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Committee on Environment
and Public Works

Washington, D.C.

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THE ROLE OF NATURAL AND NATURE-BASED FEATURES IN WATER RESOURCES PROJECTS

Wednesday, June 24, 2021

United States Senate

Committee on Environment and Public Works

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The committee, met, pursuant to notice, at 10:05 a.m. in room 406, Dirksen Senate Office Building, the Honorable Thomas R. Carper [chairman of the committee] presiding.

Present: Senators Carper, Capito, Cardin, Kelly, Wicker, Sullivan, Ernst.

STATEMENT OF THE HONORABLE THOMAS R. CARPER, A UNITED STATES SENATOR FROM DELAWARE

Senator Carper. Good morning, everyone. We are pleased to call this hearing to order this morning.

To our witnesses, Dr. Bridges, when I say Dr. Bridges, my sister and I grew up in Danville, Virginia, born in West Virginia, but grew up in Danville, Virginia. Right across the street from our house was Woodlawn Baptist Church, where our minister was Dr. Bridges, so I feel we should open with prayer, but maybe for another day.

Glad to see you, Dr. Galloway. Dr. Galloway, would you raise your hand for us, please? Dr. Galloway, nice to see you. How many years in the Army?

Mr. Galloway. Thirty-eight.

Senator Carper. Thirty-eight, but who is counting? That is great. Thank you for all those years.

Then, we will just call on Chett. Great to see you, Chett. My talking points here say that I should pronounce your name "sha-son," is that right, Chiasson? Chiasson? Has your name ever been mispronounced?

Mr. Chiasson. No, never.

[Laughter.]

Senator Carper. I am sure.

Ms. Ufner, Julie, where are you?

Ms. Ufner. Right here.

Senator Carper. Julie, great to see you.

Rick Johnson as well. Rick? Thank you. We welcome you, one and all. Thanks for joining us today, not only thanks for what you do with your lives, for our Country and for our planet.

I also want to thank Ranking Member Senator Capito and everyone on our committee, all the members of our committee. I want to thank our staffs for doing the work in preparation for this committee and giving us a chance to hopefully serve as an example for the Congress, advancing things like our bipartisan water infrastructure legislation that passed the Senate unanimously, 89 to 2 out of here, committee on a unanimous basis, followed by our surface transportation legislation, which we passed out of here last month on a unanimous vote. So we try to set an example. We are a workhorse committee, and we like being a workhorse committee.

I hope we are going to continue this track record as we start to work on the next Water Resources Development Act.

As we get started on that legislation, it is important to reflect on the work being done by the U.S. Army Corps of Engineers to address our Nation's water resource infrastructure needs. Throughout much of the 20th century, the Army Corps has successfully provided communities across our Country, including our communities especially, with protection from powerful floods

and helped shippers navigate our waterways safely to support trade and our economy.

With the support of Congress, the Corps has evolved its planning practices to consider projects that do not solely rely on steel and concrete, but also incorporate approaches that work in concert with nature itself. All too often, in the past, these nature-based approaches have failed to make it past the planning stages.

Fortunately, however, in my home State of Delaware and other parts of our Country, we are beginning to witness more frequently the benefits that these natural infrastructure projects can bring not just to our economy, but to our environment.

One example, for us close to home, is Bethany Beach, Delaware, which is located midway between Rehoboth Beah and Ocean City, Maryland. Rather than relying solely on seawalls and other hard surfaces that will decay and age in time, this project uses dredged materials to construct dunes and to place sand to protect coastal communities from hurricanes and other storms. We don't get a lot of hurricanes in Delaware. We get a lot of Nor'easters, which can be even tougher than hurricanes to deal with.

I think we have a picture here, somewhere. Do we have a picture? There it is; a picture of Bethany Beach in 2007 before

this natural infrastructure project. Where is the beach, you ask? Well, it is underneath that project, or it looks like a series of buildings on the right.

That is what Bethany Beach looks like today. There we go. What a difference a day makes. It actually not a day, what a difference a decade makes. We have come a long, long way, as you can see.

Like many of our States, Delaware's economy relies in no small part on tourism, and supports our five-star beaches, which is critical. This project protects more than just homes; it protects Delaware jobs and it protects our economy, too.

The Corps is not the only federal agency using natural infrastructure. In 2016, the Fish and Wildlife Service completed the restoration of Fowler Beach at Delaware's Prime Hook National Wildlife Refuge, a great project I am happy to be involved in. That is what it looked like, on the left, that is what it looks like today. Here, you can see before, on the left, and after the restoration on the right. We chose to work with mother nature. It is pretty amazing what the transformation has been.

This project has provided crucial habitats for threatened and endangered species, all while reducing the risk of flooding in nearby communities. In addition to protecting Delaware and the communities found along our Nation's coastlines, the Army

Corps has also provided critical support to our navigation channels, including construction and maintenance of one of our most vital shipping arteries in the American economy, and that is the Mississippi River.

Over time, the Corps has significantly altered both the course and the banks of the river through and system of dams and levees. While this system of flood control structures has protected communities from flooding and supported commerce, it has also had the unintended consequence of accelerating land loss in Southern Louisiana.

The Corps' infrastructure along the Mississippi restricts the river's natural placement of nutrient-rich sediment, which is essential for fish and other wildlife habitat, while also providing significant protection from hurricanes and storms.

Sadly, also amazingly, Louisiana loses, on average, a football field of land every one-hundred minutes. I had my staff double-check that. A football field of land every 100 minutes, just think about that, due to sea level rise caused by climate change, and our existing infrastructure is not making it better, but appears to be making it worse.

Louisiana's Port Fourchon is a vital economic driver for the Nation and has recognized the problem there and taken critical steps to increase local resiliency by using both grey and natural infrastructure together. Not just one, but both.

The port has worked to create hundreds of acres of marshlands to help reduce the impacts of storm surges, promote tourism, and rebuild Louisiana's ecosystem.

Incorporating natural infrastructure elements in the Corps' Civil Works projects can have real benefits, like those see in my home State or in Louisiana, but as I mentioned, the use of these features is still the exception rather than the rule.

That is largely because the Corps' current budgeting practices fail to capture all the benefits of natural infrastructure, especially when that infrastructure can lessen the impact of a future storm or natural disaster. For example, in budgeting for a project, the Corps currently does not count any damage avoided from future storms as a project benefit, and that is something that we believe that needs to be changed.

Today, we hope to explore the Corps' progress in using natural infrastructure and to understand how the Corps will incorporate natural infrastructure into its future planning for Civil Works projects. I am sure Dr. Bridges has some answers, and we look forward to his testimony.

The Corps has a great motto. I hope I get this right: "Essayons." I think that is right, something like that. It means "let us try." Let us try, and while we know the Corps can engineer solutions for the Nation's toughest water resource challenges, when it comes to incorporating natural and nature-

based features, it is time for us to move on to "let us do." Let us do.

With that, let me turn to our Ranking Member, Senator Capito, for her opening remarks. I am delighted to be with you, Senator Capito, and grateful to you and your staff for working with us on this.

[The prepared statement of Senator Carper follows:]

STATEMENT OF THE HONORABLE SHELLEY MOORE CAPITO, A UNITED STATES SENATOR FROM THE STATE OF WEST VIRGINIA

Senator Capito. Thank you, Mr. Chairman, and I want to welcome our witnesses. I look forward to this testimony. The timing and focus of this hearing is appropriate, as we passed WRDA out a year ago. In WRDA, as we know, Congress authorizes water resources projects and set National policies for the Civil Works Program for the U.S. Corps of Engineers.

From navigation to flood risk management, these projects are critical to the economic opportunity and safety of millions of Americans. I look forward to building on the bipartisan consensus, that the Chairman was speaking about, that we have already achieved on infrastructure policy in this committee by staying on a biannual schedule of moving WRDA legislation to enactment.

The role of natural and nature-based features, or natural infrastructure, in water resource projects has been discussed by this committee for years and incorporated into previous legislation. Most significantly, in 2016, with the Water Infrastructure Improvements for the Nation Act. In that legislation, Congress defined natural and nature-based features and included them, among other measures, to be considered in the Corps' feasibility study process for flood risk management, storm damage reduction, and ecosystem restoration projects.

This was in recognition of the role natural infrastructure can play in achieving the Corps' mission areas while producing other benefits. For example, a wetland in coastal Louisiana may help protect communities from hurricane damage as well as provide ecological habitat. A levee setback on the Missouri River can reconnect the floodplain to the river while lessening flood risk to the surrounding community.

In the 2016 bill, Congress also reiterated the essential partnership between the Corps and non-federal sponsors in undertaking such projects, requiring that natural and nature-based features be considered with the consent of the non-federal sponsor. This is the crux of what we are discussing today.

Natural infrastructure is an important tool in our toolbox that ought to be available for the consideration and application in water resource projects where practicable, cost-effective, and with the buy-in of those communities partnering with the Corps.

It is not a panacea on its own, however, as we all know. Natural infrastructure often works in concert with traditional infrastructure. In some cases, structural solutions alone may be the only viable solution to a water resource infrastructure issue.

