Interviewer: Okay, great. Yeah, so if you don't mind just starting by telling us an overview of your area of expertise and your work responsibilities.

BD025: So right now, I'm the Coastal Program Director for the Nature Conservancy in Alabama. So I'm nestled under the state chapter, but we work, of course, across the Gulf, with the Gulf team, the Southeast division, the North America region, and the globe. So we do it all. What we have been focused on is connecting people with nature and resilience in communities on the coast. So it's everything from land acquisition and protecting that land long term to provide migratory corridors for wildlife habitat and species, but also looking at using nature-based solutions to help provide alternatives for shoreline protection or storm water integration to improve water quality. Let's see - and we're working on recreation. So some work we've already done with boat ramps but boat ramps are ways to get rich people to the water and we're also looking at very much shore-based excursions and opportunities with that and with upcoming projects that we're working on, so a little bit of everything. For us we tend to be a hub. We can pull a bunch of partners together and get money from a large pot on the ground to everyone fairly easily. It's sometimes difficult for state agencies to do that. It's sometimes expensive for universities with university overhead to do that, so we try to work across those boundaries and bring the larger groups together. In my experience, if we have someone who wants to be engaged in our project they will be, they'll figure out what their role is for it, they'll let me know and we'll figure out a way to integrate them. And we leave our doors wide open on all of that. Very inclusive.

Interviewer: Very cool. Awesome. Okay, so a little of everything it seems. Okay, well, so to dive into our biodiversity discussion. So I think probably I said in the email, the very broad overarching goal of this project that we're doing at the Smithsonian in partnership with South Alabama and Steven, his group, as well as some folks at NOAA, is to understand the role of biodiversity in marine resource management. So obviously, that's a huge research question and incredibly broad. To start this conversation, one thing that we've been hearing a lot and realizing is that the term biodiversity itself means different things to different people and of course that can be measured in multiple different ways. And so as a starting point, I'm wondering what you think about when you think about biodiversity and what you see as the key aspects of biodiversity.

BD025: So let's see, yes, a big question. So I would say when I, the first thing that comes to mind when I think about biodiversity is I'm thinking about ecosystem health and I think about climate impacts a lot. So how the diversity continuum is, you know, how are we connected? And that can be from, you know, within the water, from the water to the land. The biggest example that comes to mind is there's a lot of money going to salmon recovery out west. But in the south, when we start looking at anadromous / catadromous fish runs, what we're looking at is connecting - and we're doing this now past two dams - building designs or putting designs together for fish bypasses around dams that are basically going to connect I think it's close to 600 miles of river systems. It's not for salmon, but it might be for striped bass in the future to restore those runs. And it's going to be for the mussels, the fish - the veligers of the mussels grab onto the fish gills and ride upstream and downstream. So it's within freshwater migratory species. It's gulf surging coming from the Gulf coast moving upstream and it's everything attached with that. When I think about that biodiversity, I also think about the communities, the human communities that are on the edges of those systems and how they maybe use that in different ways. It could be cultural from the tribe standpoint, from the Poarch Band. It could be community festivals with a small rural community that they're basically celebrating Mullet Run here. And it could be, you know, folks catching striped bass or tropicalization and tarpon coming into Mobile Bay now. So, and I think that same way with the habitats, fish are an easy conduit, but you know, the habitat migration, as our marshes are eroding, whether we like it or not, seagrasses frankly are moving in. And those marshes are moving into pied savannas and those pied savannas are moving upstream. if we've allowed for those corridors to be protected and if we have seen, you know, if we have kept those systems healthy with good management. And I think that's where we're not maybe doing the best we could do, but we're trying to get on the right track.

Interviewer: Okay. Okay, great. So some previous research from some of our collaborators has generalized biodiversity into four key components or bins. And so Sarah, do you mind just throwing those in the chat? But they are habitat forming species, species of conservation concern, harmful organisms, and key food webs supporting species. And so we're wondering if you agree that these are the key components of marine biodiversity. Is there anything that you would remove, change, anything that's missing that's essential when defining biodiversity in a marine ecosystem?

BD025: Yeah, we're thinking about marine stuff, I think those are good things. Just one more thing. So when you're thinking about harmful organisms, Again, thinking of migration, what we're really seeing here is we're seeing carbon coming in and it's not harmful organisms. It's different organisms because of migration, because of changes in climate, changes in what our systems are doing. We're seeing parrotfish move into Alabama. What? What? What? I mean, and they're eating the seagrass that the turtles and the manatees want to eat. So I would maybe, harmful organisms is one thing, but maybe there's also something about these, I think it is climate induced natural migration, that with mangroves eventually moving into these areas. So some way to capture that might be good.

Interviewer: Okay. Okay, great. Do you, so I think I already know this answer given the wide range of work that you do, but do you consider these four components of biodiversity in your own research? Is this a way that you think about the marine ecosystem in your own work?

BD025: Maybe not with these exact words, but in the general terms.

