

3.14 Lower Potomac

*Authors: Elizabeth M. Strange, Stratus Consulting Inc.
Ann Shellenbarger Jones, Industrial Economics Inc.*

Species and habitats along the lower Potomac River are potentially at risk because of sea level rise. This study region encompasses the estuarine portion of the tidal Potomac downstream of Mattawoman Creek to Chesapeake Bay. The region contains important habitats for a variety of fish, shellfish, and birds, and a great deal is known about the ecology and habitat needs of these species. Based on existing literature and the knowledge of local scientists, this brief literature review discusses those species that could be at risk because of further habitat loss resulting from sea level rise and shoreline protection (see map in Chesapeake Bay review). Although it is possible to make qualitative statements about the ecological implications if sea level rise causes a total loss of habitat, our ability to say what the impact might be if only a portion of the habitat is lost is more limited. A total loss of habitat might be expected if shores are protected with hard structures and the wetlands are unable to keep pace with sea level rise.

The Lower Potomac's shorelines pass through St. Mary's and Charles counties in Maryland and Westmoreland and Northumberland counties in Virginia's Northern Neck. The Maryland side is largely rural and agricultural, but population and development there are growing rapidly. Northumberland County is densely developed along the Potomac River and on the Chesapeake Bay shoreline. Westmoreland County lies entirely along the Potomac, north and west of Northumberland County. The county is highly developed, but also has many conservation areas.

The habitats found in the Lower Potomac and their likely responses to sea level rise include the following:

- Freshwater tidal marshes in the Lower Potomac are found in the headwaters of tidal tributaries. These marshes are currently keeping pace with sea level rise, largely through sediment and peat accumulation, and are expected to continue to do so (and possibly expand in some areas), even if sea level rise rates increase by 2 mm/yr or 7 mm/yr (Section 2.1).
- Brackish tidal marshes border the Lower Potomac River and the downstream portions of the estuary's tributaries. These marshes are keeping pace with sea level rise today, but are considered marginal with a 2 mm/yr increase in the rate of sea level rise, and likely to be lost to open water or replaced by submerged aquatic plants with a 7 mm/yr increase above the current rate (Section 2.1).
- Unnourished beaches and tidal flats of the Lower Potomac are likely to erode as sea levels rise. Where shores are protected with bulkheads and revetments, erosion will also occur.
- The cliffs and bluffs along the Lower Potomac are unlikely to be protected in most areas (e.g., Westmoreland State Park, Caledon Natural Area). Natural erosional processes will continue, helping to maintain the beaches below.
- Where submerged aquatic vegetation (SAV) occurs along coves, shoreline armoring may lead to loss of SAV due to increased wave energy.

Lower Potomac, Maryland Shoreline

The State of Maryland estimates that there are close to 3,440 ha (8,500 acres) of coastal tidal wetlands in the Lower Potomac River watershed, which extends from the mouth of the Potomac in St. Mary's County upstream to Mattawoman Creek in Charles County. This estuarine portion of the tidal Potomac contains mostly brackish marsh along the Potomac shoreline, with freshwater tidal wetlands in the upper reaches of tributaries such as St. Mary's River.⁵⁷⁹

In St. Mary's County, the Potomac River shoreline, as documented in the County Shoreline Situation Report, is a mix of marsh (20 percent) and beach (35 percent); the remainder is armored or low vegetated banks. Approximately 30 percent of the shoreline is currently protected, primarily with riprap. Along both the Potomac and its tributaries, most of the banks are low (< 5 feet), undergoing minimal erosion, and fully vegetated.⁵⁸⁰ The narrow tidal wetlands are about equally divided between areas considered likely to be protected and almost certain to be protected. These marshes are not expected to keep pace with a 7 mm/yr increase in the rate of sea level rise, but they might be able to keep pace with a 2 mm/yr increase in the rate of sea level rise, depending on how the wetlands are managed (Section 2.1).

In the Wicomico River, St. Clements Bay, and Breton Bay, shoreline banks are fronted by marsh (40 percent of shoreline) and a small amount of beach (15 percent); under 20 percent of the shoreline is currently protected.⁵⁸¹ Shoreline protections are likely or almost certain at the mouths of the St. Mary's River, Breton Bay, and the Wicomico River.

Areas adjacent to more rural areas on the Maryland side of the Lower Potomac (e.g., inland side of St. George's Creek, Clements Bay)

⁵⁷⁹Clearwater, D., P. Turgeon, C. Noble, and J. LaBranche, 2000, An Overview of Wetlands and Water Resources of Maryland, prepared by the Maryland Department of the Environment for the Maryland Wetland Conservation Plan Work Group, January.

