Marine and Estuarine Habitats

The NY SWAP habitats in this report are classified and described using the classification system developed collaboratively through regional and state SWAP efforts. This is also the system used in the Species Status Assessments to link each SGCN to a habitat. The classification is hierarchical and this report depicts and assesses nine marine types at the Mesohabitat level:

Marine System

1. Marine Intertidal Mesohabitat
2. Marine Subtidal Shallow Mesohabitat
3. Marine Subtidal Deep Mesohabitat

Estuarine System

4. Brackish Intertidal Mesohabitat
5. Brackish Subtidal Shallow Mesohabitat
6. Brackish Subtidal Deep Mesohabitat
7. Freshwater Intertidal Mesohabitat
8. Freshwater Subtidal Shallow Mesohabitat
9. Freshwater Subtidal Deep Mesohabitat

A table with the complete classification hierarchy for each NY SWAP marine habitat type is included in Appendix A.

Marine Mesohabitat Map

There are a great many mapping resources for the Northwest Atlantic marine environment. This list of resources is constantly evolving and improving in the types and quality of data being presented. At the time of writing this document these are the most comprehensive resources:

- Northeast Ocean Data Viewer and Northeast Ocean Data
  - http://northeastoceanviewer.org/#
  - http://www.northeastoceandata.org/
- NOAA, BOEM Marine Cadastre site
  - http://www.marinecadastre.gov/
- The Nature Conservancy's Northwest Atlantic Marine Ecoregional Assessment
  - https://www.conservationgateway.org/ConservationByGeography/NorthAmerica/UnitedStates/edc/reportsdata/marine/namera/Pages/default.aspx
- NOAA Bathymetry and Coastal Relief Models and NCCOS
  - http://maps.ngdc.noaa.gov/viewers/bathymetry/
  - http://www.ngdc.noaa.gov/mgg/coastal/crm.html
  - http://coastalscience.noaa.gov/research/scem/msp
- EPA National Coastal Assessment
  - http://www.epa.gov/emap2/nca/html/data/index.html
- Mid-Atlantic Ocean Data Portal (MARCO)

- http://portal.midatlanticocean.org/portal/

Even with these extensive resources, we found no appropriate single data source to depict New York's marine habitats. After much discussion with DEC's marine unit, we have mapped the NY SWAP habitats in this report using two primary sources. We began with the U.S. Coastal Relief Model (http://www.ngdc.noaa.gov/mgg/coastal/crm.html) to set the initial depths throughout our target area. We then used the fine-scale polygon and classification information from the National Wetlands Inventory (NWI) data set (http://www.fws.gov/wetlands/data/) to refine the Coastal Relief Model (CRM). For example, all NWI polygons classified as Marine – Intertidal were assigned to our classification as Marine-Intertidal irrespective of the depth reading from the CRM. Similarly, we used the Marine – Subtidal polygons to ensure raster values inside these polygons fell within the subtidal section of our classification and the Estuarine subtidal and intertidal polygons to classify those areas correctly. The freshwater systems in the NWI have Water Regime modifiers of "Freshwater Tidal" (Modifiers R, S, T, V), which we used to assign the appropriate freshwater classification types. The resulting map of all types is displayed in Figure 202. This is the first time a map depicting these habitat types has been attempted at this resolution for this area.

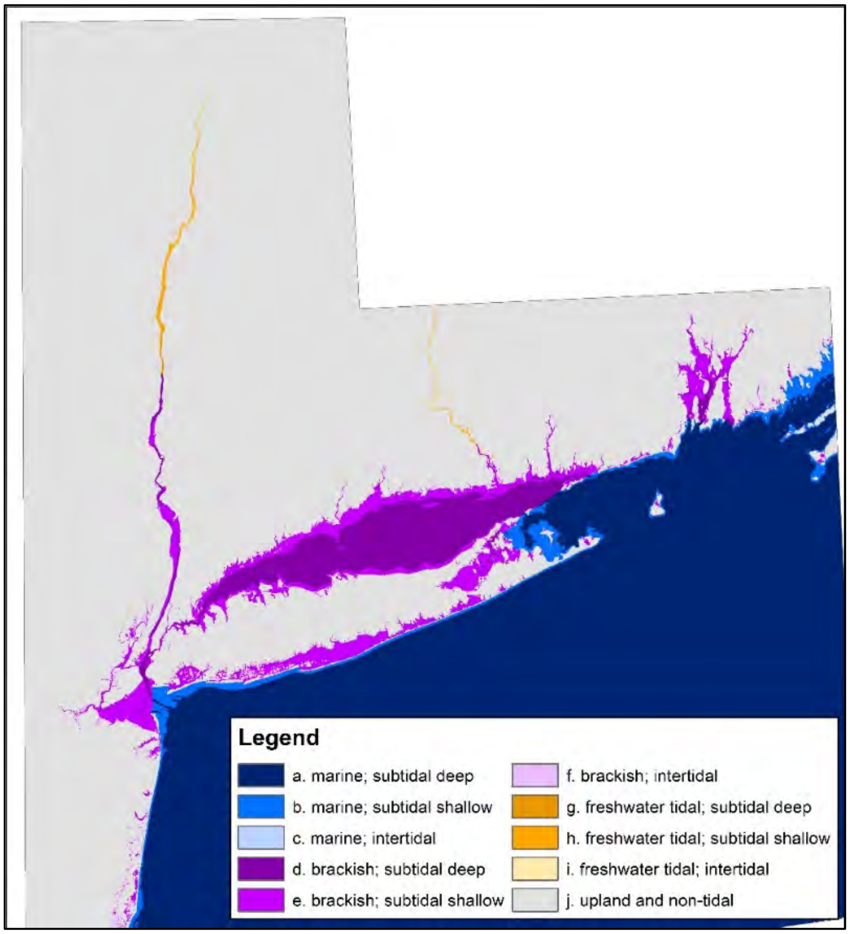

Figure 1. The marine classification depicted spatially.

Marine Assessment Areas of New York

The Marine habitat distribution maps and habitat condition assessments in this report were assessed within each of 24 areas that overall envelop the part of the state captured by the marine classification. These assessment areas generally follow Watershed Boundary Dataset (formerly Hydrologic Unit Code [HUC]) divisions (see: http://water.usgs.gov/GIS/huc.html). The watershed boundary level chosen depended on the level of division desired for the area. For the Hudson River and around New York City we used the HUC 8 level, while on Long Island we used the HUC 10 level. We divided Long Island Sound and the deepwater Marine environment into three sections, as depicted in Figure 2. More details about which boundaries were used for each division are supplied in Table 1.

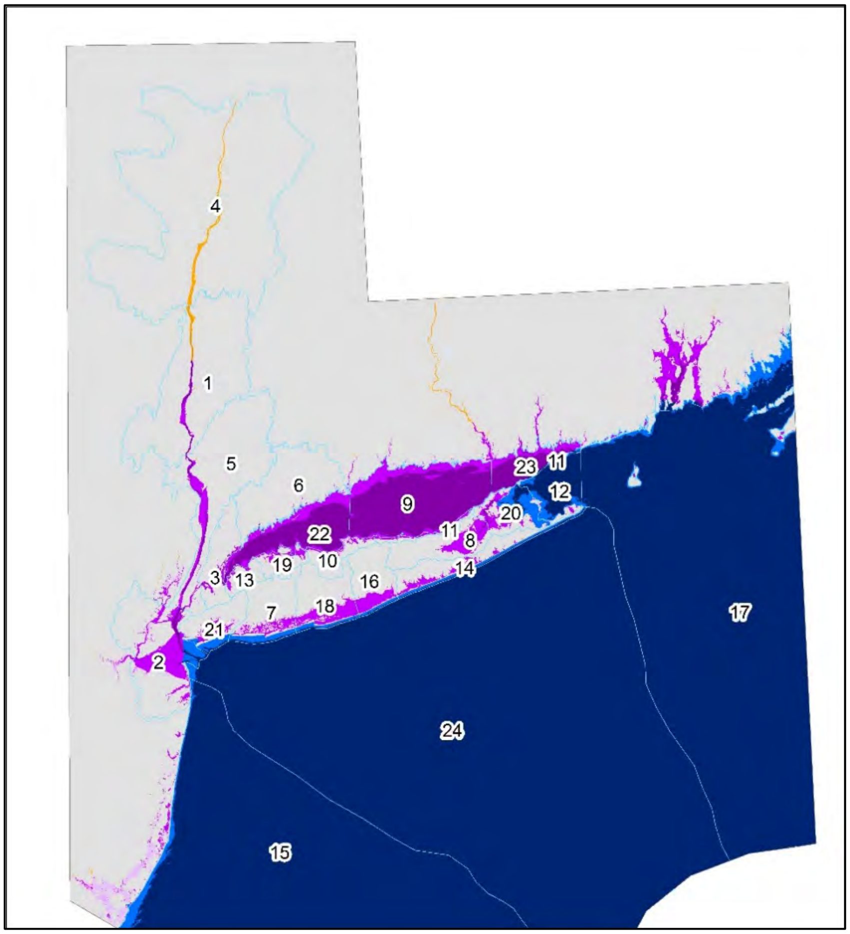

Figure 2. Grouping units used for comparisons throughout the marine environment.

Table 1. The Assessment Areas for the marine habitats assessment.

Unit ID	NAME	LEVEL	HUC ID
1	Hudson River middle	HUC 8	02020008
2	Sandy Hook-Staten Island	HUC 8	02030104
3	Bronx	HUC 8	02030102
4	Hudson River upper	HUC 8	02020006
5	Hudson River lower	HUC 8	02030101
6	Saugatuck	HUC 8	01100006
7	South Oyster Bay-Jones Inlet	HUC 10	0203020202
8	Peconic River	HUC 10	0203020205
9	Mid Long Island Sound	Custom	020302030001
10	Nissequogue River-Smithtown Bay	HUC 10	0203020103
11	Fishers Island Sound-Long Island Sound	HUC 10	0203020104
12	Napeague Bay-Block Island Sound	HUC 10	0203020208
13	Hempstead Harbor-Manhassett Bay	HUC 10	0203020101
14	Shinnecock Bay-Atlantic Ocean	HUC 10	0203020206
15	Atlantic Ocean New Jersey	Custom	020403010801
16	Carmans River-Great South Bay	HUC 10	0203020203
17	Atlantic Ocean RI MA	Custom	020302020901
18	Great South Bay-Fire Island Inlet	HUC 10	0203020204
19	Oyster Bay-Huntington Bay	HUC 10	0203020102
20	Shelter Island Sound-Gardiners Bay	HUC 10	0203020207
21	Jamaica Bay-Rockaway Inlet	HUC 10	0203020201
22	West Long Island Sound	Custom	020302030002
23	East Long Island Sound	Custom	020302030003
24	Atlantic Ocean Long Island	Custom	020302020902

Condition Assessment Scores

The condition of the NY SWAP marine habitats were assessed at the Mesohabitat level using a variety of scoring methods. These assessment tools are briefly described below.

Score 1: Heavy metal contamination in sediment samples.

This study combined sediment samples from the EPA National Coastal Condition Report IV (EPA 2012) and from the Hudson River Estuary Program Biocriteria Project (Llanso et. al. 2007). These sediment samples generally occur in the shallow subtidal habitats and thus are used as a condition indicator for these types (Figure 204).

We generated a combined metric using the methods developed by EPA. We first assembled the most recent concentration value for Arsenic, Cadmium, Chromium, Copper, Lead, Mercury, Nickel, Silver, and Zinc. We used the ERL (Effects Range Low) and ERM (Effects Range Median) values and cutoffs for each metal published in the EPA report (EPA 2012). Thus, each sample was assigned good, fair, or poor rating based on the number of analyte readings exceeding the ERL and/or ERM (page 19 in EPA 2012).

Heavy metal data are also available from Suffolk County for targeted areas around Long Island, including sites in Long Island Sound, Peconic Bay, Great South Bay, Moriches Bay, and other South Shore Bay sites. Unfortunately, these data are from surface water samples and cannot be compared to sediment samples so we had to exclude this excellent resource from this analysis.

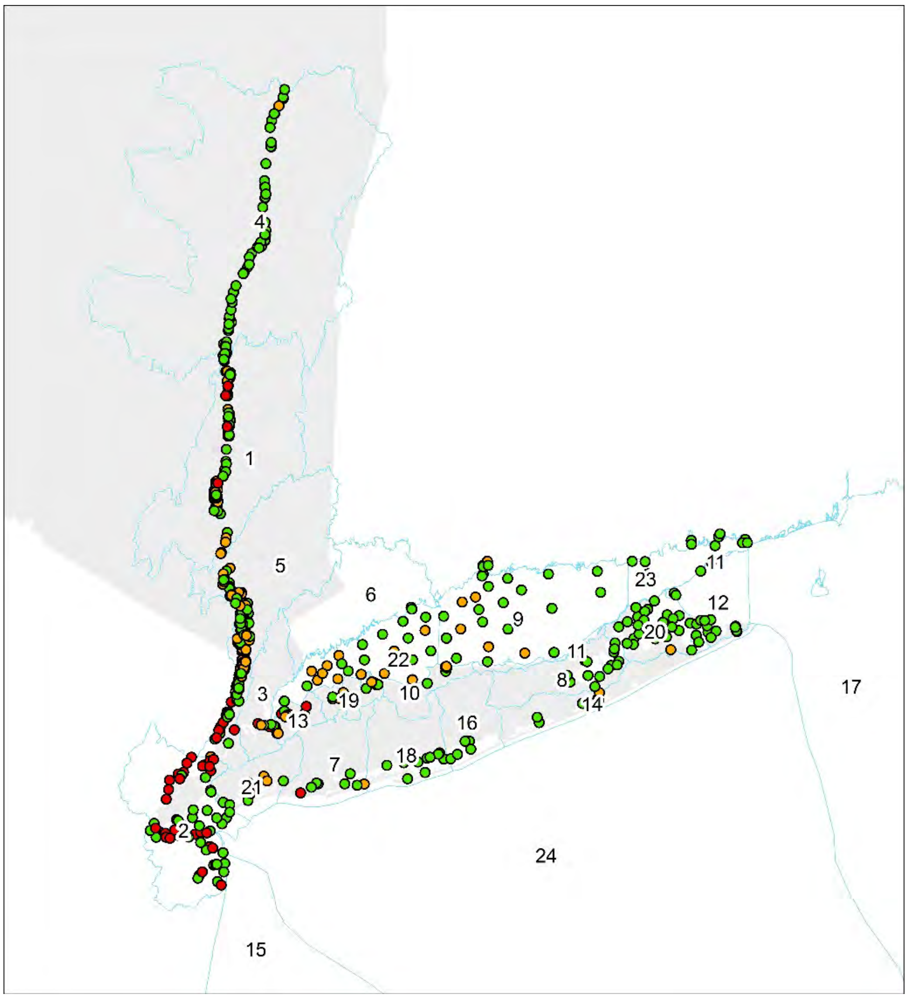

Figure 3. Sediment samples used for this metric. This is a combined data set from the EPA NCCR and the Hudson River Estuary Program.

Score 2: Chlorophyll A in open water.

The System Wide Eutrophication Model (SWEM) is a water quality model developed to assist water quality and natural resource managers improve water conditions in the study area. The

SWEM now resides with the University of Connecticut (http://swem.uconn.edu/) where development and testing of the model continues. The first version of the model was completed in 2001 and provided modeled estimates of many different condition parameters throughout our study area. The model varies in resolution depending on location within the study area and its use is most appropriate for the deeper water habitats in the marine and brackish environments.

We used the 30-day average for Chlorophyll A as our first condition metric from the SWEM (Figure 205). The EPA National Coastal Condition Report IV provides cutpoints for assessing the relative condition of the modeled values: < 5 µg/L = good; 5-20 µg/L = fair; > 20 µg/L = poor (EPA 2012, page 13).

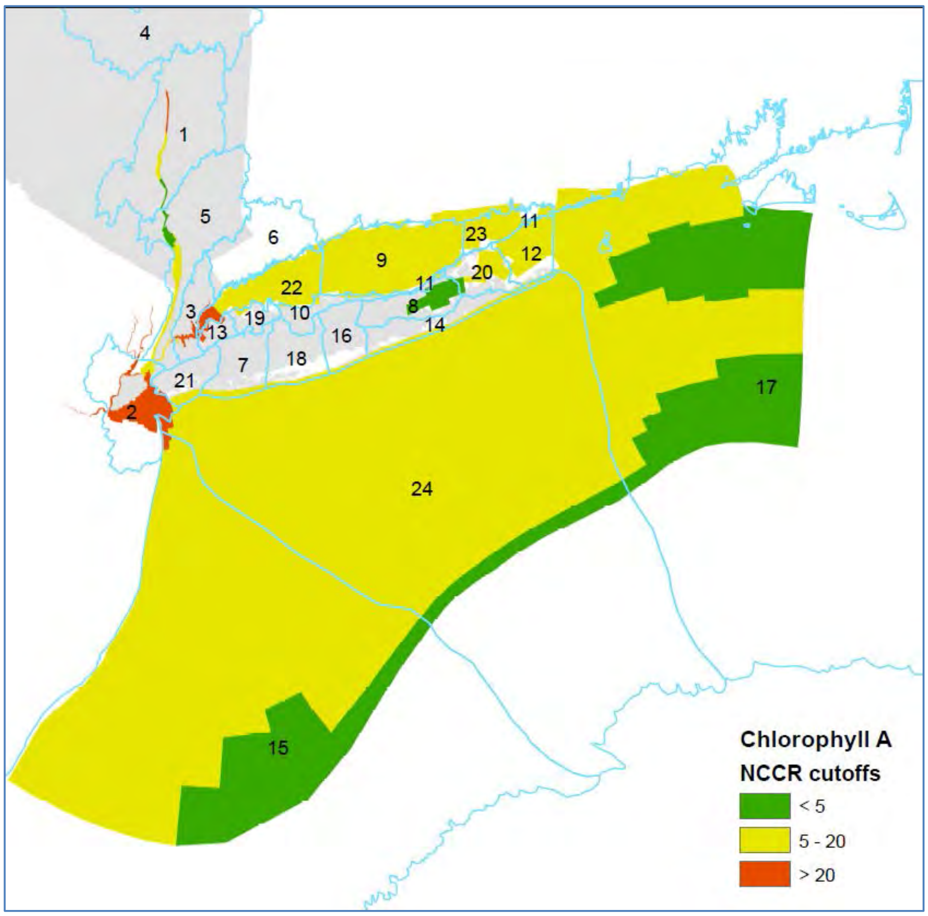

Figure 4. Chlorophyll A as modeled in the SWEM.

Cholorophyll A, in combination with dissolved inorganic nitrogen (DIN) and dissolved inorganic phosphorus (DIP), can be an indicator of susceptibility to eutrophication. Because of this 'enhanced picture' of the overall condition of the marine environment using all three indicators, these are three we chose to provide in this report.

Score 3: Dissolved inorganic nitrogen in open water.

We used the 30-day average for dissolved inorganic nitrogen (DIN) as the second condition metric from the SWEM (Figure 206). The EPA National Coastal Condition Report IV provides cutpoints for assessing the relative condition of the modeled values: < 0.1 µg/L = good; 0.1-0.5 µg/L = fair; > 0.5 µg/L = poor (EPA 2012, page 12).

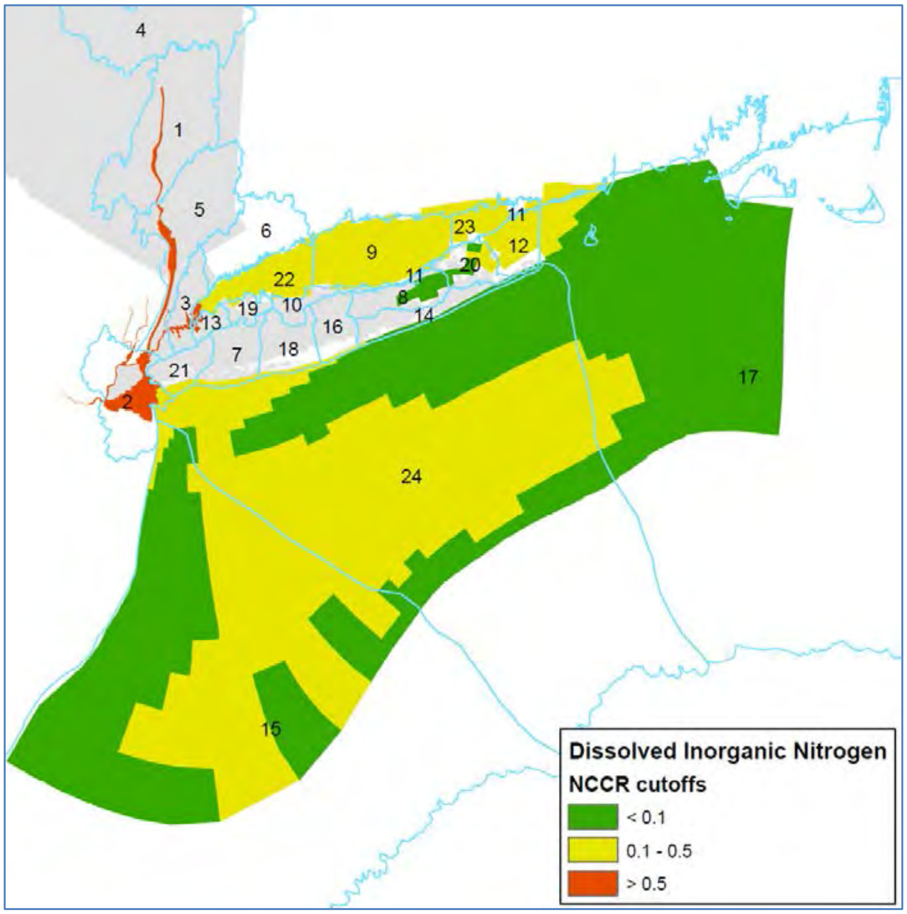

Figure 5. Dissolved inorganic nitrogen as modeled in the SWEM.

