

I. MARINE SYSTEM

The marine system consists of open ocean overlying the continental shelf, the associated coastline that is exposed to wind and waves, and shallow coastal bays that are saline because they lack significant freshwater inflow. The limits extend from mean high water seaward, beyond the limits of rooted vascular vegetation. Salinity is greater than 18.0 parts per thousand (ppt) ocean-derived salts.

A. MARINE SUBTIDAL

This subsystem includes the area below the lowest tide that is permanently flooded with tidal water.

1. Marine deepwater community: a broadly-defined community that includes both quiet and rough waters of the open ocean below the lowest tide level and beyond the seaward limits of rooted vascular vegetation. This community includes all *benthic* substrate types (ranging from rock bottom to unconsolidated bottom), as well as the overlying water column, or *pelagic* component.

Fish typical of the nearshore zone of the Atlantic Ocean include Atlantic menhaden (*Brevoortia tyrannus*), weakfish (*Cynoscion regalis*), striped bass (*Morone saxatilis*), winter flounder (*Pleuronectes americanus*), summer flounder (*Paralichthys dentatus*), bluefish (*Pomatomus saltatrix*), tautog (*Tautoga onitis*), Atlantic mackerel (*Scomber scombrus*), black sea bass (*Centropristis striata*), Atlantic croaker (*Micropogonias undulatus*), northern kingfish (*Menticirrhus saxatilis*), spot (*Leiostomus xanthurus*), American sand lance (*Ammodytes americanus*), and silversides (*Menidia menidia*). Large quantities of surf clam (*Spisula solidissima*) inhabit the nearshore benthos. Marine sea turtles that use the nearshore zone during migration include Atlantic (Kemp's) ridley turtle (*Lepidochelys kempii*), leatherback (*Dermochelys coriacea*), green (*Chelonia mydas*), and loggerhead sea turtles (*Caretta caretta*). The nearshore zone provides winter habitat for harbor seal (*Phoca vitulina*), and gray seal (*Halichoerus grypus*). Other frequently observed marine mammals include finback (*Balaenoptera physalus*), minke (*B. acutorostrata*), and humpback (*Megaptera novaeangliae*) whales. Several dolphin species, including common (*Delphinus delphis*), bottlenosed (*Tursiops truncatus*), white-sided (*Lagenorhynchus acutus*), and striped (*Stenella coeruleoalba*), as well as pilot whales (*Globicephala melaena*), are often encountered. Ocean quahog (*Artica islandica*) is the dominant species in the deeper silty-sand area, and other dominant taxa include echinoderms, annelids, and arthropods (USFWS 1996).

Distribution: in the open ocean surrounding Long

Island, in the Coastal Lowlands ecozone.

Rank: G5 S5

Revised: 2001

Source: Brown 1993; Cowardin et al. 1979; USFWS 1996; Waller 1996.

2. Marine eelgrass meadow: a community of subtidal aquatic beds dominated or codominated by eelgrass (*Zostera marina*) and typically occurring in quiet shallow polyhaline (18 to 30 ppt salinity) waters of temperate tidal embayments below the lowest tide level where fluctuations in salinity are minor.

Characteristic associated plants include a diverse array of attached (rooted and epiphytic) and unattached (suspended) marine algae. Rooted red algae are especially common including graceful red weed (*Gracilaria tikvahiae*), tubed weed (*Polysiphonia denudata*), Grinnell's pink leaf (*Grinnellia americana*), Agardh's red weed (*Agardhiella subulata*), *Rhodomela confervoides*, pod weed (*Chondria baileyana*), *Spyridia filamentosa*, banded weed (*Ceramium* sp.), and rough tangle weed (*Stilophora rhizoides*). Abundant and characteristic epiphytic marine algae include barrel weed (*Champia parvula*), tubed weed (*Polysiphonia stricta*), *Cladophora sericea* and *Pneophyllum fragile*. Other associated marine algae include the green algae sea lettuce (*Ulva lactuca*), hollow green weed (*Enteromorpha* spp.), *Cladophora gracilis*, and the brown algae gulfweed (*Sargassum filipendula*). A common exotic species is the marine green algae, green fleece (*Codium fragile*).

Characteristic animals include fish such as fourspine stickleback (*Apeltes quadracus*), mummichog (*Fundulus heteroclitus*), northern pipefish (*Syngnathus fuscus*), threespine stickleback (*Gasterosteus aculeatus*), silversides (*Menidia* spp.), naked goby (*Gobiosoma boscii*), menhaden (*Brevoortia tyrannus*), winter flounder (*Pseudopleuronectes americanus*), and northern puffer (*Sphoeroides maculatus*), marine mollusks such as bay scallop (*Aequipecten irradians*), common Atlantic slippershell (*Crepidula fornicata*), and northern quahog (*Mercenaria mercenaria*), crustaceans such as nine-spine spider crab (*Libinia emarginata*), mud crabs (e.g., *Dyspanopeus sayi*, *Panopeus herbstii* and *Rithropanopeus harrisi*), and broken-back shrimp (*Hippolyte pleurocantha*), and other marine invertebrates such as short-spine brittle star (*Ophioderma brevispina*), bamboo worms (Polychaeta), and counterclockwise coiled worm (*Spirobis spirillum*). Comb jellies (*Beroe* sp., *Mnemiopsis leidyi*) are common plankton species. Waterfowl known to extensively feed on eelgrass include brant (*Branta bernicla*) and American black duck (*Anas rubripes*) (Good et al. 1978). Plant species

composition is known to vary with different rates of exchange with marine waters. As salinity decreases eelgrass beds may grade into brackish subtidal aquatic beds dominated by widgeon grass (*Ruppia maritima*) (Macomber et al. 1979). Eelgrass meadows are highly productive, provide habitat for a rich variety of marine organisms, and enhance sediment stability. They typically occur on sands to sandy loam soils at 0.6-4.5 m (2 to 15 ft) below mean sea level.

More data on other marine shallow water communities with very little or no eelgrass are needed (e.g., marine macroalgae beds).

Distribution: in the ocean surrounding Long Island, in the Coastal Lowlands ecozone. Known from the outer Peconic Estuary and multiple bays on the south shore of Long Island including Great South Bay and Shinnecock Bay. Small occurrences are suspected from bays on Staten Island and along the north shore of Long Island bordering Long Island Sound.

Rank: G5 S3

Revised: 2001

Example: Gardiners Bay Shelter Island, Suffolk County; Gardiners Island East Shore, Suffolk County; Shinnecock Bay, Suffolk County; Great South Bay, Suffolk County.

Sources: Briggs and O'Connor 1971; Brown 1993; Cashin Associates, P.C. 1996; Dumais et al. 1999; Good et al. 1978; Macomber et al. 1979; Muenscher 1939; Strieb et al. 1995; Thayer et al. 1984; Thorne-Miller et al. 1983; NYNHP field surveys.

B. MARINE INTERTIDAL

This subsystem includes the area between the highest tide level and the lowest tide level; the substrate is periodically exposed and flooded by semidiurnal tides (two high tides and two low tides per tidal day).

1. Marine intertidal mudflats: a community of quiet waters, with substrates composed of silt or sand that is rich in organic matter and poorly drained at low tide. The substrate may be covered with algae.

Characteristic organisms are polychaetes such as *Polydora ligni*, *Streblospio benedicti*, *Nereis virens*, *Lumbrinereis tenuis*, and *Heteromastus filiformis*, mudsnail (*Ilyanassa obsoleta*), softshell clam (*Mya arenaria*), and blue mussel (*Mytilus edulis*). This community is an important feeding ground for shorebirds such as American oystercatcher (*Haematopus palliatus*), and willet (*Catoptrophorus semipalmatus*).

