Environmental and Energy Study Institute

Briefing Transcript

Coastal Resilience in the Southeast

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Moderator:

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Daniel Bresette

Alright everyone, good afternoon, I'm Dan Bresette, the Executive Director of the Environmental and Energy Study Institute. Thanks for joining us today for a virtual briefing on coastal resilience across the states of the Southeast. Even though we're not meeting today in person, I'd like to thank the office of Representative Frances Rooney for their support today. I wish we were meeting in person and under different circumstances, but we have to be responsible and realistic and an in-person convening would have been neither, but our all-star panelists were still willing thankfully to join us online and present as a webinar.

If you're joining us today for the first time, we're in the proverbial back nine of a briefing series that looks at regional approaches to coastal resilience. In 2019, we brought together panels of experts, practitioners, and community leaders through the Gulf Coast, Northeast, New England, Louisiana, and the West Coast, and one month ago today we convened experts who discussed efforts around the Great Lakes. Next up will round out our briefing series with Hawaii, Alaska, and even more. If you've missed one of our briefings on coastal resilience, or pretty much any other clean energy or climate policy topic, you can access briefing summaries and videos at www.EESI.org. And when you visit us online please take a minute to sign up for our newsletter *Climate Change Solutions,* which is the best way to stay up-to-date of all EESI goings-on, including legislation, briefings, fact sheets, and web articles. About our briefing schedule, after today we only have one other briefing on our schedule. Next Friday, we'll cover coastal resilience in Hawaii, and how policymakers and stakeholders have used financing tools to help overcome upfront costs. This will be held via webinar as well. Then we'll take stock of where we are after that, evaluate how this new online model is working so our webinars live up to our high standards. It would help us a lot to know how to improve our webinars, if you could take a moment to fill out our survey. I'm pretty sure you'll receive announcements and registration links for more briefings held via webinar in the coming weeks, but

we might need a tiny pause to make adjustments and corrections as we master this new medium. We are all very concerned about the coronavirus outbreak for very good reason, the uncertainty of the spread of the virus in particular is very unsettling but at EESI we're also doing our best to stay focused on the threat of climate change as we have over the past several decades. That is why we will continue to bring you opportunities to hear from climate, clean energy, and resilience experts via webinar. You'll also continue to receive newsletters and links to fact sheets. Climate change might not feel as urgent, relatively speaking right now, but it is, and it very likely will have even more and be even more disruptive as more of us experience its negative consequences.

One last thing before we turn to our panelists, because we're not in the same room today, I cannot call on you if you have a question, so please follow EESI on Twitter, @EESIonline, or send in your questions that way. You can also send an email to EESI@EESI.org, but engaging with you on Twitter sounds more fun. We'll draw from your question submissions after we hear from our panelists. Now, on to our panelists. Our first panelist is Heidi Stiller. Heidi is the South Regional Director for NOAA's National Ocean Service Office for Coastal Management based in St. Petersburg, Florida. Heidi serves as a focal point for senior level coastal partner interaction at the regional, state, and local levels from North Carolina around to Texas and including the Caribbean. She helps implement national and regional statutory and other coastal and ocean programs, responds to the needs of users, partners, and coastal decision-makers, and delivers technical assistance to meet coastal and ocean challenges. Heidi, I'll turn it over to you, really looking forward to your presentation.

Heidi Stiller

Thanks very much for that introduction. I'm gonna share my screen and go to presentation mode. Can you see it? Excellent. Well thank you so much to the Environmental and Energy Study Institute for the invitation to be part of today's briefing, and I also want to thank representative Rooney for being the sponsor. I'm really excited to share some of NOAA's work to help protect Southeast ecosystems and communities from coastal hazards. So up here on the screen, this photo that you see is U.S. Highway 80, and that's the only road access to Tybee Island off the Georgia coast. And this is October of 2015, and this was not a hurricane. This was flooding driven by seasonal high tides and onshore winds. This picture illustrates in sort of a dramatic way the scope of the resilience challenges that the Southeast faces. But the good news is that communities are planning and acting, and NOAA and many partners that you'll hear from some of our partners today, are helping, and so please keep your eye out for Tybee Island in the rest of my slides as well.

So just a bit about NOAA and my office. NOAA's mission in short is one of science, service, and stewardship, and our guiding vision is a future where communities, ecosystems, and economies are healthy and resilient in the face of change. Across the agency, nowhere works to understand and predict changes in climate, weather, oceans, and coasts, and then we work to share that knowledge and information with others. And finally, NOAA has a role in conserving and managing coastal and marine ecosystems and resources. My office, the Office for Coastal Management, focuses on coastal management, and that's the decisions and actions that are taken to keep the natural environment, built environment, quality of life, and economic prosperity of our coastal areas in balance. The Office for Coastal Management oversees the implementation of federal mandates, including the *Coastal Zone Management Act*, and provides financial and technical assistance to coastal states, territories, and communities, and I'll be sharing a little bit about that today.

Partnerships are key to our work. Our partners are diverse, they include state coastal management programs, state emergency managers, local governments, the private sector, professional associations, coral reef managers, academia, other feds, whoever is appropriate for the issue at hand. We do have four major partnership programs that make up the Office of Coastal Management, and each relies on collaboration across multiple sectors. The first is the National Coastal Zone Management program, the second is the National Estuarine Research Reserve System, the third is our Digital Coast Partnership and the fourth is the Coral Reef Conservation Program. We also work closely with the National Fish and Wildlife Foundation to implement the National Coastal Resilience Fund, I'll be touching on that a bit later. And of course we partner across NOAA to identify and address research and data needs. I want to just highlight while we're still on the slide that the Coastal Management Programs in each of the states and the research reserves across the country provide both technical as well as sometimes financial assistance to state and local partners, and with resilience such a pressing issue for the region, those programs in the Southeast are really a great resource, they all have work underway on resilience and and can provide a lot of assistance.

So one of the key partnerships I mentioned was the Digital Coast partnership. For over a decade now, NOAA has been working with other organizations who have memberships involved in coastal management. Together, we've built the Digital Coast. It's an enabling platform where coastal decision-makers can find data, tools, training, case studies, tutorials, to help them address the issues that they face. The platform is built on interactions between partners and users, so as we're out in the field and our partners are out there and they hear needs on the ground, we try and find resources or build resources that can go up on Digital Coast to address those needs. So not surprisingly, there are a lot of resilience related resources on Digital Coast, and I'll highlight a few today, but do urge you to check out the entire platform.

So today I want to touch on a few pieces specifically in Digital Coast, that some of our natural infrastructure resources, our visualization tools, and also the Digital Coast Academy, which is a place where you can find a host of learning resources. A thread that weaves through a lot of NOAA's work, and then we believe a critical component for resilient ecosystems and communities is natural infrastructure. And you'll be hearing more about natural infrastructure from other speakers today, but this is a topic where we're really working to provide diverse resources because of the multiple benefits that can be achieved, and we try to show some of those multiple benefits in this graphic that you see. In addition to providing effective solutions for minimizing coastal hazard impacts like flooding, erosion, and runoff, nature-based solutions also provide ecosystem services such as improving water quality, providing critical habitat, and supporting recreational opportunities. And these multiple benefits mean that natural infrastructure really are win-wins. And so we have a whole section on Digital Coast that is focused on this, we have a topics page on natural infrastructure. Here you can find examples of projects, training, information on the benefits, and even visualizations to help communicate with others about natural infrastructure.

One resource I want to mention, because it's brand-new, is our nature-based solutions for coastal hazards course. This is a new training designed to help coastal managers, planners, and others to plan for and implement natural infrastructure projects. The course has a self-guided online module that covers foundational concepts, and then there's an in-person, one-day workshop where attendees get to interact with their peers and local experts and then they work to develop their own green infrastructure strategy. And I'm happy to share that since we rolled this out last fall, it's been very popular in the Southeast. It's been hosted by partners in Jacksonville, Florida, Charleston, South Carolina, and Beaufort, North Carolina. And I just checked out the list of attendees from Jacksonville and it was so great to see the mix, because there were resource managers, private sector engineering firms, state agencies, and even some local officials. So a lot of interest in green infrastructure out there. Another green infrastructure resource we have that's more technical is a mapping guide, and it's really to help spatial analysts develop their own GIS work plan so that they can map areas that will meet conservation goals and hazard resilience goals such as flood storage.

