

## 3.15 Upper Potomac

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

Species and habitats along the Upper Potomac River are potentially at risk because of sea level rise. The Upper Potomac extends from Mattawoman Creek upstream to the head of tide of the Potomac River near Georgetown in the District of Columbia (DC) and to the head of tide of the Anacostia River near Bladensburg, Maryland. 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 Upper Potomac is the tidal freshwater portion of the river (salinity less than 0.5 ppt). In this area, the Potomac's eastern shore passes through Charles and Prince George's counties, Maryland, and DC; the western shore passes through King George, Stafford, Prince William, Fairfax, Alexandria, and Arlington counties in Virginia.

With accelerated sea level rise, the habitat effects in this study region may include the following:

- Tidal freshwater marshes are unlikely to be lost, at least not in their entirety. A panel of accretion experts convened for this report

concluded that tidal freshwater marshes in the Chesapeake Bay region can keep pace with sea level rise, possibly even in the face of a 7 mm/yr increase in the current rate of sea level rise (Section 2.1). Thus, it is likely that the tidal freshwater marshes of Mason Neck, Dyke Marsh, Roosevelt Island, and the Anacostia estuary could all keep pace with sea level rise, even if the rate of sea level rise increases by 7 mm/yr. However, erosion may contribute to reductions in the area of marshes, and migration potential is limited because of inland development.

- Small pockets of estuarine beach and mudflat are found at many sites along the shorelines of the Upper Potomac, and in the DC area these habitats are backed by coastal wooded swamps. Some locations (e.g., Indian Head) have more prominent stretches of sandy beach, but for the most part unconsolidated soft-sediment habitats are only a minor component of the shoreline in the study region. These shorelines will erode as sea levels rise, and beaches will be lost except where there is nourishment.
- Where cliffs and bluffs along the Upper Potomac are protected to preserve property, erosional processes may no longer supply adequate sediment to maintain the beaches below.
- Where SAV occurs along coves, shoreline armoring may lead to loss of SAV due to increased wave energy. Where wetlands recede, SAV could spread landward via vegetative spread or if propagules or seeds reach sites with suitable growing conditions.

### **Upper Potomac, Maryland shoreline**

On the Maryland side of the Upper Potomac River, we do not know whether the Department of Defense will choose to protect the shoreline at the Indian Head Naval Surface Warfare Center to the north of Mattawoman Creek. There is currently minimal shoreline protection, and if there is no beach nourishment as seas continue to rise, sand and mud shorelines will erode. The town of Indian Head has a developed shoreline with narrow beaches and piers, and local planners expect that the town is almost certain to be protected. Above Fort Washington shoreline protection is also almost certain; some areas are already protected with riprap.<sup>597</sup> These shorelines will erode in front of hard structures. Not only will this eliminate habitat for beach invertebrates, but increased sedimentation of nearshore waters will also impair SAV and other habitat for popular recreational fish species such as striped bass, largemouth bass, and yellow perch.

Because of the presence of several large parks and undeveloped areas, shoreline protection is unlikely from Indian Head north into Prince George's County, and the high banks in this area will prevent migration. However, the tall cliffs on the Potomac north of the Indian Head facility are likely to be protected to preserve property at the top of the cliffs.

Along the natural shorelines of Roosevelt Island in DC, shore protection is unlikely. The island consists of both upland and swamp forest as well as tidal marsh. Fish in the marsh provide food for herons, egrets, and other marsh birds. Snapping and painted turtles use the nearshore waters and shoreline for forage and resting.<sup>598</sup> The ability of the tidal marshes of the island to keep pace with sea level rise will depend in part on the supply of sediment. Increased inundation of the swamp forest with rising seas could result in crown dieback and tree mortality.<sup>599</sup>

<sup>597</sup>Berman, M.R., Berquist, H., Killeen, S., Nunez, K., Rudnick, T., Schatt, D.E., Weiss, D. and K. Reay, 2006, Prince George's County, Maryland—Shoreline Situation Report, Comprehensive Coastal Inventory Program, Virginia Institute of Marine Science, College of William and Mary, Gloucester Point, VA.

<sup>598</sup>National Park Service, Description of Roosevelt Island, accessed at <http://www.nps.gov/gwmp/pac/tri/backgrnd.html> on July 20 2006.

<sup>599</sup>Lippson and Lippson, 2006, p. 218 (see note 2).

Elsewhere in Washington, D.C., the Potomac shoreline is already largely hardened, and therefore minimal additional habitat change is expected as a result of sea level rise. Because it is a major population center, some form of shore protection is almost certain throughout the area. Currently, the District is most likely to use environmentally sensitive means of shore protection rather than allowing inland migration.

