches lie between tidal waters and near-shore vegetation. As they are mapped, this system would include sparsely vegetated coppice dunes and even low foredunes. This system is dependent on highly dynamic coastal geomorphology.

VEGETATION TYPE:

Coastal: Beach (6100)

Texas Coastal Beach

Identifier: CES203.463 **Phase 3 Code:** 6100

Description: As described for system.

South Texas Salt and Brackish Tidal Flats

Identifier: CES301.461

Geology: Recent wind-distributed coastal sands. Tidal fluctuations and wind continue to redistribute these sands.

Landform: Extensive, very gentle slopes (nearly flat).

Soils: Coastal sands.

Description: This system occurs on flats influenced by tidal fluctuations in water level, primarily driven by winds rather than by diurnal or semidiurnal tidal fluctuations. Due to the nearly level condition of these flats, small fluctuations in tidal level may result in extensive changes in inundation patterns. These flats are typically associated with hypersaline bay waters of the Laguna Madre. Some sites may have sparse vegetation consisting of *Salicornia bigelovii* (dwarf glasswort), *Salicornia depressa* (Virginia glasswort), *Batis maritima* (saltwort), *Suaeda linearis* (annual seepweed), *Sesuvium portulacastrum* (shoreline seapurslane), *Monanthochloe*

littoralis (shoregrass), and/or *Distichlis spicata* (saltgrass), but are typically unvegetated or covered by a layer of *Lyngbya* spp. (blue-green algae). The development of vast areas dominated by *Lyngbya* spp. (blue-green algae) occurs with appropriate frequency and duration of inundation. Higher flats may be too dry to support the algae, and at lower elevation, flats may remain inundated for extended periods. Occasionally flats (usually not those supporting extensive blue-green algae) may develop a substantial herbaceous cover, especially during years of increased rainfall. Development of significant areas of marsh grasses such as *Spartina patens* (marshhay cordgrass) or *Spartina alterniflora* (smooth cordgrass) is generally lacking. Scattered individuals of *Avicennia germinans* (black mangrove) occur within these flats.

VEGETATION TYPES:

South Texas: Wind Tidal Flats (6600)

South Texas Salt and Brackish Wind Tidal Flats

Identifier: CES301.461.1 **Phase 3 Code:** 6600

Description: These flats are typically unvegetated, and lack significant development of *Lyngbya* spp. (blue-green algae) on their surface. Some sites may develop substantial herbaceous cover, but typically they are unvegetated or very sparsely vegetated with species mentioned in the system description.

South Texas: Algal Flats (6610)

South Texas Salt and Brackish Algal Flats

Identifier: CES301.461.2 **Phase 3 Code:** 6610

Description: Flats dominated by *Lyngbya* spp. (blue-green algae). This algal mat covers the surface of vast areas and greatly enhances the productivity of these tidal flats.

Herbaceous Vegetation

Texas Blackland Tallgrass Prairie

Identifier: CES205.684

Geology: Cretaceous shales, marls and limestones, such as those of the Pecan Gap Chalk, Marlbrook Marl, the Navarro groups, as well as portions of the Eocene Midway Group and Wilcox formation. Also, Miocene formations (Fleming and Oakville Sandstone formations) underlie the southern outlier of Blackland prairie recognized as the Fayette Prairie.

Landform: Flat to gently rolling and dissected by drainages, with the most significant ridges associated with harder chalk formations.

Soils: Typically Vertisols, but this system may occupy mollisols or alfisols in limited parts of its distribution. The system generally occurs on calcareous clays, but may also occur on loams, clay loams, or even sandy clay loams.

Description: Currently, only remnants of this system exist, with most of the historical distribution replaced by crop production or improved pasture. *Schizachyrium scoparium* (little bluestem) is the most ubiquitous component of occurrences of this system. *Andropogon gerardii* (big bluestem) and *Sorghastrum nutans* (Indiangrass) are also common dominants. Other species commonly encountered include *Bouteloua curtipendula* (sideoats grama), *Carex microdonta* (littletooth sedge), *Sporobolus compositus* (tall dropseed), *Nassella leucotricha* (Texas wintergrass), *Bothriochloa laguroides* spp. *torreyana* (silver bluestem), *Eriochloa sericea* (Texas cupgrass), *Paspalum floridanum* (Florida paspalum), and *Tridens strictus* (longspike tridens). Forbs commonly encountered in this system include *Symphyotrichum ericoides* (heath aster), *Stenaria nigricans* var. *nigricans* (prairie bluets), *Helianthus maximiliani* (Maximilian sunflower), *Rudbeckia hirta* (blackeyed Susan), *Bifora americana* (prairie bishop), *Acacia angustissima* var. *hirta* (prairie acacia), *Desmanthus illinoensis* (Illinois bundleflower), and many more. Perhaps more commonly encountered species include *Croton monanthogynus* (doveweed), *Amphiachyris dracunculoides* (annual broomweed), and *Asclepias* spp. (milkweeds). Lowland sites and swales are often dominated by *Tripsacum dactyloides* (eastern gamagrass) and *Panicum virgatum* (switchgrass).

VEGETATION TYPE:

Blackland Prairie: Disturbance or Tame Grassland (207)

Texas Blackland Tallgrass Disturbance or Tame Grassland

Identifier: CES205.684.9

Phase 3 Code: 207

Description: Very little intact Blackland prairie remains within the region, so grasslands that are mapped in the region are assumed to primarily consist of disturbance or tame grasslands. Non-native grasses such as *Cynodon dactylon* (Bermudagrass), *Panicum coloratum* (kleingrass), *Bothriochloa ischaemum* var. *songarica* (King Ranch bluestem)

and *Sorghum halepense* (Johnsongrass) are frequently encountered. *Prosopis glandulosa* (honey mesquite) and *Acacia farnesiana* (huisache) are often present. Important native grasses may include *Schizachyrium scoparium* (little bluestem), *Bothriochloa laguroides* ssp. *torreyana* (silver bluestem), *Sorghastrum nutans* (Indiangrass), *Nassella leucotricha* (Texas wintergrass), *Bouteloua hirsuta* (hairy grama), and *Aristida* spp. (threeawn species).

East-Central Texas Plains Xeric Sandyland

Identifier: CES205.897

Geology: Associated with Eocene sand formations, particularly Carrizo Sands, but also Queen City and Sparta Sands.

Landform: High topographic positions, along with rapidly draining soils, results in conditions that only briefly retain surface moisture.

Soils: Deep sands typify this system.

Description: This small patch system is typically open, herbaceous-dominated, sand "prairie," sometimes with open, oak-dominated woodlands. Species such as *Quercus incana* (bluejack oak), *Quercus margarettae* (sand post oak), *Quercus stellata* (post oak), and *Carya texana* (black hickory) (often stunted) occur in the usually sparse overstory. Invasion by *Ilex vomitoria* (yaupon) is frequent in the absence of fire. Typical species of the understory may include *Aristida desmantha* (curly threeawn), *Brazoria truncata* (bluntsepal brazoria), *Cladonia* spp. (foliose lichens), *Cnidocolus texanus* (Texas bull-nettle), *Dichanthelium* spp. (rosette grass), *Froelichia floridana* (Florida snakecotton), *Lechea mucronata* (pinweed), *Tetragonotheca repanda* (showy nerve-ray), *Tephrosia lindheimeri* (Lindheimer goat-rue), *Polanisia erosa* (large clammyweed), *Gaillardia amblyodon* (maroon gaillardia), *Monarda punctata* (spotted beebalm), *Schizachyrium scoparium* (little bluestem), *Selaginella arenicola* ssp. *riddellii* (Riddell's spikemoss), *Rhynchosia americana* (American snoutbean), *Zornia bracteata* (bracted zornia), *Stylisma pickeringii* (bigpod bonamia), and *Triplasis purpurea* (purple sandgrass). Texas endemics, such as *Rhododon ciliatus* (Texas sandmint) and *Hymenopappus carrizoanus* (Carrizo Sands woollywhite), may be found in this system.

VEGETATION TYPES:

Post Oak Savanna: Sandyland Woodland and Shrubland (706)

East-central Texas Plains Xeric Sandyland Woodland and Shrubland

Identifier: CES205.897.6

Phase 3 Code: 706

Description: As described for the system, but overstory dominated by the woody species described. This may be a common condition, especially where fire is excluded.

Post Oak Savanna: Sandyland Grassland (707)

East-central Texas Plains Xeric Sandyland Herbaceous Vegetation

Identifier: CES205.897.9

Phase 3 Code: 707

Description: As described for the system, but lacking significant woody component. This vegetation type is representative of the system in good condition, with a fire cycle more consistent with the presumed natural cycle.

Texas-Louisiana Coastal Prairie

Identifier: CES203.550

Geology: This system is generally coincident with the distribution of the Pleistocene Beaumont and Lissie Formations.

Landform: Usually on level to gently rolling landscapes, with slopes generally less than 5%. Microtopography plays an important role in local variation in the system, with ridges, swales, mounds, depressions, mima (or pimple) mounds, and gilgai leading to a mosaic of drier and wetter plant communities.

Soils: Non-saline Vertisols, Alfisols, and (less extensively) Mollisols. Vertisols are often characterized by gilgai, resulting from shrink-swell attributes of the montmorillonitic clays of which they are composed. The Alfisols have a loamy surface with clayey subsoils.

Description: This mid- to tallgrass prairie occupies Pleistocene surfaces of the Texas and Louisiana coast, on non-saline soils of level to gently rolling landforms. It is dominated by graminoid species, such as *Schizachyrium scoparium* (little bluestem), *Sorghastrum nutans* (Indiangrass), *Paspalum plicatulum* (brownseed paspalum), *Panicum virgatum* (switchgrass), *Andropogon gerardii* (big bluestem), *Sporobolus compositus* (tall dropseed), *Paspalum setaceum* (thin paspalum), *Fimbristylis puberula* (hairy fimbry), *Dichanthelium oligosanthes* (fewflower panicgrass), *Rhynchospora* spp. (beaksedges), *Paspalum floridanum* (Florida paspalum), *Muhlenbergia capillaris* (Gulf muhly), *Tridens strictus* (longspike tridens), *Bouteloua curtipendula* (sideoats grama), *Andropogon glomeratus* (bushy bluestem), and *Tripsacum dactyloides* (eastern gamagrass). *Axonopus* spp. (carpetgrasses), *Sporobolus indicus* (rat-tail smutgrass), *Andropogon virginicus* (broomsedge bluestem), *Bothriochloa laguroides* ssp. *torreyana* (silver bluestem), and *Nassella leucotricha* (Texas wintergrass) may be particularly noticeable on over-grazed sites. Non-native graminoids that may be conspicuous to dominant components include *Cynodon dactylon* (Bermudagrass), *Cyperus entrerianus* (deep-rooted sedge), *Bothriochloa ischaemum* var. *songarica* (King Ranch bluestem), *Dichanthium* spp. (old world bluestems), *Paspalum notatum* (Bahia grass), *Lolium perenne* (Italian ryegrass), *Schedonorus phoenix* (tall fescue), and *Paspalum dilatatum* (dallisgrass). Forbs that may often be encountered include *Liatris* spp. (gayfeathers), *Sabatia campestris* (meadow pink), *Ambrosia psilostachya* (western ragweed), *Euphorbia bicolor* (snow-on-the-mountain), *Solidago* spp. (goldenrods), *Rudbeckia hirta* (blackeyed Susan), *Ruellia humilis* (low wild petunia), *Asclepias viridis* (green milkweed), *Chamaecrista fasciculata* (partridge pea), *Helianthus angustifolius* (narrowleaf sunflower), *Euthamia* spp. (goldentops), *Ratibida columnifera* (Mexican hat), *Symphotrichum ericoides* (heath aster), *Silphium laciniatum* (compassplant), *Baptisia* spp. (wild indigos), *Iva angustifolia* (narrowleaf sumpweed), *Eryngium yuccifolium* (button snakeroot), *Boltonia diffusa* (smallhead doll's daisy), and *Neptunia lutea* (yellow neptunia). Woody species may invade this typically herbaceous vegetation, including *Rosa bracteata* (Macartney rose),

Acacia farnesiana (huisache), *Triadica sebifera* (Chinese tallow), *Baccharis halimifolia* (baccharis), *Celtis laevigata* (sugar hackberry), and *Prosopis glandulosa* (honey mesquite).

VEGETATION TYPE:

Gulf Coast: Coastal Prairie (5207)

Texas-Louisiana Coastal Prairie

Identifier: CES203.550 **Phase 3 Code:** 5207

Description: As described for system.

Texas Saline Coastal Prairie

Identifier: CES203.543

Geology: Principally on the Pleistocene Beaumont Formation.

Landform: Mostly level or very gently undulating landform, typically near the coast. These sites may be inundated by saltwater during storm surges. Pimple mounds may lend some local topographic variation to the otherwise level surface.

Soils: Very deep, somewhat poorly to poorly drained with high salinity and/or sodicity, at least at some depth. These may be loams or clays. These soils may be saturated from local rainfall or, occasionally from storm surges.

Description: This system occupies saline soils, generally on near-coast, level landforms of the Beaumont Formation. Sites may be nearly monotypic stands of *Spartina spartinae* (Gulf cordgrass). Other gramimoids that may be present to abundant include *Schizachyrium scoparium* (little bluestem), *Andropogon glomeratus* (bushy bluestem), *Panicum virgatum* (switchgrass), *Muhlenbergia capillaris* (Gulf muhly), or *Sporobolus indicus* (rat-tail smutgrass). *Spartina patens* (marshhay cordgrass), *Aristida oligantha* (oldfield threeawn), *Paspalum hartwegianum* (Hartweg paspalum), and *Distichlis spicata* (saltgrass) may be common, particularly on lower, somewhat wetter, sites. Forbs are generally uncommon, but may include species such as *Borrchia frutescens* (sea ox-eye daisy), *Solidago sempervirens* (seaside goldenrod), *Iva angustifolia* (narrowleaf sumpweed), *Euthamia* spp. (goldentops), or other species more common to the non-saline soils nearby, or the salt marsh that may also be nearby. Microtopographic highs in the form of pimple mounds often have species more characteristic of less saline adjacent habitats. Shrubby species may invade the prairie, commonly including species such as *Iva frutescens* (shrubby sumpweed), *Prosopis glandulosa* (honey mesquite), *Acacia farnesiana* (huisache), *Lycium carolinianum* (Carolina wolfberry), *Tamarix* sp. (salt cedar), and *Baccharis halimifolia* (baccharis).

VEGETATION TYPES:

Gulf Coast: Salty Prairie (2207)

Texas Saline Herbaceous Coastal Prairie

Identifier: CES203.543.7 **Phase 3 Code:** 2207

Description: Occurrences of the system lacking significant shrub cover.

Inland: Salty Prairie Shrubland (2406)

Texas Saline Inland Prairie Shrubland

Identifier: **Phase 3 Code:** 2406

Description: This type may have significant cover of *Prosopis glandulosa* (honey mesquite). Or, in some cases, dense cover of *Chloracantha spinosa* (spiny aster), *Isocoma drummondii* (Drummond goldenweed), or *Borrchia frutescens* (sea ox-eye daisy) may be mapped as this type.

Central Texas Coast River Terrace Sandyland Grassland

Identifier: Previously Undescribed System

Geology: This system occurs on Quaternary alluvium of stream deposited sands.

Landform: Terraces and benches representing local highs within the level and ridge and swale topography of river floodplains.

Soils: Deep sands (typically > 1 meter (3 feet) in depth). The ecological site type is characterized as Sand Hill on soils such as Sarita-Falfurrias fine sands, but other coarse, deep sand sites on river terraces are also occupied by this system.

