ID: BD006

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I = Interviewer 1

I2: Interviewer 2

001 = Interviewee

I: And so to start with our conversation today, we've talked a lot as a team, and we really recognize that the term biodiversity means different things to different people and can be measured in multiple different ways. And so, as a starting point today, we just want to know what you see as the key aspects of biodiversity and what you think about when you think about that term.

001: I think I just answered that question. So, for the sake of your recording, by diversity, you mean as many aspects right? Everybody thinks of species richness as the primary thing, but there's much more to it. There's the community elements and all you know, 57 ecological indicators thereof, all still dealing with abundance of different species. You can get smaller. There's sub population level diversity. There's genetic diversity, and so on to that level. And then on the flip side, if you go up above population, there's some elements beyond that. Even the community. There's functional diversity. There's ecosystem diversity. There's landscape diversity. There's landscape diversity or marine scapes. However you want to call it. Habitat diversity. I think all of them are on the table. I don't think anyone should be considered at the exclusion of others. What it really boils down to is, what are your specific objectives in a given situation, of what one needs to be focusing on? And I will also add that you know, across that full range of diversity we tend to zoom in on kind of the species level, richness, species diversity, and sometimes that doesn't translate to management actions which is probably a pre-cursor to some questions you might ask later. Sure.

I: Yeah. Absolutely. Okay, great. So, some of our previous research within the team has highlighted 4 key types of species that are key for biodiversity. And I can put them in the chat, but those are habitat forming species, species of conservation concern, harmful organisms, and key food web supporting species. So we're wondering, do you agree with that? Are those the 4 key components of biodiversity that you think about in your work? Are there other things that you think about instead?

001: You missed the keystone species, right. That comes through food webs or trophic modeling. But basically, you're trying to iterate or get at what species have a larger impact by their existence in a place than just their abundance or lack thereof. And yeah, that's an important element, almost a waiting, if you will, of their individual contribution to diversity. Those are some that I've heard before that you mentioned. The keystone is the trophic element as well. There's a couple others we might explore, as in addition to how you might weight individuals for the diversity you mentioned, habitat forming. And there's functionality. But there's also biological process functionality. That will be important. So no one really cares about blue-green algae, but without them you know what happens to nutrients right? And then that has an impact on oxygen, which I guess is a way of a form or bacteria even, might be a form of habitat formation, even though it's bad habitat, with no oxygen so you could go on and on with that and then the second, or third one. You mentioned about conservation species of conservation interests or high conservation interest, biologically and ecologically speaking, that's an artifact of legislation or policy choices. The rest of them, I think, are more definable via the processes in the actual ecosystem. And what may be a protected species or species of interest in one context might not be in another. For example, we tend to frown upon most whales being hunted. But if you were to go to Norway, that would be on the menu, so sorry.

I: Okay, perfect. So yeah, I think that you've said that your focus is really at a national and international level. At this point, and so far for some previous conversations, we've been focusing on a specific system or a specific region. But I know you said in your email that you're thinking much bigger picture. And on a systems level. And so, given your answer on the area of expertise, for the rest of the questions we're hoping that you'll think about your area of expertise. But it's okay if that's not in a specific region or spatial level. But really thinking about your - we want to know from you about your area of expertise- in terms of the ecosystem-based management and how that connects to biodiversity, as you were alluding to. That's really important for answering our research questions. And so I guess with that, you've started to answer already, but I want to jump straight to the management, given that that's your area of expertise. And so are these components about biodiversity that we've been discussing – are they currently explicitly considered in management? And if so, in what management approaches or policies?

001: So there's 100 laws in the US on marine ecosystems, and we're talking marine issues, right? The 5 or 6 that are most common for living marine resources – Magnuson-Stevens Act and associated fisheries acts - Sustainable Fisheries. The Endangered Species Act and the associated Marine Mammal Protection Act, NEPA, the National Environmental Policy Act. Those you're all probably very familiar with - the Coral Reef Act, the habitat, the Hub arca, the harmful algae bloom act, you know. There's probably a good dozen that are pretty obvious, and then a lot of others are less so. The thing I would say is the endangered species - there's no overarching biodiversity policy in the US the way there is in other regions or countries, or jurisdictions. It's cobbled together largely through Endangered Species Act, and that's where it comes in to protect particular species are the significant population units or viable population issues, whatever the acronym stands for, right, you know. Thickest salmon on the West coast. As an example it comes into play there, and that is really about dial shell not extirpate population, and thereby a species. It comes into play. There's habitat it under Magnuson, under ESA and under, but it's not zoomed in on specifically, habitat forming critters. The Coral Reef Conservation Act is arguably but you don't have the equivalent for the Kelp Conservation Act or the Oyster Bed Act. You know. What have you beavers? Whatever so it's very specific for corals. The other act of the Marine Mammal Protection Act is similar to ESA, and it does afford some of those protections. The Fisheries, legislations writ large have the habitat element in it. They have a systems element in it. If you actually look at it, and they have an element of protecting a population, but for sustainable use, and if you fall below that, it's not as much looking at extra population or extinction concerns. It's more of, you know, can it be commercially viable? And we need to stop all that to say, the reason we take an ecosystem-based management approach is all these laws are telling us to do this. Some of the laws are orthogonal, or at 90 degrees to one another, with their objectives, and we try to say, listen, we need to have a more systematic ecosystem-based approach to take all this into account at once to look at all the options. That want. See how this affects all these different elements, all the different objectives, and what are the, you know, least impactful, or least desirable outcomes, and of that the biodiversity of objectives rarely come in deploy they're not formally requiring under the law except for endangered species. And again rarely in most activities. Do you see that come out as an objective, but in terms of put in them altogether worshiping more and more of that come into play, and I would say where I have seen it being considered not as a hardcore reference point or threshold, which there are legal and technical definitions of those. But there's also performance measures which are not legally mandated, but help, you understand, objectives for assistance. Those performance measures in some places are beginning to look at things like community diversity or particular levels of certain populations of species we care about. And the challenge has been most of the biodiversity efforts - attention marketing whatever. If you will have been focused on charismatic megaphone that people like to look at and hug. But there are a lot of diversity elements that are ugly and boring and muddy, and stink, and but they're just as critical right? And we need to have a sense of how those come into play. And then where I see this actually starting to emerge not as much in the Us. But some in the Us. But certainly other jurisdictions is this concept of ecological or system, level resilience, and to have that resilience you need the, you know, the multiple bans under the trampoline. So the trampoline and those multiple bands are elements of the diversity that you mentioned. So I'm seeing that emerge more frequently as performance measures, particularly in the emu. For instance.

I: Yeah, you. Our next question was, are there approaches that you know could improve the incorporation of biodiversity into management? I think you just you just started to answer that. And I think my interpretation and correct me if I'm wrong from the first part that you answered of, you know what management approaches currently consider biodiversity is that a lot of these policies are considering one component of biodiversity, that. we were talking about like a habitat forming species, or a species of concern. But they're not currently taking that system's perspective that we need to like. You were saying.

