



St. Marks National Wildlife Refuge (Wakulla County)

Photo by Amy Jenkins

### **Tidal Marsh**

**Description:** Tidal marsh is a largely herbaceous community that occurs in the portion of the coastal zone affected by tides and seawater and protected from large waves, either by the broad, gently sloping topography of the shore or by a barrier island. The width of the intertidal zone depends on the slope of the shore and the tidal range. Tidal marsh may have distinct zones of vegetation, each dominated by a single species of grass or rush. Saltmarsh cordgrass (*Spartina alterniflora*) dominates the seaward edge and borders of tidal creeks, areas most frequently inundated by the tides., Needle rush (*Juncus roemerianus*) dominates higher, less frequently flooded areas (Eleuterius and Eleuterius 1979). Other characteristic species include Carolina sea lavender (*Limonium carolinianum*), perennial saltmarsh aster (*Symphyotrichum tenuifolium*), wand loosestrife (*Lythrum lineare*), marsh fimbry (*Fimbristylis spadicea*), and shoreline seapurslane (*Sesuvium portulacastrum*). The landward edge of the marsh is influenced by freshwater influx from the uplands and may be colonized by a mixture of high marsh and inland species including needle rush, sawgrass (*Cladium jamaicense*), saltmeadow cordgrass (*Spartina patens*), Gulf cordgrass (*Spartina spartinae*), and sand cordgrass (*Spartina bakeri*), among others. A border of salt tolerant shrubs, such as groundsel tree (*Baccharis halimifolia*), saltwater falsewillow (*Baccharis angustifolia*), marshelder (*Iva frutescens*), and christmasberry (*Lycium carolinianum*) often marks the transition to upland vegetation (Clewell 1997).

Slightly higher areas within the marsh, flooded only by storm tides or extreme high tides, and isolated from freshwater influx from the surrounding uplands become very saline and desiccated due to evaporation. These flats are dominated by species that can tolerate high salinities, consisting of either succulents, such as saltwort (*Batis maritima*), perennial glasswort (*Sarcocornia perennis*), annual glasswort (*Salicornia bigelovii*), and bushy seaside oxeye (*Borrichia frutescens*); or short grasses, such as saltgrass (*Distichlis spicata*), seashore paspalum (*Paspalum vaginatum*), and shoregrass (*Monanthochloe littoralis*). These areas are also known as salt flats, mud flats, saline flats, or salt barrens.

Salt marsh soils range from deep mucks with high clay and organic content in the deeper portions to silts and fine sands in higher areas. The organic soils have a high salinity, neutral reaction, and high sulfur content; properties of soils of the tidal marsh flats on higher portions of the marsh are little studied (Coultas 1997).

**Characteristic Set of Species:** saltmarsh cordgrass, needle rush, saltgrass, saltwort, perennial glasswort, seaside oxeye, saltmeadow cordgrass, marsh elder, christmasberry

**Rare Species:** Three rare plants are found in tidal marshes: Godfrey's spiderlily (*Hymenocallis godfreyi*), endemic to Wakulla County, golden leather fern (*Acrostichum aureum*) in South Florida, and beaked spikerush (*Eleocharis rostellata*) along brackish shores in the Florida Panhandle.

A large number of rare animals are found in tidal marshes. The saltmarsh topminnow (*Fundulus jenkinsi*) is found in tidal channels in western Panhandle and ranges west to Texas. The Atlantic salt marsh snake (*Nerodia clarkii taeniata*) is endemic to Volusia County and its close relative, the Gulf coast salt marsh snake (*N. c. clarkii*), ranges from the vicinity of Cedar Key westward to Texas. The American crocodile (*Crocodylus acutus*) utilizes tidal marsh as well as tidal swamp at the south end of the Florida peninsula, on Key Largo, and on islands in Florida Bay.

