**Speaker 1:** Okay, recording is started. Okay. So just to start, I was hoping that you could tell us a little bit about your area of expertise and your current work responsibilities at your organization.

**BD038:** Yeah, so I worked at Mobile Baykeeper, or an environmental nonprofit group, that's a part of the Waterkeeper Alliance, which is a international and national nonprofit umbrella organization. And so all water keepers that are affiliated with the Waterkeeper Alliance, do some kind of awareness, pollution intervention or water quality monitoring tied to specific waterway. So we are located in Mobile, Alabama, and we have Waterkeeper jurisdiction between the Florida and Mississippi border, and there's not another Waterkeeper in Montgomery, so we don't control up that far. We usually go as far as about Mount Vernon, up in the Delta. But we work on defending and reviving any of the coastal waters and tributary waters that go into Mobile Bay and the bay itself. We specifically are working to intervene on human impacts that impede our ability to consume fish, locally caught fish safely, and impact our community's ability to swim and utilize our waterways recreationally. And we're also working to find ways to restore our oyster and seagrass beds in our area. So my role as a keeper is the staff scientist. So I work with local experts in our community, researchers, restoration ecologist, regulatory agencies, and other nonprofit groups and universities to find ways that we can make a meaningful impact in all of those areas.

**Speaker 1:** Okay, great. Thank you so much. So just for my own knowledge, so you do you all have regulatory power, or you help inform those who have regulatory power?

**BD038:** Yeah, we help inform. So we will report things to regulatory agencies, but we do have power through Waterkeeper. Alliance and the Clean Water Act to pursue litigation. So we're currently in litigation for a case and we tried to use that as a last resort, but we do not shy away from that as needed.

**Speaker 1:** Okay, great. Okay, so do so to dive in a little bit. So I think Sarah said in the email, and probably conversations with you, the really high level overarching goal of the project is to understand the role of biodiversity in marine resource management. And so one thing that we've learned at the start of this project is that the term biodiversity is means different things to different people. And of course, it can be measured in multiple different ways. And so as a starting point, we're wondering what you think about when you think about biodiversity and what you see as the key aspects of biodiversity.

**BD038:** Yeah. When I think about biodiversity from my job at Baykeeper I am thinking about diversity throughout an ecosystem and a habitat. So, for example, I was interviewing someone yesterday we have a magazine publication we started this year and I was interviewing someone yesterday for it, who studies submerged aquatic vegetation, and they got into the conversation should have, oh, what do we do about invasive aquatic vegetation? There's an argument that it still provides some benefits. It stabilizes in sediment, it can provide habitat. But that's kind of one dimensional when you start thinking about the role that can play in biodiversity, you know, what kind of loss of species would you have that are dependent upon native vegetation instead. And so all of the work, we're doing, really related to oyster, seagrass restoration. I'm trying to look at it holistically and having biodiversity in mind and wanting to just restore an organism, but restore the functionality of that habitat. So biodiversity, some key things fine for me related to that are, you know, what is the use the habitat? What kind of ecosystem resources or benefits are affected to be functional? And are those for support? And then what organisms depend in use those resources? And you can measure that your presence different things?

**Speaker 1:** Okay, awesome. Okay, so some of our previous work has generalized marine biodiversity into four key components. And we're wondering if you agree that these key components encompass marine biodiversity? And if not, how you would change this framework. So I think Sara is going to drop them in the chat right now. But I'll just read them out loud. They are habitat forming species, species of conservation concern, harmful organisms, and key food, web supporting species. And so yeah, so we're wondering if you agree that that represents marine biodiversity? And if not how you would change it?

