Interviewer: Okay great. So to start I know a bit about what you do but would you mind just briefly describing for me a little bit of your area of expertise and your work responsibilities?

BD021: Okay I'll start with my work responsibilities. I’m the Chief of Fisheries Management here at VMRC which means I am ultimately responsible for all the management of all the marine estuarine and anadromous species in the state, commercial and recreational. That means that I am a representative of the Atlantic States Marine Fisheries Commission representing Virginia. I am also a representative of the Mid-Atlantic Council representing Virginia as well. So ASMFC, I don't know how much you know about ASMFC, is an overseas state order in the jurisdictions from Maine to Florida and the Mid-Atlantic Council is one of eight regional councils. Ours is North Carolina to New York and that's in federal order. So I do both of those. So basically I'm responsible for everything. So it's like a lot of times there might be a management action that comes through those organizations that require the states to you know adopt the regulation so my team, myself and my team here will go ahead modify those regulations to take before our board to get approved. We also do legislative actions as well - those things have to be taken on within the state - you know - that's kind of like yeah we do a little bit during the year but then it's really hot and heavy during the legislative session from January through March or April where if we have a bill up there we may have to be up in the capital on a regular basis. I oversee a number of monitoring programs, so you're probably familiar with MRIP - marine recreational information program. So we've got that here, you know, that's with my group. We also have an observer program that goes out primarily looking at gillnets and sturgeon, but also doing trip bycatch and any kind of experimental fishery we have, we try to get people on the boat to see what they're catching in relation to this new gear. We also have a biological sampling program that goes to all the ports and gets biological samples from the dealers. We take otoliths on those and we age them. We're required to collect a certain number of otoliths for the Atlantic States MARINE Fisheries Commission. As a result, we have an aging lab that I oversee as well. We also have mandatory reporting, which every state has, and we have to, you know, we're required to do that by federal code and through ACCSP, and there's certain criteria in how that data is collected and how we store it and how we provide it. So we've got a group of folks doing that as well. So I think - what else do we do on a regular basis? I mean, a lot of different things. You know, we don't do as much research here. We have a couple of surveys that we do. Research in the state of Virginia - it's a lot different than other states - where states that have a Department of Natural Resources, a lot of the monitoring surveys are also done within that agency. Here in Virginia, a lot of those surveys - we fund VIMS to do a lot of that work for us. So the VIMS-ChesMMAP, or the VIMS-Striped Bass Juvenile Survey, the VECOS project they do, the VASMAP project they do, those are projects in a lot of cases we either exclusively or provide you know at least some funding to keep those projects going and provide that information into stock assessments. So that's pretty much what we do in a nutshell. I did the same thing in Georgia for eight years. No, it's ten years. Ten years I was the chief of fisheries down there as well and my expertise is probably in crustacean ecology. That's what I would say - mostly crabs and shrimp. That's probably what I'm best trained in. I have some expertise in habitat as well. Fisheries habitat, I've done a lot of EFH consultations. I was chairman of the South Atlantic Council's Habitat and Environmental Protection AP for about 12 years. So I've done a lot of that as well. But you know I've dealt with a lot of different things. I mean it's like you know I worked with them for 14 years as a researcher, so running their trawl survey. So I know a lot about the different fisheries. But if I had to describe myself, it's probably more geared towards crustacean species.

Interviewer: Okay. Okay, great. So given the high level that you work at, you may not be able to answer this question, but I'm wondering what your current area of focus is or top concern. Is that too broad of a question?