Distribution: along the seacoast of the Coastal Lowlands and Manhattan Hills ecozones.

Rank: G5 S4

Revised: 1990

Sources: Brown 1993; Townes 1939; Whitlatch 1982.

2. Marine intertidal gravel/sand beach: a community washed by rough, high-energy waves, with sand or gravel substrates that are well-drained at low tide. These areas are subject to high fluctuations in salinity and moisture. A relatively low diversity community, it is perhaps best characterized by the benthic invertebrate fauna including polychaetes (*Spiophanes bombyx*, *Pygospio elegans*, *Clymenella torquata*, *Scoloplos fragilis*, and *Nephtys incisa*), and amphipods (*Protohaustorius deichmannae* and *Acanthohaustorius millsii*). It provides feeding grounds for migrant shorebirds such as sanderling (*Calidris alba*) and semipalmated plover (*Charadrius semipalmatus*) and breeding shorebirds such as piping plover (*Charadrius melodus*).

Distribution: along the seacoast of the Coastal Lowlands and Manhattan Hills ecozones.

Rank: G5 S5

Revised: 1990

Examples: Mashomack Preserve, Suffolk County; Jones Beach, Nassau County; Fire Island, Suffolk County; Montauk Point, Suffolk County.

Sources: Brown 1993; Townes 1939; Whitlatch 1982.

3. Marine rocky intertidal: a community inhabiting rocky shores that are washed by rough, high-energy ocean waves. Characteristic organisms are attached algae, mussels, starfish, urchins, and barnacles that can withstand the impact of the waves and periodic desiccation. The community is typically rich in species. Usually more than 60% of the substrate is covered by attached organisms.

Characteristic marine algae attached to the rocks include *Ascophyllum nodosum*, *Fucus vesiculosus*, *Rhizoclonium tortuosum*, *R. riparium*, *Enteromorpha clathrata*, *E. intestinalis*, and *Monostroma latissimum*. More data on this community are needed.

Distribution: uncommon along the seacoast of the Coastal Lowlands and Manhattan Hills ecozones.

Rank: G5 S1S2

Revised: 1990

Examples: Fishers Island, Suffolk County; Montauk

Point and south shore of Montauk Peninsula, Suffolk County; Napeague Bay, Suffolk County; Huckleberry Island, Westchester County.

Sources: Brown 1993; Conard 1935; Künstler and Capainolo 1987; NYNHP field surveys.

C. MARINE CULTURAL

This subsystem includes communities that are either created and maintained by human activities, or modified by human influence to such a degree that the physical conformation of the substrate, or the biological composition of the resident community, is substantially different from the character of the substrate or community as it existed prior to human influence.

1. Marine submerged artificial structure/reef: the aquatic community associated with an artificially introduced structure submerged in marine waters that provides habitat for marine fish and other marine organisms. This includes structures that have been intentionally sunk for the purpose of attracting fish, as well as sunken ships, disposed waste, submerged bridge abutments, or any other introduced material that provides suitable habitat.

Distribution: in the ocean surrounding Long Island, in the Coastal Lowlands ecozone.

Rank: G5 S5

Revised: 1990

Source: Weisburd 1986.

2. Marine dredge spoil shore: the wetland community of a constructed, intertidal or subtidal, marine shore in which the substrate is composed of dredge spoils. This community has minimal vegetative cover and relatively low species diversity. Dredge spoil shores provide foraging habitat for terns, gulls, and several shorebirds.

Characteristic fishes in Great South Bay on sandy dredge spoils include Atlantic silverside (*Menidia menidia*), striped killifish (*Fundulus majalis*), and sheepshead minnow (*Cyprinodon variegatus*).

Distribution: along the seacoast of the Coastal Lowlands and Manhattan Hills ecozones.

Rank: G5 S5

Revised: 1990

Source: Briggs and O'Connor 1971.

3. Marine riprap/artificial shore: the wetland community of a constructed marine shore in which the substrate is composed of broken rocks, stones, wooden bulkheads, or concrete placed to reduce erosion.

Characteristic organisms are attached algae, mussels, and barnacles; percent cover and species diversity are low compared with a marine rocky intertidal community.

Distribution: along the seacoast of the Coastal Lowlands and Manhattan Hills ecozones.

Rank: G5 S5

Revised: 1990

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II. ESTUARINE SYSTEM

The estuarine system consists of deepwater tidal habitats and adjacent tidal wetlands that are usually semienclosed but have open, partly obstructed, or sporadic access to open ocean or tidal fresh waters, and in which ocean water is at least occasionally diluted by freshwater runoff. The limits extend from the upstream limit of tidal influence seaward to an imaginary line closing the mouth of a river or bay. Salinity is usually less than 30.0 parts per thousand (ppt) ocean-derived salts.

A. ESTUARINE SUBTIDAL

This subsystem includes the area below the lowest tide; the substrate is permanently flooded with tidal water; it is continuously submerged.

1. Tidal river: the aquatic community of continuously flooded substrates that support no emergent vegetation. Within the river there are two zones; the deepwater zone includes areas where substrates are usually over 2 m (6 ft) deep at low tide, the shallow zone includes submerged areas less than 2 m (6 ft) deep at low tide that lack rooted aquatic vegetation. In the river there is a vertical salinity gradient, with a surface layer of fresh water (salinity less than 0.5 ppt) floating over a deeper layer of brackish water (salinity between 0.5 and 18.0 ppt). Salinities at any one place in the river may fluctuate as the tides flow in and out because the "salt wedge" of brackish water alternately rises and falls with the tides.

Characteristic fishes include year-round residents as well as seasonal migrants or anadromous species that enter the river as adults to spawn and return to the ocean afterwards. The progeny of these anadromous fishes occupy the river as a nursery area for the remainder of the year or longer. Characteristic fishes of the deepwater include Atlantic tomcod (*Microgadus tomcod*), hogchoker (*Trinectes maculatus*), and rainbow smelt (*Osmerus mordax*). Rare deepwater species of the Hudson River include sturgeon (*Acipenser brevirostrum*, and *A. oxyrinchus*). Characteristic fishes of the shallows include striped bass (*Morone saxatilis*), American shad (*Alosa sapidissima*), banded killifish (*Fundulus diaphanus*), spottail shiner (*Notropis hudsonius*), tessellated darter (*Etheostoma olmstedii*), and pumpkinseed (*Lepomis gibbosus*). Fishes that occur in both deepwater and shallows include bay anchovy (*Anchoa mitchilli*), blueback herring (*Alosa aestivalis*), white perch (*Morone americana*), and alewife (*Alosa pseudoharengus*).

Smaller tidal rivers on Long Island flow into "tidal bays," or "backbarrier lagoons," before reaching the

ocean. Backbarrier lagoons are bodies of water that are protected from oceanic forces by barrier islands. Wave action is less significant in these enclosed water bodies than on the ocean beach, and the primary influences on backbarrier sediment are the rise and fall of the tides and activities of organisms (Leatherman 1979). Tidal bays and backbarrier lagoons may include various marine and estuarine communities, such as marine eelgrass meadow, marine intertidal mudflats, and salt marshes. More data on tidal bays and backbarrier lagoons are needed.

Distribution: in the Hudson Valley and Coastal Lowlands ecozones.

Rank: G4 S3

Revised: 2001

Example: the Hudson River, from New York City to Troy.

Source: Gladden et al. 1988; Leatherman 1979; Oertel 1985; Oertel et al. 1992.