Take my home State of West Virginia. While we have a history of terrible floods, our topography is not naturally

conducive to the implementation of many of the frequently cited examples of natural infrastructure. That is why the work being done by the Corps, the non-federal sponsors, and other stakeholders to advance our understanding of natural infrastructure through research and real-world experience is so very important.

The Engineering with Nature Initiative the Corps is leading is one example. The initiative's work is informed by research being performed at the U.S. Army's Engineer Research and Development Center, and in collaboration with partners across the globe in both the public and private sectors. The collection, summation, and dissemination of natural infrastructure best practices on an international scale will inform our decisions as policymakers and provide communities with the knowledge necessary to decide what works best for them.

Private industry is also lending its expertise. In April of 2019, the chairman and I hosted a briefing featuring both Dr. Bridges and representatives from the Natural Infrastructure Initiative, a partnership between various public and private stakeholders regarding the work that is already underway.

It is important that as policymakers, we continue to broaden our understanding through these and other efforts. We need to understand the benefits and costs of incorporating natural and nature-based features in Corps projects, both in the

short-term and over the lifespan of the project. This includes the effect of these approaches on operations and maintenance. We also need to better understand where it makes sense to incorporate these features. It may not make sense in every project.

Furthering our conceptual and practical knowledge of natural infrastructure will help us make smart investments in water resource projects that yield multiple benefits.

The missions of the Corps are as important today as at any time in our Nation's history. I look forward to hearing from our witnesses about how we can continue to support these missions, the missions of the Corps, using every tool available.

Thank you again for being with us today. I think we are going to have some stops and starts today, but we are here for you, and you are here for us. Thank you.

[The prepared statement of Senator Capito follows:]

Senator Carper. Thank you, Senator Capito.

We have two panels today, two panels of witnesses. I am going to turn to our first panel now. I would like to introduce briefly Dr. Todd Bridges for his testimony. Dr. Bridges is a Senior Scientist for the Army Corps of Engineers Engineering with Nature program. This is the program that is working on advancing natural and nature-based features and features engineering standards within the Corps.

Dr. Bridges, we welcome you. You may proceed with your testimony at this time. Thank you.

STATEMENT OF TODD BRIDGES, PH.D., SENIOR RESEARCH SCIENTIST, ENVIRONMENTAL SCIENCE, UNITED STATES ARMY CORPS OF ENGINEERS

Mr. Bridges. Thank you, Chairman and Ranking Member and members of the committee. I am honored to testify before you today.

I am the U.S. Army's Senior Research Scientist for Environmental Science at the U.S. Army Engineer Research and Development Center. Among other responsibilities, I serve as the national lead for the Corps of Engineers Engineering with Nature Initiative that is working to support sustainable, resilient infrastructure systems for the twenty-first century.

In the United States, we are blessed with an abundance of natural capital: 3,000 miles of barrier islands along our coastlines, thousands of miles of mainland beaches and dune, and a hundred million acres of wetlands in the lower 48 States. Wetlands along the northeast Atlantic Coast helped to avert $625 million of flood damage during Hurricane Sandy, and the 500,000 acres of mangroves around Florida helped to avert more than $1.5 billion in flood damages during Hurricane Irma in 2017.

Our work in nature-based solutions is informed by our definition of nature-based solutions. That is, it refers to the intentional and substantial use of natural systems to support water resources solutions. The Corps of Engineers has made significant use of such approaches for decades, and in 2010, the

Corps of Engineers established the Engineering with Nature Initiative to advance the integration of human engineering and natural systems.

We have published two volumes of "Engineering with Nature: An Atlas." These books showcase 118 examples of constructed projects around the world that illustrate what engineering with nature practice looks like, along with the economic, environmental, and social benefits they produce. Fifty of these projects were built by the Corps of Engineers. Example projects include Horseshoe Bend Island in the Atchafalaya River of Louisiana that was constructed through beneficial use of sediment dredged from the navigation channel. The island is providing 80 acres of habitat.

Hamilton and Sears Point Wetland projects in California are restoring 1,500 acres of wetlands while supporting coastal resilience with respect to sea level rise.

Our work on Engineering with Nature over the last decade has allowed us to identify many of the key enablers for advancing engineering with nature. Including developing new science and engineering practices, fostering creative planning and design, documenting the diverse benefits of nature-based solutions, communicating widely to facilitate progress, preparing practitioners through education and training, and leveraging the power of collaboration across organizations and

sectors to innovate.

Likewise, we have recognized that challenges exist. Conventional and nature-based solutions may not align with the community's vision, all solutions, whether conventional or nature-based, require land to build the solutions at the scale the problems require, and hesitancy regarding new engineering practice.

We are fueling our progress through collaboration and partnering. The Corps of Engineers established the network for Engineering with Nature with the University of Georgie in 2020 to engage across sectors and universities around the Country, including the University of Florida, the University of Oklahoma, Arizona State University, and the University of Delaware, among others.

We are partnering with other government agencies at the federal and State level, such as NOAA, the U.S. Fish and Wildlife Service, the California Department of Water Resources. The Corps of Engineers partnered with the State of Mississippi and the National Parks Service and others in restoring Cat and Ship Islands and many other projects to create one of the most mature networks of nature-based solutions in the Country.

The Corps of Engineers has established Engineering with Nature Practice Leads for coastal and river applications that complement the leadership being provided by six Engineering with

Nature proving grounds, established at the Galveston, Buffalo, Philadelphia, Mobile, San Francisco, and Saint Louis Districts of the Corps.

Dialogue and collaboration with the private sector, non-profits, and finance institutions is helping us understand the business case for nature-based solutions.

We are collaborating across the Department of Defense also to support mission resilience through engineering with nature, including the Reef Fence Program and the Defense Advanced Research Projects Agency, or DARPA, and the $5 billion rebuild of Tyndall Air Force Base following Hurricane Michael.

Nature-based solutions are being built around the world as stand-alone projects and in combination with conventional engineering to produce multi-purpose benefits.

Finally, I would like to thank you again for the invitation to testify before the committee. I look forward to answering your questions.

[The prepared statement of Mr. Bridges follows:]

Senator Carper. Dr. Bridges, we thank you for that.

I have a couple of questions. Let me just start. The first one, as you know the last couple of water bills have been directing the Corps to incorporate natural infrastructure features into its projects. The Corps Research and its Engineering with Nature program has issued natural and nature-based infrastructure design concepts for the agency to use in planning projects that address flood risks and also address and reduce storm damage.

My question is, how is the Corps doing in its efforts to implement natural infrastructure and resiliency features in areas beyond project planning, such as engineering and also project construction?

Mr. Bridges. Yes, thank you for the question, Senator. I think we are doing well and making progress in implementing these concepts and the science and engineering practice associated with these projects. As I mentioned in my remarks, we have example projects within the Corps of Engineers that literally go back decades, even a hundred years, which were utilizing the principles and practices that we associate and what we call Engineering with Nature today, and what we are endeavoring to do through the initiative is to make the exceptional projects of the past more commonplace in the future and find us a more harmonious arrangement between --

Senator Carper. It reminds me of the movie Back to the Future.

Mr. Bridges. -- to find a more harmonious arrangement between the natural and the engineered.

The challenges that many of our commuters are experiencing with respect to flooding or drought and wildfires do call for innovation, and how we comprise solutions for our communities, but I think progress is being made across the span of functional areas that you mentioned, including planning and design and construction, and the Engineering with Nature Atlases that I referenced, the 118 projects from across the world, 50 of those projects constructed by the Corps of Engineers over the recent decades illustrate that progress in practice.

Senator Carper. Thank you. We have heard time and time again that the Corps has minimally incorporated natural and nature-based features into its designs, and as I understand it, this is due in large part to the way the agency's benefit to cost ratio value the natural infrastructure.

When my staff has discussed the issue with the Corps, they are constantly told that the costs and the benefits are not able to be fully calculated, because so many of the benefits, including health, including life, and including safety are, to be honest with you, hard to quantify. For example, the Corps does not fully quantify the savings from avoiding federal

disaster relief when a flood control structure operates as intended, or the benefits that could cause the engineered beach dunes protecting the businesses and homes in a storm.

My question is this: in your opinion, what are the missing benefits that the Corps is not accounting for in the benefit to cost ratio in the project development process? Do you have some thoughts you would like to share with us today on how to improve the cost-benefit ratio analysis?

Mr. Bridges. Thank you, Senator, for the question.

I am a scientist in my work, and our focus within the Engineering with Nature Initiative is to understand how projects produce benefits and, to the extent that we can, measure those benefits, supported by sound science.

Sound science hopefully provides a solid foundation upon which to build sound policy, but policy development is part of the stick that I don't personally whittle on. It is determined by others, but what we are doing in the initiative is documenting benefits that are being created by existing projects within the Corps so that we can learn from what those projects are doing, how they are functioning, how they are performing over time, and so we are in a position to be able to incorporate that kind of information as a part of future practice, whether it is planning or whether it is engineering and design and function.

Senator Carper. Thank you.