BD021: Our top concern with us probably still remains menhaden. It's just a very controversial issue. I don't know how familiar you are with it. There's a lot of folks that feel that there's localized depletion. Menhaden are managed by the Atlantic States Marine Fisheries Commission. It's a coast wide stock. The stock assessment has come back recently and said the stock is fine. The ASMFC is also a precautionary approach. Years ago it said, "Look, we know the Bay is a nursery ground for menhaden, so we're going to put a Bay cap on that. We're going to set a cap on how much they're allowed to catch." And it's a lot. It's 51,000 metric tons. So it is a lot of fish, but it's been capped at that. And it's kind of an arbitrary number. It's kind of loosely based on a long-term average. In the last eight or ten years when a new stock assessment comes up and they either say that the coast wide harvest can increase or the coast wide harvest has to be decreased, that cap hasn't changed. It's remained the same since about 2017 now. But there's a lot of folks that feel there's localized depletion in the Bay of menhaden. So if there's less menhaden, there are less forage species, striped bass, cobia, red drum, everything - it's menhaden - and so it's been blamed for everything. There's not enough menhaden and therefore the striped bass populations are going down, blah blah blah. The recent stock assessment of striped bass has come out and said even if there was no menhaden fishing, striped bass will not recover unless there's additional management actions on striped bass. So it's, you know - and that's even you know even of an ecological reference assessment that they've done where they've basically taken into account when they're doing the stock assessment for many and they take into account striped bass as a predator on that and how much food the striped bass are going to need. So, it's the biggest issue because localized depletion in the Bay has not been proven. The studies that were done in the past said it probably isn't happening. It could happen on a temporary scale, but it wasn't really - the studies weren't definitive in saying, no, it's not happening. So a lot of the recreational groups are basically saying that, yes, all our problems are due to the menhaden fleet. We need to get them out of the Bay. So we've been dealing with that pretty heavily on a regular basis. So that's probably the biggest issue. The other issues are - along with that is - striped bass. Striped bass are tied with that. Striped bass has been - the 2018 stock assessment came out and said they are overfished and overfishing was occurring and they were both occurring for close to 10 years. So we're trying to rebuild that stock now. Unfortunately, we had a goal of rebuilding it within 10 years. We did end overfishing within about a year. We did that by taking an 18% reduction Coast wide in 2019. But last year, the recreational harvest almost doubled. And as a result - they had a 97% chance of meeting the goal of having the stock fully restored by 2029 - now it's down to 15%. So there's going to be more action on that. So those are two things that are kind of tied together. We're having some issues with blue crabs now a little bit as well so - but it's menhaden - is always, if you ask anybody here, what's the biggest headache. They're going to tell you, menhaden.

Interviewer: What, um, what has caused the recreational harvest of striped bass to double recently?

BD021: Part of it is probably - the biggest part of it is, is a very strong year class. The 2015 year class was a really, really very strong year class. And it just started coming into the fishery last year. And so the number - obviously there's more fish, there's more fish out there. People are catching them. The bag limit is only one per person, but they're probably fishing more often. There was more effort. So that's the primary goal. This year, that year class is gonna be completely within the slot limit. And so we took emergency action back in May to say, we're gonna cut the slot limit. I think it's in the ocean, it was 28 to 35 inches. They were gonna make it 28 to 31, which is a really small slot limit. But the idea behind that was to protect that year class so they have an opportunity to spawn. And so we're hoping it works. I mean, cause it's like, it was very alarming when we saw those numbers, it's like, the harvest doubled. The catch doubled in one year. And we were supposed to be in a precautionary era where we were supposed to be taking reductions and we saw this increase in like - and it's primarily because of that year class. And there hasn't been a strong year class like that coming through in the last five years.

Interviewer: Okay, gotcha. And so you said the thought that there's this localized depletion of menhaden in the Bay, but that has not been proven scientifically? Is that like..?

BD021: Yeah, it hasn't, I mean, there've been some studies done a while ago and they were somewhat inconclusive. They didn't, you know, the studies were like, well, we don't think it's occurring, but, and if it does, it's kind of short term. Now, the recreational angle is the same. Clearly, depletion is occurring because - and they throw out 100 reasons why. There's less osprey. There's less striped bass. There's less this. There's less that. But I often say there's never a smoking gun in fisheries. And to their point - are they a contributor? Probably. Yes, they're probably a contributor. But there's a lot of factors that could be going on. And we know that the striped bass harvest, especially - not much in our state, but Maryland, New Jersey, New York, and Massachusetts - were going through the roof. And so - and a big problem with striped bass is release mortality. The release mortality is about nine percent - nine percent of every fish that of all the fish they release, nine percent of them die. Now that's an average. If you get warming water temperatures like in Maryland in the summer - they have a summer fishery - if the water temperature is 85 degrees and the dissolved oxygen is 2.9 or 3.5, and you're catching this fish that's already stressed and you're releasing it, the mortality gets higher. When the water temperatures are higher, the release mortality from recreational fishing is gonna go up as well. So they call it the total removal. So total removal is a combination of what was harvested and what died as a result of released mortality. And the released mortalities were higher than the total harvest of the whole coast. And some states are as high as 30%.