001: Yeah, correct. Yeah. The recording couldn't see me, not my head. But yes, you're right.

I: Okay, okay, perfect. Okay, that's perfect. Yeah. So our there, just to follow up on that last question, are there any other approaches or corresponding components of biodiversity that would help improve that systems level perspective for management currently?

001: So that it's a little bit of a broad question.

I: Yeah.

001: I tend to have things in EBM or ecosystem-based management is pretty all inclusive. I would counter that with a question. Are you referring to other systems of how you approach things at a policy level, or are you approaching this? Are there specific tools that one could use to enacts about a biodiversity? Objectives?

I: I think the latter, more of the latter.

001: Yeah, yeah. More tools that's what I thought you might be saying, and everybody wants to get into marine protected areas or Oec Ms, and that's huge debate largely between the conservation community and the fishing community. The Iucn has several working committees on this. Several fishing groups, organizations have elements of this. All I could say is, unless you adopt a systems approach and bring all those different perspectives to the table.

I: Yeah.

001: They're just going to continue to keep talking past one another and they're going to be focusing on different facets of diversity or different facets of sustainable use and not actually get to brass tacks of where you could explore the space where both could potentially occur. Now in terms of the specific tools, certainly there are area-based measures, area-based management tools and approaches. I personally don't see them as a pangea cure and I'll be all I think they're one of the tools in the toolbox. I think they work specifically for those habitat forming elements of diversity and for organisms that have very low mobility.

I: Yeah.

001: So for us to explore area-based tools for highly migratory organisms and most fish who are pretty mobile over a lot of other organisms, move quite a bit, and to subject it to all the oceanographic features that move them around, I'm not sure that those tools are as appropriate. I think the other things we've looked at are seasonality of closures or seasonality, of stopping functions. We've also looked at the intensity of effort of, you know, fishing effort of laying pipes, of whatever laying hoses, And there's the - there's the location, there's the timing, there's the intensity of the effort, the pace of it, and then there's a volume of that effort. Be it again fishing or laying pipes or drilling stuff, or whatever those potential impacts are. And I think you need to have a toolbox that has all elements of it in that to manage for any objectives, including biodiversity objectives. But locking into any one of which are any given thing as a panacea cure, all I think is it’s a bit risky, and I've seen that happen. And again the debates are raging. Right now we're right in the middle of it. The communities are going at it. But the biggest reason I would say you need to have a systematic approach, view it from the entire ecosystem, and have multiple tools is because if one location executes an activity and it meets their objective, they're 1 one ocean. You do 1 set and it might have an intended consequence on other things, some of which may be good, some of which may be bad, and we're not by and large attuned to looking at these things as a whole, and that's what we're trying to push for if that makes sense.

I: Yeah, that that makes a lot of sense. Okay, no, that was really helpful. Thank you. You started to touch on, you know - I know that you work in fisheries, and you were starting to touch on, I think, the trade-offs between fisheries and other services. So what, you know, what are the key ecosystem services that your work focuses on and that are, you know, important to these components of our diversity that we've been discussing?

001: Yeah, again, it’s fairly broad. Maybe I could zoom it in and categorize instead of the specifics. If that's all right.

I: Yeah!

001: The sense is, if you go to like these millennial ecosystem assessments, you know, look at goods and services, or ocean uses, there's a whole range of things that people are, you know, interacting with in the ocean. And even within NOAA fisheries, there's a very set of cultures that are distinct. And the ESM, and marine mammal side, which is all about conservation and the fishery side, which is about utilization and habitat, and some of the science is kind of in between those. So it's very different cultures and just having that there is intriguing to us. And what I would say is all those different services then come into play. Like there's the provisioning server, the functional services, and all of you know there's the static spiritual services, etc. If you look at that millennial ecosystem assessment and kind of categorizes those, I would argue that the way we look at things is the performance measures. What's the economics doing? What's the social impact to coastal communities doing? What's the impact on the biological resources doing, you know, at large. Are we at risk of really harming any things of you know, huge concern? Endangered, threatened, protected species type things. And then the diversity comes into play in all of those, because a diverse fish community, for example, can support a broader human community, coastal community, with giving them multiple options of what they can catch across the year.As an example, and we've talked about endangered species as part of diversity. The habitat forming elements of diversity. It's there, but that often tends to be more coastal community uses than extractive uses. We haven't even gotten into biomedical elements of this which you know, relates to even some of the genetic diversity in the deep sea. Diversity, different habitat diversity. So the interplay there is ripe for exploration and I think it will be intriguing to look at like, if you almost did a matrix a table of your elements of diversity as your rows and your column being, you know, the different ecosystem uses or ocean and your x as goods and services. And just seeing wow, diversity really does have an impact on these, or does not. That to me would be a fascinating exercise to do if you do that, send it to me, yeah.

I: Spoiler alert. That's what we're gonna do in the second interview.

001: Okay. All right. Okay. Alright.

I: So yeah, we're yeah. We'll take some of the things that we've talked about, and we'll try to connect them with you and see how these different policies and services are impacting components of biodiversity. And vice versa, so.

001: Oh, that's great. Yeah, no, that's really great.

I: Yeah, so, well, I'm glad you said that. You know you're one of the first people, I think, to predict what we're gonna do in this sort of interview. Okay. So, so you were talking a little bit about, you know the impact on these services and biodiversity components through regulations. Are there other stressors that are impacting these biodiversity components that we need to be considering in these management approaches?

001: Well, that's a leading question, and of course there are right. What's the one you want me to say? First climate change is, is that the right answer you're looking for?

I: I mean, we're looking for, you know, stressors broadly.

001: Yeah.

I: So environmental, human, whatever you know, whatever your work is currently focused on, what the key issues are in this system, and how that is managed.

