Interviewer 1: Before we get going, which you mind just explaining a little bit more about your area of expertise and your work responsibilities or research.

BD007: Sure. So my background is in Marine Science. I did graduate work at the University of Houston, and then took a fellowship with NOAA back in DC. At the canal Cagram Fellowship, eventually I worked with NOAA’s biogeography program and I'd say biogeography in general is probably my area of expertise. I eventually took over and ran that branch through 2014. So thinking about, kind of spatial temporal patterns of species distribution and habitat use.And we did some human use stuff as part of that, too. And then, now, I moved West, so now I'm in California and I'm the research coordinator for the Channel on National Marine Sanctuary. I mean, we're doing sort of all manners of projects.Sort of a diverse array, like any scientific need. So, regardless of my particular interests, the sanctuary needs information on all kinds of things.

And so we work across a wide array of disciplines and interests, including, I guess, probably, as an intersection here, and maybe one of the reasons was that Duffy connection, and Gabrielle canonical connection. So the marine biodiversity of observation network, so one of the things we're… well, we'll probably get into it. But yeah, so everything here, deep sea corals and magazine floor mapping, and human use. And the dimensions associated with that connectivity, and communicating more effectively. Communicating science or sort of our key priorities. Right now that’s I'm involvedin.

Interviewer 1: Thank you. That was really helpful. Yeah, so it sounds like, you know, you know from our email I’ve told Emmett and Gabriel a bit about what we're working on. So our project here, the goal of our project really broadly is to understand the role of biodiversity and marine resource management. And so we're chatting with experts like yourself to really understand how different researchers and managers think about that, to help inform how we can better incorporate a biodiversity approach into management. And so to start, today, you know, we've - we recognize and we talk, as a team, a lot about how the term biodiversity means different things to different people. And it can be measured in a variety of different ways. And so we'd really like to know what you see as the key aspects of biodiversity and what you think about when you think about it.

BD007: So it's so defined - I was gonna ask you guys, similarly, I was wondering how you guys were defining it for the sake of the project. But is that the question to me, then?

Interviewer 1: Yeah. Yeah, exactly. We're - at this point, we're not defining it ourselves. We're hoping to build the definition from experts like yourself.

BD007: Okay, okay, yeah, I mean, definitely, I agree. In my - in the work that I've done over the past, people definitely have a varying of configurations and thoughts. The definition can include anything from microbes to wales, it’s pretty encompassing. So I guess, I guess the 2 - there are 2 ways that we think about biodiversity, here, that I think about biodiversity. One is just, you know, understanding, if you look at just metrics, specific measured metrics of biodiversity, like how many species, richness and evenness and number, you know, identifying kind of hotspots is, right, always, it's one of the ways to think about biodiversity. And then from that, maybe you can glean certain pieces of information that we could talk about, but the other… just understanding diversity to me also can just mean, for example, we're a place based management unit, we're part of a national marine sanctuary. So what if we captured it in our boundaries? What is it that we're managing? And so I also think about it in that way, and each one of those takes you in a potentially different direction. Well, or overlapping directions in terms of what you can glean from that information. Right? So people who wanna design a marine protected area network, or decide whether you can put in a wind farm off our coasts, or run transmission cable, or it's, you know, if you have maps and we do in many cases, of sort of hotspots of biodiversity, places where there's a lot of… in the first sense of biodiversity that I was mentioning. That's where you just have a lot of different creatures that all think this is a great spot to be, right. Maybe that seems to be a relatable flag that you can connect with resource managers and the public to suggest, okay, maybe we wanna think about instead of using this space for that purpose, whatever it is, maybe we wanna use this space. That is an example of that first way of thinking, and then the second is just understanding kind of what you've captured, right? That can be fundamental, useful, because we see something new in our sanctuary. For example, is, is it invading? Is it not supposed to be there? Is it - Is it common? But, just in places we've never looked, like the deeper waters. You know, the deeper ocean is very, very little known. We've surveyed very - only very small amounts, whereas shallow water, like by us, we have kelp by us, and I've done a lot of work and coral reefs, right. People think about those spots as important and biodiverse, but 90% of our sanctuary and most National sanctuary is in shallow water. And so you, know what's happening there. So what have we captured? What's part of our zoo? Is it threatened? Is it endangered? Is it at risk? So these are all things that I manage. I've seen, in my experience, that a manager might act on one thing to add biodiversity, hopefully, and capture it somewhere in this. And I don't often hear people consider this, but biodiversity is often used in that first example. It's like a hot spot. Right? Like. Here's where everything is. But there - there's also like, I guess, cold spots that are different and potentially important and unique in our capturing entirely different sets of organisms. And we often don't think about protecting that as well. We think, well, there's a lot of things that care about this spot. Let's protect it. But there's other unique things that we're not protecting when we protect this spot, that are just over here because they prefer a different set of conditions.And so this idea that it's important to consider, not just hotspots, but other spots, you know, and diversity. And to capture the true biodiversity means capturing like an array of habitats, oceanographic habitats, the Benthic habitats, so that you capture the spectrum, and you don't just focus. It's easy for folks, and I often see folks really just get focused on ‘here's a place where there’s lots of things’ versus ‘here's the place where just a couple things’, but these are really unique and important and amazing things. We should also protect that. So I just wanna draw that out a little bit, cause I see it missed frequently.