Turning now to visualization tools, I want to share with you two of the most popular resilience related tools that are available on Digital Coast. This first one, the Coastal Flood Exposure Mapper, helps communities visualize coastal hazards and also start thinking about solutions. The mapper allows you to search for a specific geography. What you see here is Charleston, South Carolina, and then you can look at various coastal hazards including high-tech flooding, sea level rise, FEMA flood zones, and storm surge, and the mapper can also provide a composite layer that combines the hazards to show highest exposure, that's what you see in this slide here. And then a user can overlay any coastal hazard with societal infrastructure or ecosystem maps, so looking at where you have infrastructure like schools or fire stations, and also looking at where you have natural infrastructure that can provide protection. This map here shows ecosystem types in different colors and development and greyscale, overlaid with high tide flooding. And this can help a user think about both where existing natural areas already provide protection, and to think about where additional natural infrastructure might be deployed. As you use this tool, you can make and save maps as you go with just a click of a button. And then at the end you come to a map library, and from that library you can take your maps and you can print a hard copy to bring to a meeting or you can email a colleague a link, so they're really easy to share once you've made your maps. And I'll just note that as a non tech whiz kid, I really appreciate the Coastal Flood Exposure Mapper, it's so user friendly, I've used it to make my own maps, I used it to make a map when I was working with a realtor to search for a house that would be safe from current and future flooding. So super super easy to use.

The second tool, this tool I wanted to mention is our Sea Level Rise Viewer. It allows users to visualize the potential impacts of rising water along the coast of the U.S. and its territories, and to visualize sea level rise

scenarios from the National Climate Assessment applied to their community. This tool also gives users access to the underlying data, and both state and local partners, as well as private sector companies that are helping communities plan, have used these underlying data layers in their own tools and analyses. What you see here on the screen is just the launch page but from here you can start the tool, you also see a tutorial, you can download the actual data, you can connect a related training, and finally you can also read stories about how others have used this tool, and I want to highlight one of those stories, which is Tybee Island. The city of Tybee Island which you'll remember from the opening slide there worked with partners to use the data from Digital Coast to assess their vulnerability and that ultimately led the city to adopt an adaptation plan for current and future flooding. And just a note here that my office provides technical assistance to coastal partners as well, so if a city like Tybee needs help accessing elevation data, we can walk them through that process or if a community wants some help understanding the latest sea level rise scenarios in that National Climate Assessment, we can talk with them about that as well.

As a final note on Digital Coast, I mentioned the Academy, and I really do urge you to check out this portion of Digital Coast, because it has a wealth of different types of learning resources. As just one topical example, risk communication is an area where we have work to provide a suite of resources from risk communication basics guidebook, that's something that flies off the table when I bring it to meetings, it's a really popular resource. But there's also a one-day training that you can ask to host, and there's also a webinar that shares seven best practices for risk communication. Oh dear, well this is my last slide and some are missing, so I'm gonna come out for a second and see if I can come back up to the appropriate slide, so just bear with me here. All right, I don't know why it was jumping in my presentation there.

So in addition to Digital Coast, I wanted to share with you some of the resilience funding and projects from the Southeast and the first piece I want to come back to is the National Coastal Resilience Fund which I mentioned back at the beginning. So the National Fish and Wildlife Foundation and NOAA are jointly administering the National Coastal Resilience Fund or NCRF, and this is our third year. NCRF restores, increases, and strengthens natural infrastructure to protect coastal communities while also enhancing habitats for fish and wildlife. Established in 2018, the fund invests in conservation projects that restore and expand natural features such as coastal marshes and wetlands, dunes and beach systems, oysters and coral reefs, that minimize the impacts of storms on nearby communities. In FY20, Congress appropriated 3 million for NCRF and demand for this has been very high. In 2019, the Foundation received over 170 pre-proposals from around the U.S., requesting $99.6 million. We're really grateful that this program is supporting projects that address both ecosystems and communities.

For the Southeast, there were four projects funded in 2018, you can see them up here, and one of my fellow panelists Lexia Weaver from the North Carolina Coastal Federation is implementing the first project here, so I think you'll be hearing a little bit more about that shortly. And in the titles of these projects, you can see that these projects really are meeting the dual goals of NCRF. And then in 2019, there were five Southeast projects that received funding, and at the top of the list you see again Tybee Island. So after assessing their vulnerability and working on an adaptation plan, the city is taking advantage of the National Coastal Resilience Fund funding opportunity to pursue natural infrastructure that will enhance their resilience. One of the things that's really exciting about NCRF is just the diversity and innovation that we see in projects, there's urban and rural projects, there's sand dunes, marshes, coral reef projects, and the implementers include local governments, universities, nonprofits, and state agencies.

And the last piece I'll mention are just a quick rundown on a few projects. The Post-Disaster Recovery and Redevelopment Planning project in Georgia was a super successful project that has gone on and been expanded. The Georgia Coastal Management Program worked together with their state Emergency Management Agency to help counties develop post-disaster plans, those plans have already proved useful in recent disasters such as Hurricane Matthew. And then the Southeast and Caribbean Disaster Resilience Partnership started as a group of public and private and nonprofit entities working on disaster resilience and recovery across the southeast states. They look specifically at how public-private partnerships can facilitate recovery, and then in the last year they have also grown to include Caribbean partners.

And finally two projects that I wanted to highlight that my office, the Office for Coastal Management, is supporting together with the Southeast Sea Grant programs, so North Carolina, South Carolina, Georgia, and Florida Sea Grant Programs were all collaborating on these two projects. The first one is complete, and it was a

legal analysis to look at some of the challenges that state and local governments are facing regarding sea level rise and how that's impacting road maintenance and infrastructure maintenance, some of those things. And so that research is done, there's a great legal review article called "Roads to Nowhere," I urge you to check out. And then that we have a new project that's just launching this spring that we're excited about that will build on that work, and we've asked researchers to look at the impacts of coastal flooding on access, and then look at how that is going to impact economics and coastal economy, so we're excited for that work to get underway.

And I will close it out there, but I do want to say that if anyone out there online would like more information or you want to request a briefing on anything that I covered, please reach out to Congressional Affairs Specialist Melanie Jackson, her email is up here on the screen, she can loop back with me and we can follow up. And I'll mention this photo is from Pivers Island, in North Carolina, which is right adjacent to a NOAA facility, and this is a big living shoreline project as you can probably see, so NOAA is trying to walk the walk as well as talk to talk. Thank you so much for the opportunity, and I will pass it along to Joanna.

Bresette

Thanks Heidi, that was great. I think our next panelist is Lexia, that's okay, I mean we can mix it up, but friends is our first webinar, I think we'll take it a little easier and just stay on schedule. Thanks Heidi, that was excellent. Our next speaker is Dr. Lexia Weaver, she's a coastal scientist at the North Carolina Coastal Federation and Heidi you just mentioned this organization in your presentation as the recipient of one of some of these resources to work on one of those projects. She's worked on coastal habitat restoration projects within the central region of North Carolina since 2007, focusing on the design, permitting, and construction of living shorelines. She also manages the Federation's Central Regional Office. Lexia's background is estuarine water quality and plant ecology and has conducted over 12 years of research in such environments in Florida, Delaware, and North Carolina. She holds degrees in Marine Studies from the University of Delaware, and in Biology from Barry University in Miami Shores, Florida. And with that, Lexia, I'll turn it over to you, really looking forward to your presentation.

Lexia Weaver

There we go, do you hear me? Okay, let me turn this back on. Okay do you see my slides? Excellent. Alright, well thank you so much for the invitation to present this afternoon, I'm Lexia Weaver, I'm a coastal scientist at the North Carolina Coastal Federation and I work on the design, permitting, and construction of living shorelines, both at public and private sound properties along the central coast of North Carolina, primarily using bags of recycled oyster shells as you see in the top leftmost photo of the slide. So this afternoon I'm going to highlight our approaches and our strategies for implementing living shorelines, and increase in their use in North Carolina. I'll also show you a few examples of living shorelines that we've implemented at different landscape scales, but also through different partnerships and funding mechanisms, in order to protect and restore these eroding shorelines as well as their habitats and make them more resilient to a variety of coastal hazards.

