[Interviewer] 08:06:11

Great. So before we jump into our true interview questions, I was hoping that you could just tell us a little bit more about your area of expertise and your work. We saw that you filled out our pre-interview survey, thank you so much for doing that. But we'd love to hear a little bit more about your work and your area of expertise.

[BD011] 08:06:29

Yeah, so generally the work I try to do is the science to inform ecosystem based management. So what science is needed, and a lot of that for me falls under the development of indicators and reporting on indicators. So we do that across a variety of scales. We do indicators for as small a scale as management scales like Everglades, restoration South Florida ecosystem restoration scale, and then we do larger scale indicators like I do the ecowatch.gov, which has indicators for all the nation’s waters, and broken up by large marine ecosystems. So that's kind of more of a general knowledge type of thing. My main goal is to really get the information out there to people that can use it, of what the status of marine ecosystems are, and what the issues are that we should be trying to address through management. And I guess for biodiversity. In particular, I mentioned a couple of things. So one of my big things right now is trying to get biodiversity indicators that are reliable and kind of authoritative nationwide, or at least comparable across regional scales. So I've been working on the marine biodiversity observing network program pretty much since its inception. And then I work on the America the Beautiful act, which is a 30 by 30 initiative for the US. So trying to figure out how we can use biodiversity… first of all, how we can measure biodiversity across our marine systems. And then, how can we use that to inform marine protected areas and other mesh management decisions.

[Interviewer] 08:08:20

That's great. So you will be very, very helpful for us to talk to today.

[BD011] 08:08:24

Okay.

[Interviewer] 08:08:25

A lot of our questions are around things that you work on. So it’ll be perfect. And I should have introduced myself and [Interviewer 2] better. So I'm currently a postdoc at the Smithsonian Environmental Research Center with Emmett Duffy. So the marine Biological Observation network, that's MBO, right?

[BD011] 08:08:46

Yeah.

[Interviewer] 08:08:46

That's that program. Okay, yeah. So Gabrielle, I always say her last name wrong. So she's a core PI on this project as well. And then, so is Steven Scyphers at University of South Alabama. I'm not sure if you know Steven.

[BD011] 08:09:02

I don't know, Steven. I don't think.

[Interviewer] 08:09:04

[Interviewer 2] is Steven’s Phd down in Mobile, Alabama. So that's who we are.

[BD011] 08:09:09

Okay. Yeah. No worries.

[Interviewer] 08:09:13

We’ll just start. Okay, great, yeah. So like, it sounds like, you already know from our email, and probably from as well, a lot of stuff themes really broadly. The goal of our project is to understand the role of biodiversity in marine resource management. And so to start, we recognize that the term biodiversity means different things to different people and can be measured in multiple different ways. Like you were mentioning. And so, as a starting point today, we want to know what you see as the key aspects of biodiversity and what you think about when you think about that term.

[BD011] 08:09:51

Yeah, that's - that's a huge question. So what I tend to think of is how many organisms are there In a specific area at a specific point in time. That’s biodiversity at its simplest. And being able to measure that in a directly comparable way across different systems. So as you guys are probably very aware of, sometimes biodiversity is measured with things like EDNA. Other times it's trawl survey data and things like that. And it's like, to me, to really get biodiversity in a systematic way, it needs to have everything from the phytoplankton and microbes up to the mammals. And everything in between. All the sizes, classes.

[Interviewer] 08:10:43

Great, so that leads right into our next question. So some of our previous work has been generalizing 4 key components of marine biodiversity, and I can put them in the chat because personally, I'm a visual person.

[BD011] 08:10:57

Okay.

[Interviewer] 08:10:57

So, oh, did you just do that, [Interviewer 2]? Perfect. Thank you. So those 4 components are habitat forming species, species of conservation concern, harmful organisms, and key food web supporting species. And so we're wondering if you agree that those are the key components of biodiversity. And if not, how you would change it, what you would remove, what we might be missing.

[BD011] 08:11:31

I’m trying to think… I'm trying to think of what you might be missing. The harmful organisms sticks out to me as being a little bit different then the others. Not that it's not important, but I do wonder about diversity in the sense of harmful organisms, because to me, a lot of times the harmful mostly, I guess, is biased. I deal mostly with harmful alcohol blooms in this realm, and they're pretty monospecific, so diversity's not a critical measure of those. I think the only thing you might be missing is invasive species, but that might fall under species of conservation concern. That would be my only thought there. But, key food web supporting species can mean a lot of things. So I think that's so… I'd say invasive species. And then the other thing, since I'm with NOAA, and you're already talked to Andy and Skylar. So the other thing would be commercial species, or, you know, recreational species, species of cultural importance, is what we capture for both of those.