Interviewer 1: No, that's really interesting. And a lot of the things you just mentioned, I think, fit nicely into our next question. So some of the previous research that our group has done has been on generalizing 4 key components of marine biodiversity, and those are habitat forming species, species of conservation concern, harmful organisms, and key food web supporting species. And I can put those in the chat. I'm personally visible person. If you want me to throw them in the chat. But what we're wondering is, if you consider those 4 components in your research management. I think you've already talked about a few of them, so I know the answer is yes to some degree. But also, if you agree that those are the key components of biodiversity, and if not, what would you remove? Or what would you add?

BD007: So it's actually - if you, if you don't mind putting it in the chat so I can ponder it, for sure. Like, what is a key food web supporting space is versus, for example, a keystone species. What - I don't know that you need to add necessarily for this, but it's a group of sort of critical organisms that it… yeah. It depends on what I mean by key food web spaces. But for us, we talk about - shoot, I wish I had the terminology in front of me. But there's kind of the, you know, baitfish, or you know, herrings, anchovies, plankton, or different things along that line that we know, to be important for a variety of animals, but that's different than we think about. Anyway, in our world we think about it differently than we think about sea stars and its importance on controlling the kind of top, down and bottom up effect. So anyway, in our world, we differentiate those 2. What else?

Interviewer 1: So this list is kind of meant to take biodiversity and say, there's sort of 4 elements that we’re approaching.

BD007: Okay. So I guess in the first instance, when I talked about what biodiversity can mean, the hot spot, or whatever. Right now, we're just talking kind of species lists, or Shannon diversity indices, or evenness, or something. So when we think of diversity, we also think of the pure diversity. Just everything. You know, what is - what is everything that's out there?And so like I don't… Not everything fits into these 4 deals, but yet we still care. In fact, one of the things we have to report out on periodically, as part of our sanctuary condition reports, or condition assessments, we have… specifically we have a series of questions we have to address, and one of them is what is the status of biodiversity, and how is it changing? And - and that can mean, again, different things to different people. Right? But, like, you know, among those, you know, we would be interested to know, like you, just what is happening in terms of all, all the species. We're - so we're part of the Marine sanctuary program. And so we're supposed to kind of care. Be concerned about everything. Versus differently, like in NOAA, you have the Marine Fishery service that’s maybe more focused on some of the things you have here, like species of conservation, concern, key food web species. And then there's just other species that are. There's also species of commercial and recreational interests, right? So it's that I don't know how - where that might fit in here. So that's another element. So species, of course, recreational interest, cultural interest… species that have a significant connection to local, indigenous populations, or others. Just historically, you know. So there's other groups, I guess, that might not fit in here that we, at least in the sanctuary program, might be interested in. I'm as well.

Interviewer 2: Okay, so yeah, that's so it that's great to know. So, if you are… if you or the Sanctuary don't think about biodiversity in these four bins, then, you know, we don't have to. That's what we want to know. So we don't have to force biodiversity into those 4 bins. If you, if you're thinking it more holistically, as biodiversity hotspots, and then maybe characterizing species that are of interest for different ecosystem services, then that's how we can, you know, draw this out today and think about it. That's how we want to capture how you all think about it, essentially. So, we don't have to force your definition of biodiversity into these bins is what I'm trying to say.

BD007: Okay, yeah, I think we might be thinking a little bit more broad.

Interviewer 1: Okay.