**BD038:** Yeah, that's a really interesting question. I definitely think habitat forming of species falls under the category of what biodiversity is, and key foodweb supporting species. The other two, I'm I would think, I guess harmful organisms is is something I'm not sure about. I think that that's something that can impact native biodiversity… That I don't know if it's descriptive of biodiversity. And I think species of conservation concern works as well. I feel like maybe I would replace harmful organisms with. Maybe I would replace harmful organisms with… what I'm thinking of, I think is duplicative of the food web supporting species. So maybe I don't need to replace it. I'm thinking that there needs to be something that's representative of different components of an ecosystem because you don't want to measure biodiversity, which I think we've done in the past. Maybe like 70s and 80s this is very when conservation science was starting to come up this is more akin to this. You don't want to use one thing as a measurement for biodiversity like you don't want it can be helpful, but you don't want to use one portion of the web as being indicative that an area is biodiverse. Um, but I think that that's kind of covered with foodweb because you're taking into account the different, you know, bottom up and top down representation. And at the conservation concern make sense to me because if you have representation of sensitive species, you probably have a healthy ecosystem that's biodiverse. So I agree with all three of those things. I don't know how I feel about harmful. I don't know about that one.

**Speaker 1:** Okay, fair enough. Yeah, you're not you're not the first person to say that. So it's something we're thinking about. Okay, great. We appreciate that. Thank you. Okay. And so then, like I said, at the start, the overarching goal of the project is to understand if and how we consider biodiversity and marine resource management in the US specifically and given that your area of expertise is in the Mobile area, specifically, and that's one of our case studies, where we'll be doing the workshop, I would love to hear your thoughts on on your specific study system of Mobile bay but also, if you have thoughts on like, the larger US context, that's great, as well. So we're wondering if you think that biodiversity is explicitly considered in marine resource management, and if so, in what management approaches or policies.

**BD038**: I think something that's become really apparent to me through working here. Which I know that there's been some strides towards it. But there's a big disconnect. With regulatory enforcement, for protection of species and biodiversity, there's a huge gap between the protection of the organism and then the protection of habitat that supports the organism. So a majority of listed species do not have a paired listed habitat to support their existence. And that's been a chronic problem. And so, for us, in the past, we'll get calls from people saying someone's clearing wetlands filling a wetland, they don't have a permit to do it. You know, we we've seen Eagles there or something in the past, we've seen Red Belly Slider Turtles there. The issue is, is if the surveyor doesn't see it at the point of a survey, then it's a loss. And so even though that habitat that exists, could support, by the book, should support the species. If it's not present, then just, you know, here's the permit, go ahead. And I think that's incredibly detrimental. And from a water quality standpoint, to the same thing, if water quality conditions aren't conducive to support listed species, what's the point? So I know that the US Fish and Wildlife Service is working to update that. But I'm hoping that regulatory agencies work to integrate that into their regulatory application quickly, because I think it's lacking tremendously right now.

**Speaker 1:** Okay, great. So do you think that is, is that answer specific to the Mobile Bay Area? Or do you think that that issue is pervasive across the US from your understanding?

**BD038:** I think it's pervasive across the US. And it i It's also specific to Mobile, the Mobile Bay Area. Not so much from a species standpoint, but from a Clean Water Act standpoint. We have kind of been floundering a little bit with decision being made with the Clean Water Act protections this year with EPA versus Sackett and questioning protections of wetlands, what wetlands deserve jurisdictional protection. Do any of them deserve it? And, you know, I think that that's along the same lines of if there is a lack of clarity on what types of waterways or ecosystems can be protected, there's a lot of room for interpretation and there's a lot more incentive to develop and take advantage of that and lose precious habitat. And we specifically more in Mobile have struggled with this, from the Army Corps of Engineers, regulatory side of things. And we constantly see after the fact permits being given. And one thing in particular, that's an issue, I think, here probably at large, but just that I personally seen is that I don't believe in mitigation banks, and development credits and mitigation credits. You know, the loss of fragmentation of habitat in one area cannot be supplemented by restoring or preserving area that somewhere else, species can't migrate effectively. If there's not a corridor available, you lose the filtration services that could be provided to the immediate area. And I think that that's something that the Army Corps needs to completely get rid of. I don't think it has any ecological value at all.

**Speaker 1:** Okay, awesome. That's, that's all really interesting. And a lot of that we haven't heard before. So that's really great. Okay, so I think from that response, I just got a My next question was going to be are there approaches that you would like to see to better manage for biodiversity? Which I think is the answer that you just gave me? Are there any other approaches that you want to mention that you would like to see to explicitly manage for biodiversity better in the US or in Mobile Bay?

