Part 1

**Interviewer**: Okay great. So, like I said, the overarching goal of the project is to understand the role of biodiversity in marine resource management and so like I was telling you on the walk here, we’ve been hearing that–or we’ve been learning that people define and think about biodiversity in different ways and you can measure it in different ways, and so to start, I’m wondering what you think about when you think about biodiversity and what you see as the key aspects of biodiversity.

**BD043**: Okay, okay. Well, I’ll caveat first by saying like from an engineering perspective, at this point we basically say biodiversity is a co-benefit of living shorelines and then say, like, hooray, but I think if we dove in a little bit more, I think you think about, you know, the diversity of plants that you could find at a site and diversity of animals and I guess that’s pretty much everything, yeah.

**Interviewer**: Okay, so maybe I’ll add co-benefits of living shorelines as a concept along with biodiversity?

**BD043**: Yeah, yeah, cause that’s–I mean I would say that’s really how we mostly refer to it and in my plug for mangroves, I’m like mangroves are also great for baby fish and they’re also great for turtles and they’re also great for crocodiles, you know, like all these and then that’s kind of where we’re like now let’s talk about engineering.

**Interviewer**: Okay cool. Yeah and as we continue to go, like, we want this model to be focused on your area of expertise, so if there are some engineering components that maybe I don't directly ask about but you think are important in a system, we can add those in as well just to kind of capture your systems perspective.

**BD043**: Okay, okay, and I will say too, that’s something that the engineering community has been trying to move away from too is like biodiversity is not a co-benefit, it’s like engineering, biodiversity, water quality and environmental benefits, carbon storage, like they’re all the same importance, you know. It’s not like this is the most important thing and everything else is nice to have but not necessary, it’s like they’re all… so we’re trying to move in that direction with mixed results.

**Interviewer**: Got you. Okay, so that’s why like co-benefits is so important right now on the engineering literature is what you’re saying?

**BD043**: Yeah, yeah, and I think that trying to elevate those co-benefits to like it’s not like ‘Oh and it’s nice that’, it’s like this is a key role and function of the system.

**Interviewer**: Right, okay. Cool, that makes sense. So, one of the things that we’ve been trying to do is build a framework like I was telling you for how to conceptualize biodiversity consistently, specifically for management, so we’ve made this species diversity framework and we have these four bins and I’m wondering if you agree that these are the key components of marine biodiversity and if not, what you would change or remove or how you would alter it. So, they are habitat forming species, species of conservation concern, key food web supporting species, and harmful organisms.

**BD043**: Okay, and harmful organisms would be like invasive species and stuff like that?

**Interviewer**: Yup.

**BD043**: Okay. Yes, what do you mean by habitat forming? So is that something that like, the mangroves form a habitat for baby fish?

**Interviewer**: Mhm. Exactly.

**BD043**: Okay and then food web supporting would be like there are little clams that like to dig at the beach but something eats those clams, presumably?

**Interviewer**: Mhm.

**BD043**: Okay. Cool. Okay, yeah, that makes–I agree.

**Interviewer**: Okay, cool. So I’ll add those to the… Sarah always–Sarah and I have this system down pat where when we do virtual interviews, she does the model building and I do the facilitation and note taking, so I’m like I’m never used to having to do the…

**BD043**: Well that’s the thing, anytime I am like facilitating a meeting and like it doesn't matter with how many people it’s like I cannot also do the note taking, it’s so much.

**Interviewer**: Yeah same. I’m with you, yeah. I don’t know if we’ve done any projects like this with you but there’s methods and approaches of building FCMs or mental models through interview transcriptions,and so for some of the ones that I wasn't able to have Sarah help me, I facilitated the interview and recorded and then transcribed in building the models which works well and they’re comparable methodologies but really time consuming to have to–transcriptions take so long to make and then like going through and…

**BD043**: And then I think it’s hard because like you want to give the same level of detail to everyone, like it’s easy when we’re talking like ‘Oh I didn’t mean that’, I feel like I would agonize over like ‘Oh Tori went off on a tangent, what was she trying to say’.

**Interviewer**: Absolutely, yeah. Okay, great. So then these will be our biodiversity components. And again, as you know with this stuff, feel free to add change or move as we go along what you see. Okay, so like I was saying before again, the core goal is to understand the role of biodiversity in marine resource management and so I’m wondering if you think there are management approaches that currently directly consider biodiversity and if so, what those are.