Interviewer: Okay. Okay. Great. So like I said in the start, the overarching goal of this project is to understand if and how we're managing for biodiversity. And so when thinking about all these different components of biodiversity, not just those four bins, but how you were defining and conceptualizing biodiversity at the start of the conversation, are those components of biodiversity currently explicitly considered in management in your system? And if so, with what approaches or policies?

BD025: Say that again.

Interviewer: Yeah. So, but so the start of the conversation when I was asking what you think about when you think about biodiversity. So your overarching perception of biodiversity. Is that currently managed for in your system? Is it explicitly considered in management in your system that you work in?

BD025: By us or by partners or in the system as a whole by elected officials, by resource managers. I mean, I guess so broad, but you're asking, I'm not sure how to answer. I guess all of the above, if you could specify in different ways that it is managed for, that would be great. If you know. So I think, well, I think resource managers try hard to think of all of these things. But when you're looking at the decision makers, which could be the elected officials, they don't think of all of these things and sometimes they don't ask. And I think when you think about funders, they think they're hitting on these things, but then they have a preference. And so they won't let even if the resource manager on the ground wants to hit these things, they're not always allowed to based on the funders funding constraints.

Interviewer: Okay. What about you were saying yourself at TNC, like, is that is biodiversity considered in management through your work at TNC? Is there a different answer that you would give in that context?

BD025: Absolutely. Yeah. So TNC is thinking about that, but we're also adding in the human side. Yep. So all of this stuff is great on the species, the habitat, the, you know, the wildlife, but we're trying to figure out how it fits with these communities that we're engaged with.

Interviewer: Yep, okay. Okay, so are there approaches to managing biodiversity that you think would be useful in improving ecosystem service delivery in your system? Are there specific management approaches that you would like to see being included in your system or being adapted in your system?

BD025: I think there needs to be some more work done on that. If we're talking in marine and I'm including some coastal stuff. So I think there needs to be beneficial material. beneficial dredge material just has got to be incorporated in there and it starts out maybe not being so biodiverse but it could be the thing that stops the marshes from sinking by adding thin layer across there over time that helps build those marshes up from the inside and we're seeing that we're not seeing it like Louisiana is seeing it but we're seeing that in most of the areas along the northern Gulf Coast so I think figuring out the appropriate way and the funding sources that can enable the dredge material to be used beneficially along through lines within marshes in those areas. I think that would be part that would kind of fit in here. I feel like everybody's got a good idea on dealing with invasive species, whether it be plant animal in the land-based environment and prescribed buyer. They want to do the right thing, connecting hydrology. The funds aren't always there and the state agencies in charge of it generally don't have the funds to do it. And it's really difficult to retain staff. There's a lot of turnover, then that's restarts the clock every time, it restarts the relationships every time, and that just prolongs the impacts that all of these invasive species or lack of fire or whatever, it just prolongs those impacts that then basically impact the biodiversity long-length pine and southern slash pine on the coast are just incredibly diverse systems, but they can't be managed. They're not being managed and maintained in the way that they should be. In the water, I think invasive species are, I mean, I don't know how you even come to address that. I have walked away from it because it's just, we're just gonna have to deal with the implications of ballast water and what we have done, you know, as a human group to what's going on, because how do you get rid of Tinafores or lionfish or whatever. I mean, the best that we can do is the best that we can do, but so I don't know. But I think there are other ways that these resources could be managed. And I think looking bigger, it felt like for a while the federal government wasn't looking just at single species conservation as much. They were using them as keystone species and umbrella species for multiple other species. And now it's gone back to a, you know, it's just about the Gulf Sturgeon. And that doesn't help the system necessarily. And I think because if it doesn't help the system, it doesn't help the Sturgeon. So I'm not really sure. I feel like it's very short-sighted and we've kind of swung the pendulum back to a place where it might've been in the 90s, you know, before we started doing broader ecosystem related conservation.

Interviewer: Gotcha, okay. Okay, great.

BD025: Sorry, if these are two, if I'm going down the wrong path, you just need to tell me. That's not really what we were looking at.

Interviewer: No, no, no, that's great. It's really, really informative and interesting. I wanted to take a step back 'cause you were mentioning that an important part of how you think about biodiversity and the work that TNC is doing is incorporating human diversity and how nature connects to human communities. And so when thinking about biodiversity in your system, what specific ecosystem services rely on biodiversity in your system within your work that you're working on?

