

**To: Paul Castelli**

**From: Bill Crouch**

**Date: 16 September 2011**

**Subject: Definition of High and Low Marsh**

Recent conversations with Forsythe partners have highlighted differences in the use of the terms “high marsh” and “low marsh”, when referring to salt marsh wetlands along the coast of New Jersey. The excerpts below, taken from respected and referenced sources, serve to elucidate these terms and provide us a common perspective from which to move forward with our upcoming OMWM discussions.

“The intertidal zone or lower marsh next to the estuary, bay, or tidal creek is dominated by the tall form of *Spartina alterniflora* Loisel (cordgrass). In the high marsh, *S. alterniflora* gives way to extensive stands of *S. patens* (salt-meadow grass) mixed with *Distichlis spicata* (spike grass) and occasional patches of the shrub *Iva frutescens* (marsh elder) and various forbs.”

Page 241 in: Mitsch, W.J. and J.G. Gosselink. 1993. Wetlands, 2nd ed., Van Nostrand Reinhold, New York, 722 pp

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Table 8-4 Examples of common plant species in salt marshes for various regions in North America

Coastal Plain-

lower marsh *Spartina alterniflora*

upper marsh *S. patens*, *Distichlis spicata*, *Salicornia* sp., *Juncus roemerianus*

Page 240 in: Mitsch, W.J. and J.G. Gosselink. 1993. Wetlands, 2nd ed., Van Nostrand Reinhold, New York, 722 pp

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National Conservation Training Center - Wetlands course:

F. Wetland Classification and Characterization: Salt Marshes

“As is typical of most salt marshes along the shoreline of Long Island Sound, the dominant vegetation zone is the high marsh, characterized by black grass (*Juncus gerardii*), salt-meadow cord-grass (*Spartina patens*), and spike grass (*Distichlis spicata*). The vegetation here often forms a mosaic rather than a distinct zone. Other plant associates include seaside goldenrod (*Solidago sempervirens*), perennial salt marsh aster (*Aster tenuifolius*), salt marsh aster (*Aster subulatus*), and spearscale (*Atriplex patula* var. *hastata*). Also found on the high marsh are pannes, or shallow depressions, containing glasswort (*Salicornia europaea*), stunted smooth cordgrass (*Spartina alterniflora*), sea lavender (*Limonium nashii*), seaside plantain (*Plantago oliganthos*), sea blite (*Sueda maritima*), and arrow-grass (*Triglochin*

*maritimum*). The low marsh zone exists as a narrow band along the waterward edge of the marsh, including creeks and ditches. Smooth cordgrass typically forms a monoculture here. “

[http://library.fws.gov/pubs5/ramsar/web\\_link/wetclass.htm](http://library.fws.gov/pubs5/ramsar/web_link/wetclass.htm) (accessed 8 September 2011)

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“High marsh is a tidal marsh zone located above the Mean Highwater Mark (MHW) which, in contrast to the low marsh zone, is inundated infrequently during periods of extreme high tide and storm surge associated with coastal storms. The high marsh is the intermittent zone between the low marsh and the uplands, an entirely terrestrial area rarely flooded during events of extreme tidal action precipitated by severe coastal storms.”

[http://en.wikipedia.org/wiki/High\\_marsh](http://en.wikipedia.org/wiki/High_marsh) (accessed 8 September 2011)

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#### The Native Plant Society of NJ

The first halophyte to colonize the flat and transform it into a marsh is saltmarsh cordgrass, *Spartina alterniflora*.

The tallest cordgrass is along the bay's edge and along the tidal creeks that braid their way through the marsh. Here, the pulse of tides flushes away debris from the plant's base and brings nutrients and oxygen that stimulate growth. Behind these 6-foot blades, a shorter form of the same species grows to just 1 ½ feet tall.

Farther back from the incoming tides, in the "high marsh" zone, saltmeadow cordgrass, or *Spartina patens* grows. These high meadows are flooded on an irregular basis, on the full and new moons, and during storm events. You can recognize a high marsh by *S. patens* tendency to lie flat in swirls called "cowlicks". Because it is not constantly cleansed by tides, old growth remains like a mulch at the base of the plant, keeping the ground moist and providing protected runways for many small rodents.

[http://www.npsnj.org/salt\\_marshes.htm](http://www.npsnj.org/salt_marshes.htm) (accessed 8 September 2011)

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"In southern New England, neither *Spartina patens* nor *Juncus gerardi*, which dominate high-marsh habitats, is capable of rapidly invading patches with high soil salinities (Berness 1991a)."

Page 296: Pennings, SC & MD Bertness. 2001. Salt marsh communities. In: Bertness, MD, Gaines, SD & ME Hay. Marine community ecology. Sinauer Associates, Inc. Sunderland, MA. USA. 550 pp.

"...smooth cordgrass (*Spartina alterniflora*), which dominates frequently flooded salt marsh habitats on the Atlantic coast of North America, has surface roots in the top 2-3 cm of the soil that help oxygenate the deeper roots (Anderson 1974)."

Page 291: Pennings, SC & MD Bertness. 2001. Salt marsh communities. In: Bertness, MD, Gaines, SD & ME Hay. Marine community ecology. Sinauer Associates, Inc. Sunderland, MA. USA. 550 pp.

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## Smithsonian Marine Station at Fort Pierce

### Salt Marsh Habitats: Flooding & Anoxia

As intertidal habitats, much of the vegetation in salt marshes experiences periodic tidal flooding. Low and mid marsh areas can be submerged for hours, and high marshes can experience storm surge that can affect more upland vegetation. The frequency and duration of flooding events, as well as the tolerance of individual species to saltwater submersion, is a major determinant of salt marsh zonation. Zonation occurs when various salt marsh plant species thrive in specific elevation ranges. Lower limits of plant zonation are usually set by environmental tolerances, while upper limits are mainly the result of interspecific competition (Pennings & Bertness 2001). Some plants, such as *Spartina alterniflora*, can withstand and are even limited to areas that receive substantial flooding (Montague & Wiegert 1990). Other vegetation, like *Juncus roemerianus*, prefers less frequent flooding (Eleuterius & Eleuterius 1979). Submersion in water can create a host of problems for vegetation including increased intake or loss of salts through tissues and greater exposure to aqueous toxins (Adam 1990). Waterlogged soil and high levels of decaying material can deplete oxygen, creating anoxic sediments and producing toxic sulfides (Ponnamperuma 1972, Drake 1989, Adam 1990, Pezeshki 1997). Most plants that grow in anoxic soil produce adventitious roots near the sediment surface to facilitate oxygen uptake. For example, frequently flooded plants like *S. alterniflora* grow roots in the top 3 cm of the sediment that help oxygenate deeper roots (Anderson 1974). Some plants also have a well-developed system of air passages called aerenchyma tissue, which transfer oxygen from the atmosphere to submerged roots (Ponnamperuma 1972, Armstrong 1979).

<http://www.sms.si.edu/irlspec/Saltmarsh.htm> (accessed 8 September 2011)

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## Wertheim National Wildlife Refuge

High Marsh (12.2%) - High marsh is dominated by salt hay, short growth form cordgrass, salt grass, black grass, and saltmarsh bulrush. High marsh occurs between the intertidal marsh and terrestrial lands. High marsh is flooded either during high rainfall events, spring tides, or above normal high tides.

<http://www.fws.gov/refuges/profiles/WildHabitat.cfm?ID=52561> (accessed 8 September 2011)