Score 4: Dissolved inorganic phosphorus in open water.

We used the 30-day average for dissolved inorganic phosphorus (DIP) as the third condition metric from the SWEM (Figure 207). The EPA National Coastal Condition Report IV provides cutpoints for assessing the relative condition of the modeled values: < 0.01 µg/L = good; 0.01-0.05 µg/L = fair; > 0.05 µg/L = poor (EPA 2012, page 12).

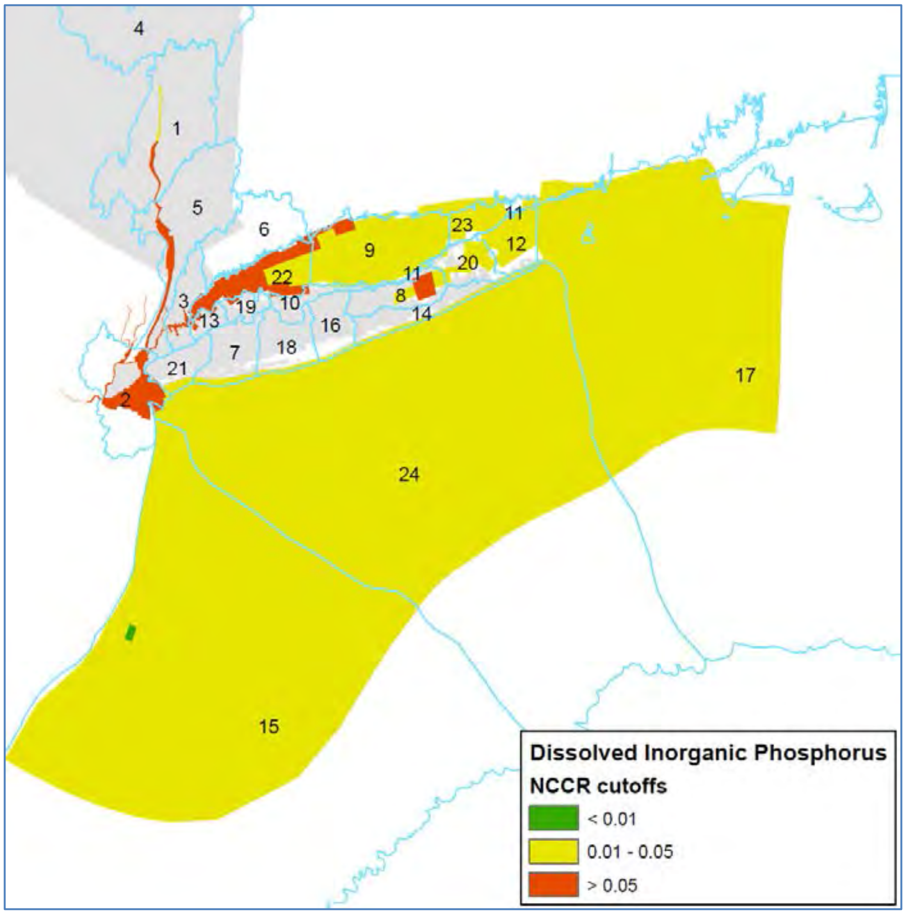

Figure 6. Dissolved inorganic phosphorus as modeled in the SWEM.

Score 5: Upland condition adjacent to intertidal habitats.

Intertidal habitats and all freshwater tidal habitats are strongly influenced by the upland areas adjacent to and within the watershed of these marine habitats. Understanding that there is a balance between the effects of the adjacent uplands and diurnal tidal flushing is important. But quantifying the relative importance of these two strong influences on habitat condition is very difficult (even with effects on vegetation; e.g., Clark and Patterson 1985). Furthermore, estimates of condition for intertidal habitats are very difficult to come by: typical marine sampling begins below the tide line, such as with the Suffolk County water quality samples. One concern on Long Island is accelerated erosion rates for many salt marshes and thus this measure is well studied (e.g.; Hartig et al. 2002, Wang 2003), but we had a difficult time finding other direct estimates of intertidal condition.

For these reasons we chose to estimate the condition of intertidal and freshwater tidal habitats by the upland stressor component. The effects of runoff on intertidal communities is well documented (Roper et al. 1988, Gardner 2003) and the link between the characteristics of runoff and development is closely related to what is in solution in the runoff water and physical characteristics of runoff, such as how ‘flashy’ it is. These runoff characteristics are closely related to the amount of impervious surface on the landscape, how close that impervious surface is to our habitat type, and other anthropogenic stressors such as residential development and railroad corridors.

We find the best way to quantify the amount of anthropogenic stress on our habitats is through the Landscape Condition Assessment model, or LCA, developed by the New York Natural Heritage Program (Feldmann and Howard 2013; Figure 208). This model includes thirteen different inputs, including five size classes encompassing roads, trails, and rail lines; three levels of development; two utility corridors, and two land-cover types. The effect of each class is modeled to extend beyond their footprint, with the effect tapering to zero in a non-linear fashion with distance effects varying by the intensity of the stressor.

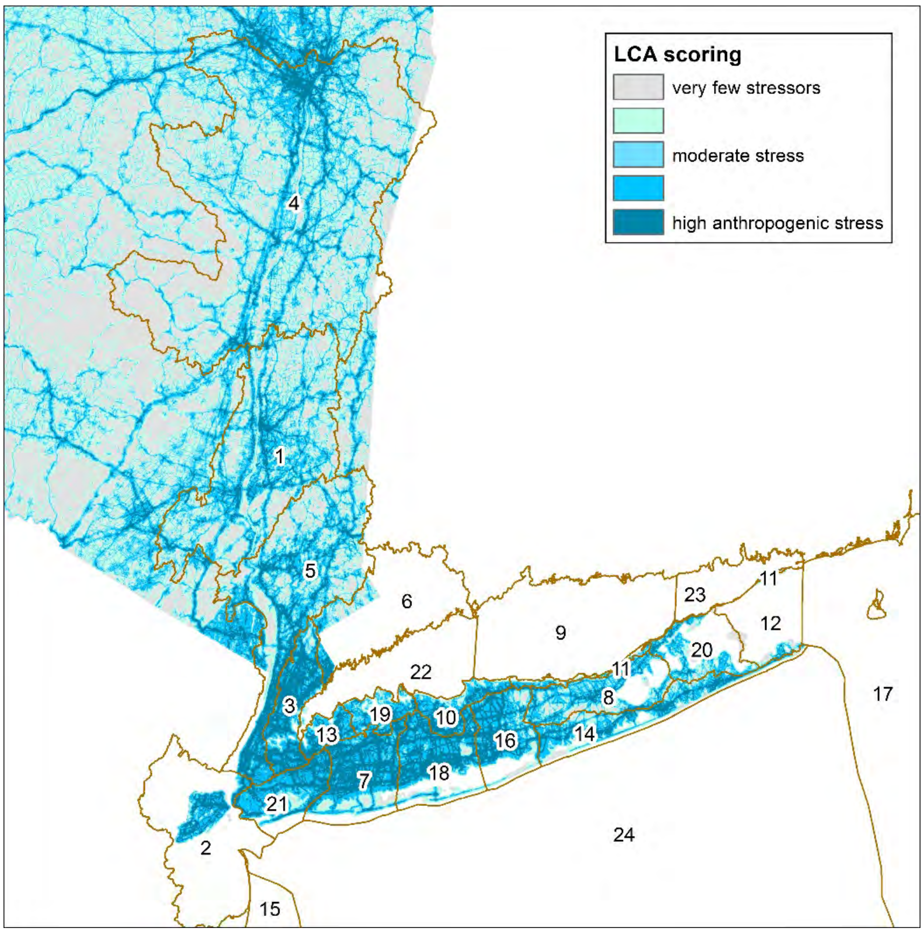

Figure 7. The Landscape Condition Assessment overlaying the marine assessment areas.

Marine System

The Marine System includes the open ocean (Atlantic waters) overlying the continental shelf and its associated high-energy coastline. Marine habitats are exposed to the waves and currents of the open ocean and the water regimes are determined primarily by the ebb and flow of oceanic tides. Salinities exceed 30 ppt, with little or no dilution except outside the mouths of estuaries.

Marine Intertidal Mesohabitat

The Marine Intertidal Mesohabitat extends from mean high water (MHW) (with spray) to mean low water (MLW). The substrate is exposed and flooded by tides (includes splash zone) and salinities exceed 30 ppt. This Mesohabitat includes three Macrohabitats described below.

Artificial Structure Macrohabitat: This habitat includes substrates that were emplaced by humans, using either natural materials such as dredge spoil or synthetic materials, such as discarded automobiles, tires, or concrete (e.g., bulkheads, groins, and jetties).

Aquatic Bed Macrohabitat: This includes habitats dominated by plants that grow principally on or below the surface of the water for most of the growing season in most years (e.g., rooted algal and drift algal).

Benthic Geomorphology Macrohabitat: This habitat includes a characterization of the geomorphology of the bottom (e.g., bar, tidal flat, channel, shellfish bed, rocky intertidal, and bank).

Distribution

The Marine Intertidal Mesohabitat extends along the south coast of Long Island passing through the following assessment areas (west to east): Jamaica Bay-Rockaway Inlet (21), South Oyster Bay-Jones Inlet (7), Great South Bay-Fire Island Inlet (18), Carmans River-Great South Bay (16), Shinnecock Bay-Atlantic Ocean (14), and Napeague Bay-Block Island Sound (12) (Figure 209). The majority of this type is predicted to be in the Shinnecock Bay-Atlantic Ocean assessment area (14) with nearly 150 acres followed by South Oyster Bay-Jones Inlet (7) with about 75 acres (Figure 210).

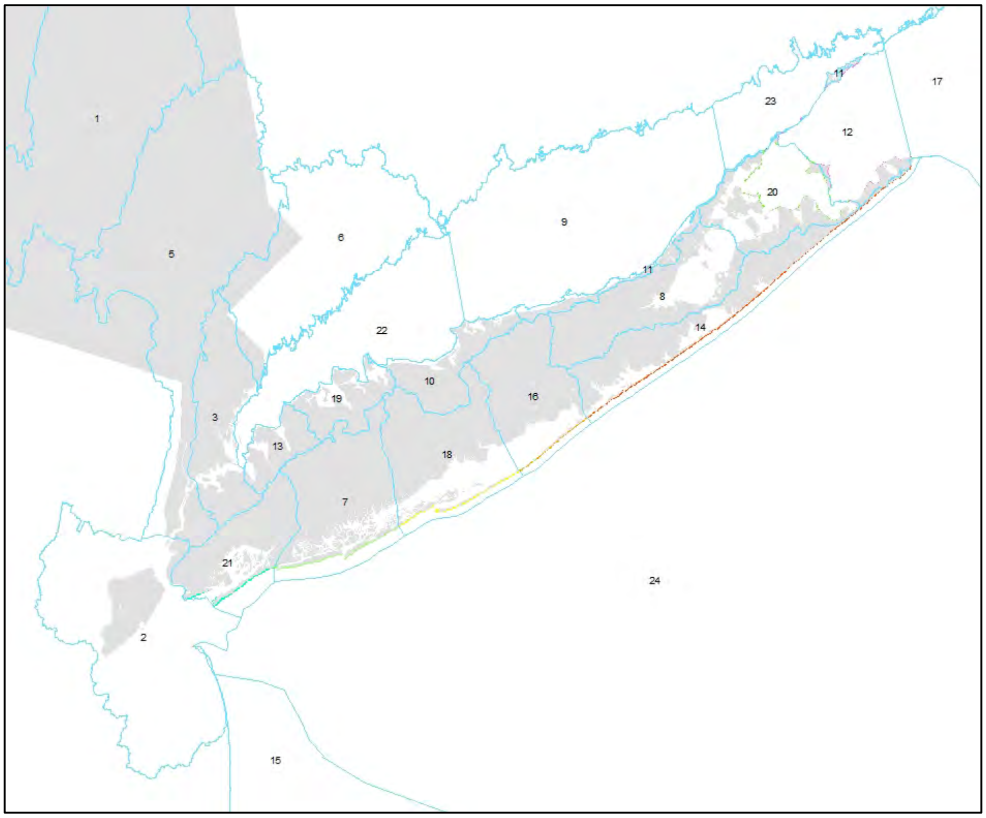

Figure 8. Distribution of the Marine Intertidal Mesohabitat.

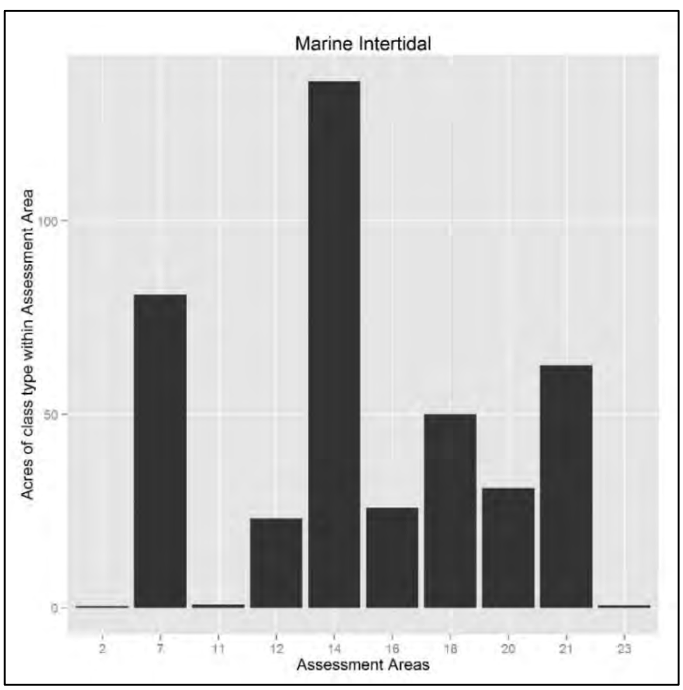

Figure 9. Distribution of the Marine Intertidal Mesohabitat by assessment area.

Condition Assessment

The Marine Intertidal Mesohabitat was not assessed for heavy metal contamination because sediment samples were not collected from within this type.

The mean LCA value for each watershed in which this habitat occurs is depicted in Figure 211. The area in the best condition is area 23, the north shore of the eastern tip of Long Island, while the sites with poorest condition tend to be the western south shore of Long Island.

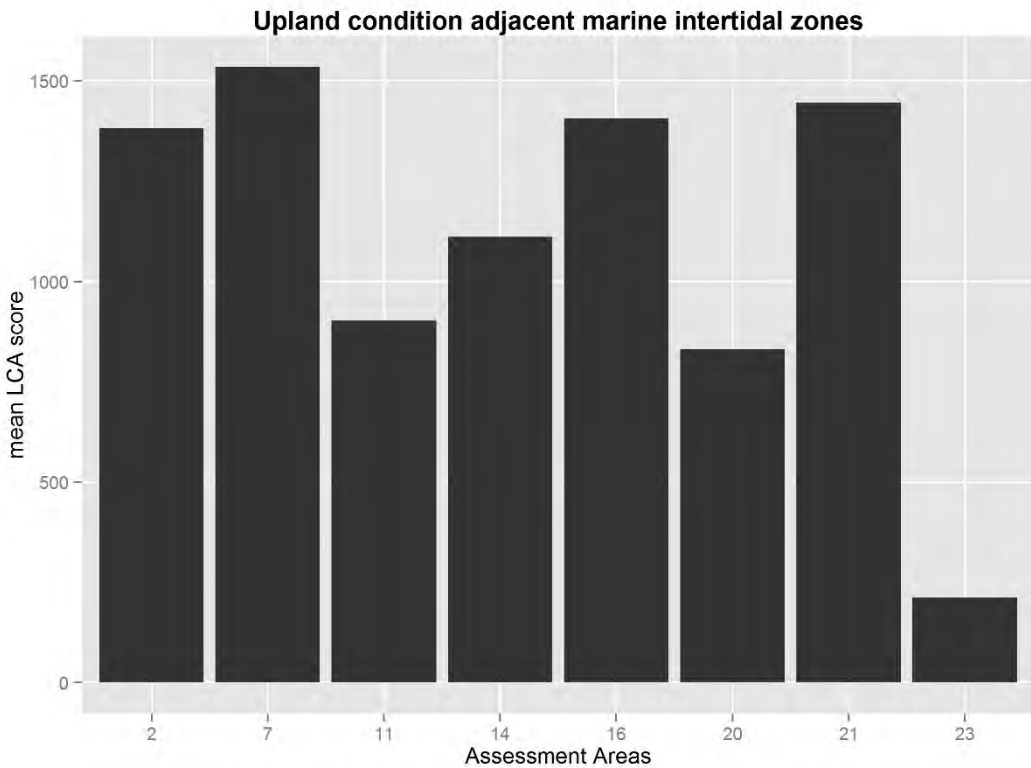

Figure 10. The mean LCA score for the watersheds (assessment areas) adjacent the marine intertidal zones.

Associated SGCN

Table 1. SGCN associated with the Marine Intertidal Mesohabitat.

Species	Common name	SGCN	Habitat link
Chroicocephalus	Bonaparte's Gull	3	Bar
Haematopus palliatus	American oystercatcher	3	Bar
Histrionicus histrionicus	Harlequin duck	3	Groins
Histrionicus histrionicus	Harlequin duck	3	Jetties
Argopecten irradians	Bay Scallop	2	Marine; Intertidal

Species	Common name	SGCN	Habitat link
Limnodromus griseus	Short-billed dowitcher	2	Marine; Intertidal
Limosa fedoa	Marbled godwit	4	Marine; Intertidal
Limulus polyphemus	Horseshoe Crab	2	Marine; Intertidal
Mercenaria mercenaria	Hard clam	2	Marine; Intertidal
Mytilus edulis	Blue mussel	3	Marine; Intertidal
Podiceps auritus	Horned Grebe	3	Marine; Intertidal
Calidris maritima	Purple sandpiper	3	Marine; Intertidal; Artificial Structure
Uca pugnax	Atlantic marsh fiddler	3	Marine; Intertidal; Benthic
Calidris maritima	Purple sandpiper	3	Rocky Intertidal
Histrionicus histrionicus	Harlequin duck	3	Rocky Intertidal
Somateria mollissima	Common eider	3	Rocky Intertidal
Arenaria interpres	Ruddy turnstone	3	Tidal Flat
Chroicocephalus	Bonaparte's Gull	3	Tidal Flat
Haematopus palliatus	American oystercatcher	3	Tidal Flat
Hydrocoloeus minutus	Little gull	2	Tidal Flat
Limulus polyphemus	Horseshoe Crab	2	Tidal Flat
Pluvialis squatarola	Black-bellied plover	3	Tidal Flat

Marine Subtidal Shallow Mesohabitat

The Marine Subtidal Shallow Mesohabitat has a substrate that is continuously submerged with depths from 0-10 m and salinities that exceed 30 ppt. This Mesohabitat includes three Macrohabitats described below.

Artificial Structure Macrohabitat: Artificial Structure—substrates that were emplaced by humans, using either natural materials such as dredge spoil or synthetic materials, such as discarded automobiles, tires, or concrete (e.g., bulkheads, groins, jetties, marinas, and reefs).

Aquatic Bed Macrohabitat: Aquatic bed—includes habitats dominated by plants that grow principally on or below the surface of the water for most of the growing season in most years (e.g., rooted vascular, floating vascular, rooted algal, and drift algal).

Benthic Geomorphology Macrohabitat: Benthic geomorphology—characterization of the geomorphology of the bottom (e.g., bar, sediment wave, channel, shellfish bed, benthic flat, and bank).

Distribution

The Marine Subtidal Shallow Mesohabitat extends from Staten Island along the south coast of Long Island to Montauk Point passing through the following assessment areas (west to east):

Sandy Hook-Staten Island (2), Jamaica Bay-Rockaway Inlet (21), South Oyster Bay-Jones Inlet (7), Great South Bay-Fire Island Inlet (18), Carmans River-Great South Bay (16), Shinnecock Bay-Atlantic Ocean (14), and Napeague Bay-Block Island Sound (12) (Figure 212). The assessment area with the most acres of this type within New York is Shelter Island-Gardiners Bay (20) with about 3,750 acres. (Figure 213).

