

See discussions, stats, and author profiles for this publication at: <https://www.researchgate.net/publication/299410281>

## Chapter 6: The Gulf Coastal Prairies and Marshes

Data · March 2016

---

CITATIONS

0

READS

65

2 authors, including:



David Bezanson

The Nature Conservancy

16 PUBLICATIONS 12 CITATIONS

SEE PROFILE

Some of the authors of this publication are also working on these related projects:



Publication Preview Source Natural vegetation types of Texas and their representation in conservation areas [View project](#)



## **Chapter 6: The Gulf Coastal Prairies and Marshes**

The Gulf Coastal Prairies and Marshes include approximately ten million acres of coastal plain, 20 to 80 miles in width, and barrier islands adjacent to the Gulf of Mexico. Soils are primarily clays and clay loams with some acidic sands and sandy loams; wetlands occur frequently in areas of poorly drained clay soils or sand over impermeable subsoils (Carter 1931). Prairie and marsh grasses were the dominant vegetation in most of the region prior to Anglo-European settlement and cultivation. However, as average annual rainfall diminishes to the south (from 40 inches at Victoria to 25 inches at Brownsville), marshes become much less extensive and brush communities become important on upland sites (Tharp 1939).

Like other former grassland areas on clay soils in Texas, the Gulf Coastal Prairies are well-suited to agriculture (except for areas of drift sand); farming, cattle ranching, and urban and industrial development have transformed the region. Of the estimated one million acres of coastal marsh existing in 1950, at least 35 percent has been displaced by urban and industrial development (Gould 1975,

FWS 1991). Prairies have been even more extensively converted to improved pasture or widely invaded by non-native grasses, weedy forbs and invasive woody species such as Chinese tallow-tree, which now grows in dense stands covering thousands of acres along the upper coast. However, sizeable remnants of most vegetation types survive, and more land has been set aside for conservation than in any other region of Texas except the Trans-Pecos.

Vegetation types range from upland prairies to saturated and saline grasslands, vegetated dunes, and fresh, brackish and salt marshes near the coast. The region ranks high in floral diversity due to its broad east-west extent, the variety of soils, and adaptation to high moisture and salinity levels. Salinity and hydroperiod (duration of seasonal inundation) are important influences on species occurrence. Most of the large coastal bay systems support extensive areas of emergent marsh dominated by cordgrasses and other halophytic grasses, shrubs, and forbs. Tidally inundated stands of smooth cordgrass provide vital nursery habitat for estuarine and marine fauna. Live oak woodlands occur on uplands especially on sand soils; river floodplains support bottomland forests. Beaches and dunes run the length of the coast on the mainland and on barrier islands. The hypersaline Laguna Madre and a few other shallow, sheltered bay areas contain extensive seagrass beds and wind-tidal flats (Brown et al. 1980).

### **Plant Communities of the Gulf Coastal Prairies and Marshes**

#### **28b. Wet Alfisol tall grasslands.**

Synonyms: None.

Description: Discrete areas of sandy loam soils on the upper Texas coast (e.g. Smith Point in Chambers County) support remnant grasslands similar to the “Cajun Prairie” which once covered 2.5 million acres of southwestern Louisiana prior to conversion to rice and sugarcane farming; these prairies are seasonally saturated and highly species-rich. Dominant species include slender bluestem

and other bluestems, brownseed paspalum, beaksedges, nutrushes, and an impressive variety of graminoids and forbs (Singhurst pers. comm.).

Status: The historic "Cajun Prairie" is largely extirpated in Louisiana, with less than 500 acres extant (Allain et al. 2004). A few small remnants are known in Texas, with a protected example at Candy Abshier WMA. The 57-acre Deer Park Prairie in Harris County recently acquired by the Native Prairies Association of Texas is a similar prairie on mixed soil types (Singhurst pers. comm.).

Suggested Priority for Further Protection of Community: High

### **33. Upland Vertisol tall grasslands (Coastal Prairies).**

Synonyms: Bluestem Grassland (McMahan et al. 1984); Little bluestem-trichloris grassland, in part (McLendon 1991); Little Bluestem-Brownseed Paspalum Series (Diamond 1993); Little Bluestem-Brownseed Paspalum Herbaceous (Weakley et al. 2000).

Description: Native grasslands on upland Vertisols in the upper Gulf Coast region are diverse and species-rich; dominant species variously include little and big bluestems, Gulf muhly (especially where slightly saline), Indiangrass, brownseed paspalum, switchgrass, hairyawn muhly, dichantheleiums, gayfeathers, asters, coneflowers, prairie-clovers, and a great variety of other forbs and graminoids, with hairyawn muhly, longtom, flatsedges, beaksedges, and rushes dominant in wet areas. Common "increasers" (species increasing in abundance with prolonged use by livestock) include Texas wintergrass and silver bluestem (Durham 1975, Box and White 1969, Butler 1979, Brown 1981, Smeins et al. 1982, Diamond and Smeins 1984, Pilko and Assoc. 1999, Weakley et al. 2000). Drier sites in grasslands on Vertisols along the central and lower coast (e.g. San Patricio, Kleberg and Nueces counties) include more drought-tolerant species such as bristlegrasses, sideoats grama, windmillgrasses, Arizona cottontop, and shortgrasses such as buffalograss and curlymesquite (McLendon 1991, Box and White 1969, Smeins et al. 1982, Patterson pers. comm.).

