Field Key to Ecological Systems of LANDFIRE Map Zones 36

NatureServe
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Introduction

The following keys to NatureServe ecological systems were developed relying on keys developed for surrounding map zones, specifically map zones 26, 32, 35, and 37 (Figure 1). The keys cover the areas found in MRLC & LANDFIRE map zone 36. The distribution of many systems can be most accurately described using EPA Level IV ecoregions, and a map of these ecoregions relative to map zone 36 is provided in Figure 1. The systems included in these keys are intended to represent the legend that LANDFIRE will be striving to map for existing vegetation in the United States. Some types are in the keys that characteristically occur at small spatial scales (generally < 2 ha in size) and hence may not be mappable by the LANDFIRE project. However, we have chosen to be inclusive in the keys, so that the user will have information on these system types for comparison purposes. In some cases they may be important for modeling fire condition class and, given their relative distinctiveness on the landscape, they may indeed be mappable.

This key is for ecological systems that occur in the Southern Texas Plains and the southern parts of the Western Gulf Coastal Plain, Texas Blackland Prairies, and Eastern-Central Texas Plains. Peripheral ecological systems common in adjacent map zones are included in the keys to facilitate inclusiveness.

Plant names are almost always in Latin and follow the nomenclature of Kartesz (1999). In limited cases, we have included synonyms for some taxa.

The keys are "dichotomous," which means the user follows the order of the 'couplets' and makes a choice between the 2 options represented in the couplet. The ordering of the couplets in each key does matter, and the user should choose the option in each couplet that best fits the data or field situation. A choice leads the user to the next couplet to be utilized in the keying process, via a number at the far right, or else leads to a final result (an ecological system type). If the choice the user makes leads to a "result," then an Ecological System or one of the aggregates is named. An aggregate can be distinguished from an Ecological System by having a name that ends in "Systems."

All keys follow the same logic. The first key directs the user to major keying groups (Key A: wooded wetlands, Key B: wooded uplands, etc.). Within these keying groups, users will be able to follow the keys directly to a system or aggregate.

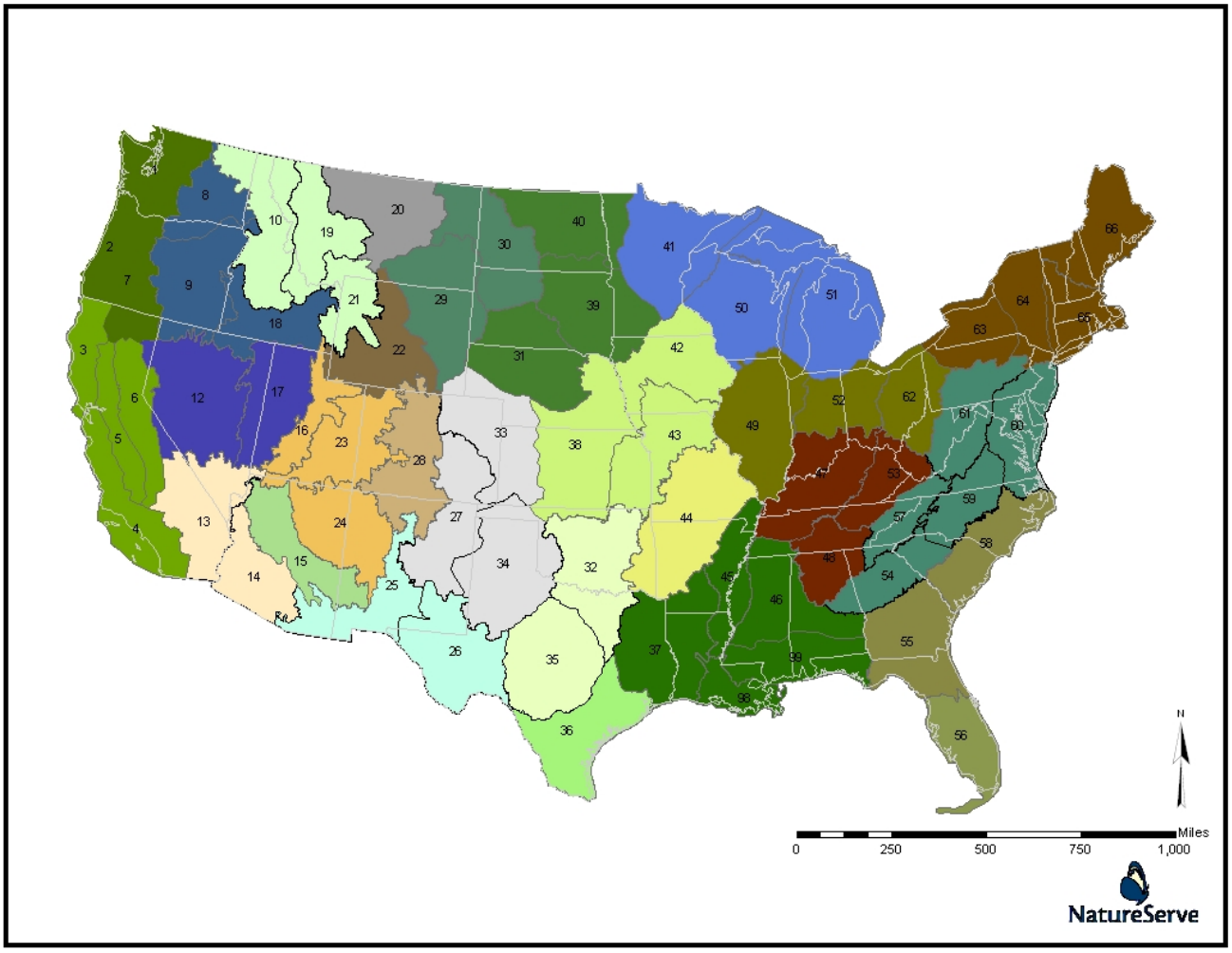

Figure 1. LANDFIRE map zone clusters with keys to ecological systems and selected alliances.