BD007: And it's not that we don't use some of these terms, certainly we have habitat forming species, like we have our oysters here and our seagrass communities, and we pay significant attention to those we just released. Our latest management plan for the Channel Sanctuary has 5 kinds of focal sections identifying issues of concern and harmful organisms that are invasive species is one of our 5 chapters. So we definitely think about that piece of conservation concern. One of our biggest efforts locally is thinking about whale cetaceans and ship strikes. That’s what our policy folks are thinking about, largely. And so, it's not that we don't use some of these terms, to be clear, or you know. So I can relate to any one of these. But I think we also maybe have a few other pieces.

Interviewer 1:Gotcha. Okay, okay, great. So you started to mention some just now, some specific species that you all think about within these bins when thinking about biodiversity. So you were talking about species of commercial, recreational interests and species of cultural interests. So thinking about your specific area of expertise, and you know your work in the Channel Islands Sanctuary, what are their specific ecosystem services that you all manage for, or that you're focused on, when you're making decisions for the sanctuary.

BD007: So the sanctuaries… I think this is true, for virtually all of the Federal marine sanctuaries. For us, our management is multi-use. So in our specific site, we actually do have 26% of our sanctuary in a no-take marine protected area. But the rest is open to - it's no take, but it's open to diving and whale watching and recreational use boating, and we get a lot of that in our neck of the woods. But it's also, and the rest of it is, open to commercial and recreational fishing communities. We have cultural engagement with our local tribe who goes out there into the sanctuary, which was formally their domain in their waters, and they have their celebrations and connections with the water and ocean communities. So we have… each sanctuary has an advisory council, and that's made up of all the community user groups that take advantage of this sanctuary and all those groups are represented. In addition, we have the military, like the Navy, they’ll have a seat. The Bureau of Ocean Energy Management - that's doing all the renewable energy and wind farms out by us. We, even though we're on the West Coast, Southern California actually does have oil and gas development offshore. And as well as science and education, research and education are both things that we're supposed to protect for and manage for and ensure. There's opportunities to provide - the sanctuary provides for educational opportunities and for research and science opportunities as well. So we have a really broad mandate. We have limited teeth. We don't control. We're separate from NOAA Fisheries, so we don't control stock. You know how much you can take, or anything like that. We only have a few regulations. We have our no take areas, and then you're not allowed to disturb the sea floor, and there's something else… you're not allowed to explore for oil and gas development in the sanctuary. Beyond that, we don't have a lot. We tend to do more community stuff, bring stakeholders together, talk through emerging issues, and try and get the right people there, so that whoever does have the authority to make an ultimate decision does so with all the user groups and stakeholders at the table. So we provide a forum and a platform for resource management, decision making, and we can on occasion do a couple things. But the - we are somewhat limited in terms of what we can control and what we can.

Interviewer 1: So our next question, I think you said this answer, was: what are the most important actors or stakeholders in this system, and who are the most affected stakeholders? So I think you just went through probably all of those, with talking about the advisory council. Are there any others that we should think about for your system?Or is that pretty much cover it?

BD007: In our specific case, I think I mentioned the indigenous population. But also in our specific case, although they're not on the Advisory Council, we have the largest shipping lanes in North America. Well, at least in the US. They go from La Long Beach, from Asia, and so the vessels actually do travel through sanctuary waters. And so we're trying to work with them to affect their speed, to reduce likelihood of ship strikes on whales, and also reduce the noise pollution, which can affect invertebrates, fishes, and cetacean marine mammals.So okay, in terms of how it impacts biodiversity, you know it is the shipping industry. It’s another sector that has interests. But we’re working with them and trying to incentivize and get them to voluntarily work with us, right? We can't tell them in the sanctuary to only travel a certain way, so we have to do it more and bring people together.

Interviewer 1: That's good to know. So again, I think you've already mentioned some of this, but like I said at the start, really, the overarching goal of this project is to understand if biodiversity is currently explicitly considered in management decisions and then what approaches are policies are needed to do so in the future. So I know you were talking about how as a sanctuary, there's a lot of area-based tools, MPAs, that you were mentioning that you all use, having the no-take zone and some of the other exploration for gas limitations. Are there other management approaches that we haven't talked about that are important for explicitly considering biodiversity in the sanctuary?