Status: Most of the coastal prairie region in Texas has been converted to cultivated land or heavily utilized pasture lands been converted to agricultural land; however, sizeable areas of native prairie remain on private ranches in Goliad, Refugio and Victoria counties. Existing rangelands throughout the region have been overtaken by invasive woody species such as huisache, mesquite, and trees from adjacent communities, weedy forbs such as yankeeweed, and exotic Chinese tallow-tree and Macartney rose. Aggressive non-native grasses, especially Old World bluestems, are a serious threat. Roughly 20,000 acres is protected in parks or refuges, but much of that acreage is restored prairie lacking the full range of original species, and some regional subtypes are not extensively protected. Examples are protected at The Nature Conservancy's Mad Island Marsh Preserve, Katy Prairie Conservancy properties (e.g. Jack Road) and Attwater's Prairie Chicken and Brazoria National Wildlife Refuges (Johnston 1963; Box and White 1969; McLendon 1991; Lange, McAlister, Rossignol pers. comm.). A few remnant prairies on land owned by Harris County for flood control include several endangered plants which occur in small openings ("slicks") within the prairie matrix; however, many such sites have been altered or destroyed (Brown pers. comm.).

Suggested Priority for Further Protection of Community: Fairly High

#### **34. Upland live oak woodlands (upper Gulf Coast).**

Synonyms: Coastal Live Oak-Sugarberry Series (Diamond 1993); Live Oak-Sugarberry Woodland Alliance (Weakley et al. 2000).

Description: Upland mottes or woodlands of coastal live oak occur on historical beach ridges and salt domes (e.g. High Island) along the upper coast and are superficially similar to oak woodlands on coastal ridges (cheniers) in Louisiana (cf. Penfound and Hathaway 1938). However, most extant live oak groves between Galveston Bay and Sabine Lake apparently do not predate Anglo-European settlement (Burkett pers. comm.). Sugarberry, elms, pasture haw, water oak, and yaupon form woodlands or mottes within grasslands in this range

(Harcombe and Neaville 1977), but the original abundance of this community type is uncertain.

Status: These woodlands have been cleared for pasture and development and supplanted by invasive species. They are important resting sites for migrating songbirds. Examples are protected at the Candy Abshier WMA and Houston Audubon Society's High Island preserves (TPWD 1996, Burkett pers. comm.).

Suggested Priority for Further Protection of Community: Fairly High

**35a. Upland live oak savannas (Ingleside Barrier).**

Synonyms: Coastal Live Oak-Red Bay Series (Diamond 1993); Plateau Oak Forest Alliance, in part (Weakley et al. 2000).

Description: Former beach ridges on sand ridges of the Ingleside, Live Oak, and Blackjack peninsulas in Aransas, San Patricio, Calhoun, and other counties support mottes, woodlands, savannas or thickets of live oak, with openings dominated by little bluestem and other grasses. The species of live oak is disputed (Simpson 1988). Other abundant species include red bay, sugarberry, southern wax-myrtle, yaupon, little bluestem, paspalums, switchgrass, Indiangrass, whip nutrush, sedges, legumes, Turk's cap, crotons, and other forbs. Somewhat similar vegetation occurs in the southern Post Oak Savanna belt of Goliad, DeWitt, Lavaca, and adjacent counties, but post oak and blackjack oak share codominance with live oak and red bay. Mottes of somewhat stunted live oaks also grow on the eastern part of the South Texas Sand Sheet in a matrix of grasslands dominated by seacoast bluestem, paspalums, lovegrasses, and other species (see Chapter 7) (Collins 1987).

Status: Large areas of oak savanna have become dense, brushy thickets, including some of the acreage (more than 20,000 acres) protected at Aransas National Wildlife Refuge and Goose Island State Park (Springer et al. 1987, McAlister and McAlister 1987, TPWD 1996).

Suggested Priority for Further Protection of Community: Fairly Low

**35b. Upland Alfisol tall grasslands (Ingleside Barrier).**

Synonyms: None.

Description: Loose sands on former beach ridges of the Ingleside Barrier where mottes or woodlands of live oak are relatively absent (presumably controlled by natural fires) support extensive areas of tallgrass prairie which is distinct from upland prairies on Alfisols of the Lissie Formation and also from barrier island grasslands. Dominant species are little bluestem and/or seacoast bluestem, Pan American balsamgrass, and brownseed paspalum with other grasses and forbs (Singhurst pers. comm.)

Status: Aransas National Wildlife Refuge protects at least 5,000 acres in good condition of this vegetation type, which is also known from private ranches in Calhoun County (e.g. the Powderhorn Ranch).

Suggested Priority for Further Protection of Community: Fairly High

**36. Coastal xeric brush.**

Synonyms: Colima Shrubland Alliance (Weakley et al. 2000).

