

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

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25 February 2009

The following descriptions cover the systems that have been identified for the legend for Phase I 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. Significant input was provided by all partners (Texas Parks and Wildlife Department, NatureServe, Missouri Resource Assessment Partnership, and The Nature Conservancy) during development of these descriptions.

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Forests, Woodlands and Savannas

Edwards Plateau Limestone Savanna and Woodland

Identifier: CES303.660

Geology: Primarily found on Cretaceous limestones of the Edwards Plateau and Limestone (also referred to as Lampasas) Cutplain, but also associated with Pennsylvanian limestones of the Palo Pinto Formation and Winchell, Ranger, Home Creek Limestone in the vicinity of Palo Pinto County, as well as on Cretaceous chalk formations in the Northern Blackland Prairie and Cretaceous limestones of the Western Crosstimbers and Rolling Plains.

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 6,440,000 acres (2,606,000 ha.). 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 is present. Significant open areas dominated by grasses may resemble prairies, and such open occurrences may grade into prairie types to the west (shortgrass prairie), northwest (Central mixedgrass), north (Southeastern Great Plains tallgrass), and east (Blackland). 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), *Quercus laceyi* (Lacey oak, in the southwestern part of the Edwards Plateau), *Ulmus crassifolia* (cedar elm), *Fraxinus texensis* (Texas ash), *Quercus sinuata* var. *breviloba* (white shin oak), and *Quercus vaseyana* (Vasey shin oak) (especially in the western part of the region). 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* (prickly pear), and *Opuntia 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* (curlymesquite), *Buchloe dactyloides* (buffalograss), *Andropogon gerardii* (big bluestem), *Bouteloua hirsuta* (hairy grama), *Bouteloua rigidisetata* (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 *Buchloe 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). Some disturbed areas on hard-bedded limestone of the western plateau are now dominated by mesquite woodland. Natural mesquite woodlands are believed to have occurred on the deeper soils of adjacent riparian systems.

VEGETATION TYPES:

Edwards Plateau: Ashe Juniper Motte and Woodland (35)

Edwards Plateau Limestone Ashe Juniper Motte and Woodland

Identifier: CES303.660.1

Phase 1 Code: 35

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), *Quercus vaseyana* (Vasey shin oak), *Quercus laceyi* (Lacey 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. In the southwestern portion of the Edwards Plateau, *Pinus remota* (papershell pinyon) and *Quercus laceyi* (Lacey oak) may be a common in the overstory. These sites tend to appear more open, but retain *Juniperus ashei* (Ashe juniper) as a significant component of the overstory and shrub layers. Pinyon woodlands tend to occur on relatively xeric sites and have a sparse herbaceous layer with species such as *Bouteloua curtipendula* (sideoats grama), *Hilaria belangeri* (curlymesquite), *Erioneuron pilosum* (hairy tridens), and others. Approximately 16% of the system consists of this vegetation type.

Edwards Plateau: Live Oak Motte and Woodland (34)

Edwards Plateau Limestone Live Oak Motte and Woodland

Identifier: CES303.660.2

Phase 1 Code: 34

Description: These relatively closed 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), *Quercus laceyi* (Lacey oak), *Quercus stellata* (post oak), and *Quercus vaseyana* (Vasey shin oak) may also be present to common. *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* (prickly pear), and *Opuntia 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. Opening between mottes are typically grass dominated with the same species that occur as understory components in the woodlands. Approximately 23% of the system consists of this vegetation type.

Edwards Plateau: Deciduous Oak / Evergreen Motte and Woodland (131)

Edwards Plateau Limestone Deciduous-Evergreen Motte and Woodland

Identifier: CES303.660.4 **Phase 1 Code:** 132

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), *Quercus sinuata* var. *breviloba* (white shin oak), and *Quercus laceyi* (Lacey 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* (prickly pear), 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), *Diachanthelium* sp. (rosette grass), *Bouteloua* sp. (grama), *Nassella leucotricha* (Texas wintergrass) and others. Approximately 11% of the system consists of this vegetation type.

Edwards Plateau: Oak / Hardwood Motte and Woodland (108)

Edwards Plateau Limestone Deciduous Motte and Woodland

Identifier: CES303.660.5 **Phase 1 Code:** 108

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. Approximately 14% of the system consists of this vegetation type.

Edwards Plateau: Post Oak Motte and Woodland (36)

Edwards Plateau Limestone Post Oak Motte and Woodland

Identifier: CES303.660.6 **Phase 1 Code:** 36

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 formations such as Edwards Limestone, Tanyard, Gorman, and Honeycut Formations. Sandy Cretaceous formations

(such as Hensell Sand) may also harbor this vegetation type. 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). In areas of transition to the Crosstimbers (such as in the Limestone Cut Plain and Carbonate Cross Timbers), it may be difficult to distinguish this system from Crosstimbers Oak Forest and Woodland. Only about 1.5% of the system consists of this vegetation type.

Edwards Plateau: Savanna Grassland (113)

Edwards Plateau Limestone Savanna Grassland

Identifier: CES303.660.9 **Phase 1 Code:** 113

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 regions with a prairie matrix (such as the northwestern transitions to shortgrass prairie, northern transitions to mixedgrass prairie, and northeastern transitions to tallgrass prairie), 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* (Bermuda grass) 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. Open, gentle slopes underlain by Glen Rose Limestone often maintain grasslands that are often dominated by *Bouteloua pectinata* (tall grama) and *Muhlenbergia reverchonii* (seep muhly). Sites under heavy, continuous grazing, or sites with thin or xeric soils tend to be dominated by shortgrass species such as *Buchloe dactyloides* (buffalograss), *Hilaria belangeri* (curly mesquite), or *Erioneuron pilosum* (fluffgrass). Numerous forb species are also 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* (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). Approximately 35% of this system consists of this vegetation type.

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 and calcareous slopes of the Crosstimbers.

Landform: Slopes generally 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 laceyi* (Lacey oak), *Quercus sinuata* var. *breviloba* (white shin oak), *Fraxinus texensis* (Texas ash), *Ulmus crassifolia* (cedar elm), *Prunus serotina* ssp. *eximia* (escarpment black cherry), *Juglans major* (Arizona walnut), 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), *Frangula caroliniana* (Carolina buckthorn), *Sophora secundiflora* (Texas mountain-laurel), *Viburnum rufidulum* (rusty blackhaw), *Rhus* spp. (sumac), *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* (widowsteers), *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 (133)

Edwards Plateau Ashe Juniper Dry-Mesic Slope Forest and Woodland

Identifier: CES303.656.1 **Phase 1 Code:** 133

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), *Quercus sinuata* var. *breviloba* (white shin oak), or *Quercus laceyi* (Lacey oak), at least). 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 (22)

Edwards Plateau Live Oak Dry-Mesic Slope Forest and Woodland

Identifier: CES303.656.2 **Phase 1 Code:** 22

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), *Quercus laceyi* (Lacey 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), *Dispyros 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 (134)

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

Identifier: CES303.656.4 **Phase 1 Code:** 134

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 laceyi* (Lacey oak), *Quercus muehlenbergii* (chinkapin oak), and *Quercus sinuata* var. *breviloba* (white shin oak). Other deciduous hardwood species such as *Ulmus crassifolia* (cedar elm), *Juglans major* (Arizona walnut), *Prunus serotina* var. *eximia* (escarpment black cherry), *Celtis reticulata* (netleaf hackberry), and *Fraxinus texensis* (texas ash) 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), *Ugnadia 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 (23)

Edwards Plateau Deciduous Dry-Mesic Slope Forest and Woodland

Identifier: CES303.656.6 **Phase 1 Code:** 23

Description: Forest or woodland on slopes generally 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 laceyi* (Lacey oak), *Quercus sinuata* var. *breviloba* (white shin oak), *Quercus muehlenbergii* (chinkapin oak), *Ulmus crassifolia* (cedar elm), *Celtis laevigata* var. *reticulata* (netleaf hackberry), *Fraxinus texensis* (Texas ash), *Prunus serotina* var. *eximia* (escarpment black cherry), *Juglans major* (Arizona walnut), and others. This system may occupy slopes on cretaceous limestone or chalk occurring north and east of the Edwards Plateau. In these situations, *Quercus shumardii* (Shumard oak), *Quercus muehlenbergii* (chinkapin oak), *Ulmus rubra* (slippery elm), and/or *Juglans nigra* (black walnut) may be present in the canopy, and may represent significant components of it. *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), *Viburnum rufidulum* (rusty blackhaw), *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* (widowstears), *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.

Edwards Plateau Mesic Canyon (not mapped)

Identifier: CES303.038

Geology: Associated with lower Cretaceous limestones of the Edwards Plateau, often on the Glen Rose or related formations.

Landform: This system occurs on lower slopes (toe slopes) and onto the margins of adjacent valleys of small drainages. Occurrences are generally found in steep canyons where insolation is minimal, or on lower positions on north facing slopes.

Soils: Rich loams, often very rocky, with little soil development. Steep Rocky Ecological Site, in part.

Description: Currently this system is not mapped individually, but will occur as inclusions within mapped Edwards Plateau slope, riparian, or floodplain forests. Its presence at lower slope positions make it transitional between slope and riparian/floodplain systems. This system is largely endemic to the Edwards Plateau ecoregion and occurs on canyon bottoms, mesic lower slopes and steep canyons, primarily in the Southern Balcones Escarpment, but also in the Eastern Balcones Escarpment (also on the Limestone Cutplain). This system also includes areas of cliff faces and lower slopes of boxed canyons occurring as narrow, sometimes long bands in areas often with seeps where moisture is consistently more available than on adjacent slopes. The tree canopy is generally closed. Common components include *Ulmus crassifolia* (cedar elm), *Juglans major* (Arizona walnut), *Quercus buckleyi* (Texas oak), *Quercus laceyi* (Lacey oak), *Prunus serotina* var. *eximia* (escarpment black cherry) (becoming less common to the north), *Fraxinus*

texensis (Texas ash) (dominant in the northeastern plateau), *Quercus muehlenbergii* (chinkapin oak), *Tilia americana* (American basswood), and *Acer grandidentatum* (bigtooth maple). Canyon bottoms may have scattered *Quercus macrocarpa* (bur oak). Substrate (limestone) and topographic position (north and east aspects and lower slopes) are the dominant characteristics of this system. Small seepage areas may be identified as the Edwards Plateau Cliff system, and are often dominated by *Adiantum capillus-veneris* (maiden-hair fern), with *Thelypteris ovata* var. *lindheimeri* (Lindheimer's maidenhair) on nearby moist habitats. Fire probably plays little role in the system, while grazing and browsing (by native as well as exotic ungulates) may play an important role in recruitment and understory composition. Adjacent, drier slopes are usually dominated by various *Quercus* species and *Juniperus ashei* (Ashe juniper). Woodlands and forests downslope of occurrences of this system may be well-developed riparian woodlands, small stringers of *Platanus occidentalis* (American sycamore), or this system may occupy the lowest topographic positions along extremely small, rocky drainages.

VEGETATION TYPES:

Edwards Plateau Bigtooth Maple Mesic Canyon (not mapped)

Identifier: CES303.038.1 **Phase 1 Code:** not mapped

Description: This vegetation type occupies the most mesic sites and are characterized by the presence of *Acer grandidentatum* (bigtooth maple). *Quercus muehlenbergii* (chinkapin oak) is a common associate, along with *Prunus serotina* var. *eximia* (escarpment black cherry), *Juglans major* (Arizona walnut), and other deciduous species. Overstory is usually a closed canopy. Mesic indicators such as *Aquilegia canadensis* (wild columbine) and *Clematis texensis* (scarlet clematis) may be present. This system is found throughout the range of the system.

Edwards Plateau Mixed Deciduous Mesic Canyon (not mapped)

Identifier: CES303.038.2 **Phase 1 Code:** not mapped

Description: Occurrences are somewhat drier than the similar Bigtooth Maple sites, and lack *Acer grandidentatum* (bigtooth maple). Sites are characterized by the presence of a relatively closed canopy of deciduous hardwoods, including *Quercus muehlenbergii* (chinkapin oak), *Q. buckleyi* (Texas oak), *Q. laceyi* (Lacey oak), *Prunus serotina* var. *eximia* (escarpment black cherry), *Juglans major* (Arizona walnut), and *Ulmus rubra* (slippery elm).

Llano Uplift Acidic Forest, Woodland, and Glade

Identifier: CES303.657

Geology: Intrusive igneous bedrock of Precambrian age.

Landform: Granit hills rising from a gently rolling landscape that is moderately dissected by drainages.

Soils: Generally sandy loams, with gravelly soils common. Soils are generally acidic and coarse, resulting from weathering of the underlying granite. Many areas of exposed bedrock are present. Most frequently encountered Ecological Sites include Shallow Granite, Sandy

Loam, Red Savannah, Gravelly Sandy Loam, Shallow Ridge, Granite Gravel, Sandstone Hill, and Granite Hill.

Description: It is comprised of a mosaic of vegetation types, including closed-canopy forests, open woodlands, savannas and sparsely vegetated rock outcrops. Common trees include *Quercus marilandica* (blackjack oak), *Quercus fusiformis* (plateau live oak), *Quercus stellata* (post oak), *Carya texana* (black hickory), *Ulmus crassifolia* (cedar elm), and *Prosopis glandulosa* (mesquite). *Juniperus ashei* (Ashe juniper) may be present, but is much less common than in the surrounding landscape. Subcanopy species may include *Diospyros texana* (Texas persimmon), *Aloysia gratissima* (whitebrush), *Ungnadia speciosa* (Mexican buckeye), *Ziziphus obtusifolia* (lotebush), *Eysenhardtia texana* (Texas kidneywood), *Aesculus glabra* var. *arguta* (Ohio buckeye), *Opuntia engelmannii* (prickly pear), *Yucca elata* (palmilla), *Nolina texana* (sacahuista), and *Opuntia leptocaulis* (tasajillo). Grasslands may be dominated by *Schizachyrium scoparium* (little bluestem), *Sorghastrum nutans* (Indiangrass), *Panicum virgatum* (switchgrass), *Bouteloua hirsuta* (hairy grama), *Bouteloua curtipendula* (sideoats grama), *Nassella leucotricha* (Texas wintergrass), *Bothriochloa laguroides* ssp. *torreyana* (silver bluestem), and *Plantago wrightiana* (Wright plantain). Granitic glades and barrens are sparsely vegetated by crustose and foliose lichens, several ferns and fern allies, and cacti. This system also includes small (up to 16 m in diameter) shallow depressions that hold rainwater and support wetland flora including the Texas endemic, *Isoetes lithophila* (rock quillwort).

