DIALOGUE

SUSTAINING COASTAL WETLANDS

SUMMARY

More severe storms and rising sea levels resulting from a changing climate pose a threat to ecosystems along the U.S. coast. These include beaches, dunes, wetlands, and marshes, which provide significant environmental, recreational, and economic benefits. Practices to sustain these ecosystems are available, but are not well understood, face legal and financial obstacles, and have not been widely implemented. On January 19, 2023, the Environmental Law Institute hosted a panel of experts who explored measures and practices for sustaining coastal wetlands in the face of a changing climate. Below, we present a transcript of that discussion, which has been edited for style, clarity, and space considerations.

Jeff Peterson (moderator) is a Visiting Scholar at the Environmental Law Institute, Co-Facilitator of the Coastal Flood Resilience Project, and author of *A New Coast: Strategies for Responding to Devastating Storms and Rising Seas*.

Amanda Santoni is an Ecologist in the U.S. Environmental Protection Agency's Office of Wetlands, Oceans, and Watersheds.

Mallory Eastland is a Project Coordinator at the South Atlantic Salt Marsh Initiative.

Nicole Carlozo is Section Chief for Waterfront and Resource Planning at the Maryland Department of Natural Resources.

Emily Donahoe is a Policy Specialist for Resilient Coasts and Floodplains at the National Wildlife Federation.

Jeff Peterson: Our goal today is to provide an overview of measures and practices that will sustain coastal wetlands threatened by more severe storms and rising seas. To give everyone a common base of information about the risks coastal wetlands face in a changing climate, we developed a read-ahead document that you can find on the Environmental Law Institute web site.[1]

I want to give a summary of some key points in that document. First, and perhaps most important, is that coastal wetlands perform valuable functions, including providing a buffer for reducing storm surges, absorbing ocean energy to minimize coastal erosion, supporting commercial and recreational fishing, providing critical habitat for birds and other species, and even sequestering carbon. There are about six million acres of tidal or saltwater wetlands around the U.S. coast, and that total is gradually declining, with the greatest losses seen in the Gulf of Mexico and the Southeast. Some of these losses are due to encroachment or development, but others are the result of damage due to storms and the rising sea level.

In the future, as climate change drives more severe storms and sea-level rise accelerates, some tidal wetlands will be overwhelmed and become open water. The National Oceanic and Atmospheric Administration (NOAA) predicts an average future sea level along the U.S. coast of 1.3 feet by 2050, four feet by 2100, and 7.2 feet by 2150 under their intermediate scenario.[2] The good news is that some wetlands will be able to migrate landward as sea levels rise. What is dry land today will become the coastal wetland of tomorrow. And landward migration can save the wetlands, but only if migration isn't blocked by human development or unfavorable natural conditions.

A key goal for this discussion is to examine what can be done to facilitate this landward migration of tidal wetlands as we continue to protect the current wetlands we have. In general, we'll be talking about three key strategies to help sustain existing tidal wetlands and to support shifting these ecosystems to higher ground.

First is education and planning. Broader understanding of climate change risks to coastal ecosystems is an impor-

Editor's Note: This Dialogue is the first in a two-part series on coastal ecosystems and their resilience to storms and sea-level rise. The second part, addressing beaches and dunes, will appear in the May issue.

1. Environmental Law Institute, Webinar Read Ahead Paper: Sustaining Coastal Wetlands in a Time of Severe Storms and Rising Seas (2023), https://www.eli.org/sites/default/files/files-general/2023-01-19%20Coastal%20Wetlands%20Webinar%20Read%20Ahead%20Document.pdf.

2. NOAA National Ocean Service, *2022 Sea Level Rise Technical Report*, https://oceanservice.noaa.gov/hazards/sealevelrise/sealevelrise-tech-report.html (last visited Feb. 24, 2023).

tant foundation to help sustain them. Better recognition of the risks helps to support development of plans to identify migration corridors and apply diverse measures to protect these assets in time frames that are appropriate to the risk.

Second is land acquisition and investments. Acquisition of titles or easements is a key tool to protect both existing coastal wetlands and the uplands that will become pathways for landward migration in response to more severe storms and rising seas. Acquisition might be done by local, state, or federal governments or nonprofit organizations.

And third is permits and regulations. Local, state, and federal governments have a range of regulatory tools for managing wetlands and protecting the landward migration pathways, and we'll explore some of those.

Ideas and innovations in these three areas are coming along, but sea-level rise is accelerating. We're in a race to sustain existing tidal wetlands and to facilitate landward migration before the sea rushes in. We hope this discussion will help build some consensus for expanded efforts to sustain tidal wetlands for the decades ahead.

I'm delighted to be joined by an expert panel with deep knowledge of these challenges. Amanda Santoni is an ecologist at the U.S. Environmental Protection Agency (EPA) working on the Coastal Wetlands Initiative. She leads the Interagency Coastal Wetlands Workgroup (ICWWG), which helps to address coastal wetlands loss, management, and restoration by bringing together seven federal agencies with programs and authorities that protect managed coastal wetlands.

Mallory Eastland is coordinator for the South Atlantic Salt Marsh Initiative (SASMI), which is part of the Southeast Regional Partnership for Planning and Sustainability (SERPPAS). It's an effort to improve coastal resilience and habitat protections by developing a regional salt marsh conservation plan for North Carolina, South Carolina, Georgia, and northeast Florida.

Nicole Carlozo is the section chief of waterfront and resource planning at the Maryland Department of Natural Resources (DNR), where she focuses on bridging planning and implementation. She works closely with federal, state, and local partners to integrate data into decisionmaking for conservation and restoration efforts. She also manages the Resiliency Through Restoration Initiative, a pilot restoration program that enhances community resilience to climate change.

Emily Donahoe works with the National Wildlife Federation (NWF) as a policy specialist for resilient coasts and floodplains. They serve as a policy representative and researcher on issues related to disaster resilience, hazard mitigation, and climate change adaptation.

First, each panelist will give a short presentation describing their work related to sustaining coastal wetlands. Second, they will respond to some general questions about options for protecting coastal wetlands in the face of more severe storms and rising seas. And third, we will take questions from the audience.