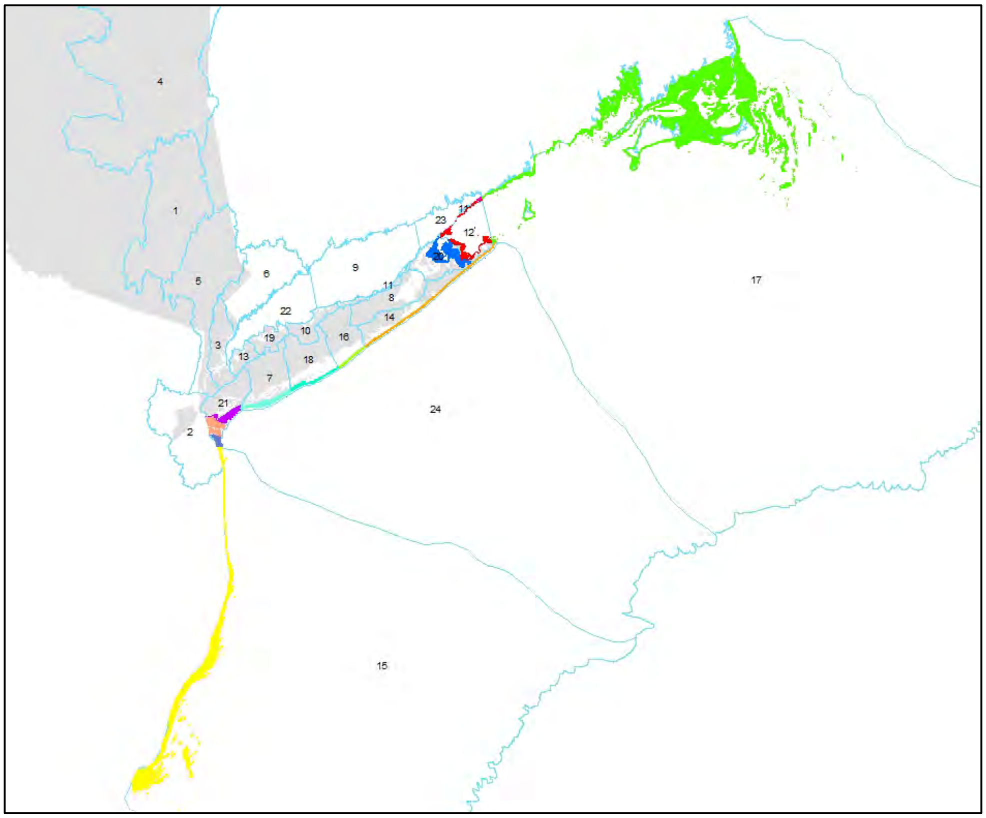

Figure 11. Distribution of the Marine Subtidal Shallow Mesohabitat.

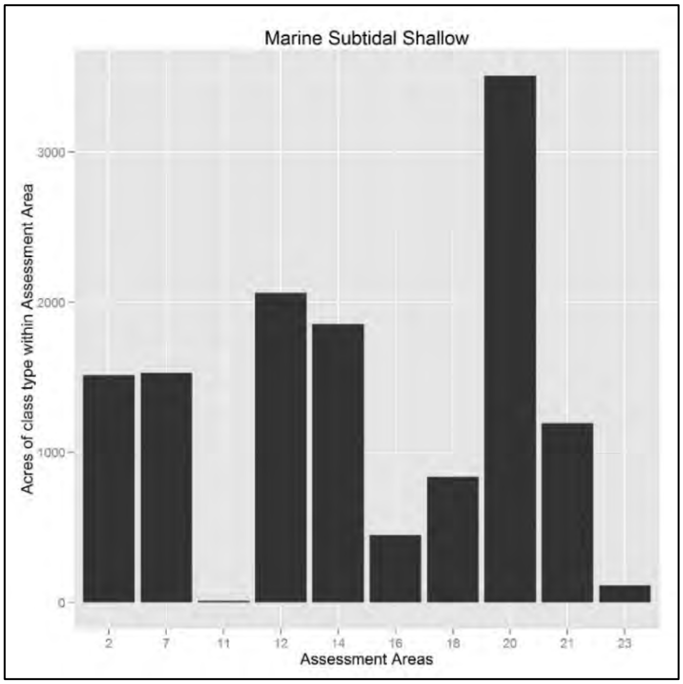

Figure 12. Distribution of the Marine Subtidal Shallow Mesohabitat by assessment area within the New York portion of the study area (e.g., excluding areas 15, 17).

Condition Assessment

Sediment samples were collected from Marine Subtidal Shallow Mesohabitat in three of the 10 (30%) assessment areas where it occurs (Figure 214 and Figure 215). However, most of the samples were collected within the assessment area that has the most acres of this type: Shelter Island Sound-Gardiners Bay (20). All sediment samples collected from this type were rated "good" based on the number of analyte readings exceeding the ERL (Effects Range Low) and/or ERM (Effects Range Median) values and cutoffs (Figure 215).

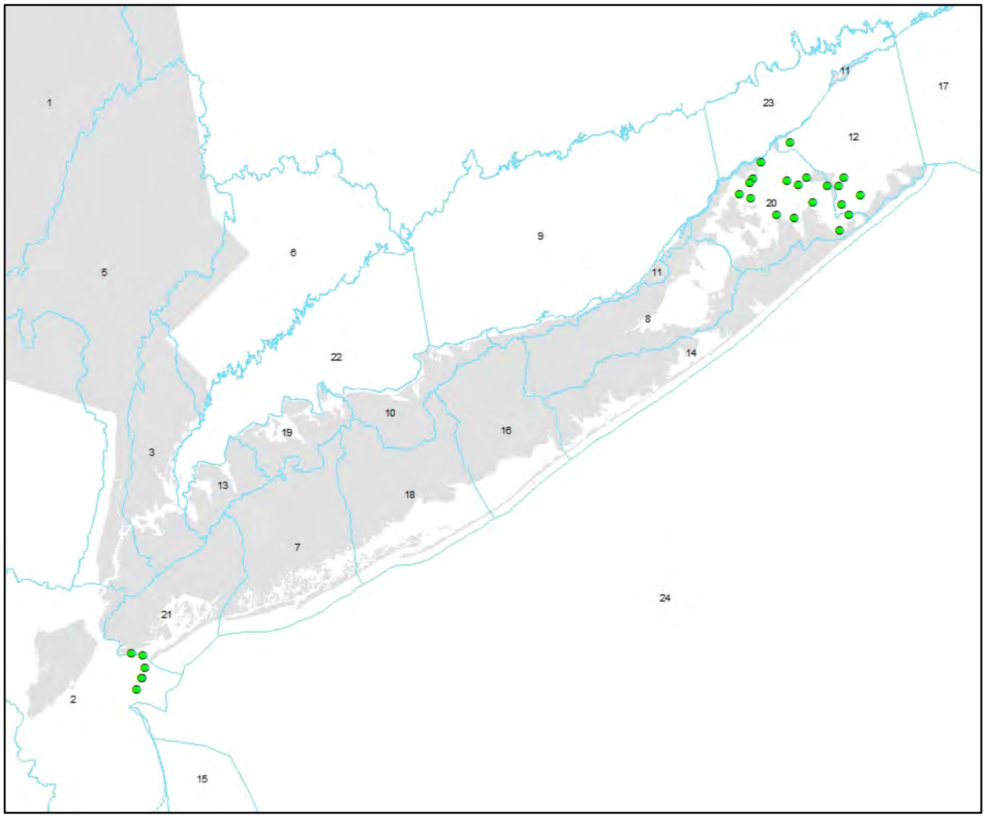

Figure 13. Sediment collection points within the Marine Subtidal Shallow Mesohabitat.

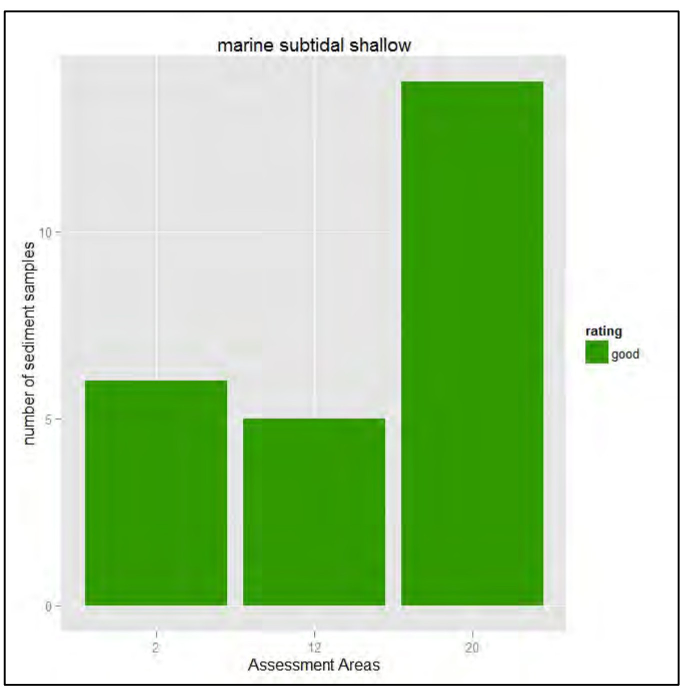

Figure 14. Sediment condition of the Marine Subtidal Shallow Mesohabitat by assessment area.

Modeled levels of Chrolophyll A were at fair to poor conditions throughout this habitat (Figure 216). Within that range, the best average conditions were the eastern section of the Atlantic and the water closest to the mouth of Long Island Sound. The two assessment areas that made it into the poor category are those most influenced by New York City and the mouth of the Hudson River: Sandy Hook – Staten Island and Atlantic Ocean Long Island.

Modeled levels of dissolved inorganic nitrogen (DIN) ranged from good to fair for this habitat type (Figure 217). The worst assessment areas were the same as those for chlorophyll A: the two zones at the mouth of the Hudson River. The assessment areas with the best modeled conditions for DIN include the western and eastern portions of the Atlantic Ocean and the eastern end of Long Island, on the Atlantic side (Shinnecock Bay area).

Modeled levels of dissolved inorganic phosphorus (DIP) ranged from fair to poor for this habitat type (Figure 218). The patterns were very similar to DIN, with the mouth of the Hudson River emerging as being in the poorest condition and the other more open areas in the best condition.

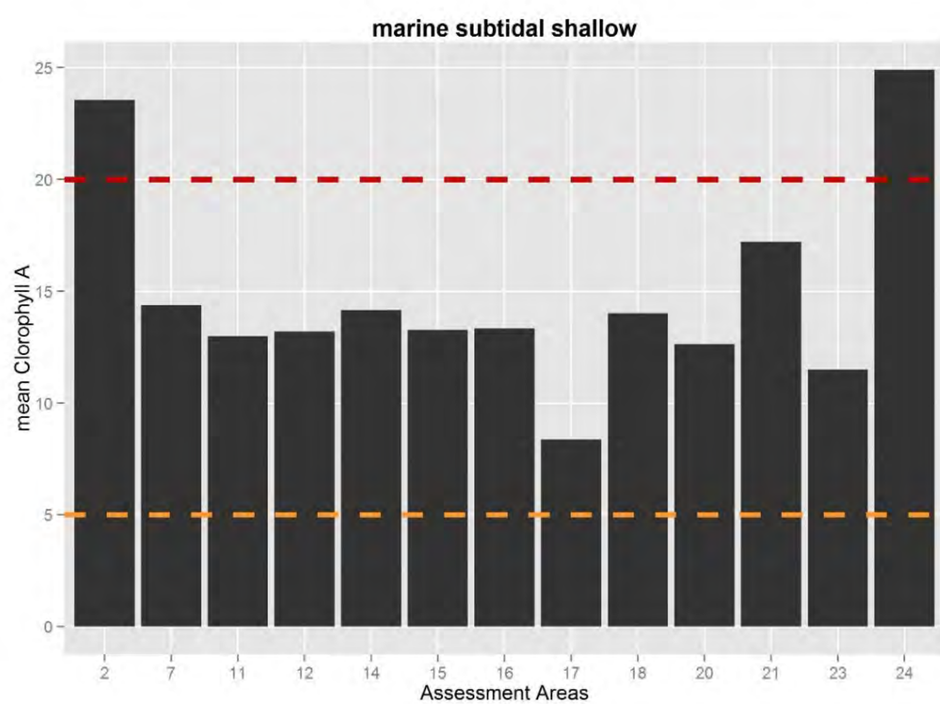

Figure 15. Mean Chlorophyll A concentrations by assessment area as estimated by the SWEM for the marine subtidal shallow mesohabitat. Bars above the orange line (5 µg/L) are classified as fair condition. Bars above the red line (20 µg/L) are classified as in poor condition.

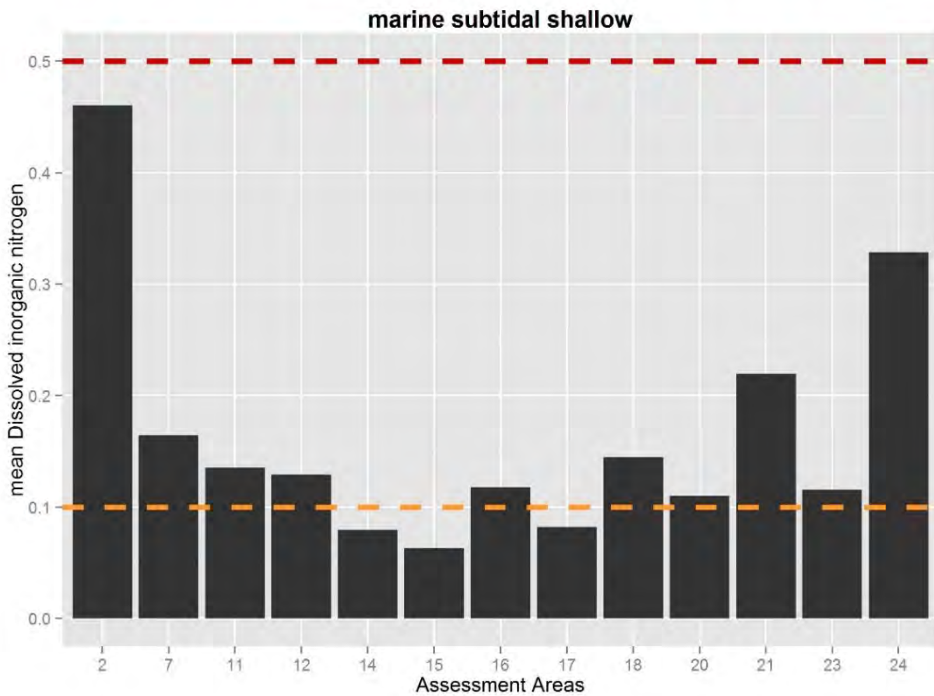

Figure 16. Mean dissolved inorganic nitrogen concentrations by assessment area as estimated by the SWEM for the marine subtidal shallow mesohabitat. Bars above the orange line (0.1 µg/L) are classified as fair condition. Bars above the red line (0.5 µg/L) are classified as in poor condition. Areas with bars below the orange line are classified as areas in good condition.

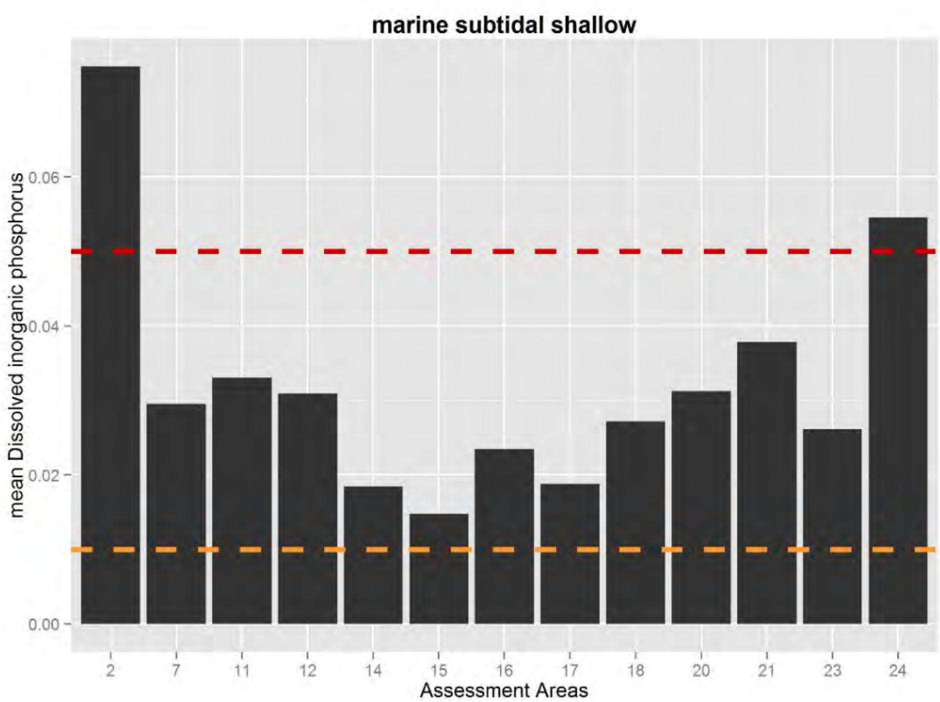

Figure 17. Mean dissolved inorganic phosphorus concentrations by assessment area as estimated by the SWEM for the marine subtidal shallow mesohabitat. Bars above the orange line (0.01 µg/L) are classified as fair condition. Bars above the red line (0.05 µg/L) are classified as in poor condition

Associated SGCN

Table 2. SGCN associated with the Marine Subtidal Shallow Mesohabitat.

Species	Common name	SGCN	Habitat link
Acipenser oxyrinchus	Atlantic Sturgeon	2	Marine; Shallow Sub-tidal
Carcharias taurus	Sand tiger shark	2	Marine; Shallow Sub-tidal
Caretta caretta	Loggerhead turtle	2	Marine; Shallow Sub-tidal
Chelonia mydas	Green turtle	2	Marine; Shallow Sub-tidal
Galeocerdo cuvier	Tiger shark	4	Marine; Shallow Sub-tidal
Lepidochelys kempii	Kemp's ridley turtle	2	Marine; Shallow Sub-tidal
Leucoraja erinacea	Little skate	3	Marine; Shallow Sub-tidal
Limulus polyphemus	Horseshoe Crab	2	Marine; Shallow Sub-tidal
Melanitta perspicillata	Surf scoter	3	Marine; Shallow Sub-tidal
Mercenaria	Hard clam	2	Marine; Shallow Sub-tidal
Microgadus tomcod	Atlantic tomcod	2	Marine; Shallow Sub-tidal
Mytilus edulis	Blue mussel	3	Marine; Shallow Sub-tidal
Raja eglanteria	Clearnose skate	3	Marine; Shallow Sub-tidal
Rhinoptera bonasus	Cownose ray	4	Marine; Shallow Sub-tidal
Sphoeroides	Northern puffer	3	Marine; Shallow Sub-tidal
Sphyrna lewini	Scalloped hammerhead	4	Marine; Shallow Sub-tidal
Sphyrna zygaena	Smooth hammerhead shark	4	Marine; Shallow Sub-tidal
Syngnathus fuscus	Northern pipefish	2	Marine; Shallow Sub-tidal
Alca torda	Razorbill	3	Marine; Shallow Sub-tidal; Aquatic
Clangula hyemalis	Long-tailed duck	3	Marine; Shallow Sub-tidal; Aquatic
Apeltes quadricus	Fourspine stickleback	2	Rooted Vascular

Marine Subtidal Deep Mesohabitat

The Marine Subtidal Deep Mesohabitat has a substrate that is continuously submerged with depths >10 m and salinities that exceed 30 ppt. This Mesohabitat includes two Macrohabitats described below.

Artificial Structure Macrohabitat: Artificial Structure-substrates that were emplaced by humans, using either natural materials such as dredge spoil or synthetic materials, such as discarded automobiles, tires, or concrete (e.g., reefs).

Benthic Geomorphology Macrohabitat: Benthic geomorphology- characterization of the geomorphology of the bottom (e.g., bar, sediment wave, channel, benthic flat, bank, pinnacle, shellfish bed, and mound).

Distribution

The Marine Subtidal Deep Mesohabitat is most abundant in the following three assessment areas: 1) Atlantic Ocean RI, MA (17) where it covers almost one million acres; 2) Atlantic Ocean NJ (15) with about 800,000 acres; and 3) Atlantic Ocean Long Island (24) with over 600,000 acres. This type also occurs off the east end of Long Island in the following two assessment areas: Napeague Bay-Block Island Sound (12) and Shelter Island Sound-Gardiners Bay (20) (Figure 219 and Figure 220).

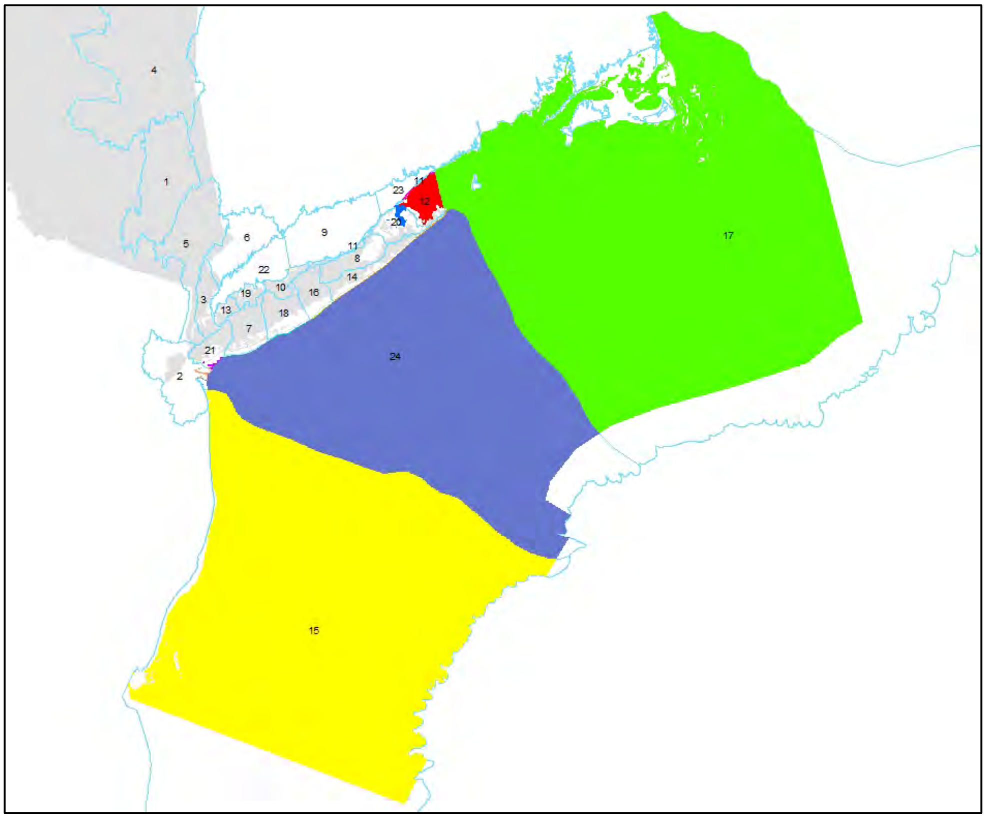

Figure 18. Distribution of the Marine Subtidal Deep Mesohabitat.