BD007: Yeah, I, it goes back to how you wanted to define biodiversity. But, for example, another big issue we have is marine debris. Things like derelict fishing gear - fishing gear are selectively removing parts of our biodiversity. So how does that impact the rest? And micro plastics are another component of the marine debris world. We're understanding that more and more, they're at almost every level of the food chain, we're finding. We're finding out their impacts. You know, at what level do we need to be engaging with policymakers as we discover that? Our biodiversity might be impacted by these, these factors, so that we can affect a regulation change to reduce the likelihood of getting - I mean every sample that we've ever analyzed in the last 20, 30 years, like we have historical samples here, has micro plastics in it. So we know that these are issues for us and they're impacting our - we suspect they're impacting our resources. We know in the case of the fishing gear, that it actually, you know, impacts habitats. It impacts the deep sea corals and sponges, like, we have deep water corals and sponges here not the shallow ones like in Florida. So you know, how are - how are these things impacting our biodiversity? So we can have... do - do we have bans on certain gear types? Again, that wouldn't be a regulation we could make, but we would sit down with all those folks and say, here's what we're finding. We’ve worked with the research community, we've worked with the industry, and here's our results. You know? And how do we move forward on this issue? Because we're perceiving some significant impacts. So those would be a couple of others. Climate, of course, is, it turns out - it seems to be changing. They say so, if one were to buy into that, one might think, especially in a place like ours, we're kind of at the where the biogeographic break, there, at the northern range endpoint of a lot of species and the southern range endpoint for a lot of other species. And so our communities, you know, are they gonna start looking more like Southern California? Are they gonna start looking more like Northern Baja or even Central Baha, or a species coming up from Mexican waters? And then, at what level do we need to engage with the Mexican officials and government, and be concerned with how those species are doing, because they may be impacting us?So it - is our sanctuary going to be fundamentally different? Are these key habitat forming species not gonna be there, right? Cal forces is what we're known for. People come to dive in our kill for us. And is that not gonna be a thing because of increased storm frequency associated with climate increase, temperature, etcetera? Yeah, how's that gonna change? Our waters are also hot spots for cetaceans. We get a ton of different species of cetaceans that come through. Well, part of that's related to upwelling well, the upcoming might be reduced. How does that affect our biodiversity? So, yeah, I mean, I could go on, right, like, climate is a big way. I mean, not that we're probably gonna regulate climate per se, but at a level we can be a group that educates and provides outreach and provides data information to people, acting in a larger region or national scale, that maybe, you know, kinda keeps things in the public eye so folks can make better decisions. So climate is pervasive basically throughout everything.

Interviewer 1: Great. Yeah. Our next question, our last question for the section, was what stresses are impacting biodiversity in your system. So I think you just probably went through all of those talking about climate, marine debris, microplastics, noise, pollution. Is there - Is there anything else in terms of key stressors that we should, we should think about? Or are those kind of the main ones for your system?

BD007: Yeah, I mean, climate is a big one. Invasives too, I think.

Interviewer 1: Okay.

BD007: Did you capture that, invasive? We have some key invasive species that are competing with some of our other foundation species for space, including our kelp for us. So that's one. Yeah, yeah, I think that's mostly…there's - I'm not quite sure how this will come into play, but it's some level, you know, things like OA and hypoxia. I mean that those are related to climate, and so forth, too. We're more offshore, so we don't tend to get a lot of the nutrient water, and we don't - well ordinarily, I don't know if you've heard lately, but usually we don't get the thing where the water comes down, from the sky, that usually doesn't happen here. So, but lately it has. But, so that means typically we don't get any. We're far enough that I'm sure we don't get runoff and nutrient inputs and so forth. But we do on occasion get, you know, a harmful agal bloom. It'll shut down a fishery for a little bit. We have a pretty big, productive fishery here, it's one of the more productive ones in California, because we have a unique set of species that are actually more closely related to Mexican waters already. And it's all the invertebrates that people… you know, the squid, and the lobster, and the urchins, and the sea cucumber and stuff. The invertebrates are here, because they’re sort of subtropical. But anyway, I guess that's just one more take on that. But yeah.

Interviewer 1: Great. Okay, perfect. So for the second half of the interview, we're gonna do a concept mapping exercise called mental modeling. Have you heard of that? Are you familiar with that process at all?

BD007: I'm not sure, you might have to introduce me to make sure.