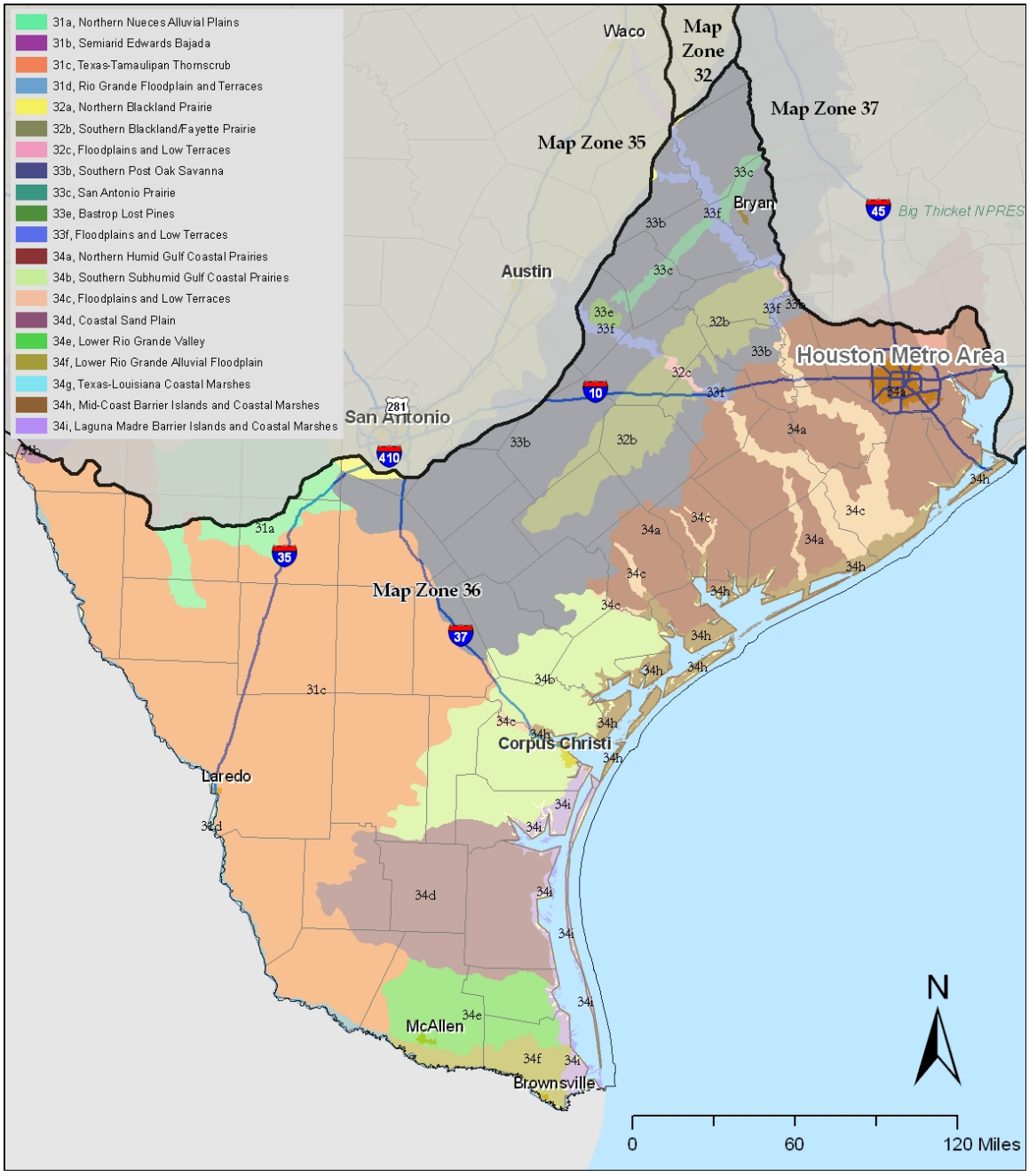

Figure 2. LANDFIRE map zone 36 in context of adjacent map zones, with EPA Level IV ecoregions identified (see http://www.epa.gov/wed/pages/ecoregions/tx_eco.htm for more details). This map zones falls entirely within Texas.

Keys are generally based on dominance within vegetation strata, with tree cover generally considered first, then that of shrubs, then the herbaceous component. Co-dominant species within a given strata are important as well, in some cases a system type will have 2 or more co-

dominant species, which may or may not be present in all stands. Some ecological system types will have a variable physiognomy; where appropriate these variable systems have been placed into the keys in several places (i.e., some grassland systems have a "savanna" physiognomy, especially when disturbed, and hence will be in the key both as wooded and herbaceous).

Some terminology is commonly employed throughout the keys that distinguish general spatial characteristics of the vegetation or environmental setting. For example 'matrix' types of vegetation are dominant across the majority of a given landscape, while 'large patch' types tend to occur as distinctive patches within the larger 'matrix.'

In the next section of the document we have provided a table showing the LANDFIRE legend units that represent non-natural vegetation and a short description for each of them. They are usually not incorporated into the keys, since they are typically recognizable without the use of a key, or else their floristic composition is so variable as to be not useful in a field key. Our primary purpose was to provide keys for the natural and near-natural vegetation of these zones.

