

**PAUL S. SARBANES ECOSYSTEM RESTORATION
PROJECT at POPLAR ISLAND
ANNUAL UPDATE
January-December 2020**

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Poplar Island Researchers - Please send any updates, findings, or occurrences of note that you have gathered from your monitoring project to Claire Ruark (MES) at cluark@menv.com or call 410-770-6505 so the information can be shared in the update. Also, due to limited boat capacity, when you schedule a site visit, please call ahead of time with the number of people in your party so transport arrangements can be made.

Operations and Expansion Update:



Figure 1. Paul S. Sarbanes Ecosystem Restoration Project at Poplar Island

From January through June 2020, MES Operations continued hydroseeding bare areas of the Cells 2 and 6 (Figure 1) interior and exterior dike faces to ensure dike stability and avoid leaving dike faces exposed. In preparation for the 2019/2020 maintenance material inflow into the Cell 2 subcells and to allow the flow of water from the inflow points toward Spillway 1, stone weirs were constructed in the Cell 2 crossdikes (Cells 2AX/2A, 2A/2B, 2B/2C) and completed to the USACE specifications. Approximately 25,000 cubic yards (cy) of sand material from the Cell 2C stockpile was moved to a higher elevation to prevent it from being covered by dredged material. MES Operations also constructed a stone recirculation pump pad in Cell 6. Elevation sticks were installed around the perimeter of both Cells 2 and 6 to monitor freeboard levels within the cells.

Inflow of maintenance material began on February 23, 2020 and concluded on June 8, 2020. The USACE contractor, Great Lakes Dredging Company, placed approximately 2.85 million cubic yards (mcy) of material into Cells 2 and 6 (Table 1). The Cell 2 subcells received approximately 1.85 mcy of material, while Cell 6 received approximately 996,000 cy of material.

Table 1. Inflow Maintenance Dredged Material 2019/2020

Inflow Point	Location	Project	Total Material Deposited (cy)
1	Cell 2AX	Baltimore Approach Channels	~303,000
2	Cell 2A		~502,000
3	Cell 2B		~500,000
4	Cell 2C		~548,000
5	Cell 6		~996,000

Total Material: ~2.85 mcy

In preparation for the 2020/2021 inflow season, MES Operations staff constructed four weir box systems to allow ponded water to flow from Cells 8 and 10 into Cell 9, to be discharged through Spillway 19. MES hauled sand from Cell 4 to widen the Cells 8/9 and 9/10 crossdikes in order to support the weir box systems, which were installed on top of a stone foundation and completed in February 2021.

A total of approximately 1.9 mcy of maintenance dredged material will be placed during the 2020/2021 inflow season; 600,000 cy in wetland Cell 9, 500,000 cy in wetland Cell 10, and 800,000 cy in upland Cell 11.

Throughout the year, MES Operations managed the Cells 1D and 4 sand stockpiles for use in dike raising. MES moved wet sand from Cell 4AB to Cell 4C to dry for later use and to prepare Cell 4AB for future cell development. Operations staff conducted trenching and crust management in Cells 1D, 2A, 2AX, 4ABC, 5CD, and 6 and deepened and widened the existing perimeter trench in Cell 5CD to construct a larger bench and promote better drainage before the next inflow of material into that cell. MES also conducted dike sand slope erosion management in future wetland Cells 8, 9, and 10.

During the year, the USACE contractor, McLean Contracting Company, installed the combination spillway/tidal inlet structures in Cell 7 (Spillway 17) and Cell 9 (Spillway 19); the structures were completed in November and the contract was completed on January 19, 2021. Additionally, H&L Contracting, LLC (H&L) continued work associated with construction of the toe dike and perimeter dike along upland Cell 11, including closing the gap that was left in the Cell 11 perimeter dike and the construction of Spillway 21 in Cell 11. Work included the placement of fabric, stone, and sand to construct the perimeter dike, the management of sand in Cells 1D and 7, the construction of five rock reefs within the embayment, and the installation of danger signs for the rock reefs. The USACE contractor, Greener Construction Services, Inc., managed water in Cells 8, 9, and 10, lowering the elevations to -7', -4', and -6', respectively, beginning on December 14. Water management will continue in order to maintain the elevations until the 2020/2021 inflow begins. This contract will allow MES Operations to reclaim available construction sand from Cells 8, 9, and 10 and lessen the impacts of wave erosion on the dike slopes.