Description: A few clay or shell ridges and spoil banks near coastal bays support xerophytic brush vegetation similar to communities of the South Texas Plains, including species such as colima, Texas persimmon, granjeno, hackberries, Berlandier wolfberry, coma or gum bumelia, brasil, mesquite, Texas prickly pear, and Trecul yucca. While certain brush species (e.g. huisache, mesquite, prickly pear) have invaded pastures throughout the Coastal Prairies, these mature brush communities apparently do not result from human disturbance (McAlister and McAlister 1987, Weakley et al. 2000).

Status: Protected examples occur at the Houston Audubon Society's North Deer Island, the Nature Conservancy's Mad Island Preserve, Texas Ornithological Society's Magic Ridge Sanctuary, and the Aransas National Wildlife Refuge (McAlister and McAlister 1987; Burkett, Dumesnil pers. comm.).

Suggested Priority for Further Protection of Community: Fairly High

### **37. Live oak-pecan-water oak floodplain forests.**

Synonyms: Coastal Live Oak-Pecan Series, Water Oak-Coastal Live Oak Series (Diamond 1993), Live Oak-Pecan Woodland Alliance, Live Oak-Water Oak Saturated Forest Alliance, Live Oak Temporarily Flooded Forest (Weakley et al. 2000).

Description: Live oak is a dominant canopy species in forested bottomlands, floodplain terraces, and interfluvial flats of the lower Brazos, San Bernard, Colorado, and adjacent river basins, with groves or mottes of live oak occurring in adjacent uplands. Pecan and water oak may be codominant. Subdominant species may include sugarberry, elms, dwarf palmetto, bois d'arc, gum bumelia, deciduous holly, vines (grapes, rattan-vine, Virginia-creeper, poison-ivy) and a sparse ground layer including basketgrass, long-leaf spikegrass, caric-sedges, panicums, and numerous forbs. Baldcypress occurs on banks of larger streams. Frequently flooded areas within these bottomlands are dominated by green ash, black willow, swamp privet, buttonbush, sedges, and smartweeds (TPWD 1978, Carr 1999b, Weakley et al. 2000, Lange pers. comm.). Similar floodplain forests occur south to the lower Guadalupe and San Antonio rivers, surrounded by upland brush or grassland communities; however, some southeastern species are uncommon or absent, while additional subdominant species are present characteristic of South Texas or Edwards Plateau vegetation (e.g. anacua, cutgrasses, chapotillo, Mexican-buckeye) (Singhurst pers. comm.).

Status: These coastal floodplain forests have been targeted for protection by conservationists in recent decades. Preserved acreage now exceeds 8,000 acres, including the Brazos Bend State Park, Nannie M. Stringfellow WMA, Peach Point WMA, and the Big Pond, Dance Bayou, and other tracts of the San Bernard National Wildlife Refuge. Several of these areas include mature examples of this forest type, and a few tracts, including the Dance Bayou tract, contain old growth (TPWD 1978; Lange, Ortego pers. comm.).

Suggested Priority for Further Protection of Community: Medium



### **38. Ephemeral freshwater wetlands.**

Synonyms: Rush-Sedge Series, in part (Diamond 1993); Southern Umbrella-sedge-Beaksedge species Seasonally Flooded Herbaceous Alliance, Saltmeadow Cordgrass Seasonally Flooded Herbaceous Alliance, in part (Weakley et al. 2000).

Description: Shallow ephemeral or seasonally flooded areas occur throughout the Gulf Coastal Prairies and include interdunal swales on sand sheets (e.g. the Ingleside Barrier) and barrier islands as well as swales, ditches and depressional wetlands in clay soils. These wetlands are characterized by high water tables that maintain hydric conditions, though the surrounding area may be dry for long intervals. Graminoids are dominant, including flatsedges, rushes, beaksedges, cutgrasses, spikesedges, American bulrush, umbrella-sedges, fimbries, and bushy bluestem, with water-hyssops, bulrushes, water-pennywort, arrowheads, cattails, and bladderworts in more often flooded swales (Carr 1997, Weakley et al. 2000).

Status: Many swales and potholes have been drained, a major component of wetland loss in Texas (Moulton and Jacob 1999). These herbaceous freshwater wetlands have been little studied. Some acreage, totaling 5,000 acres or less, is protected at Aransas and Matagorda Island National Wildlife Refuges and other sites (TPWD 1978, FWS et al. 1990).

Suggested Priority for Further Protection of Community: Fairly High

### **39. Semipermanent freshwater wetlands (Coastal Prairies).**

Synonyms: *Typha-Scirpus consociis* and *Mariscus consociis* (Penfound and Hathaway 1938); Maidencane-Alligator Weed Marsh (McMahan et al. 1984); Giant Bulrush Semipermanently Flooded Herbaceous Alliance; Maidencane Seasonally Flooded Temperate Herbaceous Alliance; Lanceleaf Arrowhead Semipermanently Flooded Herbaceous Alliance; (Narrowleaf Cattail, Common Cattail)-(Bulrush species) Semipermanently Flooded Herbaceous Alliance; Soft

Rush Seasonally Flooded Herbaceous Alliance; Southern Wild Rice Seasonally Flooded Temperate Herbaceous Alliance, in part (Weakley et al. 2000).