But before I do, I'd like to tell you a little bit about the North Carolina Coastal Federation, who we are, and what we do. The North Carolina Coastal Federation is a non-profit environmental organization, and we are focused on protecting and restoring the coast of North Carolina through environmental education, advocacy, habitat restoration, and preservation, we also host an award-winning free, daily environmental online news service called *Coastal Review Online* that covers the North Carolina coast. The Coastal Federation was founded in 1982 and we will soon be celebrating 40 years of coastal conservation, which is very exciting. We have 30 staff and a 30 member statewide Board of Directors that cover North Carolina's 20 coastal counties, out of three offices in Wanchese, Ocean, and Wrightsville Beach, North Carolina. So the North Carolina Coastal Federation, we focus on five main goals. The first is clean coastal waters that support fishing and swimming; living shorelines that reduce soundside erosion and provide habitat, which is the focus of my presentation today; thriving oysters that support the coastal environment and economy; effective coastal management that protects our coasts, any coast that is free of marine debris.

So living shorelines, to give you a little bit of background, they're environmentally friendly, more resilient and cost-effective alternatives to bulkheads and seawalls for protecting shorelines from erosion. They use natural elements such as marsh grasses and oysters to dissipate wave energy. The coastal hazard that they are addressing is natural and anthropogenic shoreline erosion from storms, sea level rise, higher water levels and tides, boat

wakes, the installation of bulkheads, as well as development. And unfortunately with the increased frequency of tropical storms and hurricanes, sea level rise, as well as human disturbances, it's very rare anymore to find a shoreline in North Carolina that is not showing some signs of erosion. So traditionally, the approach to control this erosion has been to use expensive bulkheads or stone ripraps. However, this hardening of the shoreline has led to the loss of valuable salt marsh and oyster habitat. So what happens is that when waves from boat wakes or storms come in and they hit the bulkhead, that wave energy has nowhere to go and instead it it's reflected back and as the waves recede back into the sound, in the process it takes away any sand and habitat that's in front of the bulkhead and it causes what it's called scouring. So any marsh or sand that was protecting the shoreline is slowly lost through time. When waves approach living shorelines however, that energy is not blocked, it goes through the rocks, through the structure, and then through the salt marsh grass, and that energy is absorbed and dissipated. And in addition as tide comes in over living shoreline, the sediments in the water they fall to the bottom at high tide, and over time sand and sediment build up landward of the rock sill, further protecting that shoreline from erosion. And the same is the case for natural salt marshes. The waves come in, they're absorbed by the plants, the extensive root systems of the salt marsh plants, they help to hold the sediments and the sand together and thereby prevent shoreline erosion.

And this is a bulkhead here in the photo on the left-hand side, that was built at Hammocks Beach State Park in Swansboro that was later replaced with the living shoreline in the photo just below it, consisting of a riprap still with salt marsh grass plantings. So depending on the wave energies at the site and the extent of erosion living shorelines, it can range from salt marsh wetlands at lower wave energies, to salt marsh when wetlands combined with a structure called the sill, or the gray infrastructure, that is located slightly offshore at higher wave energies. And these structures can be constructed using a variety of materials and I'll show you those in a few minutes. Another living shoreline technique that we use is a marsh-toe revetment in which material is placed right up against the existing eroding marsh and this approach is best suited for those areas where they are already severely eroded, have escarpments, and when salt marsh plantings wouldn't work, since so much sediment has already been lost. And so with this method you protect your existing marsh from further erosion. To show you how effective living shorelines are, these are photos of a shoreline in North Carolina before and after the construction of the rock sill, and this one was constructed by a contractor, and you can see the erosion that was affecting the shoreline and how the sill and the plantings have helped to restore that shoreline, making it more resilient to storms. So living shorelines provide many benefits, they are a natural alternative to the traditionally used hard shoreline stabilization methods, they attenuate waves, reduce shoreline erosion, they restore and protect valuable salt marsh and oyster habitat, they improve water quality, they are resilient and outperform bulkheads through storms, they increase property value and generally they're less than bulkheads. In addition to protecting shorelines from erosion, living shorelines also provide important habitat for oysters, fish, crabs, and birds. When they're built in areas conducive to growth, they can support significant oyster populations and recognizing this, living shorelines will be included as a major goal in the next update to the *Oyster Restoration and Protection Plan for North Carolina: A Blueprint for Action*.

So many factors are considered in the planning and design of living shorelines. We incorporate the science that has been generated from the many, many years of living shoreline research, thanks to our university partners, and we incorporated them into the design in order to install them at the proper locations with respect to all of these factors that are listed here, and to use the materials that are best suited for the environmental conditions at the site. So as I mentioned before, living shorelines can be constructed using a variety of materials and mesh bags here in North Carolina at least, in the central part of the state have worked incredibly well for living shorelines. They slow down wave energy, thereby reducing erosion and restoring valuable salt marsh and oyster habitat that has been lost. They are volunteer friendly, they recruit oysters and turn into productive oyster reefs in which the bags are no longer visible. They're also inexpensive and attractive to property owners, and they have fared incredibly well to strong storms, including the recent passage of Hurricane Florence in 2018. So, although these plastic mesh bags work extremely well, we realized that it's not the best material to be putting in the water, so we are partnering with several companies to develop potential alternatives to the traditional plastic mesh bags. So the Coastal Federation as well as many other organizations have been trying to find a degradable mesh that lasts at least three to five years to allow oysters to attach to and grow, and giving it time for the reef and the shoreline to get established before the material degrades. So we're also looking into options for a stronger plastic mesh that would not be damaged if the reefs are either affected by very high wave energies or surge, or if they are

harvested. We're also building living shorelines with Sandbar Oyster Company's innovative oystercatcher materials, which consists of jute mesh that's rolled up and coated in concrete, and it serves as a substrate for oysters to attach to and grow. Oyster domes or reef balls are another type of material that are used to build living shorelines. Other materials include oyster castles, and Atlantic ReefMaker ecosystem units which are also concrete-based. And finally at higher wave energy areas, rock sills that are comprised of granite, concrete, or marble typically used for a living shoreline construction. So there are a lot of tools in the living shoreline toolbox that can be used to build these projects.

So in terms of maintenance, unlike bulkheads, which often require costly repairs or replacement especially after storms, living shorelines, they require little to no maintenance and the salt marsh is restored in about one to three years. After Hurricane Florence passed, we assessed the majority of our living shorelines in North Carolina to see how they fared after the storm, and what we found was that the salt marsh plants and the rock sills, they were not affected by the storm and the oyster bags also remained in place and were not damaged. On the other hand, bulkheads were severely damaged, as you see at the top of that photo on the slide.

So to implement living shorelines, I can't stress enough how important partnerships are, we could not get any of our work done without our numerous and successful partnerships. We collaborate with people from all walks of life and professions to get to common ground and install practices that not only benefit the environment but also people and infrastructure, and these partnerships also help to obtain funding for these projects. In North Carolina, with the exception of the salt marsh plantings alone, which don't require any permits, living shorelines are structures, are required to obtain a *Coastal Area Management Act*, or CAMA permit. And before April 1st of last year, it was very difficult to obtain a permit for living shorelines, it just took a long time because a lot of agencies had to provide input on the project. And this was a major barrier for increasing its use in the state over bulkheads, which have always been very easy to permit. However, working with our regulatory agencies and our partners, as of April 1st of last year, simple and small-scale living shorelines can now be permitted in North Carolina just as easily as bulkheads which is great news and a great, great regulatory and partnership accomplishment in the state.