Under the Poplar Island Expansion (PIE) Tidal Wetlands License (#15-0131[R]), construction associated with the PIE requires turbidity and noise monitoring. Additional turbidity and total suspended solids (TSS) monitoring was requested by the Maryland Department of the Environment (MDE) due to the 300' opening left in Cell 11 which allowed contractor access during continued construction. Four days were monitored out of a 12-day period; this monitoring was completed on March 26, 2020, with no exceedances. Beginning

in December 2020, the turbidity monitoring previously conducted by EA Engineering, Science, and Technology (EA) is conducted by MES. An amended plan was approved by the MDE, which details the continuation of the Element 4 monitoring of once every two weeks during construction activity. Noise monitoring occurred throughout the year. PIE construction monitoring reports are submitted to the MDE monthly, and there have been no noncomplying events related to PIE construction.

Monitoring Update:

MES continues to implement the MDE guidance on monitoring procedures. Discharge this reporting period was associated with rainfall accumulation and the 2019/2020 inflow of maintenance dredged material into Cells 2AX, 2A, 2B, 2C, and 6. There were three noncomplying discharge events in 2020. Two events were related to elevated metals concentrations and one event was related to elevated TSS.

MES Environmental staff continued collecting nutrient load data for Poplar Island throughout the reporting period. Nutrient data is collected on a monthly basis from representative spillways and inlets, and daily from all spillways during times of discharge. The data will serve as a management tool to assist in development of Best Management Practices (BMPs) when Total Maximum Daily Load (TMDL) allocations are assigned for Poplar Island.

Additionally, mass balance nutrient monitoring, to determine whether development of the Poplar Island project sequesters nutrients from the dredged material, was introduced during the 2014/2015 inflow season and continued during the 2019/2020 inflow season. As part of mass balance monitoring, ammonium, total nitrogen, total phosphorous, dissolved total nitrogen, dissolved total phosphorus, and TSS are monitored during periods of discharge from cells receiving inflow. Gahagan & Bryant Associates (GBA) collected sediment samples analyzed for grain size, total nitrogen, and total phosphorus after settlement of the inflowed material.

Vegetated Wetland Cells:

Table 2. Vegetated Wetland Cells Development Timeline

Wetland Cell	Cell 4D	Cell 3D	Cell 1A	Cell 1C	Cell 1B	Cell 3A	Cell 3C	Cell 5AB	Total Acres of Wetland
Last Dredged Mat. Inflow (month, year)	NA	Jan. 2003	Mar. 2006	Mar. 2006	Mar. 2006	Apr. 2007	May 2010*	Jan. 2012	
Opened to Tidal Flow (month, year)	Apr. 2003	Mar. 2005	Mar. 2009	Jan. 2011	Feb. 2012	Oct. 2014	Sep. 2015	Nov. 2017	
Completed Planting (month, year)	Aug. 2003	Jun. 2006	Jul. 2009	Jun. 2011	May 2012	Jun. 2015	Jul. 2016**	Jun. 2018***	
Water Quality Monitoring Completed (month, year)	NA	April 2016	April 2016	April 2016	April 2016	April 2018	May 2019	Ongoing	
Acreage	24	32	45	40	36	55	57	83	372

*2010 inflow of sand from Poplar Harbor channel dredging.