Some shores of the Anacostia River may prove an exception to the general approach of preventing migration. Historically, the Anacostia included extensive freshwater wetlands. As human development proceeded, the river was dredged from its mouth at the Potomac in DC to Bladensburg, Maryland, and a stone seawall was built along the shoreline, eliminating virtually all historical wetlands.<sup>600</sup> The tidal Kingman and Kenilworth lakes were dredged, but over time they filled with sediment. In recent decades local organizations have been working to restore some of the former wetlands on the sediments in these lakes. Restoration of the 13 ha (32 acre) Kenilworth Marsh was completed in 1993; restoration of the Kingman Lake marshes began in 2000.<sup>601</sup> Other efforts to restore the river include converting of some seawalls and bulkheads to woodland buffers. As seas rise, local planners expect that some marsh migration may be allowed on Kingman Island, although parts of the island may also be armored to continue to protect some dryland uses, resulting in marsh erosion. Loss of any marsh along the Anacostia would have a notable impact because so little of this habitat is left. Monitoring of the restored habitats demonstrates that these marshes can be very productive. For example, a recent bird survey identified 177 species of birds in the marshes comprising 14 taxonomic orders and 16 families,<sup>602</sup> including shorebirds, gulls, terns, passerines, and raptors as well as marsh nesting

<sup>600</sup>See website describing wetland restoration in the Anacostia by Dr. Dick Hammerschlag of the Patuxent Wildlife Research Center, the lead scientist monitoring recovery of wetland habitats and biota:

<http://www.pwrc.usgs.gov/resshow/hammerschlag/anacostia.cfm>.

<sup>601</sup>Ibid.

<sup>602</sup>Paul, M., C. Krafft, and D. Hammerschlag, 2004, Avian Comparisons between Kingman and Kenilworth Marshes, Final Report 2001–2004, p. 4. USGS publication available online at: <http://www.pwrc.usgs.gov/resshow/hammerschlag/anacostia.cfm>.

species such as marsh wren and swamp sparrow.<sup>603</sup>

### Upper Potomac, Virginia shoreline

On the Virginia side, much of the Prince William County shoreline of the Potomac is sandy beach, and almost certain to be protected.<sup>604</sup> In the few areas where shoreline protection is unlikely, marshes will have little opportunity to migrate because most shores are developed. However, accretion rates in the Upper Potomac are likely to be sufficient to meet most sea level rise acceleration scenarios, including a 7 mm/yr accelerated rate.

Several state parks and federal wildlife refuges in Prince William County adjoin the Potomac shoreline. The Potomac River National Wildlife Refuge Complex includes the Featherstone National Wildlife Refuge across from Leesylvania State Park, the Occoquan National Wildlife Refuge at the confluence of the Potomac and Occoquan rivers on Occoquan-Belmont Bay, and the Mason Neck National Wildlife Refuge across the Bay on the Mason Neck Peninsula (Mason Neck).

The parklands on Mason Neck Peninsula are unlikely to be protected, particularly Mason Neck National Wildlife Refuge and Mason Neck State Park. However, adjacent sites on the eastern end of Mason Neck are almost certain to be protected, which could potentially affect sediment transport in the area and thus affect the ability of the Mason Neck marshes to keep pace with sea level rise.

Wetland loss will reduce habitat for species that are particular conservation targets in the refuge. The Mason Neck National Wildlife Refuge was originally established to protect the federally endangered bald eagle. Today, the refuge hosts seven nesting bald eagle pairs and up to 100 bald eagles during winter. The refuge also has one of the largest great blue heron colonies in Virginia, with an estimated 1,600 nests. In addition to serving as a major heron rookery and a nesting site for bald eagles, the marsh also provides

nesting areas for hawks and waterfowl and a stopover for migratory birds.<sup>605</sup> Herons feed on fish and other aquatic species in the marsh, and teal, mallards, and black ducks feed on marsh plants and seeds.<sup>606</sup> Six bird species, classified as “high priority” by the Atlantic Coast Joint Venture, use the Mason Neck area as overwintering and migration habitat. These include black duck, mallard, pintail, greater and lesser scaup, and the Southern James Bay population of Canada goose. The ducks and Canada goose feed on invertebrates, plant material, and seeds in the flooded marshes and adjacent rivers and lakes. Other priority species such as wood duck, American widgeon, redhead, canvasback, and ring-necked duck use these habitats for foraging and resting. Wood duck and green- and blue-winged teal use the emergent marshes for brood rearing and staging in fall.<sup>607</sup> Studies in marshes of Virginia’s Eastern Shore have found a direct relationship between marsh area and the abundance of bird species in the marsh.<sup>608</sup>

Upriver is Fort Belvoir, where protection is uncertain given the military nature of the site. Accotink Bay, adjacent to the fort, has significant areas of tidal marshes, which may be threatened by shore protections at Fort Belvoir. Among the species using the bay are shorebirds, waterfowl, and ospreys.<sup>609</sup>

Beyond Accotink Bay, the Virginia shoreline of the Upper Potomac is almost certain to be

---

<sup>605</sup>The Mason Neck NWR was established in 1969 as the first federally protected refuge for the bald eagle. A profile of the refuge is available at <http://www.fws.gov/Refuges/profiles/index.cfm?id=51610>.