Amanda Santoni: I'm going to provide a short overview of a recently released ICWWG document on recommendations for reducing wetland loss in coastal watersheds of the United States.[3] Note that these recommendations are voluntary in nature; there is no regulatory obligation to implement them. They span the three measures that Jeff mentioned we're going to talk about.

For the purposes of my presentation, coastal wetlands refer to all wetland types within Hydrologic Unit Code 8 watersheds that have a tidal influence and drain to the coast. This is broader than only salt marshes or tidal wetlands. They can also include nontidal freshwater systems, hardwood swamps on the coast, and pocosin bogs.

With that definition in mind, according to the most recent U.S. Fish and Wildlife Service (FWS) Status and Trends report, coastal wetlands are lost at a rate of about 80,000 acres per year, which equals around seven football fields every hour.[4] The sixth national Status and Trends report, which will cover years 2009 through 2019, is due for publication soon, hopefully at the end of 2023.

To address these massive losses, in 2009, the ICWWG was formed with a very lofty but important goal to reduce and reverse the trend of coastal wetland loss. As Jeff mentioned, there are seven federal agencies in the group chaired by EPA: FWS, NOAA, the Federal Highway Administration, the U.S. Department of Agriculture (USDA), the Natural Resources Conservation Service (NRCS), the U.S. Army Corps of Engineers (the Corps), and the U.S. Geological Survey. There are several other agencies that sit in periodically.

In 2022, EPA published the ICWWG recommendations for reducing wetland loss in coastal watersheds of the United States. This is a culmination of work over the past 13 years of the workgroup, and was informed by a series of workshops and pilot studies on coastal wetland loss. The audience is program managers, nongovernmental organizations (NGOs), and government staff at the federal, state, tribal, local, and regional levels, and those involved in coastal wetlands and watershed management.

The purpose of the document is to forge cooperation across stakeholder groups and to build capacity to reduce coastal wetland losses nationwide. It's important to note that these recommendations can't be implemented and evaluated by a single agency or organization alone. Partnerships are key for their implementation.

The recommendations are organized around five main themes: increasing the acreage of wetlands restored in coastal watersheds; reducing the loss of coastal wetlands to development; reducing the loss associated with silviculture in the Southeast; supporting collection, enhancement, and dissemination of landscape-scale monitoring of data; and conducting targeted outreach and stakeholder engage-

3. ICWWG, Recommendations for Reducing Wetland Loss in Coastal Watersheds of the United States (2022), https://www.epa.gov/system/files/documents/2022-06/ICWWG%20Recs_Final_508.pdf.
4. Thomas E. Dahl & Susan-Marie Stedman, Status and Trends of Wetlands in the Coastal Watersheds of the Conterminous United States 2004 to 2009 (2013), https://www.fws.gov/wetlands/documents/status-and-trends-of-wetlands-in-the-coastal-watersheds-of-the-conterminous-us-2004-to-2009.pdf.

ment. Each of the themes is broken down into recommendations that include further potential actions.

While climate and resilience are not overtly mentioned within the document, these topics are built into the recommendations. For example, the recommendations emphasize coastal wetland protection and restoration, which can support carbon storage and reduce avoidable carbon emissions. Coastal wetland protection and restoration can also enhance climate resilience by buffering the shorelines. And the recommendations call for updated and improved coastal wetland mapping, which can assist with monitoring impacts of climate change and planning for future conditions.

There are more than 60 recommendations, so I won't go into every single action. But I will go over the secondary level recommendations, each of which has individual actions. I'll be going into more detail at a National Association of Wetland Managers (NAWM) webinar.[5]

Under the restoration theme, our recommendations are increasing the amount of restoration specifically within coastal watersheds, enhancing the ability to track both restored wetland acres and function, and enhancing restoration of former sand and gravel mines. Notably, some reporting does not currently allow for differentiation between, say, enhancement, which would not result in a wetland gain, and creation, which would result in a net wetland gain.

Theme two focuses on reducing losses to development. Under this theme, we highlight actions such as voluntary programs, interagency coordination, a broader use of federal authorities, local planning, and enhancing state and tribal protections.

Within the silviculture theme, there is much more research and understanding to be done in this area. Many of the recommendations advocate for increasing understanding, coordination, and stakeholder engagement, as well as tools.

Theme four relates to data—in particular, improving the FWS National Wetlands Inventory and NOAA's Coastal Change Analysis Program data, as well as interagency coordination and improved forest and wetland mapping techniques. This is a very active area of work for the ICWWG, and we currently have a lot of great interagency work going on with mapping.

The last theme is targeted outreach and stakeholder engagement. As we were creating these recommendations, we realized that all of them required aspects of outreach and stakeholder engagement to be successful. So rather than be repetitive, we acknowledged those important efforts in its own theme.

Like I said, more information will be presented at the NAWM webinar. That will include more on implementation efforts and highlight recommendations that might be best addressed by state, tribal, and local governments. I will also point you directly to the recommendations document itself.[6] As I said, this is a very high-level overview. Much more detail and specifics are within the document.

Mallory Eastland: I'm going to talk a bit about the salt marsh, describe some of the work SASMI is doing, preview our conservation plan that is coming out in mid-to-late April, and then set the stage for some of the actual work in projects we see ourselves doing post-conservation.

Salt marshes are close to wetlands that are flooded and drained by tides, and are super important ecological guardians. They safeguard shorelines, coastal communities, and military installations from extreme storm events and impacts such as flooding. It's an extensive and iconic habitat in the Southeast, and at approximately 1,000,000 acres, it's nearly the size of the Grand Canyon National Park. The salt marshes represent a rich history, many cultures, and an irreplaceable way of life.

Importantly, it also serves as a vital habitat for many of our nation's fish and wildlife, including those that support coastal industries and state economies. The marsh provides food, refuge, and nursery habitat for more than 75% of fishery species.[7] And it contributes to the health and resiliency of the larger landscape that touches every living creature.

As Amanda mentioned, NOAA estimates that 80,000 acres of coastal wetlands, including salt marshes, are lost each year. As sea levels rise, our marshes are at risk from drowning, and they're also threatened by the region's rapidly growing population. However, the South Atlantic salt marsh and the vital services it provides can be saved. Saving this resource in the face of all these persistent threats requires a concentrated effort by those who depend on it. And this initiative is trying to do just that.