Description: This system occurs on deep sands on the terraces of rivers and streams of the coastal prairie from Austin to Refugio Counties. These sites are typically dominated by graminoids including species such as *Schizachyrium scoparium* (little bluestem), *Sorghastrum nutans* (Indiangrass), *Paspalum plicatulum* (brownseed paspalum), and *Andropogon gerardii* (big bluestem). Other grass species that may be present to dominant include *Paspalum setaceum* (thin paspalum), *Trachypogon spicatus* (crinkleawn), *Paspalum monostachyum* (gulfdune paspalum), *Elionurus tripsacoides* (Pan American balsamscale), *Cenchrus spinifex* (common sandbur), *Eragrostis secundiflora* (red lovegrass), *Aristida* spp. (threeawns), and *Triplasis purpurea* (purple sandgrass). Characteristic forbs of the system include *Aphanostephus skirrhobasis* (lazy daisy), *Heterotheca subaxillaris* (camphor weed), *Cnidoscolus texanus* (Texas bullnettle), *Stillingia sylvatica* (queen's delight), *Gaillardia aestivalis* (prairie gaillardia), *Croton argyranthemus* (silverleaf croton), *Acalypha radians* (cardinal's feather), *Croton parksii* (Park's croton), *Croton capitatus* (hog croton), *Phyllanthus abnormis* (sand leaf-flower), *Physalis cinerascens* (smallflower groundcherry), *Helianthus argophyllus* (silverleaf sunflower), *Verbesina encelioides* (cowpen daisy), *Eriogonum multiflorum* (heartsepal wildbuckwheat), *Froelichia floridana* (Florida snake-cotton), *Croptilon divaricatum* (scratch-daisy), *Diodia teres* (poor joe), *Polanisia erosa* (large clammyweed), and *Chamaecrista fasciculata* (partridge pea). *Prosopis glandulosa* (honey mesquite) is a common woody invader on these sites, but other woody species such as *Zanthoxylum fagara* (colima), *Celtis ehrenbergiana* (granjeno), and the uncommon *Prunus texana* (Texas peachbush) may also be present.

VEGETATION TYPE:

Coastal Plain: Terrace Sandyland Grassland (7907)

Central Texas Coast River Terrace Sandyland Grassland

Identifier: **Phase 3 Code:** 7907

Description: As described for system.

Texas Coast Dune and Coastal Grassland

Identifier: CES203.465

Geology: Eolian deep sands and Pleistocene barrier island and beach deposits of the Beaumont formation. This includes deep sands well inland on the South Texas Sand Sheet.

Landform: Primary and secondary dunes, as well as relatively level areas, on the mainland where deep sands are deposited. Significant local topography, in the form of swales and pothole wetlands, may be present. But, significant surface drainages are generally scarce.

Soils: Deep or coastal sands.

Description: This system includes upland, grass-dominated vegetation on deep sands. Dunes are often dominated by *Uniola paniculata* (sea oats), with other species such as *Croton punctatus* (Gulf croton), *Panicum amarum* (bitter panicum), *Ipomoea pes-caprae* (goat-foot morning-glory), *Ipomoea imperati* (beach morning-glory), *Tidestromia lanuginosa* (wooly tidestromia), *Cakile* spp. (searocket), and *Sesuvium portulacastrum* (shoreline seapurslane) also present. Upland grasslands are often dominated by *Schizachyrium littorale* (seacoast bluestem) and *Paspalum monostachyum* (gulfdune paspalum). Numerous other species, such as *Sorghastrum nutans* (Indiangrass), *Paspalum plicatulum* (brownseed paspalum), *Muhlenbergia capillaris* (Gulf muhly), *Cenchrus spinifex* (common sandbur), *Elionurus tripsacoides* (Pan American balsamscale), *Eragrostis secundiflora* (red lovegrass), *Bothriochloa laguroides* ssp. *torreyana* (silver bluestem), *Heteropogon contortus* (tanglehead), *Andropogon glomeratus* (bushy bluestem), *Spartina patens* (marshhay cordgrass), and *Dichanthelium* spp. (rosette grasses) may also be common. Numerous forbs, including such species as *Heterotheca subaxillaris* (camphor weed), *Croton* spp. (crotons), *Chamaecrista fasciculata* (partridge pea), *Rayjacksonia phyllocephala* (camphor daisy), *Physalis* spp. (groundcherries), *Helianthus argophyllus* (silverleaf sunflower), *Gaillardia pulchella* (Indian blanket), *Solidago sempervirens* (seaside goldenrod), *Baptisia* spp. (wild-indigos), *Indigofera miniata* (scarlet-pea), *Eriogonum multiflorum* (heartsepal wildbuckwheat), *Conoclinium betonicifolium* (betonyleaf thoroughwort), and *Rudbeckia hirta* (blackeyed Susan) are also commonly encountered. Some woody species are found in the system, but typically make up very little cover. Cover of woody species is limited, but may include *Baccharis* spp. (baccharis), *Opuntia engelmannii* var. *lindheimeri* (Lindheimer pricklypear), *Morella cerifera* (wax-myrtle), *Quercus fusiformis* (plateau live oak), *Quercus virginiana* (coastal live oak), and stunted *Prosopis glandulosa* (honey mesquite). Non-native woody species such as *Tamarix* spp. (salt cedars), *Schinus terebinthifolius* (Brazilian peppertree), and *Triadica sebifera* (Chinese tallow) may be present to dominant. Small areas may have sufficient woody cover to be mapped as a shrubland.

VEGETATION TYPES:

Active Sand Dune (6200)

Texas Coast Dune and Coastal Grassland Active Dune

Identifier: CES203.465.1

Phase 3 Code: 6200

Description: These are barren to sparsely vegetated deep sands where active sand movement is occurring. These sites may sometimes be 15 m or more in height and offer the greatest degree of topographic relief in the region.

Coastal and Sandsheet: Dune and Coastal Grassland (6307)

Texas Coast Dune and Coastal Deep Sand Grassland

Identifier: CES203.465.7 **Phase 3 Code:** 6307

Description: As described for herbaceous portions of the system.

Coastal and Sandsheet: Deep Sand Shrubland (6306)

Texas Coast Dune and Coastal Deep Sand Shrubland

Identifier: CES203.465.6 **Phase 3 Code:** 6306

Description: Small areas within deep coastal sands may be dominated by shrub species such as *Baccharis* spp. (baccharis), *Opuntia engelmannii* var. *lindheimeri* (Lindheimer pricklypear), *Prosopis glandulosa* (honey mesquite), *Morella cerifera* (wax-myrtle), *Iva frutescens* (shrubby sumpweed), or the non-native *Schinus terebinthifolius* (Brazilian peppertree).

Tamaulipan Caliche Grassland

Identifier: CES301.989

Geology: This system occurs on sites that have a relatively thin veneer of eolian sand over caliche substrate. Such sites occur on the edge of the South Texas Sand Sheet where it overlies caliche of the Goliad Formation.

Landform: These grasslands occur on relatively level sites atop the Goliad formation.

Soils: Shallow sands and sandy loams, sometimes red sandy loams, over caliche substrate.

Description: This system is described from the vicinity of Loreto in Tamaulipas, Mexico, but the conditions of sand veneer over caliche outcrop may also be present on the edge of the sandsheet where it passes over the Goliad Formation in northern Hidalgo and Starr Counties. Soils are a reddish sandy loam about 0.3 m in depth or less. Such sites may currently be occupied by non-native grasses such as *Pennisetum ciliare* (buffelgrass) and *Bothriochloa ischaemum* var. *songarica* (King Ranch bluestem), though invasion by these species is not observed in Mexican occurrences (Chris Best, pers. obs.). These grasslands are known to occur within a mosaic of calcareous shrublands. Johnston (1963) describes them as grassland patches (the largest of which are 50 to 100 acres in extent) within a matrix of shrubland. Grasses often dominate sites, including species such as *Schizachyrium littorale* (seacoast bluestem), *Aristida purpurea* (purple threeawn), *Bouteloua hirsuta* (hairy grama), *Elionurus tripsacoides* (Pan American balsamscale), *Trachypogon spicatus* (crinkleawn), *Heteropogon contortus* (tanglehead), *Bouteloua curtipendula* (sideoats grama), *Tridens texanus* (Texas tridens), and *Tridens muticus* (slim tridens). *Brachiaria ophryodes* and *Bouteloua radicata* (purple grama) are also noted from occurrences in Mexico. Shrubs and sub-shrubs are scattered and sometimes coalesce into larger areas, and include species such as *Calliandra conferta* (Rio Grande stickpea), *Krameria ramosissima* (calderona), *Calliandra biflora* (twoflower stickpea), *Chamaecrista greggii* (Gregg's senna), and *Macrosiphonia lanuginosa* (plateau rocktrumpet). Perennial forbs are

conspicuous and include species such as *Heliotropium confertifolium* (leafy heliotrope), *Melampodium cinereum* (blackfoot daisy), *Simsia calva* (awnless bush sunflower), *Acalypha radians* (cardinal's feather), *Cnidoscolus texanus* (Texas bull-nettle), *Galphimia angustifolia* (narrowleaf thryallis), *Hermannia texana* (Mexican mallow), *Croton capitatus* (hog croton), *Rhynchosia americana* (American snoutbean), and *Dalea nana* (dwarf dalea). Scattered shrubs that may be present include *Prosopis glandulosa* (honey mesquite), *Zanthoxylum fagara* (colima), *Cordia boissieri* (anacahuita), and *Condalia hookeri* (brasil).

VEGETATION TYPE:

South Texas: Caliche Grassland (6707)

Tamaulipan Caliche Grassland

Identifier: CES301.989

Phase 3 Code: 6707

Description: As described for system.

Woody Wetlands and Riparian

Southeastern Great Plains Floodplain Forest

Identifier: CES205.710

Geology: This system generally occupies Quaternary alluvium.

Landform: This floodplain forest occupies relatively broad flats at low topographic positions, along large streams where alluvial deposition dominates. In Phase 3, rivers include the upper reaches of the Lavaca and Navidad Rivers and middle portions of the Guadalupe and San Antonio Rivers, upstream of the Pleistocene prairie formations along the coast and downstream of the Cretaceous limestones of the Edwards Plateau.

Soils: Bottomland Ecological Sites (including Loamy, Sandy, and Clayey) characterize this system.

Description: 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 *Ulmus crassifolia* (cedar elm), *Celtis laevigata* (sugar hackberry), *Carya illinoensis* (pecan), *Fraxinus pennsylvanica* (green ash), *Ulmus americana* (American elm), and/or *Quercus fusiformis* (plateau live oak). Other species that may be present in the canopy or sub-canopy include *Platanus occidentalis* (American sycamore), *Acer negundo* (boxelder), *Gleditsia triacanthos* (common honeylocust), *Quercus macrocarpa* (bur oak), *Morus rubra* (red mulberry), and *Sapindus saponaria* var. *drummondii* (western soapberry). Especially along river margins, species such as *Platanus occidentalis* (American sycamore), *Populus deltoides* (eastern cottonwood), and *Salix nigra* (black willow) may dominate. Overgrazing and/or overbrowsing may influence recruitment of overstory species and composition of the understory and herbaceous layers. Shrub species may include *Cephalanthus occidentalis* (common buttonbush), *Ilex decidua* (possumhaw), *Ilex vomitoria* (yaupon), *Sideroxylon lanuginosum* (gum bumelia), *Vaccinium arboreum* (farkleberry), *Juniperus virginiana* (eastern redcedar), and *Cornus drummondii* (roughleaf dogwood), which may occur as dense patches following disturbance, but are otherwise generally fairly sparse. In this southern expression of the system, other shrubs such as *Prosopis glandulosa* (honey mesquite), *Acacia farnesiana* (huisache), *Diospyros texana* (Texas persimmon), and *Condalia hookeri* (brasil) may be commonly encountered. Vines such as *Campsis radicans* (common trumpet creeper), *Vitis* spp. (grape), *Parthenocissus quinquefolia* (Virginia creeper), *Toxicodendron radicans* (poison ivy), *Smilax bona-nox* (saw greenbrier), and *Ampelopsis arborea* (peppervine) may be conspicuous. Herbaceous cover includes *Elymus virginicus* (Virginia wildrye), *Verbesina virginica* (frostweed), *Chasmanthium latifolium* (inland sea-oats), *Calyptocarpus vialis* (straggler daisy), *Chasmanthium sessiliflorum* (narrowleaf woodoats), *Carex cherokeensis* (Cherokee sedge), *Tripsacum dactyloides* (eastern gamagrass), *Symphotrichum drummondii* var. *texanum* (Drummond's aster), *Geum canadense* (white avens), *Sanicula canadensis* (Canada snakeroot), *Ambrosia trifida* (giant ragweed), *Panicum virgatum* (switchgrass), *Galium* spp. (bedstraw), *Teucrium canadense* (American germander), and *Carex* spp. (caric sedge). Non-native grasses that may dominate these sites include *Cynodon dactylon* (Bermudagrass), *Bothriochloa*

ischaemum var. *songarica* (King Ranch Bluestem), and *Sorghum halepense* (Johnson grass). Herbaceous cover may be quite high, especially in situations where shrub cover is low. The non-native trees *Triadica sebifera* (Chinese tallow) and *Melia azedarach* (chinaberry) may be present.

VEGETATION TYPES:

Central Texas: Floodplain Evergreen Forest (1801)

Southeastern Great Plains Floodplain Evergreen Forest and Woodland

Identifier: CES205.710.1 **Phase 3 Code:** 1801

Description: This very minor component is as described for the system, but the canopy is dominated by *Juniper virginiana* (eastern redcedar).

Central Texas: Floodplain Live Oak Forest (1802)

Southeastern Great Plains Floodplain Live Oak Forest and Woodland

Identifier: CES205.710.2 **Phase 3 Code:** 1802

Description: As described for the system, but dominated by *Quercus fusiformis* (plateau live oak). Deciduous species can be, and frequently are, common in the canopy, but *Quercus fusiformis* (plateau live oak) clearly dominates. *Juniperus virginiana* (eastern redcedar) may also be present.

Central Texas: Floodplain Hardwood / Evergreen Forest (1803)

Southeastern Great Plains Floodplain Mixed Deciduous – Evergreen Forest and Woodland

Identifier: CES205.710.3 **Phase 3 Code:** 1903

Description: As described for the system with a mix of evergreen and deciduous species in the canopy, with *Quercus fusiformis* (plateau live oak) representing the most common evergreen, and *Celtis laevigata* (sugar hackberry) and *Ulmus crassifolia* (cedar elm) the most common deciduous species.

Central Texas: Floodplain Hardwood Forest (1804)

Southeastern Great Plains Floodplain Deciduous Forest and Woodland

Identifier: CES205.710.4 **Phase 3 Code:** 4

Description: As described for the system, but deciduous species dominating the canopy.

Central Texas: Floodplain Evergreen Shrubland (1805)

Southeastern Great Plains Floodplain Evergreen Shrubland

Identifier: CES205.710.5 **Phase 3 Code:** 1805

Description: Shrublands of the floodplains of the region that are dominated by *Juniperus* spp. (juniper) occurring as shrubs, or other shrubs, such as *Ilex vomitoria* (yaupon), *Acacia farnesiana* (huisache), or the non-native *Rosa bracteata* (Macartney rose).

Central Texas: Floodplain Deciduous Shrubland (1806)

Southeastern Great Plains Floodplain Deciduous Shrubland

Identifier: CES205.710.6 **Phase 3 Code:** 1806

Description: Shrublands of the floodplains of the region that are dominated by deciduous shrubs such as *Ilex decidua* (possumhaw), *Salix nigra* (black willow), *Cornus drummondii* (roughleaf dogwood), and/or *Cephalanthus occidentalis* (common buttonbush). Perhaps more frequently mapped shrublands are dominated by early successional species including *Prosopis glandulosa* (honey mesquite), *Acacia farnesiana* (huisache), *Celtis laevigata* (sugar hackberry), or *Triadica sebifera* (Chinese tallow).

Central Texas: Floodplain Herbaceous Vegetation (1807)

Southeastern Great Plains Floodplain Herbaceous Vegetation

Identifier: CES205.710.7 **Phase 3 Code:** 1807

Description: Floodplains of the region that lack a significant overstory or shrub canopy, but retain cover in the herbaceous layer. Maintained pastures are commonly mapped, with non-native grass species such as *Cynodon dactylon* (Bermudagrass), *Bothriochloa ischaemum* var. *songarica* (King Ranch bluestem), and *Sorghum halepense* (Johnson grass) commonly dominant.

Central Texas: Floodplain Herbaceous Wetland (1817)

Southeastern Great Plains Floodplain Herbaceous Wetland

Identifier: CES205.719.17 **Phase 3 Code:** 1817

Description: These wetlands are dominated by numerous sedge species, including *Carex* spp. (sedges), *Eleocharis* spp. (spikerushes), *Cyperus* spp. (flatsedges), and *Schoenoplectus pungens* (common threesquare). Various grasses and *Juncus* spp. (rushes) are also common. Forbs that may be encountered include species such as *Hydrocotyle verticillata* (whorled water-pennywort), *Polygonum* spp. (smartweeds), *Pluchea odorata* (purple marsh-camphor), and *Ambrosia trifida* (giant ragweed).