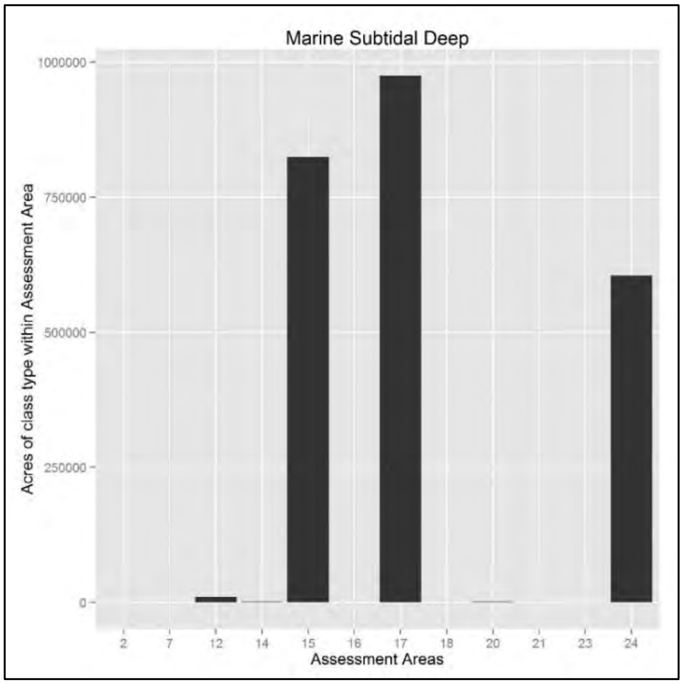

Figure 19. Distribution of the Marine Subtidal Deep Mesohabitat by assessment area.

Condition Assessment

Sediment samples were collected from the Marine Subtidal Deep Mesohabitat in two of the 12 (17%) assessment areas where it occurs (Figure 221 and Figure 222). All sediment samples collected from this type were rated “good” based on the number of analyte readings exceeding the ERL (Effects Range Low) and/or ERM (Effects Range Median) values and cutoffs (Figure 222).

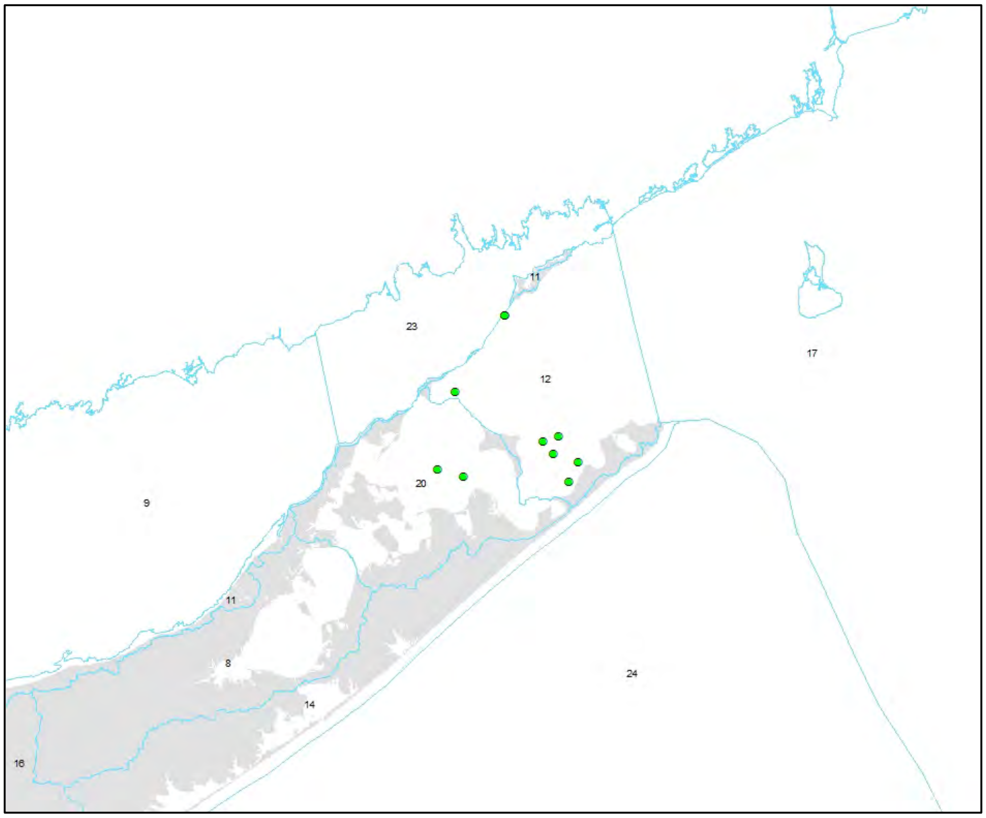

Figure 20. Sediment collection points within Marine Subtidal Deep Mesohabitat.

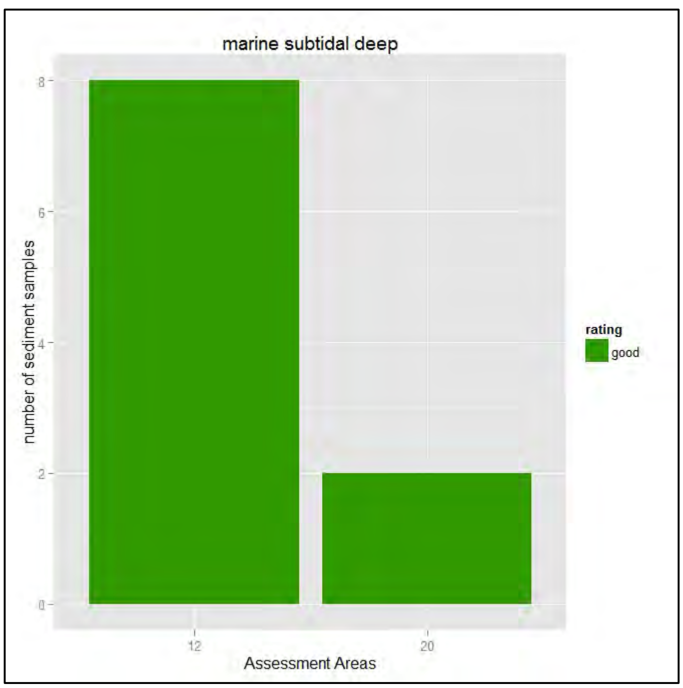

Figure 21. Sediment condition of the Marine Subtidal Deep Mesohabitat by assessment area.

Modeled levels of Chrolophyll A were at fair to poor conditions throughout this habitat (Figure 223). Within that range, the best average conditions were the offshore, Atlantic Ocean sections. The very mouth of the Hudson River at New York Harbor was the only section where the SWEM data modeled this habitat as in poor condition.

Modeled levels of dissolved inorganic nitrogen (DIN) ranged from good to fair for this habitat type (Figure 224). The worst assessment area was the same as for chlorophyll A: the mouth of the Hudson River. The assessment areas with the best modeled conditions for DIN include the open ocean portions of the Atlantic Ocean and the eastern end of Long Island, on the Atlantic side (Shinnecock Bay area).

Modeled levels of dissolved inorganic phosphorus (DIP) ranged from fair to poor for this habitat type (Figure 225). The patterns were very similar to DIN, with the mouth of the Hudson River emerging as being in the poorest condition and the other more open was areas in the best condition.

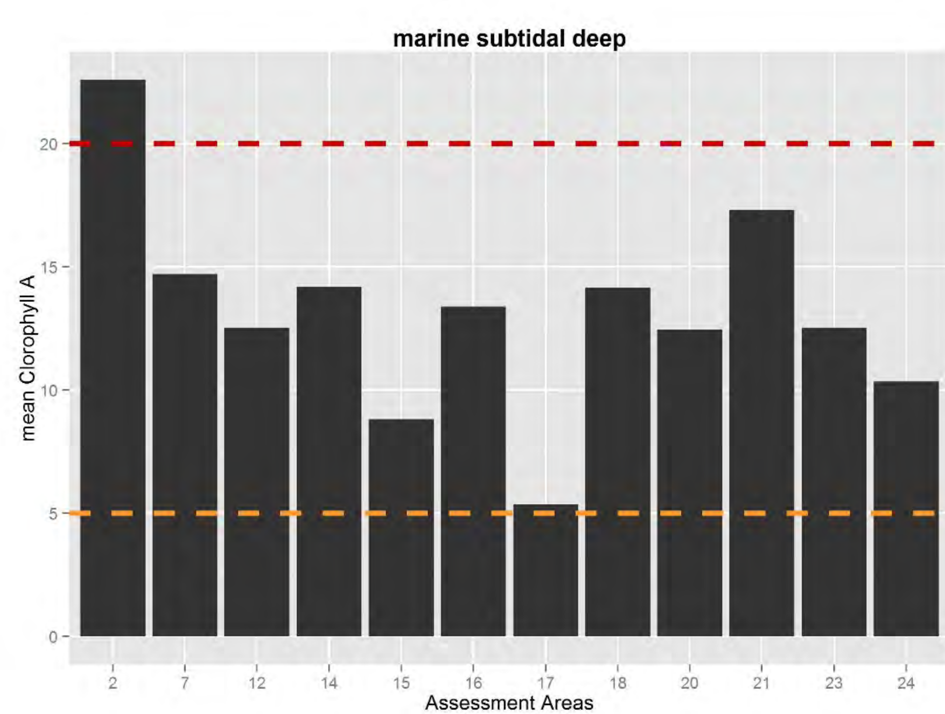

Figure 22. Mean Chlorophyll A concentrations by assessment area as estimated by the SWEM for the marine subtidal deep mesohabitat. Bars above the orange line (5 µg/L) are classified as fair condition. Bars above the red line (20 µg/L) are classified as in poor condition.

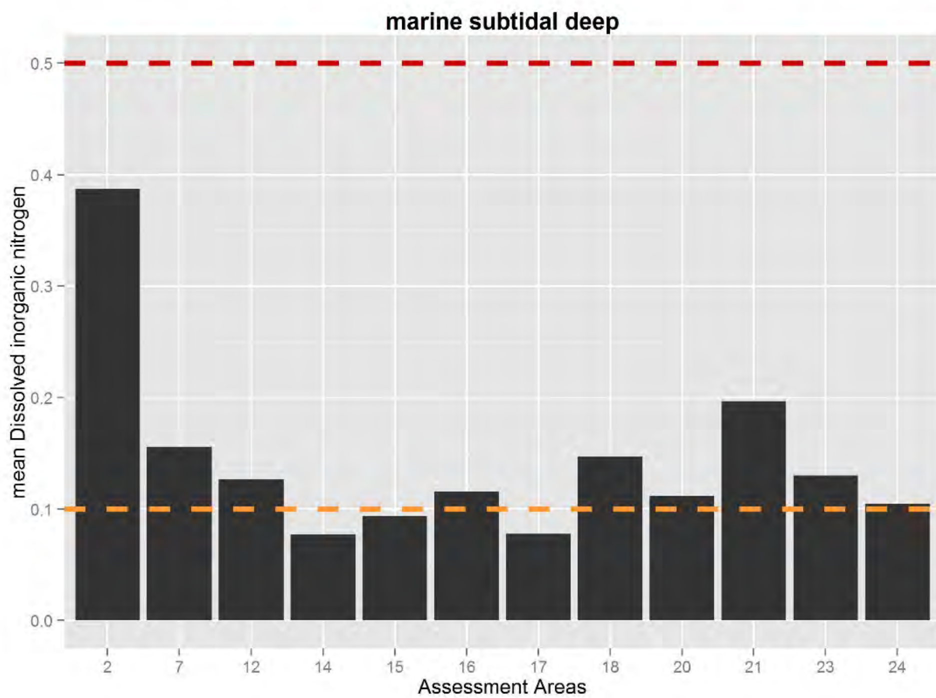

Figure 23. Mean dissolved inorganic nitrogen concentrations by assessment area as estimated by the SWEM for the marine subtidal deep mesohabitat. Bars above the orange line (0.1 µg/L) are classified as fair condition. Bars above the red line (0.5 µg/L) are classified as in poor condition. Areas with bars below the orange line are classified as areas in good condition.

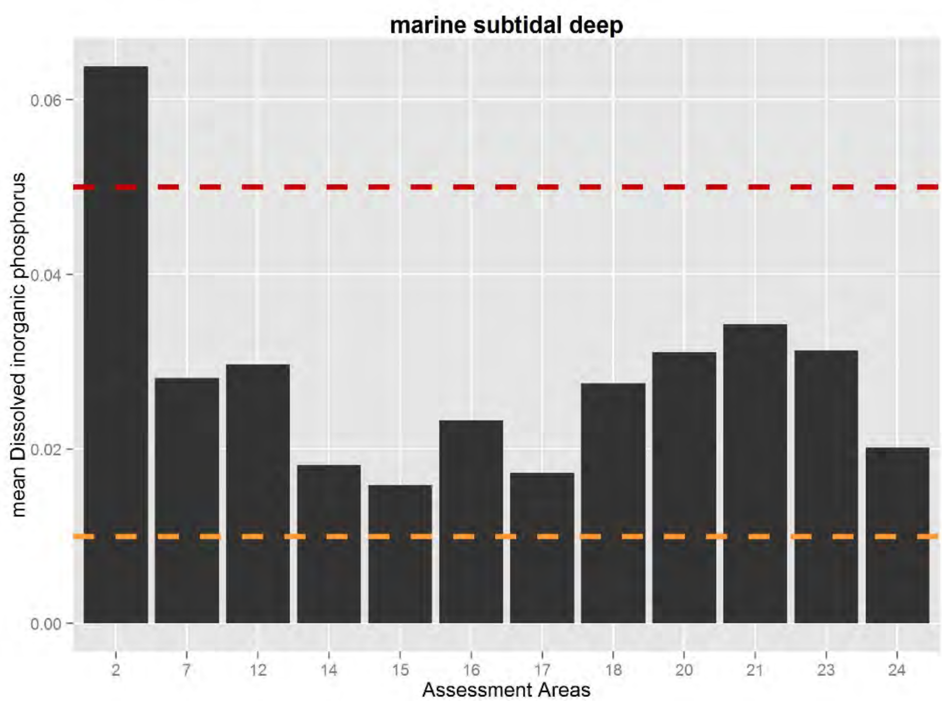

Figure 24. Mean dissolved inorganic phosphorus concentrations by assessment area as estimated by the SWEM for the marine subtidal deep mesohabitat. Bars above the orange line (0.01 µg/L) are classified as fair condition. Bars above the red line (0.05 µg/L) are classified as in poor condition

Associated SGCN

Table 3. SGCN associated with the Marine Subtidal Deep Mesohabitat.

Species	Common name	SGCN category	Habitat link
Acipenser oxyrinchus	Atlantic Sturgeon	2	Marine; Deep Sub-tidal
Alopias vulpinus	Thresher shark	2	Marine; Deep Sub-tidal
Alosa sapidissima	American shad	2	Marine; Deep Sub-tidal
Amblyraja radiata	Thorny skate	2	Marine; Deep Sub-tidal
Anchoa mitchilli	Bay anchovy	3	Marine; Deep Sub-tidal
Anguilla rostrata	American eel	2	Marine; Deep Sub-tidal
Apeltes quadricus	Fourspine stickleback	2	Marine; Deep Sub-tidal
Balaenoptera borealis	Sei whale	2	Marine; Deep Sub-tidal
Balaenoptera musculus	Blue whale	2	Marine; Deep Sub-tidal
Balaenoptera physalus	Fin whale	2	Marine; Deep Sub-tidal
Brevoortia tyrannus	Atlantic Menhaden	3	Marine; Deep Sub-tidal
Calonectris diomedea borealis	Cory's Shearwater	3	Marine; Deep Sub-tidal
Carcharhinus obscurus	Dusky shark	2	Marine; Deep Sub-tidal
Carcharhinus plumbeus	Sandbar shark	3	Marine; Deep Sub-tidal
Carcharias taurus	Sand tiger shark	2	Marine; Deep Sub-tidal
Carcharodon carcharias	White shark	2	Marine; Deep Sub-tidal
Caretta caretta	Loggerhead turtle	2	Marine; Deep Sub-tidal
Cetorhinus maximus	Basking shark	3	Marine; Deep Sub-tidal
Chelonia mydas	Green turtle	2	Marine; Deep Sub-tidal
Dipturus laevis	Barndoor skate	3	Marine; Deep Sub-tidal
Eubalaena glacialis	North Atlantic right whale	1	Marine; Deep Sub-tidal
Galeocerdo cuvier	Tiger shark	4	Marine; Deep Sub-tidal
Gasterosteus aculeatus	Threespine stickleback	2	Marine; Deep Sub-tidal
Hippocampus erectus	Lined Seahorse	2	Marine; Deep Sub-tidal
Homarus americanus	American Lobster	2	Marine; Deep Sub-tidal
Isurus oxyrinchus	Shortfin mako	3	Marine; Deep Sub-tidal
Isurus paucus	Longfin Mako Shark	4	Marine; Deep Sub-tidal
Lamna nasus	Porbeagle shark	2	Marine; Deep Sub-tidal
Lepidochelys kempii	Kemp's ridley turtle	2	Marine; Deep Sub-tidal
Leucoraja erinacea	Little skate	3	Marine; Deep Sub-tidal
Leucoraja garmani virginica	Rosette skate	3	Marine; Deep Sub-tidal
Leucoraja ocellata	Winter Skate	3	Marine; Deep Sub-tidal
Limulus polyphemus	Horseshoe Crab	2	Marine; Deep Sub-tidal
Malacoraja senta	Smooth skate	4	Marine; Deep Sub-tidal
Megaptera novaeangliae	Humpback whale	3	Marine; Deep Sub-tidal
Melanitta americana	Black scoter	3	Marine; Deep Sub-tidal

Species	Common name	SGCN category	Habitat link
Melanitta americana	Black scoter	3	Marine; Deep Sub-tidal
Melanitta fusca	White-winged scoter	3	Marine; Deep Sub-tidal
Menidia menidia	Atlantic silverside	3	Marine; Deep Sub-tidal
Phalaropus lobatus	Red-necked Phalarope	4	Marine; Deep Sub-tidal
Phocoena phocoena	Harbor porpoise	2	Marine; Deep Sub-tidal
Physeter macrocephalus	Sperm whale	2	Marine; Deep Sub-tidal
Prionace glauca	Blue Shark	4	Marine; Deep Sub-tidal
Pseudopleuronectes americanus	Winter flounder	1	Marine; Deep Sub-tidal
Puffinus gravis	Great shearwater	4	Marine; Deep Sub-tidal
Pungitius pungitius	Ninespine stickleback	3	Marine; Deep Sub-tidal
Raja eglanteria	Clearnose skate	3	Marine; Deep Sub-tidal
Rhinoptera bonasus	Cownose ray	4	Marine; Deep Sub-tidal
Sphoeroides maculatus	Northern puffer	3	Marine; Deep Sub-tidal
Sphyrna lewini	Scalloped hammerhead shark	4	Marine; Deep Sub-tidal
Sphyrna zygaena	Smooth hammerhead shark	4	Marine; Deep Sub-tidal
Tautogolabrus adspersus	Cunner	3	Marine; Deep Sub-tidal
Torpedo nobiliana	Atlantic torpedo ray	4	Marine; Deep Sub-tidal

Estuarine System

The Estuarine System includes aquatic tidal habitats, and adjacent tidal wetlands, that are usually semi-enclosed by land but have open, partly obstructed, or sporadic access to the open ocean, and in which ocean water is at least occasionally diluted by freshwater runoff from the land in a significant part of the system. The estuarine habitat system also includes freshwater wetland and aquatic habitats influenced by ocean driven tides (including those along rivers). The salinity may be periodically increased above that of the open ocean by evaporation. Along some low-energy coastlines there is appreciable dilution of sea water.

Brackish Intertidal Mesohabitat

The Brackish Intertidal Mesohabitat extends from mean high water (MHW) with spray to mean low water (0-10 m deep). The substrate is exposed and flooded by the tides (includes splash zone) and salinities are 0.5-30 ppt. This Mesohabitat includes two Macrohabitats described below.

Benthic Geomorphology Macrohabitat: Benthic geomorphology- characterization of the geomorphology of the bottom (e.g., bar, tidal flat, sediment wave, shellfish bed, tidal creek, bank, and rocky intertidal).

Tidal Wetland: Tidal wetland - an estuarine, salt, or brackish vegetated wetland area that is inundated by tidal waters (e.g., low marsh, high marsh, and formerly connected lowland areas –

where connections to tidal waters are restricted by road fills, dikes, culverts or other man-made facilities).

Distribution

The Brackish Intertidal Mesohabitat is found around the perimeter of Long Island and Staten Island in about a dozen assessment areas. In addition, there are scattered patches that extend north up the Hudson River to about Poughkeepsie (Figure 226). The two assessment areas with the most acres of this type are South Oyster Bay-Jones Inlet (7) with about 900 acres and Sandy Hook-Staten Island (2) with almost 750 acres (Figure 227).