2. Tidal creek: the aquatic community of a shallow, continuously semidiurnally tidally flooded creek with submerged areas averaging less than 2 m (6 ft) deep at low tide. The water is typically brackish to saline, but the community can range from freshwater (0 to 0.5 ppt salinity), to brackish (0.5 to 18 ppt), to saline (18 to 30 ppt or greater). Varying depth zones and flow microhabitats often result in a diverse array of ecological associations. Water levels fluctuate with the tides and two community depth zones are typically encountered: 1) the subtidal, permanently flooded, portion of the creek and 2) the intertidal portion including banks and midchannel bars or terraces exposed at low tide. Typical flow microhabitats in a fully-developed creek include abundant slow-flowing pools connected by runs with localized turbulent, fast-flowing riffles. Typical examples drain the waters of semidiurnally tidally flooded marshes and most of these marshes are coastal salt marshes of the back barrier or finger marsh type. Most tidal creeks flow in a very sinuous (i.e., meandering) pattern through a salt marsh. Although the vertical banks of the creek are regularly eroded and slump into the creek bottom, the position of the creek bed in the marsh is fairly stable and oxbows are rare. The sinuous meanders of the creek are not formed by recent erosion of the marsh, rather they are thought to be relicts of the drainage channels that were active in the tidal flats when the salt marsh grasses first became established.

Widgeon-grass (*Ruppia maritima*) is abundant in brackish to saline tidal creeks. Common epiphytic plants include the marine red algae tubed weed

(*Polysiphonia stricta*) and banded weed (*Ceramium strictum*). Other characteristic plants are the marine red algae tubed weed (*Polysiphonia denudata*), graceful red weed (*Gracilaria tikvahiae*), and *Spyridia filamentosa* and several cyanobacteria including *Hydrocoleum lyngbaceum*, *Anabaena torulosa*, and *Agmenellum quadruplicatum*.

Fauna in tidal creeks are diverse. Several fishes that are resident in brackish to saline tidal creeks at low tide also use the low salt marsh when it is flooded by high tide. Characteristic fishes that have this distribution pattern include Atlantic silverside (*Menidia menidia*), mummichog (*Fundulus heteroclitus*), striped killifish (*Fundulus majalis*), sheepshead minnow (*Cyprinodon variegatus*), fourspine stickleback (*Apeltes quadracus*), threespine stickleback (*Gasterosteus aculeatus*), and American eel (*Anguilla rostrata*). Brackish to saline tidal creeks are also utilized as nursery areas for several important marine fishes, including winter flounder (*Pseudopleuronectes americanus*), black sea bass (*Centropomus striata*), bluefish (*Pomatomus saltatrix*), and striped bass (*Morone saxatilis*). Great blue heron (*Ardea herodias*) and egrets commonly feed on the fish. Comb jellies (*Beroe* spp., *Mnemiopsis* spp.) are common plankton species. Common benthic epifauna include eastern mud snail (*Nassarius obsoletus*), daggerblade grass shrimp (*Palaemonetes pugio*), longwrist hermit crab (*Pagurus longicarpus*), and common Atlantic slippershell (*Crepidula crepidula*). Common benthic infauna include northern quahog (*Mercenaria mercenaria*), softshell clam (*Mya arenaria*), razor clam (*Ensis directus*), and bamboo worms (Polychaeta). Other characteristic marine invertebrates include blue crab (*Callinectes sapidus*), hairy sea cucumber (*Sclerodactyla briareus*), Atlantic horseshoe crab (*Limulus polyphemus*), acorn worm (Hemichordata) and terbelid worm (*Amphitrite* spp.).

Tidal creek pools have silty substrate with abundant beds of widgeon grass and tubed weed and the characteristic fauna hairy sea cucumber, American eel, grass shrimp, and eastern mud snail. Runs have sandy to gravelly substrate supporting the marine algae species tubed weed, graceful red weed, and green fleece (*Codium fragile*), a common exotic marine green algae, benthic marine fish such as naked goby (*Gobiosoma boscii*) and northern pipefish (*Syngnathus fuscus*), and many marine mollusks. Riffles have gravelly to cobbly bottoms with macroalgae beds of hollow green weed (*Enteromorpha* spp.), benthic marine fish such as naked goby and marine mollusks such as common Atlantic slippershell. Intertidal peaty banks of creeks in salt marshes, especially in pools and runs, are characterized by abundant ribbed mussel (*Modiolus demissus*), mummichog, and killifish.

Freshwater variants of tidal creeks, that drain

freshwater tidal marshes, such as those found along the Hudson River, are included here. More data on this community variant are needed.

Distribution: in salt marshes along the seacoast in the Coastal Lowlands ecozone, and along the Long Island Sound in the Manhattan Hills ecozone.

Rank: G4 S3S4

Revised: 2001

Examples: Bass Creek, Suffolk County; Hubbard Creek Marsh, Suffolk County; Mashomack Creek, Suffolk County.

Sources: Kiviat and Stevens 2001; Redfield 1972; Teal 1986; Webber 1967.

3. Brackish subtidal aquatic bed: the aquatic community of continuously flooded substrates with rooted aquatic vegetation. The water is brackish (salinity between 0.5 and 18.0 ppt) and the water is usually less than 2 m (6 ft) deep at low tide.

Characteristic species are sago pondweed (*Potamogeton pectinatus*), horned pondweed (*Zannichellia palustris*), waterweed (*Elodea nuttallii*), coontail (*Ceratophyllum demersum*), naiad (*Najas guadalupensis*), and widgeon grass (*Ruppia maritima*). A common weedy exotic is Eurasian milfoil (*Myriophyllum spicatum*).

As salinity increase downstream brackish subtidal aquatic beds may grade into marine eelgrass meadows dominated by eelgrass (*Zostera maritima*) (Macomber et al. 1979).

Distribution: along the Hudson River from New York City to Newburgh, in the Hudson Valley and Triassic Lowlands ecozones; may also occur in the Coastal Lowlands ecozone.

Rank: G4 S3S4

Revised: 2001

Examples: Piermont Marsh, Rockland County; Carmans River, Suffolk County.

Sources: Kiviat and Stevens 2001; Macomber et al. 1979; Metzler and Rosza 1982; Muenscher 1937; Senerchia-Nardone et al. 1985.

4. Freshwater subtidal aquatic bed: the aquatic community of continuously flooded substrates with rooted aquatic vegetation. The water is fresh (salinity less than 0.5 ppt) and the water is usually less than 2 m (6 ft) deep at low tide.

Characteristic species are tapegrass, or wild celery

(*Vallisneria americana*), pondweed (*Potamogeton perfoliatus*), waterweed (*Elodea nuttallii*), and naiads (*Najas guadalupensis*, and *N. minor*). Two exotic weeds, Eurasian milfoil (*Myriophyllum spicatum*) and water-chestnut (*Trapa natans*), are common in the Hudson River aquatic beds.

A characteristic bird that feeds on the subaquatic vegetation is the canvasback (*Aythya valisneria*). Other birds that feed on plants, fish and invertebrates in the vegetated shallows include bufflehead (*Bucephala albeola*), common goldeneye (*B. clangula*), common merganser (*Mergus merganser*), and greater scaup (*Aythya marila*). Wading birds such as snowy egret (*Egretta thula*), and great blue heron (*Ardea herodias*) have been frequently observed feeding in freshwater aquatic beds at low tide.

Distribution: along the Hudson River from Newburgh to Troy, in the Hudson Valley ecozone.

Rank: G4 S3

Revised: 1990

Sources: Findlay et al. 1997; Kiviat and Stevens 2001; Metzler and Rosza 1982; Muenscher 1937; Schmidt and Kiviat 1988.

