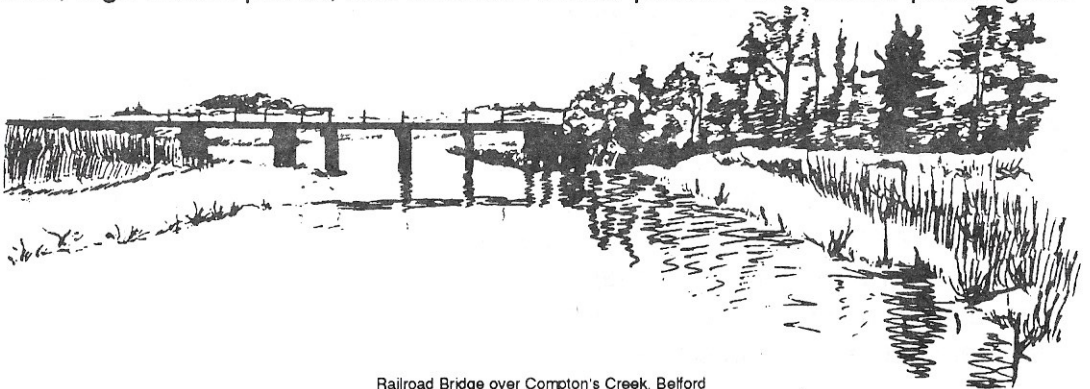


mudflats started the development of tidal marshes. The plants accelerated sediment accumulation by slowing water movement which caused more sediment to drop out of suspension. Mudflats increased in size which also created more plant habitat. Plant growth was hindered in the mudflat channels because of the flushing action of the tides. Water movement also prevented any sediment deposition within the channels.

The tidal marshes of the Middletown bayshore area are located within the watersheds of Pews, Comptons, and Ware Creeks. These creeks were once tributaries to the ancestral Raritan River and became flooded by the rising sea level. Littoral currents along the beach deposited sand, like Sandy Hook, across the flooded valleys of Pews and Comptons Creeks. Tidal currents kept the creek channels open and prevented the complete closure of the flooded valleys. The flood currents also brought sediment into the creeks to allow the development of wetland vegetation. The source of suspended sediment was the wave-sorting of glacial material and the turbid flood waters of the Raritan and Hudson Rivers. Stream-transported sediment from the upland portions of the creeks have also been deposited in the marshes. Within the one mile distance between Route 36 and the Raritan Bay the creek channels have a rapid salinity change. The streams are discharging fresh water into the marshes while tidal currents at the creek mouths are bringing salt water into the marshes.

PLANTS OF THE TIDAL MARSH

The plants that are typical of the tidal marshes can be classified as low marsh plants, high marsh plants, and brackish marsh plants. Low marsh plants grow



Railroad Bridge over Compton's Creek, Belford

at the water's edge where tidal flooding is relatively constant. High marsh plants grow where tidal flooding occurs occasionally. Brackish marsh plants are found in areas where tidal flooding and inland streams meet and the salt content of the water is lower.

Low marsh plants are mainly grasses of which the predominant species is salt marsh cordgrass. It is an upright, coarse -textured grass that grows on the water's edge. Other species include spike grass, black rush, salt marsh aster, sea lavender, and the glassworts. These species can tolerate the high salt conditions found at these sites. The cordgrasses (*Spartina*) are actually able to excrete excess salts! The high marsh plants are dominated by salt-meadow grass, a relative of cordgrass. Salt meadow-grass, or salt hay, is a finer textured grass that is easily formed by winds and water. Other species include big cordgrass, sea lavender, salt marsh bulrush, and black grass. Bayberry, switchgrass, and seaside goldenrod are also occasionally found. The brackish marsh plants are the most diverse. The transition from salt-tolerant plants to fresh water plants is evident here. Big cordgrass, salt hay, narrow-leaved cattail, phragmite, and rose mallow are some of the typical plants found here. The yearly differences in runoff or coastal flooding determine which species thrive in a particular season.

