

3.12 The Chesapeake Bay Shoreline of Middle Peninsula

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Overview

The Middle Peninsula region comprises Chesapeake Bay shorelines of Gloucester, Mathews, and Middlesex counties. Additionally, the area includes the Rappahannock and Piankatank River shorelines of these counties and several islands in the rivers.

This brief literature review discusses species that could be at risk because of further habitat loss resulting from sea level rise and shoreline protection (see Section 3.1 for general background). Existing literature and knowledge of coastal scientists in the area appears to be sufficient in many cases to make qualitative statements about the possible impact if sea level rise causes a total loss of habitat, which might be expected if shores are protected with hard structures and the wetlands are unable to keep pace with sea level rise. Our ability is more limited, however, to say what the impact might be if only a portion of the habitat is lost. The overall environmental impact of sea level rise in this multicounty region is likely to include the following:

- The tidal estuarine marshes of Gloucester County are already being submerged, and the Mobjack Bay-facing marshes of Mathews County will be marginal with an increase of 2 mm per year in the rate of sea level rise.⁵⁴⁶

⁵⁴⁶ Author's read of map in Reed et al., Section 2.1 showing wetlands in this area being converted to open water at the current rate of sea level rise; and Moore, K., 1976, Gloucester County Tidal Marsh Inventory. Special Report No. 64 in Applied Science and Ocean Engineering, Virginia Institute of Marine Science, Gloucester Point, VA. pages 42–44.

Marsh vegetation habitat for a range of species, including crustaceans, mollusks, and other invertebrates, will be lost. Birds and fish that forage on these invertebrates will therefore face a changed or limited food supply. Nesting habitat for birds will also be eliminated.⁵⁴⁷ If marsh vegetation is lost, the ecosystem functions of flood control, erosion buffering, and nutrient and contaminant filtering will be lost as wetlands are submerged.

- Unnourished beaches in the Middle Peninsula, such as the natural area preserve of Bethel Beach, are already experiencing erosion, and may be lost to accelerated sea level rise. The few plants that are well adapted to the harsh beach environment, and the rare sea-beach knotweed, will be lost. The population of least terns that nests at Bethel Beach may also lose habitat.⁵⁴⁸
- Marsh islands in the Rappahannock and Piankatank rivers are likely to be lost, eliminating valuable nesting habitat for marsh-obligate birds.

Gloucester County

East of Route 17, Guinea Neck, is vulnerable and already being submerged owing to both erosion and sea level rise (CBIM location 10).⁵⁴⁹ The

⁵⁴⁷ Author's analysis based on biological information provided in Lippson and Lippson, 2006, pp. 201–239 (see note 2); and Moore, 1976 (see note 546). For more detail on the impacts of sea level rise to wetland habitat and species, see Section 3.1.

⁵⁴⁸ Lippson and Lippson, 2006, pp. 26–42 (see note 2).

⁵⁴⁹ Author's read of map in Reed et al., Section 2.1 showing wetlands in this area being converted to open water at the

low-lying area bordering southern Mobjack Bay and Chesapeake Bay is composed of tidal wetlands. It is not likely to be protected and will continue to be lost, decreasing available habitat for the many birds, fish, and other creatures that use the marshes and tidal creeks. Some portions may be able to accrete sufficient sediment or migrate inland, but planners anticipate the construction of shoreline protections, which may preclude migration in protected areas. The 5 to 10 foot higher elevation roughly paralleled by Rte. 17 is likely to limit any inland migration that is not outpaced by sea level rise. As early as 1976, though not explicitly linked with sea level rise, it was observed that formerly reclaimed agricultural land was being converted back to marsh and high marsh vegetation species were migrating inland into forested areas.⁵⁵⁰ In the upper reaches of the York River's tributaries, such as the Pamunkey and Mattaponi rivers, tidal hardwood marshes show effects of sea level rise (CBIM location 9). Brackish to freshwater marsh plants are encroaching on these forested areas. Tree death is occurring and further inland migration is hindered by the higher upland elevation behind the forested marshes.⁵⁵¹ Tidal hardwood marshes provide nesting sites for piscivorous species such as ospreys, bald eagles, and double-crested cormorants.⁵⁵² The freshwater marshes also host a variety of migratory and breeding birds.

A study examining the relationship of birds to vegetation communities in the Lee and Hill marshes in the lower Pamunkey River indicates that bird communities may change if high marsh vegetation is replaced with lower marsh vegetation. The authors posit that brackish marshes, because of their locations at transitions between tidal freshwater and oligohaline

marshes, may face greater risk than marshes with more extreme, nontransitional salinities. Outlining a scenario in which sea level rise causes a shift of 100 ha from high marsh big cordgrass (*Spartina cynosuroides*) to low marsh arrow arum (*Peltandra virginica*), the authors estimate a reduction in the number of breeding red-winged blackbirds that currently depend on the big cordgrass portions of the marshes.⁵⁵³ However, a change to an arrow arum-dominated marsh may increase bird density and diversity during winter, particularly for waterfowl and shorebirds. Arrow arum dies back in winter, creating an open mud flat that provides invertebrate prey to birds.⁵⁵⁴