Several bird species nest in tidal marshes and are dependent on them for their entire life cycle. These include three seaside sparrows: MacGillivray's (*Ammodramus maritimus macgillivraii*) in Nassau and Duval counties; Scott's (*A. m. peninsulae*) along the Gulf coast from Pinellas to Franklin County, and Louisiana (*A. m. fisheri*), ranging from Santa Rosa County west to Texas. Two marsh wrens also breed in tidal marshes in Florida, preferring the taller vegetation along tidal creeks: Worthington's marsh wren (*Cistothorus palustris griseus*) which ranges from South Carolina to northeast Florida, and Marian's marsh wren (*C. p. marianae*) which occurs in the Big Bend area from Pasco to Franklin County, with a disjunct population in upper Escambia Bay, Santa Rosa County. The Florida clapper rail (*Rallus longirostris scottii*), utilizes tidal marshes from Pensacola south to Cape Sable and north on the Atlantic coast to Jupiter. The black rail (*Laterallus jamaicensis*) winters in northern Florida where it utilizes upper marsh habitat. Among wading birds, the reddish egret (*Egretta rufescens*), tricolored heron (*Egretta tricolor*), and roseate spoonbill (*Platalea ajaia*) favor coastal flats and marshes. Other wading birds that frequent coastal marshes include white ibis (*Eudocimus albus*), little blue heron (*Egretta caerulea*), and great white heron (*Ardea herodias occidentalis*) found in South Florida.

Several rare mammals utilize the infrequently flooded upper marsh habitat, especially areas with saltgrass (*Distichlis spicata*). The common rice rat (*Oryzomys palustris*), which is found in tidal marshes throughout the southeast has two rare varieties in Florida: the Sanibel Island rice rat (*O. p. pop. 2*) and the key rice rat (*O. p. pop. 3*). The salt marsh vole (*Microtus pennsylvanicus dukecampbelli*) is known only from tidal marshes in the vicinity of Cedar Key, Levy County. Several subspecies of mink utilize tidal marshes in Florida: southern mink (*Neovison vison pop.1*), found in the Everglades region; Gulf salt marsh mink (*N. v. halilimnetes*), found in the Big Bend from Franklin to Pasco County, and Atlantic salt marsh mink (*N. v. lutensis*), found in Nassau, Duval, and St Johns counties. The Lower Keys rabbit (*Sylvilagus palustris hefneri*) is found on higher elevations within tidal marshes from Big Pine to Boca Chica Key.

Rare invertebrates include three species of tiger beetle: the elusive tiger beetle (*Cicindela striga*), endemic to both east and west Florida tidal marshes; the Florida big-headed tiger beetle (*Tetracha floridana*) found along the Gulf coast of Florida and the saltmarsh tiger beetle (*Cicindela severa*) found along the Gulf coast of Florida and ranging west to Texas.

**Range:** Tidal marshes cover roughly 170,000 hectares in Florida (Montague and Wiegert 1990) and occur along the coast throughout the state, except for the high wave energy shorelines of Palm Beach, Broward and northern Dade counties. The greatest acreage of tidal marsh is concentrated in four areas: three with very gentle seaward slopes (the Big Bend from Wakulla to Pasco Counties, the southwest coast inland from the extensive mangrove fringe in Collier, Monroe, and Dade counties, and the Indian River Lagoon from Volusia to Martin counties) and one with a high tidal range (northeast Florida at the mouths of the St Johns and Nassau Rivers). Outside Florida, tidal marshes dominated by saltmarsh cordgrass and needle rush are found from Delaware to Texas.

**Natural Processes:** Flooding frequency and soil salinity are two the major environmental factors that influence tidal marsh vegetation (Montague and Wiegert 1990). Needle rush and saltmarsh cordgrass both tolerate a wide range of salinities, but cordgrass is found where the marsh is flooded almost daily, whereas needle rush is found where the marsh is flooded less frequently (Eleuterius and Eleuterius 1979). Saltmarsh cordgrass dominates the low marsh (portion below mean high water level), whereas needle rush occupies the high marsh (portion above mean high water level). Both species tend to form taller stands along tidal creeks where salinity is lower and shorter stands where salinity is higher.