So many of the living shoreline projects that we've implemented have been through hands-on education and restoration, we've involved the community from students to camps to businesses, we'd involve them directly in the construction of living shorelines, whether it's planting or through the assembly and the transport of the oyster bags, and also to create community buy-in from various stakeholders as well as private landowners. The Coastal Federation has also conducted a series of open houses for waterfront property owners where they learn about living shorelines, and the steps that are needed to implement them. The open houses were also attended by contractors in order to link them with these interested property owners, and at the end of the open house it included a field trip to a nearby shoreline where the activities were able to go out and kind of picture what one would look like in their own backyard. We also conduct one-on-one living shoreline consultations with property owners. Last year we did 55 coast-wide, so we do get a lot of calls for people wanting information on living shorelines and we provide them with guidance and the next steps on how to implement them, so this is a good way to get waterfront communities to adopt living shorelines for protection and habitat, and we also try to reach on homeowners associations to get the community buy-in and support. So more recently, due to the demand for living shorelines we are relying more and more on engineers and contractors to implement living shoreline projects, and this is done on all scales. Through NOAA's Coastal Ecosystem Resiliency Grants Program, we were able a few years ago to pay and train contractors to build living shorelines through hands-on construction training, which was really effective and this has helped not only to create jobs but also helped with the economy.

So in order to implement our living shoreline projects, we've been very fortunate to receive funding from various state and federal grants, regional partnerships, and private funds. In particular one granting program that's been very effective and very important our grants that we've received from NOAA and the state's Community Conservation Assistance Program as well as the Southeast Aquatic Resources Partnership, we've been able to provide cost share programs as an incentive for waterfront property owners where the landowner pays a portion of the project and the grant pays for the other portion. And this has been an extremely valuable incentive to increase the use of living shorelines in the state, property owners are 100 percent more inclined to build the living shoreline if there's funding assistance to help them out, so there's definitely a need for these types of cost share programs in the state and nationally.

So as I mentioned before, we've implemented living shorelines from very small to large scales and on various types of properties including private properties, public properties and local governments and we're also working on implementing living shorelines at the state, national, and international level, and I'm going to briefly touch on a few of these projects to show you how they came to be. So the majority of our projects, they occur at the homeowner scale. This is a property in the Newport River here shown in the photo that has eroded due to boat wakes from an adjacent navigation channel and from storms, and the property owners shown here, Mr. Steepy, he was really concerned about how much salt marsh he had lost during a period of only a few years, and he worked with us to secure some cost share funding and we built a living shrine with volunteers using bags of recycled oyster shells on his property, and here are just some photos of some of our summer interns helping to build the sill. But the really cool thing that I wanted to highlight about this project and as well as several others is the domino effect that happens when you build these on a shoreline. So once Mr. Steepy's neighbor saw what we were doing and saw how effective the living shoreline was, they wanted one as well, so instead of doing a 100-foot living shoreline on his property, we ended up doing three total properties just at this one neighborhood, now other people in the neighborhood are also interested in implementing living shorelines, so we are very thankful for this domino effect and hope it continues. So this particular project again was made possible through funding from CCAP and NOAA, and Mr. Steepy, he's been thrilled with his shoreline and especially how it fared after Hurricane Florence, and I wish there was some time because that previous photo was a really neat little video clip of Mr. Steepy sharing his experience.

So the second living shoreline example is more on a bit larger and community scale at Trinity Center in North Carolina. Trinity Center is a retreat and worship center of the Episcopal Church's Diocese of East Carolina, and the center is also the location of a very popular environmental science-based summer camp called Sound to Sea, that is run by these fantastic environmental educators and I'll tell you in a minute why they are so fantastic, not only did they provide me with these slides, but they also did a really good thing for the shoreline. So Trinity Center is located, along its sound front shoreline is Sanders Point, and this is Trinity Center’s cherish landmark and worship area, and unfortunately through the years a lot of storms, particularly Hurricane Irene in 2011 and Hurricane Sandy in 2012 eroded the Center’s shoreline, and the environmental educators at Sound to Sea immediately contacted the Coastal Federation, they knew that this, the Center they were getting ready to pursue a bulkhead and they knew that this wasn't their best option, they knew the environmental benefits of living shorelines, and they also knew how the negative effects of bulkheads can have on estuarine systems. So they got busy, they went up the chain of command and they convinced them to build a living shoreline instead of a bulkhead, and that is why I think they're fantastic. So they used funds that would have gone towards the building of the bulkheads to build the living shoreline, and actually ended up saving the Center a lot of money. So they worked with us to obtain the major CAMA permit to build two 100-foot sills, they also acquired and bagged the shells using their environmental educators, and then once the permit was obtained they worked to secure volunteers and the community to move the bags towards the shore, and the 200-foot still was built in 2014. So the area landward of the sill, we also planted it with salt marsh grasses and to give you an idea of what it looked like through time, this is what it looked like before construction, a few months after restoration in April 2014, one year after restoration in May 2015, and then four years after construction in September 2018 and you can see how the salt marsh area has been restored by the living shoreline and that photo was taken after Hurricane Florence, and you can also see, the inset on that photo is how the oyster sill is also covered in oysters. So this is Megan and Mindy, who are the environmental educators at the Sound to Sea program, receiving the Coastal Federation's prestigious Pelican Award for their efforts to save this special place, and these educators have been incorporating this living shoreline project, as well as a living shoreline concept in general and their day-to-day lessons about the estuary, which is a great way to promote these.

So finally we're implementing these living shorelines at the local government level to help towns achieve their resilience goals. This is a project at Whitaker Point in Oriental that was actually brought to our attention by a local homeowner that we worked with to install a shoreline on his property. He lives across from Whitaker Point, Mr. Jim Blackerby, who provided me with this slide, and through the years he noted the significant loss of land from this very important Peninsula that protects Whitaker Creek, and about a tenth of the town including many important businesses, boat yards, marinas, and numerous residences. So if this peninsula continued to erode and is lost, it will expose the town to storm and wind impacts from the Neuse River. So recognizing the importance of this piece of land, we work directly with the Town Manager Diane Miller to secure a large grant from the National

Fish and Wildlife Foundation to protect the peninsula with living shoreline techniques. And this funding, although large, would have only maybe covered about a quarter of it but she was wonderful in securing these other funding sources, so now the entire peninsula can be protected, so it was a great example of leveraging resources and funding sources as well. So just some photos showing the erosion at the damage at Whittaker point, and since this is a large-scale project in a significantly higher energy site, we hired an engineer, Quible & Associates out of the Outer Banks, to design the shoreline and it will consist of granite sills on the higher energy Neuse River side of the peninsula, and the more protected side of the peninsula will have loose and recycled oyster shells, and construction is scheduled, we're very excited to start next month on this project.

So working even on larger scales, we've been working on an exciting collaboration to explore and demonstrate the value of nature-based solutions for highway infrastructure, so working with our partners at the North Carolina Department of Transportation we're participating on a project to help both the United States and the Netherlands manage flood hazards that can damage and disrupt highway infrastructure. So nature-based solutions such as marsh and dune restoration and other green techniques to reduce flooding and improve water quality and habitat are being explored as part of this collaboration. So looking ahead, I've identified some next steps on what we feel are the strongest needs for continuing to expand living shorelines in the future in North Carolina but also elsewhere. The use of living shorelines, they should be strongly promoted by regulatory and resource agencies when they're determined to be the most effective and practical shoreline stabilization alternative for a particular site. All projects also that require permits, they should be expected to conduct an alternatives analysis to identify the most appropriate and effective shoreline stabilization method, and unfortunately this is not the case now in North Carolina. Financial incentives, as I discussed before, these cost share programs will help to recruit more and more people to use living shorelines which will continue to demonstrate how cost-effective they are as a stabilization method. Another way to expand the broader use of living shorelines to provide grants to communities such as, for example the town of Oriental and other towns that we're working with, to construct living shoreline projects to demonstrate their effectiveness at enhancing the resiliency of the town's infrastructures. Another need is for short-term construction insurance to cover projects during the growing phase for the saltmarsh plans. And lastly, programs that help marine contractors to expand their businesses to build living shorelines, will encourage more property owners to ask for these projects as many waterfront property owners look to their contractors for guidance on what they should do to protect their shorelines.

So that is all that I had, and I look forward to some questions.

Bresette

Great, thank you very much Lexia. And a reminder on questions, for those who may be joined a little late, we are taking questions, the best way to get us a question or to ask a question is by visiting us on Twitter @EESIonline and sending it in that way, we are taking questions and they're coming in and we're gathering them and we'll distribute them, but we'll wait until all of our panelists are done before we start asking questions.