Let me turn to Senator Capito, and then I think we have Senator Cardin on WebEx, as well, who chairs our Infrastructure Subcommittee. Senator Capito?

Senator Capito. Thank you, Mr. Chairman.

Dr. Bridges, thank you for being here today. Our staff from this committee actually visited down at Vicksburg at the U.S. Army Engineer Research and Development Center, and they saw firsthand a lot of the research that you are doing. Thank you for hosting them there.

What I would like to ask is, since you have begun and the Corps has begun in this endeavor, what gaps are you still identifying that you might be able to be working on for the future for the next 10 to 20 years? Are you able to identify those for the long-term longevity of such projects?

Mr. Bridges. Thank you for the question, Senator.

There are gaps that are related to technical issues that we have with these kinds of projects. As I mentioned, understanding fundamentally how they produce benefits, so, going to those projects and measuring them.

But there are also gaps in respect to communicating about projects across a large enterprise like the Corps of Engineers. That is one of the points of emphasis we have made within the Engineering with Nature initiative is to share information more

broadly across the Corps of Engineers and with our partners and stakeholders about good practice examples that are incorporating natural systems into engineering projects.

There is always going to be a need, for example, for technical guidance on how to plan, how to design, how to operate projects that include this combination of the natural and the engineered. We have been leading an effort, Engineering with Nature has been leading an international effort for the last five years to develop technical guidelines on the use of natural and nature-based features for flood risk management with an international consortium that includes the Environment Agency in England as well as the Rijkswaterstaat in the Netherlands or the 75 organizations and the 170 contributors around the globe drawing together practice and experience implementing these kinds of solutions.

We will be publishing this 1,000-page technical guide and complementing it with a shorter, 40-page version to provide people an introduction to what this kind of practice looks like.

So, we are working to fill gaps and to document progress widely across our organization and others so that we can, in fact, implement more projects of this nature in the future consistent with sound practice.

Senator Capito. When using natural or nature-based infrastructure, what is the maintenance and longevity of that

project as compared to what you might think of as a more traditional type of infrastructure?

Mr. Bridges. Thank you, Senator, for the question. Wetlands have existed for millennia, so they have longevity.

Senator Capito. Right. They self-create.

Mr. Bridges. Yes. And so, when we approach the design of these systems, these nature-based systems, we want to follow mother nature's lead, if you will, so that these projects, these features within the projects can be sustained over time. Maintenance of projects over decades, of course, is an area of uncertainty for conventional as well as it is for nature-based, and something that we look forward to gaining more experience on.

We have recently gone back to some decades-old projects where we have used, for example, beneficial sediment dredged from projects and built islands and wetlands in the 1970s. We have gone back to those projects recently to look at, well, how did those projects perform, and in fact, they performed quite well. So, we can learn from that in future efforts to design projects to provide the services that we are looking for through Engineering with Nature.

Senator Capito. Right. Obviously, I am on Appropriations as well, and obviously, when you think about the massive investments that the Corps makes and the massive structures that

are built or those massive problems that they are addressing, anything that could last longer and be more cost-effective is always at the top of the list. Maybe some of these solutions, while they might be more expensive on the front-end, on the back-end, they might end up actually being cost-saving and have a lot of other external benefits. I kind of went out on a limb there and said in West Virginia, we have a lot of rivers, and we have a lot of flash floods. Most of the pictures that you showed were coastline pictures. Do you find that this type of solution works better on a coast, or is more effective that say, on riverbanks and more rapid flow water, which is what we experience in my State, with the mountainous terrain?

Mr. Bridges. Thank you for the question, Senator. I think they are great examples of practice across the full spectrum of the landscapes we have in the United States. The atlases are intended to expose our many inland, riverine, small rivers, and streams, as well as more mountainous examples, including places like Scotland, which has very steep terrain, and they are working across their landscape to implement and to intervene in the system to slow down water and spread water out so that it doesn't pile up on communities in the form of floods.

I was recently made aware of an example from the City of Huntington in West Virginia, where the city itself is experiencing repeated flooding due to high rainfall events, and

the city is itself investing in nature-based solutions to relieve its overwhelmed stormwater management system.

With Engineering with Nature, what we are talking about is looking across the entire landscape to find ways in which we can implement solutions like that to relieve the burden from the conventional infrastructure by spreading it out and slowing it down, so in the case of Scotland and England, they are investing in reforestation in cases, or using features like what they call leaky dams, hundreds of these, in which they are putting these temporary wooden structures in place to be able to slow the water down, to keep it from piling up on villages downstream within the watershed.

It is a distributed approach in places that have topography like West Virginia, as opposed to flatter terrains, say, in the State of Oklahoma or Kansas or Missouri, where these kinds of features in the form of levee setbacks and other applications have been used by the Corps and other agencies to incorporate natural floodplains into flood risk design.

Senator Capito. Thank you. Thank you very much.

Senator Carper. Thanks. I think we have been joined on WebEx by Senator Cardin. Ben, are you there?

Senator Cardin. I am there, Senator Carper. Thank you very much.

Senator Carper. My neighbor, my Delmarva buddy.

Senator Cardin. Right. Thank you.

Dr. Bridges, I want to talk about two of my favorite natural pipe projects that we have in the State of Maryland and talk about some of the obstacles that we have had on moving these forward and get your assessment of how we can encourage these types of restoration projects. One is Poplar Island, which is a site that was a previously habitable island in the Chesapeake Bay that almost completely disappeared because of erosion and sea level change, which was restored using dredged material, and now is over 1,000, well, in mid-bay, we have 766 acres of wetlands that have been restored, 829 acres of upland habitat for the Chesapeake Bay wildlife that have been restored.

Poplar Island is just about completed, but it acts as a real plus for our environmental restoration of the Chesapeake Bay by bringing back to life islands that used to exist in the Chesapeake Bay that helped us deal with the quality of the water, as well as the viability of the habitat of the Chesapeake Bay.

We have another project that is moving forward, Mid-Bay, which would be the next project to restore another island on the Chesapeake Bay. I mention it because the analysis that is used on this, we have analysis based upon the environmental value of these projects, not just the economic direct costs from shipping that is done on dredged material, but we can use a broader

evaluation so that these projects can move forward, because they may appear to cost more, to Senator Capito's point, but in the long run, they are of much more cost-benefit to our entire challenge on protecting our environment as well as making sure we have commerce where are channels are dredged.

The second is Blackwater Wildlife Refuge, which has lost so much of its wetlands as a result of sea level change, erosion, the nutrient issue that we now have under eradication, all that has caused Blackwater a significant amount of its wetland's protection. We have found that by using dredged material, even though it costs a little more to get it there, you can restore wetlands and protect this wildlife refuge, which is such a valuable part of our ecosystem. You can now go to Blackwater just about any day and see so many bald eagles. It is one of our great treasures.

So, my question to you: how do we encourage the proper evaluation of these types of projects? Here, we are using dredged material, which if you look at it from the strict economic point of view, you will never get these projects moving, but if you take a more wholistic approach, we can use these approaches to not only keep our channels dredged by using materials that otherwise we have a hard time finding a location to dispose of, but we also can restore our environment at the same time.

Mr. Bridges. Thank you for the question, Senator. There is a lot to unpack in what you presented and what you asked about, but I will start at the end and just say that there is great opportunity to beneficially use dredged sediment to create the kind of value and benefit that you highlighted with the examples that you listed.

In round numbers, we dredge, across the Corps of Engineers, about 200 million cubic yards of sediment every year. We beneficially use on the order of 30 to 40 percent of that now. It is a very active discussion and area of technical activity and research, how we can used dredged material beneficially within our programs, how to make those kinds of projects more affordable, which is a key element of making our navigation program sustainable, and of course, the projects that would be produced through beneficial use.

I am happy to say that, from my point of view, our Baltimore District is quite experienced and has been very successful in using dredged material beneficially for many, many years. I mentioned in my testimony that we recently named four practice leads for coastal and riverine engineering with Nature Practice. One of our coastal practice leads is in Baltimore District and has been involved in many island restoration projects and wetland restoration projects in Maryland using dredged material beneficially.

One of those projects underway right now at Swan Island in Maryland is a partnership between ourselves and the Baltimore District and the State of Maryland and NOAA where we are examining the benefits that are being created, both from a physical point of view in terms of wave attenuation to the community in Ewell, Maryland, as well as the ecological benefits that are being generated from that project. We have been documenting beneficial use projects being produced by Baltimore in Maryland, and there is a lot of practice, good practice, that has been produced and exemplified through those projects that we are sharing across the Corps of Engineers.

The Blackwater Refuge Project, I visited that project myself, and the work that they are doing there using dredged material beneficially and thin-layer placement. In fact, the Blackwater Refuge is one of the projects we highlight in the Engineering with Nature Atlases, so there is a lot of progress being made.

There is a lot of progress to reference within the Chesapeake Bay and within the Baltimore District's work with its partners and the U.S. Fish and Wildlife and others, and sharing that practice across the floor, I believe, is going to provide a great foundation for more beneficial use in the future.

Senator Cardin. Thank you for that response.