**BD043**: Okay. So I would say–and this isn’t like policy stuff this is just like approaches–so I would say probably as like a living shoreline I’ve seen a lot of push towards those in Maryland and several different shoreline archetypes, but I think all of those really highlight you know, if you’re installing a low-crested (?) oyster reef or if you’re installing even a \_\_\_, all of those are really good for bringing in food web species like turtles and encouraging kind of like the native, which I think is usually spartina or juncus, I forget what the other name of it is, but basically just encouraging those to grow instead of phragmites which usually takes over. And so yeah, living shorelines is kind of the big management strategy. And then I’ve heard a little bit too about… I think there are some programs with DNR where homeowners are encouraged to do kind of like their own little oyster farms. We had a project–a student did a project where basically it was like testing out like resident scale oyster farms, it’s like if I wanted to just toss an oyster basket off–I don’t know if it’s a real program from DCR or if I’m like sort of misunderstanding what I heard but…

**Interviewer**: That would be… I did email someone from DNR yesterday and I don’t think I’ve heard back yet but I will definitely ask about that when I chat with them cause that would be really interesting. Is that something you think we should add or not for now?

**BD043**: I would say we could lump it under the living shorelines and just kind of keep, yeah.

**Interviewer**: Okay, and I think–it sounds like it’s important to separate out living shorelines themselves as an approach and the co-benefits from living shorelines, is that true?

**BD043**: I agree, yeah. I think that’s something that like living shorelines could have these co-benefits but that’s not, yeah.

**Interviewer**: Right, yeah. Okay, perfect. And then, are there any policies–so approaches we could also add in any policies or mandates if you think there are any that are important.

**BD043**: Okay, so the one that I know of–and I know I’m like very uneducated in this field–but I think there is something in the state of Maryland that says if you want to put in a seawall, you have to prove that a living shoreline wouldn’t work to do the same thing.

**Interviewer**: Steven was talking about–he remembered hearing about this from you all when we visited back in…

**BD043**: Yeah, I think it’s like a living shorelines act or something.

**Interviewer**: Okay, I’ll call it that.

**BD043**: Okay. But basically it’s like–and from what I’ve heard, it’s really easy to get around it like if you want to put in a seawall but you have an existing seawall, you just have to say like ‘Oh yeah see I couldn’t do it because I have a seawall there already’ but at least it’s a step I think that Maryland was taking to say like ‘No we’re really trying to get people to think about living shorelines as an approach to shoreline erosion control.’

**Interviewer**: Okay, cool. Okay, perfect. So with–this is something that we’ve been talking about with these models cause we’ll put these accent but we want the concept to have directionality so if we were to increase that, would it impact others, so I’m wondering a living shoreline act like regulations or enforcement or…

**BD043**: Yeah, so I think if that was increased you would be positive on the… like more living shorelines. Fewer seawalls.

**Interviewer**: Okay, should we…we can add seawalls.

**BD043**: Yeah, bulkheads maybe, yeah. But I would say those are kind of the big competing…

**Interviewer**: And this would decrease those… okay great. Okay, and then are there any approaches or policies that you think are needed in the future to better manage for biodiversity?

**BD043**: Policies needed in the future…that’s a good question. I think some of it will come down to like, better guidelines for living shoreline implementation, so maybe like implementation guidelines both from I think a restoration and an engineering perspective. And then I think some other I guess issues that I’ve heard about are–and again with no experience whatsoever–but like the permitting hurdles and maybe just like other obstacles, like I was part of a group that–do you know St. Mary’s church downtown?

**Interviewer**: Yeah.

**BD043**: So they have their seawall that’s like if you’re going across the Eastport bridge… they’ve been trying for like four years to put a living shoreline in–cause that seawall was failing, like I had some capstone students out there, there’s like big sinkholes in it, and basically the historic preservation commission of Anapolis like shot it down time and time again because they were like no it takes away the sight line, like the linear aspect of the shoreline which is I guess so historic and I think finally, they’ve come to a compromise but now the funding expired so now they have to reapply for funding but I think they have a compromise where they’re trying to do like a living seawall with like kind of gabions or stuff that’s like a little bit–it’s a better medium and honestly the site itself is challenging cause there’s some depth issues for just a living shoreline approach. But I think there are some of the obstacles that you don't think about like oh like everything, everyone was fine with it and then the historic preservation society said no or like some other random thing.

**Interviewer**: I didn't think about that but I feel like those are some political dynamics that will be different here than from our Gulf of Mexico case study in Alabama because like the historical society and some of the like traditions I would say.

**BD043**: And even here like at the Naval Academy, I think there’s a lot of… there’s some talk of oh we should relocate things, like we don't have to relocate everything but some things, and then there’s other talks that are like no, like we’ve been here since 1845, we will stay here forever, and so there’s definitely I think a lot of conflict between like traditional, historic, preserving tradition and making adaptive changes.

**Interviewer**: Yup, yup, that makes sense. Okay. So… removing… okay, so we’ll put that in there, and so removing that would increase living shorelines right is what you were saying?