B. ESTUARINE INTERTIDAL

This subsystem includes the area between the highest tide level and the lowest tide level; the substrate is periodically exposed and flooded by semidiurnal tides (two high tides and two low tides per tidal day). Some areas are only irregularly exposed at low tide, while other areas are only irregularly flooded at high tide. Semidiurnal submergence, warm water, copious deposits of mud, and varying salinity make the intertidal estuarine communities extreme and specialized habitats (Fassett 1928).

1. Brackish meadow: a moist, moderately well-drained brackish (0.5-18 ppt) perennial grassland with occasional isolated shrubs that is typically situated in a belt at the upper edge of salt marshes bordering sandy uplands, but may occupy large portions of interdunal basins. The community usually develops in areas with a unique combination of soils and hydrology, on deep deposits of periodically windblown or overwashed gleyed sands that are usually flooded only during spring tides and during major coastal storms, approximately two to three times per year. Periodic sand deposition and volatilized saltwater deposition are thought to prevent dominance by tall shrubs via burial and top killing of shrubs. Soil salinity over long periods of time is relatively low but may show vast fluctuations over short periods of time, producing a constantly

stressed environment. Salinity is periodically raised by the regular cycling of tides, inundation during spring tides and storm surges, and volatilized saltwater deposition. Salinity is periodically lowered by dilution from rainwater and the presence of a thin fresh groundwater lens elevated over the underlying saltwater.

The meadow is dominated by halophytic wetland to facultative perennial graminoids and ephemeral herbs. Dominant species include switchgrass (*Panicum virgatum*), salt-meadow grass (*Spartina patens* "var. *monogyna*"), and sedge (*Carex silicea*). Other graminoids present may include little bluestem (*Schizachyrium scoparium*), big bluestem (*Andropogon gerardii*), spikegrass (*Distichlis spicata*), knotroot bristlegrass (*Setaria parviflora*), purple lovegrass (*Eragrostis spectabilis*), Virginia wild rye (*Elymus virginicus*), panic grass (*Panicum amarum*), twig-rush (*Cladium mariscoides*), cyperus (*Cyperus polystachyos*, *C. dentatus*), three-square (*Scirpus pungens*), and black grass (*Juncus gerardii*).

Characteristic herbs include whorled milkwort (*Polygala verticillata*), seaside goldenrod (*Solidago sempervirens*), buttonhead goldenrod (*Euthamia tenuifolia*), seaside gerardia (*Agalinis maritima*), pinks (*Sabatia* spp.), tall wormwood (*Artemisia campestris* ssp. *caudata*), asters (*Aster* spp.), and wild germander (*Teucrium canadense*). Indicator herbaceous species at low abundance may include New England blazing star (*Liatris scariosa* var. *novae-angliae*), sedge (*Fimbristylis castanea*), salt marsh plantain (*Plantago maritima* ssp. *juncooides*), evening primrose (*Oenothera parviflora* var. *oakesiana*), and crabgrass (*Digitaria filiformis*). Sparse dwarf shrubs may include groundsel-tree (*Baccharis halimifolia*), bayberry (*Myrica pensylvanica*), and beach-plum (*Prunus maritima*). The community is prone to weedy exotic species such as red fescue (*Festuca rubra*), and soapwort (*Saponaria officinalis*). Floristic composition can fluctuate dramatically over several years in response to the fluctuating soil salinities.

Characteristic fauna include fiddler crabs (*Uca pugnator* and *U. pugnax*). The community usually occurs in close association with salt shrub and at slightly higher elevation than high salt marsh. It may develop into high salt marsh after occupation by *Spartina patens* and development of a peat layer in response to a more regular tidal influence.

Distribution: Restricted to the estuarine portion of the Coastal Lowlands ecozone. Expected to be scattered along the shore of Long Island, concentrated on the south shore, especially the South Fork of Long Island. May also occur on Staten Island.

Rank: G2G3 S1S2

Revised: 2001

Examples: Walking Dunes, Suffolk County; Napeague Meadows, Suffolk County.

Sources: Johnson 1985; Nixon 1982; NYNHP field surveys.

2. Salt shrub: a shrubland community that forms the ecotone between salt marsh and upland vegetation. Salinity levels are generally lower here than in the salt marsh (soil pore salinity ranges 7 ppt to 27 ppt); and the elevation is higher. Salt shrub does not usually develop on deep peat. More often, it occurs on a thin (0-10 cm) layer of peat, and soils share characteristics of both estuarine and maritime terrestrial settings. Periodic disturbance associated with storms causes die-back of shrubs.

Characteristic shrubs are groundsel-tree (*Baccharis halimifolia*), saltmarsh-elder (*Iva frutescens*), and pasture rose (*Rosa carolina*); salt-meadow grass (*Spartina patens*), black-grass (*Juncus gerardii*), and switchgrass (*Panicum virgatum*) are typical herbs. Salt shrub is almost always dominated by *Iva frutescens* on the marshward edge of the community, often forming a stunted leading edge of the community. *Baccharis halimifolia* only becomes more dominant in the older, more developed, landward side. The landward side of salt shrub is usually the most diverse. A characteristic animal is marsh wren (*Cistothorus palustris*).

Salt shrub is usually present as a linear feature at the upper edge of a salt marsh marking the limit of the highest spring and storm tides within a given estuarine basin. In areas where the local topography is nearly level an extensive shrubland or brackish meadow may occur.

Distribution: in sheltered areas of the seacoast in the Coastal Lowlands and Manhattan Hills ecozones. Best examples of salt shrub are within the Peconic Bay, but also along the south shore of Long Island where it is often invaded by *Phragmites australis*. Salt shrub is poorly developed along the north shore where tidal areas are steep.

Rank: G5 S4

Revised: 2001

Examples: Hubbard Creek Marsh, Suffolk County; Northwest Creek, Suffolk County; Orient Point Marsh, Suffolk County; Cow Neck Marsh, Suffolk County; Mashomack Point Marsh, Suffolk, County.

Sources: Clark 1985; Clark 1986a; Conard 1935; Hayden et al. 1995; MacDonald and Edinger 2000; Nixon 1982; Redfield 1972; NYNHP field surveys.

3. High salt marsh: a coastal marsh community that occurs in sheltered areas of the seacoast, in a zone extending from mean high tide up to the limit of spring tides. It is periodically flooded by spring tides and flood tides. High salt marsh typically consists of a mosaic of patches that are mostly dominated by a single graminoid species.

The dominant species in many large areas are either salt-meadow grass (*Spartina patens*) or a dwarf form (15 to 30 cm tall) of cordgrass (*Spartina alterniflora*); also common are large areas dominated by spikegrass (*Distichlis spicata*), black-grass (*Juncus gerardii*), and glassworts (*Salicornia* spp.), or a mixture of salt-meadow grass and cordgrass. Characteristic species of the upper slope of the high marsh (the area that grades into salt shrub) are black-grass, switchgrass (*Panicum virgatum*), sea-lavender (*Limonium carolinianum*), seaside gerardia (*Agalinus maritima*), and slender saltmarsh aster (*Aster tenuifolius*).

Characteristic animals include salt marsh mosquitoes (*Aedes* spp.), greenhead flies (*Tabanidae*), coffeebean snail (*Melampus bidentatus*), sharp-tailed sparrow (*Ammodramus caudacutus*), marsh wren (*Cistothorus palustris*), eastern meadowlark (*Sturnella magna*), clapper rail (*Rallus longirostris*), and American black duck (*Anas rubripes*).

High salt marsh is one zone within a coastal salt marsh ecosystem; it occurs in a complex mosaic with several other communities. Other communities in a salt marsh ecosystem include salt shrub and brackish meadow at the upland border of the high marsh; sea level fen in rare cases associated with freshwater seepage at the landward edge; low salt marsh at the seaward border of the high marsh and along the edges of tidal creeks that drain the high marsh; and salt pannes in shallow depressions within the marsh.