[Interviewer] 08:12:39

So for the remainder of our questions, we're hoping that you'll think about your specific area of expertise, so like we've been saying so far, our project is pretty high level right now, pretty broad. And so we're hoping to get individual expert perceptions based on how they incorporate these components about diversity into their research or management, and how you know these different components of the system. How they are considered in your work, and how it relates to biodiversity. And so I guess the first question, you know, because you work in management and you were talking about ecosystem based management a bit in your current work, are these components of biodiversity that we've been talking about, the definition that you gave and these other key components that we just went through, are they considered in your research as it relates to management? What we're trying to understand is, in your work, is there a current biodiversity approach to marine resource management? And if there isn't, are there approaches that you think that we need or that we are developing currently that could better incorporate these components of identity resource management and decision making?

[BD011] 08:13:51

So, I think, within the science it's pretty well incorporated. Within the management, much much less so. I'd say, depending on where you're looking to, right, like when you're working with the marine protected area, especially the national rate sanctions, they care a great deal about habitat forming species. They care about all these, actually. Right. But when you're working within fisheries management, they care about these things, but not to the same degree of all of them. What they really care about is are there enough fish to sustainably harvest? That inevitably depends on biodiversity, but how much that makes it into management is, in my opinion, not always as robust as we would like it to be.

[Interviewer] 08:14:45

And so are there, I guess, any examples of that for fisheries? But then also for MPS and insurance as well. Are there approaches that you would like to see, or that you think could be incorporated into management to better do so, to better consider biodiversity?

[BD011] 08:15:01

Well, one of the things is, I think, getting back to indicators. We don't have good indicators of biodiversity, and I think that doesn’t help a great deal to get things done in management, mostly because we don't have consistent measures. But we might have to think about how to develop indicators independent of measures. I think that would help a lot, and I think there's some things where we assigned this to a better job, and I keep looking at the key food web species that I think we all know that's important. And we all understand that if you don't maintain the prey sources, you can't maintain fisher resources. We haven't, I guess, made that link to management as strong as it should, and the need to figure out what prey species are important, and why and how to trade off among species. Because, you know, if you have multiple species feeding on the same prey source, you can't sustain them all maximally based on that prey source, you have to divvy up that prey somewhat. And we haven't - we haven't been very good at doing that. I mean, Skylar is working on that quite a bit, as you know. But yeah, but it's something we have - we're still working on.

[Interviewer] 08:16:10

Okay. I'm sorry. Was there more to that?

[BD011] 08:16:18

No, just thinking about the other thing. That kind of… what I think about a lot is the resiliency of a system. Diversity as a measure of the resiliency of the system. And that's something that again is around in the scientific literature quite a lot, and scientists have consensus on that. They might argue about how you measure it a little bit, but it's not… It's in the minds of managers, but it's not explicitly in any memory management that I've seen yet.

[Interviewer] 08:16:52

Great, so we've been talking about fisheries, of course. But are there other ecosystem services that your work directly relates to, or that some of these management processes that we've been talking about within your specific area of work are, you know, prioritizing? Or that the management approaches are focused on?

[BD011] 08:17:16

Yeah, so, yeah, so a lot of different ones. So within the main natural rate sites, programs, my group's done a lot of indicative development for national marine sanctuaries, and they have a specific chapter in their condition reports on ecosystem services. So, they want to look at everything from how often their sanctions are being used, to the level of shoreline protection being provided by habitats that are sanctuaries, to a lot on tourism. Because the managementary sanctuaries usually have a large tourism component. And I'm trying to think of what else there might be for Sanctuary's perspective. There might be the big blue carbons, and another one that keeps coming up more and more too lately is carbon sequestration and cycles. I think, on the sanctuary side. That's a lot. Then within management, like within different programs, I have… we've worked on river diversions in the Mississippi River. So looking at essentially building land to help protect coastal land loss in Mississippi, what impacts they have on fisheries, and using multi species model.So we get a little bit at diversity of fish species, and then what we're working on a lot now, which we just started, is offshore wind. Because that's the big thing. So, and that, you know, what that's gonna do to ecosystems and diversity, I think, is still not answered.