001: Yeah, yeah. I was wondering when you're gonna get to climate change. And you brought it up indirectly. Beyond that, before we get to that. Yes, I, personally, don't interact as much with pollution, you know. Organic, or, you know, chemical, metal, whatever pollution that's huge. The deoxygenation, we're seeing a lot of that show up. And then how that trickles through to harmful algal blooms shows up a fair bit. Other stressors… sea level rise, which is kinda climate change. But that's pretty huge, particularly if you're forming habitats, and then that habitat, with ocean acidification, is eroding. Some habitats potentially, OA is weakening them, and then the impacts from that, you know, I could give you a list of 20 or 30 different things. But the usual pressures that we're seeing in the ocean are there. Oh, I have to say plastic pollution may be part of it, but I am not seeing that in all the modeling. I've seen as big of a deal as it has made it into the public press compared to certainly climate change, and certainly, or organo chlorine perturbations, through the food web and biomagnification. And you know, even just dredging issues and dragging issues, bottom tending gear for whatever sectors the are. But it's pretty huge. That footprint there is very large, so there's a lot of those different elements. So yes, there's a lot of other pressures. And there's no way around it. It's just how do you manage it and mitigate those things, and so forth. The climate change one is fascinating, as it relates to biodiversity in that biodiversity is usually tied to a time and a place, but a lot of the places are gonna be very diverse. They're just gonna move locations, right as the waters continue to warm as currents continue to shift the water chemistry alters, and most people think of golly, you know coral reefs, but I'm thinking larger than that. We're already seeing in the fish world. Critters are moving 6 times faster than they are on land due to climate change. Mostly polar or deeper water, you know, when we track their thermal signatures, we're seeing movements of, you know, whatever it is, 10 miles a year. I have forgotten numbers. A couple of kilometers a year, 10 miles a decade. We can look it up. I can get it to you. A lot of work on that. But you know, imagine you're - I having to drive an extra mile or 2 every year to get to work? But a lot of the ocean use sector folks are gonna have to do that. A lot of the diversity elements are having to do that. And a lot of the food web elements, are having to do that. So if you're a whale and you have to travel, you know an extra 10 miles over time, that adds up. Your energetic impacts are pretty huge. The diversity elements of the genetic diversity elements. It may be actually cutting off some of the gene flows in certain locations because critters are leaving. So that's the negative side. The flip side is that there's opportunity because there's all kinds of stuff coming in. There might be new genes and organisms are probably doing, like, revolutionary adaptations and shifting their phenotypes to respiratory climate change’s impacts. Marine organizations don't hear that talked about much new fisheries emerging because critters are moving up from the tropics. It's happening now. And that diversity of the fishing community is pretty humongous. But we don't hear that. We're, you know. The management systems are pretty steady and stayed and stoic and slow to adapt, but some of the stuff you know, these critters are moving. We're trying to get plans in place to take advantage of it from the fishery perspective, from the functional diversity angle. I am not aware of any system of roading. It's functional diversity, you know. Again, large marine ecosystems scale all around the world. I'm highly acutely aware of how the compiler executing those functions is changing all the time, and it’s very rapid, and that may actually change how internal wiring diagrams or functionalities of food webs or flows within food webs are changed, but the functions are still going to be the same. They're still gonna be, you know, your nutrient process. There's still gonna be your secondary consumers. They're still gonna be habitat forming species. This is just who they are is gonna be changing, and that is a humongous, again to predict. That’s a humongous thing to mitigate. But it's also potentially providing opportunities in a positive way if we can think of them. Okay. I feel like I'm rambling, so let me stop.

I: No, no, that's all really great. Okay, perfect. The last thing before we jump into some visualization is what you know. We've been talking about these different things that biodiversity provide. Who are some key stakeholders or actors that are impacting biodiversity? And then who are the most affected stakeholders, as we think about these management processes?

001: Now, I know that might be hard to answer on a broad scale. So go to the ocean. Your sectors go, you know. Look at your matrix of ecosystem goods and services, and that's the answer to your question.

I: Yeah.

001: Who stakeholders are right. So in the world I'm not familiar with the food provisioning. It’s fishermen, fishers, but there's also environmental NGOs who have a stake in this. There's indigenous tribes who have an existence stake in this, you know, not only in this country, but some parts of the world. It is pretty acute right now. Southeast Asia, some island states in the Pacific. Academics have a stake in it. Yeah, us, right, because we study it. And if they can't study, we get funding to study it. Certain government bodies have a stake in it, to maintain how the system runs, being a little cynical, there. But the - if you then were to go to oil and gas, you were then to go to offshore energy and then to shipping or navigation in general? You were then walking through seabed mining and minerals, you know, you could go walk through all of them and the stakeholders are pretty obvious, and most of them have sectoral specific management processes. The stakeholders are very well plugged into the challenges across the sectors when they start bumping into each other. Who? What are the jurisdictions for that? And then the other challenges are the stuff beyond national jurisdictions, the high seas things where they are less clear, as you know. For example, deep sea corals or deep sea situations. There’s probably a ton of diversity impacts and opportunities in those systems. But so, that's what I would answer. That is just the obvious, you go through the ocean sector by sector, it and, gives you the clues to who the stakeholders are.

I: So, okay, so that's the end of our open ended portion of the interview. For the next portion, we're using this tool called mental modeler.I'm not sure if you're familiar with that.

001: Yeah.

I: Okay, great. So that's what we're doing for these interviews. And our goal is to take all the components that you just talked about related to biodiversity and get your perception of how they're related to one another and how they're impacting one another. And so, as we've been talking, [Interviewer 2] has been creating a list of concepts based on your answers and populated them into mental model. And then we're just gonna ask for the remainder of the interview for you to walk through the system that you've described and kind of give us your perceptions on, you know, how system components are impacting one another. If there is a relationship, if it's a positive or negative relationship, and then if it’s positive to assess you know, the weight of that relationship relative to the whole system, thinking about the system's perspectives. And so [Interviewer 2], you wanna go ahead and share your screen?

I2: Yeah, so while I pull this up, I added some component relationships while you were talking. But there's obviously no weights to them. So if you see something that you wanna change, just let me know.

I: And there's 2 ways that we can walk through this. So normally we do, as you know, we put everything into a model, it's the network model diagram. But I, you know, you kept talking about a matrix. So that's how you think better. We could also look at the matrix and fill in the boxes there as well.

001: Either of those 2 are fine. Text is probably not the best option.

I: Oh, yeah, [Interviewer 2], you're showing your Google Doc instead of mental model.

I2: Whoops my bad hold on! How about that?

001: And what I will say, yeah, is when I've done mental model exercises. And, you know, bit of part of them, or let them. What I would say is. I don't usually do it in a half hour. We set aside like a morning or 2 or 3, so I want a caveat that I need to like. Look at this, stare at it, take time, I'll give you my best shot here, and next 20 or 30 min. But just understand that there's a lot more nuance here, and that I reserve the right to say that this is incomplete. How's that?

I: Oh, you know, absolutely. And yeah, we've been, you know, trying to think, think about how to streamline this a little bit, because it is such a time consuming process. And we know everyone is so busy. So that's why.

001: Well, yeah, I understand that. I'm just saying I wanna make sure we get this right for you.

I: Oh, absolutely!

001: And I'm happy to look at it so.

I: Okay, perfect. Yeah, so maybe we'll see where we get. And then, if you don't mind we if you've used the tool before, you know we're happy to send it to you, and have you filled any gaps that maybe we missed?

001: Okay.

I: Okay, great. So is, is it easier for you to look at and this is or kind of a large complex web? Look at it in this visualization, or look at it in this.

001: Let's look at the matrix and see.

I: Okay. Great.

001: Alright. Let's go back to the visualization.

I: Okay. So what we would do is we can click on one note, and it will highlight that note and look at the concept that [Interviewer 2] already connected. So maybe let's start with the biodiversity concepts, [Interviewer 2]. Yeah, so. This is species diversity. And then. This is, then you can't see the other nodes.

001: Right.

I: Very well, so, yeah, so maybe, could we start with the 4 key components, that’s conservation concern, keystone species, harmful organisms... Yeah, perfect. Okay, so yeah, so clearly as [Interviewer 2]’s drawn. So based on, you know, what you were saying, sea level rise has a negative impact on habitat forming species. Some of these policies, like sustainable fisheries, coral reef area-based tools, have a positive impact on those species and habitat. Diversity has a positive impact on those species. Does that sound right based on what you said? And then, are there other system components that are impacting habitat forming species?