**BD043**: Yeah, I think so.

**Interviewer**: Okay. And then, so thinking of living shorelines as that’s kind of the focal point of this model, what ecosystem services–we started talking about co-benefits–but are there any other specific ecosystem services that are really important in this system that we should add in?

**BD043**: Okay, so the ones that–again and like usually this is like one sentence in all of my papers–but like ecosystem services that we highlight are habitat creation, carbon storage–I don’t know if that’s an ecosystem service or an environmental service–but carbon storage, and then like water quality improvements and like basically making, yeah, fish like it better.

**Interviewer**: Perfect. And are there any specific stakeholders that are affected by these dynamics here in the Chesapeake Bay that would be important to add?

**BD043**: Stakeholders, yeah. Definitely, so okay, so stakeholders that I would say are waterfront residents, businesses, etc. because you know with all the flooding I think that’s definitely… kind of that adaptation aspect is really crazy. Waterfront residents… I would say other stakeholders like the watermen cause I think one thing I’ve learned like here is there’s still a really robust community which I love, I think that’s really cool. I’m sure there are more stakeholders but I’ll leave it there for now.

**Interviewer**: Okay. Cool. Sounds good. And then the last thing I was gonna ask is are there any key stressors that we should add that are tied into these system dynamics? You just mentioned flooding so I went ahead and added that but are there any other key stressors that you think we should add?

**BD043**: In the Chesapeake I would say the big thing is like relative sea level risk slash climate change. That’s I think the biggest one in the Chesapeake Bay.

**Interviewer**: Okay, perfect. Okay, so I’m sure we’re going to run out of time cause it’s 2:15 but just to get started, so I’ve started adding some arrows as you can see based on what you were talking about. So as you know, we want to add in any relationships between two components, so if one component was to increase would it impact any of these other system components. So maybe we could start with living shorelines since we already have a bunch and that’s pretty central to this model, so I know you already mentioned, you know, living shorelines have a positive impact on habitat forming species and key food web supporting species, habitat creation, water quality improvement and carbon storage, are there any other components that an increase in living shorelines would a benefit, negative or positive?

**BD043**: I think–people might disagree with me–but I think it would be positive for waterfront residents and businesses because I think it’s helping with both adaptation as well as it’s prettier to look at it in my opinion, so I think it would be good. I think it would definitely be good for watermen for stakeholders cause I think habitat creation just means you’re gonna get more fish that are biting, more crabs that are biting. Good for species of conservation concern, good for plant and animal diversity. And I’m not going to say flooding even though some people say yes flooding, but I think the spatial scale of living shorelines just isn't enough like you need like kilometer scales of marsh where we don't have that.

**Interviewer**: Gotcha, okay. And what about the tie between living shorelines and co-benefits cause there might be some redundancy there but…

BD043: Yeah, I think living shorelines… good for the co-benefits that are associated.

**Interviewer**: Yeah, okay. Okay, so then maybe let’s go there. What would an increase in the co-benefits of living shorelines impact?

**BD043**: Yeah, I think it would be positive for kind of all the same things like diversity of plants and animals, habitat forming species, and then kind of the co-benefits that we sort of named or that I associated are like those ecosystem services, so that water quality, carbon storage.

**Interview**: Okay, and then same with the stakeholders?

**BD043**: Yeah, I think so.

**Interviewer**: Okay. So then let’s move to our biodiversity concepts, so what would an increase in the diversity of plants and animals impact in this model?

**BD043**: Okay, definitely I would say good for our stakeholders, both groups, I think good for water quality and habitat, probably good for both the habitat forming and the food web.

**Interviewer**: Okay, so then, let’s go to our biodiversity bins, so what does habitat forming species impact?

**BD043**: Okay, I think they would impact, in a good way, food web forming species, which would then impact–I guess so maybe from the food web I would go to the watermen, waterfront residents.

**Interviewer**: Yeah and however you–I usually preface this with– so I usually will just go around the concepts and add them but if it’s easier for you just to look at it holistically and say like this impacts this and this impacts this we can also do it that way. Whatever makes most sense to you just visually.

**BD043**: That makes sense, yeah, no, and that’s I feel the same I feel like normally I would go around but I think it’s the habitat forming species that I think is going to have an impact like here–I think I’m missing stakeholders too like tourists, I think that’s probably a big thing for Anapolis cause we rely a lot on tourists. And probably all the same benefits.

**Interviewer**: Okay, I can go in and add those afterwards too since it’s faster.

**BD043**: Okay, okay, that sounds good.

**Interviewer**: So you’re saying everything that was positive for waterfront and watermen all add to tourists after?

**BD043**: I would say yes. People can disagree with me but I would say…

**Interviewer**: This is your perception, yeah.

**BD043**: And yeah, food web supporting species I think probably also go towards like water quality and habitat and same with habitat forming species, I guess especially habitat creating and habitat forming species. And then also I think both of those would be good for species of conservation concern.

