

**PAUL S. SARBANES ECOSYSTEM RESTORATION  
PROJECT at POPLAR ISLAND  
ANNUAL UPDATE  
January-December 2018**

**Editor: Seth Keller, United States Army Corps of Engineers (USACE), Baltimore District  
Prepared by: Ryland Taylor, Maryland Environmental Service (MES)**

**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 [cruar@menv.com](mailto:cruar@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 Update:**

During the September 19, 2017 meeting, the Upland Development Team (UDT) began planning for the development of an upland cell test plot in Cell 2A. To form the test plot area, MES began constructing a crossdike dissecting Cell 2A; aligning it with the Cell 3A/3B crossdike. The crossdike was completed in May 2018 and was built to an elevation of +25 feet (Figure 1). The test plot area (approximately 30 acres in size) will receive multiple concentrated inflows of dredged material to get to the target elevation for development.



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

As part of the project’s vertical expansion, the Cell 2 dike raising began January 18, 2018. MES Operations raised the Cells 2A and 2B dikes from +23 feet to a temporary elevation of +30 feet. MES constructed the vertical lifts in segments, increasing the elevation of each segment at one-foot increments. The Cell 2A dike raising was completed in July and the Cell 2B dike raising was completed in September. The interior and exterior dike faces were hydroseeded to avoid leaving dike faces exposed for long periods of time and to ensure dike stability. The Cell 2C dike was also raised to a height of +25 feet during the period.

In preparation for the 2018/2019 inflow of maintenance material and to allow for the flow of water from the inflow points in Cell 2A and the Cell 2A test plot toward Spillway 1 (Cell 2C), notches were cut in the Cells 2A/B and 2B/C crossdikes. The associated stonework was completed to the USACE specifications, and the Cell 2A test plot trenches were filled in. Inflow of maintenance material began on December 11, 2018 and concluded on March 6, 2019. The USACE contractor, Norfolk Dredging Company, placed approximately 2.6 million cubic yards (mcy) of material into Cells 2A and 6 (Table 1). Approximately 972,000 cy of material was placed in the south end of Cell 2A, with an additional approximate 192,000 cy inflow into the Cell 2A test plot. Cell 6 received approximately 1,400,000 cy at the cell’s north end and approximately 105,000 cy at the southeast corner where there was a low spot which has hindered discharge at Spillway 16.

**Table 1. Inflow Maintenance Dredged Material 2018/2019**

<b>Inflow Point</b>	<b>Location</b>	<b>Project</b>	<b>Total Material Deposited (CY)</b>
1	Cell 2A test plot	Baltimore Approach Channels	~192,000
2	Cell 2A		~972,000
3	Cell 6		~1,505,000

**Total Material: ~2.6 MCY**

Throughout the reporting period (2018), MES Operations managed the Cells 1D and 4 sand stockpiles for use in dike raising. They also conducted trenching and crust management in Cells 1D, 2, 4, 5, and 6.

On behalf of the project’s State sponsor, Maryland Department of Transportation Maryland Port Administration (MDOT MPA), MES contracted T. Allen Marine to dredge the project’s Tilghman Island landbase boat slips. Under the Tidal Wetlands License #15-0848 and the USACE permit NAB 2015-61466, the material was dredged mechanically and then barged and offloaded onto Poplar Island. The project began on November 9 and the material was offloaded on November 14, with after dredge surveys conducted by MES. The approximately 350 cy of material was mechanically placed by MES Operations staff in the southwest corner of Cell 5CD.

**Monitoring Update:**

MES continues to implement the Maryland Department of the Environment (MDE) guidance on monitoring procedures. Discharge this reporting period is associated with rainfall accumulation, the 2018/2019 inflow of maintenance dredged material into Cells 2 and 6, and the inflow of sand material for the Poplar Island Expansion (PIE) project into Cell 1D. There were six noncomplying events in 2018. One event was related to elevated metals and five events were related to sampling or lab error.

Metals samples collected on January 25 in Cell 5AB, which is opened to tidal flow through two tidal inlets, showed a dissolved zinc concentration of 104 ppb at the 5A inlet. This is above the State Water Quality Standards (SWQS) limit of 90 ppb for dissolved zinc. The coordinating sample collected at inlet 5B (northern inlet) was 16 ppb. The following metals results collected on February 8 at both inlets were within SWQS for all metals.