Land Use, Unvegetated, Semi-natural and Altered Vegetation

LAND USE OR UNVEGETATED SURFACES	
Open Water	Open water
Developed	Generally developed lands.
Developed, Open Space	Vegetation (primarily grasses) planted in developed settings for recreation, erosion control, or aesthetic purposes. Impervious surfaces account for less than 20% of total cover. Examples include parks, lawns, golf courses, airport grasses, and industrial site grasses.
Developed, Low Intensity	Includes areas with a mixture of constructed materials and vegetation. Impervious surfaces account for 20-50% of total cover. These areas most commonly include single-family housing units.
Developed, Medium Intensity	Includes areas with a mixture of constructed materials and vegetation. Impervious surfaces account for 50-80% of the total cover. These areas most commonly include single-family housing units
Developed, High Intensity	Includes highly developed areas where people reside in high numbers. Examples include apartment complexes, row houses and commercial/industrial. Impervious surfaces account for 80 to100% of the total cover.
Agriculture	Generally developed for agricultural uses.
Pasture/Hay	These agriculture lands typically have perennial herbaceous cover (e.g. regularly-shaped plantings) used for livestock grazing or the production of hay. There are obvious signs of management such as irrigation and haying that distinguish it from natural grasslands. Identified CRP lands may be included in this land cover type.
Cultivated Crops and Irrigated Agriculture	These areas are used for the production of crops, such as corn, soybeans, small grains, sunflowers, vegetables, and cotton, typically on an annual cycle. Agricultural plant cover is variable depending on season and type of farming.
Managed Tree Plantation	These areas are used for production of products from tree crops, including fruits, nuts, and wood. This includes orchards and plantations.
SEMI-NATURAL / ALTERED VEGETATION	
Ruderal Vegetation	Vegetation resulting from succession following significant anthropogenic disturbance of an area. It is generally characterized by unnatural combinations of species (primarily native species, though they often contain slight or substantial numbers and amounts of species alien to the region as well).
Ruderal Upland - Old Field	Within this map zone, *Juniperus virginiana, Prosopis glandulosa,* or *Acacia farnesiana* may form conspicuous woody cover.
Ruderal Upland - Abandoned Tree Plantation	

Ruderal Wetland	
Introduced Vegetation	Vegetation dominated by introduced species. These are spontaneous, self-perpetuating, and not (immediately) the result of planting, cultivation, or human maintenance. Land occupied by introduced vegetation is generally permanently altered (converted) unless restoration efforts are undertaken.
Introduced Upland Vegetation - Treed	Land cover is significantly altered/disturbed by introduced tree species such as *Triadica sebifera*, *Leucaena leucocephala*, *Tamarix* sp., or others.
Introduced Upland Vegetation - Shrub	Land cover is significantly altered/disturbed by introduced woody species such as *Rosa bracteata, Rosa multiflora*, or others.
Introduced Upland Vegetation - Annual and Biennial Forbland	Land cover is significantly altered or disturbed and dominated by introduced annual and biennial forbs. Natural vegetation types are no longer recognizable. Typical species that dominate these areas include *Carduus* spp*., Centaurea melitensis, Cirsium vulgare, Daucus carota, Descurainia sophia, Erodium cicutarium, Medicago* spp., annual *Melilotus* spp., *Salsola tragus, Stellaria media, Tribulus terrestris, Trifolium repens* and *Verbascum thapsus.*
Introduced Upland Vegetation - Annual Grassland	Land cover is significantly altered or disturbed and dominated by introduced annual grasses. Natural vegetation types are no longer recognizable. Typical species include *Bromus arvensis, B. catharticus, B. tectorum,* and *Eragrostis cilianensis.*
Introduced Upland Vegetation - Perennial Grassland and Forbland	Land cover is significantly altered/disturbed by introduced, non-native perennial grasses and forbs. Natural vegetation types are no longer recognizable. Grass species include *Bothriochloa ischaemum* var. *songarica, Cynodon dactylon, Dichanthium* sp., *Eragrostis lehmanniana, Melinis repens, Panicum coloratum, Paspalum dilatatum, Pennisetum ciliare,* and *Schedonorus phoenix* [=*Festuca arundinacea*]. Forbs may include: *Lespedeza cuneata, Lepidium* spp*.,* perennial *Melilotus* spp., etc*.*
Introduced Riparian Vegetation	Land cover is altered/disturbed and dominated by introduced woody vegetation including species such as *Melia azedarach, Tamarix* spp., *Triadica sebifera,* etc.
Introduced Wetland Vegetation	Land cover is altered/disturbed and dominated by introduced wetland vegetation. Species may include *Arundo donax, Echinochloa crus-galli, Eichhornia crassipes, Paspalum urvillei,* etc.
Modified/Managed Vegetation	Vegetation resulting from management or modification of natural/near natural; vegetation, but producing a structural and floristic combination not clearly known to have a natural analogue. Modified vegetation may be easily restorable by either management, restoration of ecological processes, and/or succession.
Modified/Managed Upland Vegetation	Land cover is apparently managed/modified and dominated by trees and/or shrubs. Vegetation is a mixture of herbaceous, shrub, and tree species.
Recently Burned Forest and Woodland	Land cover is apparently modified by recent fires which have burned forest and woodland vegetation. Vegetation is a mixture of herbaceous, shrub, and tree species.
Recently Burned Shrubland	Land cover is apparently modified by recent fires which have shrubland vegetation. Vegetation is a mixture of herbaceous and shrub species.
Recently Burned Grassland	Land cover is apparently modified by recent fires which have burned grassland vegetation. Vegetation is a mixture of herbaceous and shrub species.
Modified/Managed Wetland Vegetation	These areas include created and obviously managed wetlands of varying size resulting from water diversion. Artificial Wetlands will be mapped where obvious built structures may be distinguished from imagery.