SASMI is a regional, voluntary, nonregulatory initiative. Our goal is to bring together stakeholders from across the Southeast; the range of SASMI is from North Carolina down to northeast Florida to Brevard County. We gather our stakeholders, which include local, state, and federal leaders, academia, governmental agencies, communities, and NGOs, to determine the greatest threats to the salt marsh ecosystem and opportunities for its survival in our four-state region.

This coalition effort officially launched in May 2021. Since then, SERPPAS and the Pew Charitable Trust have brought together more than 300 diverse partners. One of our core principles is strategic and science-based partnership. We built this initiative by using the conservation plan as a framework and catalyst for all the good projects and conservation to come.

We're modeled after the America's Longleaf Restoration Initiative.[8] If you're not familiar, it was a very successful landscape-scale effort to conserve the longleaf pine

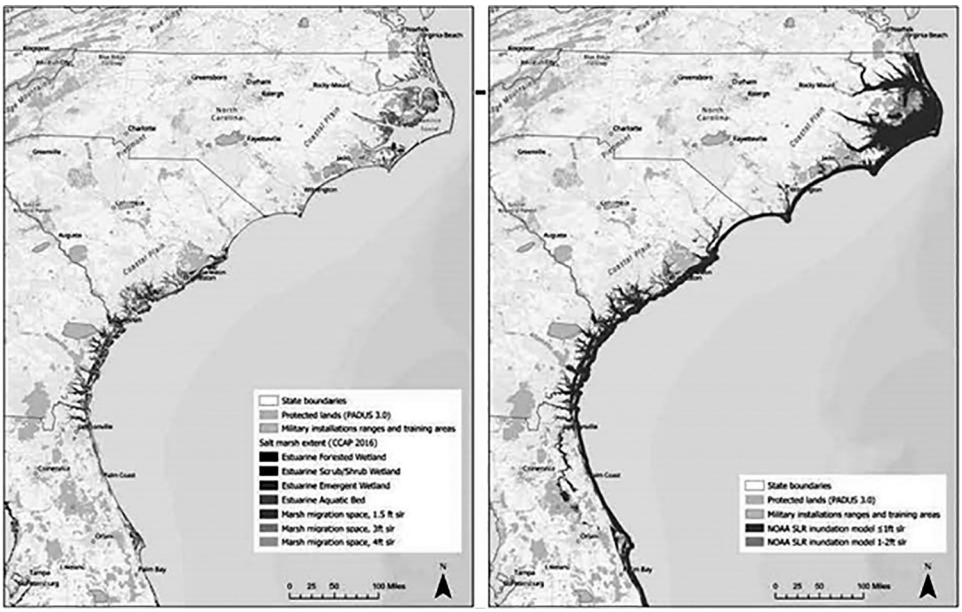
5. National Association of Wetland Managers, *2023 Past Hot Topics Webinars: Recommendations for Reducing Wetland Loss in Coastal Watersheds of the United States*, https://www.nawm.org/nawm/nawm-webinarscalls/10436-2023-past-hot-topics-webinars (last visited Feb. 14, 2023).

6. ICWWG, *supra* note 3.

7. NOAA National Ocean Service, *What Is a Salt Marsh?*, https://oceanservice.noaa.gov/facts/saltmarsh.html (last visited Feb. 14, 2023).

8. America's Longleaf Restoration Initiative, *Home Page*, https://americaslongleaf.org/ (last visited Feb. 14, 2023).

Figure 1. Projected Effect of Sea-Level Rise on South-Atlantic Salt Marsh



from Virginia to Texas. It's a great model for regional landscape conservation.

We copied quite a bit of their approach, and that's what helped build SASMI. Obviously, a salt marsh is different than a longleaf pine ecosystem, but we borrowed the idea that a conservation plan can help guide decades of conservation and bring together many different states—a diverse set of partners trying to accomplish the same goal.

I'm going to bring us back to the landscape we're trying to protect. The map [Figure 1, above] provides a scale of where the salt marsh is, and the map on the right shows different models of sea-level rise. These give you an idea of what we're working to conserve and how we're trying to be proactive in making sure that the salt marsh still exists with sea-level rise, and that it has a way to migrate inland.

I'll now provide a quick overview of the work we've done to date to create our conservation plan. We had a workshop about a year ago, in March 2022, to which we invited all our coalition members. The purpose was to lay the foundation of this conservation plan. It has been a stakeholder-driven process, and we're trying to include the experts that work and live in the communities that we're working to save.

All the pre-materials at the workshop were pooled together by several teams that were made up of a broad coalition. The rest of the coalition was invited to the workshop to provide feedback on what they had put together. A writing team then put together a draft plan. And then through a series of review and revision, we arrived at our final draft plan.

To date, we have all these reviews and feedback from the steering committee and from higher levels of leadership within network. We're talking to our partners and basically asking, you helped write and create this plan, so can you review what we have and give us your final feedback? The writing team is synthesizing all of the feedback and updating our final conservation plan. It is very exciting for us to be at this point.

I'm excited to preview some of the bones of the conservation plan that will be formally debuting in April. It's organized around our main goal of conserving the million acres of salt marsh in the South Atlantic states for the benefit of wildlife and for people in the communities there. We divided this goal into three main strategies: conserve what we have, where the salt marsh already is; restore the health of some degraded salt marsh; and then, importantly, projecting into the future, prepare for the migration of the corridors inland.

We've also identified four main cross-cutting approaches that touch on all the strategies: culture and community; policy; the ever-important need for funding; and communication, education, and outreach. They are proven ways to help the salt marsh and the communities that depend on it, and this plan charts a course for the conservation of the South Atlantic salt marsh designed to ensure that it will continue to enrich and protect the wildlife.

Again, this plan contains proven solutions that can save the salt marsh. We're not trying to reinvent the wheel. We're trying to galvanize and organize the four states to work together to protect what is truly one interconnected landscape. This includes the installation of natural and nature-based features, such as oyster reefs to fortify more layers of marsh, as well as conservation of adjacent lands that can support movement of the salt marsh to areas of higher ground as sea levels rise in the process of marsh migration.

A broad array of public and private stakeholders is already engaged in efforts in the South Atlantic states. However, meeting the mounting challenges in the future requires this unified effort that we're trying to help move along.

We recognize that the goal set forth in this conservation plan is ambitious and far-reaching. And the strategy necessary to achieve it will require an exponential acceleration of conservation activity and large-scale collaboration across local, state, and federal government, and private partners.