VEGETATION TYPES:

Llano Uplift: Live Oak Woodland (29)

Llano Uplift Acidic Live Oak Forest and Woodland

Identifier: CES303.657.2 **Phase 1 Code:** 29

Description: Canopy conspicuously dominated by *Quercus fusiformis* (plateau live oak), this vegetation type forms the common forest and woodland cover in the uplift area. *Juniperus ashei* (Ashe juniper) may be present but generally occurs at lower cover than is typical of the surrounding limestones. *Quercus stellata* (post oak), *Quercus marilandica* (blackjack oak), *Ulmus crassifolia* (cedar elm), and *Carya texana* (black hickory) may also be present in the canopy, but *Quercus fusiformis* (plateau live oak) clearly dominates. *Diospyros texana* (Texas persimmon), *Aloysia gratissima* (whitebrush), *Mahonia trifoliolata* (agarito), *Mimosa aculeaticarpa* var. *biuncifera* (catclaw mimosa), *Prosopis glandulosa* (mesquite), and *Opuntia engelmannii* (prickly pear) are common shrubs in the understory. *Schizachyrium scoparium* (little bluestem), *Bothriochloa laguroides* ssp. *torreyana* (silver bluestem), *Bouteloua hirsuta* (hairy grama), and *Bouteloua curtipendula* (sideoats grama) are common constituents of the herbaceous layer. *Schizachyrium scoparium* (little bluestem) is a common dominant. Some areas may be dominated by *Prosopis glandulosa* (mesquite), often with thick understory shrubs of *Aloysia gratissima* (whitebrush).

Llano Uplift: Post Oak Woodland (30)

Llano Uplift Acidic Deciduous Forest and Woodland

Identifier: CES303.657.6 **Phase 1 Code:** 30

Description: Forests and woodlands not dominated by *Quercus fusiformis* (plateau live oak) (though it is often present), are generally dominated by *Quercus stellata* (post oak), with *Quercus marilandica* (blackjack oak) and *Carya texana* (black hickory) also present to co-dominant. *Ulmus crassifolia* (cedar elm) and *Celtis laevigata* (sugar hackberry) may also be important components of the canopy. Shrubs and herbaceous cover are similar to those of the live oak woodland.

Llano Uplift Acidic Glade (not mapped)

Identifier: CES303.657.3 **Phase 1 Code:** not mapped

Description: Openings on exposed granitic outcrops are common throughout the region. They are characterized by foliose and crustose lichens representing the most significant cover. Cover is very sparse, but may include *Selaginella peruviana* (peruvian spikemoss), *Selaginella arenicola* ssp. *riddellii* (Riddell's spikemoss), *Selaginella wrightii* (Wright's spikemoss), *Cheilanthes* spp. (lipfern), *Pellaea* spp. (cliffbrake), *Woodsia obtusa* (common woodsia), *Sedum nuttallianum* (yellow stonecrop), *Plantago wrightiana* (Wright plantain), *Allium canadense* (Canada garlic), *Hypericum* spp. (St. John's-wort), *Agrostis* spp. (bentgrass), *Vulpia octoflora* (sixweeks fescue), *Spermolepis inermis* (spreading scaleseed), *Lepidium* spp. (peppergrass), and *Tripogon spicatus* (American five-minute grass). Small depressions in the granite may hold water and have unique floristic elements associated with them.

Llano Uplift: Mesquite / Whitebrush Shrubland (120)

Llano Uplift Acidic Deciduous Shrubland

Identifier: CES303.657.8 **Phase 1 Code:** 120

Description: On disturbed sites *Prosopis glandulosa* (mesquite) may dominate the canopy, forming a woodland overstory or, more commonly, representing a shrub layer. *Quercus fusiformis* (plateau live oak) may be present. Shrubs may form dense cover under the sparse canopy of mesquite. Species in the shrub layer commonly include *Aloysia gratissima* (whitebrush), *Ziziphus obtusifolia* (lotebush), *Opuntia engelmannii* (prickly pear), *Colubrina texensis* (Texas colubrina), and *Diospyros texana* (Texas persimmon). Some areas of high shrub abundance are clearly dominated by *Aloysia gratissima* (whitebrush) or *Ziziphus obtusifolia* (lotebush) in the shrub layer.

Llano Uplift: Grassland (160)

Llano Uplift Acidic Grassland

Identifier: CES303.657.9 **Phase 1 Code:** 160

Description: These relatively small patch grasslands may be dominated by native species such as *Schizachyrium scoparium* (little bluestem), *Bouteloua curtipendula* (sideoats grama), *Bothriochloa laguroides* ssp. *torreyana* (silver bluestem), *Bouteloua hirsuta* (hairy gramma), *Aristida* spp. (threeawn species), and/or *Nassella leucotricha* (Texas wintergrass). Scattered trees (typically *Quercus fusiformis* (plateau live oak) or *Quercus stellata* (post oak)) may be present, as well as scattered shrubs (particularly *Prosopis glandulosa* (mesquite), *Diospyros texana* (Texas persimmon), or *Aloysia gratissima* (whitebrush)). Frequently non-native grass species such as *Cynodon dactylon* (Bermuda grass) or *Bothriochloa ischaemum* var. *songarica* (King Ranch bluestem) dominate the herbaceous layer.

Crosstimbers Oak Forest and Woodland

Identifier: CES205.682

Geology: The eastern occurrences of this system are associated with sandy members of the Cretaceous Woodbine Formation, while western occurrences occupy soils derived from the sands of the Cretaceous Trinity Group (such as Paluxy, Antler, and Twin Mountain-Travis Peak Sands). Further west, in the fringe of the Western Crosstimbers, the system occurs on more rugged, rocky and gravelly sites derived from Pennsylvanian formations.

Landform: Gently rolling, moderately dissected uplands, and irregular plains becoming more rugged in the western fringe of the distribution of this system.

Soils: Sands or sandy loams, some with a claypan, are characteristic of this system. Ecological Sites typical of the eastern expressions include Sandy Loam, Tight Sandy Loam, Claypan Prairie, Sandstone Hill, and Sandy. Those more typical of the western expressions include Sandy Loam, Loamy Sand, Tight Sandy Loam, Sandy, and Clay Loam.

Description: This system is generally described as a savanna or woodland dominated by *Quercus stellata* (post oak) and/or *Quercus marilandica* (blackjack oak) and occurring in southwest-northeast trending bands separated by the Grand Prairie. Other species in the canopy may include *Ulmus crassifolia* (cedar elm), *Quercus fusiformis* (plateau live oak), *Celtis laevigata* (sugar hackberry), and *Juniperus virginiana* (eastern redcedar). The understory may have been historically dominated by *Schizachyrium scoparium* (little bluestem), but current understory composition may be largely determined by land use history and grazing pressure. In the east, where precipitation is greater, tallgrass species such as *Andropogon gerardii* (big bluestem) and *Sorghastrum nutans* (Indiangrass) may be important components of the understory, or occupy prairie patches. In the drier west, shortgrass species such as *Buchloe dactyloides* (buffalograss) become more conspicuous. Other graminoid species that may be present include *Schizachyrium scoparium* (little bluestem), *Paspalum setaceum* (fringeleaf paspalum), *Sporobolus compositus* (tall dropseed), *Bouteloua curtipendula* (sideoats grama), *Bouteloua hirsuta* (hairy grama), *Bouteloua rigidiseta* (Texas grama), *Bothriochloa laguroides* ssp. *torreyana* (silver bluestem), *Nassella leucotricha* (Texas wintergrass), and *Aristida* spp. (threeawn). Non-native species such as *Cynodon dactylon* (Bermuda grass) and *Bothriochloa ischaemum* var. *songarica* (King Ranch bluestem) frequently dominate the herbaceous layer. With the disruption of a natural fire cycle, branching of overstory species may be continuous to near ground level, reducing light penetration and leading to reduced herbaceous cover. The shrub layer may contain species such as *Smilax bona-nox* (greenbrier), *Rhus glabra* (smooth sumac), *Rhus trilobata* (skunkbush sumac), *Crataegus* spp. (hawthorn), and *Symphoricarpos orbiculatus* (coral-berry). Sites dominated by *Prosopis glandulosa* (mesquite), sometimes with *Ziziphus obtusifolia* (lotebush) as a common shrub component, are particularly common to the west. Juniper (including *Juniperus virginiana* (eastern redcedar), *Juniperus ashei* (Ashe juniper), and *Juniperus pinchotii* (redberry juniper), depending on the site) dominated sites are also frequently encountered. Prairie openings and inclusions tend to occur on tighter soils.

The Eastern Crosstimbers occupy a relatively narrow band, approximately 20 miles wide running from McLennan County in the south to the Red River. The Western Crosstimbers is a broader belt, running from about Callahan County in the south, north and east to Montague County. The Western Crosstimbers can further be divided into the Main Belt which has developed on soils derived from the Cretaceous Trinity Group sands, and the more westerly Fringe which has developed on the more rugged and rocky/gravelly sites derived from Pennsylvanian formations.

VEGETATION TYPES:

Crosstimbers: Redcedar Forest and Woodland (501)

Crosstimbers Eastern Redcedar Forest and Woodland

Identifier: CES205.682.1 **Phase 1 Code:** 501

Description: This vegetation type is a minor component of the system, with the canopy dominated by *Juniperus virginiana* (eastern redcedar). Deciduous species such as *Quercus stellata* (post oak) and *Prosopis glandulosa* (mesquite) may be present as well. This vegetation type is mostly commonly encountered in the vicinity of the Red River in Grayson County.

Crosstimbers: Live Oak Forest and Woodland (121)

Crosstimbers Live Oak Forest and Woodland

Identifier: CES205.682.2 **Phase 1 Code:** 121

Description: This vegetation type is a relatively uncommon component of the system, generally occurring in the eastern Crosstimbers on calcareous substrates. Overstory is dominated by *Quercus fusiformis* (plateau live oak), with *Quercus stellata* (post oak), *Ulmus crassifolia* (cedar elm), *Prosopis glandulosa* (mesquite), and *Juniperus ashei* (Ashe juniper) also present as minor components of the canopy. In some areas it may be difficult to distinguish occurrences of this vegetation type from occurrences of Edwards Plateau Limestone Savanna and Woodland (CES303.660) representing outliers of that system.

Crosstimbers: Post Oak / Juniper Woodland (8)

Crosstimbers Oak-Juniper Forest and Woodland

Identifier: CES205.682.4 **Phase 1 Code:** 8

Description: Sites dominated by *Juniperus* species (*Juniperus virginiana* (eastern redcedar) to the north and east, and *Juniperus pinchotii* (redberry juniper) and *Juniperus ashei* (Ashe juniper) elsewhere) are frequently encountered. Such sites, thought to result from disruption in the fire regime, may have *Quercus stellata* (post oak) and *Quercus marilandica* (blackjack oak) as co-dominants in the canopy. The dense canopy cover by cedars often results in limited light penetration and the consequent reduction in herbaceous cover. In central and southern portions of the Crosstimbers, areas over limestone substrate that are mapped as this type may be dominated by *Quercus buckleyi* (Texas oak), *Quercus fusiformis* (plateau live oak), and *Juniperus ashei* (Ashe juniper). *Ulmus crassifolia* (cedar elm) and *Celtis laevigata* (sugar hackberry) may also be important canopy species.

Crosstimbers: Post Oak Woodland (7)

Crosstimbers Oak Forest and Woodland

Identifier: CES205.682.6 **Phase 1 Code:** 7

Description: This vegetation type represents the typical occurrence dominated by the usual *Quercus stellata* (post oak) and *Quercus marilandica* (blackjack oak), with other canopy species such as *Carya texana* (black hickory), *Ulmus crassifolia* (cedar elm), *Quercus fusiformis* (plateau live oak), *Juniperus virginiana* (eastern redcedar), and *Celtis laevigata* (sugar hackberry) present. The overstory may be relatively closed, resulting in reduced herbaceous cover. In some situations, *Prosopis glandulosa* (mesquite) may be relatively dense. Grass species, particularly *Schizachyrium scoparium* (little bluestem), are present in the understory, and may form prairie openings in the woodland.

Crosstimbers: Savanna Grassland (114)

Crosstimbers Savanna Grassland

Identifier: CES205.682.9 **Phase 1 Code:** 114

Description: This is a primarily herbaceous vegetation type, representing the graminoid dominated component of the savanna as it occurs within this system. Occurrences tend to occur on tighter soils (such as on Clay Loam, Clayey Upland, Claypan Prairie, and Claypan Savanna ecoclasses), but are often dependant on appropriate land management (such as prescribed fire and/or brush control) that ensures reduced woody cover. Woody canopy represents less than 25% cover. Historically, *Schizachyrium scoparium* (little bluestem) likely dominated these grasslands, but current composition may be largely determined by landuse history and grazing pressure. In the east, where precipitation is greater, tallgrass species such as *Andropogon gerardii* (big bluestem) and *Sorghastrum nutans* (Indiangrass) may be important components. In the drier west, shortgrass species such as *Buchloe dactyloides* (buffalograss) become more conspicuous. Other graminoid species that may be present include *Paspalum setaceum* (fringeleaf paspalum), *Sporobolus compositus* (tall dropseed), *Bouteloua curtipendula* (sideoats grama), *Bouteloua hirsuta* (hairy grama), *Bouteloua rigidiseta* (Texas grama), *Bothriochloa laguroides* ssp. *torreyana* (silver bluestem), *Nassella leucotricha* (Texas wintergrass), and *Aristida* spp. (threeawn). Non-native species such as *Cynodon dactylon* (Bermuda grass) and *Bothriochloa ischaemum* var. *songarica* (King Ranch bluestem) are often significant components. It may be difficult to distinguish occurrences of this vegetation type from occurrences of Southeastern Great Plains Tallgrass Prairie to the east and Central Mixedgrass Prairie to the west. *Prosopis glandulosa* (mesquite) is a common shrub in this type, and some areas have fairly dense mesquite cover.