Key to the Ecological Systems of LANDFIRE Map Zone 36 (Including Southern Texas Plains and the southern parts of the Western Gulf Coastal Plain, Texas Blackland Prairies, and Eastern-Central Texas Plains)

This key is intended for identifying Terrestrial Ecological Systems that are found in the EPA Level III ecoregions: Southern Texas Plains, the southern portions of the Western Gulf Coastal Plain, East-Central Texas Plains, and Texas Blackland Prairies. Several peripheral and small patch Ecological Systems were added to the key for comparison, although they may not be mapped by LANDFIRE.

Please note the following conventions used to designate the systems and alliances:

[a] **indicates** a broader LANDFIRE Map Unit (aggregate system group).

[b] **indicates a** typically small patch ecological system type not being mapped by LANDFIRE.

[c] **indicates** a type that is peripheral map zone 36 that would only occur in transition areas near boundaries of these map zones.

1a. Total canopy cover generally less than 10% and representing coastal areas of open beach, unvegetated dunes, or unconsolidated shoreline. ..... **Gulf and Atlantic Coastal Plain Sparsely Vegetated Systems[a]**

1b. Total canopy cover greater than 10%. **2**

2a. Total woody canopy cover is greater than or equal to 10% **3**

2b. Total woody canopy cover less than 10% **5**

3a. Forests, woodlands, and/or shrublands restricted to drainages, floodplains, riparian or semi-riparian flats, coastal marshes, saline basins, springs, or seeps ..... **KEY A: Riparian or Wetland Associated Forest, Woodland and Shrubland Systems**

3b. Forests, woodlands, and/or shrublands of upland sites **4**

4a. Upland forests and woodlands (generally >25% tree cover) OR upland savannas (10 to 25% cover of trees generally > 3m tall, and often >20% cover of perennial graminoids). ..... **KEY B: Upland Forest, Woodland and Savanna Systems**

4b. Upland shrublands, with shrub cover greater than 10%. ..... **KEY C: Upland Shrubland and Shrub-steppe Systems**

5a. Herbaceous vegetation of uplands..... **KEY D: Upland Herbaceous Systems**

5b. Herbaceous vegetation restricted to wetland sites associated with drainages, closed or open depressions, springs, seeps, lakes, ponds, or coastal marsh. **6**

6a. Herbaceous wetland occupying acidic seeps on deep sand sites. This system is usually dominated by graminoids such as *Andropogon glomeratus, Dichanthelium scoparium, Panicum anceps, Panicum brachyanthum, Panicum virgatum, Paspalum laeve, Saccharum giganteum, Steinchisma hians, Cyperus* spp., *Eleocharis* spp., *Juncus* spp., and/or *Rhynchospora* spp. Forbs are typically divers and may include *Eryngium integrifolium, Eupatorium perfoliatum, Habenaria repens, Hypericum mutilum, Ludwigia alternifolia, Lycopodiella* spp., *Osmunda* spp., *Pogonia ophioglossoides, Rhexia mariana, Sarracenia alata,* and *Xyris* spp. *Sphagnum* moss is often present. This small patch system can be found in Burleson, Milam, and Robertson counties, possibly as far south as Gonzales County within this map zone (EPA Level IV 33b). ..... **West Gulf Coastal Plain Herbaceous Seepage Bog[b]**

6b. Herbaceous wetland or marsh found on sites other than acidic seeps on deep sand sites and found south of Lee and Burleson Counties. **7**

7a. Herbaceous wetland of interdunal swales associated with coastal dunes..... **8**
7b. Herbaceous wetland on sites other than interdunal swales. **9**

8a. Interdunal swale wetlands from Kleberg County northward (EPA Level IV 34h). ....**Central and Upper Texas Coastal Dune and Coastal Grassland**
8b. Interdunal swale wetlands south of Kleberg County (EPA Level IV 34i). ....**South Texas Dune and Coastal Grassland**

9a. Herbaceous wetland occupying pond shores within a matrix of coastal prairie. Sedges and grasses such as *Cyperus haspan, Cyperus virens, Eleocharis quadrangulata, Fuirena squarrosa, Leersia hexandra, Steinchisma hians,* and *Rhynchospora* spp. are common dominants. Herbaceous forbs may include *Centella erecta, Ludwigia* spp., *Polygonum* spp., *Sagittaria* spp., *Symphyotrichum subulatum,* and *Xyris jupicai.* This system occupies coastal counties and counties adjacent to coastal counties from Kleberg County, north to Liberty County (EPA Level IV 34a &34b). ....**Texas-Louisiana Coastal Prairie Pondshore**[b]
9b. Coastal marsh, with species such as *Spartina alterniflora, Spartina patens, Juncus roemeriana, Monanthochloe littoralis, Distichlis spicata, Salicornia* spp., *Sarcocornia* spp., and/or *Suaeda linearis* dominating sites with higher salinity. More brackish sites may be dominated or co-dominated by species such as *Schoenoplectus* spp., *Sagittaria* spp., and *Eleocharis* spp., in addition to the above species. .....**Gulf and Atlantic Coastal Plain Tidal Marsh Systems**[a]