Interviewer: Gotcha, okay. And so to make sure I'm understanding correctly, the striped bass anglers think that populations are depleted because of menhaden populations, but it's more likely because of increased effort and harvest.

BD021: It's depleted because, you know - it's taken years to get depleted. I mean, it wasn't overnight because it's a long-lived species. But yes, a lot of them are saying it's menhaden. It's the menhaden fleet. They'll make a reduction fleet catching all these menhaden. And that's the problem. There's no food for them, is what they're saying. But the stock assessment has clearly said that - the stock assessment has come out and said - this is a recreational issue. It's the recreational harvest. Not as much in the Chesapeake Bay, some in Maryland, but really, like I said, New Jersey, New York, and Massachusetts are just hammering the fish. And their populations are much bigger, and during COVID, a lot more people were fishing. And they've always had a very, I think most of those states already had a one fish limit. So when they said we had to do reductions, where do you go if you already have one fish limit? There's not much you can do. So the thought was, reduce the season and nobody wants to reduce the season because it's less opportunity. It affects charter captains. Catch and release anglers were furious with it. We're not the problem because we're catching and releasing these fish. So it's a whole gamut of things. The charter captains want it open because it means business. Even if they have to catch these fish and release them. They're still having that opportunity to catch the fish. And that's clearly been the issue. Those are kind of the big players right now. Virginia recreationally only makes up less than 3% of the total coast-wide harvest recreationally. And that's been dropping. Historically, we're about 18 to 20%, but it's been steadily dropping in our state. We have a relatively short season. Our season starts October 4th. We have a spring season, which is pretty minor, for about a month. And then our season starts October 4th, and goes through the end of the year. Whereas Maryland is - they got a trophy season in the spring, which we did away with. And then they have - they're open pretty much for most of the summer. They have a couple of weeks closed in the summer. And then they go until the late fall as well. So, you know, so we're lucky in that regard in Chesapeake Bay that we have the fish here, and they're still available to catch up in New England. Those states are only there for two to three months. So to basically start talking about adjusting that season, those states really don't want to hear anything about that.

Interviewer: Gotcha, okay, gotcha. Is that trophy season, was that in May in Maryland?

BD021: Yeah, yeah, it's May, it's usually, it varies by state. In our state, it was May 15th through June 15th. And I think, do I have Potomac River on my thing? Potomac... I think, yeah, Potomac, I think I was looking at it. I can't see it on there. Yeah, that's usually in most of the states. It's like May through June. It could be the first in June to May 15th. When we had to take the reductions in 2019, that's the first thing we did. We did away with the trophy fishery, which didn't give us a lot of savings, but those were all large spawners. And the idea was let's go ahead and protect those. But it's a small part of the fishery in the Bay.

BD021: Yeah. Okay. Okay, great. So I think I probably said in the email, so really broadly the goal of this project is to understand the role of biodiversity for marine resource management, in this case talking with you, fisheries management in particular. And so I'm wondering what you think the key aspects of biodiversity are that are important in your system that we've been talking about.