Crosstimbers: Juniper Slope Forest (128)

Crosstimbers Juniper Slope Forest

Identifier: CES206.682.11 **Phase 1 Code:** 128

Description: This is a very minor component of the system, occupying slopes greater than twenty percent and dominated by *Juniperus ashei* (Ashe juniper) or, less commonly, *Juniperus pinchotii* (redberry juniper). This vegetation type is mapped in the southern part of the Western Crosstimbers, where it is frequently associated with slopes on calcareous substrates. These occurrences might be more appropriately considered outliers of Edwards Plateau: Ashe Juniper Slope Forest.

Crosstimbers: Hardwood / Juniper Slope Forest (127)

Crosstimbers Deciduous-Juniper Slope Forest

Identifier: CES206.682.14 **Phase 1 Code:** 127

Description: Forests occupying slopes greater than twenty percent with canopies co-dominated by deciduous hardwood species (such as *Quercus stellata* (post oak), *Quercus buckleyi* (Texas oak), *Quercus marilandica* (blackjack oak), *Ulmus crassifolia* (cedar elm)) and juniper species (including *Juniperus pinchotii* (redberry juniper), *J. virginiana* (eastern redcedar), or *J. ashei* (Ashe juniper), depending on the site)). On some mesic slopes on limestones or chalks of the northern Crosstimbers, and into the Blackland Prairie, *Quercus shumardii* (Shumard oak) and *Quercus muehlenbergii* (chinkapin oak) may become the co-dominants in the vegetation type. The overstory canopy tends to be more closed than the upland counterparts, and shrub and herbaceous cover is consequently reduced. Occurrences of this type in the southern part of the Western Crosstimbers frequently occupy slopes on calcareous substrates and may be more appropriately considered as Edwards Plateau Slope forest.

Crosstimbers: Oak / Hardwood Slope Forest (72)

Crosstimbers Deciduous Slope Forest

Identifier: CES206.682.16 **Phase 1 Code:** 72

Description: These relatively closed canopy forests on slopes (greater than twenty percent) are dominated in the overstory by deciduous species, primarily oaks such as *Quercus stellata* (post oak), *Quercus buckleyi* (Texas oak), *Quercus muehlenbergii* (chinkapin oak), and *Quercus marilandica* (blackjack oak). *Ulmus crassifolia* (cedar elm) and/or *Celtis laevigata* (sugar hackberry) may also be common in the canopy. These slopes are frequently associated with the Sandstone Hill ecoclass, with the substrate derived from underlying sandstones. Evergreen species such as *Quercus fusiformis* (plateau live oak) and *Juniperus* sp. (juniper) may be present, but relatively minor components. On calcareous slope in the northern part of the Crosstimbers, and into the Blackland Prairie region, *Quercus shumardii* (Shumard oak) and *Quercus muehlenbergii* (chinkapin oak) may dominate or co-dominate, with *Quercus muehlenbergii* (chinkapin oak) tending to dominate drier sites and *Quercus shumardii* (Shumard oak) dominating more mesic sites. On such mesic sites dominated by *Quercus shumardii* (Shumard oak), subdominants may include *Quercus muehlenbergii* (chinkapin oak), *Quercus macrocarpa* (bur oak), *Celtis* sp. (hackberry), and *Ulmus rubra* (slippery elm).

Crosstimbers: Sandyland Oak Woodland (75)

Crosstimbers Sandyland Oak Woodland

Identifier: CES205.682.26 **Phase 1 Code:** 75

Description: This vegetation type represents system occurrences that occupy particularly sandy sites (typically Deep Sand and perhaps some Sandy ecoclasses), often associated with Paluxy and Antlers Sand. Differentiation of this vegetation type is currently theoretical in anticipation that these sites may be sufficiently distinct to require a separate vegetation type, however field data is largely lacking. These sites are likely dominated by *Quercus stellata* (post oak) and *Quercus marilandica* (blackjack oak). *Quercus margarettae* (sand post oak) may be present in this vegetation type, and sites should be sampled to verify, especially in Eastland and Comanche counties on Antlers

Sand or sandstone members of the Twin Mountains Formation. *Carya texana* (black hickory), *Ulmus crassifolia* (cedar elm), and *Celtis laevigata* (sugar hackberry) may be well-represented in the overstory.

East-Central Texas Plains Post Oak Savanna and Woodland

Identifier: CES205.679

Geology: Typical on sedimentary formations of Eocene age, generally of the Wilcox and Claiborne groups.

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 represents a transition from the woodlands and forests of East Texas to the prairies to the west, specifically the Blackland Prairie. Savannas and woodlands are typically dominated by *Quercus stellata* (post oak), *Quercus marilandica* (blackjack oak), and *Carya texana* (black hickory). Other species, such as *Quercus incana* (bluejack oak) (on more xeric sites), *Quercus fusiformis* (plateau live oak), *Ulmus alata* (winged elm), *Juniperus virginiana* (eastern redcedar), and *Prosopis glandulosa* (mesquite), can also be present in the overstory. In some sites, particularly in the south, *Quercus fusiformis* (plateau live oak) may codominate the woodlands. Shrubs may attain significant cover in the understory, with species including *Ilex vomitoria* (yaupon) (often dominant), *Callicarpa americana* (American beautyberry), *Vaccinium arboreum* (farkleberry), *Sideroxylon lanuginosum* (gum bumelia), *Crataegus* spp. (hawthorn), *Ilex decidua* (possumhaw), *Toxicodendron radicans* (poison ivy), and *Symphoricarpos orbiculatus* (coral-berry). Mid- and tallgrass species including *Schizachyrium scoparium* (little bluestem), *Sorghastrum nutans* (Indiangrass), and *Panicum virgatum* (switchgrass) are frequent in the understory where light penetration supports herbaceous cover, and 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) (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), and *Cynodon dactylon* (Bermuda grass) may dominate some sites. Post Oak Savanna (at least north of the Colorado River) contains species of more eastern affinities such as *Callicarpa americana* (American beautyberry), *Sassafras albidum* (sassafras), *Cornus florida* (flowering dogwood), *Vaccinium arboreum* (farkleberry), *Ulmus alata* (winged elm), and particularly *Ilex vomitoria* (yaupon), the latter species being absent from similar savannas of the Crosstimbers.

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 (109)

East-central Texas Plains Live Oak Motte and Woodland

Identifier: CES205.679.2 **Phase 1 Code:** 109

Description: *Quercus fusiformis* or *Quercus virginiana* (live oak) may dominate sites within the Post Oak Savanna. *Quercus stellata* (post oak) may be present in these woodlands, but typically only as a minor component of the canopy, or it may be completely absent. These occurrences become more common and may occupy large areas in the southeastern part of this region, but occur elsewhere as well. In the western portion of the Post Oak Savanna, occurrences tend to occupy Claypan Savannah and Claypan Prairie ecoclasses, though this cover type is less common than others within these soil types. *Ilex vomitoria* (yaupon), *Callicarpa americana* (American beautyberry), *Smilax bona-nox* (greenbrier), *Sideroxylon lanuginosum* (gum bumelia), *Toxicodendron radicans* (poison ivy), and *Zanthoxylum clava-herculis* (Hercules' club) may be present in the 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.

Post Oak Savanna: Post Oak / Redcedar Motte and Woodland (3)

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

Identifier: CES205.679.4 **Phase 1 Code:** 3

Description: Occurrences of this woodland are dominated by *Quercus stellata* (post 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 is particularly well represented on disturbed sites, particularly where fire is excluded. 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. This vegetation 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. 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. *Pinus taeda* (loblolly pine) may be in the overstory near the Bastrop Lost Pines ecoregion.

Post Oak Savanna: Post Oak Motte and Woodland (2)

East-Central Texas Plains Post Oak Motte and Woodland

Identifier: CES205.679.6 **Phase 1 Code:** 2

Description: This vegetation type generally represents the deciduous woodland component of the system. The typical occurrence is dominated by *Quercus stellata* (post

oak), with *Quercus marilandica* (blackjack oak) and/or *Quercus fusiformis* (plateau live oak) (particularly in the south) 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 may include *Diospyros virginiana* (eastern persimmon), *Juniperus virginiana* (eastern redcedar), *Ulmus alata* (winged elm), and *Ulmus crassifolia* (cedar elm), and as overstory components, are often stunted (< 12 m in height). The shrub layer includes species such as *Callicarpa americana* (American beautyberry), *Ilex decidua* (possumhaw), *Ilex vomitoria* (yaupon), *Sideroxylon lanuginosum* (gum bumelia), *Smilax bona-nox* (greenbrier), *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). *Quercus nigra* (water oak) may be co-dominant on more mesic sites, particularly in the eastern portion of Phase I.

Post Oak Savanna: Post Oak / Yaupon Motte and Woodland (4)

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

Identifier: CES205.679.7 **Phase 1 Code:** 4

Description: Many occurrences of this common 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 is dominated by *Quercus stellata* (post oak). *Juniperus virginiana* (eastern redcedar) or, in southern occurrences *Quercus virginiana* (coastal live oak) may also be present. 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. Near the Bastrop Lost Pines region, *Pinus taeda* (loblolly pine) may be an important overstory tree.

Post Oak Savanna: Savanna Grassland (115)

East-central Texas Plains Post Oak Savanna Grassland

Identifier: CES205.679.9 **Phase 1 Code:** 115

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. 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), and *Cynodon dactylon* (Bermuda grass) may dominate some sites. These grasslands may be difficult to differentiate in areas of transition to Blackland Prairie or Coastal Prairie. Claypan Savannah and Claypan Prairie ecoclasses may support occurrences of this vegetation type, particularly where land management practices including prescribed fire and other forms of brush management are implemented.

Post Oak Savanna: Redcedar Slope Forest (126)

East-central Texas Plains Eastern Redcedar Slope Woodland and Forest

Identifier: CES205.679.11 **Phase 1 Code:** 126

Description: Uncommon (at least in Phase I) relatively closed canopy woodland or forest on slopes greater than twenty percent and dominated by *Juniperus virginiana* (eastern redcedar). This type often occupies the Sandstone Hill ecoclass and is often associated with areas near the contact of the Reklaw Formation and the Carrizo Sand.

Post Oak Savanna: Oak / Redcedar Slope Forest (125)

East-central Texas Plains Oak – Eastern Redcedar Slope Woodland and Forest

Identifier: CES205.679.14 **Phase 1 Code:** 125

Description: Uncommon (at least in Phase I) forest on slopes greater than twenty percent with the canopy co-dominated by oak species (such as *Quercus stellata* (post oak), *Quercus marilandica* (blackjack oak), and *Quercus shumardii* (Shumard oak)) and *Juniperus virginiana* (eastern redcedar). *Ulmus crassifolia* (cedar elm) may also be present to common in the canopy. This type occurs in areas near the Red River on soils of the Shallow and Sandy Loam ecoclasses in Grayson and Fannin counties, as well further south on various soils between Milam and Gonzales counties (in Phase I). Near the Bastrop Lost Pines region, *Pinus taeda* (loblolly pine) may be an important overstory species.

Post Oak Savanna: Oak / Hardwood Slope Forest (76)

Identifier: CES205.679.16 **Phase 1 Code:** 76

Description: This deciduous forest vegetation type is found on slopes greater than twenty percent along the Red River and its tributaries, as well as on slopes from Milam to Gonzales counties. Slopes on calcareous substrates along the Red River may be dominated by species such as *Quercus muehlenbergii* (chinkapin oak), *Quercus shumardii* (Shumard oak), *Ulmus americana* (American elm), and *Ulmus crassifolia* (cedar elm). In the south, slopes are generally not on calcareous substrate and *Quercus muehlenbergii* (chinkapin oak) is lacking. On these sites, 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.

Bastrop Lost Pines Forest and Woodland (original Name: East-central Texas Plains Pine Forest and Woodland)

Identifier: CES205.896

Geology: Sandy Eocene formations, such as Carrizo, Sparta, and Queen City formations are most frequently associated with this system, though it may also occur on the Reklaw (another Eocene) formation.

Landform: Dissected uplands.

Soils: Sandy soils characterize this system with typical Ecological Sites including Deep Sand, Sandy, and Sandy Loam being frequently associated. It may also occupy gravelly sites, associated with more recent geologic strata.

Description: This system is dominated by *Pinus taeda* (loblolly pine), often with *Quercus stellata* (post oak) and *Quercus marilandica* (blackjack oak) present to codominant. *Quercus incana* (bluejack oak), *Quercus margarettae* (sand post oak), *Carya texana* (black hickory), *Ulmus crassifolia* (cedar elm), *Celtis* spp. (hackberry), and *Juniperus virginiana* (eastern redcedar) may also be present. *Vaccinium arboreum* (farkleberry) is a frequent shrub component of the system. Other shrub and woody vine species that may be present include *Sideroxylon lanuginosum* (gum bumelia), *Callicarpa americana* (American beautyberry), *Ilex vomitoria* (yaupon), *Toxicodendron* spp. (poison-ivy), *Rhus aromatica* (fragrant sumac), *Smilax bona-nox* (greenbrier), *Parthenocissus quinquefolia* (Virginia creeper), and *Vitis* spp. (grape). A grassy herbaceous layer may be present with *Schizachyrium scoparium* (little bluestem) commonly encountered, but other species including *Andropogon gerardii* (big bluestem), *Nassella leucotricha* (Texas wintergrass), *Sporobolus junceus* (pineywoods dropseed), *Paspalum plicatulum* (brownseed paspalum), *Paspalum setaceum* (fringeleaf paspalum), *Aristida* spp. (threeawn), *Sporobolus clandestinus* (rough dropseed), *Digitaria cognata* (fall witchgrass), *Dichanthelium oligosanthes* var. *scribnerianum* (Scribner's panicgrass), and *Dichanthelium oligosanthes* (Heller's rosette grass). Forbs are conspicuous and include *Heterotheca subaxillaris* (camphor weed), *Euphorbia corollata* (flowering spurge), *Monarda citriodora* (lemon beebalm), *Galactia volubilis* (downy milkpea), *Liatris aspera* (rough blazingstar), *Brazoria truncata* (bluntsepal brazoria), *Diodia teres* (rough buttonweed), and many others. Local accumulations of pine needles result in a patchy distribution of herbaceous cover. This system bears some resemblance to pine woodlands and forests further to the east, and may represent a western, more xeric, outlier of these similar systems.

