

## 3.3 Long Island's South Shore Barrier Island/ Lagoon System

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Species and habitats along the south shore of Long Island are potentially at risk because of sea level rise. The large back-barrier bays of the south shore include, from west to east, Hempstead Bay, South Oyster Bay, Great South Bay, Moriches Bay, and Shinnecock Bay.<sup>219</sup> These bays contain regionally significant habitats for fish, shellfish, and birds, and a great deal is known about their ecology and habitat needs.

Based on existing literature and the knowledge of local scientists, this brief literature review discusses the coastal species in the region that could be at risk because of further habitat loss resulting from sea level rise and shoreline protection (see Map 3.1). Although it is possible to make qualitative statements about the possible impacts if sea level rise causes a total loss of habitat, our ability to discern what the impact might be if only a portion of the habitat is lost is more limited. A total loss of habitat is possible if shores are protected with hard structures and the wetlands are unable to keep pace with sea level rise.

### Back-Barrier Salt Marshes

There are extensive salt marshes to the west of Great South Bay in southern Nassau County.<sup>220</sup> These marshes are particularly notable because much of the historically large area of marsh on the mainland shoreline of southern Nassau County has been lost to development and shoreline armoring, including the mainland

marshes of South Oyster Bay<sup>221</sup> and the Hempstead Bay–South Oyster Bay habitat complex.<sup>222</sup>

Based on existing studies, a panel of accretion experts, convened by EPA for this report, expect that the back-barrier marshes adjacent to Jones Inlet are keeping pace with the current rate of sea level rise and may continue to keep pace if the rate increases by 2 mm/yr. Under this scenario, wider marshes may survive this modest increase in the rate of sea level rise, but fringing marshes are likely to be lost. These scientists also indicated that if the rate of sea level rise increases by 7 mm/yr, all of the marshes adjacent to Jones Inlet will be lost. To the east of Jones Inlet, the extensive back-barrier and fringing salt marshes surrounding Great South Bay, Moriches Bay, Shinnecock Bay, and Southampton are keeping pace with current rates of sea level rise, but the accretion panel predicted that their ability to keep pace will be marginal if the rate of sea level rise increases by 2 mm/yr, and marshes will be lost if rates increase by 7 mm/yr (see Reed et al., Section 2.1).

Opportunities for marsh migration along Long Island's south shore will be limited. Much of the mainland shoreline in southern Nassau County is bulkheaded, and the rural areas that remain in eastern Suffolk County are likely to be developed in the future. The state requires a 75-foot buffer around tidal wetlands to make marsh migration possible, but outside of this buffer

<sup>219</sup>One other back-barrier bay, Jamaica Bay, is discussed in Section 3.4, New York City, because it is most often considered as part of management programs in that area (e.g., the New York/New Jersey Harbor Estuary Program).

<sup>220</sup>USFWS, 1997, Great South Bay Habitat Complex #14, pp. 447–467 (see note 172).

<sup>221</sup>NYS Department of State and USFWS, Southern New England–New York Bight Coastal Ecosystems Program, 1998, *Shorebirds*, South Shore Estuary Reserve, Technical Report Series. Available at: [http://www.nyswaterfronts.com/Final\\_Draft\\_HTML/Tech\\_Report\\_HTML/PDFs/C8A\\_Index\\_pdf.htm](http://www.nyswaterfronts.com/Final_Draft_HTML/Tech_Report_HTML/PDFs/C8A_Index_pdf.htm).

<sup>222</sup>USFWS, 1997, Hempstead Bay–South Oyster Bay, Habitat Complex #15, p. 483–494 (see note 172).

development and shoreline protection are permitted. Moreover, where wide areas of marsh do not keep pace, there will be a net loss even if marshes can migrate.

Increases in tidal creeks and channels with a modest increase in sea level rise (2 mm/yr) could benefit marsh fishes, including many commercially and recreationally important marine and estuarine transient species that move into the marshes for spawning and nursery habitat. However, where marshes are lost as the rate of sea level rise increases to 7 mm/yr, local populations may eventually move elsewhere in search of suitable nursery and foraging areas. An overall loss of nursery habitat and forage could reduce the productivity of the area's highly valued fishery resources.

The recovery of a number of at-risk bird species could be impeded if additional marsh area is lost as a result of sea level rise. For example, the Dune Road Marsh west of Shinnecock Inlet provides nesting sites for several species that are already showing significant declines, including clapper rail, sharp-tailed sparrow, seaside sparrow, willet, and marsh wren.<sup>223</sup> These marshes are also the only area in New York State where black rails are currently found on a regular basis and the only documented breeding location for sora rails on Long Island.<sup>224</sup>

The northern diamondback terrapin feeds and grows along marsh edges and the nearshore bays of the south shore. Sites on the south shore where terrapins reportedly are found include Captree State Park, east of the Robert Moses State Park on the Fire Island National Seashore, the marshes and ditches of Tobay Sanctuary near Guggenheim Park, and the western section of the Ocean Parkway, where there are signs announcing "Turtle Crossings" to protect terrapins from automobile traffic.<sup>225</sup> A local terrapin expert believes that additional marsh

loss could lead to a "very serious reduction" in their already low abundance.<sup>226</sup>