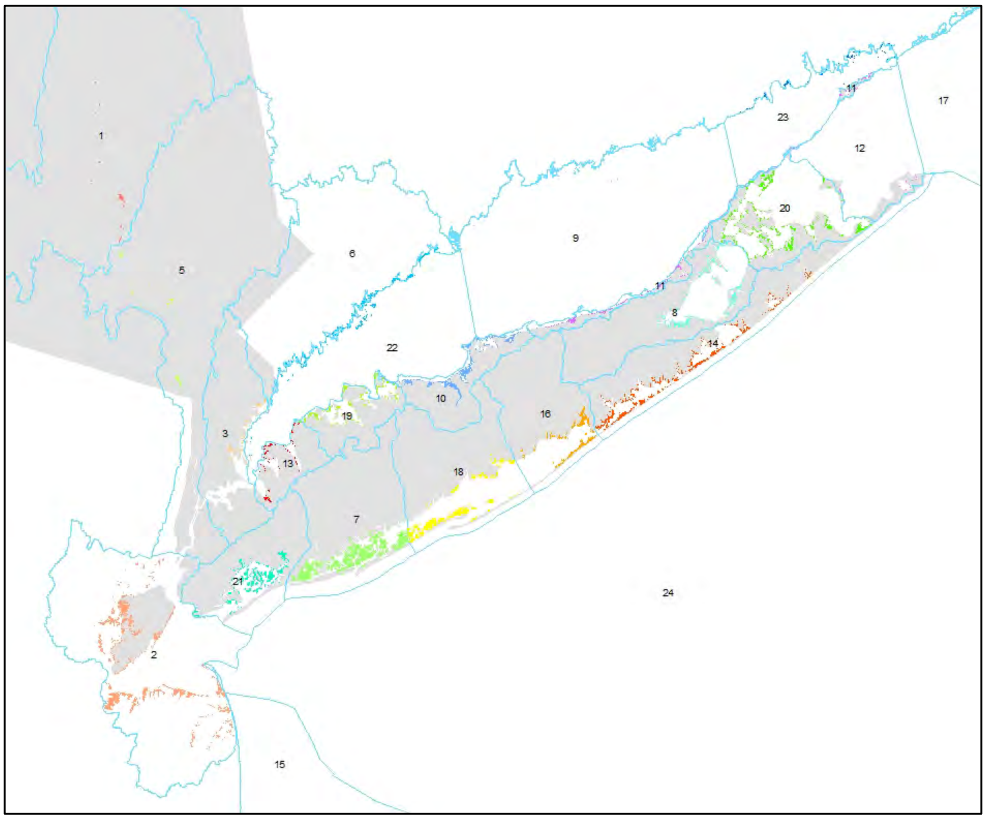

Figure 25. Distribution of the Brackish Intertidal Mesohabitat.

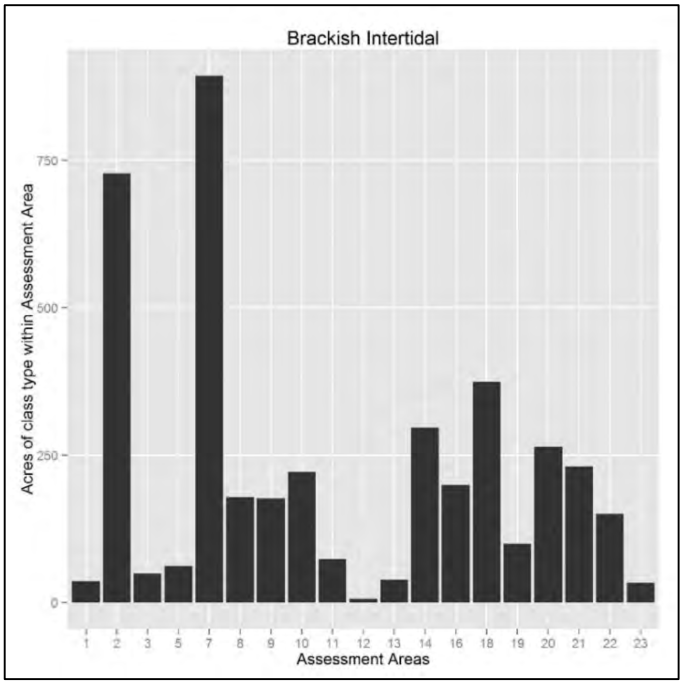

Figure 26. Distribution of the Brackish Intertidal Mesohabitat by assessment area.

Condition Assessment

The Brackish Intertidal Mesohabitat was not assessed for heavy metal contamination because sediment samples were not collected from within this type.

Based on their Landscape Condition Assessment score (Figure 228), the higher quality intertidal habitats are likely to be located along the north shore of Long Island (assessment areas 22, 9, 23), between the North and South Forks (areas 20, 12), and in the mid-Hudson River (area 1). The sites likely to have the poorest condition intertidal areas include the western edge of Long Island (areas 2, 21, 7, 18, 16), and the far western portion of Long Island Sound (areas 3, 13).

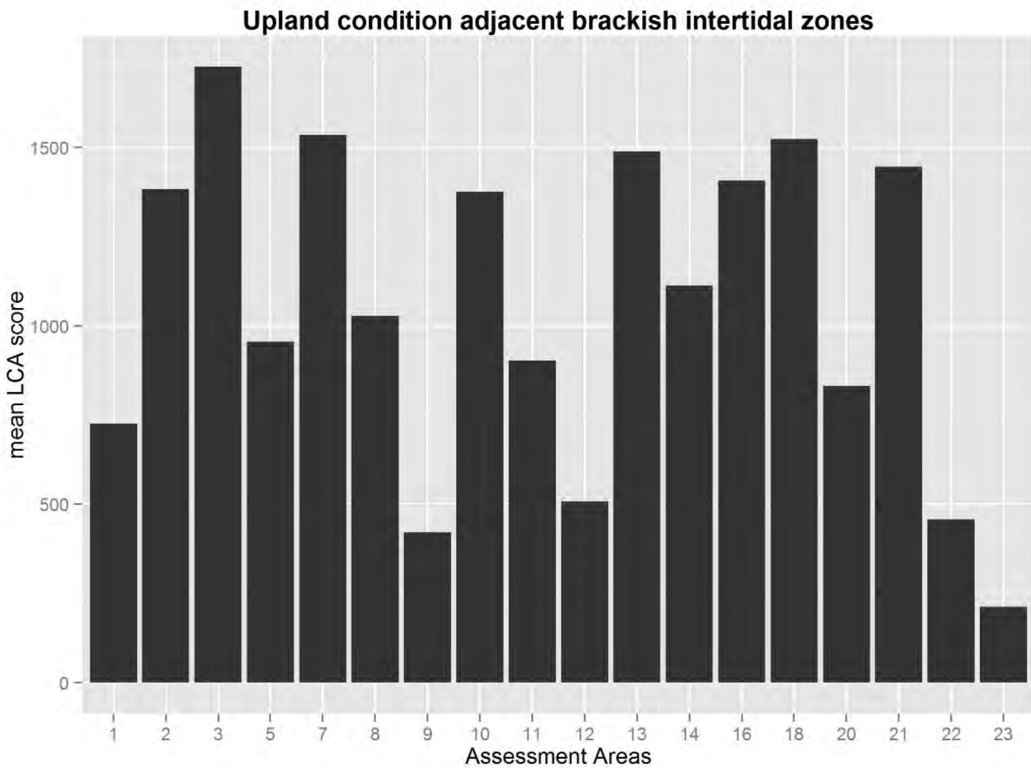

Figure 27. Mean Landscape Condition Assessment scores for the watersheds adjacent the assessment areas in which the brackish intertidal zones are found.

Associated SGCN

Table 4. SGCN associated with the Brackish Intertidal Mesohabitat.

Species	Common name	SGCN category	Habitat link
Sterna dougallii	Roseate tern	2	Bar
Ammodramus caudacutus	Saltmarsh sparrow	2	Estuarine; Brackish Intertidal
Argopecten irradians	Bay Scallop	2	Estuarine; Brackish Intertidal
Callinectes sapidus	Blue Crab	3	Estuarine; Brackish Intertidal
Crassostrea virginica	Eastern oyster	2	Estuarine; Brackish Intertidal
Fundulus heteroclitus	Mummichog	3	Estuarine; Brackish Intertidal
Geukensia demissa	Ribbed mussel	3	Estuarine; Brackish Intertidal
Mytilus edulis	Blue mussel	3	Estuarine; Brackish Intertidal
Nyctanassa violacea	Yellow-crowned night-heron	3	Estuarine; Brackish Intertidal
Podiceps auritus	Horned Grebe	3	Estuarine; Brackish Intertidal
Tringa semipalmata	Willet	3	Estuarine; Brackish Intertidal
Uca pugnax	Atlantic marsh fiddler crab	3	Estuarine; Brackish Intertidal; Benthic
Asio flammeus	Short-eared owl	2	Estuarine; Brackish Intertidal; Tidal

Species	Common name	SGCN category	Habitat link
Calidris pusilla	Semipalmated sandpiper	2	Estuarine; Brackish Intertidal; Tidal
Egretta caerulea	Little blue heron	3	Estuarine; Brackish Intertidal; Tidal
Egretta thula	Snowy egret	3	Estuarine; Brackish Intertidal; Tidal
Fundulus luciae	Spotfin killifish	3	Estuarine; Brackish Intertidal; Tidal
Hydrocoloeus minutus	Little gull	2	Estuarine; Brackish Intertidal; Tidal
Ischnura ramburii	Rambur's forktail	3	Estuarine; Brackish Intertidal; Tidal
Ixobrychus exilis	Least bittern	3	Estuarine; Brackish Intertidal; Tidal
Kinosternon subrubrum	Southeastern mud turtle	2	Estuarine; Brackish Intertidal; Tidal
Leucophaeus atricilla	Laughing gull	3	Estuarine; Brackish Intertidal; Tidal
Limnodromus griseus	Short-billed dowitcher	2	Estuarine; Brackish Intertidal; Tidal
Limosa fedoa	Marbled godwit	4	Estuarine; Brackish Intertidal; Tidal
Limosa haemastica	Hudsonian Godwit	4	Estuarine; Brackish Intertidal; Tidal
Malaclemys terrapin terrapin	Northern diamond-backed terrapin	3	Estuarine; Brackish Intertidal; Tidal Wetland
Menidia menidia	Atlantic silverside	3	Estuarine; Brackish Intertidal; Tidal
Numenius phaeopus	Whimbrel	1	Estuarine; Brackish Intertidal; Tidal
Oxyura jamaicensis	Ruddy duck	3	Estuarine; Brackish Intertidal; Tidal
Rallus elegans	King Rail	1	Estuarine; Brackish Intertidal; Tidal
Uca pugnax	Atlantic marsh fiddler crab	3	Estuarine; Brackish Intertidal; Tidal
Ammodramus maritimus	Seaside sparrow	2	High Marsh
Anas rubripes	American Black Duck	2	High Marsh
Ardea alba	Great egret	3	High Marsh
Calidris canutus	Red Knot	2	High Marsh
Circus cyaneus	Northern harrier	3	High Marsh
Fundulus majalis	Striped killifish	4	High Marsh
Laterallus jamaicensis	Black Rail	1	High Marsh
Menidia beryllina	Inland Silverside	3	High Marsh
Nycticorax nycticorax	Black-crowned Night-Heron	3	High Marsh
Plegadis falcinellus	Glossy ibis	3	High Marsh
Rynchops niger	Black skimmer	2	High Marsh
Schinia bifascia	A noctuid moth (slender flower moth)	4	High Marsh
Sterna dougallii	Roseate tern	2	High Marsh
Sterna forsteri	Forster's tern	3	High Marsh
Sternula antillarum	Least tern	3	High Marsh
Sturnella magna	Eastern meadowlark	2	High Marsh
Tringa semipalmata	Willet	3	High Marsh
Ammodramus maritimus	Seaside sparrow	2	Low Marsh
Bubulcus ibis	Cattle Egret	2	Low Marsh
Egretta tricolor	Tricolored heron	3	Low Marsh
Gelochelidon nilotica	Gull-billed Tern	3	Low Marsh

Species	Common name	SGCN category	Habitat link
Haematopus palliatus	American oystercatcher	3	Low Marsh
Sterna dougallii	Roseate tern	2	Low Marsh
Tringa melanoleuca	Greater yellowlegs	3	Low Marsh
Fundulus majalis	Striped killifish	4	Rocky Intertidal
Ammodramus maritimus	Seaside sparrow	2	Tidal Creek
Anas rubripes	American Black Duck	2	Tidal Creek
Egretta thula	Snowy egret	3	Tidal Creek
Malaclemys terrapin terrapin	Northern diamond-backed terrapin	3	Tidal Creek
Numenius phaeopus	Whimbrel	1	Tidal Creek
Pungitius pungitius	Ninespine stickleback	3	Tidal Creek
Arenaria interpres	Ruddy turnstone	3	Tidal Flat
Calidris alba	Sanderling	4	Tidal Flat
Calidris canutus	Red Knot	2	Tidal Flat
Calidris pusilla	Semipalmated sandpiper	2	Tidal Flat
Charadrius melodus	Piping plover	2	Tidal Flat
Egretta tricolor	Tricolored heron	3	Tidal Flat
Limnodromus griseus	Short-billed dowitcher	2	Tidal Flat
Limosa fedoa	Marbled godwit	4	Tidal Flat
Limosa haemastica	Hudsonian Godwit	4	Tidal Flat
Malaclemys terrapin	Northern diamond-backed	3	Tidal Flat
Numenius phaeopus	Whimbrel	1	Tidal Flat
Nycticorax nycticorax	Black-crowned Night-Heron	3	Tidal Flat
Pluvialis dominica	American golden-plover	4	Tidal Flat
Sternula antillarum	Least tern	3	Tidal Flat
Tringa melanoleuca	Greater yellowlegs	3	Tidal Flat
Tringa semipalmata	Willet	3	Tidal Flat

Brackish Subtidal Shallow Mesohabitat

The Brackish Subtidal Shallow Mesohabitat has a substrate that is continuously submerged with depths from 0-10 m and salinities between 0.5-30 ppt. This Mesohabitat includes three Macrohabitats described below.

Artificial Structure Macrohabitat: Artificial Structure-substrates that were emplaced by humans, using either natural materials such as dredge spoil or synthetic materials, such as discarded automobiles, tires, or concrete (e.g., bulkheads, groins, jetties, marinas, and reefs).

Aquatic Bed Macrohabitat: Aquatic bed- includes habitats dominated by plants that grow principally on or below the surface of the water for most of the growing season in most years (e.g., rooted vascular, rooted algal, and drift algal).

Benthic Geomorphology Macrohabitat: Benthic geomorphology- characterization of the geomorphology of the bottom (e.g., bar, sediment wave, channel, shellfish bed, benthic flat, and bank).

Distribution

The Brackish Subtidal Shallow Mesohabitat is found around the perimeter of Long Island and Staten Island in about a dozen assessment areas. This type is found in nearly all of the bays behind the barrier islands along the south shore of Long Island (e.g., Great South Bay behind Fire Island National Seashore). This type also occurs along the north and south shores of Long Island Sound. Lastly, there are scattered patches of this Mesohabitat along the Hudson River north to about Poughkeepsie (Figure 229). The top three assessment areas with the most acres of this type are Mid Long Island Sound with almost 8,000 acres (9), Sandy Hook-Staten Island with a little over 7,000 acres (2), and West Long Island Sound with about 6,000 acres (Figure 230).

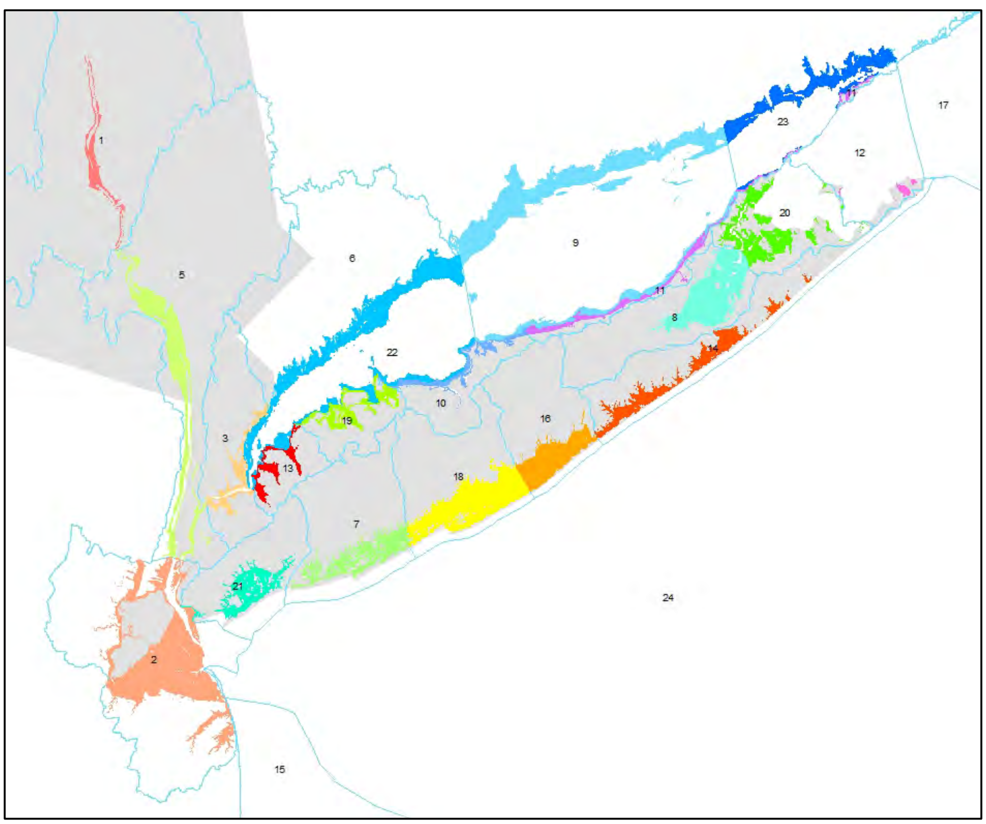

Figure 28. Distribution of the Brackish Subtidal Shallow Mesohabitat.

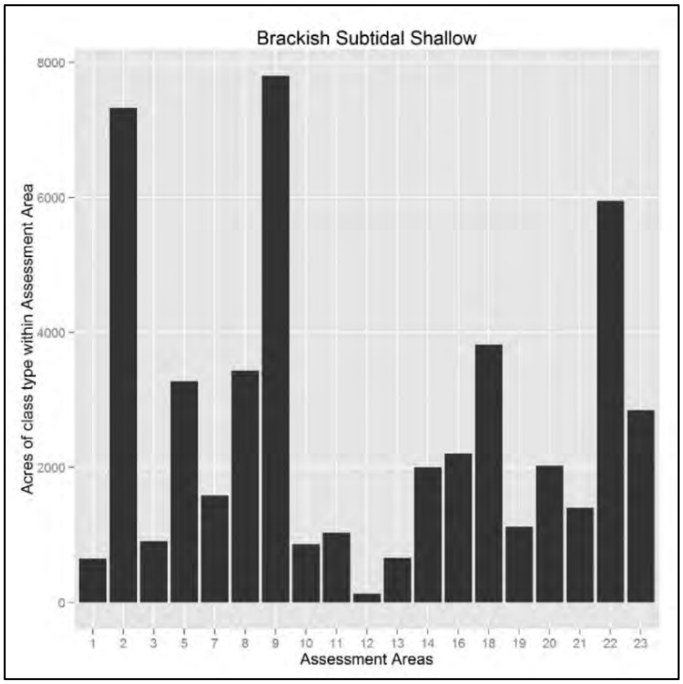

Figure 29. Distribution of the Brackish Subtidal Shallow Mesohabitat by assessment area.

Condition Assessment

Sediment samples were collected from the Brackish Subtidal Shallow Mesohabitat in all 19 assessment areas (100%) where it occurs (Figure 230 and Figure 232). Ratings of "good," "fair," and "poor" are based on the number of analyte readings exceeding the ERL (Effects Range Low) and/or ERM (Effects Range Median) values and cutoffs. Sediment samples rated "good" were collected from every assessment area except for the Bronx (3) where all samples were rated "poor." All samples collected in the following five (26%) assessment areas were rated "good": Peconic River (8), Fishers Island Sound-Long Island Sound (11), Carmans River-Great South Bay (16), Great South Bay-Fire Island Inlet (18), and East Long Island Sound (23) (Figure 232). Sediment samples rated "fair" and "poor" tend to be spatially associated with the more developed/urban portions of the study area (Figure 231). There are five assessment areas where the total number of samples rated "fair" and "poor" were greater than the number samples rated "good": Hudson River Middle (1), Sandy Hook-Staten Island (2), Hudson River Lower (5), Hempstead Harbor-Manhassett Bay (13), and Oyster Bay-Huntington Bay (19) (Figure 232).