**12 acres damaged by bird predation replanted in 2018.

***Wetland grasses were planted by June; shrubs were planted by October 2018.

Framework Monitoring Update:

Restrictions related to COVID-19 resulted in all of the project's State and Federal resource and research agencies being delayed in accessing the site. Most were able to eventually access the site to conduct field monitoring as is defined within the Poplar Island Monitoring Framework, however, at times in a reduced capacity.

From April through October, algae samples were collected at all spillways with ponded water and were analyzed for species identification by the Maryland Department of Natural Resources/Resource Assessment Service/Monitoring and Non-Tidal Assessment (DNR/RAS/MANTA) lab. Species identification occurred seasonally (in April, August, and October), and quick check analyses to determine if a harmful algal species is present occurred in the remaining months (May, June, July, and September). As per the monitoring plan, from May through October, monitoring for signs of the establishment of a Harmful Algal Bloom (HAB) was conducted in Cell 6. MES conducted weekly monitoring at Spillway 16, including the use of a handheld fluorometer to measure the concentration of phycobilin, a unique pigment found in blue-green algae. During the reporting period, algae samples contained concentrations of *Dolichospermum circinale*, *Anabaenopsis elenkinii*, *Anabaenopsis* sp., *Phoridium* sp., and *Microcystis* sp., all harmful algal species. Toxin analysis showed results were non-detect, with the exception of the samples that contained *Microcystis* sp. A sample collected on August 13 at Spillway 16 had a microcystin concentration of 12,100 parts per billion (ppb), which is above the Environmental Protection Agency's (EPA) no contact threshold of 8 ppb. Toxin analyses continued and discharge from the spillway remained on hold until the HAB event concluded on September 14, when microcystin toxin levels were reported at 4.3 ppb.

From August 5 to September 8, MES and the United States Fish and Wildlife Service (USFWS) collected 32 individuals as part of an avian mortality response. Avian botulism is suspected to have affected the majority of the individuals collected. The species most affected were gulls, followed by waterfowl and shorebirds, and were primarily found in the PIE. Since there was a toxin-producing HAB event in Cell 6 during the same period, USFWS submitted the liver of a Double-crested Cormorant (DCCO) collected from Spillway 16 to GreenWater lab for toxin analysis; the results were negative for algal toxins.

This season, the United States Geological Survey (USGS), with USFWS assistance, continued conducting surveys of Poplar Island's target nesting bird populations (Figure 2). Tern counts were higher for Common Tern (383) and Least Tern (297) this year compared to last year (317 and 239 in 2019, respectively). Most of the Common Tern nests were located in the northwest corner of Cell 2C, with additional colonies on the east side of Cell 2C and the habitat island in Cell 1B. Most of the Least Tern nests were located on the east side of Cell 2C, with additional colonies in the northwest corner of Cell 2C, Cell 1D, and Cell 4ABC. With guidance from the USFWS, MES actively deterred nesting activity from the Cell 2 historic nesting site (northeast corner of Cell 2C) and attracted them to the northwest corner, to allow for ongoing construction activity for the PIE. Since the construction of the breakwaters at the opening of the embayment was complete before nesting season, audio call systems were set up on the north and south breakwaters in an attempt to attract terns. For the eighth year, the USGS conducted a banding and resighting program to better document tern fledging success; 521 Common Tern chicks and 164 Least Tern chicks were banded in 2020.

In order to continue accessing PIE construction sand, tern and bank swallow nesting activity was also carefully managed. USFWS advised MES and USACE contractors to manage the sand stockpiles by sloping edges instead of leaving sheer cliffs (in which bank swallows will nest) and to continue activity in certain areas to deter tern nesting. This season, a few areas within the Cells 1D, 4ABC, and 7 stockpiles were set aside as tern and bank swallow nesting areas, while the rest of the stockpiles were actively managed without nesting issues.

The USGS and the USFWS also surveyed nesting populations of Osprey, Snowy and Cattle Egrets, and DCCO on and just offsite. The site's colonial nesting waterbirds and target nesting birds continue to nest successfully on Poplar Island. Osprey had only nine active pairs on Poplar Island and Poplar Harbor in 2020 (compared to 26 in 2019); however, this decline is not isolated to Poplar Island.