⁵⁸⁰Berman, M.R., Berquist, H., Dewing, S., Hershner, C.H., Rudnicki, T., Barbosa, A., Schatt, D.E., Weiss, D., and H. Woods, 2003, St. Mary's County, Maryland Shoreline Situation Report, Comprehensive Coastal Inventory Program, Virginia Institute of Marine Science, College of William and Mary, Gloucester Point, VA, Tables 6 and 7.

⁵⁸¹Ibid.

are unlikely to have shore protections, allowing the possibility of shoreline retreat. Tidal freshwater marshes at the upper reaches of the Wicomico River, St. Clement's Bay, and Breton Bay could benefit from more fluvial sediments resulting from increased storms resulting from climate change (Section 2.1).

The seasonally flooded Zekiah Swamp Environmental Area, which feeds the Wicomico River, contains freshwater tidal marsh that should be able to maintain pace with a moderate increase in the rate of sea level rise (Section 2.1). However, salt-water intrusion could lead to crown dieback, tree mortality, and potential infilling of the understory with salt marsh vegetation such as *Spartina*.⁵⁸² Nonetheless, given the swamp's relatively large area and water volume, if such detrimental effects occur they are likely to be contained to the Wicomico River end of the swamp.

At the mouth of the Wicomico are the developed areas of Wicomico Beach and Cobb Island. Cobb Island has docks, piers, and sandy beaches along its Potomac side, beaches and marsh along the mainland side, and predominantly beach shorelines along the low (0–5 feet) adjacent mainland areas (Cobb Neck). Cobb Island is almost certain to be protected (most areas already are), which is likely to lead to erosion of beaches and conversion of tidal flats to open water without other actions. On the mainland section, shore protection is likely and armoring is almost certain to protect the homes along Swan Point Neck. Wetlands are likely to be inundated in the western Swan Point section of Cobb Neck because of armoring and insufficient sediment accretion.

Farther up the Potomac toward Port Tobacco and the Nanjemoy Peninsula, the majority of the Potomac shoreline is unlikely to be protected, and brackish marshes along the shore will be able to retreat in response to sea level rise. Despite armoring of Port Tobacco, accretion rates for the tidal freshwater marshes at the head of the Port Tobacco River are most likely sufficient to allow the marshes to keep pace with a 7 mm/yr increase in the current rate of sea level

⁵⁸²Fleming et al., 2006 (see note 67).

rise. Based on its status as a military site, protection is uncertain at the Blossom Point Proving Ground's highly eroding marshes on the eastern side of the mouth of Nanjemoy Creek.

The Nanjemoy Peninsula is considered an area of great ecological significance and therefore TNC, the Conservation Fund, the Conservancy of Charles County, the Maryland Department of Natural Resources, and the federal Bureau of Land Management have all sought to acquire and carefully manage the area.⁵⁸³ The TNC-owned rookery along Nanjemoy Creek contains one of the largest great blue heronries on the East Coast. Blue herons nesting within the rookery feed on fish and other aquatic organisms found in the peninsula's wetlands and the shallow waters of the creek and the Potomac River; TNC has also purchased an option for 850 ha (2,100 acres) along Nanjemoy Creek to protect the dwarf wedge mussel, a federally and state-listed freshwater mussel. The creek is one of only four known sites where the mussel is found within Maryland, and is considered the largest and most viable population in the state.⁵⁸⁴

The remaining shoreline along the Lower Potomac in Maryland is characterized by highly eroding beaches up through Mattawoman Creek. These shorelines are unprotected and primarily adjacent to agricultural lands, which should allow for shoreline migration. Two areas of marsh, one at Halfway Creek and one with high erosion at Mallow's Bay, break up the beach shorelines in this reach of the Potomac River.

Where brackish tidal marshes are lost, nesting, foraging, roosting, and stopover areas for migrating birds would be lost. Significant concentrations of migrating waterfowl forage and overwinter in the marshes of the Lower Potomac in fall and winter, including black duck, greater and lesser scaup, brant, mallard, Canada goose, northern pintail, oldsquaw, and scoters.