## Back-Barrier Beaches

As sea levels rise, the back-barrier beaches will erode in front of shoreline protection structures, and will be lost without continual beach nourishment. Eggs of species that nest on estuarine beaches and abundant invertebrate fauna provide forage for numerous bird species, including migratory shorebirds and species that nest on nearby barrier islands, such as the federally threatened piping plover. Shorebirds feed on all trophic levels of beach invertebrate communities, including herbivorous insects, amphipods, isopods, crabs, and bivalves.<sup>227</sup>

The back-barrier beaches of the south shore provide nesting sites for the northern diamondback terrapin,<sup>228</sup> the endangered roseate tern,<sup>229</sup> and horseshoe crabs.<sup>230</sup> Cedar Beach in Great South Bay is considered important for the recovery of roseate tern.<sup>231</sup> Shorebirds feed preferentially on horseshoe crab eggs during their spring migrations,<sup>232</sup> and local biologists believe that the large numbers of shorebirds west of Shinnecock Inlet may be due in part to horseshoe crab spawning in the area.<sup>233</sup> Loss of this food resource could have a significant effect on migrating shorebirds such as red knot, which feed almost exclusively on horseshoe crab eggs during their spring migration, when they must

<sup>226</sup>Dr. Russell Burke, Department of Biology, Hofstra University, Hempstead, NY. August 1, 2006. "Diamondback terrapin and sea level rise." Email to E. Strange, Stratus Consulting, expressing his opinion about the implications of marsh loss in southern Long Island for terrapins. (Russell Burke has operated an annual diamondback terrapin conservation project at the Jamaica Bay Wildlife Refuge in the Gateway National Recreational Area since 1998.)

<sup>227</sup>Dugan et al., 2003 (see note 127).

<sup>228</sup>NYS Department of State, Division of Coastal Resources, 2004, Great South Bay-West, p. 3 (see note 171).

<sup>229</sup>USFWS, 1997, p. 454 in Great South Bay, Complex #14 (see note 172).

<sup>230</sup>NYS Department of State and USFWS, Southern New England-New York Bight Coastal Ecosystems Program, 1998 (see note 221).

<sup>231</sup>USFWS, 1997, Great South Bay. Complex #14 (see note 172).

<sup>232</sup>USFWS, 2005, Red knot, *Calidris canutus rufa*. Fact sheet available at: <http://www.fws.gov/northeast/redknot/facts.pdf>.

<sup>233</sup>NYS Department of State and USFWS, Southern New England-New York Bight Coastal Ecosystems Program, 1998 (see note 221).

<sup>223</sup>USFWS, 1997, p. 418 in Shinnecock Bay Habitat Complex #12 (see note 172).

<sup>224</sup>NYS Department of State, Division of Coastal Resources, 2004 (see note 171).

<sup>225</sup>NYS Department of State and USFWS, Southern New England-New York Bight Coastal Ecosystems Program, 1998 (see note 221).

double in weight to support long-distance migrations.<sup>234</sup> A reduction in the area of back-barrier beach habitat would also negatively impact nesting by diamondback terrapins. Although exact numbers are unknown, a diamondback terrapin expert who has conducted field studies in the area estimates that currently only a few hundred female diamondback terrapins still nest on the back-barrier beaches of Long Island's south shore.<sup>235</sup>

## Tidal Flats

Of the extensive tidal flats along Long Island's southern shoreline, most are found west of Great South Bay and east of Fire Island Inlet along the bay side of the barrier islands,<sup>236</sup> in the Hempstead Bay–South Oyster Bay complex,<sup>237</sup> and around the Moriches and Shinnecock inlets.<sup>238</sup> These flats are important foraging areas for birds and provide habitat for several edible shellfish species, including soft clam, northern quahog (hard clam), bay scallop, and blue mussel. In Shinnecock Bay, the Shinnecock Reservation has developed a subsistence aquaculture program that includes northern quahog and American oyster.<sup>239</sup>

Tidal flats and shallow water habitats are heavily used by shorebirds, raptors, and colonial waterbirds in spring and summer and by waterfowl during fall and winter.<sup>240</sup> The John F. Kennedy Bird Sanctuary is a particularly important feeding area for birds in South Oyster Bay. In summer, the state threatened least tern and a variety of herons and egrets forage here, along with the federally endangered roseate tern. The sanctuary also provides overwintering

<sup>234</sup>USFWS, 2005, Red knot. Fact sheet (see note 232).

<sup>235</sup>Dr. Russell Burke, email to E. Strange, Stratus Consulting (see note 226).

<sup>236</sup>USFWS, 1997, p. 449 in Great South Bay Habitat Complex #14 (see note 172).

<sup>237</sup>USFWS, 1997, p. 484 in Hempstead–South Oyster Bay, Habitat Complex #15 (see note 172).