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 2018/2019 inflow season. As part of mass balance monitoring ammonium, total nitrogen, total phosphorous, dissolved total nitrogen, dissolved total phosphorus, and total suspended solids (TSS) are monitored during periods of discharge from cells receiving inflow. Gahagan & Bryant Associates (GBA) collect 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	Sep. 2009	Jun. 2011	May 2012	Jun. 2015	Jul. 2016**	Jun. 2018	
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.

Planting of wetland vegetation in Cells 5AB and 3C (replanting of an approximately 12 acre area damaged by gulls and geese in 2016) was conducted by the USACE contractor, Ecological Restoration and Management (ER&M) from April to June 2018. Cell 5AB habitat island shrub planting occurred in September and October 2018.

**Framework Monitoring Update:**

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 or the Morgan State Estuarine Research Center. As per the monitoring plan, from May through October, MES conducted weekly monitoring for signs of the establishment of a Harmful Algal Bloom (HAB) in Cell 6. MES conducted weekly monitoring, including the use of a handheld fluorometer to measure the concentration of phycobilin, a unique pigment found in blue-green algae, at Spillway 16 and in Cells 5AB and 3C during planting efforts.

This season, the United States Geological Survey (USGS), with the United States Fish and Wildlife Service's (USFWS) assistance, continued conducting surveys of Poplar Island's target nesting bird populations (Figure 2). Tern counts were higher this year compared to last year, with 307 Common Tern and 330 Least Tern pairs (compared to 253 and 64 in 2017, respectively). Most of the Common Tern nests were located in the northwest corner of Cell 2C. The Least Tern nests were located in the unsuitable inflow

material pile on the northeastern side of Cell 6 and the northwest corner of Cell 2C. The USFWS actively deterred nesting activity from Cell 2's historic nesting site (northeast corner of Cell 2C) and attracted them to the northwest corner, to allow for ongoing construction activity related to the PIE. For the sixth year, the USGS conducted a banding and resighting program to better document tern fledging success; 463 Common Tern chicks and 171 Least Tern chicks were banded in 2018.

In order to continue accessing PIE construction sand, 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). This season, a few areas within the Cell 4C stockpile were left unmanaged and set aside as bank swallow nesting areas, while the rest of the stockpile was actively managed without nesting issues.

The USGS and the USFWS also surveyed nesting populations of Osprey, Snowy and Cattle Egrets, and Double-crested Cormorants on and just offsite. The site's colonial nesting waterbirds continue to nest successfully on Poplar Island and 28 Osprey pairs nested on Poplar Island and in Poplar Harbor in 2018 (compared to 12 in 2017). Of the 28 nests, only 12 were successful, with 29 fledged young. The reduction in Osprey nesting success was attributed to chick and egg predation by owls and crows.



**Figure 2. 2018 Poplar Island Bird Nesting Map**

MES continues bimonthly bird surveys for the entire site and confirmed 24 nesting species onsite for the 2018 season with 7 more suspected. Onsite nesting species include Canada Goose, American Black Duck, Mallard, Blue-winged Teal, Double-crested Cormorant, Little Blue Heron, Snowy Egret, Cattle Egret, Black-crowned Night-Heron, Glossy Ibis, Virginia Rail, Osprey, Killdeer, Black-necked Stilt, Willet, Herring Gull, Great Black-backed Gull, Common Tern, Least Tern, Purple Martin, Tree Swallow, Bank Swallow, European Starling, and Red-winged Blackbird. Outstanding bird occurrences throughout the reporting period included first site records of Ross's Goose, Grasshopper Sparrow, Cape May Warbler, and Summer Tanager as well as overwintering American Bittern, Black-crowned Night-Heron, and Short-eared Owl. This year's noteworthy findings included the first spring record of Bobolink, the highest recorded number of Black-necked Stilt in Maryland (91), and the first official census record of Rusty Blackbird (previously only reported by a birding tour group). Bird censuses performed at Poplar Island during the

reporting period had daily bird counts that ranged from 311 birds utilizing the site during a January survey to 7,283 birds onsite during an August survey.

The USFWS conducted seasonal monitoring of submerged aquatic vegetation (SAV) in Poplar Harbor and reference areas in May, July, and September. The results show a decrease in SAV coverage in Poplar Harbor compared to last year, possibly due to extensive clam dredging operations in Poplar Harbor. During the period, USFWS reported the first observation of widgeon grass growing in the tidal gut of restored wetland Cell 3D.

