Paul S. Sarbanes Ecosystem Restoration Project at Poplar Island: Wetland of Distinction

Bill Morgante[1], Wetlands Administrator, Maryland Board of Public Works, Annapolis, MD

The Paul S. Sarbanes Restoration at Poplar Island (Poplar Island) in the Chesapeake Bay (Figure 1) gained acceptance as a Wetland of Distinction (WoD) early in 2021. Poplar Island is not a typical WoD. Its adoption as the 46th WoD is unique due to its status as a *restoration* project. This restoration is exceptional in providing remote island wildlife habitat, especially for resident and migratory birds, opportunities for outreach and public education, and the preservation of local heritage. One of Poplar Island's main goals is to restore remote island habitat within the Chesapeake Bay, in part because of its importance as a safe resting spot along the Atlantic flyway. The island's location, one mile from the mainland, and the wildlife management on Poplar Island, make it a relatively predator-free destination to rest and nest. To better understand the rationale for restoring this distinctive island habitat, let's examine the island's history.

In 1847, Poplar Island comprised more than 1,100 acres. During the early 1900s, the island supported a thriving town, Valliant, with approximately 100 residents; yet by the 1920s, residents began leaving the island as its landmass eroded. Though still used as a retreat in the 1930s and 1940s, including visits by Presidents Franklin Roosevelt and Harry Truman, by the early 1990s only 3–5 acres (1.2–2 ha) of small islands and tidal mudflats remained. Poplar Island's disappearance from sea-level rise, land subsidence, and erosion seemed imminent (Poplar Island Restoration website: http://www.poplarislandrestoration.com/).

The 1975 Maryland General Assembly declared the Chesapeake Bay and its tidal tributaries a great natural asset and resource to the State and made open water placement of dredged material unlawful. Later in 1994, an interagency team from the U.S. Army Corps of Engineers, Baltimore District (USACE), Maryland Department of Transportation Maryland Port Administration (MDOT MPA), and other federal and state environmental agencies penned an agreement committing to the beneficial use of clean, non-contaminated dredged material to restore Chesapeake Bay (Bay) island habitat. This included dredge material from the Chesapeake and Delaware Canal and the approach channels to Baltimore Harbor – material that is tested to meet standards set forth by EPA for beneficial use. Following the necessary environmental studies, stakeholders decided that restoring Poplar Island could create significant remote island habitat, especially significant since valuable regional island habitat was disappearing rapidly. Estimates show that in the mid-Chesapeake Bay region, over 10,500 acres of this unique habitat has been lost in the last 150 years (Poplar Island Restoration website: http://www.poplarislandrestoration.com/).