VEGETATION TYPES:

Bastrop Lost Pines: Loblolly Pine Forest (11)

Bastrop Lost Pines Loblolly Pine Forest and Woodland

Identifier: CES205.896.1 **Phase 1 Code:** 11

Description: This vegetation type is characteristic of the system, with clear dominance of *Pinus taeda* (loblolly pine). *Vaccinium arboreum* (farkleberry) may form a conspicuous

understory, with *Schizachyrium scoparium* (little bluestem) as a common herbaceous dominant. Oak species, such as post oak (*Quercus stellata*) and blackjack oak (*Quercus marilandica*) may be present in the canopy, but pines dominate. In some cases, areas mapped as this vegetation type may be dominated by eastern redcedar (*Juniperus virginiana*).

Bastrop Lost Pines: Loblolly Pine / Oak Forest (12)

Bastrop Lost Pines Loblolly Pine – Oak Forest and Woodland

Identifier: CES205.896.4 **Phase 1 Code:** 12

Description: This vegetation type represents the transition from strictly *Pinus taeda* (loblolly pine) dominated sites to those more characteristic of the surrounding post oak savanna. As such, *Quercus stellata* (post oak), and to a lesser extent, *Quercus marilandica* (blackjack oak) are significant components of the canopy, though *Pinus taeda* (loblolly pine) remains a significant component of the canopy. *Carya texana* (black hickory), *Ulmus crassifolia* (cedar elm), and *Celtis laevigata* (sugar hackberry) may also be a conspicuous deciduous elements in the canopy. *Juniperus virginiana* (eastern redcedar) may also be present, co-dominant, or sometimes dominant on sites mapped as this vegetation type.

Bastrop Lost Pines: Loblolly Pine Slope Forest (77)

Bastrop Lost Pines Loblolly Pine Slope Forest

Identifier: CES205.896.11 **Phase 1 Code:** 77

Description: This vegetation type occupies slopes greater than twenty percent and likely represents a more mesic and closed canopy representation of the Bastrop Lost Pines Loblolly Pine Forest. As such, the canopy is dominated by *Pinus taeda* (loblolly pine), with *Quercus stellata* (post oak), *Ulmus* spp. (elms), *Juniperus virginiana* (eastern redcedar) and *Quercus marilandica* (blackjack oak) also present, but as minor components of the canopy. This forest is often found on the Sandstone Hill ecoclass. Differentiation from the surrounding upland forests based on species composition will be problematic. The shrub and herbaceous layer is less well-developed than in the surrounding uplands, due to the more closed nature of the canopy. Since *Juniperus virginiana* (eastern redcedar) in the canopy also results in coniferous evergreen canopy, forests dominated by this species may be mapped as this vegetation type.

Bastrop Lost Pines: Loblolly Pine / Oak Slope Forest (124)

Bastrop Lost Pines Loblolly Pine-Oak Slope Forest

Identifier: CES205.896.14 **Phase 1 Code:** 124

Description: This vegetation type on slopes greater than twenty percent is a minor mapped type in this system. The overstory canopy is co-dominated by the coniferous evergreens *Pinus taeda* (loblolly pine) and/or *Juniperus virginiana* (eastern redcedar) and deciduous oaks such as *Quercus stellata* (post oak) and *Quercus marilandica* (blackjack oak). *Ulmus* spp. (elms) and sugar hackberry (*Celtis laevigata*) are also common components of the overstory. This vegetation type is often found on the Sandstone Hill ecoclass.

One interesting small patch (20 – 80 acres) community that may be embedded within this mapped type occurs below the highest occurrences of the Sandylands types of the Post Oak Savanna region. This community occurs where sandhills make contact with sandy loam and sandy clay associated with the Recklaw Formation. It is an infrequent to rare community, mostly found on south and southeast facing slopes, and dominated by *Pinus taeda* (loblolly pine), *Quercus nigra* (water oak), *Nyssa sylvatica* (black gum), *Ilex opaca* (American holly), *Morella cerifera* (wax-myrtle), and *Callicarpa americana* (American beautyberry). The herbaceous layer of this community is dominated by *Rhynchospora glomerata* (cluster beakrush), *Eleocharis torilis* (twisted spikerush), *Andropogon virginicus* (broomsedge bluestem), *Chasmanthium laxum* (slender woodoats), *Dichanthelium scoparium* (velvet panicgrass), and *Pteridium aquilinum* (bracken fern). Well-developed understory seep forest flora occurs on mid and lower slopes within this type, with spring runs, spongy muck, and in some cases, quaking conditions. These seepage areas are dominated by *Woodwardia virginica* (Virginia chain fern), *Woodwardia areolata* (chain fern), *Triadenum virginicum* (Virginia St. Johnswort), *Osmunda regalis* var. *spectabilis* (royal fern), and *Osmunda cinnamomaea* (cinnamon fern), though the latter two species are rare in this landscape. This restricted community may be found in Bastrop, Lee, and Gonzales counties (lacking *Pinus taeda* (loblolly pine) in Gonzales County and therefore not mapped in this vegetation type there). Representative occurrences can be found at Hoppy Spring (Bastrop State Park) and Yegua Knobs Preserve (Bastrop/Lee County).

Bastrop Lost Pines: Hardwood Slope Forest (123)

Bastrop Lost Pines Deciduous Slope Forest

Identifier: CES205.896.16 **Phase 1 Code:** 123

Description: This is a very minor component of the system, occurring on slopes greater than 20% and dominated by hardwood species such as *Quercus stellata* (post oak), *Quercus marilandica* (blackjack oak), *Ulmus crassifolia* (cedar elm), *Ulmus americana* (American elm), and *Celtis laevigata* (sugar hackberry). This vegetation type is similar to Post Oak Savanna: Oak / Hardwood Slope Forest of the surrounding landscape.

Riparian and Wetland Systems

Edwards Plateau Floodplain Terrace

Identifier: CES303.651

Geology: This system usually occupies Quaternary alluvial deposits often within drainages largely underlain by limestones or other calcareous substrates.

Landform: Valley floors of large rivers and perennial streams. This system tends to occupy broad valley bottoms with deep alluvial deposits of the Guadalupe, Lower Brazos, Colorado, Concho, and San Antonio River drainages where they occur within the Edwards Plateau (EPA Level III), Limestone Cut Plain, Limestone Plains, or Western Crosstimbers (EPA Level IV) ecoregions.

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 texensis* (Texas ash), *Fraxinus pennsylvanica* (green ash), *Juglans major* (Arizona walnut), *Quercus macrocarpa* (bur oak), *Quercus buckleyi* (Texas oak), *Acer negundo* (boxelder), *Sapindus saponaria* var. *drummondii* (western soapberry), *Ptelea trifoliata* (wafer-ash), *Juniperus ashei* (Ashe juniper), *Prosopis glandulosa* (mesquite), and *Platanus occidentalis* (American sycamore). *Quercus stellata* (post oak) may be dominant on sandy soils within the floodplain. Woody species in the subcanopy may include *Sideroxylon lanuginosum* (gum bumelia), *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), *Juglans microcarpa* (little walnut), *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 (147)

Edwards Plateau Floodplain Ashe Juniper Forest and Woodland

Identifier: CES303.651.1 **Phase 1 Code:** 147

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

Edwards Plateau: Floodplain Live Oak Forest (117)

Identifier: CES303.651.2 **Phase 1 Code:** 117

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 *Q. fusiformis* clearly dominates. *Juniperus ashei* (Ashe juniper) may also be present.

Edwards Plateau: Floodplain Hardwood / Ashe Juniper Forest (138)

Edwards Plateau Floodplain Mixed Deciduous-Evergreen Forest and Woodland

Identifier: CES303.651.4 **Phase 1 Code:** 138

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

Edwards Plateau: Floodplain Hardwood Forest (24)

Edwards Plateau Floodplain Deciduous Forest and Woodland

Identifier: CES303.651.6 **Phase 1 Code:** 24

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

Edwards Plateau: Floodplain Ashe Juniper Shrubland (149)

Edwards Plateau Floodplain Ashe Juniper Shrubland

Identifier: CES303.651.7 **Phase 1 Code:** 149

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

Edwards Plateau: Floodplain Deciduous Shrubland (148)

Edwards Plateau Floodplain Deciduous Shrubland

Identifier: CES303.651.8 **Phase 1 Code:** 148

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), *Juglans microcarpa* (little walnut), *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 (150)

Edwards Plateau Floodplain Herbaceous Vegetation

Identifier: CES303.651.9 **Phase 1 Code:** 150

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), *Chasmanthium latifolium* (creekoats), *Carex* spp. (carices), and *Eleocharis* spp. (spikerushes). Scattered *Prosopis glandulosa* (mesquite), *Quercus fusiformis* (plateau live oak), or other overstory species may be present.

Edwards Plateau Riparian

Identifier: CES303.652

Geology: This system usually occupies buffers on either side of headwater streams and soils are generally similar to adjacent uplands, and have developed over limestone or other calcareous substrates.

Landform: As mapped here, riparian systems occur along intermittent streams.. These sites tend to be in erosional situations, as opposed to broad alluvial depositional sites. This system occurs within the Guadalupe, Lower Brazos, Colorado, Concho, and San Antonio River drainages where they occur within the Edwards Plateau (EPA Level III), Limestone Cut Plain, Limestone Plains, or Western Crosstimbers (EPA Level IV) ecoregions.

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), *Fraxinus texensis* (Texas 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 *Juglans microcarpa* (little walnut), *Chilopsis linearis* (desert willow) in the western part of the Edwards Plateau, *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 (151)

Edwards Plateau Riparian Ashe Juniper Forest and Woodland

Identifier: CES303.652.1 **Phase 1 Code:** 151

Description: Forest or woodland on riparian sites dominated by *Juniperus ashei* (Ashe juniper). Otherwise, this type fits 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 (119)

Edwards Plateau Riparian Live Oak Forest and Woodland

Identifier: CES303.652.2 **Phase 1 Code:** 119

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 (156)

Edwards Plateau Riparian Hardwood / Ashe Juniper Forest

Identifier: CES303.652.4 **Phase 1 Code:** 156

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 (25)

Edwards Plateau Riparian Deciduous Forest and woodland

Identifier: CES303.652.6 **Phase 1 Code:** 25

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

Edwards Plateau: Riparian Ashe Juniper Shrubland (153)

Edwards Plateau Riparian Ashe Juniper Shrubland

Identifier: CES303.652.7 **Phase 1 Code:** 153

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

Edwards Plateau: Riparian Deciduous Shrubland (152)

Edwards Plateau Riparian Deciduous Shrubland

Identifier: CES303.652.8 **Phase 1 Code:** 152

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

Edwards Plateau: Riparian Herbaceous Vegetation (154)

Identifier: CES303.652.9 **Phase 1 Code:** 154

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

Edwards Plateau Upland Depression

Identifier: CES303.654

Geology: Massive Cretaceous limestones, such as Edwards Limestone.

Landform: Internally draining depressions of karstic origin on level plateau surfaces.

Soils: Loams and clay loams, often mapped as Lakebed ecoclass.

Description: This system includes shallow wetlands formed over limestone on the Edwards Plateau of Texas. Variable in size and duration of inundation, these wetlands are typically found on level uplands. Dominant vegetation includes both graminoids and forbs tolerant of wet periods but not necessarily wetland-dependent. Dominant species may include *Pleuraphis mutica* (tobosa), *Buchloe dactyloides* (buffalograss), *Tridens albescens* (white tridens), *Sedum pulchellum* (widowscross), *Sedum nuttallianum* (yellow stonecrop), *Sporobolus vaginiflorus* (poverty dropseed), *Chaetopappa bellidifolia* (hairy leastdaisy), *Ambrosia psilostachya* (western ragweed), *Paronychia* spp. (whitlow-wort), and the alga *Nostoc commune* (blue-green algae). *Panicum obtusum* (vine-mesquite), *Bothriochloa barbinodis* (cane bluestem), *Pascopyrum smithii* (western wheatgrass), *Bouteloua gracilis* (blue grama), *Chenopodium album* (lambsquarters), *Helianthus ciliaris* (blue-weed), and *Solanum elaeagnifolium* (silverleaf nightshade) may also be present. Some larger occurrences of this wetland system are found in Crockett, Reagan, Schleicher, Irion and Sterling counties in the northwest Edwards Plateau (the Eldorado Plateau). In Phase I, they are found primarily in Runnels, Concho, and Sutton counties. Formation of these occurrences is apparently from solution of the underlying limestone.

VEGETATION TYPE:

Edwards Plateau: Playa (26)

Edwards Plateau Upland Depression

Identifier: CES303.654.9 **Phase Code:** 26

Description: As described for system.

Southeastern Great Plains Floodplain Forest

Identifier: CES303.651

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. Rivers such as the Sulphur, (and tributaries such as White Oak and Cuthand Creeks), Sabine (and Lake Fork), Trinity (and its major tributaries), Navasota, and portions of the Lower and Middle Brazos River (and its major tributaries) may support this system. Within Phase 1, the portions of the Guadalupe, Colorado, and San Antonio Rivers downstream of the Edwards Plateau ecoregion are also included in this system.