Mathews County

The Mathews County shoreline, bordered by Mobjack Bay to the south, Chesapeake Bay to the east, and the Piankatank River to the north, has a mix of marshes and beaches. Planners indicate that shore protection is likely or almost certain along Mobjack Bay except for a parcel of public land near the mouth of the East River. On the Chesapeake Bay coast of Mathews County, planners anticipate that the southern third of the coast is likely to be protected, the middle third is unlikely to be protected, and the most northern third, comprising Gwynn's Island (CBIM location 14) and some Piankatank River frontage, is almost certain to be protected. Wetlands and some dunes extend along the county's southern boundary along Mobjack Bay and around New Point Comfort (a Natural Area Preserve) (CBIM location 11). Low elevation woodlands (maritime forest) extend inland from the eroding marshes and dune areas and provide habitat for avian neotropical migrants.^{555,556} New

current rate of sea level rise; and Moore, 1976, pp. 42–44 (see note 546).

⁵⁵⁰Moore, 1976, pp. 42–44 (see note 546).

⁵⁵¹Gary Fleming, September 11, 2006 email (see note 76) confirming phone call notes, including information regarding his work in the Mattaponi and Pamunkey river freshwater marshes.

⁵⁵²Robbins, C.S. and E.A.T. Blom, 1996, *Atlas of the Breeding Birds of Maryland and the District of Columbia*, University of Pittsburgh Press, Pittsburgh, PA, pp. 44, 92–94.

⁵⁵³Paxton, B.J. and B.D. Watts, 2002, Bird Surveys of Lee and Hill Marshes on the Pamunkey River: Possible Affects of Sea-Level Rise on Marsh Bird Communities, Center for Conservation Biology Technical Report Series, CCBTR-03-04, College of William and Mary, Williamsburg, VA, pp. 2, 25–26.

⁵⁵⁴Ibid., p. 17.

⁵⁵⁵Virginia Department of Game and Inland Fisheries, New Point Comfort Natural Area Preserve, accessed on August 3, 2006, at: <http://www.dgif.virginia.gov/wildlife/vbwt/site.asp?trail=1&site=CMT08&loop=CMT>.

Point Comfort hosts a population of the northeastern tiger beetle (federally listed as threatened) and nesting least terns (*Sterna antillarum*).⁵⁵⁷ Marshes also line tributaries and the landward facing sides of Winter Harbor (CBIM location 12), the mouth of Strutts Creek, just south of Gwynn's Island, and the southern bank of the Piankatank. On the Piankatank, marsh areas frequently front higher elevation areas.⁵⁵⁸ Beaches, most showing signs of high erosion rates, front much of the Chesapeake-facing shore (e.g., adjacent to Winter Harbor, along Bethel Beach, Rigby Island, and Gwynn's Island). Marshes and unnourished beaches on the Piankatank are likely to be lost, because migration inland will be limited by the greater than 10 foot elevations. The marsh areas are expected to accrete sufficient sediment to only keep pace marginally with a 2 mm per year increase above current sea level rise rates, and are likely to be lost with a 7 mm per year rate increase (Section 2.1). Loss of marsh area will lead to loss of the species that depend on it, as described above.⁵⁵⁹

Bethel Beach (CBIM location 13), a natural area preserve separating Winter Harbor from Chesapeake Bay, is currently migrating inland over an extensive salt marsh area.⁵⁶⁰ The beach is undergoing high erosion,⁵⁶¹ and is home to a population of the northeastern beach tiger beetle (federally listed as threatened) and a nesting site for least terns, which scour shallow nests in the sand. In the overwash zone extending toward the marsh, a rare plant is present, the sea-beach knotweed (*Polygonum glaucum*). The marsh is

also one of few Chesapeake Bay nesting sites for northern harriers (*Circus cyaneus*), hawks that commonly nest in more northern areas.⁵⁶²

Although the shore is able to continue to migrate, these habitats will remain intact, but eventual overwash and inundation of the marsh will lead to the loss of the sea-beach knotweed and the northeastern beach tiger beetle population, as well as the nesting area for least terns and northern harriers.⁵⁶³

Middlesex County

Middlesex County lies on the northern portion of the Middle Peninsula, bordered on the south by the Piankatank River and on the north by the Rappahannock River. The river and bay shorelines are primarily beach, with marsh areas in coves and tributaries such as Broad Creek. As the Rappahannock shore forms a point near Mill Creek, the shoreline becomes predominantly marsh. Stove Point (CBIM location 16) is a defining land feature, an arm of land reaching south into the Piankatank and forming Fishing Bay (CBIM location 15). Its entire eastern shore, approximately 75 percent of which is beach, is protected by bulkheads and riprap as well as a continuous groinfield along its length. Roughly a third of the beach area has high rates of erosion. The peninsula of Middlesex County north and east of Fishing Bay is narrowly connected to the rest of the county between Jackson and Sturgeon creeks. Groinfields, riprap, and bulkheading border the whole peninsula and extend into some of the tributaries, limiting possibilities for shoreline migration.⁵⁶⁴

Apart from the southernmost end of Stove Point, and three small areas on the Rappahannock, planners indicate that shore protection in

⁵⁵⁶Virginia Department of Conservation and Recreation, New Point Comfort Natural Area Preserve, accessed on August 29, 2006, at:

<http://www.state.va.us/dcr/dnh/newpoint.htm>.