BD021: Well, I mean, okay. I think, you know, having diversity in a species, it's important because it makes a smaller, more stable ecosystem. That's what I would think. And it's like, and that's something we, what we deal with every day. If you're talking, if one species is being fished too hard, then how's it gonna affect another species in interactions? And we are slowly getting to the point where we're starting to manage based on ecology, ecosystem-based reference points and stock assessments, but it's kind of hard. It's been in Maine, it took about 10 years to develop that stock assessment. The South Atlantic has an ecosystem-based fisheries management plan that I was involved with and it was volumes. I mean, the document is not 100 pages, it's volumes, like 1,500 pages. And because it's very, you know, down there is a lot more complex with all the snapper grouper, you know, complex and everything else. But, you know, having that diversity is important. What we're seeing is that because of climate change, we're seeing new species coming in and some species that were routinely here are not here as much. We're seeing less summer flounder here. We're seeing more cobia. We're seeing more red drum. We're seeing more speckled trout. Just recently we started a shrimp fishery in our state because the abundance was getting high enough that it warranted a small, almost artisanal shrimp fishery with just a tiny 2016 for trawl and it's been pretty successful. So, you know having that, you know having a stable diversity is important but what we're seeing right now is - we're having, we're having changes in that diversity and we don't - not sure if it's stable or not and what's happening is, you know, like I said species that have been here - people have relied on both economically and recreationally and for you know, the original ecological purposes might be moving further north and aren't available but eventually some other species will fill that niche.

Interviewer: Right, okay. Yeah, so how do you think that management can cope with those changes as species distribution shifts are happening?

BD021: We're trying real hard. I think the climate is changing faster than we can keep up with it. We just went through an exercise this past year of looking at climate change in fisheries. There was a whole, the entire East Coast did it, and all the different councils got together. And it was a series of - series of workshops that were trying to come up with some kind of, I don't want to say plan, you know, like a, more of a plan of action. What to do under certain circumstances. And I think what they came up with was like, you know they came up with four scenarios and the idea behind it is like if this scenario occurs how are we going to respond to it? The one scenario would be like doom and gloom. Populations are declining and you don't know why and you don't have any control over it. Other ones might be populations are declining but you know the reason why and there are things you can do to control it. So there were four scenarios and they gave them nice cute little names and everything and the idea behind it was like just to start sort of creating the discussion, but then saying, okay, here are four scenarios that could possibly happen. And how would we respond to it? And that's - and they're just about finishing that up right now, but it's really difficult because five years ago, there was not a shrimp fishery in the state at all. I mean, I worked at VIMS in the early 1990s. And periodically we'd see a couple of shrimp and go, oh boy, big deal. You know, every now and then a few years, it's like, wow, we caught enough shrimp to take home to, you know - those five pounds of shrimp that you said you caught today. That's a lot and everybody got all excited and then you wouldn't see it again. But now what we're starting to see with some of these species like you know like I said shrimp, red drum, spot, sea trout, not only are they becoming more common in Chesapeake Bay but their abundances are increasing every year and so you know - and that's due to climate change you know - are they, as a range expanding or is it shifting northward? I don't know yet. I know some of our species are shifting northward. Black sea bass, summer flounder is definitely shifting northward. Croaker, they're speculating that croaker, their population, which used to be the epicenter off of - in and off Chesapeake Bay is now off Delaware Bay. So and that's primarily due to you know the warming water temperatures. So it's really difficult to manage. These things are occurring and because - another reason why it becomes really really difficult is that a lot of our species - is we have state-by-state allocations. Those allocations are usually based on historical landings. So I mean - so if all of a sudden more fish are being caught up in New England than off of the Mid-Atlantic, well the New England states want a bigger piece of that allocation. The infrastructure still may be in place in Virginia and places like that. Our flounder fishery does not occur in our state. It occurs north of us and off New Jersey and New York. They just have quota in our state and they come back and they land it here. So what's happened in a lot of cases - because of these shifts - we're seeing a lot of a discussion - very lively discussions and very - they get pretty heated sometimes over allocation shifts because, you know, how do you fairly distribute a species among the states when some states are seeing more quota, are seeing more fish up there, but they're meeting their quota too early and they have to shut down and they can't catch it and they have to throw the switch back versus a state that doesn't have much quota but doesn't have much in their state waters at all, but they historically had a higher part of that quota, so there's still a lot of the fish on it. We just went through that with menhaden as well, where there was a big push from the New England states to get higher quota. Virginia had the largest portion of that quota, because historically we've had, we caught the most. What ended up happening there was they had three options. They could either take a 50/50 split between old and new data. They could take 75% new data. When I say new data, the most recent three years, and 25% of the old data, or they could do the opposite, 75% of the old data, and 25% of the new. Well, somebody made a motion by the way. It's like, we want to get rid of the 75% old data, 25% new. I went, "Well, okay, if you're going to do that, I'm going to make a motion to get rid of the 75% new. You know, just use the most recent years." And that got shot down. And so, it got pretty heated and then two meetings later, we were making a final vote on this. And I kind of said, "All right, I'm willing to concede 75% new data because you want to use the most up-to-date data, but we need to keep that - we need to still have a historical perspective of a state's fishery. And it looked like it was gonna pass - at the last minute it didn't because of one or two states. And they chose to just use the last three years of data. So what they did in that case was they just decided to throw out historical fishing, historical harvest in the state and historical infrastructure and just say, we're just gonna use the most recent years. And it was kind of a, it was a little upsetting because I'm afraid we're gonna start going down that road more often. I think that yes we should use the best available data, the most recent data, but we also need to take into account historical landings and the infrastructure. So I was fine with a 50/50 split. I was pretty upset with where it went down on that one. But we're going to see that more and more with these shifts in species where - and it's going to be winners and and losers. And North Carolina is gonna be a big loser on Summer Flounder and striped bass and probably Black Sea Bass as well. We're gonna lose out on Black Sea Bass, Summer Flounder, menhaden - we lost a little bit, but we were okay with it. We kind of worked through it, so it wasn't as bad as we thought it would be. Yeah, that's one of the biggest issues we have right now is how do we adjust, how do we deal with changing diversity, changing population structure with knowing the climate, the climate's changing and the waters are warming and we're getting shifts in populations.