BD025: I will say we are mapping stormwater right now. I would think stormwater is going to have some big connections because we can get the water quality cleaned up. going to change some things that are happening with both within the freshwater system where it's generating all the way to the coast where we're seeing it come out. So I think that's a huge one. And the same thing with the fish bypass and the dam operations kind of deal is I feel like those are really huge relating to water and how water might change what salinities we're seeing, which will have impact on the biodiversity in those systems. I think we have to be cognizant of, you know, commerce in the area. In our area, we're dealing with inter-custal waterways. A lot of places have that and very active ports that are hugely visible from land. It's not like if you go to Louisiana, if you want to see the Port of with the Ushan or anywhere to the south, you are driving out through the middle of a wasteland out in the middle of nowhere. In Mobile, it's right here in downtown. Working for it, you can see it from the restaurant. You can eat and you can watch ships load and unload and you can watch them motoring up and down the bay. The impacts that those have on biodiversity are big. They, you know, it's eating away at shorelines. 80% of the shorelines in Mobile Bay are privately owned. And so we can't get money to do shoreline protection, but the wakes that are being generated now from Panamax and other ships are causing an issue. Then that causes sedimentation. And then you get this, you know, negative feedback cycle kind of coming into play.

Interviewer: Yep, yep, okay.

BD025: If that's somewhat helpful. We're dealing with a lot of the smaller communities and at Lightning Point, for example, where we rebuilt, they had huge erosion issues we were able to rebuild breakwaters about 600 feet of shoreline out and you know 40 some acres of marsh and tidal creeks and you know we never expected the public down there to really engage with any of that. We built that so that it had speed bumps, moguls in there for high areas for birds and low areas for you know crabs and tidal creeks for the fish and you know the whole suite some oyster shells for oysters, but also for nesting migratory birds, shorebirds. And now as it turns out, people are out there all the time, walking in the middle of a dang marsh. Who would have thought? I thought they're gonna sink in the mud, they're not gonna wanna be any part of this, they're just gonna stand from on high and look out over the observation decks, no way, no how. I mean, a lot of them do that and they love it, and they're enjoying from the community having this aesthetic. but some of them actually walking out there and frankly, when we're out there monitoring, they'll come out and ask us, "What are y'all doing out here?" You know, and they're engaged in a different way. So that's a different connection with biodiversity than we ever anticipated, but they are now watching seasonally the birds that are migrating through, or the types of fishing vessels that they see out on the water there in the Mississippi Sound, or, you know, when they see any of the academics out there, Dauphin Island, Selah, EberSouth, or Auburn, or us out there, can we monitor what are we looking at? And so it's a different connection than we ever expected. I don't know if that's helpful.

Interviewer: No, that is very helpful.

BD025: Do you know when you say they are out there, are these coastal residents in Mobile or Joe? Joe, Walmart, and whoever. Some of them are workers from the industry in that area. They come down from shipbuilding or whatever, take a break and eat their their lunch out there, have their morning coffee. Some of them are residents that watched us construct the project that are really excited about it. Some of them are people who live from out of town, but come down to the restaurants down there, once a month or once every two months or something. And they're like, wow, we didn't even realize this was down here and we're coming down. And now we're part of the coastal bird trail. So we get folks that from all over the world, frankly, that are down there and we never know who we're gonna run into.

Interviewer: Yeah.

BD025: It has been really just very interesting. I never, I always believed with the environment. If you built it, they would eventually come. And that's true for the human side of it as well. We, the pavilion, they can get out of the sun, they can get a nice breeze on top of the hill and they can look at this great vista. And for God's sakes, there are people there every single time we're down. The mayor stopped sending me pictures because so many people were there. And at first he thought, oh, isn't it nice? Like there's a person or a group or whatever. And he would send me pictures every time. And you know, two years, three years later now he's like, I'm not sending pictures anymore. 'Cause they're just, there are people here all the time. And that's kind of cool. It's a different connection.

Interviewer: Yeah, that's very cool. That's very cool. Okay, great. So I think I'm gonna pause there for a second. Sarah, do you wanna go ahead and share your screen? Do you have some concepts populated?

SG: Yes.

Interviewer: Great. So Judy, are you familiar with Mental Modular? Have you seen this from Steven at all, working with his group?

BD025: I think a little bit, yeah.

Interviewer: Okay, so the hope for this project is to build-- - This project is difficult-- - Oops, sorry, I'm echoing on my end. Can you guys, you're hearing my echo too. - You're echoing a little bit. - Okay, and it stopped now on my end. Let me know if you hear it again, and if not, Sarah can take over. Okay, so the goal of this project is to build mental models of how individuals such as yourself think about biodiversity and how it relates to the system that they work or live in. And so as we've been talking, Sarah's been populating some concepts into the software mental modeler, starting to draw some connections. And I'm hoping with the rest of our time we could finish drawing out this model as you see your system. And so basically mental modeler is just a way to visualize how you see a system. So we have a list of concepts in your social ecological system, and then we can assess how those concepts are related to one another. And so we would say if concept A were to increase, would that impact any other component in the system? If it was to have an impact, would that relationship be positive or negative? And then we can add a weight as well, if possible, to assess which relationships in the system are most important to driving system dynamics. So maybe, Sarah, do you wanna go through and talk about the concepts that you populated in from the conversation?

SG: Yeah, can you still hear me? I switched to headphones. Cool. So I'll start in the top left corner with the orange concepts. Those are some of the things that Judy, you mentioned, you think about when you hear the term biodiversity. The ones in gray are those concepts that we found in the literature that are thinking about biodiversity and then the additional one you added, the climate-induced migrating species. The pinkish purple ones at the top are stressors to the system or things that may negatively impact biodiversity. The yellow are either management actions that are currently being done or things that might help improve biodiversity. And then the blue on the bottom left are ecosystem services.