KEY A: Riparian or Wetland Associated Forest, Woodland and Shrubland Systems

(Woody cover >10% present and occurring on wetland or riparian sites)

1a. Shrubland occupying coastal saline sites and dominated or co-dominated by *Avicennia germinans, Borrichia frutescens, Batis maritima, Iva frutescens,* or *Prosopis reptans.* ....**Gulf and Atlantic Coastal Plain Tidal Marsh Systems**[a]

1b. Forest, woodland, or shrubland NOT occupying saline sites and NOT dominated or co-dominated by the above species..... **2**

2a. Shrubland associated with seeps on deep sands and dominated by *Ilex vomitoria* and/or *Morella cerifera*. This represents a shrub invaded occurrence of a typically small patch herbaceous system with a limited distribution within this map zone. This small patch system can be found in Burleson, Milam, and Robertson counties, possibly as far south as Gonzales County within this map zone (EPA Level IV33b). ..... **West Gulf Coastal Plain Herbaceous Seepage Bog**[b]

2b. Forest, woodland, or shrubland NOT associated with seeps on deep sands..... **3**

3a. Wooded wetland associated with acidic seeps or artesian water sources of limited distribution within this map zone. *Sphagnum* sp. may be present, and the shrub layer may have *Sabal minor, Ilex decidua, Ilex vomitoria, Morella cerifera, Aesculus pavia,* and *Sambucus canadensis* present. These are small patch occurrences occurring north and east of IH-37, and may be included within occurrences of Gulf and Atlantic Coastal Plain Small Stream Riparian Systems ((EPA Level IV33b). ....**West Gulf Coastal Plain Seepage Swamp and Baygall**[b, c]

3b. Forest, woodland or shrubland associated with streams or river..... **4**

4a. Forest or woodland associated with streams or rivers north and east of IH-37. Occurrences usually with one or more of the following species present in the canopy: *Acer negundo, Carya aquatica, Fraxinus americana, Fraxinus pennsylvanica, Gleditsia aquatica, Gleditsia triacanthos, Liquidambar styraciflua, Nyssa aquatica, Nyssa sylvatica, Quercus fusiformis, Quercus lyrata, Quercus macrocarpa, Quercus michauxii, Quercus nigra, Quercus phellos,* or *Quercus shumardii.* This system can be found within EPA Level III Ecoregions 32 (Texas Blackland Prairies), 33 (East Central Texas Plains), 34 (Western Gulf Coastal Plain), and 35 (South Central Plains). **5**

4b. Forest, woodland, or shrubland associated with streams and rivers lacking these tree species and located south and west of IH-37 within this map zone (EPA Level III 31 and Level IV 34e & 34f). **6**

5a. Forest, woodland, or shrubland associated with the Brazos, Colorado, Lavaca, Guadalupe, and San Antonio Rivers, where broad alluvial floodplains occur. ..... **Gulf and Atlantic Coastal Plain Floodplain Systems**[a]

5b. Forest, woodland, or shrubland associated with small, generally higher gradient segments of rivers and along smaller streams and creeks. ....**Gulf and Atlantic Coastal Plain Small Stream Riparian Systems**[a]

6a. Forest, woodland, or shrubland along the Rio Grande or the Nueces or Frio Rivers, associated with broad alluvial floodplains. Canopy species may include *Acacia farnesiana, Carya illinoinensis, Celtis laevigata, Ehretia anacua, Fraxinus berlandieriana, Prosopis glandulosa, Quercus fusiformis, Sapindus saponaria, Taxodium mucronatum,* or *Ulmus crassifolia.*..... ..... **Tamaulipan Floodplain**

6b. Forest, woodland or shrubland associated with smaller drainages (creeks and streams, sometimes intermittent). Canopy dominants may include *Acacia farnesiana, Celtis laevigata, Celtis pallida, Ehretia anacua, Ebenopsis ebano, Fraxinus berlandieriana, Prosopis glandulosa, Sabal*

mexicana, Salix exigua, Salix nigra, Sapindus saponaria, or *Ulmus crassifolia* .... **Tamaulipan Riparian Systems**[a]

KEY B: Upland Forest, Woodland and Savanna Systems

(Tree cover >10% and occurring on upland sites)

1a. Forest or woodland with naturally occurring *Pinus* spp. significantly represented in the canopy (> 20%)..... **2**

1b. Forest, woodland or savanna without *Pinus* spp. as a significant component of the canopy, or if so, then planted. **3**

2a. *Pinus taeda* forest and woodland occurring in Bastrop, Caldwell, Fayette, or Lee counties, generally west of US Hwy. 77 (EPA Level IV 33e). .... **Crosstimbers Southern Pine Forest and Woodland**

2b. Forest or woodland with *Pinus taeda* or *Pinus echinata* present in the canopy and NOT occurring in Bastrop, Caldwell, Fayette, or Lee counties. In the northeastern portion of the map zone, generally east of US Hwy. 77 and north and east of TX Hwy. 71. ....**Western Gulf Coastal Plain Pine-Hardwood Forest**