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 2018, a monarch tagging effort was conducted to provide data on sex ratios, migration patterns, weather influence, and mortality rates. During the 2018 season, 408 monarchs were tagged onsite.

The University of Maryland Center for Environmental Science (UMCES) continued collecting Surface Elevation Table (SET) data to track accretion rates within the Poplar Island marshes. By collecting SET data, UMCES is hoping to increase their understanding of the processes influencing elevation change and how they might affect the restored marshes' resilience to sea level rise. Before the planting of Cell 5AB, UMCES placed three pairs of SETs each in the highest and lowest elevation zones of the low marsh (zones graded with slight differences in elevation to track variances in consolidation rates). Each array has both deep and shallow SETs. The combination of deep and shallow SETs and marker horizons will allow the isolation of elevation changes from multiple zones, enabling UMCES to track changes in the deep strata below the dredged material, in the strata between the bottom of the deep and shallow SETs (from the bottom of the SETs to the bottom of the root zone), and within the root zone or at the surface.

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. As part of these investigations, an experimental wetland burn in the low marsh of Cell 1A occurred on March 27, 2018. The burn was conducted to better understand how removal of standing dead vegetation may impact stem-boring insect populations and other issues such as fungal infections that may have an effect on the overall vegetation health within Poplar Island marshes. The burn was incomplete due to the incoming tide; however, most of the standing dead vegetation within the burn zone was removed. Following the burn, insect emergence traps were installed within the burn area and a control area. UMCES reports that throughout the season, the vegetation was taller and the biomass was higher in the burn area when compared to the control area. Insect trap monitoring showed that there were notably fewer insects through June in the burn area than in the control area. These results suggest that stem-boring insects may be a primary cause of early senescence and suppressed flowering in the restored marshes and that burning could be useful as a management practice on a periodic basis.

In 2016, UMCES implemented a study to understand if different planting design impacts vegetation success. The study compared grid versus clustered planting designs for *Spartina alterniflora* on both sandy and fine-grained dredged material substrates. Cell 3C, which has received sand augmentation in some areas following the final lift of dredged material, was chosen for the field trial. The experiment set up five replicate plots of each design on each substrate, with the same number of transplants in each design. The plots were monitored through 2016 and 2017, with results presented in 2018. Results of the study show that the grid design produces more biomass and more rapid coverage on dredged material, whereas the clustered design appears to provide protection against predation in sandy areas. The recommendation for future plantings is to continue to use the grid design on dredged material substrates but consider clustering plugs or the use of larger transplants on sandy substrates to reduce mortality due to predation.



The National Oceanic and Atmospheric Administration (NOAA) was onsite in April, July, and October, continuing studies of nekton use of Poplar Island's developed wetland cells. NOAA reported that results from 2017 monitoring show an increase in nektonivorous, non-nektonivorous, and total fish abundances within restored wetland cells that have a large pond close to the inlet (such as Cells 3A and 3C). Data for the 2018 monitoring season are still being analyzed and will be shared in a future report.

In early spring of 2018, Ohio University (OU) collected and processed 143 overwintering hatchlings. Along with the 724 hatchlings that were processed in fall 2017, a total of 867 hatchlings were tagged, measured, and marked for the 2017 nesting season. Between April and June 2018 there were 187 terrapin yearlings released on Poplar Island as part of the Headstart program, where Maryland school children raise the hatchlings collected on Poplar Island in the fall and winter then release them onsite the following spring. OU reported a total of 183 nests for the 2018 diamondback terrapin nesting season. OU collected and processed 624 hatchlings in fall 2018 with 179 included in the Headstart program. Fifteen nests were left to overwinter to spring 2019, producing 67 hatchlings that were tagged, measured, and marked. This brings the total to 691 hatchlings processed for the 2018 nesting season.

#### **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 the project's target species and their habitats are protected. In an effort to protect the site's vital waterbird nesting area, the USFWS controlled for 78 adult Double-crested Cormorants (DCCO) in Cell 3D and oiled eggs from 320 nests on the Cell 1A habitat island. Poplar Island's returning DCCO nesting colony diminished this year with a count of 393 nesting pairs on the Cell 1A habitat island and 400 pairs on Jefferson Island surveyed during the 2018 season; down from a combined total of 1,310 pairs in 2017. Gull control also occurred during the reporting period, with the removal of 71 adults and the oiling of eggs in 394 nests throughout the site. Four foxes and two Great Horned Owls were removed during the reporting period. Additionally, to minimize disturbance to newly planted species in Cell 5AB, USFWS removed 32 muskrats from the cell during the reporting period (2018).