But that was a really great presentation, and now we are going to hear from Ross Weaver, no relation to Lexia, but Ross Weaver is the Program Assistant Director of Wetlands Watch. Ross's focus is on coastal resilience and environmental planning within Tidewater, Virginia. Prior to joining Wetlands Watch, he worked with the Thomas Jefferson Planning District Commission, the Institute for Environmental Negotiation, and the Sierra Club. He has a Master's degree in Urban and Environmental Planning from the University of Virginia, and Bachelor's degrees in Political Science and Environmental Policy from Virginia Tech. So with that, Ross, we'll turn it over to you, and looking forward to your presentation, thanks.

Ross Weaver

Sounds great. First, I'd like to thank EESI and our Congressional sponsor for holding this event and just to make sure, can everyone see my presentation? Excellent, great. So I'm gonna be focused on kind of a quick discussion on the local government perspective to coastal resiliency, really as it pertains, we focus on Virginia, but I think a lot of these case studies applicable to the rest of the Southeast region.

So I like to start my presentations with this slide, this is a cartoon from one of our local newspapers. Wetlands Watch as a whole, we really try to stay out of political discussion around sea level rise, in Hampton Roads and coastal Virginia as a whole, we're already seeing the effects of sea level rise quite a bit, so we focused

entirely on the adaptation side of this whole issue. Just as a kind of a frame of reference for what's happening locally in coastal Virginia, we have a tide gauge that actually goes back to the late 1920s, so we've got a pretty good record of our relative sea level, and we've seen about a one and a half foot increase per century, but you'll notice in this slide those rates have actually over doubled from 1953 to 1983, we're seeing about two and a half millimeters a year, for the last bit of study area we have we're seeing 5.4 millimeters a year. It's actually the highest rate, the mid-Atlantic has the highest rate of sea-level rise on the East Coast, for several factors we can get into if folks have questions about that. But in terms of kind of the effects that we're seeing today, I always try to include a slide showing a ghost forest, because I think it's kind of a canary in the coal mine for sea level rise. This is in New Jersey post Hurricane Sandy, so this is a large pine stand that is affected by saltwater intrusion, and it's all died out. So this can happen kind of quickly after a big hurricane event, and it also happens slowly over time.

But really we are seeing changes for our entire coastal ecosystem, and the reason Wetlands Watch actually got involved with sea level rise in the first place. About ten years ago we released a study and found that with two feet of sea level rise, we can stand to lose between 50 to 80 percent of our tidal wetlands, so that's the major issue obviously for us, because no one has estimated that coastal wetlands reduce damage just annually by about $20 billion a year, not even considering the environmental impact services that wetlands provide. Wetlands can survive sea level rise, they can migrate upland, but that's really determined based on the elevation of the open space behind the wetland. If there's a bulkhead, if there's hard infrastructure, those wetlands will join in place. That's kind of how we got involved, and that's an idea of some of the environmental issues. But since I'm talking with the locality perspective, I want to focus really on the built environments.

So this chart shows the 15 highest storm surge events in Hampton Roads. Within these 15, I think nine of these events have happened in the last 20, 21 years, but you take an event like Hurricane Sandy, which happened in 2012, and you had a foot and a half of sea level rise, which is what we're predicted to have by 2050, and you start to see really unprecedented levels of flooding in the region. I'm just gonna, as an example of this from outside of the region. During Hurricane Harvey, I believe 204,000 homes were damaged in that storm, three out of four, 75 percent of the houses that were damaged were actually outside of the regulatory floodplain, which means that those houses did not have to have flood insurance, they weren't required to. So when you're seeing these houses and these properties that are being damaged, a lot of these are areas that have never flooded before, as a result of the problems even exacerbated moreso.

But it's really not just large hurricanes and nor'easters that we're concerned about, we're also seeing a tremendous amount of nuisance flooding in the region. This is a picture of just tidal flooding from 2019 in Norfolk, Virginia. So this is often sometimes called sunny day flooding as well, but it's either driven by a high tide or wind or tides. I like this image because obviously it gives you an example of some of the day-to-day troubles when you came to your kids safely home from school, this image also shows the Chrysler Museum of Arts, which is one of the bigger cultural resources in our region. So my next slide is a graph, this is from the same neighborhood as the previous picture I showed, and it shows the hours per year that streets flood in the Hague, which is that neighborhood, so you can see a pretty significant increase over time, but when it really starts to get scary is when you add in projected sea level rise. So already we're seeing about five and a half millimeters a year, so that puts this kind of in the middle of that scary right bar there. So this really impacts the region a lot of different ways, this is an image of Norfolk's light rail system, which is clearly not being used at the moment, but if you can see to the right of this image, there's a Red Cross, this is also the location at the Santero Hospital, which is the only level two trauma center in the region. So if you can't access that, it becomes very problematic for citizens.

So really, it's not just strong events, it's not just nuisance flooding, one of the big issues that compounds the flooding of this region is our increased strain on the storm water system. So the city of Virginia Beach recently hired the firm Dewberry to create a study looking at precipitation events in the region. And they found a statistically significant increase in precipitation. So Virginia Beach has actually gone ahead and updated their whole stormwater standards, they've increased them by 20 percent to deal with this increased rainfall, but when it really becomes problematic, you take a high tide event, a nuisance flood event, and you have a precipitation event on top of that, and the stormwater system really cannot handle that kind of water, as the tidal flooding gets higher, the conveyance between the stormwater system becomes severely impacted, and often in our region we'll see water coming out of stormwater inlets, we'll see water bubbling outside of manhole covers, and so there's no conveyance happening whatsoever. So when you have a sudden rain event, you get events like this, obviously extremely disruptive to day-to-day life, there's a huge cost element to this as well.

So that's kind of, I know we don't have a ton of time in this presentation, that's kind of the idea of some of the issues that localities are dealing with. But for the majority of my presentation, I'd like to talk about some of the state, regional, and local actions that are already being undertaken, and some of the barriers we're having moving forward. So one of the things that I'm most excited about, Virginia is currently joining the RGGI market, so for those of you who don't know RGGI is the Regional Greenhouse Gas Initiative, it's essentially a carbon cap and trade system. But it's been projected that the annual revenue from that system will generate about $100 million for the state annually. The lion's share of that funding will be going towards flood preparedness and energy efficiency measures. So this is really exciting because it's sort of the first big pot of money that's been put towards resiliency in our state. Several years ago, in 2016, the General Assembly created the Shoreline Resiliency Fund. Unfortunately, that was never funded, it's still in the books, but it's never had a cent inside of it, so this is really our first opportunity to get some funding for a lot of these resiliency actions on the ground.

The governor's administration has also been really proactive in dealing with a lot of these measures, last year he released Executive Order 24, and the two big components of that were one, adopting a state flood risk management standard, this is modeled after the flood risk management standard from the Obama administration. But essentially, it's a higher regulatory standard for state-owned buildings within the floodplain, making sure that we protect that investment. And then the thing that I'm most excited about is the Coastal Master Plan. So that EO dictated that a Coastal Master Plan had to be developed, and this is something that about three other states have done to this point, it's a hugely valuable tool, especially when it comes to securing funding. After a big natural disaster, when federal funding becomes available, you really need to have a plan in place, and you need to be able to know where funding should go, where it's being dictated, and the states that have created these Coastal Master Plans, Louisiana has got an excellent one, they sort of have a leg up when funding becomes available. So that is one thing that I'm extremely interested about, excited about in Virginia. We're trying to help the governor's … working on that issue. It's a project that needs more funding but it's very important.

Looking more regionally towards Tidewater, Virginia, the General Assembly actually has created the mandate to plan for sea level rise. If you look on this graph in the light blue region, actually both of these, the darker blue and the lighter blue, all those localities are required to have a Coastal Resource Management Plan. And then in the darker blue region, that's the Hampton Roads region, those localities are required to have strategies to combat sea level rise, incorporated within their comprehensive plans. So that's a really helpful thing to have that mandate especially in areas where it's been a little bit dicier trying to get some of these actions put into place, having a mandate really does help quite a bit. One of the things we noticed at Wetlands Watch several years ago, is that there is a lot of inconsistency on what localities were planning to as it pertains to future sea level rise, this is a graph showing four of the more popular projections that we see, but each one of the organizations that has created the projections for sea level rise, they include a low, moderate, and high standard. So as a result, you have this kind of massive wave of all these different areas where you could theoretically plan. For but one thing that the Planning District Commission in Hampton Roads has done that's been extremely helpful is actually adopting a unified projection. So all of the localities within the HRPDC have agreed to plan to one and a half feet of sea level rise by 2050, three feet by 2080, and then for the longer-term infrastructure projects, roads and bridges, things of that nature, four and a half feet by 2100. So that's been one tool that's been quite helpful in terms of unified planning.