SASMI's broad and growing coalition comprises these stakeholders and experts with a shared vision for the future health, resilience, and abundance of this million-acre salt marsh expanse. Our overarching challenge is to effectively communicate with, educate, and mobilize these and additional stakeholders in a coordinated effort toward implementation of a conservation plan.

The implementation portion is what we're moving forward now. We have the base of our conservation plan. We received a lot of feedback. We have the important partners signed on. But in the next year, we'll be fleshing out what implementation is going to look like for the next decade as we start to work toward achieving the outlined strategies and goals.

Our SASMI "recipe for success" is simple when you break it down. Our greatest resources are our relationships, which have been invaluable, and we're continually building and strengthening our existing partnerships and creating new ones. Planning is the foundation. Our plan has been our concentrated focus for almost two years, and now we're moving into the more exciting part of implementation. This initiative is going to complement ongoing efforts and help achieve a landscape of conservation for the remaining vast areas of salt marsh in the United States. With a million acres at stake, we're unified in our drive to march forward.

Nicole Carlozo: I'll be speaking about incorporating climate change into land conservation, with a focus on Maryland's wetland adaptation areas. Unfortunately, Maryland is one of the more vulnerable states in the country to sea-level rise. We've experienced about one foot of sea-level rise over the past century, and we're planning for two additional feet by the year 2050.[9] Coastal communities throughout the state are experiencing more sunny-day or high-tide flooding events and higher spring runoff. We're expecting more extreme storm events as well.

With these thoughts in mind, DNR recognized that we can take actions now to better prepare for and recover from climate change impacts, both on a landscape scale and at a community level. One means of adapting to these changes is through the preservation of the state's wetlands, which I'll be talking about.

To better understand where marshes may migrate inland with sea-level rise, DNR ran the Sea Level Affecting Marshes Model (SLAMM) back in 2011 to predictively model long-term wetland and shoreline changes expected due to sea-level rise. We modeled this for the years 2050 and 2100, and the resulting marsh migration areas were then prioritized. We did this by looking at habitat features such as wetland diversity and marsh bird habitat. These prioritized marsh migration areas are what we call our "wetland adaptation areas." These areas are likely to be important future wetland habitat. The medium- and high-priority areas are what we use in our land acquisition decisionmaking process.

DNR primarily uses two tools to prioritize land acquisition. The first is called GreenPrint. This is an online mapper that's used to target parcels. The green areas identify the state's targeted ecological areas, which are identified by looking at a variety of data sets, including our wetland adaptation areas.

The second tool is a scorecard used to score parcels for acquisition. Parcels that have at least five acres of medium- or high-priority wetland adaptation areas are given additional points within this scorecard system.

I want to mention that our existing state policy prevents the acquisition of parcels subject to two feet of sea-level rise by the year 2050. These areas have been removed from the targeted ecological areas, and they're not eligible for acquisition. This decision was made to ensure that the state isn't protecting areas that will be underwater in the near future. However, these areas can be targeted for coastal resilience easements as an adaptation strategy with the goal of protecting future wetland habitat and facilitating marsh migration into the future.

Efforts are now underway to improve the state's targeting and conservation easement process. The first thing we've done is rerun the SLAMM model, and we're using that data to update our wetland adaptation areas. This is funded through the NOAA Effects of Sea Level Rise Program. We're working with George Mason University and The Nature Conservancy to quantify the wave attenuation and flood-reduction benefits of wetlands both now and in the future as sea levels rise. As part of this project, we reran SLAMM under six different sea-level rise scenarios. There's a lot more to this project than just the rerun of SLAMM, so feel free to check out our project website for more information.[10]

The new SLAMM run incorporates more recent lidar data and the state's most recent sea-level rise projections from 2018. We update those projections every five years. The projections from 2018 include values for different emissions pathways, and also provide values representing different probabilities.

We're modeling marsh migration and shoreline change for a variety of planning horizons, different emissions pathways, and different probabilities. But for statewide conservation targeting, we've zeroed in on one scenario, which represents a 17% probability using a growing emissions pathway. That equates to about 1.7 feet of sea-level rise by 2050 and 4.4 feet by 2100.

This model provides decadal time steps for a variety of emissions scenarios at a higher resolution than our previous

9. University of Maryland Center for Environmental Science, Sea-Level Rise Projections for Maryland 2018 (2018), *available at* https://www.umces.edu/sea-level-rise-projections.

10. The Nature Conservancy, *Understanding How Natural Shorelines Reduce Flood Risk*, https://www.conservationgateway.org/ConservationByGeography/NorthAmerica/UnitedStates/md/Pages/EESLR-Study.aspx (last visited Feb. 14, 2023).

run. With these data in hand, we're updating our wetland adaptation areas. We're prioritizing these areas for acquisition using a number of different factors. We're looking at sites where wetlands will remain through 2100, sites where they have not transitioned to open water, and prioritizing areas where upland is being converted to wetland. We're looking at factors like wetland size, hydric soils, areas within the state's green infrastructure hubs and corridors, and bird habitat.

Once these data are finalized, we'll be using these maps to identify parcels with at least 10 acres of upland-to-wetland conversion by the year 2100. We'll be using these types of data products to prioritize parcels for future coastal resilience easements to focus on preserving and managing that marsh migration area.

I want to talk about the state's coastal resilience easements, which remain a priority strategy for Maryland to pursue wetland adaptation. Like I mentioned, parcels subject to two feet of sea-level rise aren't eligible for acquisition, but they are eligible for resilience easements. There are provisions that were identified for these easements, which include development setbacks in areas subject to sea-level rise by 2050, buffers to protect wetland migration areas, impervious surface limits to limit pollution, and optional management actions such as an expanded vegetated buffer or the installation of a living shoreline.

Maryland's first easement was finalized back in 2013,[11] so it's been a while since we piloted these types of easements. The state just completed its second pilot project in 2021.[12] The main difference is that we added one additional element to this new project: the creation of a coastal resiliency management plan. This new element is now standard for easement agreements, and it allows us to better manage the parcel and evolve our management as climate change impacts the site over time.