Description: Freshwater wetland and pond communities occur in upland depressions and around streams and bodies of fresh water in every part of Texas, but the most extensive examples in Texas occur on the upper coast (the Chenier Plain). Typical plants of freshwater wetlands in coastal Texas include giant bulrush, softstem bulrush, maidencane (along the upper Gulf coast only), southern wildrice, spikesedges, rushes, flatsedges, cutgrasses, burheads, arrowheads, cattails, smartweeds, water-pennywort, Carolina fanwort, paspalums, panicums, switchgrass, bushy bluestem, water-primroses, powdery thalia, marsh fleabane, lake acanthus, and many other forbs and grasses. Submergent and floating-leaved aquatic species in open ponds and sloughs include duckweeds, pondweeds, watershield, water-lilies, American lotus, southern naiad, common hornwort, water-lettuce, water-ferns, and the exotic alligator weed and common water-hyacinth (Penfound and Hathaway 1938, Fleetwood 1973, Harcombe and Neaville 1977, TPWD 1978, Scifres et al. 1980, Smeins et al. 1982, Collins 1987, USFWS 1988, White and Paine 1992, Pilko and Assoc. 1999, Weakley et al. 2000, Moulton and Jacob 2000). Slightly brackish to fresh marshes and swamps influenced by seasonal or storm tidal intrusion are among the most diverse coastal habitats. These intermediate communities are limited in extent in Texas and are found primarily on the upper Gulf coast (Ortego pers. comm.).

Status: Many parks and refuges contain freshwater sloughs and other habitats, but much of the protected acreage consists of interdunal depressions on barrier islands such as Padre Island National Seashore (Laine and Ramsey 1988). True freshwater wetlands are protected at Brazos Bend State Park, McFaddin National Wildlife Refuge, and a few other refuges, totaling about 10,000 acres (TPWD 1978, 1996; Ortego, Walther pers. comm.). Many impoundments in conservation areas (e.g. Peach Point WMA, Anahuac National Wildlife Refuge) have been colonized by freshwater hydrophytes and may be considered "natural"

communities (Pilko and Assoc. 1999). Some of the largest extant freshwater marsh areas in Texas (e.g. Willow Slough in Jefferson County) are not in protected areas. Freshwater wetlands are important resources and support a large number of animal and plant species.

Suggested Priority for Further Protection of Community: Medium

#### **40. Coastal dune grasslands.**

Synonyms: Seacoast Bluestem-Gulfdune Paspalum Series, in part (Diamond 1993); Gulfdune Paspalum-Bitter Panicgrass-(Seaside Little Bluestem) Herbaceous Alliance (Weakley et al. 2000).

Description: Secondary dunes on barrier islands or near bays are often dominated by seacoast bluestem and other grasses, such as gulfdune paspalum, seashore paspalum, brownseed paspalum, bitter panicum, and red lovegrass. Common forbs include seaside goldenrod, seaside heliotrope, woolly stemodia, and many others. Gulf cordgrass, sedges and forbs (e.g. coastal water-hyssop, water-pennyworts) are dominant in low swales (Judd et al. 1977, Drawe et al. 1981, FWS et al. 1990, Weakley et al. 2000). Similar grasslands occur inland on the South Texas Sand Sheet (see Chapter 7). These communities are less diverse, but more extensive, than similar grasslands on the Ingleside Barrier (Singhurst pers. comm.). As with other coastal grasslands, disturbance may favor an increase in woody species.

Status: Roughly 25,000 acres of coastal grassland are protected in Matagorda Island National Wildlife Refuge and State Park, Mustang Island State Park, and Padre Island National Seashore (TPWD 1996, Laine and Ramsey 1998, McAlister pers. comm.). The Matagorda Peninsula, Padre Island, and Christmas Bay tracts owned by the Texas General Land Office also contain good examples of this community, but future management of these tracts is uncertain (Grimes pers. comm.). Some unprotected sites are threatened by beachfront commercial development.

Suggested Priority for Further Protection of Community: Fairly Low

**41. Gulf cordgrass saline grasslands.**

Synonyms: Gulf Cordgrass Series (Diamond 1993); Gulf Cordgrass Saturated Herbaceous Alliance, Gulf Cordgrass Seasonally Flooded Temperate Herbaceous Alliance (Weakley et al. 2000).

Description: Gulf cordgrass dominates large areas of "high" marsh (not inundated by normal tides) and saline prairies with high water tables along the entire Gulf coast. Other abundant species may include seashore paspalum, knotroot bristlegrass, bluestems, dropseeds, sedges, and rushes (Shiflet 1963, Fleetwood 1973, Scifres et al. 1980, Pilko and Assoc. 1999). Gulf cordgrass is also found in isolated saline microhabitats across inland Texas from the Pineywoods to South Texas and the Rolling Plains; these communities are dissimilar and may require more extensive description.

Status: This community has probably spread into disturbed areas of former upland grassland. Gulf cordgrass-dominated prairies are widespread and very extensively protected, with more than 45,000 acres in parks and refuges (TPWD 1996; FWS 1996; Lange, McAlister, and Walther pers. comm.).

Suggested Priority for Further Protection of Community: Low

**42a. Intermediate marshes.**

Synonyms: Marshhay Cordgrass-Olney Three-Square-Leafy Three-Square (McMahan et al. 1984); Marshhay Cordgrass Series, in part (Diamond 1993); Saltmeadow Cordgrass Seasonally Flooded Herbaceous Alliance, in part (Weakley et al. 2000).