Southeastern Great Plains Riparian Forest

Identifier: CES205.709

Geology: As defined, this system occupies buffer zones of headwater streams and soils develop in place over a variety of geologic surfaces

Landform: Valleys and drainages along headwater streams of the upper reaches of the Lavaca and Navidad Rivers and middle portions of the Guadalupe and San Antonio Rivers.

Typically in areas with erosional processes dominating over alluvial deposition.

Soils: By definition, this system is mapped along drainages upstream of the Bottomland Ecological Sites, so they will be mapped on various soils of the surrounding uplands.

Description: Trees that may be present in stands of this system include *Celtis laevigata* (sugar hackberry), *Ulmus crassifolia* (cedar elm), *Platanus occidentalis* (American sycamore), *Populus deltoides* (eastern cottonwood), *Quercus fusiformis* (plateau live oak), *Quercus nigra* (water oak), *Sapindus saponaria* var. *drummondii* (western soapberry), *Salix nigra* (black willow), *Fraxinus americana* (white ash), *Fraxinus pennsylvanica* (green ash), *Gleditsia triacanthos* (common honeylocust), *Prosopis glandulosa* (honey mesquite), and *Carya illinoensis* (pecan). The shrub layer development is variable, sometimes with species such as *Forestiera acuminata* (swamp privet), *Ilex decidua* (possumhaw), *Ilex vomitoria* (yaupon), *Sideroxylon lanuginosum*

(gum bumelia), *Juniperus virginiana* (eastern redcedar), *Cornus drummondii* (roughleaf dogwood), *Condalia hookeri* (brasil), and/or *Acacia farnesiana* (huisache). A few sites may be shrub dominated without an overstory canopy, containing species such as *Forestiera acuminata* (swamp privet), *Cephalanthus occidentalis* (common buttonbush), *Acacia farnesiana* (huisache), or *Sesbania drummondii* (rattlebox sesbania). Evergreen dominated occurrences may contain *Juniperus virginiana* (eastern redcedar), or rarely in Phase 3, *Pinus taeda* (loblolly pine). Herbaceous cover is also variable, depending on overstory and shrub canopies and recent flooding history. Herbaceous species may include *Elymus virginicus* (Virginia wildrye), *Verbesina virginica* (frostweed), *Chasmanthium latifolium* (inland sea-oats), *Chasmanthium sessiliflorum* (narrowleaf woodoats), *Tripsacum dactyloides* (eastern gamagrass), *Symphotrichum drummondii* var. *texanum* (Drummond's aster), *Amphiachyris dracunculoides* (common broomweed), *Ambrosia psilostachya* (western ragweed), *Geum canadense* (white avens), *Sanicula canadensis* (Canada snakeroot), *Panicum virgatum* (switchgrass), *Galium* spp. (bedstraw), and *Carex* spp. (caric sedge). Upland species such as *Schizachyrium scoparium* (little bluestem), *Nassella leucotricha* (Texas wintergrass), and *Sorghastrum nutans* (Indiangrass) may be common. Woody vines such as *Smilax bona-nox* (saw greenbrier), *Toxicodendron radicans* (poison ivy), *Ampelopsis arborea* (peppervine), and *Vitis* spp. (grapes) may be common. Non-native grass species that may be common to dominant on these sites include *Arundo donax* (giant cane), *Cynodon dactylon* (Bermudagrass), and *Sorghum halepense* (Johnson grass). Non-native woody species, such as *Ligustrum* spp. (privets) and *Triadica sebifera* (Chinese tallow), may be commonly encountered.

VEGETATION TYPES:

Central Texas: Riparian Evergreen Forest (1901)

Southeastern Great Plains Riparian Evergreen Forest and Woodland

Identifier: CES205.709.1 **Phase 3 Code:** 1901

Description: As described for the system, with *Juniperus virginiana* (eastern redcedar) dominating the canopy. On the eastern edge of the range of this system in Phase 3, some occurrences may be dominated by *Pinus taeda* (loblolly pine).

Central Texas: Riparian Live Oak Forest (1902)

Southeastern Great Plains Riparian Live Oak Forest and Woodland

Identifier: CES205.709.2 **Phase 3 Code:** 1902

Description: As described for the system, with *Quercus fusiformis* (plateau live oak) dominating the canopy. Deciduous species can be, and frequently are, common in the canopy, but *Quercus fusiformis* (plateau live oak) clearly dominates. *Juniperus virginiana* (eastern redcedar) may also be present.

Central Texas: Riparian Hardwood / Evergreen Forest (1903)

Southeastern Great Plains Riparian Mixed Deciduous–Evergreen Forest and Woodland

Identifier: CES205.709.3 **Phase 3 Code:** 1903

Description: As described for the system, with a mix of evergreen species, including *Juniperus virginiana* (eastern redcedar), *Pinus taeda* (loblolly pine), and/or *Quercus fusiformis* (plateau live oak) and deciduous species in the canopy.

Central Texas: Riparian Hardwood Forest (1904)

Southeastern Great Plains Riparian Hardwood Forest and Woodland

Identifier: CES205.709.4 **Phase 3 Code:** 1904

Description: As described for the system, with deciduous species dominating the canopy.

Central Texas: Riparian Evergreen Shrubland (1905)

Southeastern Great Plains Riparian Evergreen Shrubland

Identifier: CES205.709.5 **Phase 3 Code:** 1905

Description: Shrublands in riparian sites that are often dominated by *Juniperus virginiana* (eastern redcedar), young *Pinus taeda* (loblolly pine) or, sometimes broadleaf evergreen shrubs such as *Ilex vomitoria* (yaupon). *Acacia farnesiana* (huisache) dominated sites may sometimes be mapped as this type. *Rosa bracteata* (Macartney rose) may be a dominant, particularly in the central and south portions of the region.

Central Texas: Riparian Deciduous Shrubland (1906)

Southeastern Great Plains Riparian Deciduous Shrubland

Identifier: CES205.709.6 **Phase 3 Code:** 1906

Description: Shrublands in riparian sites that may be dominated by deciduous shrubs such as *Prosopis glandulosa* (mesquite), *Salix nigra* (black willow), *Cephalanthus occidentalis* (common buttonbush), *Forestiera acuminata* (swamp privet), *Cornus drummondii* (roughleaf dogwood), *Acacia farnesiana* (huisache), and/or *Ilex decidua* (possumhaw).

Central Texas: Riparian Herbaceous Vegetation (1907)

Southeastern Great Plains Riparian Herbaceous Vegetation

Identifier: CES205.709.7 **Phase 3 Code:** 1907

Description: Riparian sites lacking overstory or shrub canopy but retaining herbaceous cover. Some sites may be dominated by species such as *Schizachyrium scoparium* (little bluestem) or *Sorghastrum nutans* (Indiangrass), that are more commonly encountered in surrounding uplands. Other sites may be dominated by the non-natives like *Arundo donax* (giant cane), *Bothriochloa ischaemum* var. *songarica* (King Ranch bluestem), or *Cynodon dactylon* (Bermudagrass).

Central Texas: Riparian Herbaceous Wetland (1917)

Identifier: CES205.709.17 **Phase 3 Code:** 1917

Description: Small areas dominated by wetlands species such as *Cyperus* spp. (flatsedges), *Eleocharis* spp. (spikerushes), *Panicum virgatum* (switchgrass), and *Polygonum* spp. (smartweeds) may occur on these more upland drainages.

Edwards Plateau Floodplain

Identifier: CES303.651

Geology: This system usually occupies Quaternary alluvial deposits often within drainages largely underlain by Cretaceous limestones or drainages that receive outwash from landscapes dominated by these limestones.

Landform: Valley floors of large rivers and perennial streams. In Phase 3, this system tends to occupy broad valley bottoms with alluvial deposits of the Leona River, upper Frio River, upper Medina River, Leon Creek, and Salado Creek drainages where they occur within the Edwards Plateau or on outwash influenced by the Edwards Plateau.

Soils: Bottomland soils of various types (Loamy, Clayey, and Sandy).

Description: These are forests and woodlands with a canopy dominated or co-dominated by *Carya illinoensis* (pecan), *Ulmus crassifolia* (cedar elm), *Ulmus americana* (American elm), *Celtis laevigata* (sugar hackberry), *Celtis laevigata* var. *reticulata* (netleaf hackberry), and/or *Quercus fusiformis* (plateau live oak). *Carya illinoensis* (pecan) may be more likely to occur in deeper and better-developed alluvial soils. Apparent dominance of *Carya illinoensis* (pecan) may also be an artifact of preferential harvesting of other species, leaving this species in greater abundance. *Melia azedarach* (chinaberry) is a common non-native tree encountered on floodplains. Other species present may include *Fraxinus pennsylvanica* (green ash), *Quercus macrocarpa* (bur oak), *Quercus buckleyi* (Texas oak), *Acer negundo* (boxelder), *Sapindus saponaria* var. *drummondii* (western soapberry), *Juniperus ashei* (Ashe juniper), *Prosopis glandulosa* (mesquite), and *Platanus occidentalis* (American sycamore). Woody species in the subcanopy may include *Sideroxylon lanuginosum* (gum bumelia), *Ptelea trifoliata* (wafer-ash), *Cornus drummondii* (roughleaf dogwood), *Morus rubra* (red mulberry), *Diospyros texana* (Texas persimmon), *Parthenocissus quinquefolia* (Virginia creeper), *Vitis* spp. (grape), *Smilax bona-nox* (greenbrier), *Baccharis neglecta* (roosevelt-weed), *Malvaviscus arboreus* var. *drummondii* (Turk's cap), *Juniperus ashei* (Ashe juniper), and *Ilex decidua* (possumhaw). The herbaceous layer may be continuous, though relatively sparse, or patchy with species such as *Elymus virginicus* (Virginia wildrye), *Chasmanthium latifolium* (creekoats), *Nassella leucotricha* (Texas wintergrass), *Verbesina virginica* (frostweed), and *Carex* spp. (caric sedge). Some sites lack, or have very sparse, overstory canopies and represent shrublands or grasslands. Shrublands may be dominated by species in the shrub layer of the surrounding woodlands. Other components or dominants may include species such as *Prosopis glandulosa* (mesquite), *Acacia farnesiana* (huisache), *Sapindus saponaria* var. *drummondii* (western soapberry), *Juglans microcarpa* (little walnut), *Mahonia trifoliolata* (agarito), and *Cephalanthus occidentalis* (common buttonbush). Grassland sites are frequently dominated by the non-native species *Cynodon dactylon* (Bermuda grass) and/or *Bothriochloa ischaemum* var. *songarica* (King Ranch bluestem). Native species that may also be present in (and sometimes dominate) these sites include *Panicum virgatum* (switchgrass), *Andropogon glomeratus* (bushy bluestem), *Elymus virginicus* (Virginia wildrye), *Nassella leucotricha* (Texas wintergrass), *Hordeum pusillum* (little barley), *Tripsacum dactyloides* (eastern gamagrass), *Muhlenbergia lindheimeri* (Lindheimer's muhly), *Carex* spp. (carices), and *Eleocharis* spp. (spikerushes). Floodplain occurrences often include portions that resemble Edwards Plateau Riparian vegetation, especially along stream margins, where *Platanus occidentalis* (sycamore), *Taxodium distichum* (baldcypress), *Brickellia* spp. (brickellbush), *Cladium mariscus* ssp. *jamaicense* (saw-grass), and *Panicum virgatum* (switchgrass) are frequently encountered.

VEGETATION TYPES:

Edwards Plateau: Floodplain Ashe Juniper Forest (1001)

Edwards Plateau Floodplain Ashe Juniper Forest and Woodland

Identifier: CES303.651.1 **Phase 3 Code:** 1001

Description: As described for system, but *Juniperus ashei* (Ashe juniper) dominates the canopy.

Edwards Plateau: Floodplain Live Oak Forest (1002)

Edwards Plateau Floodplain Live Oak Forest and Woodland

Identifier: CES303.651.2 **Phase 3 Code:** 1002

Descriptions: As described for the system, but *Quercus fusiformis* (plateau live oak) dominates the canopy. Deciduous species can be, and frequently are, common in the canopy, but *Quercus fusiformis* (plateau live oak) clearly dominates. *Juniperus ashei* (Ashe juniper) may also be present.

Edwards Plateau: Floodplain Hardwood / Ashe Juniper Forest (1003)

Edwards Plateau Floodplain Mixed Deciduous-Evergreen Forest and Woodland

Identifier: CES303.651.4 **Phase 3 Code:** 1003

Description: As described for the system, with a mix of deciduous and evergreen canopy species.

Edwards Plateau: Floodplain Hardwood Forest (1004)

Edwards Plateau Floodplain Deciduous Forest and Woodland

Identifier: CES303.651.6 **Phase 3 Code:** 1004

Description: As described for the system, but deciduous species dominate the canopy.

Edwards Plateau: Floodplain Ashe Juniper Shrubland (1005)

Edwards Plateau Floodplain Ashe Juniper Shrubland

Identifier: CES303.651.7 **Phase 3 Code:** 1005

Description: *Juniperus ashei* (Ashe juniper) dominated shrublands on floodplains.

Edwards Plateau: Floodplain Deciduous Shrubland (1006)

Edwards Plateau Floodplain Deciduous Shrubland

Identifier: CES303.651.8 **Phase 3 Code:** 1006

Description: Shrublands on floodplains dominated by species in the shrub layer of the surrounding woodlands or other species such as *Prosopis glandulosa* (mesquite), *Acacia farnesiana* (huisache), *Sapindus saponaria* var. *drummondii* (western soapberry), *Mahonia trifoliolata* (agarito), *Salix nigra* (black willow), and *Cephalanthus occidentalis* (common buttonbush). *Ulmus crassifolia* (cedar elm), *Quercus fusiformis* (plateau live oak), and/or *Celtis laevigata* (sugar hackberry) may be present as a sparse and scattered overstory.

Edwards Plateau: Floodplain Herbaceous Vegetation (1007)

Edwards Plateau Floodplain Herbaceous Vegetation

Identifier: CES303.651.9 **Phase 3 Code:** 1007

Description: Grasslands on floodplains, often dominated by *Cynodon dactylon* (Bermuda grass) and/or *Bothriochloa ischaemum* var. *songarica* (King Ranch bluestem). Native

species that may be present, common, or dominant include *Panicum virgatum* (switchgrass), *Andropogon glomeratus* (bushy bluestem), *Elymus virginicus* (Virginia wildrye), *Nassella leucotricha* (Texas wintergrass), *Hordeum pusillum* (little barley), *Tripsacum dactyloides* (eastern gamagrass), *Muhlenbergia lindheimeri* (Lindheimer muhly), and *Chasmanthium latifolium* (creekoats). Scattered *Prosopis glandulosa* (mesquite), *Quercus fusiformis* (plateau live oak), *Celtis laevigata* (sugar hackberry), or other overstory species may be present.

Edwards Plateau: Floodplain Herbaceous Wetland (1017)

Edwards Plateau Floodplain Herbaceous Wetland

Identifier: CES303.651.10 **Phase 3 Code:** 1017

Description: Wetlands within floodplains often dominated by *Cladium mariscus* ssp. *jamaicense* (saw-grass), *Eleocharis* spp. (spikerushes), and *Carex* spp. (carices).

Edwards Plateau Riparian

Identifier: CES303.652

Geology: This system usually occupies Quaternary deposits. These may be alluvial or gravel deposits and are often within drainages dominated by limestone or other calcareous substrates.

Landform: Riparian systems occupy small streams, either intermittent or perennial. These sites tend to be in erosional situations, as opposed to broad alluvial depositional sites. In Phase 3, this system tends to occupy drainage bottoms of the Leona River, upper Frio River, upper Medina River, Leon Creek, and Salado Creek drainages where they occur within the Edwards Plateau or on outwash influenced by the Edwards Plateau.

Soils: By definition, this system is mapped in areas upstream of significant development of bottomland soils on soil types of the surrounding uplands.