001: Yeah. Oh, totally! This doesn't capture any of the climate change stuff, or ocean acidification.

I: Yeah.

001: You're mixing the legislation with the particular tools.

I: Yeah.

001: There are other tools as well.

I: Okay, so let's start with the stressors, then. So you said, ocean acidification impacts habitat forming species.

001: Yup!

I: And is that a positive or negative impact?

001: Well, what do you think?

I: I can't assume.

001: Alright. If I'm building calcium carbonate, you're making it more so, I guess.

I: Okay, so do any of those other stressors have a direct impact on habitat forming species in the purple?

001: Sure!All of them, except for harmful algal blooms.

I: Okay, so while Sarah's drawing those so can we go back to the management action? So, are there any other management actions that we've discussed that have a direct impact on habitat forming species specifically?

001: Oh, yeah. ESM is there. EBSM is there. They are specific performance measures. And again, you're - I don't know if you have other colors or other things, but you're mixing the tools with the act for the legislation.

I2: Yeah, we've run out of colors.

I: Right. I think we already have 5 colors, unfortunately, but we will make note.

001: Yeah. Okay, cool.Well, maybe distinguish him with a… whatever. But pretty much fishing effort closures, EBM, endangered species, NEPA. So the Magnus and Stevens act is the same as a sustainable Fisheries Act. So that's that's the same thing. You can just slash them or put them together. Yeah.

I: Okay. Great. And then, what about these other components of biodiversity that you talked about? And so I guess, maybe let's start there, actually.

I2: So in white, we have the long list of diversity components that you talk about in that first question, and then in orange we have the specific components of our diversity that we discussed after the fact. Do those components look right to you based on your answers, are there things that are redundant that we can remove, or other things that we need to add?

001: So the community structure and the community biodiversity are probably, you know, analogous or synonymous. Redundant. I guess you were saying. We talked about genetics and habitat diversity, land landscape. Level or cascade level diversity. I don't know if that's on here, as a, you know, gray box, that you might add. So, yeah.

I: Okay, great. So how do those components of diversity relate to habitat forming species specifically?

001: Oh, sorry, hold on. I'm still in your last question, linking the orange one to the gray ones. I'm not. I'm not following by biological process species.

I: Oh, what what you mean by that, or what did I mean by that when I said it? You mentioned when we talked about the 4 concepts that, like within habitat forming species, there might have been, like algae. I think you used as an example specific to a biological process, we can take it out.

001: Okay.

I2: I was just - you said stuff, and I was adding it.

001: Yeah. Yeah, fair enough. Alright. Yeah, it. Just is the way it's worded. I get what it means. It's just, you know. It's probably processes or species that drive biological processes. Something to that effect. I got it. Yeah. So there's a couple of others I'm trying to recall but I think most of them fit into the categories you have here. Yeah, okay, so sorry, [Interviewer 1]. What was your question? The next question.

I: Oh, no, my! So my next question was, how did those gray boxes of diversity, how do they relate to habitat forming species as a specific component of biodiversity?

001: Well, habitat diversity is directly the species diversity. It’s directly there. I don't know about genetic diversity. It's probably there, but I couldn't tell with, I'd say habitat forming species links to landscape diversity. That arrow would go that way. That’s - I’d say the community diversity actually is a 2 way arrow. And I would say the same for ecosystem diversity. And I would say the same for functional diversity. So 3, 2 way arrows.

I: Great, so to kind of round out our habitat forming species, how do those relate to the services that we have in blue? And I guess to start, did those blue boxes, you know, accurately represent what you were thinking when we were talking about ecosystem services? Are there any adjustments we should make to those blue boxes?

001: Oh, I'd have to pull up that full matrix to get the range. But there were the 4 categories, remember, from the millennium Ecosystem assessment. Yeah, I'm trying to remember exactly what they were. I had a paper on it years ago. I think provisioning, cultural supporting… and I always forget.

I: Regulating.

001: Yeah. Thank you. Always forget that one. Okay. Those would be the 4 main ones. I would say habitat forming species rarely are provisioning. They're definitely regulating. What were the other 2 that you had? So I can wait till you type in. I'm sorry.

I: So while she's doing that, should we remove the blue boxes? Do you think that those are, you know, encompassed within those 4 umbrella services?

001: Well, that's how I was trying to phrase it. And I think you could actually make those the other blue boxes you have as kinda subsidiaries to the 4 main ones. Yeah. So habitat forming supports or provides regulating and supporting services. I'm not sure there's much here for provisioning or cultural. Well. Some places it may be cultural, and then the biomedical benefits, for sure, the economic benefits, social and cultural, or kinda some utilization is kind of provisioning. Yeah. Hmm.

I: Okay. And then, are there any direct relationships between habitat forming species and the stakeholders and actors in that green box in the right corner? And I guess to backtrack again. Do those 4 do those green boxes, you know, accurately represent your thoughts based on our conversation?

001: So the government, indigenous groups, academics, and environmental NGOs are kinda like broad categories, right? And then the offshore energy shipping fishers, or all industry reps, you know, are specific sectoral industries. And I would just recognize that those are exemplary, but not exhaustive. There's a ton of other industry groups. I don't know if you wanna just put industry over the top of that, or whatever. Yeah, and it's not all extractive, but the one you have there are kinda in that regard. Well, shipping isn't. But the industrial, commercial, commercial groups might be a better way to frame that. And those commercial groups are the different sectors. The other group that I've neglected to mention are recreational groups, particularly in the fishery sector. Recreational commercial fisheries are often contentious. But you could have recreation. I'm trying to provide these as generic classes so they can be a lot of different things.

I: Yeah.That's great. Okay, so then, to get back to my other question, how do habitat forming species relate to these stakeholders and actors?

001: I don't know that they do. I think I think it's indirectly if they do, yeah. The arrow has to come from your green boxes to that - to the habitat forming species, I think. So, and I would say, if you have this, if you include commercial, as you know, a broad group, all 6 of them have interest in habitat forming species at one level or another. Right. And habitat forming species really only impact, maybe indigenous groups and commercial groups, but the rest of them goes the other way. And again, the indigenous groups and habitat forming species are only in certain locations. It's not by any means globally true.

I: Right.

001: So the academic line to that would be neutral. The user groups would be negative, and then the other groups would probably be positive. So, is this getting you what you need? It absolutely is just not enough time, as usual.

I: Okay, yeah. So maybe since we have a few minutes left, like, if we could just think about one other component, one of those other biodiversity components like species of conservation concern. For example, how does that relate to these different management approaches? I think that's something that's particularly of a particular interest to us.

001: So species of conservation concern, and habitat forming species are probably highly similar on all the connections you just made. You know. Maybe you don't have coral reefs there, cause that's very specific. But a lot of the rest of them would relate. And then you would also add the Marine Mammal Protection Act. All the different laws. EBM applies, EBM should apply to all your orange things easily. So, so yeah, I mean, unless it's very specific to habitat, a lot of the conservation critters have some of the same concerns or issues with them.