I would just add that, if there are areas that we can, as

policymakers do, particularly as it relates to how your projects are evaluated from a budget point of view, let us know, because it is exciting to hear what you are saying. We can do better, and I think we can perhaps help you with some of what we do here in setting the policy evaluation standards. Thank you.

Mr. Bridges. Thank you, Senator. We would be happy to follow up with you about that.

Senator Carper. Senator Cardin, thanks.

We have been joined by Senator Kelly from Arizona. Before we start the clock on Senator Kelly, we were talking on the Senate Floor earlier this week about the kind of extreme weather and extreme temperatures that you are facing. We were talking earlier today about how, in the State of Louisiana, they lose to the sea about one football field of land every one hundred minutes, and so we have that extreme at one side of the Country, and a far different kind of challenges.

Give us just a quick update on what is going on on this front in your State, please.

Senator Kelly. Well, we have got the worst fire season on record. I was up looking at the Telegraph and the Mescal fires, flew up to Northern Arizona. Last week, I went up to Flagstaff to look at a fire called the Backbone Fire. We have hundreds of thousands of acres burned, we have temperatures in the Phoenix area that have been a week above 115 degrees, a week above 110

in Tucson. Even in Northern Arizona, temperature in excess of 100 degrees, and relative humidity as low as 1 percent. I have never seen humidity at 1 percent before, at least not in this Country.

It is a challenge. As the monsoon, we get monsoon rains, but often lately, it has been less rain and just the lightning. So you get the worst part of it, and it starts the fires. It has been a significant challenge in the State of Arizona.

So Senator Romney and I are introducing a piece of legislation to try to form a commission to understand how do we do better. Right now, the Forest Service, my understanding is, successfully puts out, and they do a great job, they get about 97 percent of the fires extinguished quickly. It is that other 3 percent that we have to work on. We have to figure out a new technology, new ways, new approaches, procedures to do better, otherwise we are going to continue to see this year after year.

Senator Carper. Thank you for that update. Now we will start the clock.

Senator Kelly. Thank you. Thank you, Mr. Chairman.

Thank you for that opportunity. Dr. Bridges, I want to talk a little bit about natural infrastructure in desert climates first. I understand the Corps recently entered into a contract with Arizona State University to expand research on the use of natural and nature-based features in desert Southwest

climates.

So, this is connected to what we have been talking about. People often think of natural infrastructure as a tool to help coastal communities and Midwest communities with frequent risk of flooding. But it is good to see the Corps is acknowledging that nature-based engineering solutions have benefits for all regions of the Country. For example, understanding how to sustainably manage groundwater, aquifers, or protect surface watersheds from contamination during and after wildfires are pressing issues in Arizona and throughout the Southwest.

I am hopeful that your new research partnership with ASU will further research in these areas. Dr. Bridges, how will the Engineering with Nature Initiative at the Corps benefit from this new partnership with ASU, and what research areas do you hope to focus on with ASU?

Mr. Bridges. Thank you, Senator, for the question. We are quite excited about this partnership with Arizona State University. We have four main university partnerships right now, and we are moving West, because as you have noted, the challenges in the West are broad, and range all the way from drought and fire and flooding in the same year. In fact, fire can exacerbate flooding, because when you have a denuded landscape, the water moves off that landscape more quickly and carries sediment and debris with it, which can be quite

hazardous to communities on the receiving end of those events.

We have a range of research underway in our organization to focus on that, and we are looking forward to taking advantage of the experience and the knowledge and the innovation at Arizona State to work in those landscapes even beyond Arizona, because there is a lot in the West.

I am personally from the West. I am sensitive to the challenges that are experienced in those locations. We have to find infrastructure solutions that address the spectrum, from flooding as well as, as you have mentioned, drought and fire. I believe the data and experience that has been accumulated worldwide indicates that nature-based solutions have a role to play across that entire spectrum. So the opportunity before us is how to bring all those solution sets together and to integrate.

We have to have innovation to address the spectrum and the intensity of advancing combinations. There was a time, maybe, when hazards presented themselves, natural hazards presented themselves to us as onesies, but now we deal with twosies and threesies and moresies, which is a challenge for conventional infrastructure solutions.

Senator Kelly. Yes, I agree that this is part of the solution. We also look at more physical, concrete infrastructure as valuable, but in the West, too, we need more

water storage. It is a big deal for us in Arizona. What are some of the unique challenges with a desert landscape in coming up with natural-based infrastructure solutions?

Mr. Bridges. Well, it is the extremes. As you mentioned, the temperatures that exist and the drought conditions as well as the alternation between, as I mentioned previously, drought and heat and then flooding that presents itself. So the infrastructure solutions that we have to plan and engineer have to deal with those combinations.

Conventional infrastructure, if I can paint with a broad brush for a moment, conventional infrastructure more frequently is single purpose in its orientation, at least that was more characteristic of, I would say, the kind of 20th century approach to conventional infrastructure. But what we need now are solutions that can address this spectrum and the multiple hazards that can present themselves in very short periods of time, even within one year of each other.

That presents both a planning challenge for organizations and partnerships as well as an engineering challenge. How do you design these multi-component, multi-element systems to address that spectrum of challenges that is characteristic, I think, of conditions, increasingly so, in the West.

Senator Kelly. Thank you. We only have a few seconds remaining. This is just a yes or no question. I assume that

long-term stable funding for the Engineering with Nature Initiative would benefit the Corps and benefit the West?

Mr. Bridges. Yes, Senator.

Senator Kelly. Thank you.

Senator Carper. Dr. Bridges, I am going to ask you to remain with us, just for another minute or so. Senator Capito is going to head over to the House and the Senate Floor in just a moment to vote. We have a couple of votes that they have inconveniently scheduled right in the middle of our hearing, but it is what it is. They haven't called it yet, but we expect it any minute.

I understand Senator Wicker is on his way over here. As you know, his State has great interest in these issues. On a lighter note, I would just say I oftentimes have heard the term onesies; I have occasionally heard the term twosies. I have never heard the term moresies. It is a first in my recollection for this panel.

Senator Capito. Well, if we are talking about terms, the term I have never heard was riverine, and that is like coastal, that is how you refer to river topographies.

Mr. Bridges. Senator, there are a variety of terms used around the world. Some of our English colleagues prefer the term fluvial. That is a term in common usage.

Senator Carper. They don't talk that way in West Virginia.

Senator Capito. No, we don't have fluvials in West Virginia.

Mr. Bridges. Another way of thinking, just more inland environments that are characterized by streams and rivers, like West Virginia, and so many other places in the Country.

Senator Capito. Right, right. Thank you. I am going to go vote.

Senator Carper. Dr. Bridges, if you would just remain with us for another minute or two, because I want to give a colleague from Mississippi a chance to ask a question or two.

You spoke a good deal about the environmental benefits of your program, as you should. You mentioned documentation, that it is extremely important. I would just point out that those benefits don't always make it into the budget calculation. That is extremely concerning, and something we need to figure out how to change.

This is because non-federal project sponsors need to have a full picture of what can be achieved, what can be saved, and what can be prevented with all benefits of nature calculated. If you want to comment, you don't have to since it is not a question, but I would welcome a comment in response to that, if you will.

Mr. Bridges. Senator, I thank you again for drawing attention to the importance of benefits. We are, within the

Engineering with Nature Initiative, giving considerable attention to how we measure benefits and understand how those benefits are generated over the life of a project, especially projects that are combining conventional engineering approaches with more nature-based engineering approaches, which, you might understand, maybe makes even more complicated, in a sense, reaching an understanding of multi-purpose benefits.

But there is definitely a science element to this, and I think the science has been maturing significantly in recent decades. Terms like ecosystem services has become a very mature discipline and practice and is transitioning out of universities and into real practice. I will give you just one example of this from the private sector, Dow, the company, made a commitment several years ago to generate $1 billion of natural capital as a part of their normal business operations.

So, it is not philanthropy, but how to incorporate $1 billion of natural capital investment in nature to provide benefits to the company, they developed a specific tool in partnership with others that would allow them to do the accounting, if you will, of those benefits. So we are working with the private sector and with finance institutions to come to an understanding of how they are developing the business case for themselves for such investment, and how we might be able to draw from that understanding in our own practice.

I would be happy to work with our leadership within the Corps to follow up with you about this topic. It is a very important one. There is a science element, and clearly a policy element to it.

Senator Carper. Thank you. I am going to go ahead. I want to make sure to run this in a way that enables everybody to vote. We have a couple votes going on, and I want to look out for Senator Wicker, when he is able to join us. He is probably trying to get here. He wanted to question you, in particular.

I am going to ask you, if you would, just remain at the table, and I am going to ask our next panel to come and quietly assume your seats, please, if they would do so at this time, please. Thank you. If we could put their name plates where they belong, thank you.

We want to welcome our second panel. We have four unique voices in water infrastructure space with us today, two of whom formerly served in the U.S. Army Corps of Engineers. We welcome Dr. Mr. Galloway. Dr. Galloway, it is great to see you.