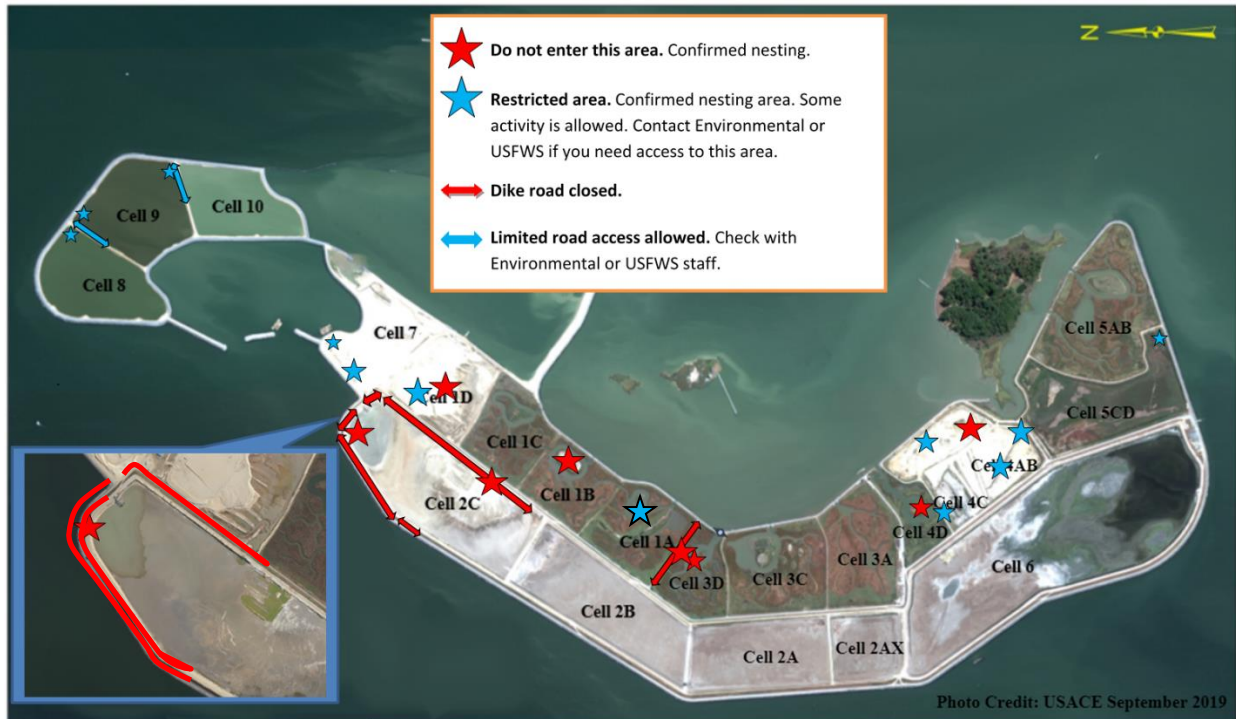


Figure 2. 2020 Poplar Island Bird Nesting Map

MES continues bimonthly bird surveys for the entire site and confirmed 28 nesting species onsite for the 2020 season with eight more suspected (species whose behaviors have indicated breeding or a possible nest nearby, but no nests or young were found). Onsite nesting species include Canada Goose, Northern Shoveler, American Black Duck, Mallard, Virginia Rail, DCCO, Snowy Egret, Cattle Egret, Black-crowned Night-Heron, Little Blue Heron, Glossy Ibis, Osprey, Killdeer, Common Gallinule, Black-necked Stilt, Willet, Herring Gull, Great Black-backed Gull, Common Tern, Least Tern, Purple Martin, Tree Swallow, Bank Swallow, Barn Swallow, European Starling, Seaside Sparrow, Red-winged Blackbird, and Common Grackle. Outstanding bird occurrences included a high count of DCCO pairs nesting onsite (2,839), a state high count (29) of Short-eared Owls in December, first site records for Glaucous Gull, Wilson's Warbler, Alder Flycatcher, Red-breasted Nuthatch, and Orange-crowned Warbler, and rarities including American White Pelicans and Whimbrels in April, Red Knots in May, Buff-breasted Sandpiper and Tricolored Heron in June, Marbled and Hudsonian Godwits in August through October, Eared Grebe in November and December, and Snowy Owl and California Gull in December. An adult female Northern Shoveler with five young was documented onsite in July, marking only the second record of breeding Northern Shovelers in the state of Maryland. Bird censuses performed at Poplar Island during 2020 had daily bird counts that ranged from 939 birds utilizing the site during a February survey to 7,697 birds onsite during a September survey.

MES confirmed the presence of SAV in Poplar Harbor during their spring seasonal monitoring; however, due to COVID-19 restrictions, USFWS was unable to conduct spring monitoring. During July and September, the USFWS conducted seasonal monitoring of submerged aquatic vegetation (SAV) in Poplar Harbor and reference areas; however, they did not detect the presence of SAV in Poplar Harbor.

Poplar Island was registered as a Monarch Waystation in 2016. Since then, USFWS has monitored both butterfly and milkweed presence in each developed wetland cell in the summer and early fall. In 2020, a continued monarch tagging effort was conducted to provide data on sex ratios, migration patterns, weather influence, and mortality rates. During the 2020 season, 503 monarchs were tagged onsite.