[Interviewer] 08:18:47

Yeah.

[BD011] 08:18:47

Yeah, so yeah. But it’s something we're thinking about.

[Interviewer] 08:18:50

Okay. Gotcha. I just wanna ask something really quickly that’s slightly, well not off topic, but less related to the interview protocol. But you mentioned something about indicator development in a chapter on ecosystem services for marine sanctuaries. Is that in the National Marine Sanctuaries Act? Or is that a different document?

[BD011] 08:19:09

No, it's with… so what we do a lot with is the marine stuff, we do condition reports which are supposed to be put out, like, every - it's a cycle when they go up. The condition report informs the management plan that then they implement, and then they redo that cycle. So the chapters in the condition report. So their condition reports have several, and biodiversity is actually called out in a couple of them, I think.

[Interviewer] 08:19:27

Okay.Oh, that's really interesting. It’s kind of in parallel to this interview process. I'm doing a policy analysis to look at some of these mandates, and how they consider biodiversity. And I was just looking at the National Sanctuary Act the other day, and it's pretty bland, I guess, is the word in terms of…

[BD011] 08:19:51

Yeah, yeah. What they do is we look at the condition reports, and specifically there's a condition report guidance document that now is probably a bit old. It might be 10 years old or so. But they talk specifically about ecosystem services, and I believe also about biodiversity. And if you look at any of the condition reports, at least especially the new ones, they still have unfortunately, when it comes to biodiversity, basically what they do is they have expert opinions because we don't have great measures of it. So it's like things getting better or worse, based on a group of experts.

[Interviewer] 08:20:33

So why, when thinking about… because these ecosystem services that we've been talking about, stakeholders who are the most important actors, or stakeholders in this system and who are the most affected, and who, you know, when we think about these management approaches and how they trickle down to impact ecosystem services. Who's been, in turn, affected in the community? Or what are their stakeholders?

[BD011] 08:20:56

Oh, definitely, the fishing community is a big one for all of these, and partly that's because it's who we work with most closely.The tourism, industry, as well. And that's everything from dive boat operators, to hotel businesses, and things of that nature. And restaurants, too, is another important one. And one of the things we end up trading off against a lot, because I do a lot of work that's related to kind of watershed management, and the - a lot of the trade-offs happen between land and water, and often between freshwater fishermen and hunters and the marine anglers, be they commercial or recreational.

[Interviewer] 08:21:52

Perfect. Okay. And so then the last question of this first part is what stressors are currently impacting the system that you work in? And how is that impacting diverging ecosystem services?

[BD011] 08:22:07

A lot. So temperature, climate change is probably one of the biggest. For sure we're already seeing species distribution shifts happening. Other ones that are at the top of my mind are eutrophication increasing the runoff. And that's causing everything from loss of some habitat like sea grass beds, especially to ships and food webs, and usually when you get eutrophication you get less healthy. Well not healthy, is the right word, less nutritious is probably the best way to think about phytoplankton that dominate. And the other big one is, and I don't know how applies but it’s related, is harmful algal blooms and the stresses they cause. And then the other big one that's kind of outside of our control in my systems is hurricanes. They can wipe them essentially out pretty quickly.

[Interviewer] 08:23:12

Okay, okay, great. So.

[BD011] 08:23:15

Oh, one more I'd say, is sound. That's another big one we have.

[Interviewer] 08:23:25

Okay, so that was all the questions for part one. Then the second part, there are only 2 parts. The second part is, we're using a tool called Mental Modeler. Have you heard of this? Are you familiar with this?

[BD011] 08:23:37

Yeah, I've used it before.

[Interviewer] 08:23:39

Perfect. Okay, so what we're hoping to do for the second half is build out a mental model based on these topics that we've been discussing. So while you and I have been chatting, [Interviewer 2]’s been building a concept list in the background, and she'll go ahead and share her screen here in a second. And then we're just hoping to talk through how these different components relate to biodiversity and marine resource management, and are connected to one another and just fill in the relationships between.

[BD011] 08:24:09

Okay.

[Interviewer] 08:24:13

Okay. Hmm, can you see that? Okay?

[BD011] 08:24:14

Yeah. Yeah, I can see it.