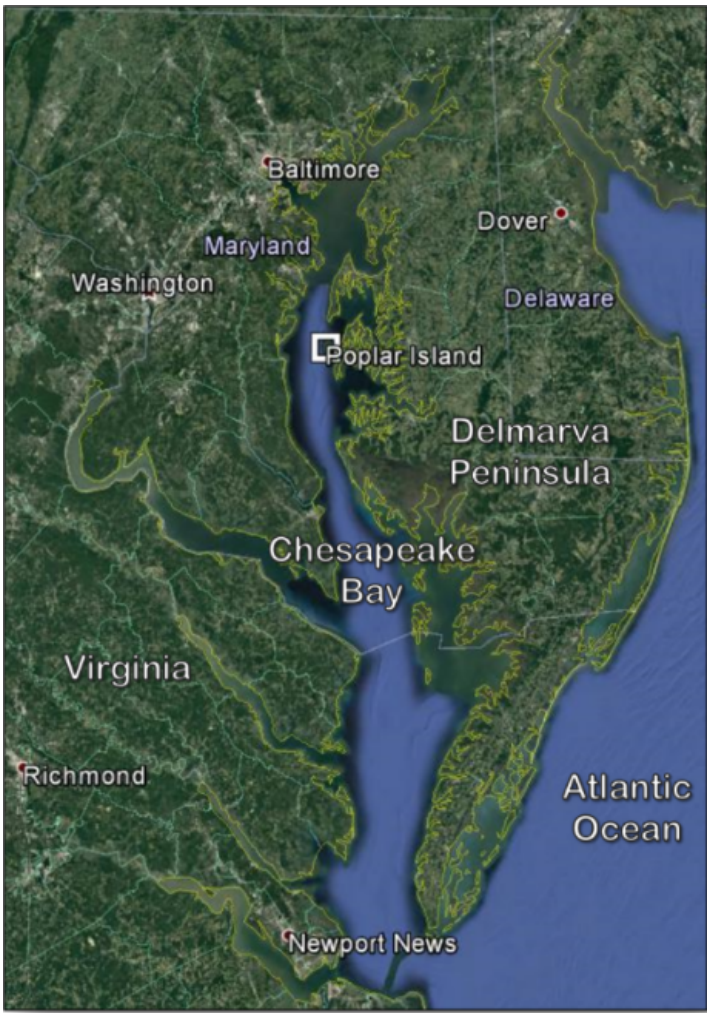

FIGURE 1. Context map for Poplar Island (MDOT MPA)

[1]Correspondence author contact: bill.morgante@maryland.gov

FIGURE 2. Aerial view of Poplar Island, October 2020 (MDOT MPA).

Construction started with perimeter containment dikes using sand, rock, and stone—adjacent to and encompassing the existing small remnant islands. The perimeter dikes were subdivided into interior "cells" allowing for directed dredged material placement and wetland development on a smaller scale (24-83 acres (9.7-33.6 ha)) with opportunities for "lessons learned" throughout the project. In 2001, restoration began with the first dredged material placement with project funding from the USACE (75%) and MDOT MPA (25%). Within the cells, dredged material was pumped in, effluent inside the cell was decanted, and once dry, graded into wetland features. These features include high and low marsh, hummocks, channels, ponds, and habitat islands serving as migratory resting and nesting habitat for the Bay's waterfowl, shorebirds, and other wildlife. Shortly after the 2001 dredged material placement, a variety of birds, amphibians, fish, and other wildlife appeared.

Fast forward to 2021—Poplar Island's total area is 1,715 acres (694 ha) with a perimeter dike enclosing the majority of the site including upland and wetland cells still in development, completed wetland cells, open water embayment, and tidal marsh (Figure 2). Though some habitat features are not yet in place and may not be fully functional for years, Poplar Island currently meets a number of important wetland evaluation criteria that sustained its nomination as a Wetland of Distinction. These include:

1. Supporting a significant number of wetland-dependent fauna, such as water birds or fish,
2. Its status as a rare or unique wetland type as a *remote island salt marsh* within its biogeographical region,
3. Provisioning remote island wildlife habitat, especially for resident and migratory birds,
4. Providing opportunities for outreach and public education, and
5. Preserving local or cultural heritage.

An extensive outreach program includes seasonal tours to the public, school groups, and birding groups on the history and ecology of the island. Tours include cultural history with references to Bay maritime history including the Chesapeake Bay Oyster Wars (BPW Wetlands blog: Maryland Oysters: Past Wars and Present Challenges), the War of 1812, and the island's discovery during the era of John Smith. An island display showcases items found during archaeological surveys carried out prior to construction. Free tours typically run weekdays March through October, and roughly a dozen tours annually are focused on birding and target birding hotspots.

Historical soils on the islands include the Mattapex and Matapeake series consisting of primarily deep, moderately well-drained, dark-brown level to gently sloping soils

developed on silty marine sediments. These consist mostly of silt loams that retain moisture and are well-suited for vegetative growth. Currently, imported soil from maintenance dredging of navigation channels is made up of fine-grained material that can contain ample available nutrients, particularly nitrogen. Dredged material is placed within a containment cell during inflow, once the cell is at capacity, the dredged material is allowed to dry out for one to two years forming a crust before being graded into typical marsh features (Figure 3). Once grading is complete, sediments are exposed to tidal inundation through tidal inlets to rehydrate the soils prior to planting and help ensure vegetative success. This sequence allows for the natural removal of sulfuric acid in the upper soil horizon and results in an adequate soil pH for marsh plant establishment (Cornwell et al. 2020).

FIGURE 3. Aerial view of Cell 2 (MDOT MPA).