**Interviewer**: Okay, great.

**BD043**: Okay, so then in terms of species of conservation concern, I don’t know if I really see any arrows going from them to like water quality, I mean I think there’s some maybe overlap here but I would keep them kind of in their own little section, like they’re what’s being impacted.

**Interviewer**: That makes sense. Okay.

**BD043**: And then similarly that’s why I don't have anything going to harmful organisms cause like maybe some of these habitat forming species would be good for harmful organisms but I’m thinking of them more as like a stressor so like they’re kind of like something that’s like impacting how living shorelines do because they’re like an outside agent. So I would do red lines from harmful organisms to all of kind of like the native habitat forming species, food web supporting species, living shorelines here in Maryland. They might actually be okay for water quality cause–and this is bad–cause like from an engineering perspective like they also provide wave attenuation and shoreline \_\_?\_\_ so it’s like on one hand as an engineer it’s very tempting to say like oh it’s fine but then like you kind of then have to be like well no you need to think about ecology too and then that’s where we are as engineers we’re like in that very infant step.

**Interviewer**: Yup, yup, okay. Yeah, there were some really interesting conversations around that at our Gulf workshop that I think will come up again at our Chesapeake workshop.

**BD043**: Okay, okay. Interesting.

**Interviewer**: Like how do we define invasive species and when do we value it vs. when do we want to mitigate it or remove its effects.

**BD043**: Yeah and it’s a challenge too because even like going back to kind of the mangrove discussion, I know some people… we were in Jacksonville doing something and like oh yeah mangroves are settled here a couple years ago and people aren't sure what to think and it’s like on one hand they’re invasive but on the other hand, now that’s where their climate is so they’re like climate marching, it’s just really a definitely challenging question.

**Interviewer**: Yeah, absolutely. Okay so then what about these ecosystem services, these guys, what do they impact?

**BD043**: Okay, so water quality, habitat creation, carbon storage… all good I think for–positive impact on climate change in that it’s making the effects of climate change less.

**Interview**: Okay, yup. All three of them?

BD043: Yeah. So it like reduces climate change. It probably doesn't do anything to sea level rise–it’s hard cause I feel like it’s positive but it’s…

**Interviewer**: I’ll make it negative cause we’re saying if we increase these services then we’re decreasing sea level rise and climate change, right?

**BD043**: Yes, but now that I’ve said this can we break sea level rise and climate change in two different things. I think it’s decreasing climate change but sea level rise I think right now is on it’s way. Maybe in the very long term it could also reduce sea level rise but we gotta…

**Interviewer**: Okay, so this decreasing but nothing to sea level rise is what we’re saying right?

**BD043**: Yeah, exactly.

**Interviewer**: Okay, and so all of these to decrease?

**BD043**: I think maybe just carbon storage.

**Interviewer**: Okay.

**BD043**: I think it’s like a feedback loop between these and then the species and the diversity of plants and animals, so like it’d kind of go like double arrows maybe. Are you allowed to do that?

**Interviewer**: Oh, yeah. So then, okay this goes here is what you're saying?

**BD043**: Yeah, because if you have better water quality you’ll get more of these animals coming and plants.

**Interviewer**: Okay, yeah so I can add those all in later since there’s so many but so you’re saying all three–just to make sure I have it right–all three of these would be positive for these guys and these guys?

**BD043**: Yeah, positive for diversity of plants and animals, habitat forming species, food web supporting species, and conversation concern species.

**Interviewer**: Perfect, okay.

**BD043**: Maybe also good for harmful organisms still because again it’s just creating more conducive conditions.

**Interviewer**: Yup, yup, yup, okay. I'll make a note of that for later.

**BD043**: Okay. Flooding… I would say has negative impacts on living… can have neg–no I won’t say flooding cause flooding I think is fine, I think sea level rise can have negative impacts on living shorelines if they can't keep up or if its… but flooding I would say is not a main driver of living shorelines failing. But that can maybe have an impact on species…

**Interviewer**: On these guys?

**BD043**: Yeah.

**Interviewer**: Okay.

**BD043**: Certain species.

**Interviewer**: would it be negative for all three of these do you think?

**BD043**: I think so, I think I guess a tough thing is like, flooding can be like disastrous for… oh wait sorry are we talking about flooding or

**Interviewer**: Oh wait sorry we’re talking about flooding not sea level rise.

**BD043**: No sorry it’s cause I’ve been talking about both but yeah.

**Interviewer**: Okay, flooding is negative for this is what you’re saying?

**BD043**: I think so… it’s I guess this is where maybe you would break out a little bit maybe the habitat forming species because you have species like nesting shorebirds that like, if the flood wipes out their nest, then you don't have the next generation of the like a salt water sparrow or something like that. But if flooding increases, maybe you do increase your inner (?) tidal zones so then you do have more space for like other things.