3a. Open woodland occupying xeric, sandy sites, and often containing *Quercus incana* or *Quercus margarettae* in the overstory. Herbaceous species that may be present include: *Brazoria truncata, Dalea villosa* var. *grisea, Gaillardia aestivalis* var. *winkleri, Helianthus occidentalis* ssp. *plantagineus, Hymenopappus carrizoanus, Lithospermum caroliniense, Loeflingia squarrosa, Minuartia drummondii, Monarda viridissima, Paronychia drummondii, Paronychia setacea, Penstemon murrayanus, Polygonella parksii, Rhododon ciliatus, Scutellaria cardiophylla, Stylisma pickeringii, Tradescantia reverchonii,* or *Valerianella florifer*a. Found along the western edge of EPA Level IV Ecoregion 33b (Southern Post Oak Savanna), west of College Station, TX and north of IH-10 (EPA Level IV 33b). . ..... **Crosstimbers Southern Xeric Sandhill**[b,c]

3b. Forests, woodlands, or savannas lacking the above composition..... **4**

4a. Forest, woodland or savanna on deep sands dominated by *Quercus fusiformis* or *Q. virginiana,* with *Quercus hemisphaerica, Persea borbonia, Callicarpa americana,* or *Malvaviscus arboreus* sometimes present. Occurrences occupy deep sands within 15 kilometers of the bay margin along the coast from Corpus Christi, north through Matagorda County, OR on the south Texas sand sheet in Willacy, Kenedy, Kleberg, or Brooks counties (EPA Level IV 34d & 34h). .... **Central Texas Coastal Fringe Forest and Woodland**

4b. Forest, woodland or savanna not dominated by *Quercus fusiformis* or *Quercus virginiana*, or if dominated by this species, then not found on deep sands within 15 kilometers of the bay margin along the coast from Corpus Christi, north NOR on the south Texas sand sheet in Willacy, Kenedy, Kleberg, or Brooks counties. **5**

5a. Woodland or savanna dominated or co-dominated by *Quercus stellata, Q. marilandica, Q. fusiformis,* or *Carya texana* and occurring north and east of IH-37, or west of IH-37 in Atascosa and Frio Counties (EPA Level IV 33b). .... **East-central Texas Plains Post Oak Savanna and Woodlands**

5b. Forest, woodland, or savanna dominated or co-dominated by species other than *Quercus stellata, Q. marilandica, Q. fusiformis,* or *Carya texana.* **6**

6a. Open woodland (tree canopy cover between 10 and 40%) dominated by *Prosopis glandulosa* and/or *Celtis pallida* with the herbaceous layer well-developed (>10% cover) and dominated by graminoids such as *Schizachyrium scoparium, Bothriochloa ischaemum* var. *songarica, Buchloe dactyloides, Chloris pluriflora, Hilaria belangeri, Nassella leucotricha, Bouteloua* spp., or *Pennisetum ciliare*. Occurrences typically occupy sandy or sandy loam soils, generally south and west of IH-37 (EPA Level IV 31c & 34d). ..... **Tamaulipan Savanna Grassland**

6b. Woodland that may be dominated by *Prosopis glandulosa* and/or *Celtis pallida* but with either tree canopy cover greater than 40% OR with the herbaceous less well-developed (<10% cover) and/or not dominated by graminoids. Shrub layer is typically well-developed, often with shrub cover greater than 40%. **7**

7a. Woodland occupying lomas (clay dunes) of coastal counties from Cameron to Kleberg, with significant density and diversity in the shrub layer. Species dominant or co-dominant in the overstory canopy may include *Prosopis glandulosa, Celtis pallida, Havardia pallens,* and/or *Ebenopsis ebano.* The diverse shrub layer may include *Acacia rigidula, Amyris madrensis, Amyris texana, Castela erecta, Citharexylum berlandieri, Lycium berlandieri, Yucca treculeana,* and/or *Zanthoxylum fagara*. These lomas typically represent conspicuous woodland islands within a matrix of coastal halophytic herbaceous or low, shrubby vegetation (high salt marsh), but some occurrences may be found further inland (EPA Level IV34d, 34e, 34f, & 34i)..... ..... **South Texas Lomas**

7b. Woodlands NOT occupying lomas (clay dunes) of Cameron or Willacy counties. **8**

8a. Woodland dominated by *Prosopis glandulosa* with canopy cover >40%, often with a diverse shrub layer which may include *Acacia* sp., *Amyris texana, Castela erecta, Celtis pallida, Condalia hookeri, Diospyros texana, Forestiera angustifolia, Karwinskia humboldtiana, Koeberlinia spinosa, Malpighia glabra, Phaulothamnus spinescens, Sideroxylon celastrinum, Zanthoxylum fagara,* and/or *Ziziphus obtusifolia*. Found south and west of Victoria, TX and commonly encountered south and west of IH-37(EPA Level IV 31a, 31b, 31c, 34b, 34d, 34e & 34f). .... **Tamaulipan Mesquite Upland Scrub**

8b. Primarily shrubland with a sparse (10 to 40%) overstory cover over 4 m in height, generally dominated by *Prosopis glandulosa* but with additional canopy species such as *Acacia farnesiana, Celtis pallida, Diospyros texana, Ebenopsis ebano, Ehretia anacua, Havardia pallens, Leucaena pulverulenta,* and *Parkinsonia texana.* A diverse and dense shrub layer is present. .... **Tamaulipan Mixed Deciduous Thornscrub**

KEY C: Upland Shrubland and Shrub-steppe Systems

(Tree cover < 10% and shrub cover > 10%, on upland sites)

1a. Shrubland dominated by *Ilex vomitoria*, lacking dense shrub form of *Quercus fusiformis* or *Quercus virginiana,* and sometimes with short *Quercus stellata* or *Quercus marilandica* also in the shrub layer. Sparse overstory of *Quercus stellata, Quercus marilandica,* and/or *Carya texana* may be present. ..... **East-central Texas Plains Post Oak Savanna and Woodlands**