High salt marshes can be further classified by landform type following Oertel and Woo (1994) into mainland fringe-marshes, mid-lagoon marshes, and backbarrier fringe-marshes.

Distribution: in sheltered areas of the seacoast in the Coastal Lowlands and Manhattan Hills ecozones. High salt marsh is best developed in the Peconic Bay and along the south shore of Long Island.

Rank: G4 S3S4

Revised: 2001

Examples: Hubbard Creek Marsh, Suffolk County; Northwest Creek, Suffolk County; Fire Island Wilderness, Suffolk County; Orient Point Marsh, Suffolk County; Wading River Marsh, Suffolk County; Hempstead Bay Wetlands, Nassau County.

Sources: Clark 1985; Clark 1986a; Conard 1935;

MacDonald and Edinger 2000; Niedowski 2000; Nixon 1982; Oertel and Woo 1994; Redfield 1972; US ACE 1995, 1999; NYNHP field surveys.

4. Salt panne: a shallow depression in a salt marsh where the marsh is poorly drained. Pannes occur in both low and high salt marshes. Pannes in low salt marshes usually lack vegetation, and the substrate is a soft, silty mud. Pannes in a high salt marsh are irregularly flooded by spring tides or flood tides, but the water does not drain into tidal creeks. After a panne has been flooded the standing water evaporates and salinity of the soil water is raised well above the salinity of sea-water. Soil water salinities fluctuate in response to tidal flooding and rainfall. Small pond holes occur in some pannes; the pond holes are usually deeper than the thickness of the living salt marsh turf, and the banks or "walls" of the pond holes are either vertical or they undercut the peat. Salt pannes can be formed by ponding of water on the marsh surface, scouring of wrack or coverage by storm wrack, and possibly by ice scour. Salt panne formation appears to be favored by a mean tidal range of about 20-80 cm and are poorly developed in settings with a mean tidal range greater than 1.6 m.

Characteristic plants of a salt panne include the dwarf form (15 to 30 cm tall) of cordgrass (*Spartina alterniflora*), glassworts (*Salicornia europaea* and *S. virginica*), marsh fleabane (*Pluchea odorata*), salt marsh plantain (*Plantago maritima* ssp. *juncooides*), arrow-grass (*Triglochin maritimum*), spikegrass (*Distichlis spicata*), and salt marsh sand spurry (*Spergularia marina*). High salt marsh communities that are dominated by the dwarf form of *Spartina alterniflora* appear to support larger, better developed pannes than marshes dominated by *S. patens* and *Distichlis spicata*. Widgeon-grass (*Ruppia maritima*) grows in the pond holes; fishes that may be permanent residents in large pond holes include mummichog (*Fundulus heteroclitus*), and sheepshead minnow (*Cyprinodon variegatus*). The salt pannes on the south shore of Long Island are intensely used by feeding shorebirds.

More data on the pond-like variant dominated by *Ruppia maritima* are needed. Comparison of this community with coastal salt pond needs to be made.

Distribution: in salt marshes along the seacoast of the Coastal Lowlands ecozone. Salt pannes are best developed on the south shore of Long Island, especially in areas of low mean tidal range. They are poorly developed in the Peconic Bay and very poorly developed on the north shore of Long Island.

Rank: G3G4 S3

Revised: 2001

Examples: Gilgo Beach Backbarrier Marsh, Suffolk County; Hubbard Creek Marsh, Suffolk County; Northwest Creek, Suffolk County; Hempstead Bay Wetlands, Nassau County.

Sources: Egler 1950; MacDonald and Edinger 2000; Miller and Egler 1950; Niedowski 2000; Nixon 1982; Redfield 1972; NYNHP field surveys.

5. Low salt marsh: a coastal marsh community that occurs in sheltered areas of the seacoast, in a zone extending from mean high tide down to mean sea level or to about 2 m (6 ft) below mean high tide. It is regularly flooded by semidiurnal tides. The mean tidal range of low salt marshes on Long Island is about 80 cm, and they often form in basins with a depth of 1.6 m or greater.

The vegetation of the low salt marsh is a nearly monospecific stand of cordgrass (*Spartina alterniflora*), a coarse grass that grows up to about 3 m (10 ft) tall. Salt marshes with large tidal ranges are often dominated by the tall form of *Spartina alterniflora*, while those with more restricted tidal ranges will maintain a short form *Spartina alterniflora* zone and grade into high salt marsh (Niedowski 2000). A few species of marine algae can form dense mats on the surface sediments between the cordgrass stems, including knotted wrack (*Ascophyllum nodosum*), and rockweed (*Fucus vesiculosus*); sea lettuce (*Ulva* spp.), and hollow green weeds (*Enteromorpha* spp.) can be abundant, especially in early summer. Other plants that are present in very low numbers include glasswort (*Salicornia europaea*), salt marsh sand-spurry (*Spergularia marina*), and lesser sea blite (*Suaeda maritima*).

Characteristic animals include clapper rail (*Rallus longirostris*), willet (*Catoptrophorus semipalmatus*), marsh wren (*Cistothorus palustris*), seaside sparrow (*Ammodramus maritimus*), fiddler crabs (*Uca pugilator* and *U. pugnax*) nesting along creek banks, ribbed mussel (*Geukensia dimissa*), and at high tide mummichog (*Fundulus heteroclitus*), and several other small fishes that live in the tidal creeks at low tide.

The low salt marsh is one zone within a coastal salt marsh ecosystem; it occurs in a mosaic with several other communities. Low salt marsh grades into high salt marsh at slightly higher elevations, and into intertidal mudflats at slightly lower elevations. Tidal creeks that drain the salt marsh flow in a sinuous pattern through the marsh, with a narrow band of low marsh lining the banks of the tidal creeks. Shallow depressions, or pannes, may also occur in the low marsh.

Distribution: in sheltered areas of the seacoast in the

Coastal Lowlands and Manhattan Hills ecozones. Low salt marsh is well-developed on the south shore of Long Island, and within the small basins of the north shore where it is the dominant community type. Although it is very degraded, about one-half of the total marsh acreage at Jamaica Bay on the south shore is low salt marsh.

Rank: G4 S3S4

Revised: 2001

Examples: Hubbard Creek Marsh, Suffolk County; Northwest Creek, Suffolk County; Lloyd Neck Marsh, Suffolk County; Nissequogue River, Suffolk County; Westhampton Island-Tiana Beach, Suffolk County; Flax Pond, Suffolk County; Hempstead Bay Wetlands, Nassau County.

Sources: Clark 1985, 1986a; Conard 1935; Dreyer and Niering 1995; Houghton and Woodwell 1980; Joneja 1981; MacDonald and Edinger 2000; Niedowski 2000; Nixon 1982; Redfield 1972; Spinner 1969; Teal 1986; US ACE 1995, 1999; NYNHP field surveys.

6. Coastal salt pond: A community inhabiting marine shoreline lakes or ponds formed by sandspits that close off a lagoon or bay. The water typically averages brackish or slightly brackish over long periods of time, but may range rapidly from fresh to saline. Occasionally the barrier beach is broken by hurricanes and the pond becomes saline until the sandspit closes the pond again. Some ponds have permanent (natural or artificial) inlets. Two community microhabitats are typically encountered within one pond complex: 1) the “pond” or aquatic portion of the complex and 2) the “shore” or the non-aquatic part of the complex. These two microhabitats are likely to warrant separate communities and may soon be distinguished in a future version of the state community classification: the former retaining the name “coastal salt pond,” the latter designated as a “coastal salt pond shore.”