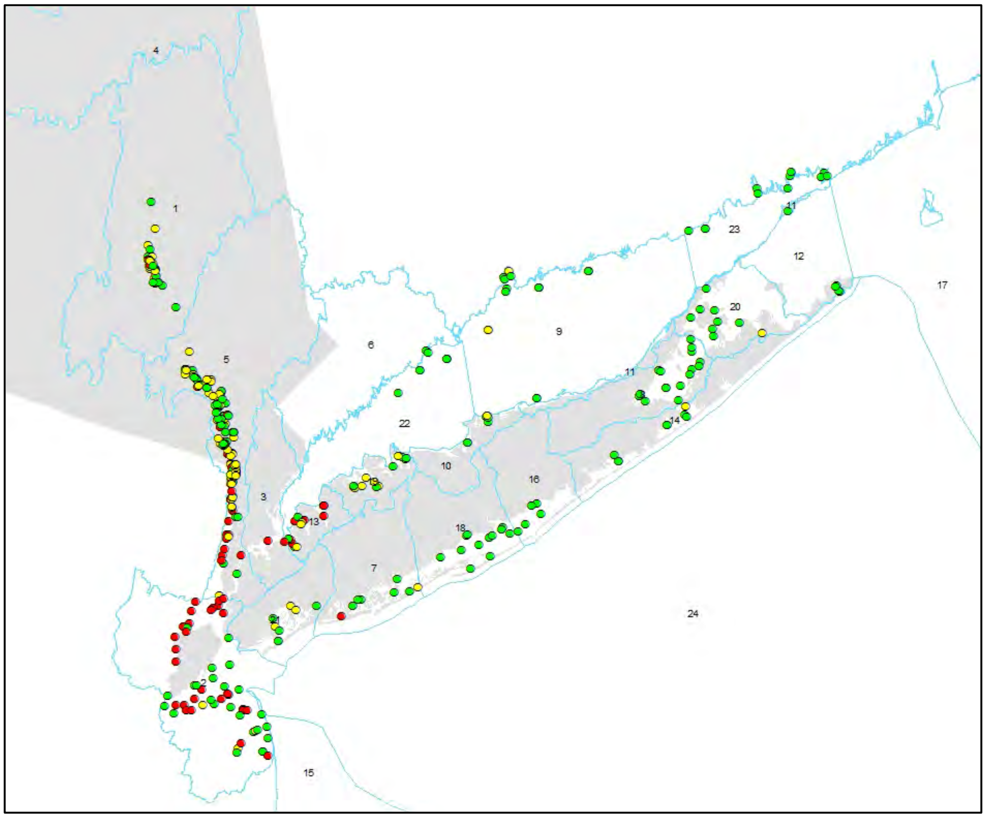

Figure 30. Sediment collection points within the Brackish Subtidal Shallow Mesohabitat.

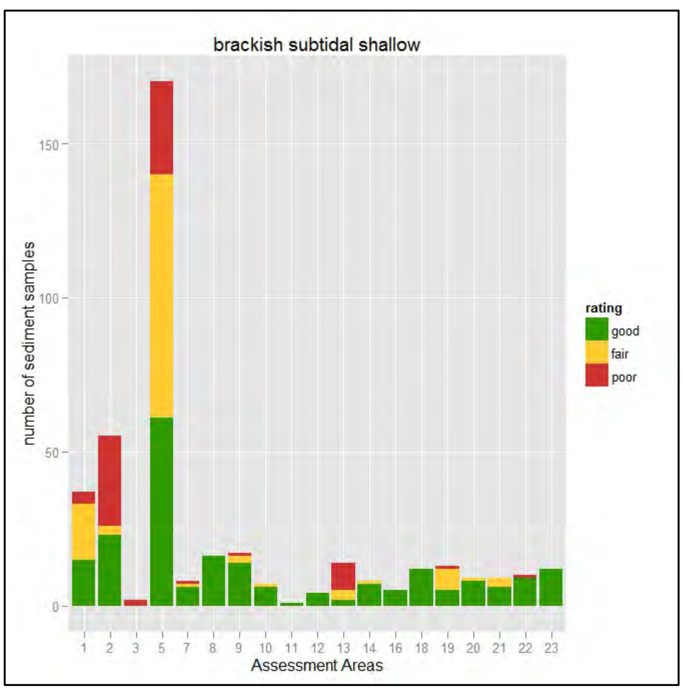

Figure 31. Sediment condition of the Brackish Subtidal Shallow Mesohabitat by assessment area.

Modeled levels of Chrolophyll A ranged from good to poor condition throughout this habitat with most assessment areas marking at fair (Figure 233). The inner section of Peconic Bay (8) scored the best, with the adjacent area around Shelter Island (20) close behind. The poorest scoring assessment area was zone 2, the New York Harbor area at mouth of the Hudson River, around Staten Island.

Modeled levels of dissolved inorganic nitrogen (DIN) ranged from good to fair for this habitat type (Figure 234). As with Chlorophyll A, the lowest nitrogen conditions were modeled in Peconic Bay (8, 20) and the worst was in New York Harbor (areas 2, 21). High DIN was also modeled to occur further up the Hudson River (1, 5) and at the far western end of Long Island Sound (3, 13).

Modeled levels of dissolved inorganic phosphorus (DIP) ranged from fair to poor for this habitat type (Figure 235). The patterns were similar to DIN, with the Hudson River, New York Harbor, and western Long Island Sound emerging as being in the poorest condition. Interestingly, the upper Hudson River area (1) did not rank as high, relatively, as these other poor performers.

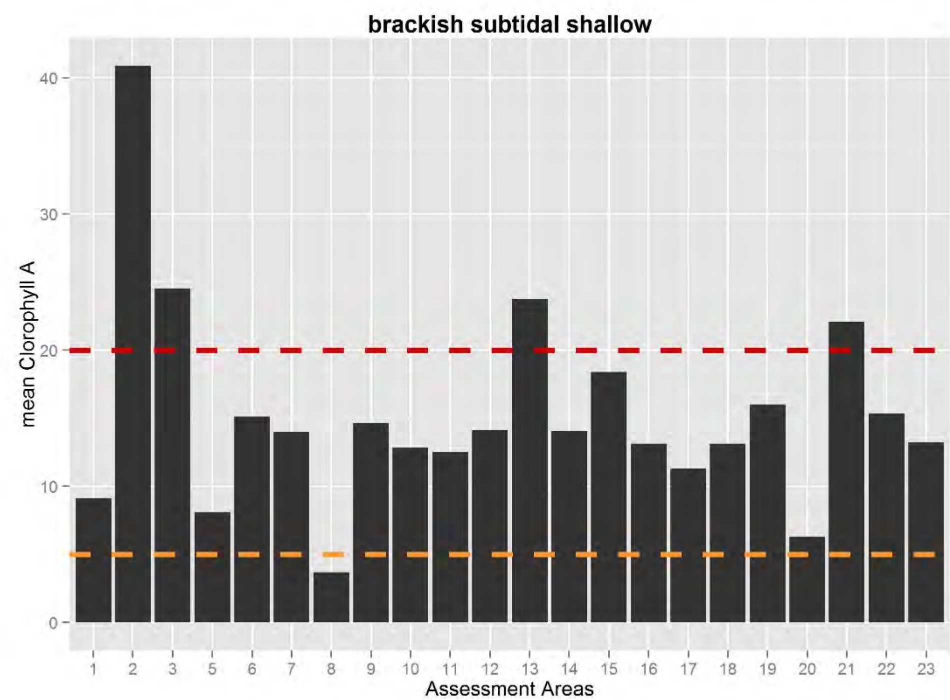

Figure 32. Mean Chlorophyll A concentrations by assessment area as estimated by the SWEM for the brackish subtidal shallow mesohabitat. Bars above the orange line (5 µg/L) are classified as fair condition. Bars above the red line (20 µg/L) are classified as in poor condition.

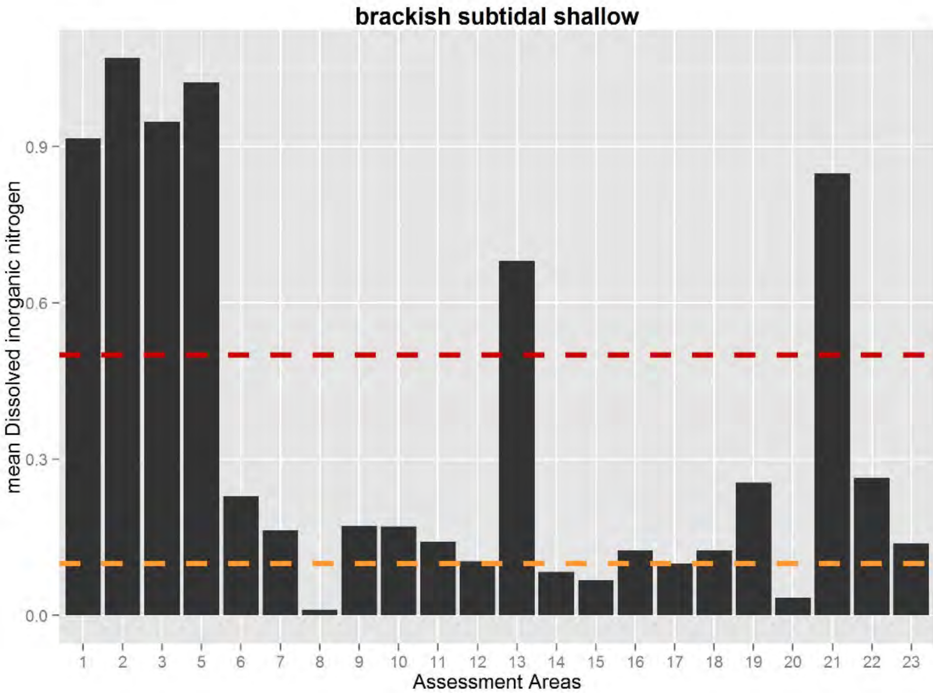

Figure 33. Mean dissolved inorganic nitrogen concentrations by assessment area as estimated by the SWEM for the brackish subtidal shallow mesohabitat. Bars above the orange line (0.1 µg/L) are classified as fair condition. Bars above the red line (0.5 µg/L) are classified as in poor condition. Areas with bars below the orange line are classified as areas in good condition.

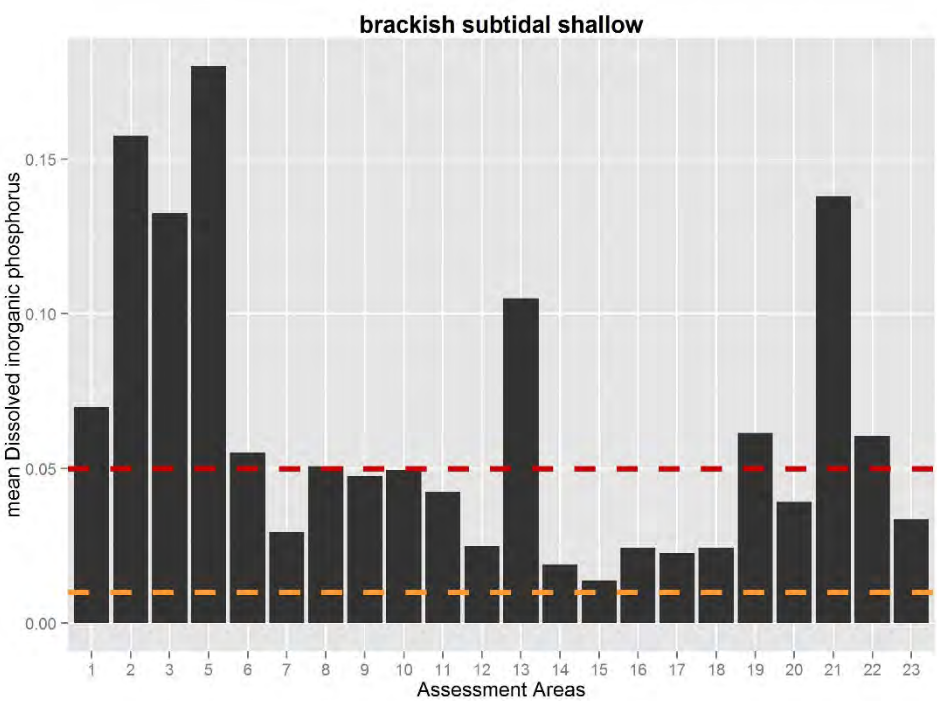

Figure 34. Mean dissolved inorganic phosphorus concentrations by assessment area as estimated by the SWEM for the brackish subtidal deep mesohabitat. Bars above the orange line (0.01 µg/L) are classified as fair condition. Bars above the red line (0.05 µg/L) are classified as in poor condition

Associated SGCN

Table 5. SGCN associated with the Brackish Subtidal Shallow Mesohabitat.

Species	Common name	SGCN	Habitat link
Tautoga onitis	Tautog (Black fish)	2	Bar
Acipenser oxyrinchus	Atlantic Sturgeon	2	Estuarine; Brackish Shallow
Apeltes quadricus	Fourspine	2	Estuarine; Brackish Shallow
Argopecten irradians	Bay Scallop	2	Estuarine; Brackish Shallow
Callinectes sapidus	Blue Crab	3	Estuarine; Brackish Shallow
Callinectes sapidus	Blue Crab	3	Estuarine; Brackish Shallow
Crassostrea virginica	Eastern oyster	2	Estuarine; Brackish Shallow
Fundulus heteroclitus	Mummichog	3	Estuarine; Brackish Shallow
Homarus americanus	American Lobster	2	Estuarine; Brackish Shallow
Ischnura ramburii	Rambur's forktail	3	Estuarine; Brackish Shallow
Libellula needhami	Needham's skimmer	3	Estuarine; Brackish Shallow
Melanitta perspicillata	Surf scoter	3	Estuarine; Brackish Shallow
Microgadus tomcod	Atlantic tomcod	2	Estuarine; Brackish Shallow
Mytilus edulis	Blue mussel	3	Estuarine; Brackish Shallow
Opsanus tau	Oyster toadfish	3	Estuarine; Brackish Shallow
Pseudopleuronectes	Winter flounder	1	Estuarine; Brackish Shallow
Sphoeroides maculatus	Northern puffer	3	Estuarine; Brackish Shallow
Syngnathus fuscus	Northern pipefish	2	Estuarine; Brackish Shallow
Aythya affinis	Lesser scaup	3	Estuarine; Brackish Shallow; Aquatic
Aythya marila	Greater scaup	3	Estuarine; Brackish Shallow; Aquatic
Oxyura jamaicensis rubida	Ruddy duck	3	Estuarine; Brackish Shallow; Aquatic
Tautoga onitis	Tautog (Black fish)	2	Jetties
Tautoga onitis	Tautog (Black fish)	2	Reefs
Menidia beryllina	Inland Silverside	3	Rooted Vascular
Syngnathus fuscus	Northern pipefish	2	Rooted Vascular
Tautoga onitis	Tautog (Black fish)	2	Rooted Vascular
Tautoga onitis	Tautog (Black fish)	2	Shellfish Bed

Brackish Subtidal Deep Mesohabitat

The Brackish Subtidal Deep Mesohabitat (Pelagic) has a substrate that is continuously submerged with a depth >10 m and salinities between 0.5-30 ppt. This Mesohabitat includes two Macrohabitats described below.

Artificial Structure Macrohabitat: Artificial Structure-substrates that were emplaced by humans, using either natural materials such as dredge spoil or synthetic materials, such as discarded automobiles, tires, or concrete (e.g., reefs).

Benthic Geomorphology Macrohabitat: Benthic geomorphology- characterization of the geomorphology of the bottom (e.g., bar, sediment wave, channel, benthic flat, shellfish bed, and bank).

Distribution

The largest areas of the Brackish Subtidal Deep Mesohabitat are within the following three Long Island Sound assessment areas (west to east): West Long Island Sound (22) with almost 15,000 acres, Mid Long Island Sound (9) with over 30,000 acres, and East Long Island Sound (23) with over 5,000 acres (Figure 236 and Figure 237). Smaller amounts of this type extend north up the Hudson River to Poughkeepsie (Figure 236).

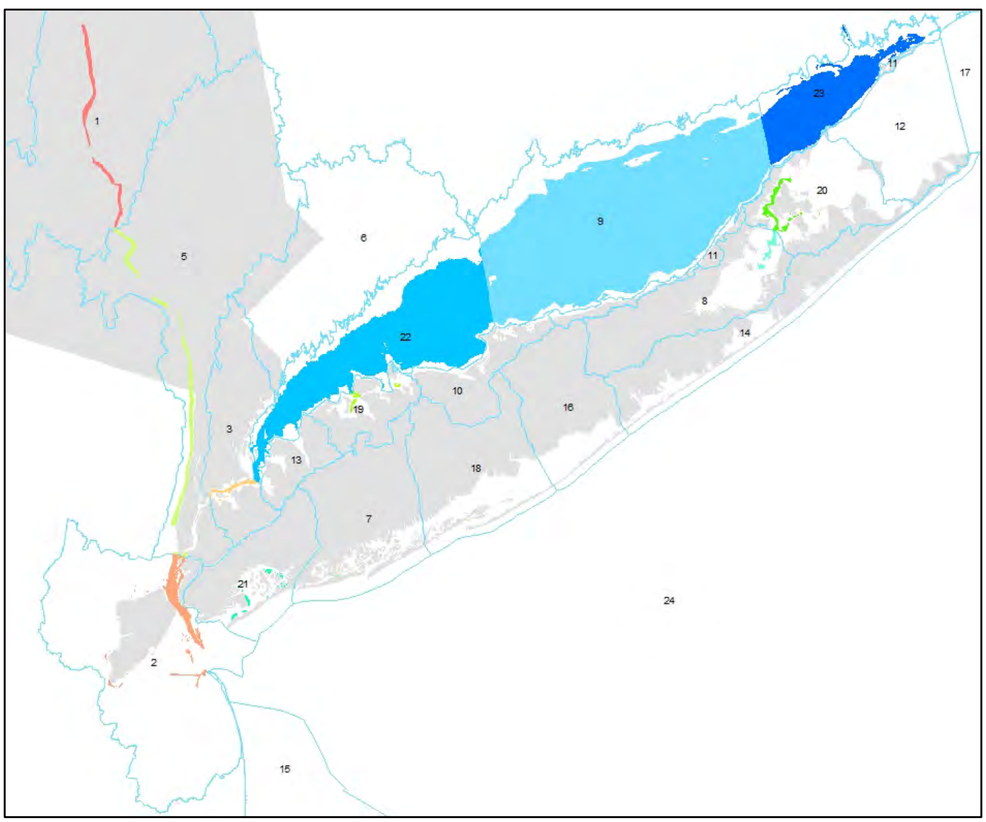

Figure 35. Distribution of the Brackish Subtidal Deep Mesohabitat.

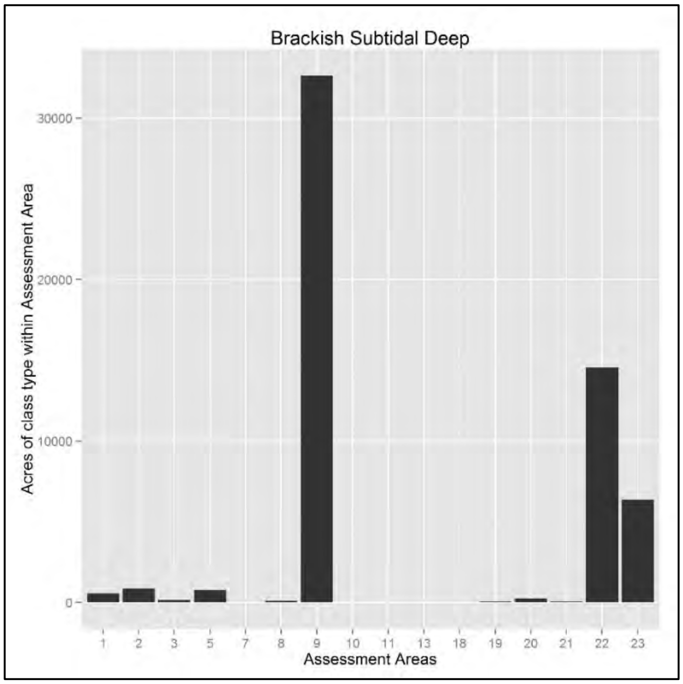

Figure 36. Distribution of the Brackish Subtidal Deep Mesohabitat by assessment area.

Condition Assessment

Sediment samples were collected from Brackish Subtidal Deep Mesohabitat in eight of the 16 (50%) assessment areas where it occurs (Figure 237 and Figure 239). However, most of the samples were collected within the two assessment areas that have the most acres of this type: Mid Long Island Sound (9) and West Long Island Sound (22). Ratings of “good,” “fair,” and “poor” are based on the number of analyte readings exceeding the ERL (Effects Range Low) and/or ERM (Effects Range Median) values and cutoffs. Sediment samples rated “good” were collected from every assessment area (Figure 239). All samples collected from Shelter Island Sound-Gardiners Bay (20) and East Long Island Sound (23) were rated “good” for this type. The assessment areas with most “fair” and “poor” samples include Hudson River Middle (1), Sandy Hook-Staten Island (2), Hudson River Lower (5), Mid Long Island Sound (9), and West Long Island Sound (22) (Figure 239).