Interviewer: Okay, so you said winners and losers, how are you seeing the commercial and recreational fishers respond to these changes?

BD021: I'm trying to think, okay, well, striped bass in Virginia at least, the fish aren't here anymore. They're not in our state waters anymore so they're shifting to other species. They're targeting Cobia, they're targeting Red Drum. Commercial is a little bit tougher because you know people have gear, that's you know certain gear that they have in licenses and quota for certain species and it makes it a little bit more difficult. For the species that are caught offshore like Summer Flounder and Black Sea Bass, are fishermen who are just fishing in the north they're just following the fish up the coast but now they have to come, you know they have to come all the way back to Virginia. They're catching this fish off on New Jersey, New York but they have to come all the way back to Virginia to land those fish right so - but they're not happy whenever there's a decline in quota - right, that's understandable um you know because in a lot of cases these are individual transferable quotas, ITQs, so they buy this quota and they own that quota so every time there's a reduction in something that they invested in they're going to have less of. And it's really difficult. I mean, when we have these allocation issues, sometimes it's not pleasant because the states start arguing among themselves and then even within the states, the recreational folks may think differently than the commercial folks and it gets very heated at times.

Interviewer: Right. So, you know, you mentioned this new shrimp. Is it the shrimp trawl fishery that's just come about because of increasing shrimp populations?

BD021: Can you say that again? You kind of broke up.

Interviewer: Oh, sorry. I said, I think if I remember correctly, you were talking about a shrimp trawl fishery that's new, given the increased populations in shrimp. Am I remembering that correctly? Okay, so yeah, are you seeing commercial fishers adapt and change to new fisheries, like a shrimp fishery, for example?