Dr. Galloway has recently retired from the University of Maryland. It is good to have a Terrapin in the house. Prior to his position in Maryland, I am told that Dr. Galloway served as Brigadier General in the U.S. Army and was an engineering leader in the Army Corps of Engineers. We thank you for all those years.

Dr. Galloway has been a leading voice in addressing climate change and natural infrastructure as part of the Corps engineering objectives and is widely respected for helping move water infrastructure standards into the 21st century.

Next, we are going to have Mr. Chett -- I am going to get this right. Your name is spelled C-H-I-A-S-S-O-N, and phonetically, I am told it is pronounced "shay-son." Is that correct? That can't be correct.

Mr. Chiasson. "Shah-son."

Senator Carper. Shah?

Mr. Chiasson. Yes, Senator.

Senator Carper. Good. What kind of name is that?

Mr. Chiasson. It is a French name.

Senator Carper. Okay. The pronunciation is on that last syllable, huh? "Son." Shay-son, shah-son. Chiasson.

Mr. Chiasson. Chiasson, yes sir.

Senator Carper. Thank you. I learned at an early age, if you figure out how people like to pronounce their name, then that is the way I pronounce it.

Chett is no stranger to natural infrastructure, serving on the Executive Board of Restore or Retreat, a leading non-profit organization focused on preserving and restoring the wetlands in Southern Louisiana. He is also the Director of Port, and it is pronounced here, "foo-shawn." Is that correct? Good. He works

as an industry partner in using natural and nature-based features in port expansion and maintenance activities.

We also have Ms. Ufner. Julie Ufner, nice to see you. The Executive Director of the National Waterway Council. The mission of the National Waterway Conference is to effect common sense water policies and programs supporting public safety, competitive economy, National security, environmental quality, and energy conservation. It is great to see you.

Finally, we have Mr. Rick Johnson from the Sacramento Area Flood Control Agency, where he has served as Executive Director since February of 2011. Before that, Mr. Johnson spent more than 40 years in federal service with the U.S. Army Corps of Engineers and U.S. Bureau of Reclamation. Thank you for your extraordinary service.

Mr. Johnson has spent his career on water resource and flood damage reduction projects. I am sure he will have a unique perspective on Engineering with Nature objectives.

With all that in mind, let’s welcome our first witness and recognize him, and that is Dr. Galloway.

STATEMENT OF GERRY GALLOWAY, PH.D., RESEARCH PROFESSOR, GLENN L. MARTIN INSTITUTE, PROFESSOR OF ENGINEERING, CIVIL, AND ENVIRONMENTAL ENGINEERING, UNIVERSITY OF MARYLAND

Mr. Galloway. Thank you, Mr. Chairman, for the opportunity to be here today.

I have been working in this business for about 60 years, both building nature-based structures and other structures within the Corps of Engineers and overseeing the construction and the use of these. I would like to make four points today about the use of these natural and nature-based features, or I will call it natural infrastructure.

Point one: use of natural infrastructure has been and continues to be an important part of the development and sustainable use of our Nation's water resources. These features work. They physically and financially benefit society. Natural infrastructure should be seen as a significant component of the Nation's water infrastructure portfolio.

Much can be learned from projects underway in this Country and abroad, as you heard from Dr. Bridges, where nations facing extremely difficult water resource challenges have already begun to increase their use of natural infrastructure in their projects. The largest projects are taking place in China, the Netherlands, and other countries.

Chinese mega-cities are using natural systems to capture

stormwater, prevent flooding, store water for repurposing, reduce pollution, and reduce the impacts of the urban heat island, something that is coming up under climate change. Their target is to capture 70 percent of the stormwater that falls on these cities, and they label these cities "sponge cities."

U.S. parallels, which are certainly not at the China scale, have been initiated in several cities including Philadelphia, Chicago, and New York under the rubric of low impact development using green roofs, bioswales, local flood storage, parks, and other natural infrastructure. Given the significant impact of urban flooding on low-income and minority neighborhoods in U.S. cities and in smaller rural communities, such efforts are a great step forward in moving towards better work in this area and providing fertile ground for increased EPA and Corps of Engineers cooperative efforts. What would Houston have been like if 70 percent of the Harvey stormwater had been captured by natural systems?

Before I close this point, I should also like to note that while natural infrastructure is certainly critical and can play a major role in water resource development, grey infrastructure, the other side, which has so effectively supported the construction the dams, levees, and navigation systems, remains an indispensable part of our approach to supporting national economic development and protecting our citizens from natural

disasters.

My second point is, over the last half-century, as seen in the legislation that has come out of this particular Capitol Hill, inclusion of environmental approaches to water resource development has been an important part of this national policy. Over the years, Congress has been wishy-washy in its full endorsement of the environment, to be honest. I would hope that today, Congressional consideration of the environment and its contribution to development are real and can be emphasized in every opportunity.

Point three: barriers have existed and continue to exist that prevent the full employment of natural infrastructure and development of water resources. I will cite five of many.

First of all, the field is skeptical that Washington, and that is the Administration, it is especially OMB, and Congress is behind inclusion of natural systems in water resource development. The overwhelming focus on economic benefits versus total benefits, which includes environment and social features, seems to drive the train.

Second, the process and procedures used to justify water resource projects in general and environmental and social benefits in particular are overly complex and unwieldy, and as a result, projects can be unnecessarily delayed or maybe never even get started. We wind up in a lot of paperwork.

In many cases, efforts to broaden the benefit base for projects to include environmental and social benefits are hampered by the lack of local interest in carrying these out, often because that would increase the cost share on something that is seen as uneconomic or tangential.

Much of the work of water resource development is conducted with inefficient and ineffective stovepipes that exist within agencies, committees of Congress, and academic disciplines.

Lastly, Congressional instructions or restrictions on the use of natural and beneficial functions and their keeping track of what they are in terms of benefits and costs has caused problems for the Corps of Engineers and not permitted them to be as innovative as they could. The work in WRDA 2020 to open this up will certainly make a big difference.

Point four: Congress can act to support the inclusion of natural and beneficial functions developed by the Army Corps of Engineers, and we would hope that that would take place, that there are things you can do in your appropriations and authorizations that send the message.

I thank you for the opportunity.

[The prepared statement of Mr. Galloway follows:]

Senator Carper. We are delighted to have you. Thanks again for joining us.

Now, our next witness, Mr. Chiasson, we have been joined by again. Senator Capito is now going to preside, and I will be back as quickly as I can. Thank you.

STATEMENT OF CHETT CHIASSON, EXECUTIVE DIRECTOR, GREATER LAFOURCHE PORT COMMISSION

Mr. Chiasson. Good morning, Chairman Carper and Ranking Member Capito and members of the committee. My name is Chett Chiasson. I am the Executive Director of the Greater Lafourche Port Commission, otherwise known as Port Fourchon. I also serve on Governor John Bel Edwards' Advisory Commission for Coastal Activities, the Louisiana Coastal Protection and Restoration Authority Finance Corporation, and the Executive Board of Restore or Retreat, as you said earlier, which is a regional non-profit coastal restoration advocacy group.

First, I would like to commend the committee for holding this hearing on this subject matter. Whenever I am speaking about Port Fourchon, I never fail to discuss our coastal restoration efforts in South Louisiana and its extreme importance to our professional and personal lives, but this is the first hearing I am aware of with the primary focus of nature-based infrastructure across all mission lines of the Corps of Engineers. Again, I commend you.

I would also like to acknowledge the contribution of my fellow panelists on this issue for the work they have done. With great thanks to this committee for passing WRDA 2020, our Port Fourchon Bell Pass Channel deepening project was authorized last year in that legislation. This project will, of course,

provide our tenants with additional draft to accommodate their vessels, but equally important, 100 percent of the dredged material will be beneficially reused for marsh creation. In total, this one project will create approximately 948 acres of new marsh. This is but one project in which we are involved.

The integration of coastal restoration into Corps and non-Corps projects is a matter of necessity where I live. In preparing for this hearing, I reached out to several of my professional colleagues from my local area who regularly interact with the Corps to get their perspective, some of which I have included in my written testimony.

It occurred to me that while we all have separate missions in our respective organizations, there are a number of common threads connecting all of us in the coastal areas of South Louisiana, and a major one is the Corps of Engineers. The Corps and other federal and State agencies are a constant presence in our State, our economy, our property, and our very lives depend upon the Corps carrying out its various missions with the highest level of excellence. For the most part, I believe the Corps achieves that level of excellence. But what is an issue is that at time, Corps policy and action can be cumbersome, inflexible, and often slow to adapt to the advancements of today, which are the foundation for tomorrow.

For example, for the Port's aforementioned deepening

project, the Corps has been reluctant to consider federal participation in the ecosystem restoration utilization beneficial use under the National Economic Development, or NED, plan due to an outdated NED policy and its application. Rather, at least at this point, we will need to cobble together Corps navigation and environmental restoration authorities to achieve our goals, and to date, this has not yet been resolved.

Although the Corps has made great strides over the years on ecosystem restoration as my written testimony discusses, fully utilizing dredged material for beneficial use and rebuilding Louisiana's coastal areas has been the exception and not the rule. In terms of Corps missions, they span navigation, flood control, and environmental restoration, to name a few.