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 *Carya illinoensis* (pecan), *Fraxinus americana* (white ash), *Quercus nigra* (water oak), *Ulmus crassifolia* (cedar elm), *Celtis laevigata* (sugar hackberry), *Ulmus americana* (American elm), *Quercus fusiformis* or *Q. virginiana* (plateau or coastal live oak), *Platanus occidentalis* (American sycamore), *Acer negundo* (boxelder), *Quercus macrocarpa* (bur oak), *Morus rubra* (red mulberry), *Fraxinus pennsylvanica* (green ash), and *Sapindus saponaria* var. *drummondii* (western soapberry). Overgrazing and/or overbrowsing may influence recruitment of overstory species and composition of the understory and herbaceous layers. Shrub species may include *Callicarpa americana* (American beautyberry), *Ilex decidua* (possumhaw), *Ilex vomitoria* (yaupon), *Sideroxylon lanuginosum* (gum bumelia), *Diospyros virginiana* (eastern persimmon), *Vaccinium arboreum* (farkleberry), *Juniperus virginiana* (eastern redcedar), *Cornus drummondii* (roughleaf dogwood), and *Viburnum rufidulum* (rusty blackhaw), which may occur as dense patches following disturbance, but are otherwise generally fairly sparse. Vines such as *Berchemia scandens* (Alabama supplejack), *Campsis radicans* (common trumpet creeper), *Vitis* spp. (grape), *Parthenocissus quinquefolia* (Virginia creeper), and *Ampelopsis arborea* (peppervine) may be conspicuous. Herbaceous cover includes *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), *Geum canadense* (white avens), *Sanicula canadensis* (Canada snakeroot), *Panicum virgatum* (switchgrass), *Galium* spp. (bedstraw), and *Carex* spp. (caric sedge). Non-native grasses that may dominate these sites include *Cynodon dactylon* (Bermuda grass) and *Sorghum halepense* (Johnson grass). Herbaceous cover may be quite high, especially in situations where shrub cover is low.

VEGETATION TYPES:

Central Texas: Floodplain Juniper Forest (139)

Southeastern Great Plains Floodplain Juniper Forest and Woodland

Identifier: CES303.651.1

Phase 1 Code: 139

Description: As described for the system, but the canopy is dominated by *Juniper* spp. (juniper), usually *Juniperus virginiana* (eastern redcedar) but *Juniperus ashei* (Ashe

juniper) and *Juniperus pinchotii* (redberry juniper) may also be present. This vegetation type is a very minor component of the system as it is mapped in Phase 1.

Central Texas: Floodplain Live Oak Forest (116)

Southeastern Great Plains Floodplain Live Oak Forest and Woodland

Identifier: CES303.651.2 **Phase 1 Code:** 116

Description: As described for the system, but dominated by *Quercus fusiformis* (plateau live oak) or *Q. virginiana* (coastal live oak). Deciduous species can be, and frequently are, common in the canopy, but *Q. fusiformis* (plateau live oak) or *Q. virginiana* (coastal live oak) clearly dominates. *Juniperus virginiana* (eastern redcedar) may also be present. This vegetation type is a very minor component of the system as it is mapped in Phase 1.

Central Texas: Floodplain Hardwood / Evergreen Forest (136)

Southeastern Great Plains Floodplain Mixed Deciduous – Evergreen Forest and Woodland

Identifier: CES303.651.4 **Phase 1 Code:** 136

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

Central Texas: Floodplain Hardwood Forest (5)

Southeastern Great Plains Floodplain Deciduous Forest and Woodland

Identifier: CES303.651.6 **Phase 1 Code:** 5

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

Along the Red River and a few of its tributaries, thin bands of riparian vegetation occurring on sandy floodplain terraces, bluffs and sandbars are significantly different in species composition from riparian communities elsewhere in the region. In Phase I, occurrences may include *Salix* spp. (especially *S. exigua*, sandbar willow), *Acer saccharinum* (silver maple, which probably does not occur in any other basin in Texas), *Juniperus virginiana* (eastern redcedar), and *Populus deltoides* (eastern cottonwood). Adjacent slopes and higher floodplain terraces support woodlands of *Juniperus virginiana* (eastern redcedar), *Quercus macrocarpa* (bur oak), *Quercus shumardii* (Shumard oak), *Quercus muehlenbergii* (chinkapin oak), *Fraxinus texensis* (white ash), *Cornus drummondii* (roughleaf dogwood), and *Viburnum rufidulum* (rusty blackhaw).

Central Texas: Floodplain Evergreen Shrubland (141)

Southeastern Great Plains Floodplain Evergreen Shrubland

Identifier: CES303.651.7 **Phase 1 Code:** 141

Description: Shrublands of the floodplains of the region that are dominated by *Juniperus* spp. (juniper) occurring as shrubs, or other evergreen shrubs, such as *Ilex vomitoria* (yaupon). This is a very minor component of the system as it is mapped in Phase 1.

Central Texas: Floodplain Deciduous Shrubland (140)

Southeastern Great Plains Floodplain Deciduous Shrubland

Identifier: CES303.651.8 **Phase 1 Code:** 140

Description: Shrublands of the floodplains of the region that are dominated by deciduous shrubs such as *Ilex decidua* (possumhaw), *Prosopis glandulosa* (mesquite), *Salix nigra* (black willow), *Cornus drummondii* (roughleaf dogwood), and/or *Cephalanthus occidentalis* (common buttonbush).

Central Texas: Floodplain Herbaceous Vegetation (142)

Southeastern Great Plains Floodplain Herbaceous Vegetation

Identifier: CES303.651.9 **Phase 1 Code:** 142

Description: Floodplains of the region that lack a significant overstory or shrub canopy, but retain cover in the herbaceous layer. Non-native grass species such as *Cynodon dactylon* (Bermuda grass) and *Sorghum halepense* (Johnson grass) may frequently dominate this vegetation type. *Tripsacum dactyloides* (eastern gamagrass) – *Panicum virgatum* (switchgrass) dominated prairies on lowlands, like those that occur at Knight Prairie and Mill Creek Bottom, may also be mapped as this vegetation type.

Southeastern Great Plains Riparian Forest

Identifier: CESYYY.YYY

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 Sulphur, Sabine, Trinity, Navasota, and Brazos Rivers. Typically in areas with erosional processes dominating over alluvial deposition. Occurrences of this system occupy drainages of the Sulphur, (and tributaries such as White Oak and Cuthand Creeks), Sabine (and Lake Fork), Trinity (and its major tributaries), Navasota, and portions of the Lower and Middle Brazos River (and its major tributaries). Within Phase 1, the occurrences of riparian systems within drainages of the Guadalupe, Colorado, and San Antonio Rivers downstream of the Edwards Plateau ecoregion are also included in this system.

Soils: By definition, this system is mapped along drainages upstream of the Bottomland Ecoclasses, so they will be mapped on 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), *Juglans major* (Arizona walnut), *Quercus fusiformis* (plateau live oak), *Quercus nigra* (water oak), *Quercus phellos* (willow oak), *Sapindus saponaria* var. *drummondii* (western soapberry), *Salix nigra* (black willow), *Fraxinus americana* (white ash), *Fraxinus pennsylvanica* (green ash), *Gleditsia triacanthos* (common honeylocust), and *Carya illinoensis* (pecan). The shrub layer development is variable, sometimes with species such as *Amorpha fruticosa* (indigobush), *Forestiera acuminata* (swamp privet), *Ilex decidua* (possumhaw), *Ilex vomitoria* (yaupon), *Sideroxylon lanuginosum* (gum bumelia), *Juniperus virginiana* (eastern redcedar), *Diospyros virginiana* (eastern persimmon), *Cornus drummondii* (roughleaf dogwood), and/or *Viburnum rufidulum* (rusty blackhaw). 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), *Symphyotrichum drummondii* var. *texanum* (Drummond's aster), *Geum canadense* (white avens), *Sanicula canadensis* (Canada snakeroot), *Panicum virgatum* (switchgrass), *Galium* spp. (bedstraw), and *Carex* spp. (caric sedge). Non-native grass species that may be common to dominant on these sites include *Cynodon dactylon* (Bermuda grass) and *Sorghum halepense* (Johnson grass). The environment and characteristics of the vegetation of this system become drier from east to west, with moister representatives (such as communities containing *Quercus nigra* (water oak)) occurring in the eastern parts of the range.

VEGETATION TYPES:

Central Texas: Riparian Juniper Forest (143)

Southeastern Great Plains Riparian Juniper Forest and Woodland

Identifier: YYY.YYY.1

Phase 1 Code: 143

Description: As described for the system, with *Juniperus* spp. (juniper) dominating the canopy. *Juniperus virginiana* (eastern redcedar) is the typical dominant, but *Juniperus ashei* (Ashe juniper) or *Juniperus pinchotii* (redberry juniper) may dominate locally in areas to the west and south (just north of the Edwards Plateau) within Phase 1. However, this is a minor component of the system.

Central Texas: Riparian Live Oak Forest (118)

Southeastern Great Plains Riparian Live Oak Forest and Woodland

Identifier: YYY.YYY.2

Phase 1 Code: 118

Description: As described for the system, with *Quercus fusiformis* (plateau live oak) or *Quercus virginiana* (coastal live oak) dominating the canopy. Deciduous species can be, and frequently are, common in the canopy, but *Q. fusiformis* (plateau live oak) or *Q. virginiana* (coastal live oak) clearly dominates. *Juniperus virginiana* (eastern redcedar) may also be present. This is a very minor component of the system as it is mapped in Phase 1.

Central Texas: Riparian Hardwood / Evergreen Forest (137)

Southeastern Great Plains Riparian Mixed Deciduous – Evergreen Forest and Woodland

Identifier: YYY.YYY.4

Phase 1 Code: 137

Description: As described for the system, with a mix of evergreen species (including *Juniperus* spp. (junipers) and/or *Quercus fusiformis* (plateau live oak) or *Quercus virginiana* (coastal live oak)) and deciduous species in the canopy.

Central Texas: Riparian Hardwood Forest (6)

Southeastern Great Plains Riparian Hardwood Forest and Woodland

Identifier: CESYYY.YYY.6

Phase 1 Code: 6

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

Along the Red River and a few of its tributaries, thin bands of riparian vegetation occurring on sandy floodplain terraces, bluffs and sandbars are significantly different in species composition from riparian communities elsewhere in the region. In Phase I, occurrences may include *Salix* spp. (especially *S. exigua*, sandbar willow), *Acer*

saccharinum (silver maple, which probably does not occur in any other basin in Texas), *Juniperus virginiana* (eastern redcedar), and *Populus deltoides* (eastern cottonwood). Adjacent slopes and higher floodplain terraces support woodlands of eastern redcedar, *Quercus macrocarpa* (bur oak), *Quercus shumardii* (Shumard oak), *Quercus muehlenbergii* (chinkapin oak), *Fraxinus texensis* (white ash), *Cornus drummondii* (roughleaf dogwood), and *Viburnum rufidulum* (rusty blackhaw).

Central Texas: Riparian Evergreen Shrubland (145)

Southeastern Great Plains Riparian Evergreen Shrubland

Identifier: CESYYY.YYY.7 **Phase 1 Code:** 145

Description: Shrublands in riparian sites that are dominated by *Juniperus* spp. (juniper) or, sometimes broadleaf evergreen shrubs such as *Ilex vomitoria* (yaupon). The juniper is usually *Juniperus virginiana* (eastern redcedar), but may be *Juniperus ashei* (Ashe juniper) or *Juniperus pinchotii* (redberry juniper) in some areas. This is a minor component of the system.

Central Texas: Riparian Deciduous Shrubland (144)

Southeastern Great Plains Riparian Deciduous Shrubland

Identifier: CESYYY.YYY.8 **Phase 1 Code:** 144

Description: Shrublands in riparian sites dominated by deciduous shrubs such as *Ilex decidua* (possumhaw), *Prosopis glandulosa* (mesquite), *Salix nigra* (black willow), *Cornus drummondii* (roughleaf dogwood), and/or *Cephalanthus occidentalis* (common buttonbush).

Central Texas: Riparian Herbaceous Vegetation (146)

Southeastern Great Plains Riparian Herbaceous Vegetation

Identifier: CESYYY.YYY.9 **Phase 1 Code:** 146

Description: Riparian sites lacking overstory or shrub canopy but retaining herbaceous cover. *Tripsacum dactyloides* (eastern gamagrass) – *Panicum virgatum* (switchgrass) dominated prairies on lowlands, like those that occur at Knight Prairie and Mill Creek Bottom, may also be mapped as this vegetation type.

Western Great Plains Floodplain

Identifier: CES303.678

Geology: This system generally occurs on Quaternary Alluvium.

Landform: Valley floors of large rivers and perennial streams. This system tends to occupy broad valley bottoms with deep alluvial deposits. In Phase 1, this system is found within the Clear Fork of the Middle Brazos watersheds.

Soils: This system occurs on Loamy Bottomland, Clayey Bottomland, and Draw ecoclasses.

Description: This system is characteristic of valley floors of large rivers and perennial streams where significant alluvial deposition occurs. Broad alluvial deposits commonly occur and are generally mapped as bottomland soils. This system can be expressed in numerous cover types including forests, woodlands, shrublands, and herbaceous vegetation (where marshes may

develop in the floodplain soils, or mesic prairie dominated by *Andropogon gerardii* (big bluestem) and *Panicum virgatum* (switchgrass) may be conspicuous). *Populus deltoides* (eastern cottonwood), *Sapindus saponaria* var. *drummondii* (western soapberry), *Prosopis glandulosa* (mesquite), *Salix nigra* (black willow), *Ulmus americana* (American elm), and/or *Celtis laevigata* (sugar hackberry) may be important components of forests or woodlands of this system. In Phase 1, *Juniperus ashei* (Ashe juniper), *Juniperus pinchotii* (redberry juniper), and/or *Quercus fusiformis* (plateau live oak) may be present to dominant. As this is the eastern extent of the overall distribution of the system, some species occur in the system at the western edge of their range, and may not be represented further west within the range of the system. Such species include *Quercus fusiformis* (plateau live oak) and *Ulmus americana* (American elm). Shrublands may also have *Prosopis glandulosa* (mesquite) and *Salix nigra* (black willow) as important components. Some shrublands in this system may be dominated by the non-native *Tamarix* spp. (saltcedar). Herbaceous vegetation may include marshes occupying floodplain sites, with species such as *Schoenoplectus* spp. (bulrush) and/or *Typha* spp. (cattails). Some sites may be dominated by tallgrass species such as *Andropogon gerardii* (big bluestem) and *Panicum virgatum* (switchgrass).