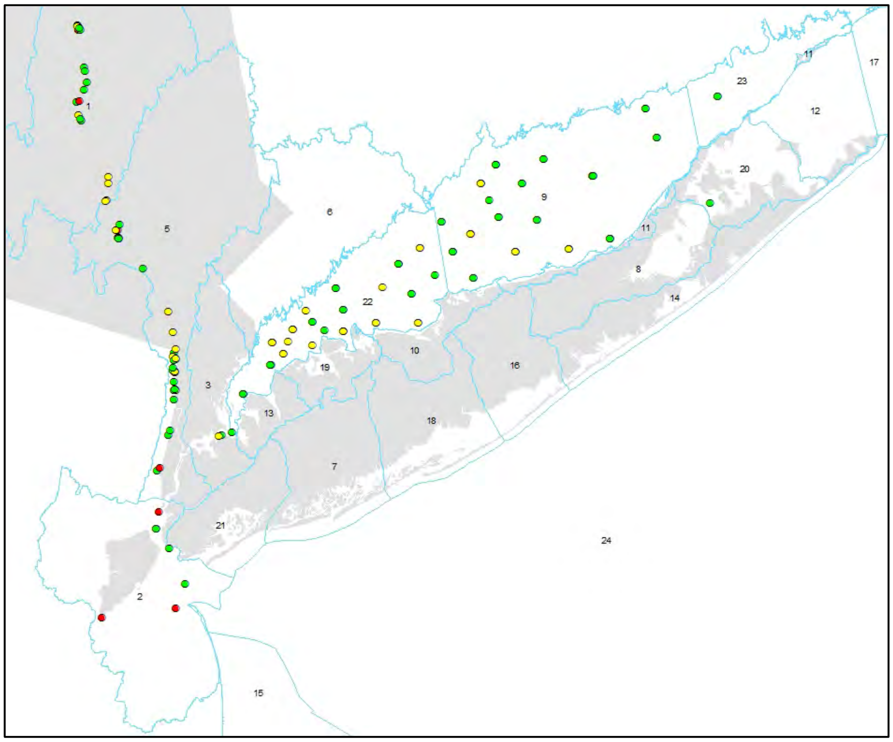

Figure 37. Sediment collection points within the Brackish Subtidal Deep Mesohabitat.

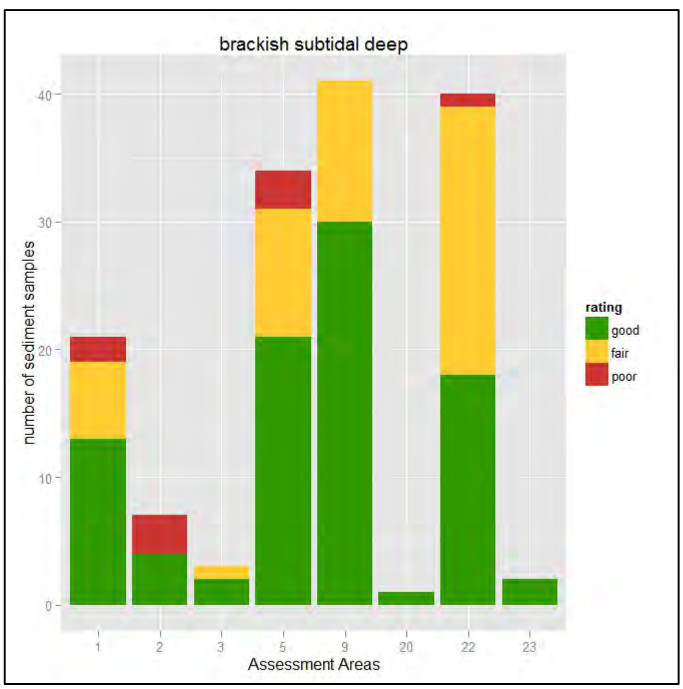

Figure 38. Sediment condition of the Brackish Subtidal Deep Mesohabitat by assessment area.

Modeled levels of Chrolophyll A ranged from good to poor condition throughout this habitat with most assessment areas marking at fair (Figure 240). The inner section of Peconic Bay (8) scored the best, with the adjacent area around Shelter Island (20) close behind. The poorest scoring assessment areas were zones 2, 3 and 13, the New York Harbor area at mouth of the Hudson River, around Staten Island and the far western end of Long Island Sound.

Modeled levels of dissolved inorganic nitrogen (DIN) ranged from good to fair for this habitat type (Figure 241). As with Chlorophyll A, the lowest nitrogen conditions were modeled in Peconic Bay (8, 20) and the worst was in New York Harbor and the Hudson River (1, 2, 5) and western Long Island Sound (area 3).

Modeled levels of dissolved inorganic phosphorus (DIP) ranged from fair to poor for this habitat type (Figure 242). The patterns were similar to DIN, with the lower Hudson River, New York Harbor, and western Long Island Sound emerging as being in the poorest condition. Better condition areas include the east end of Long Island Sound and Peconic Bay.

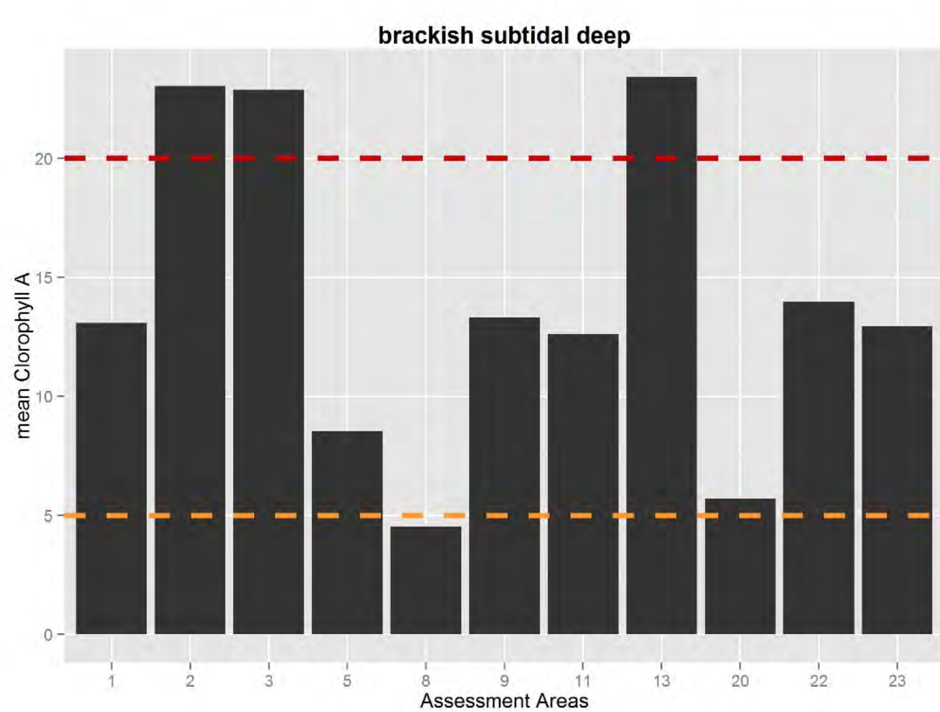

Figure 39. Mean Chlorophyll A concentrations by assessment area as estimated by the SWEM for the brackish subtidal deep mesohabitat. Bars above the orange line (5 µg/L) are classified as fair condition. Bars above the red line (20 µg/L) are classified as in poor condition.

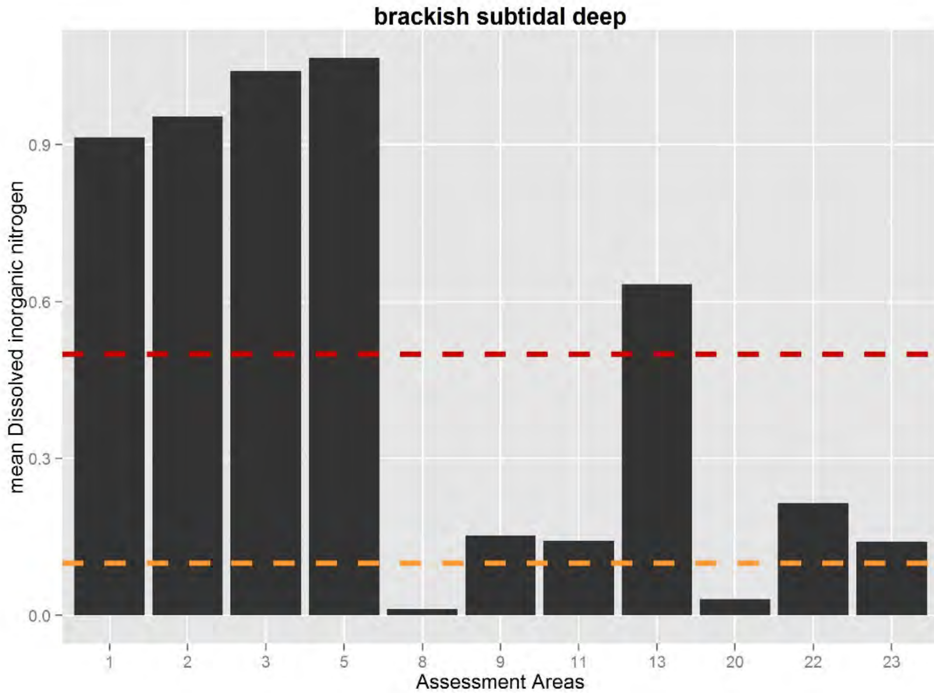

Figure 40. Mean dissolved inorganic nitrogen concentrations by assessment area as estimated by the SWEM for the brackish subtidal deep mesohabitat. Bars above the orange line (0.1 µg/L) are classified as fair condition. Bars above the red line (0.5 µg/L) are classified as in poor condition. Areas with bars below the orange line are classified as areas in good condition.

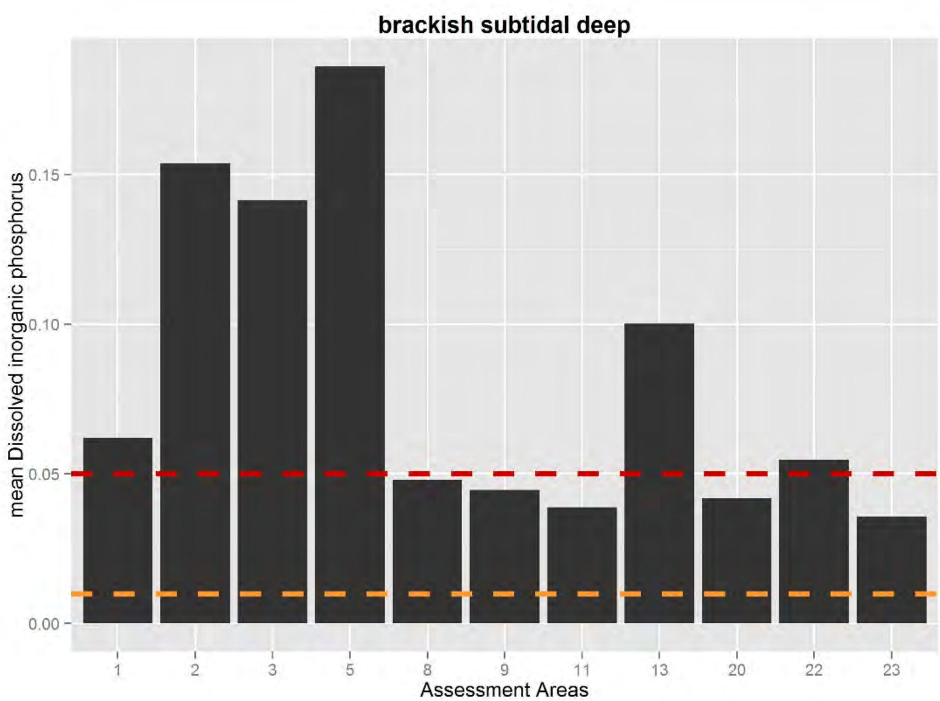

Figure 41. Mean dissolved inorganic phosphorus concentrations by assessment area as estimated by the SWEM for the brackish subtidal deep mesohabitat. Bars above the orange line (0.01 µg/L) are classified as fair condition. Bars above the red line (0.05 µg/L) are classified as in poor condition.

Associated SGCN

Table 6. SGCN associated with the Brackish Subtidal Deep Mesohabitat.

Species	Common name	SGCN category	Habitat link
Acipenser brevirostrum	Shortnose Sturgeon	3	Estuarine; Brackish Deep
Anchoa mitchilli	Bay anchovy	3	Estuarine; Brackish Deep
Brevoortia tyrannus	Atlantic Menhaden	3	Estuarine; Brackish Deep
Homarus americanus	American Lobster	2	Estuarine; Brackish Deep
Melanitta americana	Black scoter	3	Estuarine; Brackish Deep
Melanitta fusca	White-winged scoter	3	Estuarine; Brackish Deep
Opsanus tau	Oyster toadfish	3	Estuarine; Brackish Deep
Pseudopleuronectes americanus	Winter flounder	1	Estuarine; Brackish Deep
Tautogolabrus adspersus	Cunner	3	Estuarine; Brackish Deep

Freshwater Intertidal Mesohabitat

The Freshwater Intertidal Mesohabitat extends from mean high water (MHW) with spray to mean low water (MLW). The substrate is exposed and flooded by tides (includes splash zone) and salinities are less than 0.5 ppt. This Mesohabitat includes four Macrohabitats described below.

Artificial Structure Macrohabitat: Artificial Structure-substrates that were emplaced by humans, using either natural materials such as dredge spoil or synthetic materials, such as discarded automobiles, tires, or concrete (e.g., bulkheads, groins, jetties, and marinas).

Aquatic Bed Macrohabitat: Aquatic bed- includes habitats dominated by plants that grow principally on or below the surface of the water for most of the growing season in most years (e.g., rooted vascular).

Benthic Geomorphology Macrohabitat: Benthic geomorphology- characterization of the geomorphology of the bottom (e.g., bar, sediment wave, channel, tidal flat, tidal creek, and bank).

Tidal Wetland: Tidal wetland - an estuarine, vegetated wetland area that is inundated by tidal freshwater (e.g., freshwater tidal marsh, freshwater tidal swamp).

Distribution

Scattered patches of the Freshwater Intertidal Mesohabitat extend from Staten Island along the south coast of Long Island to Montauk Point passing through the following assessment areas (west to east): Sandy Hook-Staten Island (2), Jamaica Bay-Rockaway Inlet (21), South Oyster Bay-Jones Inlet (7), Great South Bay-Fire Island Inlet (18), Carmans River-Great South Bay (16), Shinnecock Bay-Atlantic Ocean (14), and Napeague Bay-Block Island Sound (12). This type tends to be located along the south shore of the Long Island headlands (i.e., along the north shore of the back barrier bays) and not associated with the barrier islands. In addition, scattered patches occur along the Hudson River to about Albany and Troy (Figure 243). The assessment area with the most acres of Freshwater Intertidal Mesohabitat is the Hudson River Upper (4) with almost 300 acres (Figure 244). The large number of assessment areas picked up here simply reflect the relatively large number of small freshwater tidal streams scattered throughout New York that are picked up by the relatively high-resolution National Wetlands Inventory (NWI) dataset.

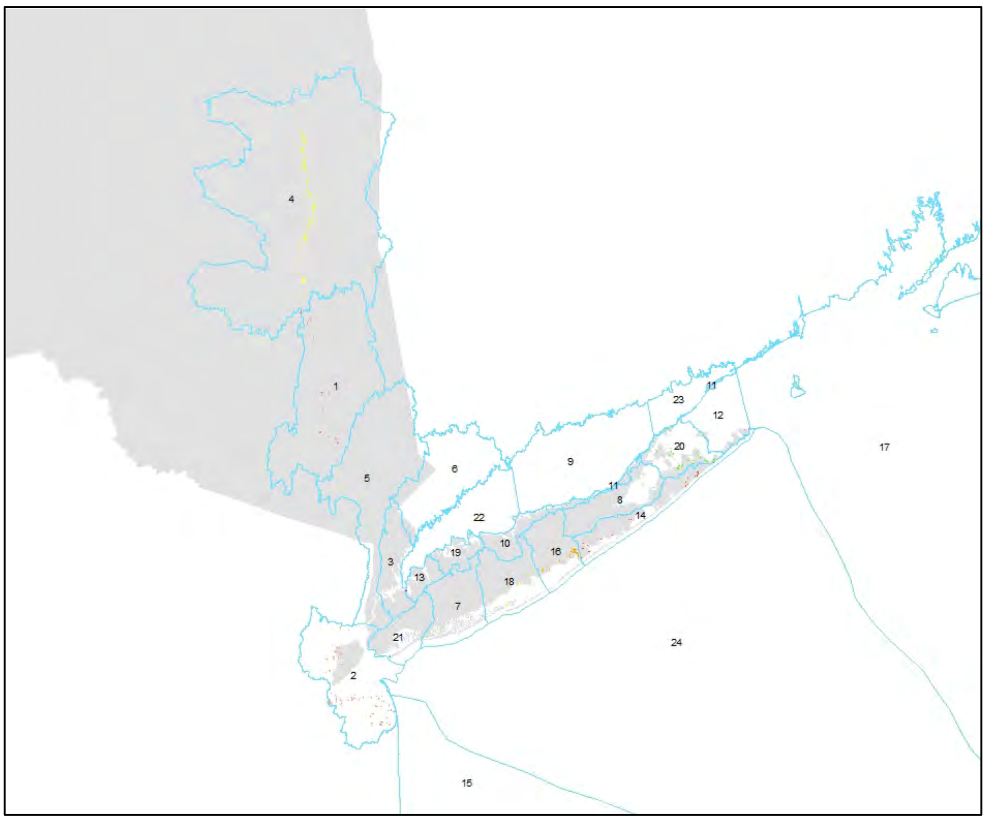

Figure 42. Distribution of the Freshwater Intertidal Mesohabitat.

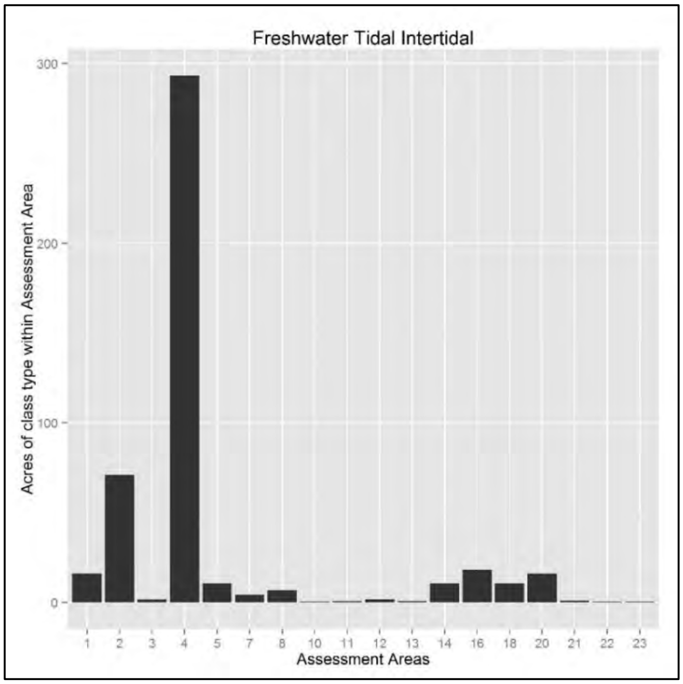

Figure 43. Distribution of the Freshwater Intertidal Mesohabitat by assessment area.

Condition Assessment

The Freshwater Intertidal Mesohabitat was not assessed for heavy metal contamination because sediment samples were not collected from within this type.

Based on the Landscape Condition Assessment (LCA, Figure 245), the locations most likely to have higher quality Freshwater Intertidal habitats include the Upper and Mid-Hudson River (areas 4, 1) and at the North Shore and eastern end of Long Island (areas 12, 23, 22). Places where this habitat type is most likely to be degraded includes the western end of Long Island (2, 21, 7, 18, 16), and the western end of Long Island Sound (3, 13).

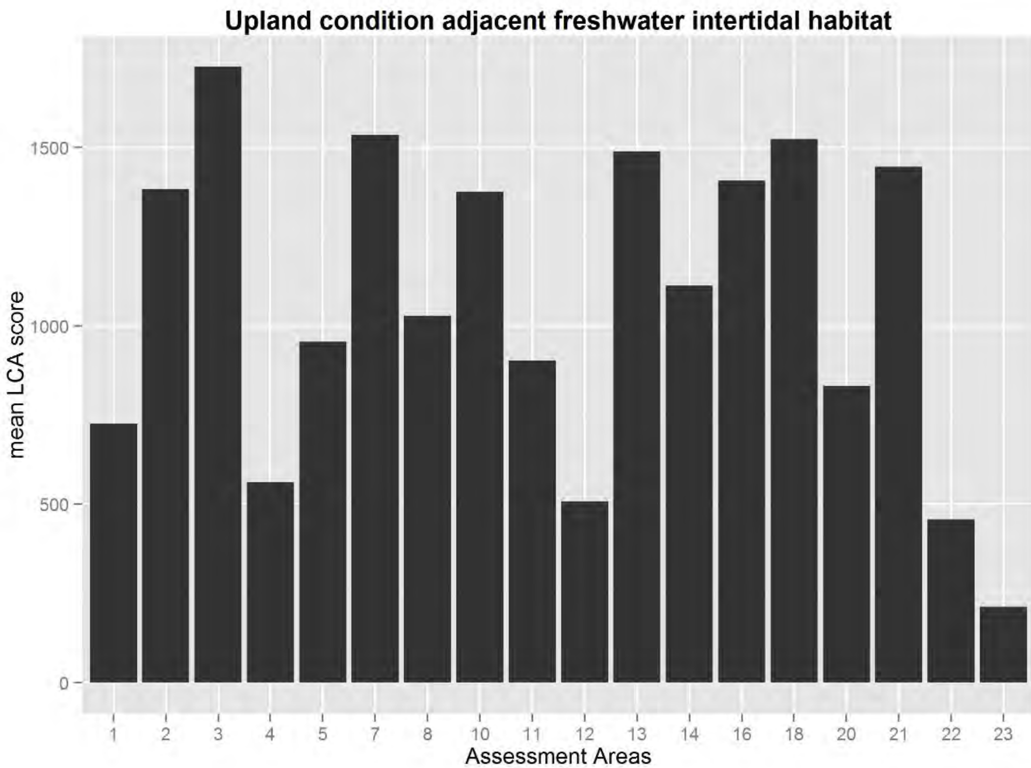

Figure 44. Landscape Condition Assessment for watersheds adjacent the freshwater intertidal mesohabitat.