Tidal marshes are some of the most biologically productive natural communities known. The base of the food chain is supplied not only by the rooted plant matter, but also by algae and detritus found on the stems of plants, on the sediment surface, and suspended in the water column of pools and tidal creeks. Commercial marine species that spend all or part of their life cycle in tidal creeks include mullet (*Mugil spp.*), spot (*Leiostomus xanthurus*), blue crabs (*Callinectes sapindus*), oysters (*Crassostrea virginica*), and shrimp (*Penaeus spp.*). The smaller minnows and juvenile fish in tidal creeks provide food for many recreationally important predatory fish, such as tarpon (*Megalops atlanticus*), snook (*Centropomus undecimalis*), red drum (*Sciaenops ocellatus*), and spotted seatrout (*Cynoscion nebulosus*; Montague and Wiegert 1990).

While there are no data on natural fire frequency in tidal marshes, fires probably occurred periodically, either by spreading from nearby uplands or from lightning strikes in the marsh itself. Needle rush re-sprouts vigorously after fire but, if burned on an annual basis, declines and is replaced by upland species (Clewell 1997). Seaside sparrows can quickly re-colonize following small-scale fires; however catastrophic fires may kill even adult birds (Post and Greenlaw 1994). Natural barriers such as tidal creeks and salt barrens would probably have naturally limited the area burned in each fire, allowing unburned marsh to serve as a refuge for species dependent on marsh habitat.

**Community Variations:** Although the two dominant marsh plants, salt marsh cordgrass and needle rush, range throughout Florida, the extent of the zone occupied by each varies with physical conditions (Kurz and Wagner 1957). On the Gulf coast, with a low tidal range of 0.6 to 0.9 meters (2 to 3 feet) and gentle seaward slope, most of the marsh is above mean high water level and is dominated by needle rush, with saltmarsh cordgrass often forming only a fringe along the seaward edge of the marsh and along tidal creeks. On the northeast coast with a tidal range of 1.4 to 1.8 meters (5 to 6 feet), most of the marsh at the river mouths is below mean high water and is dominated by saltmarsh cordgrass, with needle rush confined to a fringe on the landward margin. Away from the river mouths, however, tidal flushing is reduced, and needle rush makes up most of the marsh area. The Indian River Lagoon has a small tidal range and its marshes are mostly above mean high water. Before impoundment, they had a high marsh flora typical of salt flats (saltgrass, perennial glasswort, etc.), with needle rush forming a fringe at the landward edge (Montague and Wiegert 1990).

Most salt marsh species range throughout Florida, but a few are confined to South Florida. Species in South Florida marshes that are rare or absent in North Florida marshes include golden leather fern, tree seaside oxeye (*Borrichia arborescens*), hurricanegrass (*Fimbristylis cymosa*), narrowleaf yellowtops (*Flaveria linearis*), and seaside heliotrope (*Heliotropium curassavicum*).

From Brevard and Pinellas counties southward, tidal swamps of mangroves (*Rhizophora mangle*, *Avicennia germinans*, and *Laguncularia racemosa*) dominate the seaward portion of the tidal zone (below mean high water) with tidal marsh confined to the upper marsh zone where it is usually dominated by needle rush. Salt marsh cordgrass, if present, occurs as a fringe bordering the mangroves (Hine and Belknap 1986; Montague and Wiegert 1990). Tidal marsh in the Keys is dominated by Gulf cordgrass (Ross et al. 1992).

The following variant is defined for tidal marsh.

Variant: TIDAL MARSH BARREN – These are higher portions of the salt marsh that are too saline and desiccated to support much plant cover. Vegetation is limited to a very sparse and stunted cover of succulents and/or shoregrass and these areas often appear on aerial photographs as white patches within the marsh (Clewell 1997).

**Associated Communities:** Tidal marsh grades into floodplain marsh as one travels up rivers and is distinguished from floodplain marsh by the dominance of needle rush or saltmarsh cordgrass rather than freshwater species, such as sawgrass. The higher portions

of tidal marsh adjacent to beach dune may include some dune species such as beach cordgrass, seashore paspalum, and seashore dropseed but can be distinguished from the dune by a lack of sea oats (*Uniola paniculata*), bitter panicgrass (*Panicum amarum*), and Gulf bluestem (*Schizachyrium maritimum*). Tidal marsh is distinguished from coastal berm by the absence of the upland shrub species such as joewood (*Jacquinia keyensis*), Florida Keys blackbead (*Pithecellobium keyense*), and others. In its early developmental stages, coastal interdunal swale may be subject to periodic inundation by salt water and share some species with tidal marsh such as seashore paspalum and marsh fimbry, but as the dunes around it build up and it is cut off from the sea, the swale becomes dominated by freshwater species, such as hairawn muhly (*Muhlenbergia capillaris*; Johnson 1997). Tidal marsh is distinguished from tidal swamp by the predominance of herbaceous, rather than woody, species.