VEGETATION TYPES:

High Plains: Floodplain Juniper Forest (164)

Western Great Plains Floodplain Juniper Forest and Woodland

Identifier: CES303.678.1 **Phase 1 Code:** 164

Description: Forest or woodland as described for the system, but with *Juniperus ashei* (Ashe juniper) or *Juniperus pinchotii* (redberry juniper) as the overstory dominant. This is a very minor component of the system, at least in Phase 1.

High Plains: Floodplain Live Oak Forest (163)

Western Great Plains Floodplain Live Oak Forest and Woodland

Identifier: CES303.678.2 **Phase 1 Code:** 163

Description: Forest or woodland as described for system, but with *Quercus fusiformis* (plateau live oak) as the overstory dominant. This is a minor component of the system.

High Plains: Floodplain Hardwood / Juniper Forest (162)

Western Great Plains Floodplain Mixed Deciduous – Evergreen Forest and Woodland

Identifier: CES303.678.4 **Phase 1 Code:** 162

Description: Forest or woodland as described for system. Overstory is dominated by a mix of evergreen species (such as *Juniperus ashei* (Ashe juniper), *Juniperus pinchotii* (redberry juniper), and/or *Quercus fusiformis* (plateau live oak)) and deciduous species.

High Plains: Floodplain Hardwood Forest (161)

Western Great Plains Floodplain Deciduous Forest and Woodland

Identifier: CES303.678.6 **Phase 1 Code:** 161

Description: Forest or woodland as described for system with a deciduous overstory canopy.

High Plains: Floodplain Juniper Shrubland (166)

Western Great Plains Floodplain Juniper Shrubland

Identifier: CES303.678.7 **Phase 1 Code:** 166

Description: Shrubland on floodplain dominated by *Juniperus ashei* (Ashe juniper) or *Juniperus pinchotii* (redberry juniper). This is a very minor component of the system, at least in Phase 1.

High Plains: Floodplain Deciduous Shrubland (165)

Western Great Plains Floodplain Deciduous Shrubland

Identifier: CES303.678.8 **Phase 1 Code:** 165

Description: Shrubland on floodplain, dominated by deciduous shrub species such as *Prosopis glandulosa* (mesquite), *Salix nigra* (black willow), *Sapindus saponaria* var. *drummondii* (western soapberry), *Ziziphus obtusifolia* (lotebush) and/or *Celtis laevigata* (sugar hackberry). *Tamarix* spp. (saltcedar) may also be present to dominant in the shrub layer.

High Plains: Floodplain Herbaceous Vegetation (167)

Western Great Plains Floodplain Herbaceous Vegetation

Identifier: CES303.678.9 **Phase 1 Code:** 167

Description: This herbaceous vegetation may be represented by marshes on floodplains, where *Schoenoplectus* spp. (bulrush), *Eleocharis* spp. (spikerush), and/or *Typha* spp. (cattail) dominate. Patches of tallgrass prairie that may be dominated by species such as *Andropogon gerardii* (big bluestem) or *Panicum virgatum* (switchgrass) may also be mapped as this vegetation type.

Western Great Plains Riparian

Identifier: CES303.956

Geology: As defined, this type occurs along headwater streams and generally occurs over upland soils that have developed in place over a variety of bedrock types, often limestone in Phase 1.

Landform: This system occurs along drainages that may be intermittent and tend to be dominated by erosional processes (as opposed to depositional processes) within the drainage of the Clear Fork of the Middle Brazos River.

Soils: As this system is mapped, it by definition occurs outside of areas mapped as bottomland soils. Soils are therefore mapped with soils of the surrounding uplands.

Description: Phase 1 represents the southeastern extent of the range of the system, and shares some similarity with the Edwards Plateau Riparian and Southeastern Great Plains Riparian system to which it is adjacent. In Phase 1, this system is restricted to the drainages of the Clear Fork of the Middle Brazos River. Several cover types are represented within this system, including forests, woodlands, shrublands, and herbaceous vegetation. Forests and woodlands may have species such *Populus deltoides* (eastern cottonwood), *Salix nigra* (black willow), *Celtis laevigata* (sugar hackberry), *Juniperus ashei* (Ashe juniper), and *Juniperus pinchotii* (redberry juniper). *Quercus fusiformis* (plateau live oak) occurs here at the western edge of its

range, but may be locally dominant. Shrublands are frequently dominated by *Prosopis glandulosa* (mesquite), but may also contain species such as *Salix nigra* (black willow) and *Sapindus saponaria* var. *drummondii* (western soapberry). Herbaceous vegetation may be represented by marshes associated with small drainages and dominated by *Schoenoplectus* spp. (bulrush), *Eleocharis* spp. (spikerush), and other sedges. Grasslands associated with riparian corridors may also be present and will generally be somewhat more mesic than grasslands of the surrounding landscape.

VEGETATION TYPES:

High Plains: Riparian Juniper Forest (171)

Western Great Plains Floodplain Juniper Forest and Woodland

Identifier: CES303.678.1 **Phase 1 Code:** 164

Description: Forest or woodland as described for the system, but with *Juniperus ashei* (Ashe juniper) or, less commonly in Phase 1, *Juniperus pinchotii* (redberry juniper) as the overstory dominant.

High Plains: Riparian Live Oak Forest (170)

Western Great Plains Riparian Live Oak Forest

Identifier: CES303.956.3 **Phase 1 Code:** 170

Description: Woodland or forest of riparian situations with *Quercus fusiformis* (plateau live oak) dominating the canopy. This is a minor component of the system. Live oak occurs in this system only in the southeastern portion of its range, where *Quercus fusiformis* (plateau live oak) is at the western edge of its range.

High Plains: Riparian Hardwood / Juniper Forest (169)

Western Great Plains Mixed Deciduous – Evergreen Forest and Woodland

Identifier: CES303.956.4 **Phase 1 Code:** 169

Description: Forest or woodland as described for the system, with the canopy containing significant amounts of *Juniperus ashei* (Ashe juniper) or *Juniperus pinchotii* (redberry juniper) in addition to the deciduous components. This is a minor component of the system in Phase 1.

High Plains: Riparian Hardwood Forest (168)

Western Great Plains Deciduous Forest and Woodland

Identifier: CES303.956.6 **Phase 1 Code:** 168

Description: Forest and woodland as described for the system with a canopy dominated by deciduous species.

High Plains: Riparian Juniper Shrubland (173)

Western Great Plains Juniper Shrubland

Identifier: CES303.956.7 **Phase 1 Code:** 173

Description: Shrubland of riparian situations dominated by *Juniperus ashei* (Ashe juniper) or *Juniperus pinchotii* (redberry juniper).

High Plains: Riparian Deciduous Shrubland (172)

Western Great Plains Deciduous Shrubland

Identifier: CES303.956.8 **Phase 1 Code:** 172

Description: Shrubland of riparian situations dominated by deciduous shrub species, primarily *Prosopis glandulosa* (mesquite). This is the primary vegetation type mapped as this system.

High Plains: Riparian Herbaceous Vegetation (174)

Western Great Plains Herbaceous Vegetation

Identifier: CES303.956.9 **Phase 1 Code:** 174

Description: Grassland or marsh of riparian situations as described for the system.

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. In the west, *Pinus remota* (paper-shell pinyon) may also contribute to a scattered emergent overstory. 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), *Forestiera reticulata* (netleaf forestiera), *Ungnadia speciosa* (Mexican buckeye), *Sophora secundiflora* (Texas mountain-laurel), *Diospyros texana* (Texas persimmon), *Salvia ballotiflora* (mejozana), *Mimosa borealis* (fragrant mimosa), *Condalia hookeri* (brasil), *Rhus trilobata* (skunkbush sumac), *Opuntia engelmannii* (prickly pear), and *Mahonia trifoliolata* (agarito). This system also includes *Quercus mohriana* (Mohr's shin oak) or *Quercus vaseyana* (Vasey shin oak) dominated shrublands that are more common to the west. Herbaceous cover may be patchy and is generally graminoid with species including *Schizachyrium scoparium* (little bluestem), *Bouteloua curtipendula* (sideoats grama), *Bouteloua rigidiseta* (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. (threeawn), and others. Disturbances such as fire may be important processes maintaining this system. However, it appears to persist on thin-soiled sites. In the western portions of the Edwards Plateau, more xeric conditions lead to the slow succession of sites to woodlands resulting in long-persisting shrublands.

VEGETATION TYPES:

Edwards Plateau: Ashe Juniper / Live Oak Shrubland (18)

Edwards Plateau Limestone Evergreen Shrubland and Shrub Motte

Identifier: CES303.041.7

Phase 1 Code: 18

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), *Quercus vaseyana* (Vasey shin oak), *Quercus mohriana* (Mohr's shin oak), *Sophora secundiflora* (Texas mountain-laurel), *Mahonia trifoliolata* (agarito), and/or *Rhus virens* (evergreen sumac) contribute to the evergreen cover of this shrubland.

Deciduous shrub species, including *Rhus lanceolata* (prairie sumac), *Cercis canadensis* var. *texensis* (Texas redbud), *Diospyros texana* (Texas persimmon), *Prosopis glandulosa* (mesquite), and *Forestiera* spp. (elbowbush) may also be present but never dominant. Areas mapped as this system may, in some cases, lack significant cover of *Juniperus ashei* (Ashe juniper) and these sites are dominated by broad-leaved evergreen shrubs. Monotypic stands of *Quercus fusiformis* (plateau live oak) (occupying the shrub layer) are relatively uncommon. A sparse overstory canopy of *Juniperus ashei* (Ashe juniper), *Quercus fusiformis* (plateau live oak), *Pinus remota* (paper-shell pinyon), *Prosopis glandulosa* (mesquite), *Quercus sinuata* var. *breviloba* (white shin oak), *Quercus vaseyana* (Vasey shin oak), *Celtis* spp. (hackberry) or other species may sometimes be present. Where deciduous shrubs are present and shrub cover is distributed in a patchy mosaic, such sites may be used by black-capped vireos (*Vireo atricapilla*). Some areas currently mapped as Native Invasive: Juniper Shrubland (generally mapped on deeper soils) may be more appropriately considered as part of this vegetation type. Land use history likely contributes to the extensive nature of this type (including the Native Invasive: Juniper Shrubland on the Edwards Plateau) on the landscape. The unpalatable nature of many of the evergreen shrubs in this vegetation type enhances their proliferation under heavy browsing. The majority of shrublands on the Edwards Plateau is mapped as this vegetation type.

Edwards Plateau: Shin Oak Shrubland (20)

Edwards Plateau Limestone Deciduous Shrubland and Shrub Motte

Identifier: CES303.041.8

Phase 1 Code: 20

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), *Pinus remota* (paper-shell pinyon), *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), *Forestiera pubescens* (elbowbush), *Forestiera reticulata* (netleaf forestiera), *Rhus lanceolata* (prairie sumac), *Rhus trilobata* (skunkbush sumac), *Ungnadia speciosa* (Mexican buckeye), and/or *Mimosa borealis* (fragrant mimosa) may be significant components. Where these shrublands are patchy, they may represent appropriate habitat for black-capped vireos (*Vireo atricapilla*).

Edwards Plateau: Ashe Juniper / Live Oak Slope Shrubland (130)

Edwards Plateau Limestone Evergreen Slope Shrubland

Identifier: CES303.041.17

Phase 1 Code: 130

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 ecoclasses. *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 (129)

Edwards Plateau Limestone Deciduous Shrubland

Identifier: CES303.041.18 **Phase 1 Code:** 129

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.

Western Great Plains Sandhill Steppe

Identifier: CES303.671

Geology: Within the Phase 1 area, this system is apparently restricted to thick sandy deposits in the Seymour Formation (a Pleistocene formation formed from ancient channel deposits of the Clear Fork of the Brazos River).

Landform: On rolling to level uplands.

Soils: Within the Phase 1 area, this system is restricted to Deep Sand, Sand Hills or Sandy ecological site.

Description: Shrub cover may be variable, ranging from about 15 to 90% canopy cover. *Artemisia filifolia* (sand sage) or *Quercus havardii* (Havard's shin oak) may dominate or co-dominate the shrub layer, but *Prosopis glandulosa* (mesquite), *Rhus trilobata* (skunkbush sumac), or *Prunus angustifolia* (Chickasaw plum) may also be conspicuous. Shrub cover may sometimes be sufficient to greatly reduce the cover of herbaceous species in the understory. At some sites, shrub cover may be low and herbaceous cover is typically dominated by grass species such *Schizachyrium scoparium* (little bluestem) and *Sporobolus cryptandrus* (sand dropseed).

VEGETATION TYPE:

High Plains: Shinnery Shrubland (60)

Western Great Plains Sandhill Steppe

Identifier: CES303.671.8 **Phase 1 Code:** 60

Description: As described for the system.

Southern Great Plains Escarpment and Breaks Shrubland and Steppe

Identifier: CESXXX.XXX

Geology: May occur on various surfaces that are sufficiently resistant to erosion to form breaks or escarpments. This includes sedimentary deposits such as sandstones, limestones, or shales, or less frequently, igneous formations such as basalt.

Landform: Breaks and escarpments with slopes less than 20% as defined here, sometimes associated with canyons or drainages, but not necessarily. The system occupies slopes, but may continue over transitions to more level sites upslope and downslope.