Description: "Intermediate" marshes may be defined as somewhat fresher than surrounding brackish marshes but with higher salinity (e.g. .5 to 5 parts per thousand) than saline prairies or freshwater habitats. Common species include seashore paspalum, Olney bulrush (replaced by American bulrush on the lower coast), marshhay cordgrass, giant bulrush, coffee bean, coastal water-hyssop, spikesedges, Virginia marsh-mallow, and floating-leaved aquatic plants in open

water (USFWS 1988, Pilko and Assoc. 1999). Common reed has invaded sites of various salinities as well as colonizing spoil banks and ditches.

Status: Large areas of intermediate and brackish marsh are protected, with excellent examples at Matagorda Island, Anahuac, McFaddin, and San Bernard National Wildlife Refuges, the adjacent Sea Rim State Park and J. D. Murphree WMA, Lower Neches WMA, Candy Abshier WMA, Peach Point WMA, Guadalupe Delta WMA, and other sites. Protected acreage exceeds 100,000 acres, some in good condition (TPWD 1996; USFWS 1996; Lange, Walther pers. comm.).

Suggested Priority for Further Protection of Community: Low

**42b. Brackish marshes.**

Synonyms: Saltgrass-Cordgrass Series; Marshhay Cordgrass Series, in part (Diamond 1993); Saltmeadow Cordgrass Seasonally Flooded Herbaceous Alliance; Saltmeadow Cordgrass-(Saltgrass) Tidal Herbaceous Alliance; Groundsel-tree-Maritime Marsh-elder Tidal Shrubland Alliance; Olney Threesquare Semipermanently Flooded Herbaceous Alliance; Black Needlerush Tidal Herbaceous Alliance, in part; Beaked Ditch-grass Permanently Flooded-Tidal Temperate Herbaceous Alliance (Weakley et al. 2000).

Description: Marshes between the landward edge of tidal influence and the reach of storm tides (salinities between 5 and 18 ppt) occur throughout the Texas coastal zone. Important emergent species associated with brackish conditions include saltgrass, saltmarsh bulrush, and marshhay cordgrass, with gulfdune paspalum, seashore paspalum, Olney bulrush, small spikesedge, seepweeds, and sea ox-eye often present. Saltgrass may be dominant in lower marsh; stands of black needlerush may occur in brackish marshes as well as in fresher and more saline marshes. Higher margins are often occupied by eastern baccharis and bigleaf sumpweed, usually within a matrix of cordgrasses. Also present in this community are annual saltmarsh aster, yellow deer-pea, and other marsh plants. Submergent aquatics in brackish water include algae, burheads, rushes, common poolmat, and wigeon-grass (Penfound and Hathaway 1938,

Shiflet 1963, USFWS 1988, USFWS et al. 1990, White and Paine 1992, Pilko and Assoc. 1999, Weakley et al. 2000, Walther pers. comm.).

Status: Baccharis, saltcedar, and other shrubs may invade. A large amount of brackish marsh is protected, with good examples at Brazoria, San Bernard, Big Boggy, McFaddin, Matagorda Island, and Texas Point National Wildlife Refuges (FWS 1996; Lange, McAlister, Neaville, Walther pers. comm.)

Suggested Priority for Further Protection of Community: Low

#### **43. Sea ox-eye saline marsh.**

Synonyms: Seaside Ox-eye Tidal Shrubland Alliance (Weakley et al. 2000).

Description: Sea ox-eye daisy grows as a subdominant species on bands of saline marsh or flats coastwide, especially on the lower Gulf coast where it may grow in monospecific stands covering hundreds of acres or with maritime saltwort, shoregrass and other species (Johnston 1955).

Status: Flats dominated by sea ox-eye occur at Lower Rio Grande Valley, Laguna Atascosa, Aransas and other refuges (FWS 1987, Best pers. comm.).

This community is widespread and apparently not threatened.

Suggested Priority for Further Protection of Community: Low

#### **44. Glasswort-saltwort hypersaline estuarine flats.**

Synonyms: Glasswort-Saltwort Series (Diamond 1993); Saltwort Tidal Dwarf-shrubland Alliance; Perennial Glasswort-(Inland Saltgrass, Saltmarsh Cordgrass) Tidal Dwarf-shrubland Alliance; Key Grass Tidal Herbaceous Alliance; Gulf Cordgrass Tidal Herbaceous Alliance, in part (Weakley et al. 2000).

Description: Periodically inundated flats subject to salt water evaporation (e.g. high tide or storm tide zones) occur around coastal bay margins, in washover areas and on shores of barrier islands. These flats may be sparsely vegetated with very salt-tolerant species, including maritime saltwort, glassworts, shoregrass, seepweeds, sea ox-eye, cordgrasses, Carolina wolfberry, camphor daisy, beach carpet, sea-

lavender, and saltgrass. Bands of shoregrass grow along upper margins of tidal flats and grade into brackish marshes (Lonard et al. 1978, Drawe et al. 1981).