Dominant low marsh flora species include saltmarsh cordgrass (*Spartina alterniflora*), with the dominant high marsh species including saltmeadow cordgrass (*Spartina patens*). Other common marsh species include seashore saltgrass (*Distichlis spicata*), big saltmarsh cordgrass (*Spartina cynosuroides*), and tidalmarsh amaranth (*Amaranthus cannabinus*) (Figure 4).

Fauna surveys during the 2020 monitoring recorded 28 bird nesting species. These included the northern shoveler (*Spatula clypeata*), American black duck (*Anas rubripes*), mallard duck (*Anas platyrhynchos*), Virginia rail (*Anas rubripes*), double-breasted cormorant (*Phalacrocorax auritus*), snowy egret (*Egretta thula*), cattle egret (Bubulcus

FIGURE 4. Vegetation at Cell 1C includes (foreground to background) pokeweed (volunteer), saltmeadow cordgrass, saltmarsh cordgrass, groundseltree, and cottonwood (volunteer) (MDOT MPA).

FIGURE 5. Common terns at monitored nests at cell 2C (MDOT MPA)

FIGURE 6. Birds at Cell 2C include American avocet, sanderlings, short-billed dowitchers, and lesser yellowlegs (MDOT MPA)

ibis), black-crowned night heron (*Nycticorax nycticorax*), little blue heron (*Egretta caerulea*), glossy ibis (*Plegadis falcinellus*), osprey (*Pandion haliaetus*), killdeer (*Charadrius vociferus*), common gallinule (*Gallinula galeata*), black-necked stilt (*Himantopus mexicanus*), willet (*Tringa semipalmata*), herring gull (*Larus argentatus*), great black-backed gull (*Larus marinus*), common tern (*Sterna hirundo*), least tern (*Sternula antillarum*), purple martin (*Progne subis*), tree swallow (*Tachycineta bicolor*), bank swallow (*Riparia riparia*), barn swallow (*Hirundo rustica*), European starling (*Sturnus vulgaris*), seaside sparrow (*Ammodramus maritimus*), red-winged blackbird (*Agelaius phoeniceus*), common grackle (*Quiscalus quiscula*), and Canada goose (*Branta canadensis*) (Figures 5 and 6; MDOT MPA).

Nekton monitoring by NOAA from 2016–2019 noted the following species in abundance at Poplar Island's marshes: mummichog (*Fundulus heteroclitus*), sheepshead minnow (*Cyprinodon variegatus variegatus*), inland silverside (*Menidia beryllina*), Atlantic silverside (*Menidia menidia*), and grass shrimp (*Palaemonetes*). Other nekton observed in the marshes included blue crab (*Callinectes sapidus*), American eel (*Anguilla rostrata*), fourspine stickleback (*Apeltes quadracus*), brown bullhead (*Ameiurus nebulosus*), Atlantic menhaden (*Brevoortia tyrannus*), sheepshead minnow (*Cyprinodon variegatus variegatus*), banded killifish (*Fundulus diaphanous*), gizzard shad (*Dorosoma cepedianum*), striped killifish (*Fundulus majalis*), eastern mosquitofish (*Gambusia holbrooki*), naked goby (*Gobiosoma bosc*), channel catfish (*Ictalurus punctatus*), spot (*Leiostomus xanthurus*), pumpkinseed (*Lepomis gibbosus*), rainwater killifish (*Lucania parva*), white perch (*Morone americana*), striped bass (*Morone saxatilis*), summer flounder (*Paralichthys dentatus*), bluefish (*Pomatomus saltatrix*), black drum (*Pogonias cromis*), Atlantic needlefish (*Strongylura marina*), dusky pipefish (*Syngnathus floridae*), and white-fingered mud crab (*Rhithropanopeus harrisii*) (NOAA annual monitoring data: 2016, 2017).

Diamondback terrapin (*Malaclemys terrapin*) (Figure 7) and monarch butterfly (*Danaus plexippus*) were observed during the monitoring operation, along with rare fauna - short-eared owl (*Asio flammeus*), American oystercatcher (*Haematopus palliatus*), and glossy ibis (*Plegadis falcinellus*).