MES Environmental staff continued annual invasive control of bull and Canada thistle, mile-a-minute vine, and *Phragmites* throughout the site. *Phragmites* control in newly planted Cell 5AB is considered a high priority. The cell was treated aggressively in 2018 through two applications of Rodeo®. A controlled burn of *Phragmites* in Cell 5CD was conducted by DNR on March 27 and is anticipated to be repeated in winter 2019. An aerial spray for *Phragmites* was conducted on October 19 and was applied to approximately 75 acres across the site.

During the 2018 season, MES conducted monthly mosquito population monitoring from May through October in order to document the representative species composition on Poplar Island. Additionally, MES Environmental staff monitored mosquitoes on an as needed basis to determine when control was deemed necessary. Monitoring included landing and trap counts to ensure that the Maryland Department of Agriculture (MDA) minimum action thresholds were met before requesting aerial mosquito control be conducted. Three aerial mosquito sprays were conducted by the MDA this season on June 8, August 14, and September 28, when the mosquito population was found to be above the MDA-established threshold.

#### **Poplar Island Expansion:**

The project Expansion includes a lateral (northeast corner, new construction) and a vertical (Cells 2 and 6 dike raising) component (Figure 3). During the reporting period, under Lateral Contract 2, the USACE contractor The Wesson Group conducted work associated with construction of the toe dike and perimeter and interior dikes along Wetland Cells 8, 9, and 10, and the future embayment breakwaters (Figure 3). Work included the placement of fabric, quarry run stone, 350-pound stone, 1,500-pound stone, 2,500-pound stone, bedding stone, and sand to construct the perimeter dike, and the management of sand in Cells 1D and 7. Additionally, Cottrell Contracting Corporation inflowed construction sand dredged from the Northern Borrow Area into Cell 7 and Cell 1D. Under the PIE Tidal Wetlands License (#15-0131[R2]), turbidity and

noise monitoring associated with the construction of Wetland Cells 8, 9, and 10 dikes and the future embayment breakwaters was conducted.



**Figure 3. Map of Poplar Island including planned Expansion**

**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.

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:**

During the 2018 tour season, Poplar Island was visited by 1,278 members of the general public, 1,096 students, and 142 birders, for a total of 2,516 visitors. To schedule a tour please send an email to [poplartours@menv.com](mailto:poplartours@menv.com) or call 410-770-6503.

**Meetings, Media, and Noteworthy:**

Site Operations meetings were held approximately every two weeks throughout the period including the USACE, MDOT MPA, MES, and GBA.

The Poplar Island public website is now live; the URL is [www.poplarislandrestoration.com](http://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. Document files are in the process of being uploaded.