Description: Riparian vegetation may be characterized as woodlands, shrublands, or herbaceous vegetation. These erosional sites may be gravelly, cobbly, or rocky, and generally occupy the upper reaches of streams. Woodlands may have *Quercus fusiformis* (plateau live oak), *Platanus occidentalis* (American sycamore), *Taxodium distichum* (baldcypress), *Fraxinus pennsylvanica* (green ash), *Ulmus crassifolia* (cedar elm), *Celtis laevigata* (sugar hackberry) (including var. *reticulata*), *Acer negundo* (boxelder), *Prosopis glandulosa* (mesquite), *Quercus buckleyi* (Texas oak), *Juniperus ashei* (Ashe juniper), *Salix nigra* (black willow), and/or *Sapindus saponaria* (western soapberry). Shrub species that may be encountered in the understory of these woodlands (or, in some cases, may form shrublands lacking a significant overstory canopy) include *Baccharis* spp. (false-willow), *Salix nigra* (black willow), *Juniperus ashei* (Ashe juniper), *Sapindus saponaria* (western soapberry), *Cornus drummondii* (roughleaf dogwood), *Sophora secundiflora* (Texas mountain-laurel), *Sideroxylon lanuginosum* (gum bumelia), *Diospyros texana* (Texas persimmon), *Ungnadia speciosa* (Mexican buckeye), *Prosopis glandulosa* (mesquite), *Cephalanthus occidentalis* (common buttonbush), and/or *Aloysia gratissima* (whitebrush). Substantial patches of herbaceous cover may be present and often include species such as *Andropogon glomeratus* (bushy bluestem), *Panicum virgatum* (switchgrass), *Cladium mariscus* var. *jamaicense* (sawgrass), *Tripsacum dactyloides* (eastern

gamagrass), *Setaria scheelei* (southwestern bristlegrass), *Nassella leucotricha* (Texas wintergrass), *Eleocharis* spp. (spikerush), *Brickellia* spp. (brickellbush), *Justicia americana* (American water-willow), *Hydrocotyle* spp. (water penny), and/or *Muhlenbergia lindheimeri* (Lindheimer muhly). Frequently, *Cynodon dactylon* (Bermuda grass) and/or *Bothriochloa ischaemum* var. *songarica* (King Ranch bluestem) dominate these grassland sites. *Sorghum halepense* (Johnson grass) is also a commonly encountered non-native grass. This system includes vegetation along very small streams, reaching upstream to spring heads and runs.

VEGETATION TYPES:

Edwards Plateau: Riparian Ashe Juniper Forest (1401)

Edwards Plateau Riparian Ashe Juniper Forest and Woodland

Identifier: CES303.652.1 **Phase 3 Code:** 1401

Description: Forest or woodland on riparian sites dominated by *Juniperus ashei* (Ashe juniper). Otherwise generally fitting the description of forest or woodland occurrences of the system, with some deciduous species and *Quercus fusiformis* (plateau live oak) present in the canopy.

Edwards Plateau: Riparian Live Oak Forest (1402)

Edwards Plateau Riparian Live Oak Forest and Woodland

Identifier: CES303.652.2 **Phase 3 Code:** 1402

Description: Forest or woodland on riparian sites dominated by *Quercus fusiformis* (plateau live oak). Otherwise, this vegetation type generally fits the description of forest or woodland occurrences of the system, with some deciduous species and *Juniperus ashei* (Ashe juniper) present in the canopy.

Edwards Plateau: Riparian Hardwood / Ashe Juniper Forest (1403)

Edwards Plateau Riparian Hardwood / Ashe Juniper Forest

Identifier: CES303.652.4 **Phase 3 Code:** 1403

Description: Forest or woodland on riparian sites co-dominated by evergreen species (*Juniperus ashei* (Ashe juniper) and/or *Quercus fusiformis* (plateau live oak)) and deciduous species as mentioned in the system description.

Edwards Plateau: Riparian Hardwood Forest (1404)

Edwards Plateau Riparian Deciduous Forest and woodland

Identifier: CES303.652.6 **Phase 3 Code:** 1404

Description: As described for woodland or forest occurrences of the system, with deciduous species dominating the canopy.

Edwards Plateau: Riparian Ashe Juniper Shrubland (1405)

Edwards Plateau Riparian Ashe Juniper Shrubland

Identifier: CES303.652.7 **Phase 3 Code:** 1405

Description: Shrublands on riparian sites dominated by *Juniperus ashei* (Ashe juniper).

Edwards Plateau: Riparian Deciduous Shrubland (1406)

Edwards Plateau Riparian Deciduous Shrubland

Identifier: CES303.652.8 **Phase 3 Code:** 1406

Description: Shrublands on riparian sites dominated by one or more of the shrub species mentioned in the system description.

Edwards Plateau: Riparian Herbaceous Vegetation (1407)

Edwards Plateau Riparian Herbaceous Vegetation

Identifier: CES303.652.9 **Phase 3 Code:** 1407

Description: Riparian sites dominated by upland herbaceous vegetation as described in the system description.

Edwards Plateau: Riparian Herbaceous Wetland (1417)

Edwards Plateau Riparian Herbaceous Wetland

Identifier: CES303.652.10 **Phase 3 Code:** 1417

Description: Riparian sites dominated by wetland herbaceous vegetation as described in the system description.

Central Texas Coastal Prairie River Floodplain

Identifier: Previously Undescribed System

Geology: Typically occupying Quaternary alluvium adjacent to the Beaumont or Lissie Formations.

Landform: Terraces and margins of large creeks and rivers of the central coast including Tres Palacios Creek and the lower reaches of the Lavaca, Navidad, Guadalupe, San Antonio, and Nueces Rivers, as well as the Aransas and Mission Rivers.

Soils: Bottomland ecological site types, including loamy, clayey, and sandy sites.

Description: This system occupies bottomland soils along the coastal portions of the Navidad, Lavaca, Guadalupe, San Antonio, Mission, Aransas, and Nueces Rivers (and their tributaries) as they cross the prairie surface of the Lissie and Beaumont Formations. The extent of floodplain forest along the Mission and Aransas rivers is somewhat limited. Those rivers that continue upstream beyond these Pleistocene formations transition to forests of the **Southeastern Great Plains Floodplain** system. The Nueces River shares some affinity with the **Tamaulipan Floodplain** system to the south, and drainages further to the south and west of the Nueces, as well as the Nueces upstream of the prairie formations are attributed to that system. Floodplain systems north and east of the Navidad River are attributed to the **Columbia Bottomlands Forest and Woodland** system. This system is characterized by a woodland and forest dominated by species such as *Celtis laevigata* (sugar hackberry), *Celtis laevigata* var. *reticulata* (netleaf hackberry), *Ulmus crassifolia* (cedar elm), *Carya illinoensis* (pecan), *Ulmus americana* (American elm), *Prosopis glandulosa* (honey mesquite), and *Fraxinus berlandieriana* (Mexican ash) or *Fraxinus pennsylvanica* (green ash). Mixed deciduous / evergreen canopy may include *Quercus fusiformis* (plateau live oak) and *Ehretia anacua* (anacua) as significant components of the overstory. Sites dominated by *Quercus fusiformis* (plateau live oak) typically occur on less saturated sites such as slightly elevated situations. Less common species in the canopy may include *Acer negundo* (boxelder), *Gleditsia triacanthos* (honey locust), *Quercus macrocarpa* (bur oak), *Populus deltoides* (eastern cottonwood), *Platanus occidentalis* (American sycamore),

Morus rubra (red mulberry), and *Acacia farnesiana* (huisache). Some wetter sites may be dominated by *Salix nigra* (black willow) or, less commonly, *Taxodium distichum* (baldcypress). *Acer negundo* (boxelder), *Sapindus saponaria* var. *drummondii* (western soapberry), *Ungnadia speciosa* (Mexican buckeye) and saplings of the overstory species may form a subcanopy. The shrub layer is often not well-developed, and contains species such as *Sabal minor* (dwarf palmetto), *Ilex vomitoria* (yaupon), *Ilex decidua* (possumhaw), *Diospyros texana* (Texas persimmon), *Sideroxylon lanuginosum* (gum bumelia), *Prosopis glandulosa* (honey mesquite), *Acacia farnesiana* (huisache), *Condalia hookeri* (brasil), and/or *Cornus drummondii* (roughleaf dogwood). *Sabal minor* (dwarf palmetto) or *Ilex vomitoria* (yaupon) may sometimes form a dense shrub understory. Some sites may represent dense shrublands dominated by *Cephalanthus occidentalis* (common buttonbush) or *Forestiera acuminata* (swamp privet), with a sparse overstory. Vines are commonly encountered, including species such as *Ampelopsis arborea* (peppervine), *Vitis mustangensis* (mustang grape), *Smilax bona-nox* (saw greenbrier), *Toxicodendron radicans* (poison ivy), and *Campsis radicans* (trumpet creeper). The ground layer can be well-developed and often dominated by graminoids, including *Carex cherokeensis* (Cherokee sedge), *Carex crus-corvi* (crowfoot sedge), *Elymus virginicus* (Virginia wildrye), *Phanopyrum gymnocarpon* (savannah panicum), *Chasmanthium latifolium* (creek oats), *Leersia* spp. (cutgrasses), *Paspalum langei* (rustyseed paspalum), *Panicum obtusum* (vine mesquite) *Tripsacum dactyloides* (eastern gamagrass), *Carex bulbostylis* (narrowleaf sedge), *Carex tetrastachya* Britton's sedge, *Oplismenus hirtellus* (basketgrass), and *Dichantherium sphaerocarpon* (roundseed panicgrass). Forbs, such as *Malvaviscus arboreus* var. *drummondii* (Drummond Turk's cap), *Chloracantha spinosa* (spiny aster), *Verbesina virginica* (frostweed), *Calypocarpus vialis* (straggler daisy), *Commelina erecta* (erect dayflower), *Allium canadense* var. *canadense* (Canada wild onion), *Myosotis macrosperma* (scorpion weed), *Nemophila phacelioides* (baby blue-eyes), and the somewhat rare *Tauschia texana* (Texas tauschia) and *Spigelia texana* (Texas pinkroot), may also be found in these woodlands. *Chloracantha spinosa* (spiny aster) may sometimes form large, nearly monotypic in aspect, stands. Wetter, herbaceous dominated sites occur in these floodplains and may contain species such as *Cyperus* spp. (flatsedges), *Eleocharis* spp. (spikerushes), *Zizaniopsis miliacea* (Texas millet), *Paspalum denticulatum* (longtom), and *Typha domingensis* (southern cattail). The non-native *Triadica sebifera* (Chinese tallow) may be present to dominant in the canopy of occurrences of this system. Non-native grasses such as *Cynodon dactylon* (Bermudagrass), *Bothriochloa ischaemum* var. *songarica* (King Ranch bluestem), *Urochloa maximum* (guineagrass), and *Sorghum halepense* (Johnsongrass) may also be present and sometimes dominate the ground layer to the exclusion of other species.

VEGETATION TYPES:

Coastal Bend: Floodplain Live Oak Forest (4502)

Central Texas Coastal Prairie River Floodplain Live Oak Forest and Woodland

Identifier: **Phase 3 Code:** 4502

Description: As described for the system, but with the canopy dominated by *Quercus fusiformis* (plateau live oak).

Coastal Bend: Floodplain Live Oak / Hardwood Forest (4503)

Central Texas Coastal Prairie River Floodplain Live Oak–Hardwood Forest and Woodland

Identifier: **Phase 3 Code:** 4503

Description: Forests containing a mix of deciduous and broadleaf evergreen in the canopy. Broadleaf evergreen species include *Quercus fusiformis* (plateau live oak) and *Ehretia anacua* (anacua).

Coastal Bend: Floodplain Hardwood Forest (4504)

Central Texas Coastal Prairie River Floodplain Deciduous Forest and Woodland

Identifier: **Phase 3 Code:** 4504

Description: As described for the system with primarily deciduous hardwoods in the canopy. Almost 45% of the system is mapped as this type.

Coastal Bend: Floodplain Evergreen Shrubland (4505)

Central Texas Coastal Prairie River Floodplain Evergreen Shrubland

Identifier: **Phase 3 Code:** 4505

Description: Evergreen shrublands on floodplains with species such as *Sabal minor* (dwarf palmetto), *Rosa bracteata* (Macartney rose), *Zanthoxylum fagara* (colima), *Ehretia anacua* (anacua), *Baccharis halimifolia* (eastern baccharis), and *Acacia farnesiana* (huisache).

Coastal Bend: Floodplain Deciduous Shrubland (4506)

Central Texas Coastal Prairie River Floodplain Deciduous Shrubland

Identifier: **Phase 3 Code:** 4506

Description: Shrublands dominated by species such as *Prosopis glandulosa* (honey mesquite), *Acacia farnesiana* (huisache), *Cephalanthus occidentalis* (common buttonbush), *Forestiera acuminata* (swamp privet), and/or *Cornus drummondii* (roughleaf dogwood). Some sites mapped as this type may be dominated by *Chloracantha spinosa* (spiny aster). *Celtis laevigata* (sugar hackberry) and *Ulmus crassifolia* (cedar elm) are common within this type.

Coastal Bend: Floodplain Grassland (4507)

Central Texas Coastal Prairie River Floodplain Herbaceous Vegetation

Identifier: **Phase 3 Code:** 4507

Description: More than 22% of this system is mapped as this type, though most sites represent managed pasture and may be dominated by species such as *Cynodon dactylon* (Bermudagrass), *Bothriochloa ischaemum* var. *songarica* (King Ranch bluestem), and *Paspalum notatum* (bahiagrass).

Coastal Bend: Floodplain Herbaceous Wetland (4517)

Central Texas Coastal Prairie River Floodplain Herbaceous Wetland

Identifier: **Phase 3 Code:** 4517

Description: Herbaceous wetlands typically dominated by sedges, wetland grasses, such as *Paspalum denticulatum* (longtom) or *Zizaniopsis miliacea* (Texas millet), and wetland forbs such as *Polygonum* spp. (smartweeds).

Central Texas Coastal Prairie Riparian

Identifier: Previously Undescribed System

Geology: Beaumont or Lissie Formations.

Landform: Upland drainages accumulating flow from surrounding, mostly level landscape.

These drainages are typically erosional, sometimes incised, and rarely accrete significant alluvial deposition.

Soils: Various uplands soils. By definition, this system does not occupy bottomland ecological site types.

Description: This system represents vegetation bordering upland drainages where alluvial deposition is minimal. These sites, however, occupy locally low landscape positions and accumulate moisture from the surrounding landscape. Forested sites typically have a deciduous canopy with species such as *Celtis laevigata* (sugar hackberry), *Ulmus crassifolia* (cedar elm), *Carya illinoensis* (pecan), *Salix nigra* (black willow), *Prosopis glandulosa* (honey mesquite), *Acacia farnesiana* (huisache), and/or *Quercus nigra* (water oak). *Quercus fusiformis* (plateau live oak) may share, or sometimes dominate, the canopy. The shrub layer may be well-developed and include species such *Prosopis glandulosa* (honey mesquite), *Acacia farnesiana* (huisache), *Diospyros texana* (Texas persimmon), *Condalia hookeri* (brasil), *Ziziphus obtusifolia* (lotebush), and/or *Aloysia gratissima* (whitebrush). Some areas may lack a significant overstory and be mapped as shrublands of these species. The herbaceous layer may contain species such *Elymus virginicus* (Virginia wild-rye), *Chasmanthium latifolium* (creek oats), *Calypocarpus vialis* (straggler daisy), *Verbesina virginica* (frostweed), and *Chloracantha spinosa* (spiny aster).

VEGETATION TYPES:

Coastal Bend: Riparian Live Oak Forest (4602)

Central Texas Coastal Prairie Riparian Live Oak Forest and Woodland

Identifier: **Phase 3 Code:** 4602

Description: About 12% of this system is composed of this type, where *Quercus fusiformis* (plateau live oak) or, in some cases *Ehretia anacua* (anacua), dominates the overstory.

Coastal Bend: Riparian Live Oak / Hardwood Forest (4603)

Central Texas Coastal Prairie Riparian Live Oak–Deciduous Forest and Woodland

Identifier: **Phase 3 Code:** 4603

Description: Forests or woodlands where canopy dominance is shared by broadleaf evergreen species such as *Quercus fusiformis* (plateau live oak) or *Ehretia anacua* (anacua), and deciduous species such as *Celtis laevigata* (sugar hackberry), *Ulmus crassifolia* (cedar elm) and others.