Interviewer: Great. Thank you. So to start, this is a lot to look at. right off the bat with a quick glance. Are you immediately seeing any concepts that you think should be removed or think obvious things that we miss that you wanna add?

BD025: I can't remember how you've categorized all of these things. So I'm not sure which color is concepts. I'm not sure, Seagrass Intrusion kind of goes with the eroding marsh. And I'm not sure it's a negative thing. I just think it's a shift in, it's like an ecological shift in things. And what, let me just explain the constraint there is, say I'm a homeowner and I've got this beautiful marsh out in front of my house and property, and I've left it there because I wanted to uptake the nutrients as I'm doing my lawn and I'm having this beautiful green lawn. And I love that. And in front of that marsh is seagrass. Well, now the neighbors have gotten fake boats and they're running up back and forth, and my marsh is starting to erode. And I really wanna go in and put a core log in and do a living shoreline. Well, I can't, because the second that that marsh starts coming back, the seagrass moves in, and regulatory, I'm not allowed to have that impact. So maybe the eroding marsh and seagrass actually comes from a regulatory framework of, - Yeah, of how 80% of the shoreline being privately owned, how are they able to deal with addressing the issue to protect the land? Because pretty soon the river now is going to be up against my house. And now I'm losing things and I'm having major impacts to my lifestyle. So I think that's definitely something that kind of jumps out there. So it may be a regulatory thing. I also think, again, you have beneficial use for edge material stuff in here somewhere, right? 'Cause that's a huge, I mean, there is, so in the past down here, they basically took this offshore, pumped it out into the open wide ocean like 20 miles offshore. I mean, yeah, the land is eroding from Kentucky all the way down through to Mobile we're shipping it off and filling the ocean. What in the world were we thinking? So I think thinking about the ways that we can use that to, you know, again, boost the marshes and all. I'm trying to think of what might be missing in here. I think a lot of this, you know, it definitely all kind of ties together for sure. I can see where you're coming from. I honestly can't from this conversation believe that you wrote those into those boxes because my brain does not think like this immediately. You are bidding things as I was talking and I would have been like, I would need to draw it out on a piece of paper and then put it into this program. Because I just am going on too fast to think about how it all relates. But this, it really, it does come together fairly well.

Interviewer: Okay, great. Okay, so maybe we can start by filling in some relationships that might be missing. So I think it would be, it might make most sense to start with the concepts in the middle, the white or gray ones, are those biodiversity bins, if that's okay?

BD025: Yep.

Interviewer: So we could start with maybe habitat forming species, I think is an easy one. So would an increase in habitat forming species, does that impact anything else in this system as we have it?

BD025: I think it could help with marsh erosion and seagrass protection. Obviously water quality. And I don't see something that is kind of broad water quality. Yeah, yeah, there you go. For sure, because those are certainly direct connections. But I also think that that's something that could help private landowners and habitat forming species. I mean, we don't think about them all individually. So on the Gulf Coast, really oyster reefs with marsh grass and seagrass all together, they're kind of the three-legged stool. So we see them a lot together. one and the other, they kind of work and feed back and forth off of each other. So I would just, in most cases, we see them together. So when I think about like, say, habitat-forming species with private shorelines, we might put four logs or pescope pages out there and get some oysters, not that we're looking at harvesting, but those would then potentially also help protect the marsh grass and you know the seagrass that are in and around those places.

Interviewer: Right. Okay. It's just gonna be arrows everywhere. That happens a lot, yeah. And we don't have to also like that's why I'm recording as well is a lot of the information that you've been giving us, we can go ahead, we'll transcribe this and fill it in after the fact. So that's why we have this approach where you and I kind of go through the questions and Sarah builds it in the background because We got a lot of really beneficial qualitative information from you as well in the first part that can help inform this Okay, is there anything else that we should connect with habitat-forming species before we move on

BD025: I Don't I mean, I don't think so. I got a bunch of it there. Great What about species of conservation concern? I don't think of them that way. I mean, I guess I just don't think about single species management. I want them to be part of it, part of whatever the whole ecosystem is. Fish and Wildlife Service likes to fund things that way and I've gotten no funding from Fish and Wildlife because I just refuse to think that way. So I work with NOAA and NIPWIF and others that are thinking a little bit more about system-wide. Yeah, okay. Okay, we can take that concept out as well if that makes sense. Well, now, and I think we have to, if I'm working on a project and that, and there is a species of concern, of course I use it to my advantage. But I don't necessarily approach it from that direction. I approach it for the project and the project being a new project and then if it falls in where there's a good species of concern, then of course use it to our advantage.