I: So what about our components of diversity in the gray boxes? How do those relate to species of conservation concern, or the other orange boxes?

001: All of them contribute to some species of conservation concern, except habitat diversity, landscape diversity, ecosystem diversity, location specific diversity management. But I think the rest of them would apply there. Do I get the word for most connections, or have you done this with other people?

I: I think you actually might, but it is it, you know it's really great to get your perspective, because you do think on such a big systems perspective like you were saying. And a lot of other people that we talk with have more of a localized perspective. Which is still important, but I think this gives us a really nice overview of some of the research questions that we're trying to answer.

001: Yeah. And I'm not scared of these nasty connected networks. This is what I used to do a lot. So I actually love watching you do this. So.

I: Yeah. Yeah, a lot of people are scared of them. They’re actually quite fun. I'm curious to see what the metrics are, and we're not even anywhere near halfway done.

001: I know. But if you all want to, I'll commit to this if you all want to schedule another time block to finish this up. That would be really cool. I'd be happy to do it. Can't do it this week.

I: That would be great. I was gonna ask you what we could do, because we're recording, [Interviewer 2].

I2: Sure! I can go through and try to fill in some blanks based on the first half of our conversation. Because I think you probably gave us some other linkages that we haven't drawn yet, and then we could send this to you to look at and schedule maybe another hour call. If that's okay.

001: Yeah, or if you send, if you wanna send this to me. It's mental model. Or this, that's a software. Yeah, I could actually try drawing this stuff. Unless you wanna have the pen, [Interviewer 2], and have that control. If you're comfortable with it, it's just online. So it's not that hard to do. I'm not doing any coding behind the scenes. Okay. Alright. Yeah. Let's look into that, you know, set up, cause I don't want you to have this much there, but be kinda not all the way done, so.

I: No, we appreciate that, you know. We know your time is valuable, so we appreciate that. Okay. Alright. So yeah, maybe we'll we can stop there and we'll send you this Mmp file, and then you can just hit load in mental modeler, and it'll populate it with the file, and if it gives you, you probably know this, but if it gives you username, and password. It'll be just. It's mental modeler, mental modeler. The username and password on the website.

001: I got you.Okay. Alright. Good to remember. Yeah. Alright. Where are you with this project?

I: Yeah, so our goal at this stage is to talk with experts like you to build this general framework for how biodiversity is considered in management, and how it could be better incorporated into future approaches. And then we're going to do 3 case studies where we look at specific themes surrounding these issues, to build more localized models, and you know, use that to hopefully inform some local decision making. And then we’ll revise the general framework afterwards to make some general recommendations.

001: Okay. Cool. Curious to see how this plays out. Thanks for involving me. I appreciate that.

1: Oh, absolutely this, this is really, really informative. This is, we're only, you know -I'm a postdoc in the project. And I started in January. So the project is very new. We're still getting on ground. But you are a great person to talk to early on, so we appreciate it.

001: Okay. Good. All right.

1: Okay. Thank you.

PART 2:

[Interviewer] 10:10:17

So, I think maybe it makes no sense to start with the yellow boxes. The management approaches. And so do you want to just hit like maybe, EDM, [Interviewer 2], to start.

[BD006] 10:10:29

I would actually, if you're concerned about the orange boxes having all the links, I would highlight those, and then we could just walk around the outside of it.

[Interviewer] 10:10:37

Works for me!

[BD006] 10:10:38

Yeah. Oh, that's great. Yeah. Species of Concern… there should be some performance measures to that one. Area based measures.

[Interviewer 2] 10:11:28

I got that.

[BD006] 10:11:31

You have. Yes, you have all, most of the laws. I don't know what - the way you're thinking about a location specific diversity, but that one might fit there. Yeah, yeah, yeah. The environmental NGOs in the upper right should probably go to that one. And maybe coastal communities, climate change… depends on some of these others, maybe coastal development, but that would be low, and that would make a - oh, we missed events. That should be regulating services. I think. Depends on the species, I guess. So, alright.

[Interviewer] 10:13:07

Oh, so sorry, does species of conservation concern impact regulating services or to regulating services impact species of concern.

[BD006] 10:13:16

Species of concern goes to regulating services. Yeah.

[Interviewer 2] 10:13:23

Gotcha!

[Interviewer 2] 10:13:26

Okay.

[Interviewer] 10:13:29

Okay, great. So for those new relationships, so I guess to start with, the question marks. So do those - are those positive or negative relationships where the question marks are? If you can't assign -

[BD006] 10:13:48

By catch is negative. Species performance is neutral. Area based tools is positive. Ebm is positive. Fishing quotas and regulations is positive. NEPA, ESA, are positive. Ecological resilience… huh. Probably positive. That one actually might be a 2 way arrow as well.

[Interviewer 2] 10:14:35

Then that would be positive. Going the other way, too.

[BD006] 10:14:37

Exactly. Yeah, yeah. Okay, what are the other ones? Range and expansion is either, climate change is either, coastal communities is probably negative. Environmental NGOs is probably positive. Coastal development is probably negative. Are we missing any? I'm just trying to see. The location specific diversity is probably positive. I'm sorry, I always draw on all these boxes and arrows. I wasn't paying attention to the signs.

[Interviewer] 10:15:30

Oh, no! Worries at all, and thank you, sir, for doing this. The, the mental modeler. You have one thing clicked on the view filter is it’s finicky. The Java relationships. Okay, so for looking at this set of relationships, right now, they're all automatically set to high of a weight of one. And so normally, what we do is we categorize the relationships into a low, medium, or high impact. So are any of these relationships a lower or medium impact rather than a high?

[BD006] 10:16:12

Area based tools would probably be medium because we're talking ocean ecosystems. MSA is probably medium, I would say. All of your gray… yeah, all of your gray ones would be well. Functional diversity, ecosystem, resilience and community diversity would be medium. The others, I'd probably leave alone. Yeah. Sorry you're getting a close up of my face. I'm trying to.

[Interviewer] 10:17:02

I'm doing the same thing.

[BD006] 10:17:10

And then the rest of them I would say are fine.

[Interviewer] 10:17:15

Great. So I just quickly - before we move to the next box. So, can we talk a little bit about the relationships that you said are neutral, or could be either because math - so mathematically, and you're probably familiar with this in mental modeler. It's a frustrating component of it, but if it's neutral, then it registers it as a 0. So it's essentially equivalent to no relationship which I don't think is what you're trying to represent. It’s ok if we can't assign a sign or a weight to it, because we know that this is a really high level map that we're making. And a lot of these concepts are broad. And I understand what you're saying about like it could be either. So traditionally what I do in that situation is that I ask the participants to break that box into more specific components. So if you say it's - it could be either or like, in what case would it be positive? So we can draw the positive relationship. In what case could it be negative? So we could draw the negative relationship. We can do that, but I also don't know if that makes sense in this case, because we are thinking so big picture. But I just wanted to kind of get your thoughts on that before we just leave. These question marks.