For those of you who are not as familiar with Virginia, we have a tremendous amount of military infrastructure within the region, the largest naval base in the world is located in Hampton Roads, there's also Air Force bases, NASA has a large installation in Hampton Roads, and so many of these spaces are threatened by sea level rise, but also the localities surrounding them are clearly impacted. So one thing that we do is a series of joint land-use studies, because they're essentially partnerships between military installations and their surrounding localities. This is a great tool, because frankly I mean, with a military installation, the effects of sea level rise extends beyond their borders, if you have servicemen and women who can't get on base because the main corridor to get onto base is flooded, it really becomes a national security issue, so this is a way of doing a community driven planning process to identify projects and kind of put them the queue for federal funding. And I've included a link if you wanna see more information than the three current existing plans that are being conducted.

Moving towards some of the local action, Norfolk has done a tremendous job playing for sea level rise, several years ago they did a complete rewrite of their zoning ordinance, and they had the stated goal of creating

the most resilient zoning ordinance in the country. I think they've done a great job of actually making that happen, they've dramatically increased the elevations that homes have to be built on, they've incentivize different standards to encourage green infrastructure, anything from rain barrels, to cisterns, to green roofs, but the thing that I'm most interested in with this ordinance is the resilience quotient. Essentially, this is a menu of different tools that can be used to increase the community's resilience, and a developer has to get a certain number of points within that kind of menu of options to be allowed to develop. So that's a tremendous, tremendous tool, and really when you're thinking about how a locality responds to sea level rise, it's that sort of regulatory action that really makes a large difference over time.

Kind of in terms of more built environment, actual projects on the ground, I had to include this image from the Ohio Creek project, because this was something that just broke ground about two weeks ago, but this is kind of Norfolk's idea of the neighborhood of the future, the coastal neighborhood of the future. This originally started as a project, Wetlands Watch, we have this sort of separate program we call the Design Collaboratory, where we try to connect academic institutions with neighborhoods that have flooding problems, so I'll get engineers and architects and planners to come in and do kind of ground level, initial planning for specific neighborhoods. We did that in this neighborhood with students from Hampton University and Old Dominion University, and those designs were actually folded into the city's application for a Housing and Urban Development grant, that was actually successful, they got 115 million dollars to develop this project. Super exciting, really, can't wait to see how this turns up. For ... projects, we haven't had that kind of success again, but we've been able to leverage those student designs for a variety of smaller projects, I've been in several ... that do that kind of work.

Virginia Beach has also been a huge leader in the section, they just released their draft adaptation strategy, it's called Sea Level Wise, and with this strategy, this is a five year program, they used three million dollars of the city's own funding, they also had support from NOAA, and they're really moving from the planning phase to the implementation phase. So I'd encourage everyone to take a look at this draft, there's some really really interesting projects listed within it. And then I've mentioned that Virginia Beach took that Dewberry study about increased precipitation and actually changed their storm water standards for the first time, there's a really huge event acting kind of as a leader for the region. But one really unique thing Virginia Beach has done from the past year is that they're the first locality we've ever seen that's actually said no to a development based on future flood conditions. So there is a developer who wanted to build in a really soggy area in southern Virginia Beach, an area that's already had a lot of flooding concerns, and they actually said no to that project, and they got sued for it, but they won, and it's a really, really good success story that's a nice precedent for the other localities in our region.

Hampton is doing some great stuff too, they have a wonderful resiliency plan, but I wanted to include this slide as an idea of how some of these localities are thinking more creatively about some of these concerns. Hampton has actually created no-wake zones in their locality, so some of these streets flood so often, that people drive through them and create wakes that erode the foundation, that's a property nuisance. Sounds crazy, but it's actively happening. So this is kind of an idea of some of the outside of the box thinking that a lot of localities are using to address these issues. Having said that, there's a lot of great work happening on the ground, but there are some major challenges that remain. Most localities here, they all have programs where they use FEMA funds to elevate houses. Unfortunately, there's not enough FEMA funding to deal with all the repetitive loss properties in our region, we did a study several years ago and found that if you took every repetitive lost property through the FEMA process, it would take somewhere between 78 years to 188 years for each locality to get those properties mitigated. So, FEMA funding is now the golden bullet, it's going to fix any of this.

One of the things that we really encourage is trying to switch localities towards thinking about managed retreat. So instead of elevating a house and still having people live in harm's way, still having to look how to be on the hook for utilities, for services, we're trying to move people out of the most flood-prone areas, demolish damaged homes and turn that land into open space. And the Living River Trust is one way we're trying to do that, this is the program we're working on with several nonprofit partners to try to figure out the strategies to encourage the storm and managed retreat along from the shoreline. And again, really interesting project, I don't have time to talk about but take a look at the link if you're interested in that.

And then this isn't a project, AdaptVA.org is something that we've worked on with the Virginia Institute for Marine Sciences and the Virginia Coastal Policy Clinic, and essentially it acts as a one-stop-shop for resilience needs within the state. So it has different sea level rise projections, it has adaptations and case studies, there's a

geoportal that has data that the localities or concerned partners can use, and there's a kind of an online web viewer that's really interesting as a part of this project, so you can look to see if you're in regulatory floodplain you can add in sea level rise projections, look at critical infrastructure, there's social vulnerability there as well. And one really interesting component to this that we've been able to work on with VIMS, thanks in large part to support from NOAA, is actually developing a tool that helps to identify where a locality should prioritize nature-based features; wetlands, coastal forests, things of that nature. So it's a tool that looks at all the structures along the shoreline, it identifies for the existing natural features what's actively protecting a structured nearby, and so I can say this forest is protecting 13 structures nearby, 25 structures nearby, and then it can say you know this area doesn't have an existing natural feature, but if one was put in, it could protect four to five different houses from sea level rise or from storm events through wave attenuation, things of that nature, so excellent tool to check out, that's AdaptVA.org.

So this is my last slide, I know I'm starting to run a little behind. I just to reiterate, there are a lot of major challenges that are really affecting localities, for example Virginia is a buyer beware state for flood risk, if you're buying a home there's no requirement for anyone to disclose that it's been in the flood zone, that it's had flood damage. There's currently legislation to change that, so we're actively supporting and watching that. To this point, there has been legislation in the past that has not gone through the General Assembly, but we're hoping that that will change. Virginia is one of only a few states that is buyer beware on flood risk, so we're hoping to change that. One of the interesting things that we've seen is this issue we've found with cost-benefit analysis, essentially that different federal organizations use different methodologies to conduct a cost-benefit analysis. So for the Army Corps, for example they calculate benefits as flood losses avoided, so if you're mitigating a structure that has a high value, you get a higher BCR. This is problematic when you're trying to work in a low to moderate income community. For example the city of Hampton was looking to install a tide gate in the low to moderate income neighborhood, and they were not able to get a high enough BCR, because those structures weren't worth enough money. That's obviously, there's a social justice element, there's an environmental justice element there. And in fact as an example that Ohio Creek watershed project that was in one of my previous slides, he put that through the Housing and Urban Development benefits cost ratio, it's 35 to one, and he put that in the Army Corps' benefit cost ratio, it's five to one. So this is one example of some of the regulatory issues that localities are facing.

And in addition to that, we need to update Atlas 14, which essentially it's a precipitation study, that's how the state bases its storm water standards. As I mentioned before, Virginia Beach has done its own study and increased their stormwater standards because we're seeing so much more increased precipitation, but we need a statewide study to see if that's happening throughout the entire state, to see if all localities need to adjust those standards. Localities have issues with grant applications, it's hard to be aware of all the opportunities that come through. Almost no localities have dedicated grant writers, so even when someone's aware of a grant opportunity, it's very rare that they can actually get funded in time. There are issues with matching funds, all of that. So really in a long way of saying that our biggest issue remains funding, it's very challenging. A lot of good work on the ground, but funding remains our biggest concern.