Interviewer: Right. Okay. Okay. Can we maybe jump now to harmful organisms and the climate-induced migratory species? What impacts those or how what do those impact in the system? So when you think of harmful organisms, are you thinking about lionfish or are you thinking about red tide? Both. All-encompassing. Yeah. So usually harmful organisms, people think about invasive of species and diseases are like the two that come up a lot. - Yeah, so I think when I think of, let's see, we're trying to see what it should be connecting with. It's definitely connects with any kind of habitat management. I'm not, I'm looking around down here to see where things are, but so when I think of broader ecosystem health and ecosystem management, that is one of the things harmful organisms because we've got pigs rooting up our coastal slash fine, savannas, and that's huge, and that changes that whole side of things. I think we're seeing more connection between the harmful organisms with climate impacts because what's happening, I've worked in South Florida for a long time, and those invasive species from there are now migrating up here, and it might be a natural migration, but we brought them in and they were an invasive species from the beginning in Florida. So now they're coming into this area. So I think that I will say with harmful organisms thinking about it from the HABS end, we are looking at that from a water quality stance because that is connecting humans with nature. If they're getting out, if they're trying to go to the beach and I don't work on the Gulf of Mexico side at all, I am inside the bays, inside the lagoons, but what comes out of those lagoons and bays is what closes the beaches down for the public and the economy. And so thinking about how that shifts and we know that that also impacts oyster aquaculture. So we've got a lot of oyster harvest that happens in Mississippi Sound and in coastal Alabama we have, I think the largest aquaculture industry for oysters on the Gulf Coast. The most numerous and I think the most profitable. And that HABs can cause issues. HABs and fecal coliforms, I mean water quality in general can cause issues. So that's an economic hit. It's a livelihood hit. It's a health, public health hit. And it's a access to the natural resources hit. - Right, right, okay. - Let's see. And with the climate-induced migration of species, I think that goes back to the ecosystem health. I think if we can get our management, our habitat management in place and we can make our systems healthier, I think about the pine forest, again, fringing the coast with the the marsh, if those systems are healthy and able to respond, they're going to recover more quickly from hurricanes or any kind of minor event or major event that might happen. They're going to potentially have less erosion issues if they're healthy. When it comes to, you know, disturbance, when disturbances come through, that's going to impact what's happening with the health of the system. I think again, they are, you know, I think of them as part of the filtration prior to stuff, the natural stormwater management, you know, coming out through to our bay systems before before it reaches the coast. We're doing a lot of managed stormwater, but we're also, we've got a lot of natural percolation and natural filtration that happens along the coast as well. Okay. Okay. I want to tell you, you can keep all those boxes straight with what's everywhere. I'm just shocked. I'm just, I'm going to say I'm impressed. We may hire you and have you facilitate a discussion because I'm just like, wow, this could be really cool. We'll get her in here and help us figure out how all this maps. Perfect. All right. So I think key food web supporting species is our last biodiversity bin. And I guess I'm thinking of that when I when I think of that, tell me if this is wrong, I think about the nursery habitat stuff that we're working on. And so with that, again, I tie that back to ecosystem health, because it's, you know, I'm all about we got got people who want us to focus on red snapper, isn't that you know, glorious thing to be doing or some kind of managed oyster fishery or whatever. Folks, you know what we like to do with the Nature Conservancy on the coast? We like to make babies and we are going to find, we're going to restore the habitats that have been damaged and we are going to try to get them in the best possible health that they can be. Give them all the vitamins and whatever they need so that we can make a lot of babies on the coast and those can be, you know, crab, shrimp, fish, you name it, across the board. And we've pushed that role because we have other people who are good managers of those other things. They can deal with the unruly teenagers, they can figure out who's killing off the adults in the system, but we're going to focus on making babies. And if we can make that happen, then hopefully we've put our best foot forward in our role and what's happening on the coast. Yep. Okay. And that, you know, that's going to tie too with good water quality. And when with water quality, make sure that it's not just nitrogen, phosphorus, whatever, but it could be, it could also be the timing and quantity. What we get down here a lot is you wouldn't think so. But when the bonnet carries, fill away opens up in New Orleans, it flushes our system out. We get our salinity will drop from 25 parts per thousand to two and it kills the oysters off and it kills the oyster aquaculture off. And you know there are major impacts from that. And I would say that it's not been fully documented yet but we have John Lerner at the university looking at acidification. And how is acidification working towards, we're seeing more stone crabs, tropicalization, right? Moving in blue crabs and those are impacting the oysters, but are the oysters at their best health? Or is there some other factor that is in the thickness of the shells? And you may be familiar with Lee Smee's work on scaring the babies and making the shells thicker but I'm all about crab pee if it makes it that much stronger so those babies can survive because of course we're the ones trying to help you know promote making babies. So anyway I think water quality that whole thing hydrology as well if they know the quantity and the and the quality both need to be taken into account.

Interviewer: Right okay perfect. Okay great. I think with our remaining time, I'd like to focus on the yellow boxes in the right corner if possible. So really trying to understand how these management approaches, so yellow is management, how they impact biodiversity on this map. So we could start with private shoreline regulations maybe at the top and work our way down.