[BD006] 10:18:26

So the specific performance measures are basically like things that are overfishing or things. If it's in danger or below a certain threshold, things like that. So in that regard you could probably say they're positive. If they're above the threshold, the threshold is positive that keeps them there. If they're below. It's a negative signal, and then you need to take action as implied by other things. So I think if you wanted to, for the sake of your math, treat that as a positive effect, that it's going to drive whatever the orange box in in a positive direction, and that makes sense the other 2 climate change and distribution shifts the region, I think that's not neutral the way, the other one just was, but I think that is actually either, or they could go both ways. It depends on the properties of whatever species you're looking at. So I would break those driver pressure boxes down. I would actually say, it's dependent upon the properties in the orange box. That’s why I would kinda leave it that way, so it could be both. If that makes sense to you.

[Interviewer] 10:19:51

So that makes a lot of sense. Okay, that's great. So just really quick to go back to the species performance measures. So, do you think that that would be a low, medium, or high impact? Just given on what you were saying of, like, if there's a threshold effect, I just wanna make sure that that weight is right.

[BD006] 10:20:13

I don't know it is. If it's it depends on a lot of the other features of that. And how the response of the management system is, how responsive that particular organism is to the actual effect. And then it also depends on the life history of that organism. The timing, etc. Etc. So, like, if you look at it internationally, you have the red list of species right in the, and they have their grades of, you know, performance measures, you know, if you don't want it to be really high I would put it at medium.

[Interviewer] 10:20:55

Okay.

[BD006] 10:20:55

But I would put it at low. I think it, there's so many caveats to it, but I also get you need a simple answer, a straightforward answer.

[Interviewer] 10:21:07

No, that's great. Thank you. It's that's - I think that's a limitation of this method. Sometimes these really complex issues are boiled down to a weight. And that's not often realistic, but.

[BD006] 10:21:19

I'm an ecosystem modeler. I get boiling down to simple right? Interesting.

[Interviewer] 10:21:24

Okay, great. So let's move to the next orange box. It sounds like half that form of species are maybe pretty well covered. But maybe let's take a glance. A couple of question marks, but I think they may end up being neutral again.

[BD006] 10:21:50

They, if they're the ones…coastal development is probably negative. If it's range expansion or other ocean impacts, I would leave them for the reason we just went through with climate change.

[Interviewer 2] 10:22:03

Okay.

[BD006] 10:22:04

The one. Looking at this again. The one that you might add a link to is landscape diversity. What - let's see. Yeah. Yeah, and location specific diversity. Sorry I can't believe I missed that one. My bad. And by having that for me. Sorry. Go ahead. Yes.

[Interviewer 2] 10:22:37

And are those - but this was positive, sorry.

[BD006] 10:22:45

And you're talking things like oyster reefs and coral reefs and savs, and that kind of thing with this.

[Interviewer] 10:22:52

Yeah.

[BD006] 10:22:54

Then I think you need to have the shipping and navigation industry as a negative impact, and the fishermen as a negative impact as well. And then these are probably provisioning services from habitat to provisioning services positively.

[Interviewer 2] 10:23:30

Okay.

[Interviewer] 10:23:33

Great. And are there any downgraded weights to lower or medium that we should change?

[BD006] 10:23:58

Community diversity would be medium, I'd say the rest of these are pretty accurate, as being high.So do you have other questions on this one?

[Interviewer] 10:24:25

I think if those weights are good, then we can move on to next one.

[BD006] 10:24:29

Yeah. So I'm just thinking, harmful organisms.

[Interviewer] 10:24:36

Yeah.

[BD006] 10:24:36

If there's other things I'm missing, I'll tell you the link, the direction, the positive negative direction, and the potential way here. Harmful algal blooms are harmful organisms. That's their pollution influences. I think climate change should probably connect to that. And that would be high, and it would be neutral, or both ways. I would say coastal communities would impact that in a positive, sorry, in a negative way and high level. And then…Yeah.

[Interviewer] 10:25:34

So. Sorry, really quick. I just wanted to. The coastal community. So if you, just make sure we have it right, if you increase coastal communities, you decrease harmful organisms. I just wanna make sure.

[BD006] 10:25:51

Alright, then I'm thinking of it wrong. The more there are coastal communities, those are gonna cause more harmful organisms.

[Interviewer] 10:25:57

It's - yeah. Those ones are always confusing when the concept is inherently negative itself.

[BD006] 10:26:01

Yeah, yeah, I understand. Yeah, I'm thinking, like, eutrophication.

[Interviewer] 10:26:06

Yeah, yeah, yeah.

[BD006] 10:26:06

And loading, and all that stuff. So the one from harmful organisms to others… I would actually draw harmful organisms to deoxygenation as a positive medium relationship. And there was one other one. And I think harmful organisms as a negative relationship to both provisioning and supporting services is probably necessary. And those are both probably pretty high, or weighted at one. Yeah.

[Interviewer] 10:27:00

Okay, yeah, so are there any other weights that we should decrease with harmful organisms?

[BD006] 10:27:23

No, but the one you probably should have is harmful algae bloom as a positive, strong relation to that one. I think they're all pretty good.

[Interviewer] 10:27:42

Okay. And we're leaving range, climate change, and resilience as neutral.

[BD006] 10:27:50

I think resilience should actually be positive, if, if resilience has an impact, it's gonna make harmful organisms be less of a… so I'm just trying to like, is that a double negative or…?

[Interviewer] 10:28:06

Yeah, right?

[BD006] 10:28:08

Oh! So the more ecological resilience you have, the less harmful species you have. So maybe it is negative.

[Interviewer] 10:28:20

Okay. Okay. Great.

[BD006] 10:28:25

Yeah. Alright.

[Interviewer] 10:28:29

Okay, what is our next…? Targeted species.

[BD006] 10:28:36

Okay. So NEPA needs to go to that as a positive but a low weight. The MSA is a positive and high weight. I think you have that fishing quotas and regulations as positive and high fishing effort regulations positive. High seasonal closure should go there, that's positive, and I would say medium.

[Interviewer] 10:29:17

Hmm! Hmm! I hate when that happens. Hold on a sec. I'll bring it back.

[BD006] 10:29:25

It's okay.

[Interviewer 2] 10:29:29

The computer's not super happy about this. Okay.

[Interviewer] 10:29:36

Okay. So we just need to remember, [Interviewer 2], to basically merge this with the.

[Interviewer 2] 10:29:42

Yes.

[Interviewer] 10:29:43

Okay.

[Interviewer 2] 10:29:46

Seasonal closures was high.

[BD006] 10:29:48

No, it's medium weighing. But yeah, that's fine.

[Interviewer 2] 10:29:50

Sorry.

[BD006] 10:29:57

And by catch would actually be negative, I think. And specific performance measures would be medium and positive too. Ecological resilience would be positive. All your gray ones there are gonna be positive, and probably all of them would be medium. Yeah, that makes more sense thinking about that. Indigenous groups, government, environmental NGOs, and coastal communities should all have a low but positive connection. Boy… just walking through this. I didn't finish the job, I'm sorry.