Poplar Island provides an opportunity to enhance understanding of restoration ecology through monitoring the restoration project's sediment, vegetation, elevation changes, water quality, and wildlife. The project is restoring 1,715 acres (694 ha) including 829 acres (335.5 ha) of upland, 110 acres (44.5 ha) of open water embayment, and 776 acres (314 ha) of tidal marsh. Tidal marsh restoration includes small habitat islands abutting tidal creeks providing nesting habitat for colonial-nesting birds. Poplar Island will be maintained in perpetuity as an undeveloped

FIGURE 7. Diamondback Terrapin at Cell 3D (MDOT MPA).

island for wildlife habitat. Baseline monitoring data, first published in 1996, provides adaptive management program data and will continue through 2044. The Poplar Island Project will be succeeded by the Mid-Chesapeake Bay Islands Ecosystem Restoration Project, using lessons learned from Poplar Island. Since the Chesapeake Bay is experiencing double the global rate of sea-level rise due to regional subsidence, Poplar Island marshes will serve as a test-bed for scientist's ability to create tidal marshes resilient to sea-level rise (Poplar Island Restoration website).

Poplar Island monitoring has generated useful information for other restoration projects. Below is a brief synopsis of selected monitoring studies.

- In monitoring the carbon balance at Poplar Island, it appears the high nutrient status of the dredged material results in elevated rates of internal carbon cycling. Enhanced wetland plant production rates have led to high rates of vertical marsh accretion for this region, yet it does not appear that high rates of carbon export to adjacent tidal waters has
- occurred. The retention of surface biomass in the marshes is thought to result from perimeter dikes and the restricted tidal exchange resulting from the dike inlets (Staver et al. In press).
- In monitoring the effectiveness of using dredged material for newly created marsh soils, it appears the data suggest fine-grained dredged material from soils meeting EPA criteria are successful for tidal wetlands restoration when dredged soils are allowed to dry after placement and later exposed to tidal inundation for one to two years (Cornwell et al. 2020).
    - After soil tidal exposure during the wetland development process, nutrient-rich fine-grained dredged material exhibits a pH well-suited to plant success. These conditions favor the successful growth of wetland plants and have resulted in dense growth of *Spartina alterniflora* and *Spartina patens* (Staver et al. In review).
    - The examination of multiple wetland planting cells allows for a generalization of soil property transformation valid for wetland restoration using sediments dredged in the upper Chesapeake Bay. These results are best used as a guide to potential soil transformation, with different results likely under different conditions of sediment and soil physical character, salinity, and nutrient concentrations (Cornwell et al. 2020).

The creation of this rare remote island salt marsh in the Chesapeake Bay serves an international model for the beneficial use of dredged material. Poplar Island supports a significant number of wetland-dependent wildlife, especially resident and migratory birds while providing ample opportunities for outreach and public education. ■

REFERENCES

BPW Wetlands Blog 5/17/2017: Maryland Oysters: Past Wars and Present Challenges, Accessed May 2021.

Cornwell, J., M. Owens, L. Staver, and J. Stevenson. 2020. Tidal marsh restoration at Poplar Island I: Transformation of estuarine sediments into marsh soils. Wetlands 40: 1673-1686.

NOAA National Marine Fisheries Service. Annual Report on Nekton Surveys for the Paul S. Sarbanes Ecosystem Restoration Project at Poplar Island 2016, 2017, Beaufort, NC. 97 pp.

Paul S. Sarbanes Ecosystem Restoration Project at Poplar island Annual Update January-December 2020. Page 5. Accessed May 2021.

Poplar Island Restoration website: Accessed May 2021.

Staver, L., J. Stevenson, J. Cornwell, N. Nidzieko, K. Staver, M. Owens, L. Logan, C. Kim, and S. Malkin. 2020. Tidal marsh restoration at Poplar Island II. Elevation trends, vegetation development, and carbon dynamics. Wetlands 40: 1687-1701.

Taylor, R. 2020. Paul S. Sarbanes Ecosystem Restoration Project at Poplar Island Annual Update January-December 2020. Accessed May 2021. http://www.poplarislandrestoration.us/PDF/2020%20WG%20Annual%20Update.pdf