The annual Habitat Subgroup meeting was held at the MES headquarters annex building on February 27, 2018. The Poplar Island semiannual Working Group meetings were held onsite on June 13, 2018 and at MES headquarters annex building on November 20, 2018. Please check the project website [www.poplarislandrestoration.com](http://www.poplarislandrestoration.com) documents list or contact Carolyn Blakeney with MES at [cblak@menv.com](mailto:cblak@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 February, Lorie Staver (UMCES) gave a talk at the USFWS office in Annapolis titled “Elevation Monitoring at Poplar Island”.
- In February, March, April, June, and October, Rachael Gilde (MES) presented “Poplar Island an international model of innovative reuse” multiple times; as the dinner speaker at the American Society of Highway Engineers water resources themed meeting, at the Smithsonian Environmental Research Center in Edgewater as part of their Inspiring Bay Optimism lecture series, at Phillips Wharf Environmental Center in Tilghman as part of their winter lecture series, at the MDTA Earth Day Fair, at the Galesville Heritage Society Quarterly Dinner, and at the Chesapeake Bay Maritime Museum as part of their fall speaker series.
- In March, multiple media sources referenced Poplar Island including the following:
  - *OCNJ Daily* cites Poplar Island as a model project for the restoration of Shooting Island in an article “Ocean City looks to rebuild eroded wetlands on a neighboring island”.
  - *The Cape May County Herald* also references Poplar Island as a model project for Shooting Island in the article “Dredged material could be used to rebuild back bay island”.
- In April, media referencing Poplar Island included the following:
  - *The Capital Gazette* featured video footage and an article called “Young students continue National Aquarium’s terrapin restoration program” highlighting the National Aquarium’s part of the program and a turtle release on Poplar Island.
  - *WBOC-TV 16* showed a video feature and article about the Poplar Island project titled “Poplar Island restoration and expansion underway”.
- Also in April, William Nardin (UMCES) presented a poster at the European Geophysical Union titled “The effect of tides, wind and vegetation seasonality in controlling water and sediment fluxes in Poplar Island (MD), USA”.
- In May, media referencing Poplar Island included the following:
  - *The American Journal of Transportation* wrote an article titled “Lt. Governor Boyd Rutherford kicks off first North American Greenport Congress Conference in Baltimore”. This is the first time the Greenport Congress was held in the USA and the article discusses its importance as well as highlighting how the Port of Baltimore has shown a commitment to the environment.
  - Also in the *American Journal of Transportation* was an article titled “Collaboration: Survival strategy for ports” that discussed collaboration as a strategy for ports to achieve their environmental goals and mentioned that the Greenport Congress participants got the opportunity to visit Poplar Island.
- Also in May, Lorie Staver (UMCES) gave a seminar at the Easton Branch of the Talbot County Library titled “Tidal Marsh Restoration at Poplar Island: Maximizing Resiliency” as part of Horn Point Laboratory’s Science After Hours program.
- In June, media referencing Poplar Island included the following:



- *WBAL-TV 11* filmed a feature and wrote an article titled “Children help diamondback terrapin make comeback in Maryland” that focused on the terrapin head start program and filmed a turtle release.
- *Dredging Today* published an article “Additional funding announced for Chesapeake Bay projects” that announces extra funding for projects such as the PIE.
- In July, Lorie Staver, Jeff Cornwell, and William Nardin gave a presentation on UMCES involvement in the Poplar Island project to the Bay Cabinet (including MES director, Roy McGrath, representatives from the governor’s office, and others).
- Also in July, a paper by P. R. Marban, D. J. Prosser, & J. Murrow was presented at the meeting of the Society for Conservation GIS in Monterey, CA titled “Assessing island loss in the Chesapeake and Delmarva Coastal Bays”.
- In September, the *Bay Journal* wrote an article “Whether they’re coming or going, all Chesapeake islands have a tale to tell” that covers the story and success of Poplar Island.
- Also in September, Kristina Motley (MES) gave a talk titled “Poplar Island an international model of innovative reuse” to the Classic Hatteras Rendezvous Club at the St. Michael’s Harbor Inn, Marina & Spa in St. Michaels.
- In October, *Sea Grant Maryland* published an article “Birds dig dredge” that covered the story of Poplar Island and featured the experiences of a birding tour on the island.
- *Hellenic Shipping News Worldwide* posted a video titled “MDOT MPA invests in Poplar Island” that features flyover footage as well as facts about Poplar Island and the Port of Baltimore.
- In November, Dr. Willem Roosenberg co-edited a book titled *Ecology and Conservation of the Diamond-backed Terrapin* that references his work with terrapins on Poplar Island.
- In December, the *Chesapeake Bay Program* wrote an article titled “Eternally Christmas at Poplar Island” that focuses on the use of recycled Christmas trees for habitat on Poplar Island.
- Several Poplar Island presentations were given at the fall meeting for the American Geophysical Union in Washington, D.C. including:
  - Henry et al. (a teacher part of the Headstart program) presented “Is hotter better for our Head Start terrapin program”.
  - Taddia et al. (UMCES) presented a poster titled “UAVs to assess channels’ shape evolution in a restored salt marsh”.
  - Staver et al. (UMCES) presented “The influence of high nutrient availability on the carbon balance in restored marshes: An example from Poplar Island, MD in the Chesapeake Bay”.
- Also in December, Pete McGowan (USFWS) presented a poster titled “Promoting Change in Common Tern Nest Site Selection to Minimize Construction Related Disturbances at the Paul S. Sarbanes Ecosystem Restoration Project at Poplar Island” at the Restore America’s Estuaries conference in Long Beach, CA.