**Interviewer**: So normally what we would do in that–exactly how you described it, we would break that concept out into those specific species, but for sake of complexity and time, we won't do that, and that’s kind of the point of the individual interviews versus the workshop, so we’re building this higher level framework in individual interviews and then we’re using the workshop to talk about more context specific, local dynamics.

**BD043**: Like in these bins what’s going on.

**Interviewer**: Exactly and so we’ll bring in specific species during the workshop that fall within those bins to kind of break out those nuances.

**BD043**: Got it. Okay, okay. Got it.

**Interviewer**: So we can make–so I left it just as a question mark–so we can have an uncertain linkage, so we’ll do that.

**BD043**: Perfect. I was gonna say yeah if you have like a purple one. Good in some ways and bad in some ways. Okay cool.

**Interviewer**: So would that be just for habitat forming species or also for other species?

**BD043**: I think also for food web supporting species, species of conservation concern, harmful organisms, I think for all of those, and then I guess kind of the catch all to that could be diversity of plants and animals.

**Interviewer**: Okay. And leave them all as uncertain or the gray?

**BD043**: Except for maybe diversity of plants and animals cause I think if you had an increase in flooding, you are limiting the diversity of plants and animals because only the plants that can handle the flooding are gonna stay.

**Interviewer**: Yup, okay. Okay, perfect, okay, so I’ll decrease that like that, okay. Cool.

**BD043**: And I think sea level rise is gonna be similar with uncertain connections to habitat forming, food web supporting, conservation concern, and harmful organisms but similar reduct– bad for diversity of plants and animals.

**Interviewer**: Okay, I’m gonna add in those question marks after with the transcription.

**BD043**: Okay, and then I would say sea level rise also though is down on habitat creation and not good for the stakeholders, especially the waterfront businesses, and tourists too… maybe increase in tourists for a while but then sharp plummet in tourists, like oh let’s \_\_?\_\_\_ or maybe that’s just me who like…

**Interviewer**: So then anything else for the–I know that we’re about out of time–anything else for the stressors that we want to add, the climate change negative impacts?

**BD043**: I think climate change would make sea levels rise worse, so like higher climate change impacts, and flooding too, so increase in both of those, negative impacts on habitat–Hey Martin, give me two minutes, I’m so sorry, thank you so much.

**Interviewer**: Sorry, what was the last thing you said?

**BD043**: Negative on habitat and kind of I would put it on all the species too.

**Interviewer**: As negative, okay. I’ll add this in after too. Okay, so then, okay, so the only things we didn't get to were stakeholders and management. If you have another time to just finish that up quickly that would be great but no worries if not too.

**BD043**: Yeah, okay. Do you want to… I’m around like most of tomorrow and we could even just finish on like a Zoom if that works or you’re welcome to come here or I could meet you somewhere, I’m happy to get coffee…

Part 2

**Interviewer**: I almost forget every time and I’m like no this is so important.

**BD043**: Well at least you remember now and not like at the end.

**Interviewer**: Yup, yup, okay anyway so bulkheads, yeah.

**BD043**: Increase in bulkheads I think would be decreasing the living shorelines so red towards living shorelines and the co-benefits, because you don't have them. I think also red for all of the species bins and diversity. I try not to sound like a miser in my coastal engineering class but I’m pretty much like if I teach you one thing it’s that bulkheads are not good for the environment, sometimes they’re necessary but… they don't do much for your sediment and all that stuff so. Cool, okay, then red for habitat creation. I mean they probably contribute more carbon than they store but I don’t know if they have a direct effect on carbon storage, maybe I guess they’re taking away from something that could store carbon so I would say red towards carbon storage and then also for water quality I guess just because by not doing anything, it’s taking up space.

**Interviewer**: we can also like… sorry go ahead… I was just gonna say sometimes I find it helpful, there’s this feature where we can like look at all the relationships, so you can see like what we’ve done and what we haven’t done if that’s helpful.

**BD043**: Okay, cool. I would say… I wouldn’t draw a line from bulkheads to sea level rise but I would draw a maybe a red line from sea level rise to bulkheads because I think as sea levels rise basically the bulkheads are failing and so we need to raise the height of sea walls or we need to just improve, yeah.