[Interviewer 2] 08:24:20

Okay.

[Interviewer] 08:24:20

It's so small. Okay, [Interviewer 2], so do you want to run through the concepts, and we can make sure that we accurately represented your thoughts.

[Interviewer 2] 08:24:33

Yeah. So we'll start at the top left. These white concepts are biodiversity measures, or what you said when you thought of diversity. The orange ones are those concepts that we came up with. I pulled out harmful organisms, cause it sounds like that's not really a good metric of biodiversity. We can keep it in. We can also just take it out. And then I added the other ones that you mentioned. Green are key stakeholders in the system. All the pink are different stressors, blue is our ecosystem services, and then yellow is management actions that could improve biodiversity or manage for biodiversity. So the other ecosystem service would be… I guess it's offshore wind, so it's probably clean energy, or clean energy production.

[BD011] 08:25:37

Something along those lines depends on what kind of definition of ecosystem services you guys are using. I think.

[Interviewer] 08:25:56

Is there anything else that we should add or remove?

[BD011] 08:26:06

I guess the other stressor. I don't have it directly but there is fishing.

[Interviewer] 08:26:16

And I was thinking about that - we might need that as a service as well.

[BD011] 08:26:21

Yes, for sure. Yup!

[Interviewer 2] 08:26:29

So do we want them. So we wanted us both, [Interviewer]?

[Interviewer] 08:26:34

Yeah, I guess we… yeah. Maybe let's add it in as a blue. Just so we know. But it might get redundant. We’ll build out the relationships, and then we can take one out.

[Interviewer 2] 08:26:46

Okay.

[Interviewer] 08:26:58

Is there anything else?

[BD011] 08:27:06

I guess, stakeholders. That’s the other thing I would include, I mean, that you guys are working with. But how are you… are you classifying NGOs as stakeholders? I know that's always kind of a…

[Interviewer] 08:27:15

Yeah, yeah, yeah, I know, I tend to think of stakeholders more as community members. But that's not always true. It can be policy makers as well.

[BD011] 08:27:24

Yeah.

[Interviewer] 08:27:28

Some - I think some people clump decision makers in and others don't.

[BD011] 08:27:30

And I think that would be another one, just kind of general coastal communities. As you guys have learned, as I've gone through this process, never let experts start rolling mental modelers, otherwise they always get huge.

[Interviewer] 08:28:00

Yeah, you should see some of the ones we've created. I don't think that we've had a simple model in this process, and I've done a lot of FCM projects. And you always, like with community members, there's usually a really wide range of some really really simple ones, and some really complex ones. And I've never seen a simple one with an expert one.

[BD011] 08:28:20

Yeah, that never happens.

[Interviewer] 08:28:23

It never happens. Yeah, okay, I'm skeptical about adding in more concepts. But there are a few manager approaches that I heard you talk about. I'm wondering if we should add, I think maybe fishing regulations in general.

[BD011] 08:28:38

Yeah, so I'm sorry, management concepts. I missed that. So fishing regulations and best management practices. And I don't know how we wanna break that up, because that's - that could be everything from nutrients to best management practices.

[BD011] 08:28:59

Yeah, I, it just generally may be called like land-based sources of pollution best management practices, or something like that. And… hmm! Where would I? Probably restoration would be another management action. Right, now I made it way too big.

[Interviewer] 08:29:51

That's okay. I just, I was looking back through my notes and the other 2 things that I wanted to just ask about were… we were talking about sanctuaries. Do you consider that one in the same as MPAs. Or is that something we should separate?

[BD011] 08:30:02

No, it's an MPA.

[Interviewer] 08:30:06

And then, EBM, your EBFM was the other one that you had talked about.

[BD011] 08:30:10

Yeah, I think if done right, like, it doesn't need to be its own management activity. It's just linking all these different things together and I'd say the other thing management… actually though, that we're missing here, is how to classify things. Like it's mostly done through a NEPA process.

[Interviewer] 08:30:18

Okay. Okay. Great.

[BD011] 08:30:34

So it's like the divergence… the decision to do the divergence is done through a NEPA process. The decision of where to site wind farms, and least when farms are done, is through a NEPA process. So I would probably put it as a NEPA. Yeah, NEPA processes, or something like that. Yeah. Because as long as you get comprehensive management, all the different policies there, EBMs, just connect those all amongst one another, so you can trade off.