Dominant plants of the pond can vary considerably with the frequency of exchange of marine waters. Typical ponds are dominated by the submergent vascular plant widgeon grass (*Ruppia maritima*) and the marine red algae tubed weed (*Polysiphonia* spp.). Other characteristic plants of the pond include the marine green algae *Cladophora* spp. Marine algae are often less frequent in more saline examples. Needle spikerush (*Eleocharis acicularis*) is typical of temporarily flooded edges of ponds. Brackish ponds may contain flora typical of brackish subtidal aquatic beds including sago pondweed (*Potamogeton pectinatus*), clasping-leaved pondweed (*Potamogeton perfoliatus*), and horned pondweed (*Zannichellia palustris*). Four pond associations have been listed by

Thorne-Miller (1983) including widgeon grass beds, marine green algae beds, tubed weed beds and sago pondweed beds.

Characteristic pond fauna include multiple species of grass shrimp (e.g., *Palaemonetes* spp.), and the estuarine minnows mummichog (*Fundulus heteroclitus*), sheepshead minnow (*Cyprinodon variegatus*), silversides (*Menidia* spp.), and various killifish. Coastal waterbirds in the heron family (Ardeidae) including great blue heron (*Ardea herodias*) and egrets feed on the fish.

The pond shore typically consists of an assemblage of up to several narrow zones floristically resembling other estuarine community types. Along a wet to dry moisture gradient and low to high elevation gradient, these community types may include: intertidal mudflats, low salt marsh, high salt marsh, salt panne, salt shrub and brackish meadow. Similar zones resembling palustrine communities may occur in examples with freshwater.

Characteristic species of the pond shore are dwarf spikerush (*Eleocharis parvula*), switchgrass (*Panicum virgatum*), salt-meadow grass (*Spartina patens*), cordgrass (*Spartina alterniflora*), reedgrass (*Phragmites australis*), saltmarsh fleabane (*Pluchea odorata*), three-square (*Scirpus americanus*), rose-mallow (*Hibiscus moscheutos*), pigweeds (*Chenopodium* spp.), mock bishop’s-weed (*Ptilimnium capillaceum*), spikegrass (*Distichlis spicata*), saltmarsh-elder (*Iva frutescens*), and groundsel-tree (*Baccharis halimifolia*). Abundant pondshore fauna include saltmarsh mosquitoes (*Aedes* spp.). Other characteristic pondshore fauna include green-headed fly (*Tabanus nigrovittatus*) and planthoppers (*Prokelisia marginata*).

Distribution: along the seacoast in the Coastal Lowlands ecozone.

Rank: G4 S1S2

Revised: 2001

Examples: Oyster Pond, Suffolk County; Tobaccolot Pond, Suffolk County.

Source: Harlin et al. 1995; Thorne-Miller et al. 1983; NYNHP field surveys.

7. Brackish interdunal swales: temporarily tidally flooded temperate marshes in interdunal swales dominated by halophytic graminoids. Individual swales occur as small patches positioned between fore-, primary and secondary dunes in a maritime dunes system, typically on barrier islands. Swales experience dynamic fluctuations in water levels and salinity. Water levels are highest after infrequent and sporadic overwash that occurs when tides or waves overtop the

berm, transporting water and suspended sand through the foredune into low-lying areas within the dune system, usually during spring tides, full moons or major storms. Flood frequency can vary from several times per year to as little as once every 25 years. At this time groundwater levels rise, vegetation may float, and water pools into temporary ponds. During the driest times, ponds evaporate, surface sands are no longer saturated, salt concentrates then enters the groundwater, and salt deposits form on the surface. Salinity is typically mixohaline, water being derived from a mix of saline ocean overwash and freshwater groundwater lens. However, it can vary greatly at certain times of the year from oligohaline (0 ppt) to supersaline (70 ppt) in response to the salinity of the groundwater and accumulation of salt during evaporation.

The dominant flora are mostly grasses, sedges and rushes including salt-meadowgrass (*Spartina patens*), dwarf spikerush (*Eleocharis parvula*), three-square (*Scirpus pungens*), flatsedge (*Cyperus polystachyos*), and jointed rush (*Juncus articulatus*). The abundance of any one dominant can vary widely year to year in response to salinity fluctuations. Other characteristic flora includes halophytes such as salt-meadow grass (*Diplachne maritima*), seaside bulrush (*Scirpus maritimus*), toad-rush (*Juncus bufonius* var. *halophila*), sedge-rush (*Juncus scirpoides*), mock bishop's-weed (*Ptilimnium capillaceum*), golden dock (*Rumex maritimus*), saltmarsh aster (*Aster subulatus*), red pigweed (*Chenopodium rubrum*), saltmarsh fleabane (*Pluchea odorata*), rose-mallow (*Hibiscus moscheutos*), knotweed (*Polygonum ramosissimum*), and saltmarsh-elder (*Iva frutescens*). Seabeach amaranth (*Amaranthus pumilus*) is a characteristic plant at the upper edge of the community in drift lines. Reedgrass (*Phragmites australis*) is questionably native in this community.

The community is known for its importance to wildlife. Characteristic fauna include piping plovers (*Charadrius melodus*), American oyster catchers (*Haematopus palliatus*), yellowlegs (*Tringa melanoleuca* and *T. flavipes*), and Canada geese (*Branta canadensis*) (which use the community as a foraging ground), abundant salt marsh mosquitoes (*Aedes* spp.), fiddler crabs (*Uca* spp.), odonates and other insects. Eastern mud turtle (*Kinosternon subrubrum subrubrum*), and eastern spadefoot toad (*Scaphiopus holbrookii holbrookii*) reportedly use this habitat (US ACE 1995, 1999).

Soils are deep sands, often become anaerobic but lack peat accumulation. The surface is often rusty colored from a coating of blue-green algae. Community variants include semi-permanent pools, long-lived wet swales with perennial graminoids and newly-formed sparsely-vegetated damp swales with early successional

annual forbs. Occurrences of this community are sometimes ephemeral representing the early stages of salt marsh or coastal salt pond formation or rapidly transforming into reed grass marshes.

Distribution: Restricted to estuarine portion of Coastal Lowlands Ecozone, probably only on the south shore of Long Island. Known occurrences restricted to barrier islands from Jones Beach Island West to Westhampton Beach. Additional occurrences possible west to Gateway National Recreation Area and east to Montauk Point.

Rank: G3G4 S1S2

Revised: 1990

Examples: Jones Beach Island East, Suffolk County; Jones Beach Island West, Suffolk County.

Sources: US ACE 1995, 1999; NYNHP field surveys.

8. Brackish tidal marsh: a marsh community that occurs where water salinity ranges from 0.5 to 18.0 ppt, and water is less than 2 m (6 ft) deep at high tide. This community consists of a mixture of salt marsh and freshwater tidal marsh species, with no species attaining dominance over extensive areas (although some species are locally abundant in patches). The vegetation in a brackish tidal marsh is dense and dominated by tall graminoids.

Characteristic plants are narrowleaf cattail (*Typha angustifolia*), rose-mallow (*Hibiscus moscheutos*), wild rice (*Zizania aquatica*), pickerel-weed (*Pontederia cordata*), arrowleaf (*Peltandra virginica*), water smartweed (*Polygonum punctatum*), reedgrass (*Phragmites australis*), marsh fern (*Thelypteris palustris*), bulrushes (*Scirpus americanus*, *S. fluviatilis*, *S. novae-angliae*, *S. robustus*, *S. tabernaemontani*), water-hemp (*Amaranthus cannabinus*), dwarf spikerush (*Eleocharis parvula*), arrowhead (*Sagittaria latifolia*), lilaopsis (*Lilaeopsis chinensis*), hedge bindweed (*Calystegia sepium*), seaside goldenrod (*Solidago sempervirens*), yellow iris (*Iris pseudacorus*), and saltmarsh fleabane (*Pluchea odorata*). Purple loosestrife (*Lythrum salicaria*) is a common weed in brackish marshes.