<sup>606</sup>Personal observations of J. Bucknam, interpreter, Mason Neck State Park and USFWS fact sheet “Mason Neck National Wildlife Refuge, Potomac River National Wildlife River Refuge Complex,” available at:

<http://www.fws.gov/northeast/facts/MasonNeck06.pdf>.

<sup>607</sup>Atlantic Coast Joint Venture, 2005, Revised Waterfowl Implementation Plan—Focus Area Report, Lower Potomac River, Virginia, pp. 485–486.

<sup>608</sup>Watts, 1993 (see note 61).

<sup>609</sup>Virginia Department of Game and Inland Fisheries, Accotink Bay Wildlife Refuge, Army Garrison Fort Belvoir. Accessed December 5, 2007 at: <http://www.dgif.state.va.us/wildlife/vbwt/site.asp?trail=1&site=CMN05&loop=CMN>.

---

<sup>603</sup>Paul et al., 2004, p. 11 (see note 602).

<sup>604</sup>NOAA, 2005 (see note 538).

protected up through Washington D.C., with the possible exception of habitats within National Park Service holdings. The freshwater tidal marsh within the Dyke Marsh Preserve is one of the last major remnants of the original freshwater tidal marshes of the Upper Potomac River,<sup>610</sup> making it particularly valuable for local populations of fish, birds, and other wildlife.

The marsh proper is dominated by cattails, along with several other common freshwater tidal marsh plants, including arrow arum, sweetflag, and spatterdock.<sup>611</sup> Adjacent to the marsh, the Hunting Creek embayment contains one of the largest mudflats along the Upper Potomac River, providing forage areas for both migratory and resident birds.<sup>612</sup> A survey of the marsh in 2000 found 62 species of fish, 9 species of amphibians, 7 species of turtles, 2 species of lizards, 3 species of snakes, 34 species of mammals, and 76 species of birds in Dyke Marsh.<sup>613</sup> The rare least bittern and the federally listed bald eagle breed in the marsh, and scientists at the University of Maryland believe that other rare species such as black rail and American bittern could also breed there.<sup>614</sup> The marsh also contains the only known breeding population of marsh wrens in the upper tidal Potomac.<sup>615</sup> A fish survey between 2001 and 2004 collected longnose gar, a species on

Virginia's candidate list. There was substantial evidence of the marsh's importance as juvenile fish habitat, with large numbers of juveniles collected, including juveniles of striped bass, American shad, yellow perch, blueback herring, and alewife. All of these are species that are important for commercial and recreational fisheries in the area. Typical marsh residents such as killifishes, which provide food for these estuarine species, were also collected.<sup>616</sup>

Erosion and subsidence are problems in the marsh today.<sup>617</sup> Previous dredging and marsh removal may be contributing factors, in part because these activities eliminated the tidal creeks that drained the marsh.<sup>618</sup> Much of the current emergent marsh is on a shelf of shallow water about 0.91–1.22 m (3–4 ft) above mean low tide and is therefore not inundated during the marsh's typical 3 ft tidal cycle.<sup>619</sup>

Scientists analyzing current marsh conditions to make recommendations to the National Park Service about restoration of the marsh concluded that responses of the marsh's vegetation communities to inundation will require additional study to predict the effects of sea level rise on the existing marsh or any new marsh that is created.<sup>620</sup>

---

<sup>610</sup>Johnston, D.W., 2000, "The Dyke Marsh preserve ecosystem," *Virginia Journal of Marine Science* 51:223–273, p. 242.

<sup>611</sup>Ibid.

<sup>612</sup>Ibid., p. 228.

<sup>613</sup>Engelhardt, K.A. M., S. Seagle, and K.N. Hopfensperger, 2005, *Should We Restore Dyke Marsh? A Management Dilemma Facing George Washington Memorial Parkway*, Final Report, submitted to the George Washington Memorial Parkway, National Park Service, National Capital Region, McLean, VA, p. 4.

<sup>614</sup>Gates, J.E., and R. Peet, 2005, *Birds of Dyke Marsh Wildlife Preserve Virginia: A Ten-Year Analysis of Transect Count Data*. Unpublished manuscript submitted to Melissa Kangas of the National Park Service, National Capital Region National Parks, McLean, VA. September 5. pp. 25–26.

<sup>615</sup>Johnston, 2000, p. 248 (see note 610).

---

<sup>616</sup>Mangold, M. F., R.C. Tipton, S.M. Eyler, and T.M. McCrobie, 2004, *Inventory of Fish Species within Dyke Marsh, Potomac River (2001–2004)*, U.S. Fish and Wildlife Service in conjunction with Maryland Fishery Resources Office, Annapolis, MD, October 22.

<sup>617</sup>Johnston, 2000, pp. 229 and 242 (see note 610).

<sup>618</sup>Engelhardt et al., 2005, p. 2 (see note 613).

<sup>619</sup>Engelhardt et al., 2005, p. 3 (see note 613).

<sup>620</sup>Engelhardt et al., 2005, p. 7 (see note 613).