Interviewer 1: Yeah, for sure. So, [Interviewer 2], do you wanna go ahead and share your screen while I'm chatting? So, mental model is a tool that we use to basically draw a system to understand how you see all these system components that we've been talking about so far. So while you and I have been chatting, [Interviewer 2] has been making a list of concepts based on your answers to the questions we've been talking about. And then, for this part, we want to understand how these different system components are connected to one another. So, for example, one of our core research questions is, how are these management approaches impacting biodiversity, like we've been talking about. And so this is the software we use where we can draw those arrows between those system components, and we can assess if 2 components are connected, if it's a positive or negative impact, if component A is having a positive or negative impact on component B in the system. And then we can also, we call this tool semi quantitative, because then we'll also ask you if it has a low, medium, or high impact relative to the rest of the system. So we can - we can kind of start to go through it. And of course, you know, ask questions as we go to make sure you you're comfortable with the process. Does that sound? Okay?

BD007: Sure that's good.

Interviewer 1: Okay, great. So I guess first, [Interviewer 2], do you wanna go through kind of what you've drawn here? We wanna make sure that we're - we have the right concepts based on your answers. That we understood what you were saying appropriately.

Interviewer 2: Yeah, so in orange are the key concepts that Kelsey brought up first, and then when you added more, I put those underneath the gray as just general things you think of, when you are talking about biodiversity. Green on the top right are stakeholders within the system. The blue are ecosystem services that you're specifically managing for. Yellow is management currently in place and then potential actions to manage for biodiversity. And then the pink at the top are stressors. And I made a few connections that you explicitly mentioned, that had a negative impact on biodiversity or species diversity. And then you said more then a few times, like how do increased temperatures impact diversity, or how do microplastics impact biodiversity. So those arrows are question marks. So, if you know those relationships, we can fill them in, but otherwise we can leave them as unknown.

Interviewer 1: Okay. Great. So maybe first, before we go into the relationships, just with this quick glance - and we can continue to adjust as we go, obviously. Do these concepts look, you know, at a quick glance, look right? Do they look like they're representing your thoughts accurately?

BD007: Yeah, that was a great job of capturing things. I think I might add the military to one of the green ones in the top left. But yeah, that was, I think this is good. Should get us started.

Interviewer 1: So let's start with the biodiversity components in the center and orange.

BD007: Okay.

Interviewer 1: And, so maybe we'll start with habitat forming species. So what in the system here is impacting habits at forming species?

BD007: Increased storm frequency., invasive species, derelict fish gear, increased temperatures… yeah, that's what I'd say.

Interviewer 1: Okay.

BD007: And it will not be negative, I guess.

Interviewer 1: Sometimes it's easier to talk about the weighing at the end, or sometimes it's easier for people to think about it as we go. I guess, with these first few are there weights that you think you could assign to those relationships? So for example, you know, does invasive species have a low, medium, or high negative impact on habitat forming species? And you could think about that relative to the other stressors. So you know, how are invasive species impacting habitat forming species compared to the, like, fishing year?

BD007: Okay. So I'd say, climate increases storm frequency. But those are, to me, related. But I guess climate captures more than just increased storm frequency. So those both would be high. Maybe increase temperatures, we could say medium. Derelict fish gear… let's say low. And invasive species. Let's say low, right now.

Interviewer 1: [Interviewer 2] were there any other ones that we…?

Interviewer 2: Yeah, sorry if I'm missing an arrow. The arrows get crazy.

BD007: Yeah, I can see.

Interviewer 2: Should - for now, should I take the arrows off of this concept, or leave them?

Interviewer 1: Oh, I think it's okay if you leave them. Well, we can get to that after.

Interviewer 2: Okay. Okay.

Interviewer 1: Okay, I just wanna make sure that we went through… so did we talk about increased storm frequency? We did. Okay, all right. Okay, so thinking about the reverse relationship, are habitat forming species impacting anything in this system?

BD007: Like, so, do habitat forming species impact climate, is that the…?

Interviewer 1: Exactly. Yeah, yeah. Or anything else. Would an increase in habitat forming species impact anything in the system?

BD007: Yeah, I mean, maybe on a small local scale, it's been shown to impact climate. More seagrass for us means more carbon sequestration. And also, I believe, lower ocean acidification locally, which is kind of cool.

Interviewer 1: Okay.

BD007: So, yeah, I think that would be the main ones. Basically - oh, I don’t know if it would be stronger, I'd say low. But - and then low for invasive as well. More habitat forming species, they're doing well, doing healthier. The ecosystem’s a little more resilient to invasive species. So I'd say, that's low as well.

Interviewer 1: Okay. Okay. So now, moving onto species of conservation concern. And so, we'll just do the same exercise. So what in the system is impacting those species of conservation concern?

BD007: This is gonna be quite a web. Okay. Species of conservation concern are impacted by derelict fishing gear, increased temperatures, climate change, noise pollution… those would be the main ones.