Characteristic birds include red-winged blackbird (*Agelaius phoeniceus*), swamp sparrow (*Melospiza georgiana*), marsh wren (*Cistothorus palustris*), yellow warbler (*Dendroica petechia*), common yellowthroat (*Geothlypis trichas*), song sparrow (*Melospiza melodia*), Virginia rail (*Rallus limicola*), American goldfinch (*Carduelis tristis*), and eastern kingbird (*Tyrannus tyrannus*).

Brackish marshes are best developed on large river systems characterized by gentle slope gradients coupled

with tidal influence over considerable distances. The downstream limits of the community begin where cordgrass (*Spartina alterniflora*) no longer dominates tidal creek or river banks, and the upstream limits extend to where the hollow green weeds (*Enteromorpha intestinalis*) can no longer be found. Brackish tidal marshes can be distinguished from freshwater tidal marshes by the lack of species restricted to freshwater, such as spatterdock (*Nuphar advena*), sweetflag (*Acorus americanus*), and blue flag (*Iris versicolor*), and a decrease in cover of sedges (*Carex* spp. and *Cyperus* spp.). Brackish marshes that are dominated by reedgrass (*Phragmites australis*) as a result of anthropogenic disturbance should be classified as a cultural community, such as estuarine impoundment marsh or estuarine dredge spoil shore. Examples where the tidal influence is greatly diminished may be classified as reedgrass/purple loosestrife marsh, a palustrine cultural community.

Brackish tidal marshes may grade into “supratidal marshes” in areas above mean high water where salt can concentrate by evaporation (Buckley and Ristich 1977, Kiviat 1979, Kiviat and Stevens 2001). More data on supratidal communities are needed.

Distribution: along the seacoast of the Coastal Lowlands ecozone, and along the Hudson River from New York City to Newburgh in the Triassic Lowlands and Hudson Valley ecozones.

Rank: G4 S3S4 *Revised:* 2001

Examples: Constitution Marsh, Putnam County; Iona Island, Rockland County; Piermont Marsh, Rockland County; Nissequogue River, Suffolk County; Carmans River, Suffolk County.

Sources: Buckley and Ristich 1976; Dreyer and Niering 1995; Kiviat 1979; Kiviat and Stevens 2001; MacDonald and Edinger 2000; Metzler and Rosza 1982; Muenscher 1937; Odum et al. 1984; Senerchia-Nardone et al. 1985; Swift 1987; NYNHP field surveys.

9. Brackish intertidal mudflats: a sparsely vegetated community, characterized by low-growing, rosette-leaved aquatics. The community occurs on exposed intertidal mudflats where water salinity ranges from 0.5 to 18.0 ppt. This community is best developed where mudflats are nearly level so that broad expanses are exposed at low tide. The rosette-leaved aquatics are completely submerged at high tide, and they are usually coated with mud.

Characteristic species are spongy arrowhead

(*Sagittaria calycina* var. *spongiosa*), strap-leaf arrowhead (*Sagittaria subulata*), mudwort (*Limosella australis*), three-square bulrush (*Scirpus americanus*), and tapegrass (*Vallisneria americana*).

Distribution: restricted to the Hudson River from New York City to Newburgh in the Triassic Lowlands and Hudson Valley ecozones.

Rank: G3G4 S1S2 *Revised:* 1990

Examples: Piermont Marsh, Rockland County; Constitution Marsh, Putnam County; Iona Marsh, Rockland County.

Sources: MacDonald and Edinger 2000; Muenscher 1937; NYNHP field surveys.

10. Brackish intertidal shore: a community of the intertidal gravelly or rocky shores of brackish tidal rivers and creeks where water salinity ranges from 0.5 to 18.0 ppt. This community is usually sparsely vegetated. More data on this community are needed.

Distribution: along the seacoast of Long Island in the Coastal Lowlands ecozone, and along the Hudson River from New York City to Poughkeepsie in the Triassic Lowlands and Hudson Valley ecozones.

Rank: G3G4 S1S2 *Revised:* 1990

Example: Hands Creek, Suffolk County.

Source: Kiviat and Stevens 2001; NYNHP field surveys.

11. Freshwater tidal swamp: a forested or shrub-dominated tidal wetland that occurs in lowlands along large river systems characterized by gentle slope gradients coupled with tidal influence over considerable distances. The swamp substrate is always wet and is subject to semidiurnal flooding by fresh tidal water (salinity less than 0.5 ppt).

The characteristic trees are green ash (*Fraxinus pennsylvanica*), black ash (*F. nigra*), red maple (*Acer rubrum*), slippery elm (*Ulmus rubra*), and American hornbeam (*Carpinus caroliniana*); northern white cedar (*Thuja occidentalis*) is a distinctive associate in at least one example in the Hudson Valley. Common shrubs and vines are alders (*Alnus serrulata*, *A. rugosa*), spicebush (*Lindera benzoin*), arrowwood (*Viburnum recognitum*), silky dogwood (*Cornus amomum*), red-osier dogwood (*C. sericea*), gray dogwood (*C. foemina* ssp. *racemosa*), Virginia creeper

(*Parthenocissus quinquefolia*), and poison ivy (*Toxicodendron radicans*).

Characteristic groundlayer species are rice cutgrass (*Leersia oryzoides*), sensitive fern (*Onoclea sensibilis*), clearweed (*Pilea pumila*), spotted jewelweed (*Impatiens capensis*), common monkeyflower (*Mimulus ringens*), knotweeds (*Polygonum hydropiper*, *P. hydropiperoides*, *P. sagittatum*), skunk cabbage (*Symplocarpus foetidus*), hog peanut (*Amphicarpaea bracteata*), groundnut (*Apios americana*), wild yam (*Dioscorea villosa*), sedge (*Carex grayi*), Jack-in-the-pulpit (*Arisaema triphyllum*), and swamp milkweed (*Asclepias incarnata*).

Distribution: along the Hudson River from Newburgh to Troy, in the Hudson Valley ecozone.

Rank: G2G3 S1

Revised: 1990

Examples: Roger's Island, Columbia County; North Tivoli Bay, Dutchess County; Catskill Marsh, Greene County.

Sources: DeVries and DeWitt 1986; Kiviat 1983; Kiviat and Stevens 2001; Leonardi 1990; Leonardi and Kiviat 1990; McVaugh 1958; Westad 1987; Westad and Kiviat 1986; NYNHP field surveys.

12. Freshwater tidal marsh: a marsh community that occurs in shallow bays, shoals, and at the mouth of tributaries of large tidal river systems, where the water is usually fresh (salinity less than 0.5 ppt), and less than 2 m (6 ft) deep at high tide. The vegetation is dominated by aquatics that are emergent at high tide. Typically there are two zones in a freshwater tidal marsh: a low-elevation area dominated by short, broad-leaf emergents bordering mudflats or open water, and a slightly higher-elevation area dominated by tall graminoids.

Characteristic plants of the low-elevation, broad-leaf emergent zone include spatterdock (*Nuphar advena*), pickerel-weed (*Pontederia cordata*), arrowleaf (*Peltandra virginica*), and fowl mannagrass (*Glyceria striata*). Under the canopy of emergents (or between clones) there may be a sparse understory of rosette-leaved aquatics such as narrow-leaved arrowheads (*Sagittaria subulata*, *S. graminea*, and *S. rigida*), and mud-plantain (*Heteranthera reniformis*).