[Interviewer] 08:31:04

Perfect. Okay. Okay, so maybe this is where this gets fun. I'm not sure if know Steven Gray? He was the one who developed mental modeler, and he's also collaborating this project, and Sarah and I keep joking that we need to tell him to change the interface to where it's much larger. Because our models get so complex in this process.

[BD011] 08:31:27

Yeah, yeah.

[Interviewer] 08:31:30

We don't have enough space for it. Oh, we'll try our best. So, I think maybe because we're most interested in it, let's start with biodiversity. Maybe the concepts in Orange, if that's okay with you. And so I, you know, I can give an overview. But I know that you said you've used mental modeler. So as I'm sure you know, we're gonna ask - we'll go through each of the color bins. We'll try to clump them together to make it a little more streamlined. So to start thinking about these orange contexts that are the specific aspects of biodiversity, how do you see those components impacting the remainder of the system?I guess if we start with food web species, if we were to increase food web supporting species, how would that impact the other components of this system?

[BD011] 08:32:14

Yeah, so, yep. So I would go… that will impact the fishing community by giving them more fish. So I'll keep it to the main things. It'll impact the tourism industry, especially by making dives nicer. And it'll impact coastal communities by increasing recreational opportunities. I'd say. And restaurants, too. And then fishing as well, positively. Oh, I meant that well, that one, too, but also the other one, which is where it might get redundant.

[Interviewer] 08:33:03

Yeah.

[BD011] 08:33:03

That's kind of going likewise around. So do you want arrows coming out, or do you want arrows going into?

[Interviewer] 08:33:14

Whatever - whatever works in your brain, how you think about it.

[BD011] 08:33:18

Yeah, cause I would say to me like it would be, that would be a positive feedback loop. Right. Then fishing would impact them negatively. The key habitat food web supporting species.

[Interviewer] 08:33:25

Yeah, okay. Yeah, so we can take one of those out, and we'll just - we will make a note that it's a stressor and a service.

[BD011] 08:33:36

Yeah.

[Interviewer 2] 08:33:38

Okay.

[BD011] 08:33:42

So hurricanes. I won't put it out there because we haven't published it yet, but we're - we're about to publish some work showing that hurricanes actually will increase prey species quite a lot. So have decreased prey species. And eutrophication, but also decreased the prey species. Climate change. I know it would affect it, but I'm not sure in what direction, because it will probably change depending on what the species is, more than anything.

[Interviewer] 08:34:21

Right.

[BD011] 08:34:25

Species distributions. And this is so… this is, yeah. Another thing with it. So species distributions, like climate change isn’t necessarily gonna change the distribution of them. But they don't have a big positive, negative type of impact on them.

[Interviewer] 08:34:39

Right? Yeah. So I think so, what I usually do in situations like this is we break the concept down so that we can specify positive and negative. And I think we already have so many concepts. But you were just talking about species of distribution, or the changes of different species in the community.So maybe we can add a concept that specifies that in particular.

[BD011] 08:35:07

Yeah.

[Interviewer] 08:35:07

That's the mechanism that's impacting the system.

[BD011] 08:35:11

Yeah.

[Interviewer] 08:35:11

So what would be, like, the most concise way of like…

[BD011] 08:35:15

Price. Price distributions. I'd say, yeah.

[BD011] 08:35:21

And then both, both species distributions and climate change would feed into that.

[BD011] 08:35:25

That thing go into food web supporting species.

[Interviewer] 08:35:37

Yeah, I guess we could write like, so we could write changes in species distribution. So increasing climate change is increasing the change in species distribution.

[BD011] 08:35:45

Yeah. Offshore wind will probably increase food web supporting species. And then…so, we have tourism as a stakeholder in a service to… actually, that's another one. We kinda duplicate it. So.

[Interviewer] 08:36:07

Oh, yeah.

[BD011] 08:36:09

Yeah, we can. Yeah, let's take out the tourism one then, I guess, [Interviewer 2], since we don't have anything to connect yet. So restoration would increase food web supporting species. And biodiversity in indicators should increase it. That should increase fishing regulations and MPAs. And it should increase both resilience and number of organisms per area. Alright, that's everything.

[Interviewer] 08:36:56

Gotcha. Hold on for the next one. Okay, so species of conservation concern is that next?