The coastal resiliency management plan includes a range of components. It includes a map that delineates the wetland adaptation buffer, which allows for that natural wetland migration. Managers consider other factors to delineate this area, including sea-level rise data, the state's wetland adaptation area data, as well as field indicators from site visits. Several management recommendations within the buffer have been identified to focus on preserving the services that the wetlands provide both now and into the future. These include things like seeding and planting and invasive species management. But I want to mention that monitoring and research are still very much needed to help develop this guidance and to develop best practices for management of these areas.

Lastly, I want to mention that the management plan is expected to be updated every 10 years to allow for monitoring and evaluation of these sites, as well as integration of new data and science-backed management strategies. But right now, policies are still needed at the state level to inform the development and oversight of these plans, as well as their decennial updates.

Emily Donahoe: I am going to talk about the opportunities we have with the recent influx of resources from the Infrastructure Investment and Jobs Act[13] and the Inflation Reduction Act.[14] I'm also going to talk about opportunities in the federal legislative and regulatory space to protect and restore coastal environments. I'm going to end with sharing NWF's new tool to connect communities to federal funding and technical assistance for nature-based solutions.

Historic, once-in-a-generation levels of funding have been recently released to agencies across the federal family that can be used to invest in our coasts and to protect and restore coastal wetlands, as well as the upland areas that wetlands will migrate to as sea levels rise.

The Infrastructure Investment and Jobs Act was signed into law in November 2021. This is also known as the Bipartisan Infrastructure Law, and it is a $1.2-trillion package. This includes significant funding to protect against hazards and to increase the nation's resilience. Fifty billion dollars were allocated to this bucket, for protecting against droughts, floods, and other hazards. I want to highlight two allocations: $492 million that is going to coastal infrastructure projects under NOAA's National Oceans and Coastal Security Fund, and $491 million that is going to NOAA's community-based habitat restoration projects.

The Inflation Reduction Act was signed into law in August 2022. This includes approximately $700 billion of funding, with nearly $400 billion dedicated to climate energy-related provisions. And $3 billion of this will go to NOAA for restoring marine, estuarine, coastal, and Great Lakes habitats.

Given the availability of these billions of dollars in funding to numerous agencies, this is a critical opportunity to think creatively about how to deploy these monies across the federal family and across agencies to protect and restore coastal wetlands. Allocating and using this money well in the time frame that we have will be critically important. There is an urgency for the federal family and nonfederal stakeholders to think strategically to achieve large-scale benefits for our coastal habitats.

I also want to take a moment to talk about the current federal legislative and regulatory landscape and how recent developments and potential near-term items could assist with protecting coastal habitats and wetlands. First on the list is the Water Resources Development Act of 2022,[15] which was enacted in late December 2022 as part of the National Defense Authorization Act.

The Act authorizes Army Corps of Engineers activities related to water resource management and ecosystem restoration. The Act will help protect communities and

11. State of Maryland Board of Public Works, After Meeting Agenda Summary (Aug. 21, 2013), https://bpw.maryland.gov/MeetingDocs/2013-Aug-21-Summary.pdf.
12. State of Maryland Board of Public Works, After Meeting Agenda Summary (Sept. 15, 2021), https://bpw.maryland.gov/MeetingDocs/2021-Sept-15-Summary.pdf.
13. Pub. L. No. 117-58, 135 Stat. 443 (2021).
14. Pub. L. No. 117-169, 136 Stat. 1818 (2022).
15. Pub. L. No. 117-263 (2022).

the environment by directing the Corps to help restore the nation's shorelines, riverbanks, and streambanks, and allow for evaluation of flood risks when planning flood and storm damage-reduction projects.

I want to highlight two provisions in particular. First is §8103, which will authorize the Corps to carry out projects for the protection and restoration of coastal shorelines and riverbanks, including projects that advance the conservation and restoration of natural functions and the values of rivers and shorelines. Second is §8106, which will require the Corps on request to formulate project study alternatives to maximize benefits for the reduction of flood risks and to maximize the net benefits for any primary purpose for water supply or water conservation purposes. Both provisions could be helpful in protecting these wetland migration corridors.

I also want to highlight the Coastal Barrier Resources Act (CBRA).[16] CBRA was passed by the U.S. Congress in 1982 to reduce development in high-risk coastal areas, protect coastal habitats, and save taxpayer dollars. The Act designated relatively undeveloped areas in about 3.5 million acres of coastal land along the Atlantic, Gulf of Mexico, Great Lakes, U.S. Virgin Islands, and Puerto Rico, as the Coastal Barrier Resources System. The CBRA system prohibits most new federal expenditures and financial assistance within the system, which protects existing coastal wetlands and potentially their migratory paths as sea levels rise.

Related to this is the Strengthening Coastal Communities Act of 2022.[17] This bill was introduced in December 2022, and would expand the CBRA system to add coastal areas in northeastern and Mid-Atlantic states. Notably, it also calls for a pilot project that would identify additional areas for inclusion within the CBRA system that are vulnerable to coastal hazards, and areas where coastal barriers and associated habitat are likely to migrate as sea levels rise. This expansion of the CBRA system would be critical to allow for wetland migration. We hope to see this legislation reinvigorated in this Congress.

I want to highlight the Federal Emergency Management Agency's (FEMA's) rulemaking on the Federal Flood Risk Management Standard (FFRMS).[18] The FFRMS was established to encourage federal agencies to consider and manage current and future flood risks to increase resiliency. This requires agencies to prepare for and protect federally funded buildings and projects from flood risks. In the fall of 2021, FEMA put out a request for information (RFI) on updating the FFRMS. We are awaiting their response on that, which we hope to see soon. Updating and strengthening the standard could provide another avenue to allow for more migration corridors for migrating wetlands.

Last, there is a new tool that NWF released called the Nature-Based Solutions Funding Database.[19] This database is a tool created for communities seeking federal funding or technical assistance for nature-based solutions. The great thing about this tool is that it has a filter feature that allows interested entities to select their specific needs in their search for federal funding to find relevant resources for that entity-specific project. The filters include purpose, eligibility requirements, support type, cost-sharing requirements, and federal agency.

As an example, the drop-down menu for "purpose" can include the climate resilience adaptation purpose and the flood/storm risk-reduction purpose. Other filters might include local government as the eligible entity, grant funding and needs-based for cost-sharing requirements, and FEMA as the agency. It includes programs from the recent Inflation Reduction Act as well as other federal agencies and other programs. We just released this tool in early December 2022, so we're looking for more feedback.