Coastal Bend: Riparian Hardwood Forest (4604)

Central Texas Coastal Prairie Riparian Deciduous Forest and Woodland

Identifier: **Phase 3 Code:** 4604

Description: As described for the system, where deciduous canopy species predominate.

Coastal Bend: Riparian Evergreen Shrubland (4605)

Central Texas Coastal Prairie Riparian Evergreen Shrubland

Identifier: **Phase 3 Code:** 4605

Description: Upland drainages where shrubs such as *Ilex vomitoria* (yaupon), *Zanthoxylum fagara* (colima), *Rosa bracteata* (Macartney rose), or *Acacia farnesiana* (huisache) dominate. *Celtis laevigata* (sugar hackberry), *Celtis ehrenbergiana* (granjeno), and *Prosopis glandulosa* (honey mesquite) are often present.

Coastal Bend: Riparian Deciduous Shrubland (4606)

Central Texas Coastal Prairie Riparian Deciduous Shrubland

Identifier: **Phase 3 Code:** 4606

Description: Primarily disturbance shrublands of upland drainages dominated by species such as *Prosopis glandulosa* (honey mesquite), *Acacia farnesiana* (huisache), small *Celtis laevigata* (sugar hackberry), *Salix nigra* (black willow), or *Cephalanthus occidentalis* (common buttonbush).

Coastal Bend: Riparian Grassland (4607)

Central Texas Coastal Prairie Riparian Herbaceous Vegetation

Identifier: **Phase 3 Code:** 4607

Description: Sites on upland drainages that often represent managed grasslands dominated by *Cynodon dactylon* (Bermudagrass), *Paspalum notatum* (bahagrass), or *Bothriochloa ischaemum* var. *songarica* (King Ranch bluestem).

Coastal Bend: Riparian Herbaceous Wetland (4617)

Central Texas Coastal Prairie Riparian Herbaceous Wetland

Identifier: **Phase 3 Code:** 4617

Description: Herbaceous dominated wetlands along upland drainages.

Columbia Bottomlands Forest and Woodland

Identifier: Previously Undescribed System

Geology: On extensive Quaternary alluvium along rivers and major drainages, but also found on adjacent Beaumont and Lissie Formations.

Landform: On the level to gently rolling uplands of the coastal prairie and floodplains. Significant local topographic relief associated with terraces, depressions, levees and swales of the floodplains of the lower Colorado, Brazos, and San Bernard Rivers and their major tributaries.

Soils: Primarily on the Clayey or Loamy Bottomland ecological site types, but also found on blackland and claypan soils within the basin.

Description: This system occurs on Quaternary alluvium and adjacent Pleistocene terraces (Beaumont and Lissie Formations) along the Brazos, San Bernard, and Colorado Rivers (as they pass through these Pleistocene formations), and adjacent streams such as Oyster Creek, Caney

Creek, and Linnville Bayou. Chocolate Bayou represents the eastern extent of this system as the forest grades into systems more closely resembling the **West Gulf Coastal Plain Small Stream and River Forest** system to the northeast. Tres Palacios Creek represents the southwestern limit of this system, as floodplains further south and west share closer affinity to coastal rivers such as the Mission and Aransas. This system occupies a generally level landscape, punctuated by a series of swales, depressions, and natural levees. Much of the flooding experienced by this system results from seasonal precipitation and tropical storms, not from over-bank flooding. Over-bank flooding is infrequent, occurring about every 15 to 25 years (M. Lange, Pers. Comm.). Soils are frequently clayey bottomlands (such as Pledger or Brazoria clays) or loamy bottomlands (such as those of the Asa or Norwood series). This system expresses a range of communities along a moisture gradient ranging from the wettest sites along stream margins and depressions, to somewhat drier sites on ridges and natural levees. Herbaceous communities and open water typically characterize the wettest sites, with species such as *Eleocharis quadrangulata* (squarestem spikesedge), *Sagittaria graminea* (grassy arrowhead), *Sagittaria platyphylla* (delta arrowhead), *Ludwigia* spp. (water-primroses), *Saururus cernuus* (lizard's tail), *Azolla caroliniana* (Carolina mosquito-fern), and *Lemna obscura* (little duckweed). Such very wet sites may have *Taxodium distichum* (baldcypress) and *Salix nigra* (black willow) in the overstory, or may be shrub swamps dominated by *Cephalanthus occidentalis* (common buttonbush) and/or *Forestiera acuminata* (swamp privet). Sites inundated somewhat less frequently, such as meander scars, abandoned oxbows, and channels, are often dominated in the overstory by species including *Fraxinus pennsylvanica* (green ash), *Ulmus americana* (American elm), and *Carya aquatica* (water hickory), while the woody understory of these sites are typically open and may be dominated by *Cephalanthus occidentalis* (common buttonbush) and/or *Forestiera acuminata* (swamp privet). Rarely, *Leitneria floridana* (corkwood) may be a conspicuous component of the shrub layer. Herbaceous cover is often patchy and can include species such as *Phanopyrum gymnocarpon* (savannah panicum), *Echinodorus cordifolius* (heartleaf burhead), *Carex* spp. (carices), *Rhynchospora corniculata* (horned beakrush), *Saururus cernuus* (lizard's tail), *Polygonum punctatum* (water smartweed), *Hygrophila lacustris* (Gulf swampweed), *Boehmeria cylindrica* (false nettle), *Mikania scandens* (climbing hempweed), and *Lemna obscura* (little duckweed). Flats and ridges that are only occasionally flooded are often dominated by *Celtis laevigata* (sugar hackberry), *Ulmus crassifolia* (cedar elm), *Quercus nigra* (water oak), and *Quercus shumardii* (Shumard oak). Shrubs on these sites include *Ilex vomitoria* (yaupon), *Sapindus saponaria* var. *drummondii* (western soapberry), *Malvaviscus arboreus* var. *drummondii* (Drummond Turk's cap), *Symphoricarpos orbiculatus* (coralberry), and *Callicarpa americana* (American beautyberry). *Sabal minor* (dwarf palmetto) and *Carex cherokeensis* (Cherokee sedge) are more abundant on these sites, and other species such as *Toxicodendron radicans* (poison ivy), *Chasmanthium sessiliflorum* (narrowleaf woodoats), *Chasmanthium latifolium* (creek oats), *Calyptocarpus vialis* (straggler daisy), *Oplismenus hirtellus* ssp. *setarius* (basketgrass), and *Polygonum virginianum* (jump seed) may be present. Clay backflats in this landscape may be dominated by *Quercus virginiana* (coastal live oak) and *Carya illinoensis* (pecan), and *Quercus virginiana* (coastal live oak) may also share dominance with other canopy species on natural levees of these river systems. Blackland soils on the Pleistocene surface (such as those of the Lake Charles series) are often occupied by a forest dominated or co-dominated by *Quercus nigra* (water oak), *Celtis laevigata* (sugar hackberry), *Ulmus crassifolia* (cedar elm), *Fraxinus pennsylvanica* (green ash), and less frequently *Quercus virginiana* (coastal live oak). The shrub layer on these sites is often well-developed and typically

dominated by *Ilex vomitoria* (yaupon), sometimes with *Sabal minor* (dwarf palmetto), *Cornus drummondii* (roughleaf dogwood), and *Prunus caroliniana* (Carolina laurelcherry) also present. Vines are commonly encountered including species such as *Vitis mustangensis* (mustang grape), *Toxicodendron radicans* (poison ivy), *Ampelopsis arborea* (peppervine), and *Berchemia scandens* (Alabama supplejack). *Chasmanthium sessiliflorum* (narrowleaf woodoats), *Carex cherokeensis* (Cherokee sedge), *Carex crus-corvi* (crowfoot sedge), *Urochloa platyphylla* (broadleaf signalgrass), and *Juncus* spp. (rushes) and numerous other species are commonly found in the herbaceous layer. It is unclear whether these typically prairie dominated surfaces are now occupied by woodland and forest due to a disruption in natural fire cycle and disturbance, or whether the unique hydrology or other environmental factors of the Columbia Bottomlands leads to this incongruity. *Tillandsia usneoides* (Spanish moss) is a frequently encountered epiphyte in these forests. Riverside woodlands, along major rivers, have *Platanus occidentalis* (American sycamore) and *Populus deltoides* (eastern cottonwood) in the canopy (David Rosen, Pers. Comm.). The non-native tree *Triadica sebifera* (Chinese tallow) may often be encountered, sometimes as a significant or dominant component of the canopy.

VEGETATION TYPES:

Columbia Bottomlands: Live Oak Forest and Woodland (4702)

Columbia Bottomlands Live Oak Forest and Woodland

Identifier: **Phase 3 Code:** 4702

Description: This type typical occupies slightly drier sites on levees and ridges and is dominated by *Quercus virginiana* (coastal live oak). This is the region of transition between *Quercus virginiana* (coastal live oak) and *Quercus fusiformis* (plateau live oak). We refer to live oaks in this section of the coast as *Quercus virginiana* (coastal live oak), though the true taxon, or taxa, is not known.

Columbia Bottomlands: Mixed Evergreen / Hardwood Forest and Woodland (4703)

Columbia Bottomlands Mixed Evergreen–Deciduous Forest and Woodland

Identifier: **Phase 3 Code:** 4703

Description: Forest and woodland with the canopy shared between *Quercus virginiana* (coastal live oak) and hardwood species described for the system.

Columbia Bottomlands: Hardwood Forest and Woodland (4704)

Columbia Bottomlands Deciduous Forest and Woodland

Identifier: **Phase 3 Code:** 4704

Description: About 47% of the system is represented by this forest and woodland characterized by a deciduous canopy of species described for the system.

Columbia Bottomlands: Evergreen Shrubland (4705)

Columbia Bottomlands Evergreen Shrubland

Identifier: **Phase 3 Code:** 4705

Description: Shrublands or sparse woodlands with a well-developed shrub layer with species such as *Ilex vomitoria* (yaupon), *Sabal minor* (dwarf palmetto), *Quercus virginiana* (coastal live oak), *Rosa bracteata* (Macartney rose), or *Baccharis* spp. (baccharis). These shrublands are often the result of disturbance. Areas where cover in

the shrub layer is dominated by *Triadica sebifera* (Chinese tallow) may also be mapped as this type. Species such as *Celtis laevigata* (sugar hackberry), *Quercus virginiana* (coastal live oak), and *Salix nigra* (black willow) may also be present.

Columbia Bottomlands: Deciduous Shrubland (4706)

Columbia Bottomlands Deciduous Shrubland

Identifier: **Phase 3 Code:** 4706

Description: Shrub dominated sites that may have a sparse woody overstory with species in the shrub layer such as *Cephalanthus occidentalis* (common buttonbush), *Salix nigra* (black willow), *Forestiera acuminata* (swamp privet), and/or *Cornus drummondii* (roughleaf dogwood). *Triadica sebifera* (Chinese tallow) may be a conspicuous component of these shrublands, which often result from disturbance.

Columbia Bottomlands: Grassland (4707)

Columbia Bottomlands Herbaceous Vegetation

Identifier: **Phase 3 Code:** 4707

Description: These are herbaceous dominated sites occupying bottomland soils and lacking significant shrub or overstory canopy cover. They are mostly managed grasslands dominated by grasses such as *Cynodon dactylon* (Bermudagrass), *Paspalum notatum* (bahiagrass), and *Lolium perenne* (Italian ryegrass).

Columbia Bottomlands: Herbaceous Wetlands (4717)

Columbia Bottomlands Herbaceous Wetlands

Identifier: **Phase 3 Code:** 4717

Description: Wetlands dominated by herbaceous species such as *Carex crus-corvi* (crowfoot sedge), other *Carex* spp. (carices), *Eleocharis quadrangulata* (squarestem spikesedge), *Rhynchospora* spp. (beaksedges), *Juncus* spp. (rushes), *Sagittaria* spp. (arrowheads), *Saururus cernuus* (lizard's tail), *Echinodorus cordifolius* (heartleaf burhead), *Typha* spp. (cattails), and/or *Polygonum* spp. (smartweeds).

Columbia Bottomlands: Riparian Live Oak Forest and Woodland (4712)

Columbia Bottomlands Riparian Live Oak Forest and Woodland

Identifier: **Phase 3 Code:** 4712

Description: Forests or woodlands along drainages outside of bottomland soils, but within the Columbia Bottomlands landscape, where the canopy is dominated by *Quercus virginiana* (coastal live oak).

Columbia Bottomlands: Riparian Mixed Evergreen / Hardwood Forest and Woodland (4713)

Columbia Bottomlands Riparian Mixed Evergreen–Deciduous Forest and Woodland

Identifier: **Phase 3 Code:** 4713

Description: Forests or woodlands along drainages outside of bottomland soils, but within the Columbia Bottomlands landscape, where the canopy is co-dominated by *Quercus virginiana* (coastal live oak) and deciduous species.

Columbia Bottomlands: Riparian Hardwood Forest and Woodland (4714)

Columbia Bottomlands Riparian Deciduous Forest and Woodland

Identifier: Phase 3 Code: 4714

Description: Forests and woodlands with a deciduous canopy that occupy sites along drainages but outside of bottomland soils.

Columbia Bottomlands: Riparian Evergreen Shrubland (4715)

Columbia Bottomlands Riparian Evergreen Shrubland

Identifier: Phase 3 Code: 4715

Description: Evergreen shrublands, often resulting from disturbance, that occupy sites along drainages but outside of bottomland soils. Species such as *Baccharis* spp. (*baccharis*), *Rosa bracteata* (Macartney rose), *Ilex vomitoria* (yaupon), or small *Quercus virginiana* (coastal live oak) sometimes dominate this type. Some sites dominated by *Triadica sebifera* (Chinese tallow) may be mapped as this type.

Columbia Bottomlands: Riparian Deciduous Shrubland (4716)

Columbia Bottomlands Riparian Deciduous Shrubland

Identifier: Phase 3 Code: 4716

Description: Shrublands dominated by deciduous species along drainages that are outside of bottomland soils and are often the result of disturbance. Species such as *Sapindus saponaria* var. *drummondii* (western soapberry), *Cephalanthus occidentalis* (common buttonbush), *Cornus drummondii* (roughleaf dogwood), or *Sesbania drummondii* (rattlebox sesbania) may be dominant. Disturbed sites may be dominated by *Prosopis glandulosa* (honey mesquite), *Acacia farnesiana* (huisache), or *Triadica sebifera* (Chinese tallow).

Columbia Bottomlands: Riparian Grassland (4727)

Columbia Bottomlands Riparian Herbaceous Vegetation

Identifier: Phase 3 Code: 4727

Description: These are typically managed grasslands on upland drainages. Most are dominated by non-native species such as *Bothriochloa ischaemum* var. *songarica* (King Ranch bluestem), *Cynodon dactylon* (Bermudagrass), *Paspalum notatum* (bahiagrass), and *Lolium perenne* (Egyptian ryegrass).

Columbia Bottomlands: Riparian Herbaceous Wetland (4737)

Columbia Bottomlands Riparian Herbaceous Wetland

Identifier: Phase 3 Code: 4737

Description: Herbaceous wetlands along upland drainages outside of bottomland soils. These wetlands are often dominated by sedges, rushes, and forbs such as *Polygonum* spp. (smartweeds).

Tamaulipan Floodplain

Identifier: CES301.990

Geology: Quaternary alluvium.

Landform: Floodplains of rivers and large creeks where sediment is deposited. Topography is relatively level with some relief associated with levees and depressions developed from meanders of the waterway, or historical meanders of the Rio Grande (Resaca).

Soils: Alluvial soils of the Bottomland Ecological Sites, including loamy, clayey, and sandy. The Lowland Ecological Site type also supports this system.