[BD011] 08:37:04

Yeah. So if you increased species of conservation concern, it would probably have a… welI. I guess stakeholders would like that, so I’ll put it as positive there. So going from that to NGOs, and that's one of those loops. Probably NGOs would… increase species of conservation concern? Same with the tourism industry. It would increase tourism. And coastal communities, as well. So noise pollution would negatively impact it. Hurricanes, I don't know. Hurricanes would negatively impact it. Eutrophication would also be a negative impact as well. And I don't know if you wanna go across them. So I would have… well, we'll get to that, I guess. But I would have the key food web supporting species positively impacting species of concern if you're allowing those.

[Interviewer] 08:38:31

Oh, yeah.

[BD011] 08:38:32

That's it.

[Interviewer] 08:38:34

You know, if there’s a relationship that you see, we’ll add it.

[BD011] 08:38:36

Yeah, so eutrophication. And then, climate change and distribution changes again, I would go species distribution changes negative to species of conservation concerns. I'm sure, when there's tried no impact, blue carbon… so species of conservation concern could positively impact what should positively impact blue carbon. Clean energy production could negatively and possibly will, likely will, negatively impact it. So land-based sources of pollution… best management practices should positively impact that. This is a concern, same with restoration and Neepa processes. Actually all of the management things should possibly be implemented if done well. And then resiliency, I think resiliency would positively impact species of conservation, concern, and number, and then for species of conservation concern it would positively impact number of species. That's my thought.

[Interviewer] 08:40:14

Okay.

[BD011] 08:40:16

My goodness, that's a lot.

[Interviewer] 08:40:17

No, this is great. I should have mentioned after the food web supporting species but, so, as I'm sure you know, one benefit of mental model is that we can also specify the weight of the relationships as low, medium, or high. So how we've been doing this to streamline the process since the models have become so complex, is we've been doing - we've been setting one, which is the highest weight automatically. But then, as we go, if you see relationships that you think are lower, that are low or medium impact instead of high, then, if you want to specify… like [Interviewer 2] will automatically, put it as one. But if there's a relationship that you see is lower, and you want to specify that as we go, then we'll do that.

[BD011] 08:40:58

Okay, that sounds good.

[Interviewer] 08:41:01

Okay, so yeah, so maybe really quick, before we go on, can you think of any here?I know we have so many lines, but we can click on each note to highlight it. Are there any relationships that you think so far that we've drawn that might have a lower impact on the system?

[BD011] 08:41:19

Yeah. The species of conservation concern to the blue carbons is probably a lower one.

[Interviewer] 08:41:23

Okay, so do you think that would be a low or medium impact?

[BD011] 08:41:28

Low.

[Interviewer] 08:41:29

Okay.

[BD011] 08:41:39

Yeah, it's tough for the other ones. That's the only one that really stands up to me.

[Interviewer] 08:41:43

Okay. Okay, so I'll check in on that. If you think about it as we go, and you want to specify, that's great. Otherwise I'll check in at the end of each concept as well.

[BD011] 08:41:54

Okay.

[Interviewer] 08:41:56

Okay, so should we move to habitat forming species.

[BD011] 08:41:58

That sounds good. So, yeah, it has a positive impact on the fishing community. Positive impact on tourism, industry. And I'll say it again, with NGOs it’s probably positive both to and from NGOs. Positive impact on coastal communities. And positive impact on, well, so, yeah, positive impact on fishing. But then I'd also put fishing as having a negative impact. Hurricanes have a negative impact on habitat forming species, so that’s one of the ones I would maybe do. I'd do it as a low negative impact on habitat forming species. And eutrophication has a negative impact on it. And the same goes for species history, distribution, changes, and… and then offshore wind. I would put a medium positive impact. We don't have a 10 farming species. And then habitat forming species to blue carbon. And oh! Yeah, it'd be high and same for shoreline protection. And not to clean energy production. So land plays as a source of pollution. Best management practices go to habitat for me. Species is positive. Restoration to that is positive.

And NEPA too, that's positive. Same with actually all those biodiversity fishing regulations, all those should be positive. And then resiliency. Probably both increasing resilience and resiliency would increase habitat forming species too. And then habitat forming species would increase the number of organisms per area. Okay.

[Interviewer] 08:45:18

Okay, so then, species of cultural importance.