The University of Maryland Center for Environmental Science (UMCES) continued collecting rod-Surface Elevation Table (SET) data to track accretion rates within the marshes. The accretion rates vary between wetland cells and within cells; generally, areas closer to the inlets are keeping pace with sea level rise (SLR) better than areas further from the inlets. Data collected and analyzed from sediment, porewater, and vegetation samples continues to be used by UMCES to assist in determining the cause of periodic vegetation die-back within the developed wetland cells, as well as monitoring the overall health of the site's restored marshes.

Using data collected from Cell 1B in 2014, UMCES conducted a carbon budget analysis, to determine how nutrient rich restored marshes affect carbon fluxes, including carbon sequestration, how they keep pace with sea level rise (SLR), and the implications of these findings on restoration design. The results show that Poplar Island has a relatively high rate of carbon sequestration with a calculated burial rate of 182 grams of carbon per meter squared per year. The carbon burial rate converts to an estimated vertical accretion rate of ~6 millimeters (mm) per year, with approximately equal contribution from the roots and shoots. The dredged material marshes of Cells 3D, 1A, and 1C have an average measured vertical accretion rate of 7.4 mm per year, suggesting that the ~6 mm per year of organic matter inputs are the significant source of material for vertical accretion. Overall, Poplar Island marshes have shown that fine-grained, nutrient-rich dredged material can be used successfully in marsh restoration, and that their accretion rates are keeping pace with SLR. This limited study seems to indicate that much of the Poplar Island marshes' vertical accretion rates are directly related to the wetlands limited export of plant biomass which is likely directly related to the site's containment dikes.

UMCES conducted a study of the Cell 5AB pond in 2019; preliminary data shows that the channels connecting to the pond are changing shape from their original constructed design. UMCES deployed an Isco sampler within a channel which indicated that TSS are highest during an ebb tide and is likely collecting in the pond or contributing to the changing channel formation. The pond study ended earlier than anticipated due to COVID-19 limitations; however, UMCES expects to continue the study.

Due to Ohio University's (OU) COVID-19 travel restrictions, OU did not process the overwintering 2019/2020 terrapin hatchlings. Instead, MES removed the rings around the nests in order to allow the terrapins to emerge without being counted. OU researchers arrived onsite in June to conduct their normal seasonal monitoring of terrapin nesting and hatchling success and marked re-capture study.