[Interviewer] 10:31:19

No, no, no, you're this is why we just wanted to have a follow up, just to make sure. It's so much to look at.

[BD006] 10:31:23

Yeah. Yeah. And then fishermen should have a…I don't know. Negative and high weight. Hmm. Dredging, dragging bomb gear should be negative and medium. And climate change should be high and neutral or intermediate. So the fishing quota and the fishing effort signs should be positive. If that's helpful, I think those are the only others.

[Interviewer] 10:32:41

Great alright! Should we move to the next box?

[BD006] 10:32:47

I think so. That'd be great. Food web supporting species. Oh, okay, go back to targeted species. That's a high, strong, positive, for provisioning service, right? Sorry I forgot that. So! By catch is negative and medium. Fishing effort and fishing quotas are positive and low. NEPA is positive and medium. Other marine laws and treaties are positive and medium. ESA is positive and low. Area based tools is positive and low. And then let's see… you should add species functional and ecological resilience to this, and those would be positive and medium. And then those, I think, would be 2 way arrows. The same thing. And then. See the 5 green ones on the left: government indigenous groups, academics, environmental NGOs, coastal communities. Those would have a positive but very low connection. Fishermen in the shipping industry would have a negative and low connection. And recreational groups would have either medium level or a neutral, because it could go either way. Okay. And then this would be… this would be both be a provisioning and supporting service, so there would be positives from this to those 2. And probably even regulating, and that would probably be medium. Am I allowed to hit pause, and go back on something when you're done?

[Interviewer] 10:36:48

Absolutely.

[Interviewer 2] 10:36:51

Yes. Okay.

[BD006] 10:37:06

So both food web species and targeted species, I think, are gonna also be impacted by recreational groups. But that would be, you know, negative or positive. I can't tell. And kinda - but I think the arrows would be going the other direction to both from targeted species and food web species to both recreational groups and fishers, and I think those are positive and high. I hadn't been thinking of both words. I do not envy the matrix you're gonna have to deal with. Okay. And then a really weird one, with the other ocean uses, they should have a positive and high effect on other ocean impacts. And I'm looking at some of these. There's probably a few that don't even have any connections to them, even though there's a box here. Yeah.

[Interviewer] 10:38:32

Yeah, maybe let's - we'll finish the orange boxes as a priority. But, if possible, with the stakeholders… try to just take a glance. All connections like you were just describing between a stakeholder and a stressor.

[BD006] 10:38:47

Yeah. Okay. Okay.

[Interviewer] 10:38:52

Yeah. So what's the connection to keystone?

[BD006] 10:38:57

Yeah.

[Interviewer 2] 10:38:57

And species, or rather, biological processes.

[BD006] 10:39:01

Right.

[Interviewer] 10:39:02

I thought, naively, it was like, this will be quick today.

[BD006] 10:39:07

I'm sorry.

[Interviewer] 10:39:08

No, it’s not you. It's - we're getting so much helpful information. We really appreciate your time. I'm sorry that it's taking so much time.

[BD006] 10:39:18

So fishing quotas should be positive there by catch should be negative, range expansion should stay, you know, ambiguous. Yeah. And those are all weighted about right. The ones I would add are ESA and NEPA and the Marine Mammal Protection Act. A positive and high for charismatic megafauna. And then I think other marine laws and treaties should also be positive and high. Genetic diversity should be positive and medium. Species diversity should be positive and high. And then again, those first 5 green ones up there on the left should all be positive and medium on that one. Yeah. Except for environmental NGOs, that should be very high. For that. Yeah. And shipping and navigation should be negative. Okay. And then charismatic megafauna should also have a climate change, neutral and medium. Charismatic megafauna should have a positive and high towards cultural services. Okay. And then if you wanna save time, I would say mostly what we just did last here… most of what we just did for charismatic megafauna relates to keystone species, with the exception being that you would need to add ecosystem diversity, functional diversity, and logical resilience as positive medium impacts to that one.

[Interviewer] 10:42:25

Hmm! I see what you're saying.

[BD006] 10:42:25

So if you can just make a note that whatever we added for charismatic megafauna, it should also be in keystone species. And then add those other 3 gray ones. And take, yeah, take out the genetic diversity.

[Interviewer] 10:42:48

Did you get the slight differences, [Interviewer 2]?

[Interviewer 2] 10:42:53

Yeah. I sent you a slack message about it.

[Interviewer] 10:42:58

Okay.

[BD006] 10:42:58

Or we can walk through it. I'm just trying to save you time.

[Interviewer] 10:43:01

No, no, no, that's yeah. If we can save time, that makes a lot of sense to me.

[BD006] 10:43:06

Yeah. And then the species driving - species driving biological processes should be probably quite similar to the habitat forming species relationships.

[Interviewer 2] 10:43:07

I got all that.

[Interviewer] 10:43:09

Okay. Thank you.

[BD006] 10:43:19

With the exception of - well, I even would think the habitat diversity would probably be fine there, too. So if you need to replicate those relations, I think that's probably fair, and that would save you time.

[Interviewer 2] 10:43:36

Okay.

[BD006] 10:43:38

That's not so.

[Interviewer] 10:43:47

Okay, so is that - I think maybe we've done all the orange boxes now.

[Interviewer 2] 10:43:53

Yes.

[Interviewer] 10:43:55

Love it. Okay, so maybe we could prioritize in our time left the yellow management boxes, and just like, if you wanted to click on each of them and hopefully, we can do this pretty quickly, because I probably already have a lot of relationships. But just making sure that we have everything from the yellow boxes to any of the other boxes, not just the orange ones.

[BD006] 10:44:32

So other laws and treaties, I think, have a positive impact on species diversity. Genetic diversity, I think, is impacted by government. These are all positive and just medium. If that's helpful. You wanna move on to the next one?

[Interviewer] 10:45:38

Yeah, that's good. Yeah.

[BD006] 10:45:42

So, yeah. So that's probably positive enough, by government and environmental NGOs. It has a negative impact on by catch. And…I don't know why it's related to cultural services. That’s my bad on that. I don't think that makes sense.

[Interviewer 2] 10:46:27

We can check that out.

[BD006] 10:46:29

Yeah. I mean, keeping this high level and simple, that's what I would recommend in there.

[Interviewer] 10:46:36

Yeah.

[BD006] 10:46:38

ESA… sorry. Is that the one you wanna do next?

[Interviewer] 10:46:44

Yeah, sure. Yeah. Whatever ones you wanna go to next.

[Interviewer 2] 10:46:44

Sure!

[BD006] 10:46:52

Yeah, that's probably pretty good. The - it would probably also have genetic diversity in habitat diversity. We have habitat diversity as positive and medium. And it would be impacted by the government in a positive medium way. And you got the genetic diversity one. I'm sorry I just oh, you moved it. You moved. I got it. Okay. And then back down. What's next? MSA? Yeah, I don't know that these laws should go to the services, so I would drop the one to the provisioning services. Yeah, that actually has a neutral impact on fishers and recreational users. Is that negative? But it's actually designed to not necessarily be negative. And then I think the flip side is that the fisher's recreational groups and environmental NGOshave a positive influence medium on the MSA. So leave the link between the fishers and MSA as neutral. I think. Yeah, probably. But then turn it around and have stuff from those. Yeah. Also, I would say, be positive on MSA.