Also, in terms of laws that this committee has passed, such as flood control acts, various water acts, Clean Water Act, Endangered Species Act, just to name a few. These laws all have different goals and varying mandates and corresponding implementation by the Corps and other federal agencies, but the everyday lives of Americans aren't bifurcated like that. We are people making a living, raising a family, enjoying free time, whatever our calling is in life.

So, the Corps, and this gets the hard amount of message today, the Corps and every other government agency, for that matter, must be able to overcome the inevitable silos within its

organization, based on its various statutory mandates and implemented policies and must be able to utilize and manage all of its assets over multiple disciplines with flexibility, ingenuity, and timeliness, whether it is in immediate response to a hurricane or flood even or whether it is in planning a 50-year flood damage reduction project, or a large-scale multi-year coastal restoration project with beneficial use disposal as a component of a navigation project.

The final point I will make is that the vast majority of non-federal sponsors involved with any Corps project are some sort of governmental organization. We, too, are under statutory mandates and operate on our own set of policies to which we must adhere, and we, too, are ever mindful of the need to spend our public dollars wisely and efficiently.

Being at the local government level, I suspect we are able to, at times, think, adapt, and act quicker that a federal agency. But I do think that it should be an overarching goal of the Corps and committees in Congress like yours with jurisdiction over these matters to continuously seek flexibility, efficiency, and innovation in administering these laws. Listen to and work more creatively with the local sponsors, the NGOs, and the businesses involved in those projects, because while we all have a common goal in mind, we all have different perspectives, skillsets, and mandates.

Again, members of the committee, thank you.

[The prepared statement of Mr. Chiasson follows:]

Senator Capito. [Presiding] Thank you.

We now have Ms. Julie Ufner, the Executive Director for the National Waterways Conference. The mission of the National Waterways Conference is to effect common sense water policies in programs supporting public safety, a competitive economy, national security, environmental quality, and energy conservation. Welcome.

STATEMENT OF JULIE UFNER, PRESIDENT AND CEO, NATIONAL WATERWAYS CONFERENCE

Ms. Ufner. Thank you. Good morning, Chairman Carper, Ranking Member Capito, and members of the committee. I am honored to be here today to talk about the role of natural and nature-based features in water resource projects.

My name is Julie Ufner. I am President and CEO of the National Waterways Conference. We represent the full spectrum of water resource stakeholders, many of which who are non-federal partners with the Army Corps of Engineers Civil Works Projects and are responsible for significant financial commitments for the construction and maintenance of the projects. We do appreciate the committee holding this hearing today, and we are really happy to be here with these other witnesses.

Prior to this hearing, we reached out to our members to ask for their input on natural and nature-based features, and we got some varied responses. While there is much to be sorted out in terms of effectiveness, there is consensus among our members that nature-based features should be part of the larger water infrastructure toolbox.

Nature-based features are a good idea when it is appropriate. It fits into the existing overarching design, and there is consensus with the non-federal sponsors, but it is not

going to work under all circumstances. Take, for example, two separate projects in Orange County, California. One project used natural designs to successfully redirect flows from a waterway, and the County saved close to $80,000. Another project had higher installation costs, and the engineers are unsure whether the project will work long-term.

Additionally, some of our members indicated they are often challenged by existing or even competing federal agency regulations when trying to include nature-based features. A good example of this is the Corps' levee vegetation removal policy under Public Law 8499. Under this policy, all vegetation, except grass, is to be removed from levees, which would make nature-based features infeasible. If levees are not in compliance with this policy, they would be ineligible for federal disaster assistance.

Moreover, our urban members note that there are many constraints that may limit or prevent nature-based features from being used in densely populated areas due to available land, high real estate, as well as rights of ways issues. Furthermore, there is limited data on life cycle costs. When the data is available, there are indications that the costs will vary tremendously on the location and nature and extent of the problem being addressed, let alone whether it is affordable for the local sponsor.

But we know from experience that where infrastructure is in place, whether it be grey, green, or a combination of both, communities tend to experience a lesser degree of physical harm and economic damage during both coastal and inland storm events. When used effectively, nature-based solutions can be a valuable component of an overall, larger project as long as the feature fits with the project and there is buy-in by the local sponsor.

In conclusion, before good ideas are required, we must be sure that those approaches work and that the federal taxpayer and the non-federal sponsor can bear the cost. In response to Congress's directive for the Corps to evaluate nature-based features in the last three WRDA bills, we would encourage a meaningful review of these provisions, including how they are working at the agency.

Any solutions must be continued to be built upon the experiences that are on the front line. Those that are on the ground, including the flood control districts, levee boards, emergency managers, and port authorities, to name a few. Not only will such an approach save the taxpayers money, but it will also mitigate the difficult decisions later on on how to address flooding and whether and where to rebuild. The conference stands ready to assist you in this effort.

Thank you for the opportunity to testify today, and I am happy to take any questions.

[The prepared statement of Ms. Ufner follows:]

Senator Capito. Thank you.

Our final witness is Mr. Rick Johnson from the Sacramento Area Flood Control Agency, where he has served as the Executive Director since February of 2011. Before that, Mr. Johnson spent more than 30 years in federal service with the U.S. Corps of Engineers and the U.S. Bureau of Reclamation.

Mr. Johnson has spent his career on water resource and flood damage reduction projects, and I am sure he will have a unique perspective on Engineering with Nature objectives. Thank you, and welcome.

STATEMENT OF RICK JOHNSON, EXECUTIVE DIRECTOR, SACRAMENTO AREA FLOOD CONTROL AGENCY

Mr. Johnson. Thank you very much for the opportunity to testify today. I did want to take an opportunity to recognize our new Senator from California, Senator Padilla, who is on the committee, and thank him for his support.

As you mentioned, my name is Rick Johnson, with the Sacramento Area Flood Control Agency, or SAFCA.

Sacramento is one of the most at-risk cities in the Country for riverine flooding with more than $70 billion in damageable property and over a half million people at risk. The city sits at the confluence of the Sacramento and American Rivers. The Yolo Bypass, immediately west of Sacramento, carries about 85 percent of flows during large flood events.

Water is also conveyed to the Sacramento Bypass through the Sacramento Weir. Our flood issues have been recognized by leaders like you in our Congressional committees, and we have an active construction program run by the Corps of Engineers to rebuild our system.

I was asked to discuss one of our projects specifically ongoing in the Sacramento Bypass. The projects on the American River were designed to significantly increase the carrying capacity of the river, thus reducing the flood threat to Sacramento. However, this has created a problem where the

American River joins the Sacramento River. Downstream of that juncture, the river cannot adequately handle additional flow.

Likewise, the Sacramento Weir and Bypass, which empties into the Yolo Bypass, do not have adequate capacity either. Fortunately, the land on the north side of the Sacramento Bypass is not urbanized, and that gave us an opportunity to increase the flow-carrying capacity by setting back the levees. As part of the project, we were also able to include a fish passage to allow species such as salmon and steelhead, who have historically been trapped behind the old Sacramento Weir, to move back into the Sacramento River. The widened floodplain will also allow other habitats to be established.

In cases such as urban areas like ours, there may not always be opportunities for solely nature-based solutions. However, there are opportunities to incorporate nature-based components into structural solutions.

For example, we have situations on the American River where the river has eroded its banks and threatened the levee. Normally, we would like to set the levees back from the main channel to allow the river to move more naturally. However, since the land adjacent to the levees has already been urbanized, it made a set-back levee solution cost-prohibitive and too disruptive to the community.

A traditional structural solution would be to harden the

levee and its banks with a rock barrier called revetment. However, in this case, we were able to come up with a nature-based component that was added to the structural solution. A planting berm was constructed on top of the revetment and planted with vegetation. This solution still provided the structural hardening of the levees, but also restored and even enhanced the shaded riverine habitat in this section of the river.

I also wanted to provide an example of how current policies can have a limiting effect on implementing nature-based components.

The Yolo Bypass was originally constructed for flood control only, but has evolved over the decades into an area with multiple uses, including providing critical habitat. Improving the Yolo Bypass is urgently needed, but this time, we need to study it through a multi-purpose lens. The Corps did a study previously, but their process and policies made it impossible to fully examine all the uses and benefits the Bypass could offer, including critical habitat.

I provide more specifics in my written statement, but I will simply highlight an administrative policy by the Corps that should be revisited in the future.

While the real estate interest in land for flood control purposes were purchased with easements for the Yolo Bypass, the

agency policy is that if we want to use these same lands to provide environmental benefits, we would have to acquire them through fee title, which made it very cost-prohibitive. Policies and practices such as these have made it difficult to incorporate more nature-based solutions and components into projects.

The Yolo Bypass Comprehensive Study, authorized by Congress in Section 209 of WRDA 2020, directs the Corps to perform a comprehensive study of the Yolo Bypass with a multi-purpose perspective. It is also an opportunity to re-think the types of benefits that can be used to justify multi-purpose projects.

We look forward to working with our partners at the Corps on this study.