**Interviewer**: Okay, so that would be a negative?

**BD043**: Yeah. And then going back to from bulkheads on the individual stakeholders, I would say probably actually blue lines to tourists and businesses, I think a lot of businesses want a bulkhead and you know it’s definitely a…so you can get to the water. Maybe a green line for watermen though because you’re taking away these habitats and then if you’re trying to get crabs then you’re not gonna be able to have much luck.

**Interviewer**: Okay, sorry negative?

**BD043**: I feel like I’m missing a ton of stakeholder groups too though but rather than try to add them just rely on other people for them.

**Interviewer**: Yeah, definitely, that’s why we have a sample, so I think whatever the core stakeholders are from your perspective of what came to mind first is helpful.

**BD043**: Okay, okay. But yeah, I would say definitely tourism businesses are probably more pro-bulkhead cause it’s your access, it’s not mucky like a marsh or whatever, despite all the good things.

**Interviewer**: Okay, cool. So then the living shorelines act, so how does that impact the other components, and we can think of it as like the regulations or like the impact of the living shorelines act, like the more that we implement those regulations under that framework, how does that impact the system?

**BD043**: Okay, sorry that was… Vivian turned off the video. So the living shorelines act I think basically it’s going to serve to add more living shorelines.

**Interviewer**: Ope we already have that, okay yeah.

**BD043**: And decrease bulkheads, like I would say those are the two main ones but then kind of going from more living shorelines would be all of the same–Oh no! Are you still there?

**Interviewer**: Oh yeah I see you.

**BD043**: Oh good, okay. Sorry.

**Interviewer**: She’s like we’re done with this meeting, mom.

**BD043**: But, so I would say all the things living shorelines have I would do the same for the living shorelines act because if you have more living shorelines than you have more co-benefits, carbon storage, water quality. I don't know though how that I guess is best done in the mental modeler, I would say short term the living shorelines act affects how many living shorelines we have.

**Interviewer**: Okay. It sounds, if I’m interpreting correctly, so it sounds like living shorelines indirectly has a positive effect on our biodiversity but that’s because it creates more living shorelines and so we want the linkages to be direct relationships, so if I’m understanding what you’re saying it’s like living shorelines act increases living shorelines and then living shorelines themselves are what positively benefits biodiversity.

**BD043**: Yes, exactly, exactly. So, the living shorelines act itself I don’t think is doing anything directly to increase biodiversity.

**Interviewer**: Okay yeah okay perfect. That’s what I thought.

**BD043**: Got it, okay. That’s super helpful.

**Interviewer**: Sorry, I have my puppy with me, where’s Scout? Scout, come here.

**BD043**: Aw, hey Scout! Hey buddy!

**Interviewer**: And she’s eating a poisonous plant behind us. Can you not? Can you lay down please? Can you lay down? Oh my god it’s just…

**BD043**: I feel like dogs are a lot like toddlers, just get into things…

**Interviewer**: My sister has a–I have a nephew, he’s ten now–but when I first got Scout, I got her at nine weeks old, so I would say like oh this really feels like having a kid and my sister was like don't say that, it’s not true. I was like alright oh well.

**BD043**: I don't know I totally see it and like I feel like to kind of interest them I give her little treats or like shake something in front of her face like ohhh…

**Interviewer**: This is why I like to go into the office. Okay, sorry. So I think that’s for living shorelines act so maybe removing permitting hurdles and obstacles would go there.

**BD043**: I would say then that that would have a positive effect on living shorelines.

**Interviewer**: Okay, oh we have that, okay.

**BD043**: And then, but probably a negative effect on bulkheads because the way I’m thinking about that, permitting hurdles, is that right now I think the permit for a bulkhead is like known, I think the permitting for living shorelines is really challenging from what I understand which is extremely little, so I would say making it easier to permit living shorelines would make people do more living shorelines than bulkheads.

**Interviewer**: Yup, okay. That makes sense. Does that impact anything else?

**BD043**: I think indirectly but no, I think… well actually I would say it impacts positively maybe like businesses and watermen and tourists, because if like people want to make those changes to their shorelines, it’d give them the mechanism to do that.

**Interviewer**: Okay, so this could be positive for waterfront residents and businesses–sorry did you say it was positive for any of the other stakeholder groups or was it just the residents?

**BD043**: I would say probably just the residents because I feel like they’re the ones who are gonna be like needing to do the permitting, maybe watermen but I would lump that more with the businesses so. Oh, she’s bringing me trash, so.

**Interviewer**: Gosh, okay, so better living shoreline implementation guidelines. How does that impact the system?  
  
**BD043**: I think similarly that will remove permitting obstacles so I’m not sure what color that line should be but there will be fewer obstacles, so more obstacles will be removed.

**Interviewer**: Okay, so if we have better shorelines, we’re increasing shoreline implementation guidelines, then we’re… I think it’s positive cause then it’s a double negative right cause we have it as removing obstacles.