Species List

Annual salt marsh aster (*Aster subulatus*)
Beaked spike rush (*Eleocharis rostellata*)
Big cordgrass (*Spartina cynosuroides*)
Black grass (*Juncus gerardi*)
Groundsel bush (*Baccharis halimifolia*)
Indigo bush (*Amorpha fruticosa*)
Low sea-bite (*Suaeda maritima*)
Marsh elder (*Iva frutescens*)
Narrow-leaved cattail (*Typha augustifolia*)
Orache (*Atriplex patula*)
Perennial salt marsh aster (*Aster tenuifolius*)
Phragmites (*Phragmites australis*)
Rose mallow (*Hibiscus moscheutos*)
Salt marsh bulrush (*Scirpus robustus*)

Salt marsh cockspur (*Echinochloa walteri*)
Salt marsh cordgrass (*Spartina alterniflora*)
Salt marsh fleabane (*Pluchea odorata*)
Salt marsh sand spurrey (*Spergularia maritima*)
Salt-meadow grass (*Spartina patens*)

ANIMALS OF THE TIDAL MARSH

(For a description of each major group, please see Beach and Dune section.)

There are quite a few species found in the tidal marsh that are also found in the bay, especially among the mollusks, crustaceans and fishes. This demonstrates adaptability to a range of salt concentrations in the water. Species found upstream where there is little or no salt tend to be the same species found in fresh water marshes elsewhere, and marine species are found downstream where salt content is high. Because of this range of habitat in the tidal marsh, many species of birds can feed here without competing for food sources. During migration in spring and fall, flocks of birds may use the tidal marsh as a stopover, to rest and feed.

Annelids

Rosy Magelonas (*Magelona rosea*)
Trumpet Worm (*Petinaria gouldii*)

Mollusca

Common Marsh Snail (*Melampus bidentatus*)
Common Moon Snail (*Lunatia heros*)
Ribbed Mussel (*Modiolus demissus*)
False Angel Wing (*Petricola poladiformis*)
Atlantic Oyster Drill (*Urosalpinx cinerea*)
American Oyster (*Crassostrea virginica*)
Bay Scallop (*Aequipecten irradians*)
Blue Mussel (*Mytilus edulis*)
Quahog (Hard Clam) (*Mercenaria mercenaria*)
Shipworm (*Teredo navalis*)
Squid (*Lolliguncula brevis*)

Crustacea

Northern Rock Barnacle (*Balanus balanoides*)
Hermit Crab (*Pagurus longicarpus*)

American Lobster (*Homarus americanus*) (juvenile)
Blue Crab (*Callinectes sapidus*)
Fiddler Crab (*Uca pugnax*)
Rock Crab (*Cancer irroratus*)
Mud Crab (*Eurypanopeus depressus*)

Fishes

American Eel (*Anguilla rostrata*)
Sheepshead Minnow (*Cyprinodon variegatus*)
Mummichog (Killifish) (*Fundulus heteroclitus*)
Striped Mummichog (Striped Killifish) (*Fundulus majalis*)
Bay Anchovy (*Anchoa mitchilli*)
Striped Anchovy (*Anchoa hepsetus*)
Atlantic Silverside (Shiner) (*Menidia menidia*)
Alewife (*Alosa pseudoharengus*)
American Shad (*Alosa sapidissima*)
Atlantic Menhaden (Bunker) (*Brevoortia tyrannus*)
Atlantic Sturgeon (*Acipenser oxyrinchus*)
Shortnose Sturgeon (*Acipenser brevirostrum*)
White Perch (*Morone americana*)
Scup (Porgy) (*Stenostomus chrysops*)
Black Drum (*Pogonias cromis*)
Tautog (*Tautoga onitis*)
Winter Flounder (*Pseudopleuronectes americanus*)
Bluefish (*Pomatomus saltatrix*)
Weakfish (Sea Trout) (*Cynoscion regalis*)
Summer Flounder (Fluke) (*Paralichthys dentatus*)
Striped Bass (*Morone saxatilis*)