Associated SGCN

Table 7. SGCN associated with the Freshwater Intertidal Mesohabitat.

Species	Common name	SGCN	Habitat link
Fundulus heteroclitus	Mummichog	3	Estuarine; Freshwater Intertidal
Sterna hirundo	Common tern	3	Estuarine; Freshwater Intertidal; Artificial
Hydrocoloeus minutus	Little gull	2	Estuarine; Freshwater Intertidal; Tidal
Rallus elegans	King Rail	1	Estuarine; Freshwater Intertidal; Tidal
Ardea alba	Great egret	3	Freshwater Tidal marsh
Botaurus lentiginosus	American bittern	3	Freshwater Tidal marsh
Egretta tricolor	Tricolored heron	3	Freshwater Tidal marsh
Ixobrychus exilis	Least bittern	3	Freshwater Tidal marsh
Nyctanassa violacea	Yellow-crowned night-heron	3	Freshwater Tidal marsh
Plegadis falcinellus	Glossy ibis	3	Freshwater Tidal marsh
Tyto alba	Barn owl	2	Freshwater Tidal marsh
Nyctanassa violacea	Yellow-crowned night-heron	3	Freshwater Tidal Swamp
Fundulus majalis	Striped killifish	4	Tidal Creek
Gasterosteus aculeatus	Threespine stickleback	2	Tidal Creek
Menidia beryllina	Inland Silverside	3	Tidal Creek

Species	Common name	SGCN	Habitat link
Stylurus plagiatus	Russet-tipped Clubtail	3	Tidal Creek
Stylurus plagiatus	Russet-tipped Clubtail	3	Tidal Flat

Freshwater Subtidal Shallow Mesohabitat

Freshwater Subtidal Shallow Mesohabitat has a substrate that is continuously submerged with depths from 0-2 m and salinities <0.5 ppt. This Mesohabitat includes three Macrohabitats described below.

Artificial Structure Macrohabitat: Artificial Structure-substrates that were emplaced by humans, using either natural materials such as dredge spoil or synthetic materials, such as discarded automobiles, tires, or concrete (e.g., bulkheads, groins, jetties, and marinas).

Aquatic Bed Macrohabitat: Aquatic bed- includes habitats dominated by plants that grow principally on or below the surface of the water for most of the growing season in most years (e.g., rooted vascular).

Benthic Geomorphology Macrohabitat: Benthic geomorphology- characterization of the geomorphology of the bottom (e.g., bar, sediment wave, channel, benthic flat, and bank).

Distribution

The majority of the Freshwater Subtidal Shallow Mesohabitat occurs in the following two assessment areas: Hudson River Upper (4) with about 1,250 acres and Hudson River Middle (1) with about 250 acres (Figure 247). Small amounts of this type are predicted for the following assessment areas: Hudson River Lower (5), Shinnecock Bay-Atlantic Ocean (14), and Oyster Bay-Huntington Bay (19) (Figure 247).

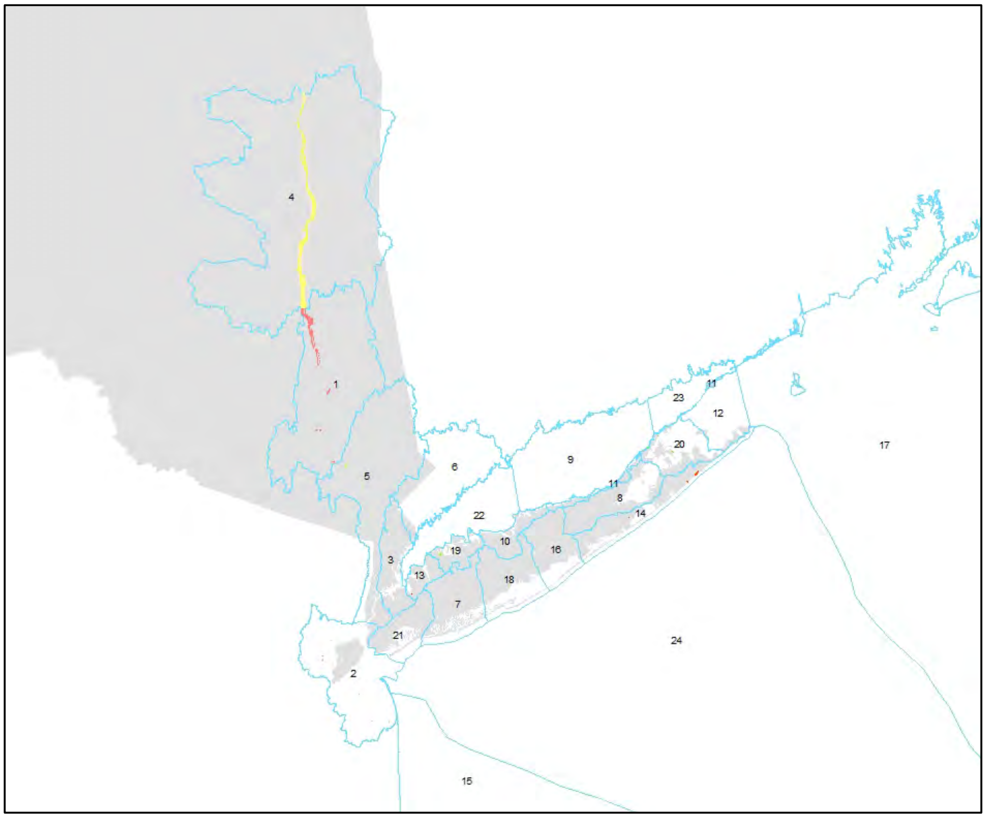

Figure 45. Distribution of the Freshwater Subtidal Shallow

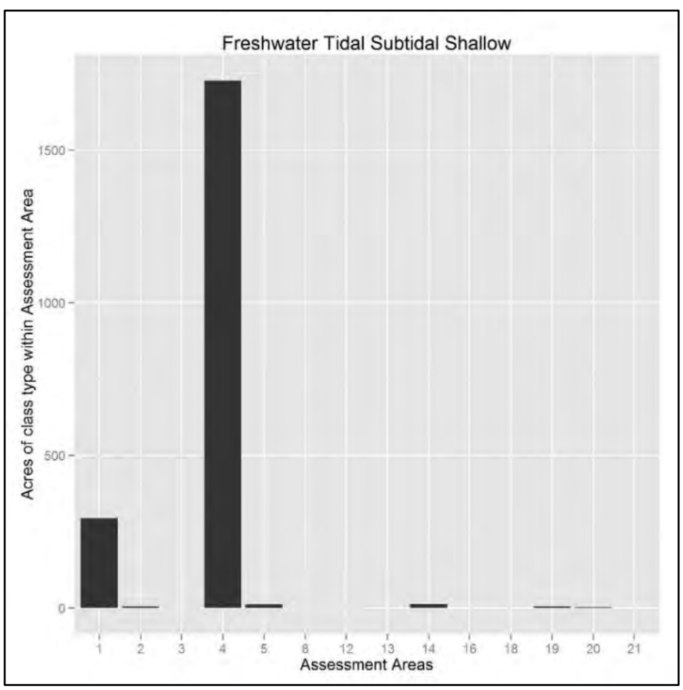

Figure 46. Distribution of the Freshwater Subtidal Shallow Mesohabitat by assessment area.

Condition Assessment

Sediment samples were collected from the Freshwater Subtidal Shallow Mesohabitat in two of the 14 (14%) assessment areas where it occurs. However, most of the samples were collected within the two assessment areas that have the most acres of this type: Hudson River Upper (4) and Hudson River Middle (1) (Figure 247 and Figure 249). The vast majority of sediment samples collected in both assessment areas were rated “good” based on the number of analyte readings exceeding the ERL (Effects Range Low) and/or ERM (Effects Range Median) values and cutoffs (Figure 249).

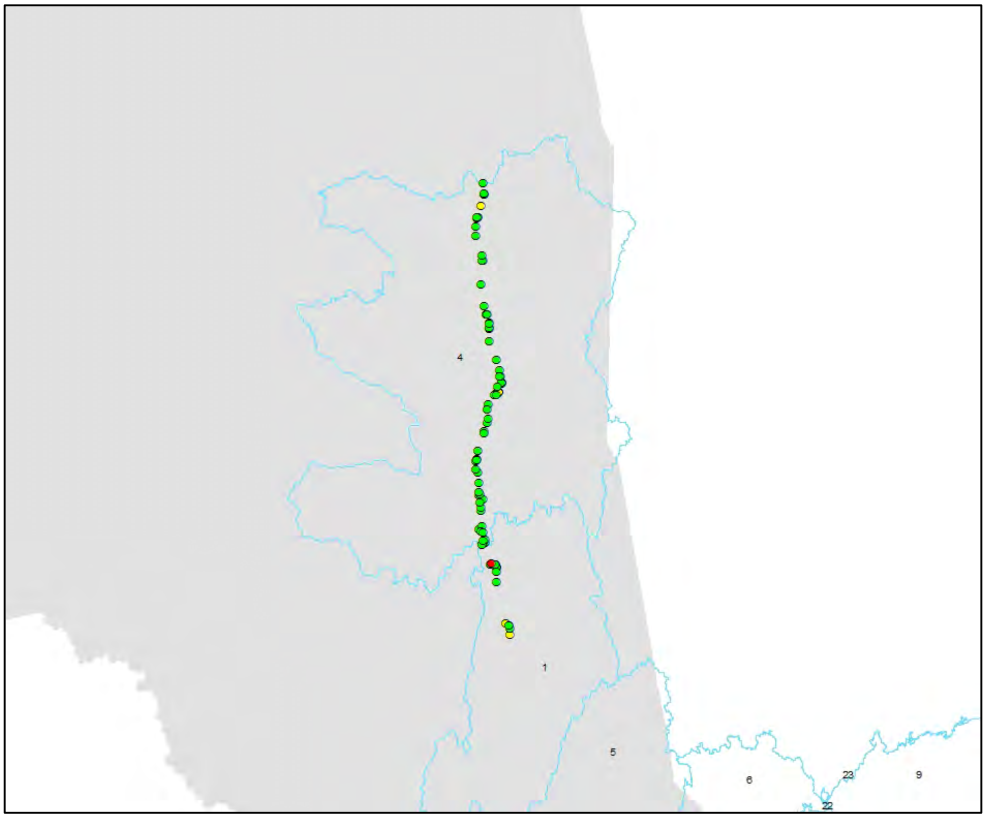

Figure 47. Sediment collections points within the Freshwater Subtidal Shallow Mesohabitat.

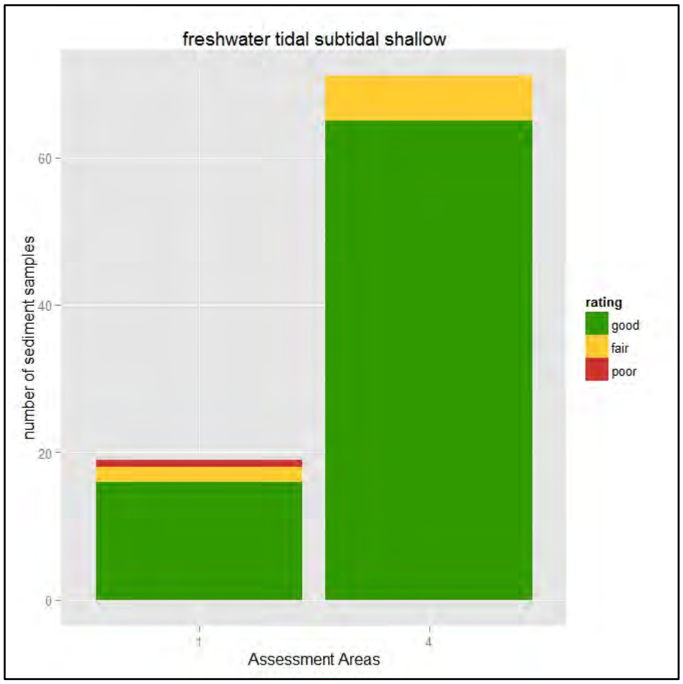

Figure 48. Sediment condition of the Freshwater Subtidal Shallow Mesohabitat by assessment area.

Associated SGCN

Table 8. SGCN associated with the Freshwater Subtidal Shallow Mesohabitat.

Species	Common name	SGCN category	Habitat link
Acipenser oxyrinchus	Atlantic Sturgeon	2	Estuarine; Freshwater Shallow Sub-tidal
Callinectes sapidus	Blue Crab	3	Estuarine; Freshwater Shallow Sub-tidal

Freshwater Subtidal Deep Mesohabitat

The Freshwater Subtidal Deep Mesohabitat has a substrate that is continuously submerged with depths >2m and salinities <0.5 ppt. This Mesohabitat includes one Macrohabitat described below.

Benthic Geomorphology Macrohabitat: Benthic geomorphology- characterization of the geomorphology of the bottom (e.g., bar, sediment wave, channel, benthic flat, and pinnacle).

Distribution

The Freshwater Subtidal Deep Mesohabitat appears to be limited to the following two assessment areas: Hudson River Middle (1) with over 300 acres and Hudson River Upper with less than 50 acres (4) (Figure 250 and Figure 251).

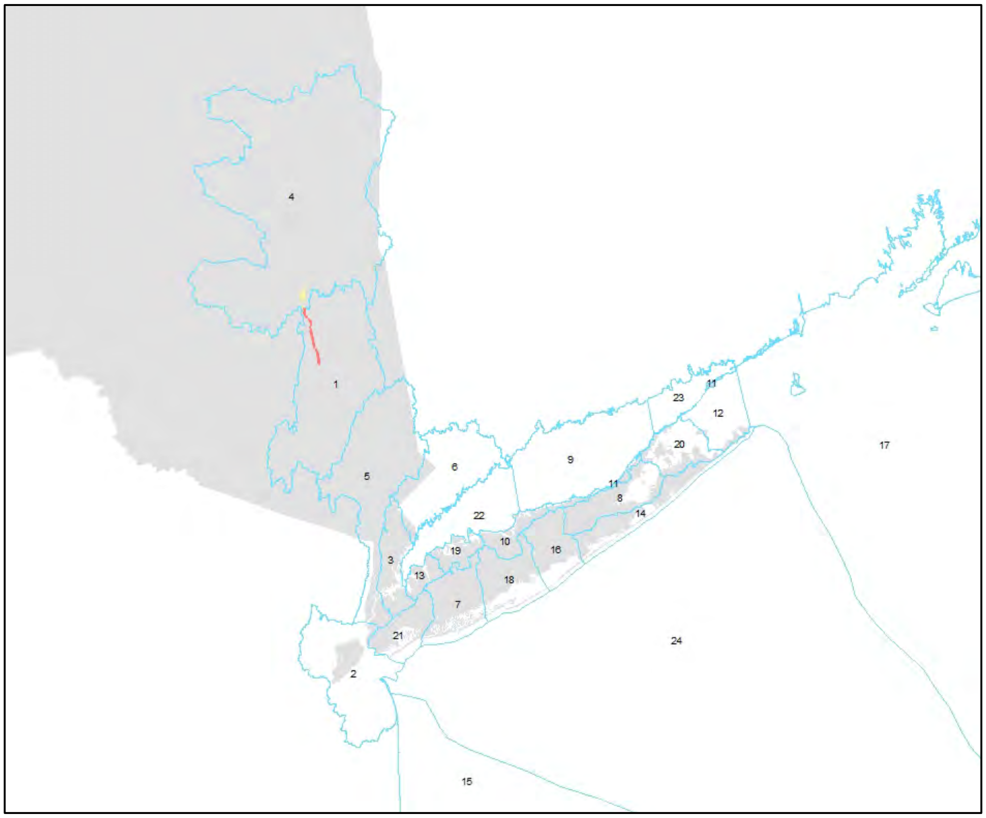

Figure 49. Distribution of the Freshwater Subtidal Deep Mesohabitat.

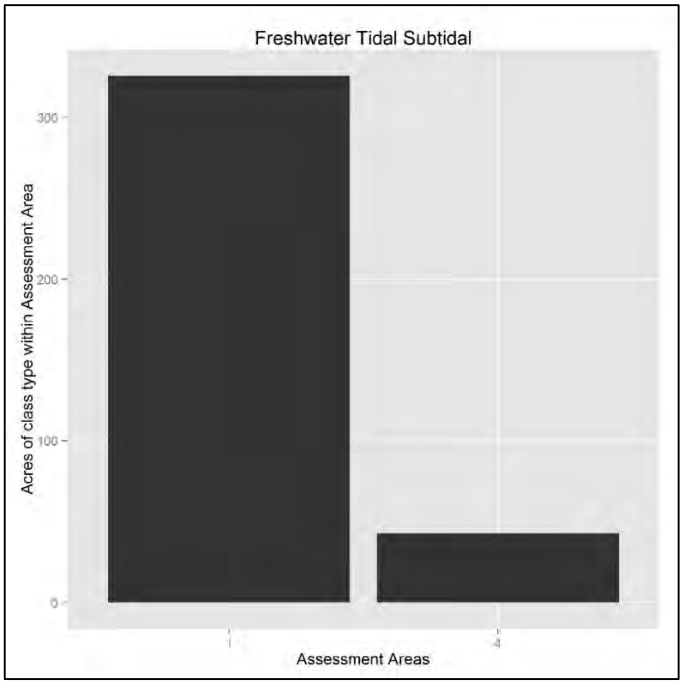

Figure 50. Distribution of the Freshwater Subtidal Deep Mesohabitat by assessment area.

Condition Assessment

Sediment samples were collected from the Freshwater Subtidal Deep Mesohabitat in one of the two (50%) assessment areas where it occurs. However, most of the samples were collected within the assessment area that has the most acres of this type: Hudson River Middle (1) (Figure 26 and Figure 28). The vast majority of sediment samples collected in this assessment area were rated "good" based on the number of analyte readings exceeding the ERL (Effects Range Low) and/or ERM (Effects Range Median) values and cutoffs (Figure 253).

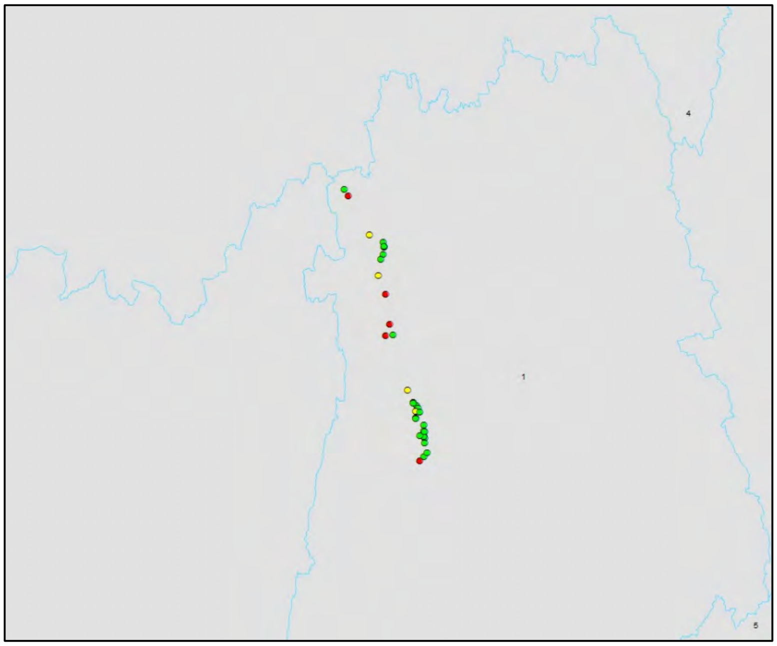

Figure 51. Sediment collection points within the Freshwater Subtidal Deep Mesohabitat.

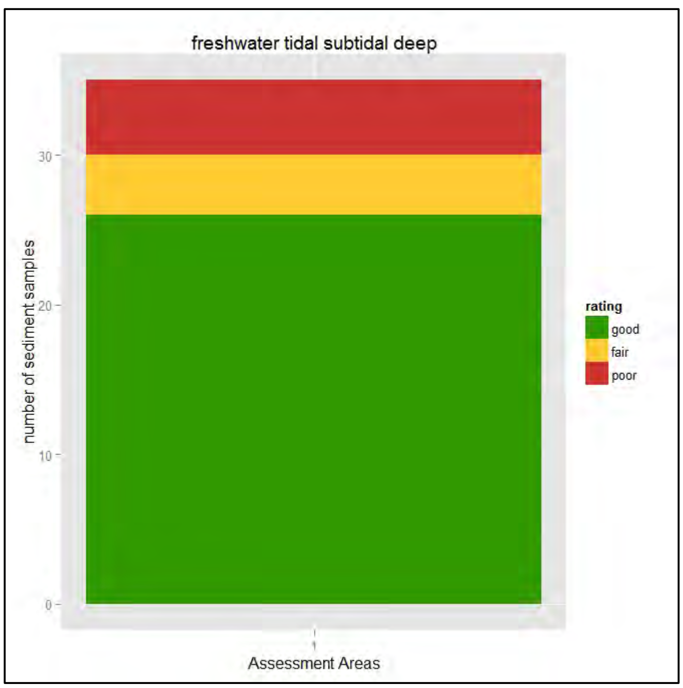

Figure 52. Sediment condition of the Freshwater Subtidal Deep Mesohabitat by assessment area.

Associated SGCN

Table 9. SGCN associated with the Freshwater Subtidal Deep Mesohabitat.

Species	Common name	SGCN category	Habitat link

Acipenser brevirostrum	Shortnose Sturgeon	3	Estuarine; Freshwater Deep Sub-tidal
Brevoortia tyrannus	Atlantic Menhaden	3	Estuarine; Freshwater Deep Sub-tidal