1b. Shrubland dominated by species other than *Ilex vomitoria*, or if shrub canopy is dominated or co-dominated by *Ilex vomitoria*, then *Quercus fusiformis* or *Quercus virginiana* well represented in the shrub layer. **2**

2a. Shrubland dominated or co-dominated by *Larrea tridentata.* This system generally occurs along the western edge of the map zone including Kinney, Maverick, Dimmit, Webb, Zapata, and Starr Counties, especially within 30 km of the Rio Grande. ..... **Chihuahuan Mixed Desert and Thorn Scrub**

2b. Shrubland NOT dominated by *Larrea tridentata*, though *L. tridentata* may be present. **3**

3a. Shrubland occupying sandy soils along the central Texas coast, and dominated by a shrub form of *Quercus fusiformis* or *Quercus virginiana* (locally known as running live oak). This system occurs in the coastal counties of San Patricio, Aransas, Refugio, and Matagorda (EPA Level IV 34h). .. .. **Central Texas Coastal Fringe Forest and Woodland**

3b. Shrubland not dominated by a shrub form of *Quercus fusiformis* or *Q. virginiana.* **4**

4a. Shrubland occupying saline sites and dominated or co-dominated by *Avicennia germinans, Borrichia frutescens, Batis maritima, Iva frutescens,* or *Prosopis reptans.* ..... **Gulf and Atlantic Coastal Plain Tidal Marsh Systems**[a]

4b. Shrubland NOT dominated or co-dominated by *Avicennia germinans, Batis maritima, Borrichia frutescens, Iva frutescens,* or *Prosopis reptans.* **5**

5a. Shrubland dominated or co-dominated by *Acacia berlandieri, Acacia rigidula, Castela erecta, Eysenhardtia texana, Guaiacum angustifolium, Leucophyllum frutescens,* and/or *Salvia ballotiflora* and occupying thin-soiled sites over calcareous parent material. *Prosopis glandulosa* may be present but if so, has a canopy cover less than 40%. These shrublands are usually dense (shrub cover >50%). ..... **Tamaulipan Calcareous Thornscrub**

5b. Shrubland NOT dominated or co-dominated by the above species and occupying sites other than thin-soiled situations over calcareous parent material. **6**

6a. Shrubland occupying sandy or sandy loam sites and representing small patches within a mosaic of open grasslands. Occurrences are dominated by *Prosopis glandulosa,* sometimes with *Celtis pallida* or *Diospyros texana* also present in the canopy. *Celtis pallida, Diospyros texana, Lycium berlandieri, Zanthoxylum fagara,* or *Ziziphus obtusifolia* are often conspicuous components of the shrub layer. These shrublands form patches within a mosaic of woodland, shrubland, and open grasslands. ..... **Tamaulipan Savanna Grassland**

6b. Shrubland NOT a small patch within a mosaic of open grasslands on sandy or sandy loam sites, though sites may be dominated by *Prosopis glandulosa.* **7**

7a. Shrubland occupying lomas (clay dunes) of coastal counties from Cameron to Kleberg, with significant density and diversity in the shrub layer. Sparse overstory (<10% canopy cover) may be dominated by species such as *Prosopis glandulosa, Celtis pallida, Havardia pallens,* and/or *Ebenopsis ebano.* The diverse shrub layer may include *Acacia rigidula, Amyris madrensis, Amyris texana, Castela erecta, Citharexylum berlandieri, Lycium berlandieri, Yucca treculeana,* and/or *Zanthoxylum fagara.* These lomas typically represent conspicuous woodland or shrubland islands within a matrix of coastal halophytic herbaceous or low, shrubby vegetation (high salt marsh), but

some occurrences may be found further inland (EPA Level IV34d, 34e, 34f, & 34i). .... **South Texas Lomas**

7b. Shrubland occupying sites other than lomas (clay dunes) of coastal counties of south Texas. **8**

8a. Shrubland clearly dominated by *Prosopis glandulosa* (>75% of shrub cover). Shrub species other than *Prosopis glandulosa* may be numerous including *Acacia farnesiana, Acacia greggii, Acacia rigidula, Amyris texana, Castela erecta, Celtis pallida, Condalia hookeri, Colubrina texensis, Karwinskia humboldtiana, Koeberlinia spinosa, Parkinsonia texana, Sideroxylon celastrinum, Zanthoxylum fagara,* and *Ziziphus obtusifolia.* This system occurs south and west of Victoria, Texas, and more commonly south and west of IH-37 (EPA Level III 31 and Level IV 34b, 34d, 34e & 34f). ..... **Tamaulipan Mesquite Upland Scrub**

8b. Divers shrubland that may have *Prosopis glandulosa* present, but where this species represents less than 75% of shrub cover. *Acacia rigidula* may dominate the shrub layer, or there may be no clear dominant. Species present may include *Acacia farnesiana, Acacia greggii, Amyris texana, Castela erecta, Celtis pallida, Condalia hookeri, Colubrina texensis, Karwinskia humboldtiana, Koeberlinia spinosa, Parkinsonia texana, Phaulothamnus spinescens, Sideroxylon celastrinum, Zanthoxylum fagara,* and *Ziziphus obtusifolia*. This system occurs south and west of Victoria, Texas, and more commonly south and west of IH-37 (EPA Level III 31 and Level IV 34b, 34d, 34e & 34f). ..... **Tamaulipan Mixed Deciduous Thornscrub**