Characteristic plants of the slightly higher, graminoid zone include narrowleaf cattail (*Typha angustifolia*), river bulrush (*Scirpus fluviatilis*), bur-reed (*Sparganium eurycarpum*), wild rice (*Zizania aquatica*), and blue flag (*Iris versicolor*).

Other characteristic plants that occur in both zones include arrowhead (*Sagittaria latifolia*), rice cutgrass

(*Leersia oryzoides*), water-hemp (*Amaranthus cannabinus*), spotted jewelweed (*Impatiens capensis*), estuary beggar-ticks (*Bidens bidentoides*), sweetflag (*Acorus americanus*), softstem bulrush (*Scirpus tabernaemontanii*), sedges (*Carex hystericina*, *C. lacustris*), and cyperus (*Cyperus* spp.). Purple loosestrife (*Lythrum salicaria*), and reedgrass (*Phragmites australis*) are common exotics in this community.

Some marshes include small areas of sandflats, often dominated by one or a few species. Characteristic plants of sandflats include three-square bulrush (*Scirpus americanus*), water horsetail (*Equisetum fluviatile*), Pennsylvania bittercress (*Cardamine pennsylvanica*), mud-hyssop (*Gratiola neglecta*), water smartweed (*Polygonum punctatum*), and an exotic, black mustard (*Brassica nigra*).

Characteristic birds include marsh wren (*Cistothorus palustris*), red-winged blackbird (*Agelaius phoeniceus*), swamp sparrow (*Melospiza georgiana*), Virginia rail (*Rallus limicola*), song sparrow (*Melospiza melodia*), yellow warbler (*Dendroica petechia*), least bittern (*Ixobrychus exilis*), American goldfinch (*Carduelis tristis*), willow flycatcher (*Empidonax traillii*), and common yellowthroat (*Geothlypis trichas*).

Distribution: along the Hudson River from Newburgh to Troy, in the Hudson Valley ecozone, and smaller examples on the tidal rivers of Long Island.

Rank: G3G4 S2

Revised: 1990

Examples: Stockport Creek Marshes, Columbia County; North Tivoli Bay, Dutchess County; Catskill Marsh, Greene County; Rogers Island, Columbia County.

Sources: DeVries and DeWitt 1986; Kiviat 1973; Kiviat 1979; Kiviat and Stevens 2001; Leck et al. 1988; Metzler and Rosza 1982; Muenscher 1937; Odum et al. 1984; Swift 1987; NYNHP field surveys.

13. Freshwater intertidal mudflats: a sparsely vegetated community characterized by low rosette-leaved aquatics. This community occurs on exposed intertidal mudflats where the water is fresh (salinity less than 0.5 ppt). This community is best developed where mudflats are nearly level so that broad expanses are exposed at low tide. The plants are completely submerged in 0.9 to 1.2 m (3 to 4 ft) of water at high tide; and they are usually coated with mud.

Characteristic species are strap-leaf arrowhead (*Sagittaria subulata*), mud-plantain (*Heteranthera*

reniformis), grass-leaf arrowhead (*Sagittaria graminea*), stiff arrowhead (*Sagittaria rigida*), three-square bulrush (*Scirpus americanus*), golden club (*Orontium aquaticum*), and wild rice (*Zizania aquatica*).

Distribution: along the Hudson River from Newburgh to Troy, in the Hudson Valley ecozone.

Rank: G3G4 S2 *Revised:* 1990

Examples: Stockport Creek Marshes, Columbia County; North Tivoli Bay, Dutchess County; Rogers Island, Columbia County.

Sources: Kiviat and Stevens 2001; Muenscher 1937; NYNHP field surveys.

14. Freshwater intertidal shore: a community of the intertidal gravelly or rocky shores of freshwater tidal rivers and creeks, sometimes occurring at the base of cliffs. The vegetation may be very sparse.

Characteristic species are heartleaf plantain (*Plantago cordata*), estuary beggar-ticks (*Bidens bidentoides*), water-hemp (*Amaranthus cannabinus*), smartweed (*Polygonum hydropiperoides*), cardinal flower (*Lobelia cardinalis*), Pennsylvania bittercress (*Cardamine pennsylvanica*), mud-hyssop (*Gratiola neglecta*), golden club (*Orontium aquaticum*), and an exotic, black mustard (*Brassica nigra*).

Distribution: along the Hudson River from Newburgh to Troy, in the Hudson Valley ecozone.

Rank: G3G4 S2S3 *Revised:* 1990

Examples: Tivoli Bays, Dutchess County; Inbocht Bay, Greene County.

Sources: Kiviat and Stevens 2001; McVaugh 1958; Muenscher 1937; NYNHP field surveys.

C. ESTUARINE CULTURAL

This subsystem includes communities that are either created and maintained by human activities, or are modified by human influence to such a degree that the physical conformation of the substrate, or the biological composition of the resident community is substantially different from the character of the substrate or community as it existed prior to human influence.

1. Estuarine submerged structure: the aquatic community associated with an artificially introduced structure submerged in estuarine waters, such as a tidal river or creek, that provides habitat for fish and other organisms. This includes structures that have been intentionally sunk for the purpose of attracting fish, as well as sunken ships, disposed waste, submerged bridge abutments, or any other introduced material that provides suitable habitat.

Distribution: in the Hudson Valley, Hudson Highlands, Manhattan Hills, and Coastal Lowlands ecozones.

Rank: G5 S5 *Revised:* 2001

2. Estuarine channel/artificial impoundment: the aquatic community of an estuarine channel or bay that was created or modified by a barrier or dam which obstructs the outflow of water; an artificial estuarine deepwater community.

Distribution: in the Hudson Valley, Hudson Highlands, Manhattan Hills, and Coastal Lowlands ecozones.

Rank: G5 S5 *Revised:* 1990

3. Estuarine ditch: the aquatic community of a ditch or narrow channel excavated in an estuarine marsh for the intended purpose of reducing mosquito populations. These ditches have not been very effective in reducing mosquito populations; the ditches have probably done more harm to the salt marsh vegetation than is justified by the effectiveness of the mosquito control efforts.

Distribution: along the seacoast of the Coastal Lowlands and Manhattan Hills ecozones.

Rank: G5 S5 *Revised:* 1990

4. Estuarine impoundment marsh: a marsh community that occurs in a wetland created or modified by a barrier or dam that obstructs the outflow or inflow of water, and which has a biological composition significantly different from the composition of a natural estuarine marsh. This community is characterized by an abundance of weedy species such as purple loosestrife (*Lythrum salicaria*), reedgrass (*Phragmites australis*), or water-chestnut (*Trapa natans*).

Distribution: in the Hudson Valley, Hudson Highlands, Manhattan Hills, and Coastal Lowlands ecozones.

ESTUARINE COMMUNITIES

Rank: G5 S5

Revised: 1990

5. Estuarine dredge spoil shore: the wetland community of a constructed estuarine shore in which the substrate is composed of dredge spoils. This is a community with minimal vegetative cover and relatively low species diversity. Several distinct types of dredge spoil habitats have been described (Kiviat and Stevens 2001).

Distribution: in the Hudson Valley, Hudson Highlands, Manhattan Hills, and Coastal Lowlands ecozones.

Rank: G5 S5

Revised: 2001

Sources: Kiviat and Stevens 2001.

6. Estuarine riprap/artificial shore: the wetland community of a constructed estuarine shore in which the substrate is composed of broken rocks, wooden bulkheads, or concrete placed so as to reduce erosion. Vegetative cover and species diversity are low compared to natural estuarine shores.

Distribution: in the Hudson Valley, Hudson Highlands, Manhattan Hills, and Coastal Lowlands ecozones.

Rank: G5 S5

Revised: 1990

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