**BD038:** Yeah, I think, because we work with water, or directly, a bigger thing that would be helpful would be to actually for state agencies to actually seek out opportunities to capitalize on the purpose of the Clean Water Act, which has been, you know, something that hasn't ever been enforced to the degree that it was initially meant to when it was enacted. So it's treated the the regulations that protect of waterways use, so if it's designated for swimming or industrial purposes, or agricultural purposes, or the propagation of fish and wildlife, the use that a waterway is given as the designation therefore, kind of constricts what kind of effluent or runoff can go into that waterway, if the outfall from a wastewater treatment plant can go into that waterway, and if so, how many, and then how many gallons of effluent can come out of it. And you know, how much riparian vank can be cut down for development and things of that nature. And that's often treated as a ceiling and not something to strive for, for improvement of water quality. So, if a waterway is given a designation, that Clean Water Act purpose is to improve pass that to make plans to increase the protections to get a better designation, a better use with the ultimate goal of all waterways being supporting fishing the swimming, but in Alabama, oftentimes, if waterway is already designated as something lower than that with less protections like for industrial uses, the goal is to not let it degrade past that point. rather than pushing it in a more positive direction, and I think that that has a lot of implications for protection of species and for support of biodiversity is wanting to or not wanting but mandating to have improvement plans in place in a timely manner.

**Interviewer 1:** Okay, so basically, there's a threshold that they don't want it to go below, but they are, like you said, they are working to actually improve the water quality if it is degraded, or if it stays above that threshold?

**BD038:** Well, yeah, my, my perspective is that that's always been treated as a nice suggestion, or that would be nice to do that. And then decades go by

**Interviewer 1:** Gotcha.

**BD038:** It's like, a purpose or not doing.

**Interviewer 1:** Yeah. Okay. Are there approaches or policies right now that you think manage biodiversity well and that we should keep doing or that we could improve over time?

**BD038:** I Don't know if this is not policy based . And because I don't work very much on species policy or biodiversity policy, outside of what I mentioned, but I, I do think that effort, like the Audubon Society does to do. To make species counts and biodiversity, you know, that's, that's within one area, that's just birds, but to make that accessible public, to engage the public to take part in counts and speciation and engaging the public to be aware of, you know, how seasonality affects that with migrations, when to go out when to work, making it easy with apps for people to share the data they're collecting. I think that if that's not policy based, but that could pick up incentivize to be a policy in the future incentivization. So in order to, you know, use a bullet like that, I think that that's really helpful.

**Interviewer 1:** Okay, great. Okay, see,looking at the time, Sarah, this might be a good point to switch to the next bar, if that's okay with you. Sorry, there's some background noise in the office. I don't know why I can't see you, Sarah. What does that sound good. You want to go ahead and share? What? Okay. Sorry, what you said?

**Interviewer 2:** Can you hear me?

**Interviewer 1:** Yes, I can hear you. I can hear you. Oh, okay. I'm in a conference. But there's no, there's no door for some reason. So when people walked by, seems counterintuitive. Now, there should be a door on a conference room. Okay, Sara, do you want to explain this? There's a lot of background noise here for me.

**Interviewer 2:** Yeah. So, Cassie, are you familiar with mental modeler at all?

**BD038:** No, I haven't seen this before.

**Interviewer 2:** Okay, so well, you and Kelsey have been talking, I've been making some concepts that kind of sum up what you've been talking about. And I'll go through them in a second. But we can use this like map basically to create, like a physical way of how you view the system and Mobile Bay. So we can connect these concepts to each other that are focused around biodiversity to see like which management policies do a good job in Mobile Bay, which don't which have the potential to do that in the future. That's like kind of a fun way to do an interview, I think. So, I'll just go through the concepts quickly. These gray ones at the top are those key components of biodiversity that we identified and I pulled out harmful organisms because you didn't like that. You didn't think that that was a key aspect. And then the two orange ones. So diversity of organisms and ecosystem function are the ways that you think about biodiversity in your work. And then a lot of blue concepts, which are management, or policies that either could manage for biodiversity or are the way that the system in Mobile Bay is enforced now. So regulatory enforcement of protected species, and then their associated habitats, water quality enforcement through the Clean Water Act, US Army Corps of Engineers and EPA enforcement, mitigation banks and development credits, exceeding water quality thresholds. And then species counts or biodiversity data public. Like I said, I was doing this on the fly as you were talking with Kelsey. So if anything doesn't seem right, or if you want to add or take anything out, or we can definitely do that before we move on.