**BD043**: Yeah, I think it’s blue too. And I think more implementation guidelines would be positive for living shorelines because I think people would be more willing to implement them. And maybe I think similarly I would do it positive to residents and negative to bulkheads.

**Interviewer**: Okay cool. Anything else for the orange management…?  
  
**BD043**: One more, sorry, I think I would do implementation guidelines I would do positive to co-benefits as well cause ideally those guidelines would also give you some information about what co-benefits to expect and how to maximize those co-benefits.

**Interviewer**: Okay, cool. So then our stakeholder groups, so how would increasing tourists in the area impact the system?

**BD043**: I would say tourists probably I would do a blue line to bulkheads and maybe a red line to living shorelines. I’m probably not being so fair cause I think there is some ecotourism and marsh walks and stuff but I think in general like I’m thinking of city dock and I think just right now it’s not like… the normal is like more \_\_?\_\_\_ at this moment.

**Interviewer**: Yup, okay, cool. Anything else for tourists?

**BD043**: I would say probably just those two.

**Interviewer**: Okay, and then what about waterfront residents and businesses?

**BD043**: Can you hold on?

**Interviewer**: Yeah, please, take your time.

**BD043**: Thanks. She found her way to the stairs, which is like usually I’m okay if she’s crawling up and down which is for better or worse but she was like standing and then like rocking back and forth and I was like you’re gonna fall. So anyway, so sorry about that, so we were talking about waterfront residents?

**Interviewer**: Yeah, yeah, yeah, yeah, yeah.

**BD043**: Okay. I would, oh man, can I do a question mark line to both, I think maybe a blue line to bulkheads but a question mark to living shorelines I think, cause I think the normal is to just put in a bulkhead oh great now my–put out a pier for my boat and all the things but I think there’s maybe some more appetite for living shorelines depending, so a question mark.

**Interviewer**: Okay, cool. And then what about watermen?

**BD043**: watermen… maybe blue to living shorelines. I don’t know if they would necessarily take away the bulkheads so I maybe wouldn’t connect it there but I would say if there’s more watermen, maybe they would be advocating more for living shorelines.

**Interviewer**: Okay, cool. Okay great. Anything else that you think… I think that that was those were the only ones that we didn’t get to do last time.

**BD043**: Yeah, I think this is pretty much all for me. Like I said, I think if I were to sleep on this and think about it I could probably name like a handful more stakeholders but they would have I think similar arrows, so I would say just rely on the real experts for those.

**Interviewer**: Yeah, okay, cool. The only other thing I was gonna ask, so if we have time sometimes we add weights to these relationships. I don't know if you remember that from some of our other work. So we can categorize relationships based on the relative impact that that relationship has on the system so it’s basically a way of just like showing if some relationships are driving system dynamics, we can quantify that categorically, so we can give relationships a low, medium, or high impact. Obviously we have so many relationships so that would be really time consuming and hard to do but like there was one example that you gave when I was doing the transcript that I think you said sea level rise had a really strong negative impact on tourists maybe and waterfront residents but less so on watermen, so like that would be an example of how we would like probably give a high impact to tourists and residents but then a lower medium impact on watermen if that makes sense. So it’s totally okay if you can't answer this question cause there’s so many arrows but I was just wondering if there are any other relationships like that that you think are like really important to driving system dynamics that we want to emphasize.

**BD043**: Yeah, so I would say definitely… I think sea level rise just in general is kind of driving a lot of these system dynamics, so like I would say high negative impact on bulkheads, or at least bulkheads at their current elevation, and then… oh it's a good question, I would say maybe also living shorelines would have kind of the biggest I would say is like habitat creation. I would emphasize that one and emphasize kind of like those maybe even three species which is habitat forming, key food web supporting, and species of conservation concern. My personal opinion is I think that living shorelines, at least the scale, is that they do better for making habitat and they do some carbon storage but they’re sort of a small footprint still so it’s not like it’s these acres of marsh grass. I think those are the ones I would call out.

**Interviewer**: Okay, cool. Okay, perfect, that’s really helpful, that’ll be good to have in the notes. Okay, awesome, so that was it for the modeling, the only other thing I was gonna ask you if you had just a few minutes was if you had recommendations for other people to talk to that would be willing to do an interview and then maybe come to the workshop in April.

**BD043**: Yeah, oo, gosh, and let me rattle a couple off and then can I like send you an email with like a few other names?