Description: This ecological system occurs along rivers and major drainages in south Texas from the central portion of the Nueces River south to northeastern Mexico and west to the vicinity of Del Rio, Texas. Generally, the system is expressed as a deciduous woodland or forest with tree height reaching to 15 meters, and canopy cover variable but sometimes reaching near 100 percent. The canopy may have a conspicuous (sometimes dominant to co-dominant) evergreen component of species such as *Ebenopsis ebano* (Texas ebony) and *Ehretia anacua* (anacua). Dominant species of the overstory canopy often includes one or more of the following species: *Celtis laevigata* (sugar hackberry), *Ulmus crassifolia* (cedar elm), *Fraxinus berlandieriana* (Mexican ash), *Prosopis glandulosa* (honey mesquite), *Acacia farnesiana* (huisache), *Diospyros texana* (Texas persimmon), *Leucaena pulverulenta* (tepeguaje), *Celtis ehrenbergiana* (granjeno), *Sapindus saponaria* var. *drummondii* (western soapberry), *Ebenopsis ebano* (Texas ebony), *Ehretia anacua* (anacua), and *Parkinsonia aculeata* (retama). In northern portions of the range of this system, particularly within the Nueces River drainage, *Carya illinoensis* (pecan) and *Quercus fusiformis* (plateau live oak) may be conspicuous components of the overstory. Forests and woodlands may have significant shrub cover including saplings of the overstory species in addition to species such as *Zanthoxylum fagara* (colima), *Condalia hookeri* (brasil), *Forestiera angustifolia* (desert olive), *Sideroxylon* spp. (bumelias), *Aloysia gratissima* (whitebrush), *Acacia greggii* var. *wrightii* (Wright's acacia), *Malpighia glabra* (Barbados cherry), *Guaiacum angustifolium* (guayacan), *Ziziphus obtusifolia* (lotebush) and *Amyris texana* (Texas torchwood). Other shrub species, such as *Buddleja sessiliflora* (Rio Grande butterflybush), *Phaulothamnus spinescens* (snake-eyes), *Lippia alba* (white lipia), and *Amyris madrensis* (Sierra Madre torchwood) may be encountered in southern expressions of the system. *Salix nigra* (black willow) may dominate sites, especially at river's edge and wet sites. Riverbanks and other sites with a reduced overstory canopy (either from disturbance or prolonged inundation) may also be shrub dominated, often with one or few species such as *Baccharis neglecta* (Rooseveltweed), *Baccharis salicifolia* (seepwillow), *Arundo donax* (giant reed), *Sesbania drummondii* (rattlebox sesbania), or *Cephalanthus occidentalis* (common buttonbush), and *Salix exigua* (Texas sandbar willow), *Mimosa asperata* (black mimosa), or *Cephalanthus salicifolius* (willowleaf buttonbush) in the lower Rio Grande Valley. The herbaceous layer is typically not well developed, but may include species such as *Trichloris pluriflora* (multiflower false Rhodes grass), *Setaria scheelei* (southwestern bristlegrass), *Panicum virgatum* (switchgrass), *Paspalum langei* (rustyseed paspalum), *Paspalum denticulatum* (longtom), *Carex crus-corvi* (crowfoot sedge), *Cyperus articulatus* (jointed umbrellasedge), *Rivina humilis* (pigeonberry), *Calyptocarpus vialis* (straggler daisy), *Chromolaena odorata* (cruciata), *Teucrium cubense* (Cuban germander), *Urtica chamaedryoides* (slim stinging nettle), *Parietaria pensylvanica* (cucumberweed), *Verbesina microptera* (southern frostweed), *Chloracantha spinosa* (spiny aster), *Parthenium confertum* (false ragweed), and *Malvaviscus arboreus* var. *drummondii* (Drummond Turk's cap). Vines such as *Serjania brachycarpa* (littlefruit sippie-jack), *Cocculus diversifolius* (orientvine), *Clematis drummondii* (old man's beard), and *Cissus trifoliata* (ivy treebine) are frequently encountered, and *Tillandsia usneoides*

(Spanish moss) often drapes the branches of overstory species. Non-native grasses such as *Cynodon dactylon* (Bermudagrass), *Urochloa maxima* (guineagrass), *Pennisetum ciliare* (buffelgrass), *Bothriochloa ischaemum* var. *songarica* (King Ranch bluestem), and *Bromus catharticus* (rescuegrass) are often present to dominant, and sometimes to the exclusion of most other herbaceous species.

VEGETATION TYPES:

South Texas: Floodplain Evergreen Forest and Woodland (7402)

Tamaulipan Floodplain Evergreen Forest and Woodland

Identifier: CES301.990.2 **Phase 3 Code:** 7402

Description: Forests or woodlands with the canopy dominated by broadleaf evergreen species such as *Ebenopsis ebano* (Texas ebony), *Ehretia anacua* (anacua), or, in the north *Quercus fusiformis* (plateau live oak). Deciduous species may be present, but broadleaf evergreen species clearly dominate.

South Texas: Floodplain Mixed Deciduous / Evergreen Forest and Woodland (7403)

Tamaulipan Floodplain Mixed Deciduous-Evergreen Forest and Woodland

Identifier: CES301.990.3 **Phase 3 Code:** 7403

Description: Forests or woodlands where deciduous canopy species such as *Celtis laevigata* (sugar hackberry) and *Ulmus crassifolia* (cedar elm) share dominance with broadleaf evergreen species such as *Ebenopsis ebano* (Texas ebony) and *Ehretia anacua* (anacua).

South Texas: Floodplain Hardwood Forest and Woodland (7404)

Tamaulipan Floodplain Deciduous Forest and Woodland

Identifier: CES301.990.4 **Phase 3 Code:** 7404

Description: Forests or woodlands with the canopy dominated by deciduous species such as *Celtis laevigata* (sugar hackberry), *Ulmus crassifolia* (cedar elm), *Celtis ehrenbergiana* (granjeno), *Prosopis glandulosa* (honey mesquite), *Leucaena pulverulenta* (tepeguaje), and *Diospyros texana* (Texas persimmon).

South Texas: Floodplain Evergreen Shrubland (7405)

Tamaulipan Floodplain Evergreen Shrubland

Identifier: CES301.990.5 **Phase 3 Code:** 7405

Description: Dense shrublands containing species such as *Acacia farnesiana* (huisache), *Opuntia engelmannii* var. *lindheimeri* (Lindheimer pricklypear), *Arundo donax* (giant reed), *Guaiacum angustifolium* (guayacan), and *Zanthoxylum fagara* (colima).

South Texas: Floodplain Deciduous Shrubland (7406)

Tamaulipan Floodplain Deciduous Shrubland

Identifier: CES301.990.6 **Phase 3 Code:** 7406

Description: Shrublands or somewhat sparse woodlands dominated by species such as *Prosopis glandulosa* (honey mesquite), *Celtis ehrenbergiana* (granjeno), *Celtis laevigata* (sugar hackberry), *Diospyros texana* (Texas persimmon), *Parkinsonia aculeata* (retama),

Aloysia gratissima (whitebrush), *Chloracantha spinosa* (spiny aster), and *Condalia hookeri* (brasil).

South Texas: Floodplain Grassland (7407)

Tamaulipan Floodplain Grassland

Identifier: CES301.990.7

Phase 3 Code: 7407

Description: Sites often dominated by non-native graminoids such as *Cynodon dactylon* (Bermudagrass), *Urochloa maximum* (guineagrass), *Dichanthium annulatum* (Kleberg bluestem), *Pennisetum ciliare* (buffelgrass), or *Bothriochloa ischaemum* var. *songarica* (King Ranch bluestem). Other species that may be present include *Bothriochloa laguroides* ssp. *torreyana* (silver bluestem), *Panicum hallii* (Hall's panicum), *Spartina spartinae* (Gulf cordgrass), *Sporobolus airoides* (alkali sacaton), *Bouteloua dactyloides* (buffalograss), and *Trichloris pluriflora* (multiflower false Rhodes grass).

South Texas: Floodplain Herbaceous Wetland (7417)

Tamaulipan Floodplain Herbaceous Wetland

Identifier: CES301.990.17

Phase 3 Code: 7417

Description: Wetlands dominated by herbaceous species such as *Schoenoplectus pungens* (common threesquare), *Cyperus articulatus* (jointed umbrellasedge), *Typha domingensis* (southern cattail), other sedges and forbs such as *Echinodorus berteroi* (common burhead).

Tamaulipan Ramadero

Identifier: CES301.992

Geology: Widespread system on various geologic strata.

Landform: Upland drainages in various landscapes. Drainages are extremely flashy from runoff from surrounding landscape. These sites are infrequently flooded during local rainfall events, but because they accumulate runoff, they tend to be slightly more mesic in this otherwise xeric landscape.

Soils: Various upland soils (not Bottomland ecological site types), sometimes mapped specifically as Ramadero Ecological Site.

Description: These woodlands are found along drainages (locally known as ramaderos) that are extremely flashy and are infrequently and briefly flooded during local rain events. The soils are typically clay loams or sandy clay loams, and moisture accumulation due to their topographic position promotes the development of a closed canopy (relative to the surrounding landscape) from 5 to 10 m in height. The overstory canopy is typically dominated by species such as *Prosopis glandulosa* (honey mesquite), *Acacia farnesiana* (huisache), *Celtis ehrenbergiana* (granjeno), and/or *Parkinsonia aculeate* (retama). *Celtis laevigata* (sugar hackberry) and/or *Ebenopsis ebano* (Texas ebony) may also be present in the canopy. Some sites have a relatively open subcanopy, but more commonly the shrub layer is thick, sometimes impenetrable, and varies in height from 1 to 5 m. Species commonly encountered in the shrub layer include *Aloysia gratissima* (whitebrush), *Phaulothamnus spinescens* (snake-eyes), *Celtis ehrenbergiana* (granjeno), *Condalia hookeri* (brasil), *Forestiera angustifolia* (desert olive), *Diospyros texana*

(Texas persimmon), *Ziziphus obtusifolia* (lotebush), *Koeberlinia spinosa* (allthorn), *Malpighia glabra* (Barbados cherry), *Zanthoxylum fagara* (colima), *Opuntia engelmannii* var. *lindheimeri* (Lindheimer pricklypear), *Guaiacum angustifolium* (guayacan), *Colubrina texensis* (Texas hogplum), and *Amyris texana* (Texas torchwood). Ground cover can be sparse, or in more open stands, may have a fairly continuous grassy cover. Species encountered in the herbaceous layer include *Clematis drummondii* (old man's beard), *Parietaria pensylvanica* (cucumberweed), *Salvia coccinea* (tropical sage), *Calyptocarpus vialis* (straggler daisy), *Rivina humilis* (pigeonberry), *Malvastrum americanum* (Rio Grande false-mallow), *Ruellia* sp. (wild petunia), and *Verbesina microptera* (southern frostweed). Grasses include *Trichloris pluriflora* (multiflower false Rhodes grass), *Bothriochloa barbinodis* (cane bluestem), *Bouteloua curtipendula* (sideoats grama), *Setaria scheelei* (southwestern bristlegrass), *Setaria macrostachya* (bigstem bristlegrass), *Setaria leucopila* (plains bristlegrass), *Chloris cucullata* (hooded windmillgrass), *Digitaria californica* (Arizona cottontop), *Pappophorum bicolor* (pink pappusgrass), *Bouteloua trifida* (red grama), *Bouteloua dactyloides* (buffalograss), and *Hilaria belangeri* (curlymesquite). The introduced grasses *Pennisetum ciliare* (buffelgrass), *Urochloa maximum* (guineagrass), and *Cynodon dactylon* (Bermudagrass) often dominate these sites, sometimes to the near exclusion of other herbaceous cover. This system may merge downstream with the Tamaulipan Floodplain system.

VEGETATION TYPES:

South Texas: Ramadero Evergreen Woodland (7602)

Tamaulipan Ramadero Evergreen Woodland

Identifier: CES301.992.2

Phase 3 Code: 7602

Description: Less than three percent of this system as it is mapped is occupied by this type which has a significant broadleaf evergreen component, often *Ebenopsis ebano* (Texas ebony) but sometimes *Quercus fusiformis* (plateau live oak) in the northern part of the South Texas Plains.

South Texas: Ramadero Woodland (7604)

Tamaulipan Ramadero Woodland

Identifier: CES301.992.4

Phase 3 Code: 7604

Description: Woodlands 5 to 10 m in height, with a canopy typically dominated or co-dominated by *Prosopis glandulosa* (honey mesquite), *Acacia farnesiana* (huisache), *Celtis ehrenbergiana* (granjeno), *Parkinsonia aculeata* (retama), and/or *Celtis laevigata* (sugar hackberry). The shrub layer is often well-developed.

South Texas: Ramadero Dense Shrubland (7605)

Tamaulipan Ramadero Dense Shrubland

Identifier: CES301.992.5

Phase 3 Code: 7605

Description: Dense shrublands occupying drainages, with canopy cover reaching near 100% from 0.5 to 3 m in height. These shrublands may be dominated by numerous species. *Aloysia gratissima* (whitebrush) may sometimes form dense stands in these sites.

South Texas: Ramadero Shrubland (7606)

Tamaulipan Ramadero Shrubland

Identifier: CES301.992.6

Phase 3 Code: 7606

Description: Typical shrublands along drainages making up 65% of the system in Phase 3. These sites are dominated by a suite of shrub species including *Prosopis glandulosa* (honey mesquite), *Acacia farnesiana* (huisache), *Celtis ehrenbergiana* (granjeno), *Diospyros texana* (Texas persimmon), and *Ziziphus obtusifolia* (lotebush).

Rio Grande Delta Thorn Woodland and Shrubland

Identifier: Previously Undescribed System

Geology: Quaternary alluvium.

Landform: Sites within the historic floodplain of the Rio Grande delta, typically on slight rises such as old natural levees or resaca banks.

Soils: Often on Clayey or Loamy Bottomland Ecological Sites, but occasionally on Clay Loam or Gray Sandy Loam types.

Description: This diverse, usually broad-leaved evergreen, woodland is found on resaca banks and old natural levees on the Rio Grande delta. Sites are well-watered, somewhat elevated relative to the surrounding landscape, and tend to occupy loamy or clayey bottomland soils. Occasionally occurrences can be found on clay loams (such as Raymondville or Racombes soils) or gray sandy loams (such as Hidalgo sandy clay loam). The sometimes patchy canopy of these woodlands often contains species such as *Ebenopsis ebano* (Texas ebony), *Ehretia anacua* (anacua), *Celtis laevigata* (sugar hackberry), *Ulmus crassifolia* (cedar elm), and *Celtis ehrenbergiana* (granjeno), and may reach heights of 15 m. Species such as *Phaulothamnus spinescens* (snake-eyes), *Amyris madrensis* (Sierra Madre torchwood), *Amyris texana* (Texas torchwood), *Diospyros texana* (Texas persimmon), *Leucaena pulverulenta* (tepeguaje), *Guaiacum angustifolium* (guayacan), *Malpighia glabra* (Barbados cherry), *Adelia vaseyi* (Vasey's adelia), *Bernardia myricifolia* (oreja de raton), *Sideroxylon celastrinum* (la coma), *Condalia hookeri* (brasil), *Forestiera angustifolia* (desert olive), *Havardia pallens* (tenaza), *Iresine palmeri* (Palmer's bloodleaf), *Trixis inula* (tropical trixis), *Xylosma flexuosum* (brush-holly), and *Randia rhagocarpa* (crucillo) may occur as shrubs or in the sub-canopy, and some individuals of a few of these species may reach heights of 4 to 5 meters. This shrub or understory layer can be extremely dense, almost impenetrable. Woody cover, including the patchier overstory canopy and the almost continuous shrub/understory layer, often reaches greater than 90%. This system is sometimes referred to as a tall shrubland, since shrubs are often the dominant lifeform, but frequently reach heights resembling the stature of woodland. *Prosopis glandulosa* (honey mesquite) may occasionally be absent or uncommon in the canopy, and is generally not dominant except in disturbed situations. The herbaceous layer is generally represented by a only a few species and is relatively sparse, with species such as *Rivina humilis* (pigeonberry), *Plumbago scandens* (climbing plumbago), *Celosia nitida* (West Indian cock's comb), *Chromolaena odorata* (crucita), *Leersia monandra* (bunch cutgrass), *Digitaria californica* (Arizona cottontop), *Setaria* spp. (bristlegrasses), *Salvia coccinea* (tropical sage), *Petiveria alliacea* (hierba de las gallinitas), *Malvastrum americanum* (Rio Grande false-mallow), *Urtica chamaedryoides* (slim stinging nettle), *Verbesina microptera* (southern frostweed), *Calyptocarpus vialis* (straggler daisy), and *Justicia pilosella* (hairy tubetongue) sometimes present. Vines such as *Serjania brachycarpa* (littlefruit slipplejack), *Urvillea ulmacea* (apaac),

Cocculus diversifolius (orientvine), *Mikania scandens* (climbing hemp-weed), *Cardiospermum* spp. (balloon-vines), *Chiococca alba* (David's milkberry), *Cissus trifoliata* (ivy treebine), and *Passiflora* spp. (passionflowers) may also be commonly encountered. The rather rare epiphyte *Tillandsia baileyi* (Bailey's ballmoss) may be found in these woodlands, along with the more common *Tillandsia recurvata* (ballmoss) and *Tillandsia usneoides* (Spanish moss). Younger occurrences, especially those occupying drier sites, tend to present as shrublands, often dominated by similar, though shorter, canopy species. These occurrences also tend to be less diverse, lack the layered structure, and usually support fewer epiphytes. This system differs from the related **Tamaulipan Floodplain** system in that it has higher diversity, a significant evergreen component to the canopy, a higher subtropical component to the species assemblage, is restricted in range to the Rio Grande delta and vicinity, and often occurs as slight rises in the otherwise relatively level landscape.