They reported a total of 241 nests for the 2020 diamondback terrapin nesting season. OU collected and processed 735 hatchlings in fall 2020 with 24 nests left to overwinter until spring 2021.

Due to the cancellation of the spring school terrapin release tours, Poplar Island tour staff and MES outreach staff, in collaboration with OU and the Terrapin Education and Research Partnership (TERP) partners, successfully coordinated the processing and release of 141 Headstart terrapins, which occurred on April 1. The Headstart program typically allows Maryland school children to raise the hatchlings collected on Poplar Island in the fall and then release them onsite the following spring. MES Outreach created a compilation video of the individual terrapin releases, so that the participating schools could view their Headstart's return to the wild. Due to the uncertainty of how long schools would remain virtual, the outreach team opted for a reduction in the number of hatchlings included in the 2021 Headstart program. MD DNR approved a request to distribute 11 hatchlings to be kept on Poplar Island and within the homes of some terrapin program partners to allow the TERP Headstart program to continue operating virtually with terrapin-themed programming.

Wildlife and Invasive Vegetation Management:

Under a Federal Fish and Wildlife Depredation Permit, certain species continue to be managed on Poplar Island. Management of wildlife is conducted to ensure target species and their habitats are protected. In an effort to protect the site's vital waterbird nesting area, the USFWS controlled for adult DCCO in Cell 3D.

Poplar Island's returning DCCO nesting colony increased significantly in 2020, with 2,839 pairs nesting on both the Cells 1A and 3D habitat islands (compared to nine nesting pairs on the Cell 1A habitat island in 2019). Due to their COVID-19 restrictions, USFWS was unable to conduct spring control to prevent DCCO from colonizing on the Cell 3D habitat island. The nesting in Cell 3D has led to extensive vegetation damage to the island's interior. Once USFWS returned to the site in June, DCCO control efforts resumed, and 85 adult DCCO were removed.

Throughout 2020, gull control also occurred but was limited, with the removal of 74 individuals and the oiling of eggs in 48 nests. Twenty-four Canada Geese were removed throughout the site, and two Great Horned Owls were removed from Coaches Island, with no evidence of nesting. Due to the large muskrat population recorded in winter of 2019, USFWS removed 161 muskrats from Cells 3D and 5AB, in addition to areas of burrowing activity observed on the upper dike of Cell 2, to prevent dike destabilization.

MES Environmental staff continued annual invasive control of bull and Canada thistle, tree of heaven, mile-a-minute vine, and *Phragmites australis* throughout the site. Environmental staff continued to monitor mosquitoes on an as needed basis. No aerial mosquito sprays were conducted by the Maryland Department of Agriculture (MDA) this season.

Safety:

As discussed at the Poplar Island Working Group meetings, to ensure that all activities occurring on the project site are coordinated and everyone is following the appropriate safety procedures, it is required that all guests contact the site to inform staff of a visit at least one day in advance. This would also be the appropriate time to set up any transportation that is needed. Advanced coordination should also be made for those with their own boat transportation. Everyone must sign in when they arrive onsite.

Due to the ongoing COVID-19 pandemic, site access is limited. Everyone arriving will be asked a series of COVID-19 screening questions before any work can be conducted. Masks must be worn inside building common areas, on the boat, and when sharing vehicles. Additionally, all personnel must adhere to social distancing (> 6 feet).

For those researchers who are at the site during off-peak times, please contact the site to let them know when you will be onsite; a sign in sheet and safety vests will be provided for your use during those times. For safety reasons, if you are by yourself, you will need to be accompanied by an MES employee for the time you are on the island. While visitors are welcome, normal operations duties may make it necessary to postpone certain visits if enough notice is not provided.

Tours:

The 2020 tour season was suspended due to COVID-19 restrictions. Tour staff instead have been giving virtual presentations, beginning a new video blog series, and creating a virtual tour. Tours remain suspended currently in 2021. Visit the Poplar Island website, linked below, for more information.