[BD011] 08:45:23

Okay, so yep. Positive to the fishing community. Same positive to NGOs. And positive to the tourism industry too, and well… positive to coastal communities and positive to restaurants. Then positive to fishing, so fishing and then negative impact from fishing too. So noise pollution will likely have a negative impact on it. I’d put that as medium. Hurricanes…so that would have a negative impact. Leave hurricanes in, that sounds like a very clear one. Trophic on these is via the habitat forming species. So I'd go habitat forming species, if they increase species of cultural concern, would increase. And same with food web supporting species. Then an increase of species of cultural importance should increase species distribution changes, which would happen due to climate change. And that’ll likely have a negative impact on species of cultural importance. So wind… now I wouldn't do anything to blue carbon or shoreline protection. Actually nope, none of those. So restoration should positively increase those and NEPA process should positively increase. Diversity indicators, fishing and MPAs, all those should positively increase. And then resiliency would positively increase it. And species of cultural importance would increase organisms per area. Okay.

[Interviewer] 08:48:19

Okay, great. And then I think invasive species is the last orange box.

[BD011] 08:48:23

Okay, so invasive species would be negative to the… well. That one's tough. So it's negative unless they produce a fishery around the invasive species. I think it still is negative in general, though, so I would call it negative and pretty high, certainly. Like, yeah, I keep it high. Like lion fish, which is a big one now. So NGOs should negatively impact invasive species.

[Interviewer] 08:48:53

Awesome.

[BD011] 08:49:08

And I would say invasive species might positively increase NGOs because, yeah, there's whole NGOs that sprung up around lion fish. Negative impact on… well, hmm, I wouldn't draw anything for the tourism industry. Negative impact on coastal communities, though. And restaurants. I wouldn't draw anything. And negative impact on fishing. So species distribution changes… that probably is gonna positively impact invasive species. Restoration should negatively impact invasive species. Biodiversity indicators… price should negatively impact invasive species. Same with fishing regulations. MPAs… oh, that's a tough one! So they could positively - they probably do positively impact. Yeah, I, just maybe just leave it alone. I'm trying to think of the science I've seen. I haven't seen enough of it but just logically, that’s what I think. So resiliency. Invasive species should negatively impact resiliency and negatively impact the number of organisms per meter squared. Key food web supporting species would positively impact invasive species. An invasive species would negatively impact them. Species of conservation concern… yes, so species of conservation concern would be negatively impacted.

So invasive species would negatively impact species of conservation concern, and habitat forming species would positively impact invasive species. And then species of cultural importance. So that's a competition thing. So invasive species negatively impact a species of cultural importance. And I guess it would leave it at that, for now.

[Interviewer] 08:51:57

Okay, great. So I know we're quickly running out of time, which is a theme in our interviews, since there's -

[BD011] 08:52:06

You're pretty ambitious to, yeah.

[Interviewer] 08:52:10

No, no, I know, and it's hard cause it's an exhausting exercise.

[BD011] 08:52:10

Mentally. And it takes a lot of time.

[Interviewer] 08:52:15

So we don't wanna take more than an hour of people's time.

[BD011] 08:52:18

Yeah.

[Interviewer] 08:52:18

We're trying to block ways to be efficient. I think the next thing I want to focus on with our remaining time is the management approaches. Those yellow boxes.

[BD011] 08:52:26

Yeah.

[Interviewer] 08:52:27

So maybe let's start with MPAs. How do those impact the system?

[BD011] 08:52:31

So, okay. And I've already handled those. MPAs should increase resiliency. And they should increase the number of organisms per area. They should… they positively impact the fishing community, but I'd say in general, the fish community negatively impacts them. That might be - just do that. One is low, because that's a generalization that doesn't always hold. And then MPAs positively impact the tourism industry. Oh, I'm sorry we're going to NGOs next so…but that's fine. Tourism industries, positive. Tourism industry to MPAs is positive for sure.

[Interviewer 2] 08:53:39

Okay.

[BD011] 08:53:40

And same with NGOs, like you can put both 2 NGOs as positive, and from NGOs to MPAs as positive. And MPAs positively impact coastal communities. So MPAs can… MPAs positively impact fishing. And positively impact noise pollution. I’d do a medium positive for eutrophication from MPAs. So Mpa's offshore… so offshore, I'd go MPAs to blue carbon is positive. MPAs to shoreline protection is positive. MPAs to clean energy production as negative. And then MPAs… so to me it's tough to draw lines among the management boxes. They should all be connected. Often they're not, but even when they are, it's not really positive or negative. It's a trade-off situation. So. Alright, and then fishing regulations next.