So that's all I have, please do reach out to me if you have any questions, I'd love to chat, have another meeting, anything like that, but I'll bring it back to the moderator.

Bresette

Thanks Ross, that was a great presentation and one thing you mentioned a few times is your presentation had some links in the slides, I just want to remind everyone the presentations, as well as written summaries and the video recording will be available at EESI.org at some point sometime in the next couple days or weeks, so if people need to go back and check that out, same thing with the YouTube video from Lexia's presentation, we'll definitely be able to have that online for you.

Our final speaker is Joanna Walczak, she is the Southeast Regional Administrator for the Florida Department of Environmental Protection's Florida Coastal Office, she's based in Miami where she oversees the Biscayne Bay, Coupon Bight, and this one's gonna get me up but let me see if I can say it, Lignumvitae Key Aquatic Preserves, as well as Florida's Coral Reef Conservation Program. Joanna, you can tell me if I got that right or not. Joanna's the state's co-manager of the Florida Keys National Marine Sanctuary with the National Oceanic and Atmospheric Administration, she's also the state's point of contact for the U.S. Coral Reef Task Force, and U.S. All Island's Coral Reef Committee. Joanna, really looking forward to hearing your presentation, I'll turn it over to you.

Joanna Walczak

Thank you for this opportunity, thank you to EESI especially, thank you Representative Rooney. Alright, welcome to Southeast Florida, where we have Florida's coral reef, which is over 330 nautical miles, starting in Dry Tortugas down in the southwest coast all the way up to Martin County. It is the largest continental barrier reef in the U.S., and I apologize for the technical difficulties, my internet seems to have just decided to get challenging. This coral reef is unique in the United States because it is in close proximity to such a dense and urban population in South Florida. Many of you may know about the Florida Keys National Marine Sanctuary, and different ways that we manage the reefs through the NOAA process, and federal processes, the National Parks, [inaudible]... called the Southeast Florida Ecosystem Conservation Area, and I just wanted to highlight that there are so many different uses of this system, that there are many ways we need to manage for it. Most of the time [inaudible]... the sea, but what most folks don't know about are that they're ultimately our first line of coastal resilience and defense in the southeast part of our coast [inaudible]…. The more life they have, which means the higher they are, they ultimately provide a level of ecological service called shoreline protection, and we now have the ability thanks to the U.S. Geological Survey to value those benefits. This [inaudible] valuation of that role of shoreline protection, and Florida's coral reefs alone provided over $330 million annually in shoreline protection, and that goes to over $1 billion in flood reduction and infrastructure protection in a severe storm event.

I wanted to highlight this area down in southeast Florida around Miami and Broward County. This is a major metropolitan area that is receiving direct benefit from our coral reefs offshore. We also [inaudible]... this alone is a billion-dollar industry. We also know that there are drugs in the market already using coral reef organisms, and so we essentially have a backyard medicine cabinet. And then most people think about tourism, how folks come to coral reefs to snorkel and dive, and Florida's reefs alone provide over 71,000 jobs and $6 billion annually. And these are outdated numbers, this is back from 2001 and 2004, so I can only imagine the numbers today.

Globally, coral reefs are under threat and Florida's are no different. So I'm sure you guys have heard about the increased frequency and severity of extreme thermal events, in this case hot and cold water, but I also wanted to point out as unfortunately we're seeing in the terrestrial side of the world these days, pathogens are becoming more violent with the changing environment. We're also dealing with ocean and coastal acidification, coastal acidification being defined here as increased land-based sources of pollution that are leading to these major pH changes now. We also in Florida are compounded by the local stressors. We can do things about the local stressors, things like the coastal construction, the kind of over loving of our coral reefs [inaudible].. very complex especially in these environments where you have a very dense population. But they are in our control. Unfortunately, like any wildlife population, living in a really stressful situation for prolonged time leads you to be less resilient and less able to fend off things like disease that come across.

So unfortunately, back in 2014, we started witnessing at that point, a small-scale coral disease outbreak started near Miami, and it rapidly spread over the past six years. It has spread across almost the entire reef, and as of this month is officially past the Marquesas Keys out west of Key West, and here is why that's so important to all of us, because it is starting to spread now into the Atlantic Caribbean, it has gone beyond Florida and currently we don't see any signs of its stopping. This is really, really important because it's actually eating the living veneer of coral tissue, it's called stony coral tissue loss disease. It's highly infectious, it is waterborne, it has a long residence time of pathogens, we're looking at six years whereas previous disease events we had only seen a matter of a couple of months to maybe a year. It affects over 22 of the reef building corals that we have, and that's very different from previous disease outbreaks, where previously maybe only one or two species were impacted at a time. So we're really talking about more than half of the primary rebuilding species of coral in the Atlantic Caribbean are being impacted by this disease. In certain species we're also seeing an incredibly high prevalence rate. What that means is in certain species, for every hundred colonies we looked at, we could see 95 of those colonies being impacted by this disease. It also has an incredibly high mortality rate, which means that once it is infected, it is more likely than not to fully die, and that is impacting both the youngest colonies all the way up to our oldest colonies. And back in 2015 we lost a colony that was over 330 years old, and just to underscore that that's older than our country.

So at this point we're pretty safe in saying that this is a globally unprecedented coral disease outbreak, and because it's unprecedented globally we had to pull together an unprecedented response to it. And so we have

unified every single partner that we possibly can in Florida to collaborate on this very important response effort. It is overseen by two state agencies and two federal agencies, but it is really a compilation of all of the local, state, federal agencies, NGOs, academia, climate partners, you name it, anyone is welcome to this table, and we are really, I feel like this is one of the most awesome accessories that we've seen because we have broken down the agency silos, broken down the data sharing silos, and making sure that we are transparently, openly communicating across all of these different institutions, which as I'm sure you can understand is very complex, but it's a testament to how important this effort is. I've got two websites on the bottom there in case anybody wants more details on the very high level that I'm about to go over. The one on the left is the technical website, the one on the right is more of a media communications summary.

So really quickly because I know we're getting short on time, we're taking two approaches just to this event; the short-term, on-the-ground response, and then the long-term addressing those ecosystems' resilience. Short term, we are working with our teams to identify the pathogen and characterize the disease and how it's being transmitted, and determine if any of the environmental factors like nutrients and temperature and salinity are actually helping drive this disease. We also know that we can't wait to figure out what it is, it may take years, and so we worked with our teams to develop lab trials and ultimately field trials to take action and treat the lesions that are on these corals in order to maintain a wild population in the short-term. We also know that we needed to go out and rescue both the ones that were before the disease boundaries, so we went out and actually took corals out of the water and got them into aquaria. And now as the disease has been moving through the reef, we were actually collecting the genetics from the survivors. And ultimately this genetic material, the ones that have never seen disease and the ones that have lived through it and survived, those will be combined into the new generation of super strong coral. The only [inaudible] structure, they create these big large facilities that can grow baby strong corals and create the capacity to do so to build the technical resources as well as the infrastructure. And so we are looking at developing even a whole workforce flow of creating a new industry in South Florida specific to the grow out of these new corals. But ultimately, because this disease has lasted way longer than any of us anticipated, we're still doing some very kind of fail fast projects to understand what, where, and when we can restore. We don't want to be putting corals out there that we know or that might just die again, and so we're doing very quick and easy projects to understand what the most appropriate thing is to store, and when.

In terms of the long term, ultimately we will not be successful with all of those things that we're doing in the short term if we don't address the ecosystem resilience and address those ecosystem stressors. So thankfully, we have an amazing administration who's got a bold vision for a brighter future specifically about restoring water quality here in Florida, and we are working within all of the state agencies to align as many possible tools as we can to address the water quality coming. Florida is one big watershed and so everything that happens upland happens and funnels out into these reefs, but one of the things that we've highlighted is that because this is a unique ecosystem, we don't have coral reef specific water quality criteria established and so we'll be moving forward with that with assistance from many of our partners.