Meetings, Media, and Noteworthy:

Site Operations meetings were held approximately every three weeks throughout the period including the USACE, the Maryland Department of Transportation Maryland Port Administration (MDOT MPA), MES, and GBA.

The Poplar Island public website's URL is www.poplarislandrestoration.com. Features of the website include project goals, media highlights, photos and maps, current newsletter, link to the onsite weather station, wildlife link to Ebird.org, social media links for USACE, MDOT MPA, and MES, all documents, work cited for any articles, papers, or conferences related to Poplar Island, and a contact page that links directly to MES tour staff to schedule a tour.

The annual Habitat Subgroup meeting was held at the MES headquarters annex building on February 26, 2020. The Poplar Island semiannual Working Group meetings were held virtually on June 23, 2020 and December 1, 2020. A Monitoring Subgroup meeting was held virtually on November 4, 2020. Please check the project website's documents list or contact Alexa Poynter with MES at apoynter@menv.com if you would like a copy of the meeting summaries.

The following articles and presentations relating to Poplar Island were published and conducted throughout the reporting period:

- In January, the *Star Democrat* published an article titled “Town promotes Christmas tree collection for Poplar Island waterfowl” about the annual collection of Christmas trees by Easton Public Works and the habitat enhancement program initiated by USFWS and MES.
- In February, Lorie Staver (UMCES) gave a talk titled “Dredged Material for Tidal Marsh Restoration: Lessons from Poplar Island” to the Talbot County Garden Club. Lorie also gave this talk to the Maryland Federation of Garden Clubs in September.
- In May, two papers were published in the scientific journal, *Wetlands*. These were written by UMCES researchers and were titled, “Tidal Marsh Restoration at Poplar Island I: Transformation of Estuarine Sediments into Marsh Soils” and “Tidal Marsh Restoration at Poplar Island II: Elevation Trends, Vegetation Development, and Carbon Dynamics”. The first paper focuses on the chemistry of channel deposits compared to the initial chemistry in the wetland cells and presents the geochemical basis for the observed plant success in the completed wetland cells. The second paper examines the suitability of nutrient-rich dredged material as a substrate for tidal marsh restoration with regards to vegetation and elevation trends, along with developing a carbon budget for one of the developed wetland cells.
- In June, July, November, and December, Kristina Motley (MES) and Ryland Taylor (MES) each presented “Poplar Island an international model of innovative reuse” to multiple groups including the Herrington Harbor Sailing Association, Tri-State Bird Rescue and Research, St. Mary’s College of Maryland’s Coastal Ecology class, Hunter Sailing Association, and the Eastern Shore Land Conservancy.
- In July, *Chesapeake Bay Magazine* produced an article titled “Poplar Island Terrapins: Research and education team up for conservation” about the Terrapin and Education Research Partnership on Poplar Island.
- In September, Poplar Island and Lorie Staver (UMCES) were featured in a video released by the Chesapeake Bay Sentinel Site Cooperative called “Turning the Tide” that won first place at the 2020 National Estuarine Research Reserve Association’s film festival.
- In December, Lorie Staver (UMCES) gave a talk titled “Blue carbon potential in beneficial use projects: an example from Poplar Island” at the annual Maryland Water Monitoring Council Conference.
- Also in December, articles referencing Poplar Island included the following:
 - *The Avenue News* published an article titled “MDOT honored for protecting the Baltimore Harbor” about The Award of Excellence for Environmental Mitigation given to them by the American Association of Port Authorities. Poplar Island is mentioned as one of the many environmental initiatives at the Port of Baltimore.
 - The *Bay Journal* published an article titled “Former U.S. Sen. Paul Sarbanes, early and tenacious Bay champion, dies” about the death of Senator Paul Sarbanes and referencing his influence and support of Poplar Island.