BD025: So and I'll put this, we have private shoreline regulations, but this could also be industrial seawalls. So when you look at it, you're dealing with a bulkhead, right? Just a flat surface. We've been working with Ken Heck and some folks out of Sydney, Australia, on some panels that can be mounted to seawalls in industrial areas. It could be at passes like in Orange Beach. It could be along, say, Ingalls Shipbuilding in Pascagoula, along ports, it could be wherever, but it will help diversify something that is flat. So provide opportunities for Bryozones and Algies and whatever to colonize, which would then maybe in our area might enhance sheep's head. And from looking at it from the shore-based area, you're looking at subsistence fishers being able to maybe catch food and put it on the table in a little bit different. So the thread to take, you know, that type of thing to an outcome. But with private living shorelines, you're looking at the opportunity of taking something from a seawall, adding Martian, which could have water quality improvement. Two, I think, do you see Brienne put in, you know, a two square feet of marsh, junk is on the edge of a lot could uptake 70% of the nitrogen and phosphorus runoff. That's huge when you're dealing with eutrophication and riverine systems as it comes in. It's also filtering out any sediments that might come through. So that's, you know, there's a whole level with that. So I think thinking about how and with that encompassing in our area, 80% of the shoreline plus hardened areas that are municipal industrial whatever you want to call them. I mean that could be a minor well minor upgrades could be major could see major impacts. Yeah so with the seawall panels beneficial dredge material honestly we just need we're losing shoreline and then we're pumping it offshore so we just need to build it up. And again, like I mentioned, our marshes, we have some beautiful extensive marshes still in coastal Alabama, but they're drowning from the inside. The little microtidal system, incremental sea level rise, incremental subsidence equals nobody surviving. And so species shifts within those mars, if we can do some prescription of thin layer placement. Every five years, 50,000 cubic yards across x number of acres gives it this much boost and that's enough for it to keep up and thrive and be healthy instead of being on the edge of being an unhealthy system. And if the impacts occur when that system is not healthy at rebounds. Its rebound time is much longer. So oyster reef building, what do we mean by that? Just like building reefs? Sanctuary rates? Are we looking at it in conjunction with breakwaters? What do we mean by oyster reef building? I think I added it when you were talking about different shoreline restoration projects. We unbelievably are thinking about a sanctuary Oyster Reef in Alabama, which is unheard of. We don't do sanctuary anything on this coast. But we are working with a private landowner who's got a private lease and we're looking at doing a sanctuary thing. But we also are breakwaters. We are not larval limited, which is great. So we have the opportunity to make a lot of babies if we could possibly get substrate in the ground. And so I think looking at all of that in conjunction with in the oyster reef building, it could be a combination of beefing up the existing reefs that are out there, the wild harvest reefs. It could be looking at breakwaters and using them strategically for shoreline protection areas, but so they are kind of multi-purpose, if you will, and then we are looking at the sanctuary idea. With that, I will say one of the biggest issues with that is sedimentation. The sediment in the water column settling on it and burying this and the state on their bandaged wild harvest reefs have had huge issues with sedimentation from the riverine systems. We're a delta just like the Mississippi River. We are not blue water. That's like a bran perdido. So it is that it is a dirty system and that's okay. It's a mud-based system, but it's changed so much that that mud is now impacting the resources that used to be protecting those areas to begin with. And I think the breakwater is the same way. The breakwater is helping with the erosion and the protection and serving a substrate for the oysters. I mean that in some areas we're using breakwaters to protect the area where we know we have prolific seagrasses that are being impacted by boat wakes. We can't really fill back there, we wouldn't want to, but we can't really fill back there because of the seagrasses, but those seagrasses, you know, take off seasonally, and then that's just great nursery habitat. So again, the making the babies on the coast. Stormwater management, again, right now the stormwater is running off at such a rapid pace. there is stormwater infrastructure, it is antiquated. In some cases we're going, we're looking at infrastructure that we're retrofitting from the, you know, 60s that was put in and, you know, culverts are crumbling or, you know, they haven't been managed. So we have a lot of culverts that are half full of sediment. Well, and grass is growing in them. Like you could mow inside the the culvert. Well, you know, that's obviously not functional. So resetting the stormwater clock, cleaning those things out, cleaning them up. I think at the time, a lot of these municipalities and counties were not necessarily in the management business, like they did it, and then they walked away and figured it was going to be self maintaining. And it wasn't, it didn't just continually flush itself. So thinking about that, and resetting that, we're doing out of Mississippi Sound right now and at the new airport downtown. They're building it out of an old army base and that is just crazy