Hérons and egrets feed on fish and invertebrates, and ducks feed on seeds and submerged plants. Rails, coots, and migrant shorebirds are transient species that feed on fish and invertebrates in and around the marshes and tidal creeks. The rich food resources of the tidal marshes also support rare bird species such as bald eagle, which nest in nearby wooded areas and feed on fish and invertebrates in marshes and tidal creeks, and northern harrier, which nest and forage in marshes.⁵⁸⁵

Fish species common in the brackish waters of the region include resident marsh species such as killifishes, anchovies, silversides, blennies, gobies, and hogchoker. Striped bass and white perch move in and out of marshes year-round. Anadromous fishes, including herrings and shad, as well as marine transients such as Atlantic menhaden and drum species, are present in late spring and early fall.⁵⁸⁶ The most visible invertebrates of the brackish marshes are red-jointed fiddler crab, marsh periwinkle, Atlantic ribbed mussel, and common clam worm.⁵⁸⁷

The tidal freshwater marshes support additional species that are rare in brackish environments. Green frog, southern leopard frog, redbelly turtle, Eastern painted turtle, Eastern ribbon snake, and northern water snake are all found in the tidal freshwater marshes of the Chesapeake Bay region. Perching birds such as red-winged blackbirds are common in stands of cattail.⁵⁸⁸

Without nourishment, beaches and tidal flats in front of shoreline protections in this area will erode as seas rise. These habitats often contain a high diversity and abundance of species ranging from microscopic organisms that live between sediment grains and can reach 2 billion individuals per square meter⁵⁸⁹ to filter-feeding bivalves and deposit-feeders such as fiddler crabs and mud snails found just below the surface. In turn, numerous predators feed on

⁵⁸³U.S. Bureau of Land Management, 2004, Lower Potomac River Proposed Coordinated Management Plan, prepared in cooperation with the State of Maryland Department of Natural Resources, Annapolis. April, p. 72.

⁵⁸⁴Maryland Department of Natural Resources, 2005, Maryland Tributary Strategy, Lower Potomac River Basin Summary Report for 1985–2003 data, Maryland Department of Natural Resources, Annapolis, p. 2.

⁵⁸⁵White, 1989, pp. 107–123 (see note 25).

⁵⁸⁶White, 1989, p. 85 (see note 25).

⁵⁸⁷White, 1989, p. 124 (see note 25).

⁵⁸⁸White, 1989, pp. 107–109 (see note 25).

⁵⁸⁹Bertness, 1999, p. 256 (see note 133).

these invertebrates, including snails, blue crab, and a variety of fishes and birds.⁵⁹⁰

Lower Potomac, Virginia Shoreline

On the Virginia side of the Lower Potomac, shoreline protection is almost certain throughout Northumberland County, with shoreline protection already in place for much of the developed land (see Section 3.14). Beaches and tidal flats line the Potomac shore of Northumberland County, and low vegetated banks and brackish marsh edge the many coves and inlets.⁵⁹¹ Most of the county is almost certain to be protected, leading to erosion of unnourished beaches and preventing marsh migration.

In Westmoreland County, from the Yecomico River to Currioman Bay, most areas are likely or almost certain to be protected. Much of the likely protected areas of the Potomac shoreline are bordered by brackish marshes, which may be inundated under most sea level rise acceleration scenarios due to insufficient accretion and the inability to migrate. In these areas, wetlands may be replaced by SAV beds.

Farther upstream, Westmoreland State Park has undeveloped bluffs up to 45.7 m (150 ft) high with narrow sandy beaches along the shore. With shoreline protection unlikely, continued cliff erosion is presumed, which will provide sediment to maintain the beach toe against increasing sea level rise.

The highly developed areas near Colonial Beach are almost certain to be protected. Although some brackish marshes may be lost along the Potomac shore, tributaries on either side of the area are unlikely to be protected, which should preserve wetland habitats in these areas. However, unless nourished, the rocky, sandy shoreline at Colonial Beach may be lost due to the close proximity of residential development to the water.

In King George County, the Mathias Point Neck area is almost certain to be protected, The shoreline is a mix of narrow sand beaches, wooded banks, and marsh areas, with jetties and docks extending into the water. There is a large fringing bed of SAV, dominated by milfoil, wild celery, and hydrilla,⁵⁹² from the Upper Machodoc Creek to Mathias Point, with smaller beds between Mathias Point and Quantico.⁵⁹³

Farther upstream are the Caledon Natural Area and the adjoining Chotank Creek Natural Area Preserve, which is part of the Cedar Grove Farm conservation easements. At the eastern edge of the Caledon Natural Area, shoreline protection is likely on the northern side of Chotank Creek. Protection is unlikely, however, on the southern side of the creek, which may allow sufficient area for wetland migration.

The Caledon Natural Area and the Chotank Preserve provide a diversity of habitats that are potentially vulnerable to sea level rise and shoreline protection. Along the shoreline at Caledon is a narrow strip of sand-gravel beach backed by freshwater tidal marsh dominated by cattails and *Phragmites*. In shallow areas, the marshes are dominated by pickerelweed and arrow arum. Marsh areas are backed by swamp forest of sweet gum and oak. Some of the swamp trees that have died because of excess standing water now provide nesting sites for bald eagles. Red headed woodpeckers are also seen nesting in these areas.