⁵⁵⁷Ibid.

⁵⁵⁸Berman, M.R., Berquist, H., Dewing, S., Glover, J., Hershner, C.H., Rudnicki, T., Schatt, D.E., and Skunda, K., 2000, Mathews County Shoreline Situation Report, Special Report in Applied Marine Science and Ocean Engineering No. 364, Comprehensive Coastal Inventory Program, Virginia Institute of Marine Science, College of William and Mary, Gloucester Point, VA.

⁵⁵⁹Lippson and Lippson, 2006, pp. 201–239 (see note 2).

⁵⁶⁰Gary Fleming email on September 11, 2006 (see note 76), including information regarding Bethel Beach.

⁵⁶¹Berman et al., 2000 (see note 558).

⁵⁶²Virginia DCR Bethel Beach fact sheet, accessed at: <http://www.dcr.virginia.gov/dnh/pgbethel.pdf> on August 3, 2006.

⁵⁶³Author's analysis based on biological information for Bethel Beach (see note 562).

⁵⁶⁴Berman, M.R., Berquist, H., Dewing, S., Glover, J., Hershner, C.H., Rudnicki, T., Schatt, D.E., and Skunda, K., 2000. Middlesex County Shoreline Situation Report, Special Report in Applied Marine Science and Ocean Engineering No. 368, Comprehensive Coastal Inventory Program, Virginia Institute of Marine Science, College of William and Mary, Gloucester Point, VA.

Middlesex County is likely or almost certain. Most of the county along the Rappahannock River is already protected with groinfields extending on both sides of Sturgeon Creek.⁵⁶⁵ Without nourishment, beaches in this area are likely to be lost. Off shore from Mill Creek in the Rappahannock River, Parrott Island, composed of tidal marsh, will not be protected. All the marsh areas in Middlesex County may keep pace with a 2 mm per year increase in sea level rise rates through accretion, but not likely with a rate increase of 7 mm per year. Similarly, Berkeley Island in the Piankatank is unlikely to be protected (Section 2.1). This island will potentially be inundated and submerged, presumably leading to loss of habitat for biota that typically inhabit these ecological communities. These may include crustaceans, mollusks, and other invertebrates that feed on and fertilize the marsh vegetation and the turtles (e.g. diamondback terrapins) and birds (e.g. ducks, rails) that forage on them. Habitat for forage and game fish that spend portions of their lives in wetlands will be lost, as will nesting habitat for marsh obligate birds.⁵⁶⁶ Islands are also a particularly desirable nesting habitat for birds, owing to the general absence of larger mammalian predators.⁵⁶⁷

Wrapup

The three areas where specific data are available for the Middle Peninsula are vulnerable to sea level rise. First, the Guinea Neck marshes will potentially be converted to open water under an increased rate of sea level rise scenario of 2 mm and most likely will be converted at 7 mm (Section 2.1). Presumably, as in other marsh areas, this will result in impacts to the invertebrates such as crabs and shrimp that use the vegetation,

and the birds that feed on them. Likewise, it will eliminate nesting and forage habitat for birds and fish. Second, Bethel Beach may survive with sufficient sediment input, and continued lack of shoreline protections, allowing for survival of the area's northeastern beach tiger beetle and the rare sea-beach knotweed. The beach portion is already experiencing high erosion, and it is estimated that a 7 mm increase in rates of sea level rise might overwhelm the migration processes and lead to marsh inundation in these areas. Third, the tidal marshes in the York River tributaries (the Pamunkey and Mattaponi rivers) are already impacted by sea level rise, and vulnerable to future changes, particularly if changes in salinity drive changes in vegetative cover. In the forested hardwood marshes of the upper reaches, increased salinity is expected to eliminate the forested marsh, which will reduce habitat for eagles and other piscivorous birds.⁵⁶⁸ In the brackish marshes in the lower Pamunkey River, inundation may occur if rates of sea level rise increase by 2 mm per year, and is expected with an increase of 7 mm per year. Inundation may increase the percentage of low marsh vegetation (arrow arum), resulting in reduced numbers of red-winged blackbirds and other birds that prefer higher marsh areas, yet habitat for wintering waterfowl would be enhanced because of the likelihood of increased mud flats in winter.⁵⁶⁹

⁵⁶⁵Berman et al., 2000 (see note 564).

⁵⁶⁶Author's analysis based on biological information in Lippson and Lippson, 2006, pp. 201–239 (see note 2).

⁵⁶⁷Eyler et al., 1999 (see note 78).

⁵⁶⁸Author's analysis based on discussion with Gary Fleming, and on Robbins and Blom, 1996 (see note 552).

⁵⁶⁹Author's analysis based on Paxton and Watts, 2002 (see note 553).