Soils: May occur on various soils, as well as on sites where little soil development has occurred. Rough Breaks Ecological Sites are characteristic of this system, but other sites such as Rocky Hill and Gravelly Ecological Sites may also be occupied by this system.

Description: This system is closely related to, and may overlap with the previously described system **Southwestern Great Plains Canyon System (CES303.665)**, though the currently considered system is not confined strictly to canyons. The physiognomic character of occurrences ranges from sparsely vegetated to shrubland, to sparse woodland. Bare ground is often conspicuous and herbaceous cover is usually dominated by mid- to shortgrasses such as *Aristida purpurea* (purple threeawn), *Bouteloua curtipendula* (sideoats grama), *B. gracilis* (blue grama), *B. hirsuta* (hairy grama), and *Schizachyrium scoparium* (little bluestem). Forbs, including species such as *Artemisia ludoviciana* (western mugwort), *Calylophus* sp. (sundrops), *Chaetopappa ericoides* (heath least-daisy), *Krameria lanceolata* (trailing ratany), and *Melampodium leucanthum* (plains blackfoot), may also be present. Shrub canopy may be dense, with some species reaching tree stature, and on some sites forming sparse woodland. Shrub and tree species include *Juniperus pinchotii* (redberry juniper), *Juniperus ashei* (Ashe juniper), *Quercus mohriana* (Mohr's shin oak), *Rhus trilobata* (skunkbush sumac), *Dalea formosa* (feather dalea), *Cercocarpus montanus* (true mountain mahogany), *Prosopis glandulosa* (mesquite), and *Gutierrezia sarothrae* (broom snakeweed).

VEGETATION TYPE:

Rolling Plains: Breaks and Canyon Deciduous Shrubland (71)

Southern Great Plains Escarpment and Breaks Deciduous Shrubland Steppe

Identifier: Currently undescribed **Phase 1 Code:** 71

Description: As described for the system.

Rolling Plains: Breaks and Canyon Evergreen Shrubland (2105)

Southern Great Plains Escarpment and Breaks Evergreen Shrubland Steppe

Identifier: Currently undescribed **Phase 1 Code:** 2105

Description: As described for the system, but shrub cover with significant amounts of evergreen species such as *Juniperus ashei* (Ashe juniper), *Juniperus pinchotii* (redberry juniper), or *Quercus mohriana* (Mohr's shin oak).

Herbaceous Vegetation

West Gulf Coastal Plain Herbaceous Seepage Bog (not mapped)

Identifier: CES203.194

Geology: Often associated with Eocene sand formations such as Queen City, Sparta, and particularly Carrizo Sands.

Landform: Generally found on slopes, as well as on valley floors and toe slopes where seepage from upslope occurs through the deep sands on site. In Phase 1, this system is found from Guadalupe County, northeast to Burleson and Milam counties.

Soils: Deep Sand, Very Deep Sand, or Wet Sandy Draw Ecological Sites are typical of this system and surrounding areas.

Description: This small patch system typically presents as an herbaceous wetland, though sometimes significant shrub cover by *Morella cerifera* (waxmyrtle) may be conspicuous. The herbaceous layer is dominated by a dense, species-rich, graminoid-forb layer less than 1 m tall with continuous to nearly continuous cover, typically 80-90%. Seepage results from the percolation of water through a porous sand layer until it encounters a more impermeable layer and flows to the surface. Grass species present may include species such as *Andropogon glomeratus* (bushy bluestem), *Dichanthelium scoparium* (velvet panicum), *Panicum anceps* (beaked panicum), *Panicum brachyanthum* (prairie panicgrass), *Panicum virgatum* (switchgrass), *Paspalum laeve* (field paspalum), *Saccharum giganteum* (sugarcane plumegrass), and *Steinchisma hians* (gaping panicum) [= *Panicum hians*]. Sedges and rushes are well-represented and may include *Cyperus strigosus* (strawcolored nutgrass), *Eleocharis acicularis* (needle spikerush), *Fuirena squarrosa* (hairy umbrellasedge), *Juncus dichotomus* (forked rush), *Juncus diffusissimus* (slimpod rush), *Juncus effusus* (common rush), and *Rhynchospora* spp. (beakrushes, including *R. gracilentia*, *R. oligantha*, and/or *R. rariflora*). A diverse forb assemblage is typically present, and may include *Eryngium integrifolium* (simpleleaf eryngo), *Eupatorium perfoliatum* (common boneset), *Habenaria repens* (waterspider false reinorchid), *Hypericum mutilum* (dwarf St. John's-wort), *Ludwigia alternifolia* (bushy seedbox), *Lycopodiella* spp. (clubmoss), *Osmunda cinnamomea* (cinnamon fern), *Osmunda regalis* (royal fern), *Pogonia ophioglossoides* (rose pogonia) in the eastern part of the region, *Polygala cruciata* (drumheads), *Rhexia mariana* (Maryland meadowbeauty), *Sarracenia alata* (pitcherplant), *Symphotrichum dumosum* var. *dumosum* (bushy aster), *Woodwardia* spp. (chainfern), and/or *Xyris* spp. (yellow-eyed grass, *X. ambigua*, *X. baldwiniana*, *X. difformis*, *X. jupicai*, *X. laxifolia*, and/or *X. torta*). Seeps may feed downslope depressional wetlands which may be overtaken by shrub species such as *Morella cerifera* (waxmyrtle), or may be dominated by *Eleocharis* spp. (spikerush), *Juncus* spp. (rush), *Panicum hemitomom* (maidencane), and/or *Rhynchospora* spp. (beakrush). Species diversity of this system declines towards the west, with occurrences within Phase I constituting relatively depauperate representatives. The bogs of the East-Central Texas Plains Post Oak Savanna, commonly referred to as "muck bogs," differ from similar bogs within the West Gulf Coastal Plain by a decrease in species richness towards the west.

East-Central Texas Plains Xeric Sandylands

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 an 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), *Cnidioscolus texanus* (bullnettle), *Cyperus grayoides* (Illinois flatsedge) in the northeastern part of the region, *Dichanthelium* spp. (rosette grass), *Froelichia floridana* (Florida snakecotton), *Hymenopappus artemisiifolius* (woolly-white), *Lechea* spp. (pinweed), *Opuntia humifusa* (eastern pricklypear), *Polanisia erosa* (large clammyweed), *Schizachyrium scoparium* (little bluestem), *Selaginella arenicola* ssp. *riddellii* (sand spikemoss), *Stylisma pickeringii* (bigpod bonamia), *Triplasis purpurea* (purple sandgrass), and *Yucca louisianensis* (Gulf Coast yucca).

VEGETATION TYPES:

Post Oak Savanna: Sandylands Woodland and Shrubland (13)

East-central Texas Plains Xeric Sandyland Woodland and Shrubland

Identifier: CES205.897.6

Phase 1 Code: 13

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: Sandylands Grassland (135)

East-central Texas Plains Xeric Sandyland Herbaceous Vegetation

Identifier: CES205.897.9

Phase 1 Code: 135

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.

Southern Blackland Tallgrass Prairie

Identifier: CES205.684

Geology: Cretaceous shales, marls and limestones, such as those of the Eagle Ford, Austin, Taylor, and Navarro groups. Also, Miocene formations (Fleming, Oakville Sandstone, and Cook Mountain formations) underlie the southern outlier of Blackland prairie recognized as the Fayette Prairie. Eocene Cook Mountain formation underlies the San Antonio Prairie.

Landform: Flat to gently rolling, with the most significant ridges associated with the harder Austin Chalk formation.

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. Soils derived from certain Miocene formations may be slightly acid.

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. Lowland sites and swales are often dominated by *Tripsacum dactyloides* (eastern gamagrass) and *Panicum virgatum* (switchgrass). A relatively unique type occurring on low pH Alfisols is dominated by *Sporobolus silveanus* (Silveus' dropseed), *Carex meadii* (Mead's sedge), and *Fimbristylis puberula* (hairy fimbry).

Several groups of communities are sufficiently unique to recommend including descriptions of them. Southern Blackland Alfisol Tallgrass Prairies occur on Alfisols at the northern and eastern edges of the Blackland Prairie region. These sites are typically more species-rich than other occurrences of the system. Multiple communities at the association level have been defined for this type including: *Schizachyrium scoparium* (little bluestem) – *Sorghastrum nutans* (yellow Indiangrass) prairies with various associated graminoids and forbs, varying with soil type and landscape position; *Tripsacum dactyloides* (eastern gamagrass) dominated prairies, often with a number of co-dominant forbs and grasses; and, *Sporobolus silveanus* (Silveus' dropseed) – *Carex meadii* (Mead's sedge) – *Tridens strictus* (longspike tridens) prairies associated with low pH Alfisols, known from Fannin, Lamar, and Grayson counties. The more typical communities of the system are Vertisol tallgrass prairies. There are also *Tripsacum dactyloides* (eastern gamagrass) – *Panicum virgatum* (switchgrass) dominated prairies on lowlands, like those that occur at Knight Prairie and Mill Creek Bottom.

VEGETATION TYPE:

Blackland Prairie: Disturbance or Tame Grassland (55)

Texas Blackland Tallgrass Prairie

Identifier: CES205.684.9

Phase 1 Code: 55

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* (Bermuda grass), *Sorghum*

halepense (Johnson grass), and *Bothriochloa ischaemum* var. *songarica* (King Ranch bluestem) are frequently encountered. Mesquite (*Prosopis glandulosa*) is often present and may be fairly dense. 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).

Southeastern Great Plains Tallgrass Prairie

Identifier: CES205.685

Geology: Lower Cretaceous formations, including various limestones, sands (such as from the Paluxy and Antlers formations), and clays (such as from the Walnut formation).

Landform: In contrast to Blackland Prairie, surfaces are flat rather than undulating, and valley slopes are angular rather than rounded. The “cuesta” landforms with gentle slopes leading up to relatively abrupt escarpments are characteristic of this portion of the Southeastern Great Plains Tallgrass Prairie.

Soils: Soils of the Southeastern Great Plains Tallgrass Prairie in Texas differ from those of the Southern Blackland Prairie in being browner in color and containing more rock fragments, though much of the region occupied by this prairie is included in the Blackland Ecological Site. Clay Loam, Sandy Loam, Shallow, and Claypan Prairie are also significant Ecological Sites for this system. Soils of this area are more frequently characterized as Mollisols, as opposed to the Vertisols more characteristic of the Blackland Prairie. Calcareous clays are commonly encountered.

Description: *Schizachyrium scoparium* (little bluestem) tends to dominate sites of this system, with *Bouteloua curtipendula* (sideoats grama) as another significant component. Other grasses that are frequently present include *Nassella leucotricha* (Texas wintergrass), *Bothriochloa laguroides* ssp. *torreyana* (silver bluestem), *Aristida* spp. (threeawn), *Andropogon gerardii* (big bluestem), *Buchloe dactyloides* (buffalograss), *Sporobolus compositus* (tall dropseed), *Bouteloua hirsuta* (hairy grama), *Sorghastrum nutans* (Indiangrass), *Muhlenbergia reverchonii* (seep muhly), *Chloris verticillata* (tumble windmillgrass), and *Erioneuron pilosum* (hairy tridens). Forbs species such as *Symphotrichum ericoides* (heath aster), *Ambrosia psilostachya* (western ragweed), *Tragia ramosa* (catnip noseburn), *Amphiachyris dracunculoides* (common broomweed), *Dyschoriste linearis* (narrowleaf dyschoriste), *Salvia texana* (Texas sage), *Oenothera* spp. (evening primrose), *Stenaria nigricans* var. *nigricans* (prairie bluets), *Lindheimera texana* (Texas star), *Thelesperma* spp. (greenthread), *Dalea* spp. (prairie clover), and *Psoralidium* spp. (scurfpea) may be encountered. Occurrences often contain and are sometimes dominated by the non-native grass *Bothriochloa ischaemum* var. *songarica* (King Ranch bluestem) and/or *Cynodon dactylon* (Bermuda grass). Significant areas of this system remain within the Grand Prairie of Texas.

VEGETATION TYPE:

Grand Prairie: Tallgrass Prairie (10)

Southeastern Great Plains Tallgrass Prairie

Identifier: CES205.685.9

Phase 1 Code: 10

Description: As described for the system.

Central Mixedgrass Prairie

Identifier: CES303.659

Geology: Typical of Pennsylvanian formations of the Red Rolling Plains.

Landform: Gently rolling uplands.

Soils: Generally on loams and clay loams. Often on Ecological Sites such as Clay Slopes, Loamy Prairie, Clayey Upland, Claypan Prairie, Sandy Loam, and Clay Loam.

Description: Central Mixedgrass Prairie represents the common prairie type in the western portions of Phase I. This prairie often has *Schizachyrium scoparium* (little bluestem) as a dominant, with *Bouteloua curtipendula* (sideoats grama), *Bouteloua hirsuta* (hairy grama), *Bouteloua gracilis* (blue grama), *Buchloe dactyloides* (buffalograss), *Andropogon gerardii* (big bluestem), *Pascopyrum smithii* (western wheatgrass), and *Nassella leucotricha* (Texas wintergrass) also commonly encountered. Grazing tends to favor shortgrass species such as *Buchloe dactyloides* (buffalograss) and *Bouteloua gracilis* (blue grama). This system is frequently invaded by juniper (primarily *Juniperus pinchotii* (redberry juniper)) and *Prosopis glandulosa* (mesquite).

VEGETATION TYPE:

Rolling Plains: Mixedgrass Prairie (33)

Central Mixed Grass Prairie

Identifier: CES303.659.9

Phase 1 Code: 33

Description: As described for system.

Chihuahuan – Sonoran Desert Bottomland and Swale Grassland (Tobosa Swales)

Identifier: CES302.746

Geology: Typically on Quaternary alluvium, but may be local in nature and mapped within various geological formations.

Landform: Generally found on local topographic lows that may be associated with a drainage or may occur as basins or swales.