Interviewer 1: Okay. And are those all negative?

BD007: All negative. Yeah.

Interviewer 1: Okay. And then what about the scale of low, medium, or high impact for each of those?

BD007: Okay. I'd say climate would be high. Derelict fishing gear would be medium. Increased temperature would be medium, and noise pollution would be high. That - did I get them all?

Interviewer 1: I think so? Yeah, great. And then, same as before, thinking about the other direction. Do species of conservation concern impact anything in the system?

BD007: No, I don't think so.

Interviewer 1: Okay, great. So then let's go to harmful organisms. So again, what in the system is impacting organisms?

BD007: Climate, I mean, it's - are habs harmful organisms? I don't know. Oh, yeah. Yeah. I think it's even in… yeah. I don't know. How do you wanna handle that?

Interviewer 1: Yeah, that's a good point. I mean, we can remove habs if it's nested within that. And then do we have any relationships there? I don't think we do, right?. No. Okay. So yeah, maybe let's remove habs, since it…

BD007: Harmful organisms are kind of a stressor, as component of biodiversity. Yeah, like increased temperature, and then similar, I guess, to invasive species. Invasive species impact habitat forming species. But yeah, it's kind of both a - I guess a major, as you guys do it, a biodiversity component, but it's also like a stressor for sure. Okay, so we can I guess… let me think about this. So what do we have in bases?

Interviewer 1: So would you say for those 2 connections, are those… that relationship that we have between invasive and habitat forming species, does that apply for harmful organisms? Because because if it's one in the same, then we could remove invasive species again. And just, you know, we know that underneath the umbrella of harmful organisms is invasive species.

But if - if there are separate relationships between the two, then we want to keep them separate. I mean I don't know how you capture invasive species or harmful organisms.

BD007: Right. So, invasive species are impacted by temperature and climate, increased climate, or changes in the ambient conditions make things more suitable for potential invasion. Right? So, that's a direction. And then the other is invasive species out competing habitat forming species for space.

Interviewer 1: Right.

BD007: So yeah, I can go either way on that.

Interviewer 1: Okay. Yeah, maybe… I mean, we don't have to do it there, but maybe we'll combine those after the fact. But if you don't wanna change the relationships right now, we can - you and I can do that when we clean up the model afterwards. If that's easier. But does that sound good to everyone?

BD007: Yeah, that - that's fine. So yeah, then I would just leave it with these two. And I would say they're both high.

Interviewer 1: Okay. Yeah, okay, so harmful… so I know we were just talking about invasive species as a harmful organism, impacting habitat forming species. Is there anything else that harmful organisms are impacting in the system? So in the other direction. I mean, not of the pink, the stressors.

BD007: One, I guess.

Interviewer 1: Okay, so we can - if it's faster, like, if there are management approaches, or biodiversity services, or stakeholders that also have relationships with these components, we can talk about that now, too. I think maybe that might be more efficient. But however you think about it works for us.

BD007: Either way. We could probably knock these next 4 out pretty quick, now that I think we're catching on.

Interviewer 1: Yeah, okay, so okay, yeah. So species - which one is next, species of cultural concern?

BD007: Sure, yeah. Species of cultural importance are affected by climate change, increased temperature, derelict fishing gear, increased storm frequency, and noise pollution. Yeah. And probably microplastics, too, I guess. And everything… so I guess microplastics would be low. Climate change is increased, temperatures and storm frequency should all be high, and maybe noise pollution would be medium. Did that do it?

Interviewer 1: And then, what about in the opposite way, do these species of cultural importance impact…

BD007: No, I don't think so.

Interviewer 1: Okay, so species of commercial or recreational interest, what are those? What impacts those?

BD007: I would say everything there. The climate ones, like climate, increase temperature and increased storm, high noise pollution. And for micro plastics and invasives, I would do low. For derelict fishing gear I would do medium. Yeah.

Interviewer 1: And [Interviewer 2] there, as we go like we can fill these in, since I know it's getting crazy with the recording. And it's a lot okay. Great.

BD007: And I don't think there’s any reverse ones there. And then key food web supporting species… climate, temperature, and storm. Those can all be high. Micro plastics and derelict fishing gear is low. And I don't think there's a reverse relationship.

Interviewer 1: Okay. And then I think our last one is the keystone species section. I think it's probably the same. So, climate, temperature, and storms are all high. Derelict fishing gear, medium. And invasive species, low.