Status: This community is abundant along bays and beaches on the Gulf coast and occurs at many refuges and parks, including Matagorda Island National Wildlife Refuge and State Park, Boca Chica WMA, Mustang Island State Park, and others. Total protected acreage is 7,000 acres or more (TPWD 1996, FWS et al. 1990, FWS 1997, Judd et al. 1997). Some sites may be threatened by residential and industrial development on bay shores and barrier islands.

Suggested Priority for Further Protection of Community: Fairly Low

#### **45. Tidal salt marshes.**

Synonyms: *Spartina alterniflora* consociates; *Distichlis* consociates, in part (Penfound and Hathaway 1938); Smooth Cordgrass-Marsh Saltgrass-Sea Ox-eye Marsh (McMahan et al. 1984); Smooth Cordgrass Series (Diamond 1993); Saltmarsh Cordgrass Tidal Herbaceous Alliance, Saltgrass Tidal Herbaceous Alliance (Weakly et al. 2000).

Description: Bay and estuary margins inundated by daily tidal fluctuation will only support plants tolerant of high salinities (2-5 percent). Smooth cordgrass is often dominant, especially from Nueces County north, forming pure stands along estuarine margins and in tidal marshes. Saltgrass, black needlerush, and saltmarsh bulrush may also be important. Tidal marshes commonly adjoin vegetated saline flats containing glassworts, saltwort, shoregrass, and other species (Shiflet 1963, Penfound and Hathaway 1938, White and Paine 1992). Though plant diversity is low, smooth cordgrass marshes support rich fauna and are nursery areas for commercial fish and crustacean species.

Status: Despite extensive protection and restoration efforts, cordgrass marshes have decreased by more than 50 percent due to development (FWS 1979). At least 30,000 acres are protected, with examples at Aransas, Matagorda Island, San Bernard, Brazoria, and Texas Point National Wildlife Refuges, Galveston Island and Sea Rim State Parks, and Bolivar Flats Shorebird Sanctuary (TPWD

1996; Texas General Land Office 1998; Burkett pers. comm.). The Matagorda Peninsula tract owned by the General Land Office contains excellent examples of cordgrass marsh, but future management of the property has not been decided (Grimes pers. comm.)

Suggested Priority for Further Protection of Community: Fairly Low

**46. Black mangrove tidal shrub marsh.**

Synonyms: Black Mangrove Series (Diamond 1993); Black Mangrove Tidal Shrubland (Weakley et al. 2000).

Description: Intertidal bay margins or flats on the lower Texas coast may support stands of black mangrove, usually as a low shrub. Cordgrasses or halophilic forbs are usually present. The extent and stature of black mangrove in Texas is limited by winter freezes. Extensive stands in Nueces and Calhoun Counties may be somewhat transient, but occurrences in the Laguna Madre have persisted since a freeze event in 1989 (Lonard, White pers. comm.). In the absence of freezes, other mangrove species take root and grow in washover areas (Patterson pers. comm.).

Status: The status of black mangrove in Texas is variable due to climatic variation. The best stands (including large specimens) are located at the mouth of the Rio Grande in the Lower Rio Grande Valley National Wildlife Refuge and around South Bay, which is designated as a state coastal preserve. These sites are potentially threatened by oil spills in coastal bays (White pers. comm.).

Suggested Priority for Further Protection of Community: Fairly High

**47. Beaches and active coastal dunes.**

Synonyms: Seaoats-Seacoast Bluestem Grassland, in part (McMahan et al. 1984); Sea Oats-Bitter Panicum Series (Diamond 1993); Cenicilla-Beach Morning Glory Series (Diamond et al. 1987), Railroad-vine Herbaceous Alliance, Sea Oats Temperate Herbaceous Alliance (Weakley et al. 2000).



Description: Beaches extend the entire length of the Texas coast, either on the mainland or on barrier islands (which are uninterrupted, except by channels and cuts, from the Colorado River to the Mexican border). Beaches and foredunes on barrier islands are usually sparsely vegetated. Colonizing plants on backshore or stabilized beach dunes may include sea oats, morning-glories, bitter panicum, beach-tea, sea-purslanes, sea rocket, gulfdune paspalum, sea-lavender, and coastal dropseed. Leeward sides of dunes often support lush growth of sea oats, beach-tea, marshhay cordgrass, camphor daisy, gulfdune paspalum, partridge pea, beach evening-primrose, flatsedges, camphor-weed, leafless cressa, western ragweed, and other graminoids and forbs (Judd et al. 1977, Lonard et al. 1978, Drawe et al. 1981, Carls et al. 1991).

Status: Beaches are owned by the state of Texas, but dunes on barrier islands are private and many have been densely developed. However, more than 150 miles of beachfront are protected in Padre Island National Seashore, Matagorda Island, McFaddin and San Bernard National Wildlife Refuges, Mustang Island and Sea Rim State Parks, Boca Chica WMA, and other areas, which contain approximately 10,000 acres of dunes and grasslands (TPWD 1996; FWS et al. 1990; FWS 1997, 1999).

Suggested Priority for Further Protection of Community: Medium

#### **48. Wind-tidal algal flats.**

Synonyms: Blue-green Algae Wind-Tidal Flat Nonvascular Alliance (Weakley et al. 2000).