[Interviewer] 10:49:09

Okay.

[BD006] 10:49:11

Yeah, add recreational groups. That's the only other one. Harmful algal blooms would be that, and probably negative on the harmful organisms.

[Interviewer] 10:49:36

I think, yeah, feel free to add those. And I think the issue is that we had to switch versions. So I think that probably because I remember you saying this already, some of them are in our other version. But...

[BD006] 10:49:49

Okay. Sorry.

[Interviewer] 10:49:50

No, no, no! I just, I want - I remember you saying that I think there are probably some things that you've already said. But feel free to say them again. So we have… they come up.

[BD006] 10:50:00

Alright, and then the Coral Reefs. Yeah, it's habitat forming species. Maybe the species driving biological processes. Yeah. And then the others are more like tools, actual management tools. Sorry. I just wanna make sure we're still getting weights for those all the last ones we've set up are all higher. Yes. Sorry.

[Interviewer] 10:50:45

Okay, sure. No. I just wanna make sure.

[BD006] 10:50:52

Seasonal Closures… that one probably is a positive impact. Sorry I missed that. Yeah, yeah. Yeah. Yeah, I think you've got fishing quota. Yeah, that and effort should both have a positive impact from the Magnus. And I thought I had. Are they there?

[Interviewer 2] 10:51:40

Yeah, we haven't.

[BD006] 10:51:41

Alright, it's okay. Area based tools… yeah. So from other other marine laws and actually ESA and MSA should be positive and medium to this one. Okay. So that should be positive and high to a charismatic megafauna, as well. And that should have positive and high lines from MMPA, ESA, and MSA. Okay. Am I still working on… are you both out of here? I'm sorry.

[Interviewer] 10:53:17

Are we wearing you out? Is the bigger, more important question.

[BD006] 10:53:18

No! No! What's striking me is that I was interrupted when I was working on this last time.

[Interviewer 2] 10:53:25

Hmm!

[BD006] 10:53:27

I didn't quite get it.

[Interviewer] 10:53:27

Oh, no, no! This this is great!

[BD006] 10:53:30

Wanna do by catch? Yeah. And that should have a positive line from Marine Mammal Protection Act and the MSA. Yeah.

[Interviewer] 10:53:54

Sorry. So I just want to clarify with that one.

[BD006] 10:53:56

Those are negative because they're trying to lower it. Right? Yeah. But it should be strong. Yeah. Yup, okay.

[Interviewer 2] 10:54:03

Yeah. Okay.

[Interviewer] 10:54:08

Is that - I think we did all of the management.

[Interviewer 2] 10:54:13

That's all the management.

[BD006] 10:54:14

Yeah.

[Interviewer] 10:54:14

Okay, great. Just in the last 5 min, the last thing I just wanted to check on was on to make sure that we have the appropriate relationships between the stakeholders and the services. That’s the one thing that I could think of that maybe we're missing.

[BD006] 10:54:32

See, the thing is nothing should go directly from the green to those blue boxes.

[Interviewer] 10:54:37

Okay. Great.

[BD006] 10:54:39

I think it should come through the orange, or maybe the purple or the gray, and then back. So that's how I'm thinking of it.

[Interviewer] 10:54:49

That's perfect. Okay. And then, is there anything else? I'm not sure. I know we have stressors to the orange boxes, is it the same thing where, like, it would be indirect back to services and stakeholders? So if we have stressors to the species, then that should be covered.

[BD006] 10:55:12

Yeah. Anything from your kind of pinkish, purplish boxes should go through the orange or ray.

[Interviewer] 10:55:17

Okay.

[BD006] 10:55:20

And then back, yeah.

[Interviewer] 10:55:24

Okay, perfect, [Interviewer 2], am I missing anything else?I mean, I guess the only other thing I'm thinking about is the gray boxes, because we didn't go through each of those but I know that we have them all connected to the orange. Are there any, like, obvious connections from the gray boxes to the other colors that we could have missed?

[BD006] 10:55:51

Yeah, me or [Interviewer 2]?

[Interviewer] 10:55:52

Yes, I'm sorry I'm asking you.

[BD006] 10:56:01

The only one I - I mean. Yeah, I think we walked through and got most of them. The one I would flag is Gray to Gray.

[Interviewer] 10:56:08

Hmm, okay.

[BD006] 10:56:10

Right. And we haven't done that. So genetic diversity leads to species diversity. Species diversity leads to community diversity, functional diversity, and ecological resilience. Ecological resilience and community diversity lead to habitat and landscape diversity. And then have habitat diversity, landscape diversity, and community diversity lead to ecosystem diversity. So I would - I think you… I would reverse the arrows, but, you know. So think of it as genetically, the species leads to a functional community and resilience, and then those lead to habitat landscape and ecosystem diversity. So think of your biological hierarchy.

[Interviewer] 10:57:02

Okay. Okay.

[BD006] 10:57:04

If that helps.

[Interviewer] 10:57:07

That helps a lot. I definitely missed a couple of those, but I know that the transcript picked it up.

[BD006] 10:57:13

I figured. That's ok.

[Interviewer 2] 10:57:14

So that's okay. Yeah, I got that last sentence with the order.

[Interviewer] 10:57:17

So I think, yeah, I think we have it. Okay. And then the other ones are from the green to the actual purple ones. There's probably some there that we haven't fully got into, but I think the main thing is we've got the green to the orange, and that would impact those so.

[Interviewer] 10:57:39

Right. Okay, okay.

[BD006] 10:57:40

Yeah.

[Interviewer] 10:57:44

Okay. I think, with our 3 min to spare, we've done it.

[BD006] 10:57:45

Alright!

[Interviewer] 10:57:50

Thank you so so much we cannot thank you enough for all of your time on this. This is so helpful. We've shared a little bit with the team with Emma and Gabrielle about our conversations with you, and they are really excited about your insights. So we're really excited.

[BD006] 10:58:09

I’m sure I'm lowering your expectations. But I'm happy to help. This is fun. It's really good to see you all working on this and whenever you get it written up, whenever you get it ready to distribute, I would love to see what you came up with for the whole project.

[Interviewer] 10:58:29

Oh, absolutely. Yeah. We'll definitely be in touch.

[BD006] 10:58:31

Okay. Alright, thank you both. Enjoy. You're in Alabama.

[Interviewer] 10:58:37

Sarah is.

[Interviewer 2] 10:58:38

Hi, Anne. Yeah.

[BD006] 10:58:39

I was gonna say, enjoy your lunch. Better enjoy your hour before whenever maybe lunch early.

[BD006] 10:58:45

I don't enjoy the rescue.

[Interviewer] 10:58:47

Mining mental break. After this.

[Interviewer 2] 10:58:47

Thank you.

[BD006] 10:58:48

Yeah.

[Interviewer] 10:58:50

Thank you. Bye.