[Interviewer] 08:55:32

Yeah, yeah, that's great.

[BD011] 08:55:33

So I go fishing regulations. What's the time scale that we're looking at, are we just thinking about, like, right now?Are we supposed to be thinking like 3 generations into the future, or…?

[Interviewer] 08:55:46

Yeah, I would think right now. I think with the limitation of mental modelers, it's static.

[BD011] 08:55:51

Yeah.

[Interviewer] 08:55:52

So usually, I think about it in current time.

[BD011] 08:55:55

So I'd say, fishing regulations negatively impact the tourism industry. And fishing regulations positively impact coastal communities. And fishing regulations negatively impact fishing and species distributions. I guess, negatively impact fishing regulations because what happens is the species distribution changes, and then the fishing regulations aren’t valid anymore. And… oh, and then fishing regulations should positively impact resilience at the top, and they should positively impact the number of organisms per area. Alright. Then biodiversity indicators again are positive to resiliency and positive to the number of organisms. So I'm switching it up on you. And then biodiversity indicators should be positive to the fishing community and positive to NGOs. And positive to tourism and coastal communities.So fishing would negatively impact biodiversity indicators.Noise pollution would negatively impact biodiversity indicators. Hurricanes negatively impact biodiversity indicators. Habs negatively impact biodiversity indicators, but biodiverse indicators can be positive. I'd say medium positive. Perhaps. Eutrophication negatively impacts biodiversity indicators, and so does species distribution changes. Then diversity indicators… I'd say low negative, I mean low positive on blue carbon. And biodiversity indicators…I think that's it. I don't know about…. yeah, okay. And then we're not out of time I can do one more again.

[Interviewer] 08:59:30

Yeah, yeah. That'd be great.

[BD011] 08:59:31

So NETA processes are positive on resiliency and number of organisms. And NEPA processes are positive for the fishing community. Positive for coastal communities. Positive, for fishing. Negative for noise pollution. Negative for… sorry. Positive on species to species distribution changes. NEPA processes probably are negative to offshore wind. So Neepa processes should increase, increase shoreline protection. So positive to shoreline protection. And I guess negative to clean energy production.

[Interviewer] 09:01:21

Yeah, we should stop there. But thank you so much.

[BD011] 09:01:23

And if you want me to - like I have, I've used mental modeler before. So I can keep working through this. If you want to send me the link to it, or if you want to create another one that I can play with, that's fine by me.

[Interviewer] 09:01:32

If you don't mind, like, we, we would greatly appreciate that. But we want to be respectful of your time, but that would be great.

[BD011] 09:01:40

Yeah, yeah, I'd be happy to do that. That's no problem.

[Interviewer] 09:01:44

Okay, great. Thank you so much. We really appreciate it. This was really helpful. We learned a lot. So we really appreciate your time.

[BD011] 09:01:51

No problem. Thank you. I'm glad you guys are doing it. And I look forward to seeing what comes out of this study.

[Interviewer] 09:01:56

Yeah, we will definitely keep you informed.

[BD011] 09:01:58

Yeah, and I should send you… we did a paper comparison of mental model. Loop, analyses, and what was the third one? We did qualitative network modeling and camera. Yeah. So we're looking at all 3 different kinds of methods across the socio ecological system to try and get to, like, model comparisons.

[Interviewer] 09:02:21

Oh, cool! Was the other one like a Bayesian belief network?

[BD011] 09:02:24

Yeah, Bayesian belief network, yes. Yeah. Yeah. John Ring was the lead author. I can send that to you, though, for you guys.

[Interviewer] 09:02:29

Oh, John Ring. I just did a post doc with him on my project.

[Interviewer] 09:02:35

So that's why I was wondering if…

[BD011] 09:02:35

Well, yeah. So John was the lead author on that, and oh, so you're familiar with it.

[Interviewer] 09:02:39

The paper? Yeah.

[BD011] 09:02:43

Great. Yeah. John's great.

[Interviewer] 09:02:44

Yeah, yeah, he's great. Okay, well, thank you so much.

[BD011] 09:02:48

Thank you. Take care! Bye!

[Interviewer] 09:02:48

We really appreciate it again. Have a great day. You, too, bye!