Interviewer 1: Great! So, I wanna move to management next, if possible, the yellow. So, what role are these different management approaches playing in the system? So I guess to start, maybe, how are they impacting these components of diversity that we've been talking about?

BD007: So area based management, which I combine with MPAs and no take areas, you know, in a similar vein both of those have a positive impact on diversity. Increased resistance and resilience in the system too, and that'd be that just, I guess, pretty much all the measures there.

Interviewer 1: And would - are those all high, or do they have different relative impacts?

Bd007: Yeah. All the same, and I guess all high. And yeah, in my head, I think of ecosystem based management management, and no take are… I guess that's a specific type. But both, if we wanna keep those separate, then I would. It would be the same for MPA slash no take areas.

Interviewer 1: Yeah, I think we could probably take out MPAs, [Interviewer 2], if they’re, you know, if you think of them nested together. Okay, great. Does area-based management impact anything else in our system? Like anything else, being, for example, another…

BD007: Like, I think all of our - we have the biodiversity thing, but then we kind of split it out into one of those groups of biodiversity into species diversity, right? So they - it would have right relationships to all, all of those things. Right. And it would be positive to all of them, except for harmful organisms.

Interviewer 1: And do you think that it has a positive effect on all of those equally or their relative impacts?

BD007: It has the most significant impact on species of commercial and recreational interest. It's most direct there. And I guess species of conservation concern… so there maybe those two are high, and then the rest of the medium.

Interviewer 1: Okay. I know it's 3: 28, and I wanna be, you know, cognizant of your time. And of course we appreciate your time. Is - do you have time for like, 15 more minutes to finish this up quickly, or… are you okay?

BD007: Yeah, I think if we get - I think if we can do it kinda quickly, I think I can. I can probably do about 10 min.

Interviewer 1: Okay, okay, great, thank you. We appreciate it. Okay, so then, is anything in this system impacting area based management?

BD007: No.

Interviewer 1: Okay, and so then, what about our other 2 types of management? Our other considerations for management. The oil gas exploration and the EDNA research.

BD007: Oil and gas exploration impacts harmful organisms. And therefore it also affects biodiversity. It increases basic species, decreases biodiversity, so… and gas exploration leads to more harmful organisms. So I guess that's a positive relationship in that sense, and oil and gas exploration. Right. It's a negative to the diversity measures. In terms of high, medium, or low… I'd say low overall, I'd say low for biodiversity. I'd say high for invasive species.

Interviewer 1: And then, what about Edna research?

BD007: I don't think of that as, like, a management tool. It’s not necessarily - it’s just a science thing. Yeah, I don't know if that belongs with this. Like, in terms of what we need, the tools we have available to us to the sanctuary are like place based management and area based management and reducing oil and gas… what else do we have available to us? I know bottom disturbance, no benthic disturbance, I guess, would be the other one if we wanted a third. But those other 2 are probably 2 biggest ones. The oil and gas is really the reason why they have sanctuaries on the West coast. And then place based management is our primary tool, like implementation, no take protected areas, or you can do this activity here, but not here. Okay, yeah, so we can go ahead and take the EDNA out. Then that sounds good.

Interviewer 1: Okay, great. Okay. So then I wanna quickly just go over it back to our diversity components. I know we've talked a bit about how things are connected. But other than, you know, our orange components of the specific types of species, are any are stressors or stakeholders or any of these other system components impacting broader diversity?

BD007: Yeah, we have… oh, I guess we didn't do all of them. Sorry. Yeah. So all of those things, like noise pollution, probably I would anticipate that all of the stressors there negatively impact biodiversity. And the climate ones would be the high noise solution, microplastics would be low, and then the derelict fishing gear and invasive species could be medium.

Interviewer 1: And would those impacts be the same for all of those different types of diversity that we have listed out?

BD007: Yeah, yeah, yeah, I think, so.

Interviewer 1: Okay, great. Okay. So then, I think our last thing is… maybe we can knock out the stakeholders and the services together. Since you know, I think they're the intersect. So, how are these system components of diversity and stressors and management that we've been talking about - Is the relationship between those components directly to the stakeholders or services?

BD007: Is there a relationship between… sorry?

Interviewer 1: Stressors and the services and the stakeholders. Yeah, so these stakeholders up in the right in the green, what in the system that we’ve been talking about for any of the others, are impactful stakeholders.