BD021: I mean, yeah. We're trying, we're trying to do it. I mean, it's - that's one of the things and we're trying to do that. It's how, how that all started, there was a gill netter off of Virginia Beach. And he just started, he started to see shrimp in his gill nets. And he said, look, can we have a trawl fishery? And in Virginia, trawl has been outlawed for years. You're not allowed to trawl at all. And so I think the first year we gave him an experimental permit and he had some funky little 16 foot rig that he used and he was mildly successful. We did it on an experimental permit. And the next year we gave two people permits and they modified it a little bit and they started learning more and more. And so each year we just added a little bit onto that. So we went from one to two to four to eight. And got to where they were catching a half million pounds of shrimp in about 10 weeks. And so what those guys would normally be doing that time of the year is gill netting for spiny dogfish. So it gave another opportunity, but we have grown that fishery, we've been really methodically slow with it and we don't want to have the historical trawl net with the four nets on board. It's only a tiny six-inch net. And we have a lot of, you know - and we've been real successful with it. I mean, it's like, for that reason, because we've gone slow, we've monitored the bycatch, we still monitor it every trip, so we have an idea of what their bycatch is. We get daily reports on them and the catch. So we've grown that slowly, and it's allowed those, Right now it's 12 off of Genia Bay, should probably be another 12 on the Eastern Shore. So those folks that are in it are adapting to that new fishery. And so they're, you know, as some, like Spiny Dogfish, the quotas have been reduced, have been going down almost every year. So it allows them to use that same boat to go out and do this as well. We also have a blossoming blue catfish fishery in our state. Blue catfish were introduced in the 70s, and they've kind of taken over in places. They survive better. They grow faster than the white and the channel cats. They use the same beds for reproduction. They eat blue crabs, they eat eels, they eat shad, all kinds of species. They're much more salinity tolerant, so they can survive much further down the river. Now they're getting over to the eastern shore rivers and creeks over there as well. So it's a Bay-wide problem, but the issue is also, it got introduced by my sister agency, Department of Wildlife Resources, for a trophy fishery. So right now on the James, it's a world-class trophy fishery, the way you can get world record blue catfish on a regular basis. And it's about a couple of million dollar fishery on the James River. So our freshwater counterpart thinks it's a wonderful thing. And we're like, no, this is an awful thing, but we've been able to develop some new fisheries for using electrofishing and some other gear to try to get more people involved with it. And then that would take pressure off some of the other fisheries like blue crabs and oysters, for instance.

Interviewer: Sorry you broke up for a second there. So you said that blue catfish was introduced in the 70s. Do you mean that it was an introduced species? It's not native to the area?

BD021: Yep. It was introduced.

Interviewer: Gotcha, okay. Okay, so are there other invasive species that exist in the region that are an issue or that are becoming a new fishery like the blue catfish fishery you were just talking about?

BD021: Yeah, blue cat, blue cat's the biggest one. That is clear. It is dominating the estuaries. We don't even see white cats and channel cats. And in the fishery surveys, they hardly ever see those species anymore. They only see blue cats. Snake cats are another one. Snake cats, not as much commercially or recreationally, but they were introduced probably about eight or 10 years ago and they're starting to get a foothold. They're a little bit further up, they're more in fresh water than the blue cat. So now the catfish, the blue catfish, I thought they stayed at 11 parts per thousand, but they're finding that they can do just fine up to 18 to 20 parts per thousand. So when you get, when they can tolerate those salinities - and then we have a strong rain event that could lower salinities substantially down, you know, down to the mouth of a river, they could easily, you know, go from one river to another. And that's what, that's what we're seeing. I mean, we actually had some catfish caught right near the Bay Bridge Tunnel in an area called Kiptapeak, just north of the Bay Bridge Tunnel after a strong rain event a couple of years ago. So, you know, they are spreading almost to the entire Bay and, you know, NOAA Chesapeake Bay Office has a Invasive Species Workgroup that - we're not gonna eradicate them, which is, you know, what can we do to manage them is what we're trying to do and what's their ecological impact on other fisheries. And we know that they're having an ecological impact on blue crabs, for instance.

Interviewer: Gotcha, okay, okay, great. So one of the ways that we've been thinking about, so one of the things we've been hearing a lot is that biodiversity is much too broad of a term and people think about it differently. And so we've divided biodiversity into four categories. And I'm wondering if you agree with these four categories and if these are things that you think about. We've already talked about some of them, but one is habitat forming species. One is species of conservation concern. One is key food web supporting species. And then the last is harmful organisms. So I can put those in the chat if you're a visual person, but I'm wondering if you agree with those and if those are things that you think about in your work.