**BD038:** Yeah, I think, um I think one thing, now that I've had more time to think about the terms that describe biodiversity, maybe, instead of harmful, I would suggest adding kind of making the word. It wouldn't be necessarily keystone species, although keystone species would probably fall into this category a lot. But kind of, like poster child species, things that are dependent upon another species being present, like a habitat forming species, or are kind of indicative to an area. And so that's a little bit different than like we talked about with I think, species of conservation concern. envelops sensitive species that can be reflective of four conditions. But if different habitats or areas have something that's kind of earmark representation that should be there, that can be something to work towards. You know, if this species is present, then surely a host of other species should also be present.

**Interviewer 2:** Yeah, added Keystone poster child species. Does that work?

**BD038:** Yeah, that works.

**Interviewer 2:** Okay. Anything else you would change here? Or does this all look good?

**BD038:** It looks good. I think, under EPA enforcement, maybe specifying that more to say that there there's a maybe a disconnect between federal standards and state standards, and enforcement.I think the rest of it looks good.

**Interviewer 2:**  Cool. Kelsey do you want to drive? Or do you want me to just keep going.

**Interviewer 1:** um, if you don't mind doing it, the oyster Fiesta, the guy runs room. Next to me is seemingly having some sort of fiesta party. That is very loud. So if you don't mind doing Sara, that would be great. I was just gonna say a couple things. I was looking at my notes. And I was wondering, Cassie, I know we have ecosystem function. And maybe this encompasses it, but I know you emphasize the importance of habitat. And we have some of that in the blue boxes with the management tool, but I didn't know if there was something else that we should add to encompass that just represent your definition.

**BD038:** Yeah, because remind me again, what are the the orange, what is the orange category?

**Interviewer 2:**  Those asks what you thought of when you thought of biodiversity. And you didn't say ecosystem function. I was like a phrase, but that's kind of what I thought you were getting at. But again, we can change that.

**BD038:** No, I think ecosystem function should definitely be there. But maybe instead of diversity of organisms saying, you know… protection of habitat kind of against biodiversity of species.

**Interviewer 1:** Okay, awesome. The other I was gonna mention two other things quickly that I thought were really interesting that you said, and I want to make sure they're they're captured. I know, you have, you have said the exceeding water quality thresholds. And I think maybe this is redundant, but I thought it was really interesting talking about the improvement plans. I think that was through the Clean Water Act Two, if I'm remembering correctly, do you think that that is like one of the same? Or would it be worth adding that as a separate concept, because that's something we haven't really heard about before?

**BD038:** Yeah, I think it's good to have those separated as two different things because the Clean Water Act in and of itself, at a national level needs to be modernized and enforced better. And then the water quality thresholds can be more locale specific. And the you know, the Clean Water Act kind of feeds into that. But if, you know, it's, if it's not strong and federal level, that's problematic. And then it also works from bottom up, if it's not being enforced at those micro levels, then, you know, all of a sudden, you have, like, in our case, here, we have 60, some odd waterways listed as impaired in our immediate watershed. And only one of those represents how organisms interact with it lot of it, you know, the impairment has to do with people's use. But if it's supportive of the propagation of fish and wildlife, it's usually very protected for people's uses as well.

**Interviewer 1:** Cool. And then the last thing, I think you already have it, Sarah, but I just want to I don't know if we should reword it, but the species count biodiversity data concept. I thought it was really important. Cassie, you were talking about the use of citizen scientists essentially, to do that. I think that's what you're getting at with with public there, Sarah, but I wanted to make sure we had that represented as well. Is that do you think one of the same is that concept? Cassie? Just want to make sure?