<sup>238</sup>NYS Department of State and USFWS, Southern New England–New York Bight Coastal Ecosystems Program, 1998, p. 4 (see note 221).

<sup>239</sup>USFWS, 1997, Shinnecock Bay Habitat Complex #12 (see note 172).

<sup>240</sup>Erwin, M.R., 1996, "Dependence of waterbirds and shorebirds on shallow water habitats in the Mid-Atlantic coastal region: An ecological profile and management recommendations," *Estuaries* 19:213–219, p. 213.

habitat for abundant waterfowl, including American black duck, blue-winged, and green-winged teal.<sup>241</sup> Shinnecock Bay supports populations of wintering waterfowl of statewide significance.<sup>242</sup>

The tidal flats around Moriches and Shinnecock inlets are particularly important foraging areas for migrating shorebirds. If shoreline waters become too deep for foraging on these flats, migrating shorebirds could have insufficient foraging areas to support their long-distance migrations. Scientists writing on behalf of the South Shore Estuary Reserve program have asserted that "because shorebirds concentrate in just a few areas during migration, loss or degradation of key sites could devastate these populations." These scientists note that local populations of black-bellied plover, whimbrel, red knot, sanderling, semipalmated sandpiper, least sandpiper, and short-billed dowitcher are already showing declines.<sup>243</sup>

## Nearshore Shallow Waters and Submerged Aquatic Vegetation (SAV)

Seagrass beds occur along much of the southern shoreline of Long Island.<sup>244</sup> The consequences of sea level rise for SAV are unknown. However, Short and Neckles predicted that a 50 cm (19.7 in.) increase in water depth as a result of sea level rise, which could occur during this century, could reduce the light available for seagrass photosynthesis by 50 percent, resulting in a 30–40 percent reduction in eelgrass growth. These researchers suggested that this will, in turn, result in reduced productivity and functional values of seagrass beds.<sup>245</sup> The importance of eelgrass beds for the secondary production of the south shore is indicated by a study of the Great

<sup>241</sup>USFWS, 1997, p. 487 in Hempstead–South Oyster Bay, Habitat Complex #15 (see note 172).

<sup>242</sup>NYS Department of State, Division of Coastal Resources, 2004, Shinnecock Bay, p. 2 (see note 171).

<sup>243</sup>NYS Department of State and USFWS, Southern New England–New York Bight Coastal Ecosystems Program, 1998, p. 1 (see note 221).

<sup>244</sup>NOAA, Benthic Habitat Mapping. SAV map accessed December 4, 2007 at:

<http://www.csc.noaa.gov/benthic/data/northeast/longis1.htm>.

<sup>245</sup>Short and Neckles, 1999, p. 178 (see note 91).

South Bay by Briggs and O'Connor (1971), who found that 23 of 40 recorded fish species clearly preferred naturally vegetated bottom to unvegetated areas.<sup>246</sup>

## Marsh and Bay Islands

Increased flooding and erosion of marsh and dredge spoil islands could reduce habitat for bird species that forage and nest on these islands, particularly gulls and terns. Erosion on Warner Island is reducing nesting habitat for roseate tern and increasing flooding risk during nesting.<sup>247</sup> The Hempstead Bay–South Oyster Bay complex

includes a network of salt marsh and dredge spoil islands that are important for nesting by herons, egrets, and ibises. Hempstead Bay is the primary nesting area in Long Island for yellow-crowned night-herons. Waterfowl such as brant and American black duck feed and rest in the shallow waters around the islands and tidal flats of the complex. An average of 25,000 waterfowl have been counted on midwinter aerial surveys.<sup>248</sup> Lanes Island and Warner Island in Shinnecock Bay support colonies of the state-listed common tern and the federally endangered roseate tern.<sup>249</sup> Carter's Island has supported nesting by the state endangered least tern.<sup>250</sup> Local planners have indicated that eroding marsh islands such as those in Great South Bay may need to be artificially protected to maintain the vegetated wetlands.

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<sup>246</sup>Briggs, P.T. and J.S. O'Connor, 1971, "Comparison of shore-zone fishes over naturally vegetated and sand-filled bottoms in Great South Bay," *New York Fish and Game Journal* 18(1):15–41; cited in NYS Department of State and USFWS, Southern New England–New York Bight Coastal Ecosystems Program, 1998, *Estuarine Fish*, p. 8 (see note 221).

<sup>247</sup>NYS Department of State and USFWS, Southern New England–New York Bight Coastal Ecosystems Program, 1998, *Coastal Colonial Waterbirds*, p. 6 (see note 221).

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<sup>248</sup>USFWS, 1997, p. 486 in Hempstead Bay-South Oyster Bay, Habitat Complex #15 (see note 172).

<sup>249</sup>USFWS, 1997, p. 418 in Shinnecock Bay, Habitat Complex #12 (see note 172).

<sup>250</sup>USFWS, 1997, p. 432 in Moriches Bay, Habitat Complex #13 (see note 172).