infrastructure that's terrible. The fish bypass in the dam operations is so fun. I would say for that, what we have in place in Alabama are two dams that block fish passage at this point, historic fish passage. And they were put in when we were doing a lot of transportation, riverine transportation from Kentucky and Tennessee all the way down. And those aren't even used anymore. The Army Corps spends, I want to say, over $20 million a year to operate two dams that are being opened on occasion for a recreational boat. And but they don't want to pull them out. I was really all for blowing them up. I thought it could be a really great visual. I thought we could do some celebrations behind it. Nobody else really agreed. So we're looking at fish bypasses. But along with that, I think the really great opportunity is we historically had striped bass runs in Alabama and shad runs in Alabama. and we could restore those and the celebrations for the mullet and all of those things upstream between here and there and that's a huge community connection. We all love the same fish so you know that's kind of fun from the Gulf of Mexico up. Shoreline restoration kind of was hit on with the breakwaters and the private living shoreline stuff and invasive species we hit when we talked a little bit about harmful organisms, but I would just say I think that's going to be more and more. And I am not a doomsdayer, but I also think we need to be realistic about what we think we can't control or not. The best thing ever is manage pig hunts. We still need to deal with them outside of those hunt dates, but why not get the hunters to help? In my mind, I'm convinced if you can put it on a sticker, we can eat it, we can destroy it. So if we can figure out ways for the human race to do stuff like that, that's great. Because we know we can deplete resources if we're given the chance, if there's a viable option. So I think really being creative with what the invasive species are, like if lionfish could hit the menu in a ton of restaurants and it could become a fishery, we can destroy it. So it's harder to do that with plants, but I think there are options. And so one just quick reference with the oyster industry, one of our big issues down here on the salinity regime when we do have really good water quality is the oyster drill. And I always lack with folks who would have thought the snail would be the biggest predator, you know, that would cause concern, but I went out pre-COVID, I would take Fridays off generally and I know that some of the aquaculture folks, so I asked them if I could go down and collect the snails off because if you can imagine it's like a big, it's like a huge perfume bottle out there where the aquaculture is with all of the scent coming from all of these oysters out there. Come on in, you know snails, you know we're all over here, look at us over here. So the snails come literally running as fast as a snail can and they coat the outside of these cages, well I take a bucket out there and grab a ton of these and bring them home and I eat them myself because I've had escargot and I love conch, you know, these are smaller versions of that and I think we've got some farm-to-table restaurants here could we do this? They eat them in Louisiana and they've been talking about it down at Little Lagoon. So I take them into Noble South downtown and say hey I got a great bucket of snails for y'all, I happen to know the guy so thanInterviewerully he wasn't offended. But and they loved it. The problem is, Judy, on an occasional Friday, getting down there when the weather is good to go collect snails isn't, you know, an industry. But if somebody could do it, there are restaurants that are willing to figure out ways to put those things on a menu. And like I said, if we can eat it or put it on a stick, we can decimate it. So, or at least find some level of control, right? So I think there's an I I mean, I'm pushing this with Auburn University. I'm pushing this with Sea Lab. I'm pushing this Marine Resources. Judy is the crazy snail lady. Prescribed by her huge, honestly, that's probably the least well-funded land stewardship activities are the most underrated, could have the most impact, are the most underrated and least funded parts of the puzzle in my mind. Everybody wants the flashing oyster or the breakwater or the cool marsh or a nice bird or whatever. Nobody wants to go out and burn something. But in the end, wildfire and disaster protection, you're looking at emergency response potential and the system is becoming healthier for those species that live in it. I don't know, it is, it pains me. And I was on the phone right before this call with one of our stewardship folks trying to get them a fire truck. I mean, they just need equipment that is not 20 years old and falling apart because it's a safety issue. And you've gotta have, from the people doing it, you've gotta have a safety issue. And there have to be people that are trained to move up through those professional careers and making that link with nature. And they want to, but it's just that the funding is so difficult for that kind of stuff. So, and that goes back to the funding constraints and the funders not really wanting to trust that we know what really needs to happen on the ground versus them. So we did the Lightning Point Project. It was a great project. NIFWIF considered it Shoreline Protection, didn't want us to monitor anything associated with oysters. Now we're doing it out of the kindness of our heart and pockets ourselves, but why would the funding agency for a $15 million project, not allow $1,000 a year ago to pay for staff to go out and collect six quadrats of oyster data. That is ridiculous to even have it as an argument in the scale of things.