Even if the rate of sea level rise increases by 7 mm per year, these marshes are likely to be able to migrate inland. The marshes provide habitat for catfish, perch, sunfish, and carp, and support numerous turtles, including the red-eared palm slider and its close relative the yellow-belly palm slider, painted turtles, and snapping turtles. Green heron, great blue heron, and the

⁵⁹⁰For general information on the fauna of soft-sediment habitats, see Bertness, 1999 (see note 133).

⁵⁹¹Berman et al., 2002, Northumberland, Table 4 (see note 576).

⁵⁹²Species of SAV are provided as examples; in reality, species vary annually. Long-term trends in SAV from DC to Maryland Point are described in Rybicki, N.B. and J. M. Landwehr, 2007, "Long-term changes in abundance and diversity of macrophyte and waterfowl populations in an estuary with exotic macrophytes and improving water quality," *Limnology and Oceanography* 52:1195–1207.

⁵⁹³Maryland Department of Natural Resources, 2005, Maryland Tributary Strategy, p. 15 (see note 584).

occasional egret feed on fish and invertebrates in the marshes. Jones Pond within the marsh was breached by Hurricane Ernesto and is now tidal. The pond attracts numerous waterfowl, including Canada geese, tundra swan, and many duck species, including mallards, canvasback, and black ducks. Upstream of Caledon, residential developments line the shore, which is primarily composed of sandy beaches along the Potomac, with freshwater tidal marshes in the upper reaches of tributaries.⁵⁹⁴ In the more densely developed areas, shoreline protection is almost certain. Similarly, even in the less dense areas, shore protection is likely. Shoreline protections will inhibit any inland migration of these shoreline habitats.

With the exception of the southern edge of the headwaters of Potomac and Accokeek creeks, protection is likely or almost certain throughout this region. Between these creeks lies the 1,619 ha (4,000 acre) Crow's Nest Peninsula, an area of substantial conservation interest as well as a target for potential development. The peninsula is ecologically noteworthy for its 1,416 ha (3,500 acre) of unfragmented mature hardwood forest, considered the finest remaining example in the Mid-Atlantic coastal plain, and 283 ha (700 acre) of undisturbed tidal freshwater marsh. The marshes include three vegetation zones, defined according to elevation in relation to mean low water. Below mean low water is a zone of yellow pond lily with clusters of American lotus. Next are mixed stands of pickerelweed, arrow arum, spatterdock, and wild rice. At the highest elevation is a zone of marsh hibiscus, smartweed, cardinal flower, big cordgrass, jewelweed, and beggar-ticks.⁵⁹⁵

In addition to their value as a rare example of pristine freshwater tidal marsh, the marshes of Crow's Nest Peninsula provide habitat for numerous bird species, including some 26 species of waterfowl that use the freshwater tidal marshes and wooded swamps for nesting, migration, and overwintering habitat. These include 10 of 13 North American Wildlife

Conservation Association Priority Wildlife Species. There is also a large great blue heron rookery along upper Potomac creek that supports more than 600 nests. The marshes also provide valuable spawning and nursery habitat for a number of economically important recreational and commercial fish species, including striped bass, alewife, blueback herring, white perch, hickory shad, and yellow perch.⁵⁹⁶

Although currently not developed, the potential for future development makes shore protection along Crow's Nest Peninsula likely. The fringing wetlands would be unable to migrate in these areas if shore protections were implemented (and potentially unable to migrate in the absence of protections, given the bank heights in many areas). However, sediment accretion is likely to be sufficient to maintain wetlands in place even if the rate of sea level rise increases by 7 mm per year above the current rate.

In Aquia Creek, to the north of Crow's Nest Peninsula, shoreline protection is almost certain. Several areas already have breakwaters (e.g., eastern shore of Aquia Landing) that might disrupt sediment transport, potentially preventing sufficient marsh accretion (e.g., in the freshwater tidal marshes on the western side of Aquia Landing). Sandy beach occurs near the mouth of Aquia Creek. The remainder of the county shoreline north of Aquia Creek is also primarily sandy beach, about two-thirds considered by planners as likely to be protected and one-third almost certain. Without nourishment, these beaches are likely to be eliminated in areas where armoring restricts shoreline retreat.

⁵⁹⁴NOAA, 2005 (see note 538).

⁵⁹⁵USFWS, 2000, Final Environmental Assessment: Proposed Accokeek National Wildlife Refuge, USFWS Region 5, October, pp. 11–12.

⁵⁹⁶USFWS, 2000, pp. 12–18 (see note 595).