**Interviewer**: For sure, yeah that’d be great.

**BD043**: So one person who is awesome and who's been working in this for awhile, his first name is Al and his last name is… give me a second… Albert McCullough. He’s an engineer, he works on the eastern shore but he’s done a lot of like these beneficial use of dredge material project, and so I think he would have some really good insight on the project planning and co-benefits. Another person who's kind of on a related project his name is David Kurson, he’s with the Audubon Society. And then I would say some folks from DNR who would be good to connect to would be Wes Gould, Wesley G-O-U-L-D, and I would be very happy to send you e-introductions too if that’s useful. And they might point you… I’ll start with Wes and he can point you to other people at DNR but there’s probably a handful of folks that would be good there. Oh and sorry one more person, I would say… give me just a second…Underwood…ah shoot I’m gonna forget his name but I think his name is Keith, let me do one more. Ah, it’s Chris Becraft, his last name is B-E-C-R-A-F-T. He does this design build of living shorelines with this group called Underwood Associates and they do it’s like them and one other group that does all the living shorelines around here so like they would probably have some pretty interesting insights.

**Interviewer**: That’s really cool. Yeah, if you have time and don't mind sending evites but also like I know, I’m sure your inbox is crazy so I’m happy to just send them myself just even having the name is really helpful.

**BD043**: Okay, okay, cool. You know what if you want to do that–and I would say all of them are probably pretty responsive but if you reach out to them and you don’t hear back, I would be happy to maybe then connect you.

**Interviewer**: Okay, cool. Do you mind if I just tell them that you recommended that I reach out to them just to use your name?

**BD043**: Yeah, absolutely, feel free to do that. Yeah, tell them that sorry we haven’t talked in a little while, don't tell them I mentioned them but yeah no they’re all great, so yeah. Highly recommended.

**Interviewer**: Okay, that’s awesome, thank you. Yeah, I was like… do you work with any waterfront homeowners for your work right now that you could think of that would be interested in coming to the workshop?

**BD043**: Oh good question. Waterfront homeowners…the only folks that I can think of and they’re not a waterfront homeowner so I guess the answer is no, but I have worked a little bit with some folks at St. Mary’s at the church on their living shoreline and so I don't know if it makes sense to connect you with the person who’s trying to make that project happen or like I think, I don't really remember, but I think the priests that live there are technically the waterfront homeowners cause I don't know how that all works, so I could connect you with them but they might be more of a special case, but maybe I could connect you with… her name is Pat Sullivan and she is a gem of a human. She works with NOAA but she’s the one who’s been kind of… she’s probably the best contact I think for that.

**Interviewer**: Okay. Is she a NOAA employee or she’s just like working with NOAA to get the living shoreline at St. Mary’s?  
  
**BD043**: I think she either is or was a NOAA employee or affiliate and I don't know what any of those distinctions mean but like I’m not sure, she might be retired, like her name has NOAA after it so like I think she has at least worked for them in the past or is working for them or something like that.

**Interview**: Okay, cool. Yeah, I’m interviewing someone from NOAA Chesapeake Bay office who I think he’s like the director of the habitat division so I wonder if maybe she is or was under him, so that might be redundant with him if he can come to the workshop but maybe I’ll just keep that in the back of my head if he can’t come to the workshop. Okay, cool. Yeah and then the other thing I wanted to ask you is do you know working at the Naval Academy like what the… like is there someone from the military side that would be interesting to get their perspective or like do you have any inside knowledge on like the military’s standpoint on some of these issues?

**BD043**: Yeah, so it’s actually been kind of cool because since my time here I’ve seen kind of a general shift in yes we’re still gonna be implementing bulkheads in a lot of places but there is more like oh we can do this climate thing and like we can make some better management decisions, so the person that comes immediately to mind is Sarah Phillips. She’s the university architect and she’s co chair of this group called the sea level rise advisory council and she’s been kind of leading us, like I’m part of the committee but I’m mostly just a supporting like… I sit quietly and take notes member. So she’s probably the one I would recommend. She has the ears of like a lot of these actual decision processes.

**Interviewer**: Gotcha, okay, that’d be very cool. Okay, maybe I’ll reach out to her. Okay cool. Well I think those were all my questions, all the things I wanted to ask you. Thank you so much again for taking the time to meet twice. Like I said last time if you can come to the workshop in April, we would love to have you. I can send you the formal workshop invitation invite if you like…

**BD043**: I would be really interested to go and my guess is that–I think it’s a Monday Tuesday right?

**Interviewer**: I think it was a … I think it was a Wednesday Thursday.

**BD043**: I think you mentioned the dates and I checked them. I probably could do something where I teach and then go for a half day and then maybe go for the second day. So definitely if you don't mind sending the dates and if it’s okay for me to come, I would be really interested to join.

**Interviewer**: Okay cool. Yeah, we would love to have you. It’d be great.

**BD043**: Yeah, thank you it would be nice.

**Interviewer**: Well, yeah that was all I had.