Jeff Peterson: I'm going to pose some questions to the panel. Each person will get a chance to respond, but it's intended to be an open discussion among the panelists.

Emily, you mentioned the FFRMS. It does seem like the new flood risk standard might be helpful in limiting new development encroaching on existing tidal wetlands and even in protecting migration corridors. Do you have further thoughts on that?

Emily Donahoe: Generally, I'm very supportive of the FFRMS, but it is important to realize its current limitations and that it only limits development related to federal projects and funds. Areas are still open to development by private interests. But generally, the FFRMS does require agencies to determine specific federal building or project dimensions like how high or wide or expansive a project or building needs to be to manage or mitigate current or potential flood risks.

It is a major step forward and it's important, but it also has its limits on reach. It will take other incentives or disincentives to prevent other types of development or private development from occurring in these areas. We're very hopeful that FEMA will follow through with the RFI last fall to update the FFRMS, which could be another tool in the toolbox to help protect migration corridors.

Amanda Santoni: I'll second that. With migration, it's really a puzzle of how to use and leverage different authorities at different levels to help make a difference. Of course, new federal standards are going to provide one additional layer of protection. But there are still opportunities in state and local protections and ordinances or other programs that can serve as another piece of the puzzle.

16. Pub. L. No. 97-348, 96 Stat. 1653 (1982).
17. S. 5185, 117th Cong. (2022).
18. FEMA, *Federal Flood Risk Management Standard*, https://www.fema.gov/floodplain-management/intergovernmental/federal-flood-risk-management-standard (last visited Feb. 14, 2023).
19. NWF, *Nature-Based Solutions Funding Database*, https://fundingnature-basedsolutions.nwf.org/ (last visited Feb. 3, 2023).

Jeff Peterson: A common theme is the question of mapping areas for migration or landward pathways. Is there a need for a national standard for mapping of tidal wetland migration corridors, or perhaps a coordinated national program to set priorities like Nicole talked about that's already underway at the state level in Maryland? Would that be useful at this point?

Mallory Eastland: I can add some insight on the issues we've run into when trying to do a regional approach to mapping. Our states do different things. Georgia, for example, has a specific mapping model that they use for funding. We had lots of conversations with the state, and it was very important that we not disregard the models that they used because their funding mechanisms are based on those models, and they invest significantly into their SLAMM models.

So far, I've only found evidence that points to the answer: "We might not be ready." It would be helpful to have a national approach, but it would take a lot of outreach, coordination, and sensitivity in understanding why some states might do it differently than other states. Due to the nature of our initiative being voluntary and nonregulatory, we ultimately found it best to incorporate the model Georgia already was using, along with the other agreed-upon model that the other three states were using.

Nicole Carlozo: I would add that many states are doing this kind of work already through their coastal zone management programs. And I want to plug a report that just came out through the Virginia Institute of Marine Science.[20] They completed a project funded through Chesapeake Bay Trust. It was a synthesis of shoreline, sea-level rise, and marsh migration data for wetland restoration targeting.

The report gives a feel for how many different types of models are already out there to utilize. There's SLAMM, InVEST,[21] and other models. Each one is run at a different scale and has different outputs. The marsh migration areas identified by each of the tools don't necessarily overlap depending on the inputs. So, it's important to not only look at a landscape scale, but also to investigate barriers and migration at the site level.

I would support more ongoing research on questions about marsh transition and the management of those areas. That could really benefit states trying to grapple with saltwater intrusion, loss of agricultural lands, and wetland loss, and help determine how best to protect and enhance those migration areas.

Emily Donahoe: We currently don't have maps that demonstrate where natural floodplains exist in the country. Period. And having those natural floodplains mapped could be an important way to assess what we currently have, what has deteriorated over time or developed over time, or what areas will be deteriorated or developed over time.

I want to again highlight the opportunity with CBRA and the need for enhancement or expansion of the CBRA system to expand those migration corridors and the pilot program that was in the bill I mentioned, which could be a great way to identify and map additional areas as well.

Jeff Peterson: With FEMA in the process of revising its regulations governing local ordinances that local governments adopt as part of the National Flood Insurance Program, would new local floodplain ordinances be a potential tool for local governments to map migration corridors as well as floodplains, and adopt development limits to protect areas within those corridors?

Emily Donahoe: I'd love to hear the local perspective too, but I think, again, this could be another tool in the toolbox. Local floodplain ordinances could help with this problem. All levels of government should be working together in looking at this issue. Local governments tend to have their best interests at heart, of course, and there is an important role here for local governments to identify and map. It could result in a more varied outcome, which is a strength but could also be a weakness. Looking back at updating the FFRMS, from the federal perspective, it could be a way to strengthen that process too.

Amanda Santoni: From an EPA perspective, we are also working with NAWM to create case studies of local wetland ordinances for state and local governments. That might be another tool for folks at the state and local levels if they don't have local wetland ordinances already or if they want to change some of their wetland ordinances in the context of these new floodplain ordinances that are beginning to come out.

Jeff Peterson: One more question for the panel. There are federal regulations under §404 of the Clean Water Act (CWA)[22] that provide protection to existing wetlands, including tidal wetlands. But they don't extend to protecting landward migration corridors that are for future wetlands. However, we do have a precedent with the Endangered Species Act (ESA)[23] that includes authority to protect both current and future critical habitat.

Is there a federal role in protecting tidal migration pathways? Or should we conclude that protecting these corridors is the principal responsibility of local and state governments and perhaps nonprofit organizations?

20. Molly Mitchell et al., Scope of Work 8: Synthesis of Shoreline, Sea Level Rise, and Marsh Migration Data for Wetland Restoration Targeting Final Report (2022), https://cbtrust.org/wp-content/uploads/VIMS_Marsh_Migration_final_reportmetadatsheets_30Sept2022.pdf.
21. Stanford University Natural Capital Project, *InVEST*, https://naturalcapitalproject.stanford.edu/software/invest (last visited Feb. 14, 2023); Duke University Nicholas Institute for Energy, Environment and Sustainability, *Coastal Protection and Blue Carbon for Eastern States*, https://nicholasinstitute.duke.edu/project/coastal-protection-and-blue-carbon-eastern-states (last visited Feb. 24, 2023).
22. 33 U.S.C. §§1251-1387, ELR Stat. FWPCA §§101-607.
23. 16 U.S.C. §§1531-1544, ELR Stat. ESA §§2-18.