In conclusion, I wanted to thank you for having me here today and for this opportunity to speak, and also for passing WRDA 2020, and our Section 209. I did want to recognize the professionalism of your respective staffs and all their help in getting ready. Thank you, and I will be willing to take any questions.

[The prepared statement of Mr. Johnson follows:]

Senator Capito. Thank you. Thank you very much.

I believe we have Senator Wicker on WebEx to question. Are you on, Senator Wicker?

Senator Wicker. You sure do. Can you hear me, Madam Chair?

Senator Capito. We can. Thank you.

Senator Wicker. Okay. Thank you so much. Three hearings in one morning at the same time, we have to do a delicate dance, so I do appreciate the committee accommodating me.

Dr. Bridges, I want to ask about the Bonnet Carre Spillway. It was open for months in 2019, and Mississippi's coastal resources were devastated by the flood of freshwater coming into the saltwater Mississippi Sound. Businesses and livelihoods were negatively affected across the Mississippi coast.

In response, Congress authorized a study of the lower Mississippi River in last year's WRDA. This study would provide scientific basis to identify projects to reduce the reliance on the one solution of Bonnet Carre and look at a multiple of opportunities. It is likely that a complex system like the lower Mississippi River could use both nature-based and traditional features for flood control.

How could ERDEC contribute to this study and help the Army Corps provide better flood control for a complex water resource project like this and avert setting all of the floodwater in one

direction and devastating an entire economy?

Mr. Bridges. Thank you for your question, Senator. One of the main areas of activity of the Engineering with Nature Initiative is to work collaboratively with our project teams across the floor, at districts and division offices to envision and to bring ideas and innovation and to implement these ideas.

I think there are opportunities, of course. My understanding of the project that you mentioned, the implementation guidance is being prepared by headquarters, and ERDEC has a long tradition of collaborating with our Mississippi Valley division and our New Orleans district. I have some confidence that we will do so in regard to this project, as well.

As you pointed out, our river infrastructure systems are challenged, and they are being challenged now in ways that they have not been in the past. In a colloquial sense, we can say that the systems are really pressurized, and solutions to those going forward, in the long-term, do call for an all of the above approach. As you noted, nature-based approaches, which we may call in some cases within the Corps levee setbacks, are really restoring floodplain back to rivers to kind of de-pressurize, to spread out the water.

One mechanism for doing that, the spillways that you mentioned, including Bonnet Carre and others can be used in a

complementary fashion to those kinds of approaches. One of the opportunities that nature-based approaches provide in this context is the opportunity for multiple purposes to be gained from those elements of the solution, where habitat and access for hunting and fishing and other kind of social purposes can be incorporated and be providing benefits for communities year-round in addition to those times during high water when that space is being utilized for what we might call flood storage.

Senator Wicker. Okay. Let me just interject here, and you can supplement the answer on the record.

Time is marching on, and this is going to take some time. It just seems to me that there has to be a way that we can spread the freshwater and not devastate an economy.

On the nature-based features, one example of that would be Ship Island and Cat Island, and that was a result of collaboration between ERDEC, the National Park Service, and my home State of Mississippi. What scientific and technical capabilities did your shop at ERDEC provide to facilitate this?

Mr. Bridges. The Engineering Research and Development Center has been collaborating and supporting our Mobile District in the network of projects that you mentioned, a part of MISSIP, including Cat and Ship Island, for more than ten years, a whole variety of ways, including hydrodynamic modeling instead of transport modeling and monitoring of sea grasses and sturgeon

and sediment placement methods for those frustration projects. It is almost innumerable ways in which we have been working with Mobile District and those projects.

Mississippi can be quite proud, I believe. That network of projects along the coast of Mississippi is perhaps one of the most mature examples of nature-based solutions in action of anywhere in the Country. Mobile District is one of our Engineering with Nature Proving Grounds, and we are looking forward to even more support to them in the future to deliver solutions of that type.

Senator Wicker. Thank you, Dr. Bridges, and thanks to the committee for, again, indulging me and my time constraints.

Senator Capito. Thank you, Senator Wicker.

Dr. Bridges, you can take your leave. We appreciate your testimony, and thank you. I know you have been very, very resourceful for us. Thank you.

I am going to start questioning. Ms. Ufner, I want to talk about partnerships between the Corps and non-federal sponsors. Obviously, that was the crux of your testimony. I think I heard that you and maybe Mr. Johnson had some concerns about different agencies playing into these projects, and is the right hand talking to the left hand.

Can you expound on that a little bit and give me an example of other agencies that are working with the core and the non-

federal sponsors to get these kinds of projects off the ground?

Ms. Ufner. Thank you, Senator, for your question. I am happy to respond. I may defer to Mr. Johnson for more specific examples.

At least, from our members, from what we understand, we do hear of some challenges with the Army Corps of Engineers working with other federal agencies, specifically in levee safety, per se, with FEMA. We highlighted an example with Public Law 8499 earlier, but there are other examples on how does flood risk management fit in with the overall issues within levee safety.

Our point has always been that it is our non-federal sponsors who are on the ground paying for these projects, and they are in touch with the local communities. They know what is best for the program, so we would really encourage federal agencies to work with in that confine.

Senator Capito. Mr. Johnson, did you want to make a comment on that?

Mr. Johnson. I just might add one. In California, especially, we are very cognizant of impacts on the habitat. So when sometimes some of the Corps directives, they want us to remove some of the vegetation that are on or near the levees, that has created some issues with some of the other federal agencies, the Fish and Wildlife Service, the National Marine Fisheries Service. So those can complicate projects when that

are odds on purposes at a federal level.

Senator Capito. Mr. Chiasson, I do you have any experience with conflicting federal agencies in working on the Corps projects, with your project?

Mr. Chiasson. I could talk for three hours about that, but what I can tell you is yes, there are. What happens, a lot of times, especially when you are trying to get a permit to do some work in a coastal area, there is conflicting, and we talked about silos, everybody has their own mission, and a lot of times, all those missions conflict.

So it is hard as a local sponsor to try to tap dance around all of those different, instead of looking at what the main mission of the project is and where we are trying to go, and trying to mold that together to make something that is actually doable, because it is both environmentally and economically beneficial.

Senator Capito. Does your port primarily serve as a land base for offshore oil and gas support service companies? Is that the main function?

Mr. Chiasson. Yes, it does. We like to call it offshore energy these days.

Senator Capito. That is good. This is an interesting question, I think, for this, because the Biden Administration's Fiscal Year 2020 budget request includes language stating that

one of the objectives considered in developing the request was "not funding work that directly subsidizes fossil fuels, including work that lowers the cost of production, lowers the cost of consumption, or raises the revenues retained by producers of fossil fuels."

Would that cause you a problem that you are going to be, because of the function that your port is there for, its main function, servicing the oil industry? You are going to get knocked down in your ability to get help?

Mr. Chiasson. Yes, it would, and it would also hinder our ability to look at offshore wind and other sources of energy offshore. As an offshore oil and gas services port currently, it is our customers, it is the technology that exists, and offshore oil and gas, that actually are helping to create the offshore wind farms in the northeast. That type of ruling, or that regulation, would hinder us from even embarking on further capabilities to serve as the offshore wind market, and we are going to continue to try to pursue that.

Senator Capito. Right. I might add, too, if the substance of the hearing is nature-based and natural infrastructure. If you are hemmed up from being able to access the expertise and the funding that goes along with that, as a goal of being more environmentally friendly or compatible, you are really cross purposes, I think, from what this regulation would say.

Mr. Chiasson. That is correct.

Senator Capito. Okay. I am waiting for the Chairman to take his seat so I can go vote.

I am going to ask Ms. Ufner again, when putting projects together, and I know a lot of funding comes from non-federal partners, how important is the research and development that Dr. Bridges talked about, and how do you coordinate that with your non-federal partners, with your membership?

Ms. Ufner. Thank you for that question, Senator. That is a difficult question to answer, because what we have found from talking with our members is that natural-based features, the challenges differ across the Nation. The challenge is, this has been around for years, nature-based features, and we are still learning a lot about them.

One of the examples that we highlighted in the testimony on Orange County, California, they had two very similar projects, one worked, one did not. What will work in, say, California, with Mr. Johnson, may not work in the Gulf Coast, and that is still research that is happening.

It is hopefully through these projects as we move forward that we will be able to glean more details and share them with each other, because it is all about collaboration and becoming a win-win for us all in the end.

Senator Capito. Yes, and I would imagine Dr. Bridges

talked about the atlas that is being created. I am sure that would be very helpful to projects all across the Country.

Mr. Chairman, thank you, and I will go make my vote.

Senator Carper. [Presiding] Great. Thanks so much for chairing. I want to come back to, if I can, to Dr. Galloway, and ask a couple questions, and then we will wrap it up.

Dr. Galloway, you are well-known as an expert in disaster resilience and water resources policy. Did you know that? Working as a governor-appointed official in not one, but two States, Louisiana and Maryland. If you ever talk to the governor down there, give him our best, John Bel Edwards. Give him our best.