KEY D: Upland Herbaceous Systems

(Herbaceous vegetation cover >20% and woody cover <10% occurring on upland sites)

1a. Herbaceous vegetation of xeric sites on deep sands north of, and including, Bastrop County. Woody species such as *Quercus incana, Q. margarettae,* or *Q. stellata* may be present. Forbs such as *Brazoria truncata, Dalea villosa* var. *grisea, Gaillardia aestivalis* var. *winkleri, Helianthus occidentalis* ssp. *plantagineus, Hymenopappus carrizoanus, Lithospermum caroliniense, Loeflingia squarrosa, Minuartia drummondii, Monarda viridissima, Paronychia drummondii, Paronychia setacea, Penstemon murrayanus, Polygonella parksii, Rhododon ciliatus, Scutellaria cardiophylla, Stylisma pickeringii, Tradescantia reverchonii, Valerianella florifera* are characteristic of this vegetation..... **Crosstimbers Southern Xeric Sandhill**[b]

1b. Herbaceous vegetation of sites other than xeric areas on deep sands, or if on such sites, lacking the above species and occurring south of Bastrop County..... **2**

2a. Grassland occupying coastal dunes, interdunal swales, and sandy sites of adjacent mainland. Dominant species may include *Panicum amarum, Paspalum monostachyum, Paspalum virgatum, Schizachyrium littorale, Spartina spartinae,* and *Uniola paniculata*. **3**

2b. Grassland occupying sites other than coastal dunes, interdunal swales, or sandy sites of adjacent mainland. **4**

3a. Grassland from Kleberg County northward (EPA Level IV 34h). ..... **Central and Upper Texas Coast Dune and Coastal Grassland**

3b. Grassland south of Kleberg County (EPA Level IV 34i). ..... **South Texas Dune and Coastal Grassland**

4a. Grassland occurring with a mosaic of forest, woodland, or shrubland with woody components dominated or co-dominated by *Prosopis glandulosa, Quercus fusiformis, Q. virginiana, Q. stellata,* or *Q. marilandica*. **5**

4b. Grassland forming a matrix, not occurring within a mosaic of forest, woodland, or shrubland. .. **7**

5a. Grassland occurring within a mosaic of woodland and/or shrubland dominated by *Prosopis glandulosa* south and west of IH-37. Typical grass species may include *Bouteloua curtipendula, Bothriochloa barbinodis, Schizachyrium scoparium,* and *Trichloris pluriflora.* These grasslands typically occupy deep sands (on and around the south Texas sand sheet), sands, or sandy loams (EPA Level IV 31c, 34c, 34d & 34e). ..... **Tamaulipan Savanna Grassland**

5b. Grassland within a mosaic with forest, woodlands, or shrublands, but woody component NOT dominated by *Prosopis glandulosa*. **6**

6a.. Grassland occurring within a mosaic of forest or woodland dominated by *Quercus fusiformis* or *Q. virginiana* on sandy soils in coastal counties (from San Patricio, north to Matagorda County) or on the sand sheet of south Texas (primarily Kenedy and Brooks Counties) (EPA Level IV 34d & 34h). Dominant grass species is typically *Schizachyrium littorale*. ..... **Central Texas Coastal Fringe Forest and Woodland**

6b. Grassland occurring within a mosaic of forest, woodland, or shrubland not located on coastal sands or south Texas sand. ..... **East-Central Texas Plains Post Oak Savanna and Woodland**

7a. Grassland of deep sands on the sand sheet of Kleberg, Kenedy, Brooks, Jim Hogg, and northern Willacy and Hidalgo Counties (EPA Level IV 34d). Dominant grass species may include *Andropogon gerardii, Muhlenbergia capillaris, Paspalum plicatulum, Schizachyrium littorale, Sorghastrum nutans,* and *Trachypogon spicatus.* ..... **South Texas Sand Sheet Grassland**

7b. Grassland on sites other than deep sands of the sand sheet of Kleberg, Kenedy, Brooks, Jim Hogg, and northern Willacy and Hidalgo Counties. **8**

8a. Grassland on deep and poorly drained, generally saline soils, along the coast and within 40 km of the bay margin. The dominant species is typically *Spartina spartinae*, though *Panicum virgatum*, *Paspalum hartwegianum*, *Schizachyrium scoparium*, *Sporobolus airoides*, and/or *Spartina patens* may also be common. ..... **Texas-Louisiana Saline Coastal Prairie**

8b. Herbaceous vegetation NOT on saline soils near the coast, and not dominated by *Spartina spartinae*..... **9**

9a. Grasslands of the coastal prairie (EPA Level IV 34a & 34b) with dominant or co-dominant species such as *Andropogon gerardii*, *Panicum virgatum*, *Paspalum plicatulum*, *Schizachyrium scoparium*, and *Sorghastrum nutans*. This system can be found in coastal counties from Kleberg County northward, and counties immediately adjacent to those counties inland, and Waller and Colorado Counties. ..... **Texas-Louisiana Coastal Prairie**

9b. Grasslands of the Fayette (EPA Level IV 32b) and San Antonio (EPA Level IV 33c) Prairies, generally north and east of coastal and adjacent counties. *Schizachyrium scoparium* and *Sorghastrum nutans* are common dominants. *Andropogon gerardii*, *Bothriochloa laguroides*, *Bouteloua curtipendula*, *Nassella leucotricha*, *Panicum virgatum*, *Paspalum plicatulum*, and *Tripsacum dactyloides* may also be significant components depending on topo-edaphic conditions. ..... **Southern Blackland Tallgrass Prairie**