Interviewer: Yeah, wow. Wow.

BD025: Sorry.

Interviewer: No, I mean, that was all, that was so much great information. Thank you so much. Can I backtrack one second? So should we remove shoreline restoration? Do you think that's redundant with some of the other management concepts that we have?

BD025: I think the seawall panels, the private, the breakwaters, all of that falls, all of those fall under shoreline. Okay. So shoreline is kind of the umbrella for all of those pieces that kind of fold into their fence.

Interviewer: Okay. Perfect. Yeah, that does make sense. Okay, great. Well, I know we're just about out of time. Is there, and I know that it looks absolutely insane now, so it might be impossible to answer this question, but is there anything that you think that's really key to this map that we've missed that we haven't covered?

BD025: There's no way that I can tell you something was missing or wasn't covered. I will continue to say that I think, you know, overall when you're thinking about biodiversity and what we think about with maintaining that babies on the coast that grow into adults that become the seafood platter that is the Gulf of Mexico. Think about it from the perspective of these coastal communities that like Biola Battery or Moss Point in Mississippi where the fishing industry folks are and the fact that folks that are your age are not going back to those towns and don't necessarily want to take on going out on a shrimp boat for three months at a time to collect shrimp in the Gulf of Mexico to feed the nation, where is that going to happen? How does that fit into this puzzle? Are we gonna have, are we gonna end up having like a foreign lottery for harvest and then would it come back to the US? I mean, where is this food gonna come from in the future? Those are things that we think about when we're starting to think about. And it's the same thing, I lived in Alaska, the tribes and the small coastal communities wanted, their kids to experience the world, but to come back home and they can't. They wouldn't, you know, they, they experienced life outside of the North Tundra and they decided they wanted to live in downtown Atlanta or, you know, California or whatever, who is going to be the next realm? And that's where we think some of the aquaculture kind of feeds in because it's more of a business, you know, it's got a different feel to it. But, you know, remember in Alabama, on secure fisheries and in bioallobattery, we process 80% of the fish of the seafood in the Gulf of Mexico. We have a small coast. We don't collect it all. But your oyster shucking, your shrimp processing, your crab picking, you know, the whatever it is that is happening here. We do a lot of it. We do the lion's share of it in Alabama. The kids these days do not want to go into a crab picking house and pick the crabs. They have other expectations and that's great. But where does that fall? And how does that relate back into what we think? Are we going to not harvest in the future? We're going to, are we going to see a huge drop off of fishery related jobs for, you know, out there in the big grants came up, whatever, or is it going to be industrial? Like we have cattle production. industrial in the out west. Are we going to see that kind of thing monopolized and then how does that work when it comes to on land picking and how does that change the communities which would change their link with nature and which would change maybe their connection with the coast or any of these you know these things and that would be more strictly tourism than any kind of real livelihood connection. So anyway, these are the things that our team thinks about and it's too big for us to answer.

Interviewer: Yeah. Yeah. I just, before this postdoc, I was a postdoc at NOAA Fisheries in Juneau, Alaska, and a lot of my work was in Kodiak and everything you said is exactly what we heard there.

BD025: I was in Homer and Sildotna and ended up at some of the remote villages and I just, and I love them and I mean, think about that. And I didn't think it would be that way. And in Florida, every year when I was there, it was a different crop of people because it was very much a tourism thing. In Alabama, I'm dealing with, we just did an acquisition and that family had owned that property since the Louisiana Purchase. Like eight generations of the same family owned the same property. Like in Alabama, they never leave, they never move, they stay. And so the connection now, now that we are more global and more integrated and we can move more, you know, kids are going off to school and they're going off to see the world and then yeah, in their 40s and their 60s coming back and settling down, or you may be even in their late 30s to have families, but in the meantime, there's a whole lot of movement like there's a there's like a missing generation from you know, because out exploring, which I'm not saying that's bad. I'm just saying, what does that mean in the grand scheme of how we approach these kind of questions like you're looking at? I don't know. I don't know. And you guys probably know better than me because you're of that generation. I'm just looking in.

Interviewer: Yeah. I mean, personally, I have been all over and I'm physically in Vermont right now and it's exactly what you said. My family has been here for generations and it's just in my generation now that people are leaving. So I see it in my research and I see it in my personal life too. You're absolutely right. Interesting.

BD025: Yeah. Anyway, I don't know how that ties into the whole story, but it's we think of those bigger things Yeah, we think of them because we're dealing with the communities and the people in those communities of how things are changing And anyway, yep.

Interviewer: Well on that note before I let you go so we are This is stage one of this project in these individual interviews And then the second part is that we're running workshops in our different case studies and we're bringing folks like you resource managers and stakeholders. So, you know, in particular, it'll be very fisheries-focused, I think, aquaculture-focused, together to build these models like we did with you today, collaboratively. So do some collaborative modeling and then look at, you can run these scenario simulations with this technique and you can say, "Okay, if we incorporated this management intervention, how would it impact biodiversity and how would that subsequently impact ecosystem services that different community members rely on. And so one of our case studies is Gulf of Mexico and we'll be doing it in mobile in October. So if you're available and would be able to participate, we would love to have you. You don't have to answer now, but just wanted to give my pitch. -

BD025: What, do you have dates yet or you're just?

Interviewer: It's October 11 to 13, I believe.

BD025: All right. Yeah, I think I'm in town, I go out of town in late October.

Interviewer: Okay.

BD025: So we'll see. Yeah, if I can't be there, then I can certainly have somebody from my team there, they think. I've got an extra 10 years on the digestion of all the material, but they've got it in. It's in their DNA. So they'll be able to provide just as much of an idea on some of that.

Interviewer: Okay. That would be fantastic. Thank you so much.

BD025: Yeah. Yes. All right. You guys have a great one.

Interviewer: Huh, bye bye.