Amanda Santoni: It's another piece of the puzzle, and I think some existing federal regulations already play a role. For example, with §404, as you mentioned, you can't have a marsh migrate if there is no marsh to begin with. If you think at a broader level, as Emily was articulating with some of the regulations in FEMA, I'm thinking, also, NOAA and FWS. Potentially grants from USDA, NRCS, even guidance coming out from the Federal Highway Administration or assistance that they are giving to specific states for their highway modifications.

They can each play a different role. We can use federal authorities already, although maybe not to the extent that you're talking about. That being said, I think everyone is aware of the current challenges associated with regulating existing wetlands. So, you can imagine the challenges at the federal level for extending regulations to future wetlands.

Mallory Eastland: I agree with Amanda, and I do think there's a federal role. We have a lot of coastal military installations that are going to be impacted by sea-level rise, and a lot of them are trying to be proactive and are pretty engaged with SASMI. The Sentinel Landscapes Partnership is a good example of actions by federal agencies like the U.S. Department of Defense (DOD). As the marsh migrates inland, military training grounds are also migrating with that, and the loss of salt marsh impacts the military mission as well.

DOD has already recognized the importance of preparing for marsh migration. Like I said, Sentinel Landscapes looks at the installation, and then looks at the surrounding landscapes and how the community is impacted and works to protect natural resources at that broader scale. As Amanda mentioned, we have some of the same partners. FWS, EPA, and so on, engage and recognize that there is definitely a role for them to play.

Nicole Carlozo: To add a Maryland perspective, we sit within the Chesapeake Bay Watershed, so we have the Chesapeake Bay Watershed Agreement,[24] which outlines specific goals and objectives for a healthy Chesapeake Bay. This includes the creation or reestablishment of tidal wetlands. The seven jurisdictions in the watershed are part of the agreement. We have the Chesapeake Bay Commission and EPA. Together we're working to evaluate how sea-level rise will impact our wetland goals.

In some ways, we're already doing this through these partnerships—federal, state, and nonprofit partners working together to identify solutions for how we can meet our wetland goals. I think marsh migration is going to be part of that solution, whether it's tackled at a local, state, or federal level—or all of the above. A lot of the key players are already looking into this.

Emily Donahoe: I agree with my fellow panelists. This is a whole-of-government approach from all levels. Natural systems that house wildlife also provide numerous co-benefits to communities like cleaner water, cleaner air, recreational opportunities, hazard risk-reduction benefits, and more. So ideally, everybody wants to help protect the existing habitats and look to increase restoration of those habitats through conservation efforts and nature-based solutions.

I also want to highlight that the question related to the ESA is awaiting comment from the RFI, which I mentioned FEMA put out last fall, on ways to better promote conservation on threatened and endangered species in their habitats consistent with the ESA. We'll be looking to see what they end up saying for that, too.

Jeff Peterson: We have an audience question asking, what if you have a marsh that simply can't migrate because it's in front of a coastal community or is facing some other physical obstacle? What sort of management techniques are possible? For instance, thin-layer deposition or ways to enhance the accretion of the marshes. What is in the toolbox for marshes where migration isn't an option?

Mallory Eastland: For us, we have lots of different nature-based solutions related to shorelines and thin-layer placement. The solution isn't just for everybody to move inland, because that's not realistic, and it disregards a lot of communities' intrinsic attachment to the land, and it would not be environmentally just. It wouldn't be equitable either because a lot of lower-income communities are ones that live in lower-lying land that's going to be most affected. That's not SASMI's approach.

There are a lot of different tools in the toolbox, including nature-based solutions. We're hoping to continually add to that toolbox.

Nicole Carlozo: Something that we're investigating right now is thin-layer sediment placement. We did a study with the National Estuarine Research Reserve System looking at different thicknesses of sediment placement and the best practices for that type of approach in different regions across the United States.[25] There is ongoing research. We're piloting something right now in Maryland on the Eastern Shore in a project coming up later this year. There are living shorelines. There are different types of restoration practices that depend on identifying those areas that are the most important to protect. How do we look at all the ecosystem services of these systems to determine what we are going to let migrate on its own versus what we want to keep in place?

24. Chesapeake Bay Program, Chesapeake Bay Watershed Agreement (2014, amended 2022), https://d18lev1ok5leia.cloudfront.net/chesapeakebay/Chesapeake-Bay-Watershed-Agreement-Amended.pdf.

25. National Estuarine Research Reserve System Science Collaborative, *Thin-Layer Sediment Placement: Evaluating an Adaptation Strategy to Enhance Coastal Marsh Resilience*, https://nerrssciencecollaborative.org/project/Raposa17 (last visited Feb. 24, 2023); Raposa et al., *Evaluating Thin-Layer Sediment Placement as a Tool for Enhancing Tidal Marsh Resilience: A Coordinated Experiment Across Eight US National Estuarine Research Reserves*, Estuaries & Coasts (2023), https://link.springer.com/article/10.1007/s12237-022-01161-y.

Jeff Peterson: As you look at either mapping or related protections for marsh migration pathways, are you finding property owner reluctance or resistance? Are you finding any organized pushback to the question of where the marsh is going to go? Or should an upland area be used for some other purpose than a marsh?

Nicole Carlozo: We've only had two easements that have gone through in the past 10 years. There wasn't a lot of interest. About 10 years ago, when we developed the easement, there wasn't as much interest in that type of strategy. But we're hearing a lot more interest now as property owners are seeing the actual impacts on their properties. They're seeing more of the agricultural lands becoming too wet. This is basically a strategy that would allow us to prevent those marsh migration barriers from being put in place. We can work with the property owners to make sure that they're not keeping water out, that we can allow the marsh to transition over time.

There were some challenges with implementation from an interest level. But as folks are seeing impacts on the ground now with all the sunny-day or tidally influenced flooding, I think there are more opportunities and there's more interest.

Jeff Peterson: Here's a question on a practical problem. Have you seen cases where there's been financing, for instance, for a buyout of a property or a structure and demolition to make way for migration of a wetland as sea levels rise?