BD007: Right. So I'd say… you know, those top 6 stressors, invasives species, and storms and so forth, are all affecting biodiversity and the ecosystem. And so they’re affecting the fishing industry for sure. The research and science is getting done. And the scientists that are documenting that, they have to change their techniques to document it. And they're affecting the educators. And those are all groups - those are all groups within the Sanctuary Advisory Council, so sort of a broader term that captures all, all that.

Interviewer 1: So I had, yeah, however, we wanna do that. Okay, yeah, we can… it's all grouped under the umbrella. And if they're all gonna have the same impacts, we can go ahead and clean it up after and take this out.

BD007: Yeah, so the Central Advisory Council consists of each one of those groups with the exception of the shipping vessels, it consists of the military, tribal, commercial fishing, recreational fishing, etc. Education and research I think we had there. So all that's part of that.

Interviewer 1: Okay. Great.

BD007: Yeah, so all those would be largely, negatively affecting the majority of stakeholders on the Advisory Council. For educators to get the word out, the researchers have to change their approach. The commercial and recreational fishing communities catches are dependent on these things. The - the joy of the recreational community, of going out and seeing all the biodiversity is… they're sad.

Interviewer 1: Yeah, okay.

BD007: Yeah, sad. And yeah, so I, yeah, I'd say, all that's negative. And in the same way I would do all the climate ones. Storms, temperature, and climate change are highly negative. I'm kinda… and maybe derelict fishing gear is negative. We didn't do fishing as its own thing, I guess, but yeah, we can take fishing out of that system. Well, I mean, it's a service. So it's slightly different. But if there's redundancy we can remove it.

Interviewer 1: Yeah. Oh, I see. I see. I see, cause it's an inconsistent services.

BD007: Yeah.: No, it's - that's fine. Okay. Yeah, and I, I think, Sarah, you are incredibly good at this. I'm trying to keep up with that. That was amazing. If this is really how my brain works, I'm so scared. There is a lot - a lot of links. And the relationships would be, I think, the same there for commercial, recreational fishing, as it would be for recreation and tribal. Okay. So then I… I guess what you are alluding to there, for me, in my head… the way I have it is there was a lot of overlap between our stakeholders and our in the services. So that was kind of… there's the recreational user group, and they're benefiting from recreational opportunities. Right. So it's kind of like - I was overlapping those in my head.

Interviewer 1: Right. Okay, okay. So it would be… okay. So we can fill it after if it's, it's basically all the relationships that you're describing are the same for tribal and water recreation as well for fishing.

BD007: Yeah, yeah, yeah, I think so.

Interviewer 1: Okay, okay. So then, I think the last thing really is… you were starting to allude to the fact that these services and stakeholders were getting hurt from the diversity. So are there direct relationships that we should draw between the diversity concepts in white and the specific types of species diversity in orange to the services and the stakeholders.

BD007: So drawing a link between diversity and services, yeah? Okay, I got you. Yeah, I think, you know, just in general, again, I know I've treated all those diversity indices the same, you know, they’re similar for me. You know, I think there's a positive relationship between biodiversity and the services, and therefore the stakeholders. So arrows going from the… yeah, exactly. And I would say high in every case.

Interviewer 1: So it sounds like, based on what you've just said, if I'm interpreting correctly. So the diversity components are positively yeah, exactly what [Interviewer 2] did. The diversity components are impacting the services and services benefit and stakeholders. That's the loop that we're talking about.

BD007: Yeah, yeah.

Interviewer 1: Yeah, okay, so I think you said you talked about the general diversity components. Are there any of the specific species diversity components that are impacting the services in different ways?

BD007: No for me. I love them all. Yeah, yeah, I wouldn't.

Interviewer 1: Okay, okay. So the - you know, the benefits of diversity to the services are captured from the white to the blue, is what you're saying.

BD007: Yeah.

Interviewer 1: So we don't need to draw anything. Okay, I think… is there anything that I missed that's critical, [Interviewer 2], before we let [BD007] go? Okay. I think that's everything. Do you think that the white concepts are too redundant, [BD007]?

BD007: Yeah, because all of the relationships are the same for them. Or do you wanna leave? Yeah. Yeah. Now, seeing kinda how this all played out, I think they could be collapsed. Yeah. It's like a biodiversity concept.

Interviewer 1: Okay. Okay. Great. Well, we'll fix that. We'll clean that up. Thank you so so so much for your time. I apologize that we went over an hour, but we really appreciate it. This is really really useful for our project. Thank you again.

BD007: No problem. Good luck you guys, this, this is really, really cool.