VEGETATION TYPES:

Rio Grande Delta: Evergreen Thorn Woodland (7802)

Rio Grande Delta Evergreen Thorn Woodland and Shrubland

Identifier: **Phase 3 Code:** 7802

Description: Much of this system (>90%) is mapped as this type with broadleaf evergreen species such as *Ebenopsis ebano* (Texas ebony) and *Ehretia anacua* (anacua) making up a significant portion of the overstory canopy and a dense shrub layer of numerous species present.

Rio Grande Delta: Deciduous Thorn Woodland and Shrubland (7804)

Rio Grande Delta Deciduous Thorn Woodland and Shrubland

Identifier: **Phase 3 Code:** 7804

Description: Woodlands with increased dominance of deciduous species such as *Celtis laevigata* (sugar hackberry), *Ulmus crassifolia* (cedar elm), and *Celtis ehrenbergiana* (granjeno).

Rio Grande Delta: Dense Shrubland (7805)

Rio Grande Delta Dense Shrubland

Identifier: **Phase 3 Code:** 7805

Description: Dense shrublands often representing younger occurrences and occurrences occupying slightly less well-watered sites. *Phaulothamnus spinescens* (snake-eyes), *Guaiacum angustifolia* (guayacan), *Celtis ehrenbergiana* (granjeno), and *Diospyros texana* (Texas persimmon) are often conspicuous components.

Tamaulipan Palm Grove Riparian Forest

Identifier: CES301.991

Geology: Quaternary alluvium.

Landform: Currently on levees and resaca margins and adjacent lower sites near the current Rio Grande channel. Historically more widespread within the Rio Grande delta.

Soils: Loamy or Clayey Bottomland Ecological Sites.

Description: This system is currently limited to relatively small groves (typically less than 20 hectares) of *Sabal mexicana* (Mexican sabal palm, sometimes referred to as *Sabal texana*) located on loamy or clayey bottomland soils, such as those of the Rio Grande, Zalla, and Matamoros series, on the Rio Grande Delta and near the Rio Grande itself in Cameron County, Texas and similar sites in adjacent Mexico. These often occupy slight elevations along the margins of resacas or old river terraces, but may also occur on level sites. The system may have once occurred along the Rio Grande more than 120 km from its mouth, but is now limited to a few sites near the Gulf, with a few small stands identified in extreme southern Hidalgo County, Texas. These forests and woodlands often have a canopy dominated by *Sabal mexicana* (Mexican sabal palm), or may share dominance with other floodplain species such as *Ebenopsis ebano* (Texas ebony), *Celtis laevigata* (sugar hackberry), *Leucaena pulverulenta* (tepeguaje), *Ulmus crassifolia* (cedar elm), *Ehretia anacua* (anacua), and *Fraxinus berlandieriana* (Mexican ash). *Prosopis glandulosa* (honey mesquite), *Sapindus saponaria* var. *drummondii* (western soapberry), and *Diospyros texana* (Texas persimmon) are often present in the subcanopy. The canopy of these forests may reach a height of 15 m, and the subcanopy, to 10 m, may be composed of some of the species mentioned above. The shrub layer can be patchy with some areas extremely dense and containing species such as *Zanthoxylum fagara* (colima), *Malpighia glabra* (Barbados cherry), *Celtis ehrenbergiana* (granjeno), *Erythrina herbacea* (coralbean), *Ziziphus obtusifolia* (lotebush), *Randia rhagocarpa* (crucillo), *Parkinsonia aculeate* (retama), *Havardia pallens* (tenaza), *Chiococca alba* (David's milkberry), *Iresine palmeri* (Palmer's bloodleaf), and members of the canopy and subcanopy, and other areas relatively open. In some situations the ground may be covered with a layer of dead palm fronds, restricting the development of an herbaceous layer. In other areas, species including, but not limited to, *Leersia monandra* (bunch cutgrass), *Salvia coccinea* (tropical sage), *Petiveria alliacea* (hierba de las gallinitas), *Rivina humilis* (pigeonberry), *Plumbago scandens* (climbing plumbago), *Tamauilpa azurea* (blue boneset), *Cocculus diversifolius* (orientvine), and *Malvaviscus arboreus* (Turk's cap) may be present in the herbaceous layer. Fire may have been an important process in these forests as the sites may become extremely dry and a significant, if patchy, layer of palm thatch may be present. These forests appear to differ from other forests dominated by *Sabal mexicana* (Mexican sabal palm) further to the south. Ojeda and González Medrano (1977) describe a site of limited distribution in the northern part of the Sierra de San José de las Rusias in the Municipio of Soto La Marina in Tamaulipas, Mexico. It occurs at higher altitudes and on Oligocene geologic formations. Their brief description suggests that this is likely different in composition and process from the presently described system. Lopez and Dirzo (2007) describe a site further south in Vera Cruz, that also seems to differ relative to composition.

VEGETATION TYPE:

South Texas: Palm Grove (7502)

Tamaulipan Palm Grove Riparian Forest

Identifier: CES301.991

Phase 3 Code: 7502

Description: As described for system.

Herbaceous Wetlands

Southeastern Coastal Plain Interdunal Wetland

Identifier: CES203.258

Geology: Coastal eolian sands, extending inland on the South Texas Sand Sheet. Also on Pleistocene barrier island and beach deposits of the Beaumont formation, such as on the Ingleside Barrier.

Landform: Occupying topographic lows of interdunal swales and potholes.

Soils: Deep sands and coastal sands.

Description: These wetlands occur on topographic lows in nearly level to steeply rolling landscapes on sands and deep sands along the coast and inland on the South Texas Sand Sheet. They are alternately wet and dry (due to seasonal rainfall events) and generally lack tidal influence, but may contain halophytic species due to the influence of salt spray and repeated inundation and evaporation. They are graminoid dominated sites, with species such as *Spartina patens* (marshhay cordgrass), *Andropogon glomeratus* (bushy bluestem), *Panicum virgatum* (switchgrass), *Paspalum monostachyum* (gulfdune paspalum), *Distichlis spicata* (saltgrass), *Fimbristylis castanea* (chestnut fimbry), *Rhynchospora colorata* (whitewtop sedge), *Eleocharis* spp. (spikerushes), *Rhynchospora* spp. (beaksedges), *Typha* spp. (cattails), and *Schoenoplectus pungens* (common threesquare). Forbs such as *Hydrocotyle bonariensis* (largeleaf pennywort), *Centella erecta* (spadeleaf), *Phyla nodiflora* (common frog-fruit), *Samolus ebracteatus* (coast brookweed), *Bacopa monnieri* (coastal water-hyssop), and *Pluchea foetida* (marsh fleabane) may be conspicuous. Woody species such as *Batis maritima* (saltwort), *Sesbania* spp. (rattleboxes), *Prosopis glandulosa* (honey mesquite), and *Baccharis* spp. (baccharis) may be present but do not typically constitute significant cover.

VEGETATION TYPE:

Coastal and Sandsheet: Deep Sand Grasslands Swale Marsh (6507)

Southeastern Coastal Plain Interdunal Wetland

Identifier: CES203.258

Phase 3 Code: 6507

Gulf Coast Chenier Plain Salt and Brackish Tidal Marsh

Identifier: CES203.468

Geology: Recent alluvial and windblown deposits.

Landform: Coastlines, bay margins, bay inlets, along dredged canals, creeks, and river inlets where tidal influence is adequate to maintain high salinities.

Soils: Fine textured soils, sometimes with high organic content at the surface. Ecological Sites (ecoclasses) include Brackish and Saltmarsh types.

Description: This typically herbaceous dominated system has a composition that varies depending on the salinity of the environment and the depth and frequency of tidal flooding. Marshes that are frequently flooded by tides (low marshes) tend to be strongly dominated by *Spartina alterniflora* (smooth cordgrass). Occasionally these sites may have significant cover of *Avicennia germinans* (black mangrove), though freezes tend to reduce the cover of mangrove in this system. Some patches of *Juncus roemerianus* (blackrush) may be interspersed. Higher marshes of saline to brackish sites tend to be somewhat more diverse, with *Spartina patens* (marshhay cordgrass) a common dominant. *Spartina alterniflora* (smooth cordgrass) may be present, but is typically not strongly dominant. Other species that may be present, or sometimes dominant, include *Spartina spartinae* (Gulf cordgrass), *Distichlis spicata* (saltgrass), *Batis maritima* (saltwort), *Salicornia* spp. (glasswort), *Schoenoplectus robustus* (sturdy bulrush), *Schoenoplectus americanus* (three-square bulrush), *Paspalum vaginatum* (seashore paspalum), and *Sporobolus virginicus* (seashore dropseed). *Iva frutescens* (shrubby sumpweed), *Borrchia frutescens* (sea ox-eye daisy), and *Baccharis halimifolia* (baccharis) are commonly encountered woody species.

VEGETATION TYPES:

Chenier Plain: Salt and Brackish Low Tidal Marsh (5707)

Gulf Coast Chenier Plain Salt and Brackish Regularly Flooded Tidal Marsh

Identifier: CES203.468.7 **Phase 3 Code:** 5707

Description: Low, regularly flooded tidal marsh, often dominated by *Spartina alterniflora* (smooth cordgrass).

Chenier Plain: Salt and Brackish High Tidal Marsh (5717)

Gulf Coast Chenier Plain Salt and Brackish Irregularly Flooded Tidal Marsh

Identifier: CES203.468.17 **Phase 3 Code:** 5717

Description: Sites with irregular tidal inundation, often dominated by species other than *Spartina alterniflora* (smooth cordgrass), though it may be present.

Chenier Plain: Salt and Brackish High Tidal Shrub Wetland (5716)

Gulf Coast Chenier Plain Salt and Brackish Irregularly Flooded Tidal Shrub Wetland

Identifier: CES203.468.16 **Phase 3 Code:** 5716

Description: Shrub dominated sites with irregular tidal inundation. Species such as *Iva frutescens* (shrubby sumpweed) or *Baccharis halimifolia* (baccharis) are often common. Some sites dominated by *Arundo donax* (giant reed) may also be mapped as this type.

Texas Coast Fresh and Oligohaline Tidal Marsh

Identifier: CES203.472

Geology: Young quaternary alluvium.

Landform: Mouths of rivers and bayous emptying into bays of the Galveston Bay system.

Soils: Soils of the Tidal Flats and Salt Marsh Ecological Sites where they occur in areas of sufficient freshwater inflow.

Description: Tidal marshes where salinity is maintained sufficiently low through freshwater inflows to produce fresh to oligohaline water chemistry. These marshes typically occur as small patches along bay margin and river or bayou mouths.

VEGETATION TYPE:

Coastal: Fresh and Intermediate Tidal Marsh (5907)

Texas Coast Fresh and Oligohaline Tidal Marsh

Identifier: CES203.472 **Phase 3 Code:** 5907

Description: As described for the system.

Texas Coast Salt and Brackish Tidal Marsh

Identifier: CES203.473

Geology: Recent alluvial and eolian deposits along the coast.

Landform: Nearly level very gentle slopes, and flats influenced by tides.

Soils: Coastal sands and various Salt Marsh Ecological Sites.

Description: These marshes occupy relatively low-lying, coastal situations on level landforms influenced by tidal fluctuations. Some sites are only influenced by storm tides, or tides resulting from extreme wind events. The composition of these marshes is primarily influenced by the frequency and duration of tidal inundation. Salinity on some marshes, particularly in the south, is maintained by salt spray from prevailing southeasterly winds. Low marshes are regularly flooded and representative examples are dominated by *Spartina alterniflora* (smooth cordgrass), *Juncus roemerianus* (blackrush), or *Avicennia germinans* (black mangrove). Significant areas of *Avicennia germinans* (black mangrove) become more frequent towards the south, while extensive areas of *Spartina alterniflora* (smooth cordgrass) become rare south of Corpus Christi Bay. Areas of decreased frequency and/or duration of tidal inundation are often referred to as high, or irregularly flooded, marsh. These marshes may be dominated by species such as *Spartina patens* (marshhay cordgrass), *Distichlis spicata* (saltgrass), *Schoenoplectus robustus* (sturdy bulrush), *Schoenoplectus americanus* (three-square bulrush), *Sporobolus virginicus* (seashore dropseed), *Monanthochloe littoralis* (shoregrass), and *Spartina spartinae* (Gulf cordgrass). Shrubs, subshrubs, and forbs, such as *Batis maritima* (saltwort), *Borrchia frutescens* (sea ox-eye daisy), *Sesuvium portulacastrum* (shoreline seapurslane), *Salicornia* spp. (glassworts), *Suaeda linearis* (annual seepweed), *Limonium* spp. (sea-lavenders), and *Lycium carolinianum* (Carolina wolfberry) are commonly encountered in these marshes. Some irregularly flooded sites may become shrub-dominated with species such as *Iva frutescens* (shrubby sumpweed) or *Baccharis halimifolia* (eastern baccharis). In the south, extensive areas are dominated by *Borrchia frutescens* (sea ox-eye daisy) and these often occur at very slightly lower elevations and higher salinities than nearby *Spartina spartinae* (Gulf cordgrass) salty prairie. These *Borrchia* flats may be very infrequently flooded, perhaps only under extreme storm tide conditions. Other species that may be encountered in these situations include *Maytenus phyllanthoides* (gutta-percha), *Prosopis reptans* (tornillo), *Monanthochloe littoralis*

(shoregrass), *Distichlis spicata* (saltgrass), and *Batis maritima* (saltwort). The aspect dominant on these sites is clearly *Borrichia frutescens* (sea ox-eye daisy).

VEGETATION TYPES:

Coastal: Tidal Flat (5600)

Texas Coast Salt and Brackish Tidal Flats

Identifier: CES203.473.1 **Phase 3 Code:** 5600

Description: Unvegetated or very sparsely vegetated flats affected by tidal fluctuations.

Coastal: Sea Ox-eye Daisy Flats (5605)

Texas Coast Salt and Brackish Borrichia Flats

Identifier: CES203.473.5 **Phase 3 Code:** 5605

Description: *Borrichia frutescens* (sea ox-eye daisy) is the clear aspect dominant of these irregularly flooded sites. These flats become very extensive from Corpus Christi Bay, southward.

Coastal: Mangrove Shrubland (5606)

Texas Coast Mangrove Shrubland

Identifier: CES203.473.6 **Phase 3 Code:** 5606

Description: Shrublands dominated by *Avicennia germinans* (black mangrove). These tidal shrublands become increasingly well-developed towards the south. Fairly well-developed mangrove shrublands can be found in Redfish Bay near Aransas Pass.

Coastal: Salt and Brackish Low Tidal Marsh (5607)

Texas Coast Salt and Brackish Regularly Flooded Marsh

Identifier: CES203.473.7 **Phase 3 Code:** 5607

Description: Marshes frequently inundated by tides and often dominated by *Spartina alterniflora* (smooth cordgrass).

Coastal: Salt and Brackish High Tidal Shrub Wetland (5616)

Texas Coast Salt and Brackish Irregularly Flooded Tidal Shrub Wetland

Identifier: CES203.473.16 **Phase 3 Code:** 5616

Description: These sites may be dominated by species such as *Iva frutescens* (shrubby swampweed) or *Baccharis halimifolia* (eastern baccharis).