Nicole Carlozo: I don't have any direct experience with that type of project. I know they exist in the world, but I'm not aware of any of them.

Emily Donahoe: FEMA is one agency that provides funding for a buyout of a property through a variety of programs, including the Hazard Mitigation Grant Program, the Flood Mitigation Assistance Program, and potentially the Building Resilient Infrastructure and Communities Program. There are increasingly more federal agencies that are also providing financing for this type of work. You can use the database tool that NWF has put together to look into this further. There should be information on that website about a variety of financing for buyouts.

Mallory Eastland: As part of pulling together a plan, we had a team that was looking at infrastructure and sustainable development. They explored those types of projects and funding for those projects, and particularly funding for things like green infrastructure, like the "America the Beautiful" green infrastructure plan.

It's something that we were thinking about longer term. It's not going to impact the salt marsh migration and, hopefully, will avoid some of the heavier impacts of sea-level rise.

Jeff Peterson: Another question: does Maryland consider the combined effects of climate change and nutrient pollution on the role of essential fish habitat for finfish and shellfish in Chesapeake Bay?

Nicole Carlozo: We have a NOAA coastal management fellow right now in our office working on climate change impacts to fisheries in Maryland. That's something that we're looking into. As I mentioned earlier, we're also a signatory on the Chesapeake Bay Watershed Agreement. We work with many different jurisdictions from a habitat perspective, a fisheries perspective, and a water quality perspective. The best part of that effort is that we're looking at the impacts of climate change on water quality from a nutrient-loading perspective, and habitat from a sea-level rise perspective. We're always looking at this issue from a different lens. We look at carbon sequestration, marsh migration, fisheries, water quality. It's all interrelated.

Jeff Peterson: Here's a question from a local perspective. A Mid-Coast Mainer is looking for guidance on advising a town on land use planning ordinances and revising a comprehensive plan, particularly with regard to wetland migration and housing needs. Are there examples of local plans, and particularly comprehensive plans, that you would cite as a particularly good model for someone at the local level who wanted to see what other communities in comparable situations facing this question have done?

Nicole Carlozo: I don't have any examples off the top of my head. But I will offer that we have an annual grant solicitation, and we provide funding to local governments and municipalities to do these kinds of updates for their comprehensive plans. If that's an issue that a jurisdiction in Maryland wanted to pursue, we could work with them toward an application for our grant program.

Amanda Santoni: One thing that comes to mind is Georgetown Climate Center's Managed Retreat Toolkit.[26] I'm not sure if that would provide any additional information for this individual in Maine. But it might be worth checking out if there's relevant information.

Jeff Peterson: Here is a question for Mallory, asking if there's anything similar to your multistate effort planned or underway on the West Coast?

Mallory Eastland: Not that I am aware of. At least when we started, what we were trying to do was relatively new. I've heard from several initiatives since then mostly on the East Coast, asking about lessons learned because they're trying to do similar things within their region. One of the things that SASMI hopes to do long term is serve as a successful model for other kinds of regional initiatives, salt marsh conservation or otherwise.

26. Georgetown Climate Center, *Managed Retreat Toolkit*, https://www.georgetownclimate.org/adaptation/toolkits/managed-retreat-toolkit/introduction.html (last visited Feb. 3, 2023).

Jeff Peterson: Another question: do you know if state department of transportation (DOT) lidar data would be useful in analyzing landward migration corridors for wetland habitats? Lidar can indicate low-elevation landscapes near existing wetlands that may make movement inland easier.

Mallory Eastland: I do think it's helpful. We had a mapping team that was working on a SASMI-like tool that has been used to inform this process. It is not something that's well developed enough that we're marketing it broadly. But I have at least a map layer that looked at DOT data. I think it was helpful, and people with far more knowledge than me at mapping identified that and incorporated it into that tool.

Emily Donahoe: I would add that there are a lot of different components that can be looked at if we're looking at marsh migration. What we're now looking at is, are marshes accreting? Is there sediment available in the system to allow for accretion? Is erosion occurring? Looking at local sea-level rise rates as well as elevation. I think there are different data sets that could be helpful.

Jeff Peterson: One last question: thinking about the big picture, we have a national goal for no net loss of wetlands. Could there be a national goal for sustaining some part of our tidal wetlands over the long term in the case of these tidal wetlands? Might it even be possible to have a goal for a net gain?

Emily Donahoe: Stressing the importance of first protecting what we have and minimizing the loss of our current wetlands is critical, and then working to restore or increase restoration activities. That net gain goal could absolutely be a helpful messaging tool for those types of outcomes.

But actually achieving those outcomes would remain to be seen. Currently, the no-net-loss goal has sometimes been exploited. It does sometimes provide an excuse to allow significant wetlands impacts in one location for the promise of a wetland being restored in another location, which potentially never occurs. So, a net gain goal could potentially have the same problem.

To restore these areas or to even hold them steady requires very intentional land management to allow for the migration of tidal wetlands. This would mean planning inward expansion, perhaps relocation, and not allowing for harmful engineering, or hard armoring of those shoreline areas. Protecting what we have is of utmost importance, then planning for what we'll lose. All of that would require resources, planning, and political will.

Mallory Eastland: A net gain goal has the potential to undercut some of our messaging and potentially undermine the importance of what we're trying to communicate. For example, when we reach out to some of our stakeholders, especially people not as involved with the salt marsh or who perhaps don't understand how sea-level rise is going to impact our wetlands, and we start to talk about net gain, they might think, well, if we're gaining, then what do I have to be worried about?

So, that's something we think about when speaking to leadership. While it might be a nice lofty goal to have, it doesn't communicate the dire situation that we're in, and the immediate need for us to concentrate because we are at risk of losing this really valuable resource. That's one of our key messages. And loss certainly is a little minimized if you're thinking of a net gain goal.

Amanda Santoni: I'll second some of the complexity of this question because the more I ponder it, the more complex it becomes and there might not be a simple answer. As Emily put it, the intentionality of it is important. For example, in terms of coastal wetlands, many emergent wetlands have been replaced with open water and ponds. So, there might be some benefit to looking at specific wetland type as well. In some instances, there could even be competing interests between groups for different types of coastal wetlands, or even different types of tidal wetlands. It gets pretty complex. But the more intentional you can get, the more targeted a goal can become.