BD021: Yeah, I mean, as soon as you said them, I'm like, okay, I can think of like key food species - menhaden. Menhaden is a forage species. That's probably the primary one. Harmful would be blue catfish. You may want to include, if you want to talk about shellfish, cownose rays, because they go into shellfish beds and they just destroy them. And suppose you have a species of concern. Is that the other one?

Interviewer: Yeah.

BD021: Yeah, we are-- each state has something called the Wildlife Action Plan, which the purpose of that Wildlife Action Plan is to preserve habitat and species so that they do not become candidates for threatened, for protected resources, threatened or endangered species. It's a really interesting list. If you get a chance to look at it, because like in our state, there's hardly any saltwater species at all right now. It's like, it's - there's a few anadromous species, like striped bass on there. We were looking through the list recently and there were 40 species of amphipods, like the Allegheny cave amphipod, which is a crustacean, but blue crabs aren't on that list. So it's like, so we're in a process of trying to add some species that, you know, blue crabs are species of concern because they're keystone species in the bay. So, you know, we think that should be added, but yeah, we have, you know, our stock assessments give us an idea of what species are of concern. I really don't work very often in terms of, you know, writing or endangered for the most part. I mean, the only species I deal with that is with sturgeon. That's the only species that we have there. Most, you know, some people will say, "Oh, this species needed, like a couple of years ago, people were trying to get American eel on the Endangered Species Act." Oh, the Endangered Species List. No, I, yeah, and I was like, I worked on eels for a number of years. It's like, they had growing numbers. They're nowhere near endangered. Endangered to me is something like, you just don't ever, ever see it anymore. And it's like, is it a species of concern? Absolutely. But, and I think that's a separate category from being in the ESA's list as far as the federal government is concerned. So I could see on that list, species of concern - American eel, blue crabs, striped bass. Just - that's just off the top of my head. Those are the ones that we know their abundances are low right now. So what was the habitat one again? Habitat forming species? Habitat forming species like oysters?

Interviewer: Yeah, exactly. Yeah.

BD021: That's what you're referring to? Oh, okay. Yeah. We do think about that. We do a lot of restoration here. Most of it is - most of the restoration - we call it restoration, but it's mostly restoration for commercial purposes. So we go ahead and restore a reef to the point where it's viable for commercial harvest. I know in my old job in Georgia, we had restoration where we were doing restoration just for habitat purposes. We were in fisheries and we were getting money to basically go out and build oyster reefs. And we were doing that on a regular basis, and those oyster reefs were not to be harvested for oysters at all. But we also had people in our same agency that were doing what they call restoration to allow commercial harvest. So yeah, I think it's, we work with that. I think it's important. You know, I've seen that firsthand where if you go ahead and you build a reef, you know, if you have more, you know, a lot of our species, especially the new ones we're seeing, like red drum and speckled trout, they are going to be found on oyster reefs. I worked in Georgia for 16 years and I could go out there and I could say, "If there's an oyster reef, you throw your line there, you're going to catch one of those two species because that's where they are all the time." And so it's important to have that structure in the water. There's a lot of reasons for restoration of habitat. Not only does it create habitat for the fish, but it stabilizes the shoreline, the oysters have filtered a lot of benefits of having species that are habitat forming. To a lesser extent, we have an artificial reef program that when we put that out, the fouling organisms that go on those - have reef balls or cement that go down and they get fouled with, you know, initially with microalgae and then they start getting the sea grapes and things like that on it and small bryozoans and then they get small, you know, soft corals on them and then, you know, small fish start inhabiting those as well and then they become a complete ecosystem on their own. So, yeah, I do, I mean, I think those are pretty decent terms. I think I didn't think of them in that way, but yeah, it's like, every day we deal with that and those kinds of things.

Interviewer: That's what I hear a lot, that people wouldn't think of that, but then once they hear it, they're like, "Oh yeah, that makes sense, I agree with that." Which is good to hear. So it sounds like from your answers - oh, sorry, go ahead.