You have been working with those folks in two States to address long-term strategies for sustainable infrastructure in coastal conservation. You have also served, I am told, on numerous boards and commissions across the globe and have extensive experience with the Corps as a former District Commander and Appointee on the Mississippi River Commission. You have seen these challenges, I think, from all angles.

Here is the question. In your opinion, what are the biggest barriers or challenges to incorporating nature-based design concepts into the Corps' Civil Works Program?

Mr. Galloway. I think the biggest single problem is a failure for those that are in the process of approving and

reviewing to recognize two things: one, that not all benefits can be quantified in terms of dollars. You can come up with qualitative and quantitative approaches that explain what is happening, but when you are building something that, for example, a nature-based system that provides relief from heat or reduces pollution, and yet the major project itself may be flood control or something else, people discount that. Don't do that. Separable item. Come in with another project.

We have got to take a systems approach that recognizes there are multiple benefits with nature-based approaches, and we need to be able to figure out how to incorporate them.

The second part of that is, we need to figure out a way to have agencies work together on projects where they are not at cross-purposes, but their authorizations and their interests are slightly different, but we need to pull them together. You can take the case of Hampton Roads in Virginia, where we are suffering with sea level rise, and they are trying their best to do something there. You have multiple agencies, each with a stovepipe giving them funds and authorities.

How do you mix those? How do you blend those? Who is trying to put all those things together? The locals certainly have a challenge in bringing these people to the table. Even once they get to the table and agree, how do you get them to get the authorities from Washington to move ahead with a coordinated

approach to dealing with this, dealing with the multiple permits and all the things you have heard from both Port Fourchon and from SAFCA? It is a challenge.

Senator Carper. Thank you for that answer; it was good. Very good.

Mr. Chiasson, as a Louisiana port director, you have had a front row seat to seeing the impacts of climate change. You are also on the, I am told you are on the Executive Committee for Restore or Retreat, a non-profit organization that addresses Louisiana's land loss by advocating for large-scale coastal restoration projects.

Since Hurricane Katrina, the port has constructed a number of new facilities and created hundreds of acres of wetlands, integrating both traditional engineering concepts and nature-based features using a variety of different funding sources and programs. In your opinion, does the Corps of Engineers Civil Works process allow for integration of nature-based features into projects? The second part of that question would be, how could it be improved?

Mr. Chiasson. Thank you. I can give you an example of what we are dealing with from what in WRDA 2020 was just passed, and we were authorized to go 30-foot draft, but we are still in the environmental process, finalizing that. You have to look at it from the Corps NED policy, and that is the National Economic

Development plan.

What that looks at is least costly and environmentally acceptable alternative. What was asked of us is to investigate and look at the NED plan and we wanted to have the NED to be the offshore disposal site, which, one, is just not smart in South Louisiana because we need every speck of sand we can to rebuild our coasts. Like we said, we want to use 100 percent beneficial use.

Two, we don't have an offshore disposal site actually activated, so there is no place for us to actually put it. That is still something that we are trying to deal with.

What we need to look at is not staying in our stovepipes, or not keeping silos there of where these funding sources are for us to be able to participate with these navigation projects, but bring in the environmental portion of those and utilizing beneficial use of dredged material. It is critically important for us in South Louisiana and across the coast to do that.

At this point, where we are, a typical cost-share is 75 percent federal, 25 percent local sponsor. Right now, where we are because of the NED portion, it is actually 51 percent local, and 49 percent federal. We need to change that.

Senator Carper. Thank you very much.

I want to come back real quickly to you, Dr. Galloway, if I could, just a quick follow-up. What changes are needed to the

Corps' cost-benefit methodology to enable the Corps non-federal project sponsors and the public to better evaluate and compare nature-based infrastructure to other alternatives?

Mr. Galloway. Mr. Chairman, it is interesting to me, because I have been around so long, 60 years.

Senator Carper. That is not long around here.

Mr. Galloway. Yes, sir. We know how to do these things. There are experts within the Corps and within the academic community that have been working with how you evaluate these issues. The issues come up, like Mr. Chiasson just said, is the issue, if there is a focus, if the objective is strong on NED, economics, you tend to disregard the other.

I think we can find the methodologies, but what we need, in my view, is for the Congress to ask and say, we want a response in terms of the evaluations that balances all of these.

You go back to the 1980s when Tug Fork was being built as a project in West Virginia, and it was lectured to in the Senate that this benefit-cost is supposed to be the sum of all the benefits, the sum of all the costs, and we need to blend and be prepared to deal with both quantitative and qualitative benefits and costs in the same document. This can be done. There are people that are ready to do it, but it takes a will to do that.

Senator Carper. Thank you. I am going to stop picking on you now, and we will find Mr. Johnson. Mr. Johnson, in your

opinion, are there specific Corps policies and procedures that disincentivize the inclusion of natural and nature-based infrastructure? If so, what are some of those policies and procedures?

Mr. Johnson. Thank you very much, sir. I referred briefly to one in my oral testimony. Let me expound a little bit on it because it was a recent experience.

In the Yolo Bypass, when the Corps built it for flood control, they purchased 59,000 acres, they purchased flood easements on it. It is primarily farmers who grow rice, and then during the flood season, their lands are fallow.

One of the projects we wanted to approach the Corps on is to incorporate a nature-based solution during those fallow periods. Salmon and steelhead, they get into the bypass, grow eight to ten times larger than in the main stem. So what we wanted to do was to work out a process where the farmers on their lands, when their fields are fallowed, would grow salmon and steelhead.

We were told that if we did that, Corps policy would require us to purchase all the lands in fee title because it was an environmental restoration component. So while it is okay for our primary purpose for flood control to have easements, if we wanted to add the secondary benefit on the land that we already have rights to, we would have to go purchase it in fee title.

That alone, it basically made it so we couldn't move forward with that particular possibility of adding a nature-based solution to a period of time during the flood season where we weren't getting anything out of the land there.

Senator Carper. Okay. Thank you for that response.

Ms. Ufner, I have one quick question for you. You mentioned, Mr. Johnson mentioned agriculture. There is a press conference going on right now on legislation on the Floor on how can we enable and better equip farmers so that they can be fighting on the right side of climate change and still make money. So I am looking forward to that for the ag community.

But before I run off to do that, a question, if I could, for Ms. Ufner, please. Has the navigation community recognized benefits derived from the beneficial use of dredged materials for the creation of marsh buffers and other landforms that reduce the overall cost of traditional dredging and disposal? If so, how, and what are the barriers to expand this practice, please?

Ms. Ufner. Thank you, Senator. That is why I appreciate that you have the port here to also talk about the benefits of the dredge fill.

We do have two examples within our testimony, both that feature on Louisiana, but on the beneficial use of dredge, and we do appreciate Congress moving forward and recognizing the

beneficial use. Having said that, there are still some challenges. The costs can be very prohibitive.

One of the examples we have from Louisiana that they were estimated $20 million to move the dredged material 12 miles, and the port would not have been able to do it except for the State of Louisiana stepping in. So if we can address those overall costs of what it costs and allow people or entities to move forward with projects when you have a willing sponsor, that is all that we can ask for. Thank you.

Senator Carper. Thank you. In closing, let's give a little bit of context here. This is the last day we are going to be in session until after the Fourth of July, and there is a lot we are trying to get done in committees and on the Floor. Even over at the White House right now, there are meetings just beginning on the bipartisan infrastructure package that we worked on in this committee, and I think made a good contribution to a couple of them.

But all that is going on literally while we are here, so I thank you for bearing with us as we move through our agenda. I want to thank you for your time and I want to thank you for what you do with your lives, and for all of us. Thank you for making us smarter.

My dad used to say, my sister and me, when we were little kids, have you taken your smart pills today? Maybe your parents

did something like that to you, but you have given us a couple good smart pills here. We are grateful for that.

The Corps and the important work it does protects us from floods, and also it helps shippers navigate our waterways safely so that we can adapt to the realities that we are seeing, the climate crisis. We heard some gripping comments from our Senator Kelly from Arizona about what they are facing there, and what we have talked about in Louisiana, about losing a football field of land every 100 minutes is pretty hard to imagine.

Incorporating natural infrastructure into its future planning is a cost-effective, efficient way that we can shield communities from the impacts of future storms and natural disasters. It is my hope that today's hearing has shed some light on that urgent need and will help foster further action.

For some final housekeeping, I want to ask unanimous consent to submit for the record a number of reports and articles relating to the Corps' use of natural infrastructure and ongoing research by the Corps and non-federal stakeholders about nature-based initiative. These documents stress how natural infrastructure can be used as a tool to address the impacts of climate change, including increased severe weather events and sea level rise. Hearing no objection.

[The referenced information follows:]

Senator Carper. Additionally, Senators will be allowed to submit questions for the record through the close of business on July the 12th. We are going to compile those questions and send them on to each of you. We would just ask that you reply to us by July 13th. I was just kidding on that, no. By July 22nd. I wanted to make sure you are listening, so July 22nd, if you could have your responses back by then, that would be great.

With that, again, one last time, thank you. Happy Fourth of July. God bless you all. Thank you. This hearing is adjourned.

[Whereupon, at 11:47 a.m., the hearing was adjourned.]