**BD038:** Yeah, I think it is. Yeah,

**Interviewer 1:** Okay. Cool. Okay. Yeah. So do you mind driving Sarah? For the rest?

**Interviewer 2:** Yeah, sure.

**Interviewer 1:** Thank you.

**Interviewer 2:** Um, so for the rest of the time that we have, we're going to try to connect some of these concepts together. And so basically, what that means is, we'll start with the gray boxes. So we'll start with key food web supporting species as an example. And so I'll ask, Which of these concepts if key food web supporting species were to increase? Would any of these be affected by that increase? And this is all relative, just based on the other concepts that are here. So if key food web supporting species were to increase, what happens to any of these other concepts?

**BD038:** Should I relate it to the other bins or categories and not The others within the for example, the gray boxes

**Interviewer 2:** it could connect to anything, okay? But it doesn't have to connect to everything either. It's whatever you think

**BD038:** I think that if key food webs supporting species, it's the number of them or types of them were to increase. Most of these other things would also have to increase except for the mitigation banks and exceeding water quality thresholds, those would need to decrease

**Interviewer 2:** You said everything else would increase here

**BD038:** Yes. This is kind of fun, I think AI. Is this platform free, you have to pay for it.

**Interviewer 2:** It's free. It was developed by one of our collaborators at Michigan State.

**BD038:** Okay,

**Interviewer 2:**  so, yeah, you just need to put in a username and password which is mental modeler for both all lowercase. But yeah, we use this a lot for these kinds of interviews. It's a really easy way to just kind of visualize things for people and most people who understand how it works really like doing it.

**BD038:** Yeah. We have a team retreat in January, this seems like this would be a nice activity for everyone to visualize thoughts in their head.

**Interviewer 2:** Yeah, for sure. I can send it to you this too.

**BD038:** Okay. Cool. Thank you.

**Interviewer 2:** Yeah, um Okay. So, we can also assign weights to these arrows. And this is just a strength of the relationship from low medium or high in relation to the other arrows in the system. So if you think you can assign weights or like if one of these increases you think is much higher than other ones we can add those but otherwise we can move on this gets kind of in the weeds

**BD038:** I think that there would definitely be more weight assigned to ecosystem function and habitat production and probably water improvement plans I think those three I'm trying to think about the difference between regulatory enforcement. Yeah, maybe more specifically regulatory enforcement of protected species habitat. Ecosystem function and water improvement plan so probably waited more than the others.

**Interviewer 2:** So if those are high, would you say the rest of the medium or the rest are low?

**BD038:** Oh, the rest are probably probably medium

**Interviewer 1:** Sarah I think probably, I mean, yeah, feel free to add those in now. But for the sake of time, we probably don't have time to do weights which is totally fine if we don't get those today.

**Interviewer 2:** Okay, that's fine. Am I, since our recording, I'm just going to go back and change that.

**Interviewer 1:** That's perfect. Okay.

**Interviewer 2:** Okay, cool. So let's move to habitat forming species. So same thing of habitat forming species increase what happens to everything else?

**BD038:** I think it would be the same thing, I think everything would increase except for the two that we had already highlighted as decreasing.

**Interviewer 2:** Sounds like I'll just move on, that's really, we'll just skip it. And then it makes the map much more clear to keep going. Okay, same thing with species of conservation concern.

**BD038:** Yeah, if that were to, I guess I'm thinking about it in terms of delisting and not because as we saw this year, they're extinct. So that's why they're dealing with the decrease of species of conservation concern. So thinking about it from that standpoint, if that were to decrease, I think that would mean that all of these things would increase. It would be the same again, mitigation bakes, we need to decrease exceeding water quality thresholds, we need to decrease the rest should increase if we were to see that happen. But if it makes it easier for y'all to make it increase in terms of its improving, then you get my drift.