Coastal: Salt and Brackish High Tidal Marsh (5617)

Texas Coast Salt and Brackish Irregularly Flooded Marsh

Identifier: CES203.473.17 **Phase 3 Code:** 5617

Description: Irregularly flooded marsh dominated by graminoids such as *Spartina patens* (marshhay cordgrass), *Distichlis spicata* (saltgrass), and *Schoenoplectus* spp. (bulrushes).

Texas-Louisiana Coastal Prairie Pondshore

Identifier: CES203.541

Geology: This system occurs on the coastal Pleistocene terraces, including the Beaumont and Lissie Formations.

Landform: Local topographic lows such as ponds and swales within the generally level landscape.

Soils: Soils tend to be fine-textured, or are characterized by a relatively impermeable subsurface horizon.

Description: This system occurs as ponds or swales within the coastal prairie matrix. Soils are poorly-drained, and surface water from rainfall and local runoff is retained for much of the year (except for periods of high evapotranspiration). Occurrences are wetter than the *Tripsacum dactyloides* (eastern gamagrass) or *Panicum virgatum* (switchgrass) dominated prairie sites of the **Texas-Louisiana Coastal Prairie**. These wetlands are primarily herbaceous, sometimes with sparse woody cover, and are composed of various species, such as *Eleocharis quadrangulata* (squarestem spikeseedge), *Fuirena squarrosa* (hairy umbrellaseedge), *Cyperus haspan* (sheathed umbrellaseedge), *Cyperus virens* (green flatsedge), *Rhynchospora* spp. (beaksedges), *Leersia hexandra* (clubhead cutgrass), *Steinchisma hians* (gaping panicum), *Panicum virgatum* (switchgrass), *Andropogon glomeratus* (bushy bluestem), *Xyris jupicai* (Richard's yellow-eyed grass), *Centella erecta* (erect centella), *Sagittaria papillosa* (nipplebract arrowhead), *Sagittaria longiloba* (longlobe arrowhead), *Ludwigia glandulosa* (Torrey water-primrose), *Ludwigia linearis* (narrowleaf water-primrose), *Bacopa* spp. (waterhyssops), *Hydrocotyle* spp. (pennyworts), *Symphyotrichum subulatum* (hierba del marrano), and *Sesbania* spp. (rattleboxes). Large areas of some of the occurrences may be relatively homogeneous, dominated by one or a few species. Areas of open water within the ponds may contain floating and submerged aquatic species, including *Stuckenia pectinata* (sago pondweed), *Ceratophyllum demersum* (coontail), *Brasenia schreberi* (Schreber watershield), *Nymphoides aquatica* (largeleaf floating heart), and *Nelumbo lutea* (yellow lotus).

VEGETATION TYPE:

Gulf Coast: Coastal Prairie Pondshore (5307)

Texas-Louisiana Coastal Prairie Pondshore

Identifier: CES203.541

Phase 3 Code: 5307

Description: As described for system.

Tamaulipan Saline Lake

Identifier: Previously Undescribed System

Geology: Mostly mapped on the edge of the sandsheet over the Goliad Formation. Quaternary clay dunes (Qcd) are sometimes nearby.

Landform: Broad, gently sloping, interior draining basins.

Soils: Highly saline sands or sandy loams.

Description: These saline lakes are interior draining basins, receiving runoff from the surrounding landscape. Solution of salts from parent material, deposition from runoff, and subsequent evaporation has lead to a highly saline situation. Sites may be unvegetated or have

sparse vegetation. Some areas at very slightly higher landscape positions in the basin are dominated by halophytic grasses such as *Sporobolus airoides* (alkali sacaton), *Distichlis spicata* (saltgrass), *Sporobolus pyramidatus* (whorled dropseed), and *Monanthochloe littorale* (shoregrass). Other halophytic forbs and sub-shrubs may also be present, including *Borrchia frutescens* (sea ox-eye daisy), *Batis maritima* (saltwort), *Salicornia* spp. (glassworts), *Atriplex matamorensis* (Matamoros saltbush), *Sesuvium portulacastrum* (shoreline seapurslane), and *Suaeda linearis* (annual seepweed).

VEGETATION TYPES:

South Texas: Saline Lake Flats (7700)

Tamaulipan Saline Lake Flats

Identifier: **Phase 3 Code:** 7700

Description: Unvegetated or very sparsely vegetated lake margin.

South Texas: Saline Lake Grassland (7707)

Tamaulipan Saline Lake Grassland

Identifier: **Phase 3 Code:** 7707

Description: Sites along the margin of saline lakes where grasses, forbs, and subshrubs have sufficient cover to be mapped as vegetated.

Agricultural and Other Human-related Mapped Types

Pine Plantation > 3 meters tall (9301)

Phase 3 Code: 9301

Description: Dense stands of *Pinus taeda* (loblolly pine) characterize this type that is mapped over moist soils where natural pine stands are not expected to occur. Some sites mapped as this type contain *Quercus fusiformis* (plateau live oak), *Quercus virginiana* (coastal live oak), *Juniperus virginiana* (eastern redcedar), or *Ilex vomitoria* (yaupon) in Phase 3.

Pine Plantation 1 to 3 meters tall (9305)

Phase 3 Code: 9305

Description: Young, planted *Pinus taeda* (loblolly pine) stands are most common within this type, which is mapped over moist soils where natural pine stands are not expected to occur. Some sites mapped as this type contain sparse or short *Quercus fusiformis* (plateau live oak), *Quercus virginiana* (coastal live oak), *Juniperus virginiana* (eastern redcedar), or *Ilex vomitoria* (yaupon) in Phase 3.

Row Crops (9307)

Phase 3 Code: 9307

Description: This type includes all cropland where fields are fallow for some portion of the year. Some fields may rotate into and out of cultivation, frequently, and year-round cover crops and tame hay fields are generally mapped as grassland.

Urban High Intensity (9410)

Phase 3 Code: 9410

Description: This type consists of built-up areas and wide transportation corridors that are dominated by impervious cover.

Urban Low Intensity (9411)

Phase 3 Code: 9411

Description: This type includes areas that are built-up but not entirely covered by impervious cover, and includes most of the non-industrial areas within cities and towns.

Mainly Natural Azonal Mapped Types

Barren (9000)

Phase 3 Code: 9000

Description: This type includes areas where little or no vegetative cover existed at the time of image data collection. In Phase 3, this includes fallow fields or areas within cropland blocks that

remained barren throughout one growing season, heavily grazed pastures where bare soils was dominant, and areas of exposed rock and bare soil on outcrops, river bars, or associated with development.

Invasive: Evergreen Shrubland (9505)

Phase 3 Code: 9505

Description: A variety of mainly disturbance shrublands with species such as *Acacia farnesiana* (huisache), *Baccharis* spp. (baccharis), *Rosa bracteata* (Macartney rose), *Triadica sebifera* (Chinese tallow)(north), *Ilex vomitoria* (yaupon), *Prosopis glandulosa* (honey mesquite), *Ziziphus obtusifolia* (lotebush), *Zanthoxylum fagara* (colima)(south), *Celtis ehrenbergiana* (granjeno)(south), and *Condalia hookeri* (brasil)(south) characterize this type. Sparse tree cover with species such as *Quercus fusiformis* (plateau live oak), *Quercus virginiana* (coastal live oak), *Quercus nigra* (water oak)(north), *Celtis laevigata* (sugar hackberry), and *Ulmus crassifolia* (cedar elm) may also occur.

Marsh (9007)

Phase 3 Code: 9007

Description: This type is usually associated with man-made ponds or tanks, and a variety of herbaceous sedges, rushes, *Eleocharis* spp. (spikerushes), *Schoenoplectus* spp. (bulrushes), *Polygonum* spp. (smartweeds), and grasses, together with shrubs such as *Cephalanthus occidentalis* (common buttonbush) and *Salix nigra* (black willow) may be important in this mapped type.

Native Invasive: Baccharis Shrubland (9116)

Phase 3 Code: 9116

Description: This type is mapped on salty or sandy soils and *Baccharis* spp. (baccharis), *Prosopis glandulosa* (honey mesquite), *Tamarix* spp. (salt cedars), and *Iva frutescens* (shrubby sumpweed) are the most common dominants. Other shrubs may include *Triadica sebifera* (Chinese tallow), *Borrchia frutescens* (sea ox-eye daisy), *Rosa bracteata* (Macartney rose), *Forestiera acuminata* (swamp privet), and *Zanthoxylum fagara* (colima), and grasses may include *Spartina spartinae* (Gulf cordgrass), *Distichlis spicata* (saltgrass), *Cynodon dactylon* (Bermudagrass), and *Sporobolus indicus* (rat-tail smutgrass).

Native Invasive: Common Reed (9107)

Phase 3 Code: 9107

Description: Areas mapped within this type are often dominated by nearly pure stands of *Phragmites australis* (common reed) on formerly disturbed soils.

Native Invasive: Deciduous Woodland (9104)

Phase 3 Code: 9104

Description: This broadly-defined type often has *Prosopis glandulosa* (honey mesquite), *Celtis laevigata* (sugar hackberry), *Ulmus crassifolia* (cedar elm), or *Acacia farnesiana* (huisache) among the dominants. To the northeast, species such as *Quercus nigra* (water oak), *Salix nigra* (black willow), and *Fraxinus* spp. (ashes) may be important, whereas to the west, species such as *Celtis ehrenbergiana* (granjeno), *Zanthoxylum fagara* (colima), and *Diospyros texana* (Texas

persimmon) are more common. *Quercus fusiformis* (plateau live oak), *Quercus virginiana* (coastal live oak), or *Quercus stellata* (post oak) may also be present.

Native Invasive: Huisache Woodland or Shrubland (9124)

Phase 3 Code: 9124

Description: This broadly-defined type often has invasive shrubs or small trees such as *Acacia farnesiana* (huisache), *Prosopis glandulosa* (honey mesquite), *Celtis laevigata* (sugar hackberry), *Ulmus crassifolia* (cedar elm), or *Triadica sebifera* (Chinese tallow) among the dominants. *Quercus fusiformis* (plateau live oak) or *Quercus virginiana* (coastal live oak) may be present in the tree layer and other common species include *Celtis ehrenbergiana* (granjeno), *Forestiera angustifolia* (elbow bush), *Acacia berlandieri* (guajillo), *Opuntia engelmannii* var. *lindheimeri* (Lindheimer pricklypear), *Diospyros texana* (Texas persimmon), and *Rosa bracteata* (Macartney rose).

Native Invasive: Juniper Shrubland (9105)

Phase 3 Code: 9105

Description: This type contains both *Juniperus ashei* (Ashe juniper) and *Juniperus virginiana* (eastern redcedar) shrublands in Phase 3. The former is limited mainly to the northwestern portion of Phase 3 in the area underlain by Cretaceous limestone, chalks, or marls of the Edwards Plateau, whereas the latter is mainly in the northeast and east. In both cases, species such as *Quercus fusiformis* (plateau live oak), *Prosopis glandulosa* (honey mesquite), *Celtis laevigata* (sugar hackberry), and *Ulmus crassifolia* (cedar elm) may be components.

Native Invasive: Juniper Woodland (9101)

Phase 3 Code: 9101

Description: This type may be dominated either by *Juniperus ashei* (Ashe juniper) in the northwest, over Edwards Plateau limestones, or by *Juniperus virginiana* (eastern redcedar) in the northeast and east. *Quercus fusiformis* (plateau live oak) is a common component, and species such as *Celtis laevigata* (sugar hackberry) and *Ulmus crassifolia* (cedar elm) occur throughout. *Quercus stellata* (post oak) and *Ilex vomitoria* (yaupon) are commonly associated with *Juniperus virginiana* (eastern redcedar).

Native Invasive: Mesquite Shrubland (9106)

Phase 3 Code: 9106

Description: *Prosopis glandulosa* (honey mesquite) is often the dominant species of this broadly-defined type, but species such as *Acacia farnesiana* (huisache), *Celtis laevigata* (sugar hackberry), *Condalia hookeri* (brasil), *Diospyros texana* (Texas persimmon), *Celtis ehrenbergiana* (granjeno), and *Opuntia engelmannii* var. *lindheimeri* (Lindheimer pricklypear) may also be important. Trees such as *Quercus fusiformis* (plateau live oak), *Quercus virginiana* (coastal live oak), or *Quercus stellata* (post oak) may form a sparse canopy.

Native Invasive: Pricklypear (9128)

Phase 3 Code: 9128

Description: This type is only mapped on disturbed soils and may contain species such as *Prosopis glandulosa* (honey mesquite), *Acacia farnesiana* (huisache), *Celtis ehrenbergiana*

(granjeno), and *Zanthoxylum fagara* (colima) as well as *Opuntia engelmannii* var. *lindheimeri* (Lindheimer pricklypear) among the dominants.

Non-native Invasive: Chinese Tallow Forest, Woodland, and Shrubland (9204)

Phase 3 Code: 9204

Description: More or less dense stands of *Triadica sebifera* (Chinese tallow) characterize this type, which is generally mapped over prairie soils, but a diversity of mainly invasive deciduous shrublands and sparse woodlands are circumscribed. Other component species may include *Prosopis glandulosa* (honey mesquite), *Acacia farnesiana* (huisache), *Baccharis* spp. (baccharis), *Rosa bracteata* (Macartney rose), *Ulmus crassifolia* (cedar elm), *Quercus nigra* (water oak), *Ligustrum sinense* (Chinese privet), and *Ilex vomitoria* (yaupon). Sparse tree cover with *Celtis laevigata* (sugar hackberry), *Quercus nigra* (water oak), *Quercus fusiformis* (plateau live oak), *Quercus virginiana* (coastal live oak), and *Liquidambar styraciflua* (sweetgum) may be present.

Non-native Invasive: Rose Shrubland (9205)

Phase 3 Code: 9205

Description: *Rosa bracteata* (Macartney rose) is the most common dominant of this type, but a variety of mainly invasive shrub types may occur, including species such as *Acacia farnesiana* (huisache), *Baccharis* spp. (baccharis), *Triadica sebifera* (Chinese tallow), *Celtis laevigata* (sugar hackberry), *Ulmus crassifolia* (cedar elm), and *Ilex vomitoria* (yaupon). Sparse tree cover with species such as *Quercus fusiformis* (plateau live oak), *Quercus virginiana* (coastal live oak), *Quercus nigra* (water oak), *Celtis laevigata* (sugar hackberry), and *Fraxinus pennsylvanica* (green ash) may also occur.

Non-native Invasive: Salt Cedar Shrubland (9204)

Phase 3 Code: 9204

Description: Mainly invasive shrublands are characteristic of this type and *Tamarix* spp. (salt cedars) is the most common dominant. Species such as *Iva frutescens* (shrubby sumpweed), *Baccharis* spp. (baccharis), *Prosopis glandulosa* (honey mesquite), *Acacia farnesiana* (huisache), *Celtis laevigata* (sugar hackberry), and *Borrichia frutescens* (sea ox-eye daisy) may also be present.

Open Water (9600)

Phase 3 Code: 9600

Description: In addition to large lakes, rivers, and marine water, ephemeral ponds may be mapped as open water in Phase 3. Some mapped areas may support vegetation with pioneering species such as *Salix nigra* (black willow), *Populus deltoides* (eastern cottonwood), *Triadica sebifera* (Chinese tallow), *Suaeda* spp. (seepweeds), *Borrichia frutescens* (sea ox-eye daisy), *Batis maritima* (saltwort), *Juncus* spp. (rushes), sedges, *Typha* spp. (cattails), and *Eleocharis* spp. (spikerushes).

South Texas: Disturbance Grassland (9187)

Phase 3 Code: 9187

Description: A variety of mainly heavily grazed grasslands, including managed exotic pastures, are circumscribed within this type. Common dominant species include *Cynodon dactylon*

(Bermudagrass), *Dichanthium annulatum* (Kleberg bluestem), *Bothriochloa ischaemum* var. *songarica* (King Ranch bluestem), *Pennisetum ciliare* (buffelgrass), *Panicum coloratum* (kleingrass), *Aristida* spp. (threeawns), and *Urochloa maximum* (guineagrass). Shrubs and small trees such as *Prosopis glandulosa* (honey mesquite), *Acacia farnesiana* (huisache), *Ziziphus obtusifolia* (lotebush), and *Celtis ehrenbergiana* (granjeno) are common components.

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