**Management Considerations:** Currently about 65 percent of the total area of tidal marsh in the state is protected on conservation lands and aquatic preserves. Although large expanses of tidal marsh remain in natural condition along the coasts of the Big Bend, northeast Florida, and the Everglades, many marshes closer to population centers have been either destroyed by bulkheading and filling or impacted by ditching and impoundment for mosquito control. The state originally held title to all tidal marshes as sovereign submerged lands but sale to private owners was encouraged prior to the 1960's before the value of marshes to marine life was recognized (Rudloe 1972; Hamann and Tucker 1997). Close to half the area of tidal marsh fringing Charlotte Harbor and Tampa Bay was lost to development between 1950 and 1980. Along with loss of marshes came loss of adjacent seagrass beds, due in part to the increased turbidity of the water caused by the reduction in sediment filtration that the marsh once provided (Haddad and Joyce, Jr. 1997).

Many tidal marshes along the east coast south of Jacksonville were ditched and/or impounded for mosquito control in the 1940's, denying the female salt marsh mosquitoes (*Aedes taeniorhynchus*, *A. sollicitans*) the damp mud surface which they require for egg laying. Tidal marsh plants, however, cannot tolerate permanent flooding and die when the marsh is impounded. Most of the publicly owned marshes in Brevard and Volusia counties have been re-opened to tidal flushing. Some of these areas have re-established to tidal marsh, but others have lost too much sediment for marsh plants to re-colonize (Parkinson et al. 2006).

Pesticides sprayed on marshes to control mosquitoes adversely affect the marsh food chain. Changes in the east coast marshes resulting from these various mosquito control measures contributed to the extinction of the dusky seaside sparrow (*Ammodramus maritimus nigrescens*) on Merritt Island and the reduction in range of MacGillivray's seaside sparrow south of the St. Johns River (Post and Greenlaw 1994). Tidal marshes in the Everglades and Big Bend region have not been as heavily impacted, but human population growth is increasing north of Tampa and on the northeast coast and pressure for marinas, coastal development, and mosquito control will follow (Haddad and Joyce, Jr. 1997).

Prescribed burns have traditionally been used in tidal marshes to provide tender shoots as food for geese and other wildlife and to decrease the possibility of wildfires. Fire should

be used with caution in marshes so as not to cause destructive peat fires or adversely affect rare bird or other species dependent on the marsh habitat for nesting and foraging (Nyman and Chabreck 1995).

Sea level rise is already affecting tidal marsh distributions in at least one portion of Florida. Along the broad, flat Big Bend coast, sea level rise has led to the invasion of marsh grasses into the lower parts of the hammock islands that dot these marshes. These islands are dominated by sand live oak (*Quercus geminata*), slash pine (*Pinus elliottii*), red cedar (*Juniperus virginiana*), and cabbage palm (*Sabal palmetto*). The presence of former islands is marked by groups of trunks of dead cabbage palms (the most salt tolerant of the upland trees) standing in the middle of what is now tidal marsh (Williams et al. 1999).

**Reference Sites:** St. Marks National Wildlife Refuge, Big Bend Wildlife Management Area, Lower Suwannee National Wildlife Refuge, Nassau River - St. Johns River Marshes Aquatic Preserve, Everglades National Park, Florida Keys Wildlife and Environmental Area (Lower Sugarloaf Key)

**Global and State Ranks:** G4/S4

**Crosswalk and Synonyms:**

Davis	9/Coastal marsh
SCS	18/Salt Marsh
Myers and Ewel	Salt Marshes
FLUCCS	642/Saltwater Marshes

Other synonyms: saltmarsh, coastal wetlands, tidal wetlands

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Timucuan Ecological and Historic Preserve (Duval County; salt marsh cordgrass in foreground)  
Photo by Gary Schultz

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