**Interviewer 2:** Yeah, so Kelsey, would that mean that everything should be flipped?

**Interviewer 1:**  What do you mean, in terms of how she just answered that question?

**Interviewer 2:** Yeah, because it was answered as if the number of species were to decrease, which is a good thing. But is the opposite of how that like the model, like the arrows work,

**Interviewer 1:** but just for species to conservation concern, you're saying? Yeah,

**Interviewer 2:** yeah.

**Interviewer 1:** Yeah, this goes back to what we were talking about with this concept of the preferred state. So I would say it's like… However, it's most intuitive to you, we just want to make sure we're representing it consistently across the map.

**BD038:** I gotcha. So if we were to keep it in the same frame of thought, literally saying that the, for me the way I'm interpreting it, if the number of species of conservation concern were to increase, then the it would flip like you're saying, Sarah, because sorry, that's my bird clock. The mitigate the mitigation bank exceeding water quality thresholds would increase if the number of species being listed increased.

**Interviewer 1:** And you're when I say

**BD038:** that more complicated

**Interviewer 1:** just to make sure we have a right so when you're saying so now, the way we have it framed is you would prefer for the number of species that are listed as a conservation concern to decrease that would be your preferred state of that concept.

**BD038:** Okay. Correct, yes, yes.

**Interviewer 2:** Okay. And then the last gray box will do Keystone and poster child species. So what happens as they increase?

**BD038:** I think it would be the same that we put for food webs supporting species and habitat forming species. So everything would increase except for mitigation baits and exceeding water quality thresholds.

**Interviewer 2:** Cool. All right, let's move to the orange boxes. So if habitat protection for biodiversity increases, what happens to the other concepts?

**BD038:** I would think that listed species with decrease in mitigation banks and water quality exceeding water quality thresholds would decrease. And I would like to they might be too complicated for what we're talking about. But I don't know about this public species counts. I think that a caveat to that may need to involve access to those habitats. Theoretically, I guess they the public may see more species and more diversity is more habitat protected. But would those you know urbanized wildlife interactions happen more, they would probably need to have access to places to see those species utilizing the habitats. And that might be one caveat to that. So that could decrease if they don't have that access.

**Interviewer 2:** Should we add access to biodiversity or access to habitats as a concept?

**BD038:** I don't know. I mean, it's the access itself doesn't help the species directly. I think it helps indirectly because when people understand that they can utilize habitats and it's not something in the way of them adding yet another carwash or storage facility to their city. It can make a huge difference. So I would I would add it. I think it helps with people's perception of nature too, because oftentimes in urbanized settings, you don't get a lot of biodiversity. So people may not even understand that there are different types of something. It's not that every time you see something flying through the air, it's just a bird.

**Interviewer 2:** Right. Okay.

**BD038:** And then, of course, everything else I think I was saying would increase

**Interviewer 2:** or habitat protection.

**BD038:** Mhm

**Interviewer 2:** Okay. Okay, cool. Um, okay. And then how about ecosystem function?

**BD038:** I think everything would increase. So it'd be the same as last. Listen to the fees have decreased as well, mitigation and water quality thresholds, this decrease of ecosystem functionality increased

**Interviewer 2:** okay with the rest of the time, we definitely don't have time to finish all the management concepts. But let's do a regular two regulatory enforcement of protected species.

**BD038:** Yeah, so species of concern would, should decrease. And I think all of the gray box or the remaining gray boxes would increase. I think biodiversity data would increase. And I think EPA and Army Corps enforcement would increase or actually, I'll just keep it at EPA or federal enforcement. The court doesn't work on that actively

**Interviewer 2:** moving to enforcement of protected species habitat, would that be the same or there, there's differences there.

**BD038:** I think it would be the same, except this time the court would be involved and there would also need to be an increase of water improvement plans and water quality enforcement.

**Interviewer 2:** And then, well, it's 1059. I don't want to take up more of your time. So we can pause there.

**BD038:** The when this is done, this is going to like form an image of something right? Like Picasso paintings.

**Interviewer 2:**  Yeah, like a Rorschach test, basically. Yeah.

**BD038:** And they're not Picasso but Alvin or Dali

**Interviewer 1:** and this will be using this tool during the workshop. So we'll get to do more of this and hear the rest of your thoughts. So it's, yeah, it's okay though. We didn't have time to finish today because we will be to be continued. Um,