Reptiles

Diamondback terrapin (*Malaclemys terrapin*)
Snapping turtle (*Chelydra serpentina*)
Mud turtle (*Kinosternon subrubrum*)
Musk turtle (*Sternotherus odoratus*)

Birds

American Bittern (*Botaurus lentiginosus*)
Great Blue Heron (*Ardea herodias*)
Great Egret (*Casmerodius albus*)
Snowy Egret (*Egretta thula*)
Little Blue Heron (*Florida caerulea*)
Tricolored Heron (*Hydranassa tricolor*)
Green Heron (*Butorides striatus*)
Black-crowned Night Heron (*Nycticorax nycticorax*)
Glossy Ibis (*Plegadis falcinellus*)
American Black Duck (*Anas rubripes*)
Osprey (*Pandion haliaetus*)
Rough-legged Hawk (*Buteo lagopus*)
Northern Harrier (*Circus cyaneus*)
Clapper Rail (*Rallus longirostris*)
Semipalmated Plover (*Charadrius semipalmatus*)
American Oystercatcher (*Haematopus palliatus*)
Greater Yellowlegs (*Tringa melanoleuca*)
Willet (*Catoptrophorus semipalmatus*)
Whimbrel (*Numenius phaeopus*)
Herring Gull (*Larus argentatus*)
Laughing Gull (*Larus atricilla*)
Ring-billed Gull (*Larus delawarensis*)
Forster's Tern (*Sterna forsteri*)
Black Skimmer (*Rynchops niger*)
Short-eared Owl (*Asio flammeus*)
Tree Swallow (*Iridoprocne bicolor*)
Marsh Wren (*Cistothorus palustris*)
Sharp-tailed Sparrow (*Ammospiza caudacuta*)
Seaside Sparrow (*Ammospiza maritima*)
Boat-tailed Grackle (*Quisicalus major*)

Mammals

Raccoon (*Procyon lotor*)
Muskrat (*Ondatra zibethicus*)
Gray squirrel (*Sciurus carolinensis*)
White-Footed Mouse (*Peromyscus leucopus*)

Meadow Vole (*Microtus pennsylvanicus*)
Pine Vole (*Pitymys pinetorum*)
Norway Rat (*Rattus norvegicus*)
House Mouse (*Mus musculus*)
Eastern Cottontail (*Sylvilagus palustris*)
Opossum (*Didelphis marsupialis*)

WHY SHOULD WE CARE? THE IMPORTANCE OF MARSHES

Besides the overwhelming number of birds which rely specifically on marsh habitats for food, breeding grounds, and nesting materials, a surprising number of fish and animal species rely upon marshes as well. In many marshes, as vegetation grows, leaves and stems break down in the water to form detritus, which is the principal food source for many aquatic microorganisms and invertebrates, such as clams, oysters, crabs, and also for small species of fish. Many of these organisms in turn become food for shrimp, larger fish, fur-bearing animals, reptiles, and birds.

Most of the important coastal species of fish spawn offshore but use marshes as protective nursery areas for rearing their young. Several significant species are permanent residents, while others, like striped bass, bluefish, salmon, and flounder are transients that feed in marshes as they pass through. Just as important as the commercial species are the many sport-fishing species which rely upon natural wetlands at some stage of their lives.

Fur bearing mammals such as muskrat and otter, as well as reptiles like turtles, also make tidal marshes their homes.

Not only are tidal marshes important to fish and animals, research has shown that in many ways, tidal marshes are as critical to the quality of human life as they are to the many species that have adapted to their water reliant regime.

Because of their intermediate role between terrestrial and aquatic ecosystems, tidal marshes are also very valuable in helping maintain and improve water quality. Their complicated water-soil-plant structure not only intercepts runoff before it reaches the sea, it also forms an important nutrient processing area