Description: Wind-tidal sand and mud flats occur around all coastal bays but are most extensive in the Laguna Madre system. After inundation by storm tides, flats support blooms of cyanobacteria and become important feeding grounds for shorebirds including the endangered piping plover (Elliott pers. comm.).

Status: Areas of tidal flats are protected in Padre Island National Seashore, Mustang Island, Bolivar Flats Shorebird Sanctuary, Lower Rio Grande Valley

National Wildlife Refuge (the Boca Chica tract) and other preserves (Laine and Ramsey 1998, Texas General Land Office 1998).

Suggested Priority for Further Protection of Community: Fairly Low

**49. Estuarine seagrass beds.**

Synonyms: Manatee-grass Permanently Flooded Tidal Herbaceous Alliance, Shoal-grass Permanently Flooded Tidal Herbaceous Alliance, Turtle-grass Permanently Flooded Tidal Herbaceous Alliance, Tufted Seagrass Permanently Flooded Tidal Herbaceous Alliance (Weakley et al. 2000).

Description: Seagrasses grow throughout shallow waters of most coastal bays, most extensively in the Laguna Madre, Redfish Bay, Aransas Bay, and Baffin Bay, and are crucial habitat areas for estuarine fauna (Texas General Land Office 1998). Shoal-grass is the most widespread species, with turtle-grass and manatee-grass common in slightly deeper water (10-12 feet) and wigeon-grass growing in inshore or brackish environments (Weakley et al. 2000).

Status: Submerged lands are owned by the state of Texas. Areas of seagrasses are subject to dredging, damage from boat traffic, and changes in extent and composition due to climatic fluctuations.

Suggested Priority for Further Protection of Community: Fairly Low (Note: all examples are in state ownership)

Table 6. Conservation areas in the Gulf Coastal Prairies and Marshes, with types of vegetation occurring within each area.

Conservation Area and Manager	Vegetation Types Occurring in Area	Acreage of Area	Source
Anahuac National Wildlife Refuge (FWS)	33 (25%),39 (5%),41 (8%),42a (43%),42b (14%),45 (2%)	34,337 (FWS) 63 (easement)	FWS 1996
Aransas National Wildlife Refuge (FWS), Johnson Ranch (TNC)	33,35a and 35b (40%), 36 (1%),37,38,39,41, 44,45 (>7%)	57,989 (FWS), 245 (TNC)	McAlister pers. comm.
Armand Bayou Nature Center and State Coastal Preserve (Harris County, City of Pasadena, GLO/TPWD, Rice University, University of Houston)	15a,33 (25%),42b,45	2,402	Brown 1985, Smeins and Diamond 1986
Atkinson Island WMA (TPWD)	42b (48%),45 (25%)	152	TPWD 1996
Attwater's Prairie Chicken National Wildlife Refuge (FWS)	19,28,33,37,38	10,541	Rossignol pers. comm.
Austin's Woods Units, San Bernard NWR (FWS, 5 tracts)	16,19,37,39	32,000	Lange pers. comm.
Big Boggy National Wildlife Refuge (FWS, conservation easement)	33 (7%),39 (6%),41 (12%),42a and 42b (30%),44,45 (19%)	4,216 (FWS), 310 (easement)	FWS 1997, 1999, Lange pers. comm.
Big Reef Nature Park (City of Galveston)			
Bolivar Flats Shorebird Sanctuary (HAS)	44,45 (30%),47 (10%),48	1,146	Burkett pers. comm.
Bolivar Peninsula (Elm Grove Preserve) (TNC)		308	
Boy Scout Woods Sanctuary, High Island and Smith Oaks Sanctuaries (HAS/TNC)	34 (30%)	256	Burkett pers. comm.
Brazoria National Wildlife Refuge (FWS), Christmas Bay State Coastal Preserve (GLO), Follets Island (GLO), West Slop Bowl (CTC)	33 (16%),39 (5%),40 (<1%),41 (12%),42a and 42b (24%),44,45 (10%),47 (<1%),49	44,414 (FWS) 485 (land) (GLO) 200 (CTC)	TPWD 1996; FWS 1997, 1999; Lange pers. comm.
Brazos Bend State Park (TPWD)	19 (2%),32,33 (8%),37 (25%),38,39 (12%)	4,897	TPWD 1978, TPWD 1996
Buccaneer Cove (Coastal Bend Land Trust)		134	
Candy Abshier WMA (TPWD)	34 (18%),38,41 and 42a (40%)	207	TPWD 1996
Challenger 7 Memorial Park (Harris County)	35 (2%),41 (<10%)	part of 320	Boyd pers. comm.