But we also know that the public-private partnership is a main focus of building a future here in Florida. The Florida Keys, I'm sure many of you have heard it just put out this really amazing partnership called Mission Iconic Reefs and it's bringing together all of the practitioners to really make a difference in restoring seven iconic reefs in the Florida Keys. We also were just successful in partnering with the National [inaudible], if you saw the Super Bowl in Miami and see us, but our partnership with Force Blue, who are a mission oriented group of special operations veterans, have selected Miami to restore, they actually planted a coral field and are working to bring together new and exciting private partnerships along with all of the work that we're doing in the public sector, and implementing these ecosystem restoration projects.

And the last thing I want to leave you with is that we know that we have to be [inaudible] order to [inaudible] so we're talking about, and so you heard earlier about the living shorelines and evaluation from the different federal agencies that go into building plans, projects, and through the Nature Conservancy, there's some excellent work being done in Mexico as a pilot project, they're doing a feasibility study here in Florida as well as Hawaii on whether or not we can create a parametric insurance for coral reef restoration. This would be specifically triggered after hurricane events that may damage the reefs, because these reefs are shown to have such economic contribution to protecting not just our beaches, but our coastal infrastructure, and so is there a way to create that cost-benefit link? But finally, it is really about making sure that all of this is getting to our stakeholders, is communicated to our stakeholders, and that our stakeholders now have a voice in determining

where we go with reef management and with coastal management in the future. And so these are all some logos of the partners that we work with in the partner groups, but I think this is probably one of those important things that we continue to do as our ecosystems keep changing. And I will leave it at that, thank you.

Bresette

Thanks Joanna, thanks very much. We have a little bit of time in our allotment, and I'm gonna skip ahead to questions from our online viewers. Since I have been asking people to submit questions, I might as well reward them by actually asking them rather than asking mine, so let's start with, one question is about redirecting funds from programs or projects that promote less sustainable infrastructure construction, and the question is how can we better devote resources to living shorelines and other more sustainable infrastructure projects, and devote fewer of our resources to building things like those bulkheads that will just deteriorate and cause lots of other problems? What are your ideas, panelists, for how we can do that a little bit better? And anyone's welcome to jump in but if not, I'll call on Heidi first, if she has anything, but I can see you, so if you have anything you want to say, communicate it visually.

Stiller

Okay, sure. So I think that there are some good innovations happening to really encourage resilient measures right, and we heard a little bit from Lexia about how the permitting process is now on equal footing, so it's just as easy to do a small-scale living shoreline as it might be to do a bulkhead. So that sort of thing is really good to see, and I think that providing new funding sources to do some of these more resilient measures, we're also seeing that, and there's new investments at the federal level in mitigation and resilience work. We see that in FEMA moving towards building a resilient infrastructure and communities program, that's going to be coming out soon. And we see it as well from the Housing and Urban Development, their Community Development Block Grant Mitigation Program is helping areas after disaster do this mitigation and resilience work, which is really great to see.

Bresette

Thanks. Lexia, do you have anything you'd like to say as a follow up?

Lexia Weaver

Just that that would be a wonderful thing, to just fund those projects that will better the environment, absolutely, which I think is what's being done now. I mean, I don't think you can get funding to build the bulkhead, not that I'm aware of.

Bresette

Ross?

Ross Weaver

Yes, I would just say from a regulatory standpoint, for a while Virginia had a policy of making living shorelines the preferred alternative, but that has just been strengthened to where now if you're trying to build a bulkhead you actually have to prove that a living shoreline is not suitable for the site, which is a much stronger requirement, I think that helps quite a bit as well.

Walczak

I was just going to mention that some of the work we're doing is on trying to figure out how to incentivize projects like this within the regulatory models, so when they do the calculations of the cost-benefit, providing a better way to value things like this that are equal to a bulkhead is really needed, especially in the coral world, I know we struggle with it, planting a coral does not give you a lot of lift in these models, and so making sure that you can figure out out of the box way of creating that incentive.

Bresette

Heidi, in your response to that question you mentioned permitting, and we got a question about permitting. And the question is, how does that process get easier? Are those local authorities, state authorities, or the federal authorities, and what's specifically changed? And Lexia, I think you were the one who actually gave the example in your presentation, so maybe we'll start with you, but how does it actually happen, how does permitting become easier?

Lexia Weaver

Sure. So, this was a process that was started by our state's Division of Coastal Management, so they got all of the state and federal agencies that provide input on living shoreline permits together along with practitioners such as the Coastal Federation, and some local scientists as well, and it took a series of meetings and quite a bit of time, but we got there. I mean, it's a great thing, we all sat down and came up with permit conditions that everyone was happy with, so for example for these projects, you can't use fill or you can't go a certain distance offshore with the structure, they can't be a certain height or things like that, so we got to permit conditions that everyone agreed with and then that way, as long as those permit conditions are met it doesn't require the extra state and federal agency input which shortens the amount of time for the permit. So it was led by our state, but again having everyone come to the table and provide that input was really important.

Bresette

Is that something that's specific to North Carolina, or is that process something that other coastal states could potentially replicate?

Lexia Weaver

I'm not sure, but I'm sure if it's not something that's being done in other states that it could be replicated, and I'd be happy to put anyone in touch with how we did the process and change that ruling and amended that permit to require less input from the agencies and streamlined it.

Stiller

And I'll jump in and mention that South Carolina is working on this very thing right now, the state Coastal Management Program is partnering with their research reserves to study different living shoreline methodologies so that they can develop regs that will be smart for the environment, and also help with some of the permitting challenges, so South Carolina is working on it too.

Bresette

Ross or Joanna, anything you'd like to add? I'm sure you have permits where you live, too.

Walczak

Yeah I'd just add that with the very rapidly changing ecosystems out there, our regulatory structure is not flexible enough to keep up with some of the very fast decisions that have to be made, and very pilot-scale treatments that we're having to do in the coral world, and so we've been working very closely on that with our federal family partners to look for opportunities there, but sometimes it's not a federal issue, sometimes it's a local issue as well, so it's just something that I think all of us and the coastal systems will have to be adapting to is adapting that regulatory framework.

Bresette

Ross, feel free to jump in there if you'd like, you might get the last word.

Ross Weaver

I mean that kind of covers it, I think that there've been some talks about trying to simplify the permit process here as well, but really I think the kind of the actions like I just mentioned with the living shorelines becoming the sort of the de facto shoreline management solution there are really kind of where we're at.

Bresette

And I think that is actually the last word, we are just about at 3:30, and so I think we'll go ahead and close there. Thanks to you all for your flexibility this week and your understanding, as we had to cancel travel and move this online, hopefully we'll have an opportunity to meet in person sometime soon and talk a little bit more about these issues. EESI does this, is going to be continuing doing this work for some time, hopefully we'll have opportunities to meet and continue, so thank you very much for that. Also have to say special thanks to Amber and the rest of the policy team here at EESI, and especially Tom Murray and Dan O, I'm the Dan B, he's the Dan O, for all their work getting us set up with technology on very short notice, the technology I think that worked pretty well, but if you have thoughts that you'd like to share about that, panelists, you're welcome to share with us, but also our attendees, our viewers online, if you have feedback that you'd like to provide about either the platform that we used or the format that we used, this is pretty much how we do our briefings in person, fewer interruptions in terms of flow, I didn't have any follow-up questions for our panelists today, but we're looking for any feedback because we do have another one of these next Friday talking about Hawaii coastal resilience and resilience financing. We're also going to, probably in April have one on Alaska coastal resilience, and one probably in that same time frame although it's not quite set yet one on Puerto Rico and Virgin Islands, looking at how you engage in resilience while you're also attempting to recover from natural disasters. So those briefings will finish out our series, and we're probably going to have to hold those while we're all teleworking, so anyone who has any feedback please go ahead and take our survey. While you're online, please follow us on Twitter so you can ask us questions next time, and never forget, always sign up for *Climate Change Solutions,* it's the best newsletter to keep up with EESI and pretty much anything else the federal government's trying to do on climate and clean energy policy. So with that, all thanks everyone, thank our panelists again for being with us today online, and thanks to our attendees and hope everyone makes the best of a bad situation. Social distancing, this is a pretty good example of social distancing, I'm alone here, and wash your hands and do everything else that you're supposed to do to keep healthy, so with that we'll end there. Thanks again, and have a great rest of your day and great weekend, thank you.

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