Soils: Found on tight soils, typically Clay Flat Ecological Sites.

Description: This system is named based on the regions (Chihuahuan and Sonoran Deserts) where it is best developed and occupies significant areas, however it does occur well outside these regions, at least as far north and east as the Rolling Plains of Texas. The system typically occurs in local topographic lows that may be associated with drainages, or may represent swales or basins, but typically receives run-off from the surrounding landscape. Soils are generally clayey, and in some cases the shrink-swell characteristics of the soil may limit the development of woody species. *Pleuraphis mutica* (tobosa) is generally the clear dominant, though other species such as *Panicum obtusum* (vine-mesquite), *Sporobolus airoides* (alkali sacaton), and *Pascopyrum smithii* (western wheatgrass) may be present. *Prosopis glandulosa* (mesquite) may

be present, and in some cases may develop into a significant canopy. The system probably occupies the Clay Flat Ecological Site within Phase 1.

VEGETATION TYPE:

Southwest: Tobosa Grassland (62)

Chihuahuan – Sonoran Desert Bottomland and Swale Grassland (Tobosa Swales)

Identifier: CES302.746.9 **Phase 1 Code:** 62

Description: As described for system.

Western Great Plains Shortgrass Prairie

Identifier: CES303.672

Geology: This widespread system occurs on various geologic formations, but is limited in Phase 1 to the western portions.

Landform: Often on level to gently rolling uplands.

Soils: Within Phase 1, this system occurs on Rough Breaks, Shallow Clay, Very Shallow, and Very Shallow Clay Ecological Sites.

Description: This system is better developed and more widespread to the north and west of Phase 1, and occurs sporadically on the western edge of Phase 1. *Buchloe dactyloides* (buffalograss) and *Bouteloua gracilis* (blue grama) are common dominants. Other species that may be present include *Aristida purpurea* (purple threeawn), *Bouteloua curtipendula* (sideoats grama), *B. hirsuta* (hairy grama), *B. rigidisetata* (Texas grama), *Erioneuron pilosum* (fluffgrass), *Hilaria belangeri* (curlymesquite), and *Pascopyrum smithii* (western wheatgrass). Shrub cover is generally low, but may include species such as *Acacia greggii* (catclaw), *Rhus microphylla* (littleleaf sumac), *Rhus trilobata* (skunkbush sumac), *Dalea formosa* (feather dalea), *Mahonia trifoliolata* (agarito), *Juniperus* sp. (juniper), and *Prosopis glandulosa* (mesquite). Forbs such as *Calylophus* sp. (sundrops), *Melampodium leucanthum* (plains blackfoot), *Krameria lanceolata* (trailing ratany), and others are often present. *Gutierrezia sarothrae* (broom snakeweed) may be present with significant cover, especially on sites with intense and continuous grazing. In this, the southeastern most expression of the system, it tends to occur on sites with soils providing relatively dry conditions such as Shallow Clay, Very Shallow, and Very Shallow Clay Ecological Sites.

VEGETATION TYPE:

High Plains: Shortgrass Prairie (64)

Western Great Plains Shortgrass Prairie

Identifier: CES303.672.9 **Phase 1 Code:** 64

Description: As described for system.

Sparse Vegetation

Edwards Plateau Carbonate Glades and Barrens (not mapped)

Identifier: CES303.655

Geology: Non-slope forming members of the Glen Rose formation, or areas of massive limestones such as Edwards Limestone.

Landform: Usually level to gently sloping uplands on plateau tops, or level benches between slopes in stair step topography.

Soils: Very shallow soils, sometimes very little soil development over rocky substrates.

Description: These are generally small patch occurrences with very sparse herbaceous cover, sometimes with occasional scattered shrubs. These sites generally co-occur with savannas, representing the shallowest soils sites, often on exposed or near-exposed limestone. They may occur as bands with adjacent grasslands, shrublands, or open woodlands. Herbaceous cover may include species such as *Chaetopappa bellidifolia* (hairy lestdaisy), *Evax prolifera* (rabbit's tobacco), *Croton monanthogynus* (prairie-tea), *Sedum nuttallianum* (yellow stonecrop), *Sedum pulchellum* (widowscross), *Sporobolus vaginiflorus* (poverty dropseed), *Centaurium texense* (Texas centaury), *Spermolepis inermis* (spreading scaleseed), *Chamaesyce serpens* (matted sandmat), *Heliotropium tenellum* (pasture heliotrope), *Lesquerella* spp. (bladderpod), and others.

A possible outlier (the system occurring well outside the ecoregion within which it is normally found) of this system consists of small patch occurrences of very sparse herbaceous cover found on very shallow soils over chalk outcrops in isolated locales of North Texas (Gober, Annona, Austin Chalk and Pecan Gap formation). Species include *Bouteloua rigidiseta* (Texas grama), *Sedum pulchellum* (Texas sedum), *Sporobolus vaginiflorus* (poverty dropseed), *Nostoc commune* (nostoc), *Penstemon cobaea* (white beardtongue), and *Lesquerella* spp. (bladderpod). Adjacent woodlands or savannas on thin-soiled chalk ridges may contain *Quercus shumardii* (Shumard oak), *Quercus muehlenbergii* (chinkapin oak), *Celtis* sp. (hackberry), *Cornus drummondii* (roughleaf dogweed), *Viburnum rufidulum* (rusty blackhaw), *Fraxinus texensis* (Texas ash), and others.

Edwards Plateau Cliff

Identifier: CES303.653

Geology: Hard-bedded limestones.

Landform: Vertical or near vertical rock faces, sometimes alternating with slope forming limestone members.

Soils: Little to no soil development. Some soil accumulating on ledges and in crevices.

Description: Some of these sites may be mesic, accumulating moisture from nearby slopes in crevices within the limestone substrate, and seeps may be present. They often occur as long narrow bands. Composition and cover on these cliff faces is a function of aspect, canopy cover provided by surrounding systems, local climate, and moisture available from the underlying

geologic formation. Seeps and mesic sites may have fairly dense cover of *Adiantum capillus-veneris* (maiden-hair fern) with patches of *Thelypteris ovata* var. *lindheimeri* (Lindheimer's maidenhair) present. More xeric sites often have significant shrub cover, with species such as *Buddleja racemosa* (Texas butterflybush), *Ungnadia speciosa* (Mexican buckeye), *Diospyros texana* (Texas persimmon), *Ageratina havanensis* (shrubby boneset), *Garrya ovata* ssp. *lindheimeri* (Lindheimer's silktassel), *Bernardia myricifolia* (southwest bernardia), *Philadelphus* spp. (mock-orange), *Styrax* spp. (snowbell), and *Toxicodendron radicans* ssp. *eximium* (poison ivy). Herbaceous species that may be present include *Salvia roemeriana* (cedar sage), *Penstemon baccharifolius* (baccharisleaf beardtongue), *Schoenus nigricans* (black sedge), *Chaetopappa bellidifolia* (least daisy), *Perityle* spp. (rockdaisy), and ferns in the genera *Asplenium*, *Astrolepis*, *Cheilanthes*, and *Pellaea*. Sparse grasses including *Bouteloua hirsuta* (hairy grama), *Bouteloua rigidiseta* (Texas grama), and *Aristida oligantha* (oldfield threawn) may be present. These cliffs often serve as refugia from herbivores.

VEGETATION TYPES:

Edwards Plateau: Wooded Cliff / Bluff (27)

Edwards Plateau Wooded Cliff / Bluff

Identifier: CES303.654

Phase 1 Code: 27

Description: Same as system description.

Edwards Plateau: Barren or Grassy Cliff / Bluff (175)

Edwards Plateau Barren or Grassy Cliff / Bluff

Identifier: CES303.654.0

Phase 1 Code: 175

Description: This vegetation type generally lacks significant vegetative cover due to the limited potential for soil development on such steep surfaces. These cliffs or bluffs may have development of some lichen and patchy grass clumps in limited areas where soil can remain stable. Sparse shrubs and herbaceous cover (with species suggested in the system description) may be present.

Southeastern Great Plains Cliff

Identifier: ZZZ.ZZZ

Geology: Often associated with steep bluffs forming along riparian corridors. The geology typically consists of Pennsylvanian and Cretaceous sandstones and Cretaceous limestones.

Landform: Steep cliffs and bluffs (slope greater than 100%) generally found along drainages, particularly the Brazos River and its tributaries.

Soils: Sandstone Hill, Steep Adobe, Steep Rocky are typical ecoclasses associated with this system.

Description: This system can express itself as wooded or sparsely vegetated. When wooded, the system likely resembles the surrounding Crosstimbers slope forests. The overstory may be dominated entirely by deciduous hardwoods, or be dominated by *Juniperus ashei* (Ashe juniper) or *Juniperus virginiana* (eastern redcedar), or have canopy with a mixture of deciduous and evergreen components.

VEGETATION TYPES:

Central Texas: Wooded Cliff / Bluff (178)

Southeastern Great Plains Wooded Cliff or Bluff

Identifier: ZZZ.ZZZ.6

Phase 1 Code: 178

Description: Cliffs or bluffs with significant overstory canopy resembling that of surrounding slope forest.

Central Texas: Barren or Grassy Cliff/Bluff (179)

Southeastern Great Plains Barren or Grassy Cliff or Bluff

Identifier: ZZZ.ZZZ.9

Phase 1 Code: 179

Description: Cliffs or bluffs lacking a woody overstory. These bluffs are typically so steep as to preclude the development of significant soils, making the herbaceous layer patchy or lacking. The majority of this system in Phase 1 is mapped as this vegetation type.

Agricultural and other Human-related Mapped Types

Rowcrops

Phase 1 Code: 39

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 are generally mapped as grassland.

Grass Farm

Phase 1 Code: 41

Description: Most areas mapped as this type in Phase 1 are dominated by *Cynodon dactylon* (Bermuda grass) and consist of golf course fairways and greens that are fertilized and irrigated. This type also includes a few areas of highly productive grassland on or near floodplains.

Urban High Intensity

Phase 1 Code: 101

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

Urban Low Intensity

Phase 1 Code: 102

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

Mainly Natural Azonal Mapped Types

Azonal types are those types that are widespread and not particularly characteristic of any region or naturally occurring vegetation type. This may be due to disturbance, where wide ranging species adapted to disturbed conditions predominate. In other areas, land management may have resulted in invasion of widespread species such as juniper or mesquite. Azonal types may also be used to refer to general physiognomic types that are not ascribable to particular naturally occurring systems.

Native Invasive: Deciduous Woodland

Phase 1 Code: 44

Description: This broadly-defined type often has *Celtis laevigata* (sugar hackberry), *Ulmus crassifolia* (cedar elm), or *Prosopis glandulosa* (mesquite) among the dominants, and *Quercus stellata* (post oak) or *Quercus fusiformis* (plateau live oak) may be important. *Juniperus virginiana* (eastern redcedar) or *Juniperus ashei* (Ashe juniper) may also be present.

Native Invasive: Juniper Woodland

Phase 1 Code: 45

Description: The majority of this mapped type is similar to Edwards Plateau: Ashe Juniper Motte and Woodland mapped vegetation type, with *Juniperus ashei* (Ashe juniper) and *Quercus fusiformis* (plateau live oak) the most common dominants. In the southern Post Oak Savanna, *Juniperus virginiana* (eastern redcedar) or sometimes *Pinus taeda* (loblolly pine) is the primary dominant, with *Quercus stellata* (post oak) and *Ulmus crassifolia* (cedar elm) common components. In the northern portion of the Blackland region, *Juniperus virginiana* (eastern redcedar) is the common dominant. In some of the western portions of Phase 1, *Juniperus pinchotii* (redberry juniper) may dominate.

Native Invasive: Juniper Shrubland

Phase 1 Code: 111

Description: Various species of *Juniperus* (juniper) dominate these shrublands. *Juniperus virginiana* (eastern redcedar) is the primary dominant of these shrublands or low woodlands in the Blackland Prairie, Post Oak Savanna, and far northern Crosstimbers ecoregions. To the west, on the Rolling Plains, *Juniperus pinchotii* (redberry juniper) may be the dominant. In other areas, *Juniperus ashei* (Ashe juniper) may dominate these shrublands.

Native Invasive: Mesquite Shrubland

Phase 1 Code: 46

Description: *Prosopis glandulosa* (mesquite) is often the dominant species of this broadly-defined type, but it may occur as a variety of open woodlands to dense shrublands with a variety of other species such as *Quercus fusiformis* (plateau live oak), *Juniperus ashei* (Ashe juniper), *Celtis* spp. (hackberries), *Ulmus crassifolia* (cedar elm), *Ziziphus obtusifolia* (lotebush), *Diospyros texana* (Texas persimmon), and *Mahonia trifoliolata* (agarito). Some areas of other deciduous shrubs, such as *Quercus sinuata* var. *breviloba* (white shin oak) and *Rhus lanceolata* (prairie sumac) may be mapped as this type.

Open Water

Phase 1 Code: 100

Description: Most open water in Phase 1 consists of reservoirs or large ponds, although large rivers, including the Colorado and Brazos, are also mapped as open water.

Marsh

Phase 1 Code: 57

Description: Areas mapped as marsh are small, and consist of wet or alternately wet and dry soils with herbaceous vegetation.

Swamp

Phase 1 Code: 105

Description: Areas mapped as swamp in Phase 1 are typically forested wet or alternately wet and dry soils at the upper ends of reservoirs in the northern part of Phase 1. A variety of species, including *Taxodium distichum* (baldcypress), *Ulmus americana* (American elm), *Ulmus crassifolia* (cedar elm), *Salix nigra* (black willow), and *Quercus macrocarpa* (bur oak) may be present.

Barren

Phase 1 Code: 107

Description: This type includes areas where little or no vegetative cover existed at the time of image data collection. Large areas cleared for development are included, as well as rural roads and buildings and associated clearing in primarily rural areas. Stream beds with exposed gravel or bedrock, rock outcrops, and year-round fallow fields are also included.