Francine Cohn Preserve (TNC)		302	
Frost Deen Preserve (GBF)	33,38,41,42a,42b, 44,45	35	Green pers. comm.
Galveston Island State Park (TPWD)	38 (5%),40 (74%),42b (3%),44,45 (15%),47 (<1%)	1,959	TPWD 1996
Goliad State Park and Historic Site (TPWD)	26,55	144	TPWD 1996
Goose Island State Park (TPWD)	35a (15%),35b,38 (7%),44 (6%),45 (6%)	447	TPWD 1996
Guadalupe Delta WMA (TPWD)	19,39,41,42a,42b	6,777	Ortego pers. comm.
Hog and Schwing Bayous Preserve (GBRT)		815	
Horseshoe Marsh Bird Sanctuary (HAS)		645	
Intracoastal Property (HAS)	45	66	Burkett pers. comm.
Jesse Jones Nature Center (Harris County)		225	
John M. O'Quinn Estuarial Corridor (Scenic Galveston)		2,840	
Justin Hurst WMA (TPWD)	29,33,37,38,39,41, 42a,42b,44,45,47	15,612	TPWD 1996, Ortego pers. comm.
Katy Prairie Conservancy preserves (mult. tracts)	15a,26,33,38	11,597	
Laguna Atascosa National Wildlife Refuge - South Padre Island (FWS)	38,40,47,48	24,831	Judd et al. 1977
Lafitte's Cove Nature Preserve			
Lower Neches WMA (TPWD)	4 (9%),37 (<1%),39 (13%),42a (75%)	3,077 (land)	TPWD 1996
Mad Island WMA (TPWD) and Runnels Family Mad Island Marsh Preserve (TNC)	33,36,39,41 (44%),42a,44,45	7,281 (TPWD) 7,063 (TNC)	TPWD 1996, Dumesnil pers. comm.
Matagorda Island WMA and Aransas National Wildlife Refuge Matagorda Island Unit (FWS/TPWD/GLO)	36 (<1%),38 and 39 (6%?),40 and 41 (33%),42b,44,45 (19%?),47 (3%),49 (10%)	26,166 (state), 30,502 (FWS)	FWS et al. 1990, McAlister pers. comm.
Matagorda Peninsula Tract (GLO)	40 (20%),42b (20%), 45 (50%),47 (10%)	6,942	TPWD 1996
McFaddin National Wildlife Refuge (FWS and conservation easement), Sea Rim State Park and J.D. Murphree WMA (TPWD)	33 (<1%),38 (<1%),39 (1%),41,42a,42b,44,4 5 (<1%),47	51,112 (FWS) 7,749 (easement) 24,366 (TPWD)	TPWD 1996; Walther pers. comm.
Moody National Wildlife Refuge (FWS conservation agreement)	Not available	3,517	

Mousa Property (HAS)	14	13	Burkett pers. comm.
Mustang Island State Park (TPWD)	40 (50%),44 (25%),47 (15%),48 (10%)	3,700	TPWD 1996
Nannie M. Stringfellow WMA (TPWD)	16 (15%),19,37 (50%),39 (20%)	3,552	Lange pers. comm.
Nash Prairie Preserve (TNC)	28 (18%),? (80%)	427	Singhurst pers. comm.
North Deer Island (HAS)	36	7.6	Burkett pers. comm.
Nueces River Delta Preserve (Coastal Bend Bays and Estuaries Program)		5,430	
Padre Island National Seashore (NPS) and North Padre Island tract (GLO)	38 and 39 (16%),40 (10%),42a,44,47 (5%),48 (22%),49 (20%?)	83,381 (NPS) 44,982 (water) 3,751 (GLO)	Laine and Ramsey 1998
Port Aransas Nature Preserve at Charlie's Pasture		1,217	
Pierce Marsh Preserve (GBF/TNC)	41,42b,45,48	985 (GBF), 1,361 (TNC)	Green pers. comm.
Redhead Pond WMA (TPWD/TNC)	41,42b,49	37	TPWD 1996
Rich Sanctuary (GBF)	33,39,43,45	167	Green pers. comm.
Sabine Pass Battleground State Historic Site (THC)	42a (28%)	54	TPWD 1996
San Bernard National Wildlife Refuge (FWS)	26 (2%),33 (2%),39 (4%),41 (26%),42a and 42b (25%),44, 45 (19%),47 (1%),49	27,414	FWS 1997,1999; Lange pers. comm.
San Jacinto Battleground State Historic Site (TPWD)	42b (1%),45 (10%)	1,117	TPWD 1996
Shamrock Island Preserve (TNC/GLO)	49	110	
Stephen F. Austin State Park (TPWD)	50 (43%)	664	TPWD 1996
Sweetwater Tract (GBF)	38,41,42b,45,48	458	Green pers. comm.
Texas City Prairie Preserve (TNC)		2,313	
Texas Point National Wildlife Refuge (FWS)	38 and 39 (<1%),41 (8%),42a (2%),42b and 45 (65%?),48,49	8,952	Diamond and Smeins 1986, Walther pers. comm.
Varner-Hogg Plantation State Historic Site (THC)	37 (15%)	66	TPWD 1996
Welder Flats State Coastal Preserve (GLO)	48,49	1,480	

Welder Wildlife Refuge (Rob/ Bessie Welder Wildlife Foundation)	33,53a,55,64	6,800	Drawe et al. 1978
Total: 627,883 acres (5.8 percent of region)			
Abbreviations of Managing Entities:			
FWS=U.S. Fish and Wildlife Service	CTC=Cradle of Texas Conservancy	GBF=Galveston Bay Foundation	
GLO=Texas General Land Office	GBRT=Guadalupe-Blanco River Trust		
TPWD=Texas Parks and Wildlife Dept.	HAS=Houston Audubon Society		
THC=Texas Historical Commission	TNC=Nature Conservancy		