BD021: Yeah, you're breaking up a whole lot.

Interviewer: Oh God, I'm sorry, I'm gonna go off camera, maybe that'll help me. So when we were talking through the four categories, I think that you kind of talked a bit about habitat-forming species restoration plans, for species of conservation concern, ESA - we were talking about different fisheries management approaches for the key food web supporting species and the harmful organisms, but I'm wondering if you think in other ways that those four categories are being effectively managed for and then more holistically, is biodiversity itself being considered in current management?

BD021: Okay, um, yeah, I would think that habitat is being managed well. But like I said, in our state, it's more towards, it's more towards habitat. We're building habitat, we're - they're habitat forming organisms that we're building that habitat that you just hope it - they'll harvest it at some point and then we replenish it. The species of concern, are we managing it well? In some regards, yes, in some regards not. I mean, if we were managing well, they probably wouldn't be species of concern. You know, something like sturgeon, for instance, it's gonna take a hundred years to recover that species. And it's like - so everything we're doing today is just a drop in a bucket. I mean, it took years for it - it's a long-lived animal. It takes a long time to reproduce. And what we're seeing now is a result of 70 to 80 years in the making. So that's a rare species because of its life stage. Most of our species are living less than 10 years. So we can usually - once we put an action in place, we should start to see some recovery on those. But is our management effective? Yes, somewhat. If the goal is, like in oysters, the goal is to rebuild that species within 10 years. And usually we do meet that goal. Not always, like for eels, I don't think we've met that goal yet. Key food species. I would say that for forage species, I think we're managing, if it's a forage species that's either caught recreationally or commercially, I think we're probably managing it well, but there's a whole lot of forage species that we're not managing like, menaids, silversides, juvenile sciaenids, it's like spot croaker. We may not be managing those species as well. Harmful species I kind of think of like if we went and created a management plan for the species and try to manage and we probably get their population under control because it seems like a lot of times you know what our management it's uh... and so that sometimes it becomes counterintuitive - I say that as a joke so don't quote me i got i got a set when I worked in the south - the southeast - they were talking about lionfish and what they could do about lionfish and I just said off the cuff - maybe you should create a management plan and start managing it. I'm sure we can estimate the population in 10 years. And it's just, it was a joke because it's like, you know - but yeah, I mean, the hard part, I mean, you know, blue cats, I think we can be managing them better. It should have - I will let you know that when I was at VIMS 20 years ago, we brought it to the attention of anybody who would listen to us. It's like all of a sudden we started seeing all these blue cats in our catches and seeing their numbers increase exponentially and we were screaming at the top of our lungs and nobody was listening to us. The freshwater guys thought it was great. They thought it was wonderful. And we're like, no, this is not gonna be good. This is not gonna be good in the estuaries. It may be good in freshwater, but they're gonna be eating stuff. They're gonna be eating whatever's available. And now we're finding out they eat an average of 1.1 crabs per day. So, so it's, you know, I don't think, I don't think, you know, we have acted, acted quick enough on some of these species. But when we see these introduced species, you know, I think we could do a better job of that. And as far as bio - you wanted to know about biodiversity. I don't know how much - I'm trying to think with biodiversity. Let me think about that some more. I'll think about that as we keep on talking.

Interviewer: Okay. Um, yeah, I wanted to follow up. So when you said harmful organisms, we're not acting fast enough. Like are, do you think that there are actions that could be done sooner or is it just like that's just like, you know, the way that the management process works - is that like it's just not fast enough to deal with that?

BD021: In the case of blue catfish, I think we probably could have acted sooner. I think there was uh, I think if we promoted a commercial fishery at an earlier stage we may have been able to keep their numbers. Yeah, you weren't gonna get. By the time we were seeing them in our trawl survey - we would see initially - would see a couple every now and then and all of a sudden one year we started catching two to five hundred in every single trawl in certain areas of the river. And then over time you just saw that the distribution, you know - increase over time so I think if it was promoted as a commercial fishery earlier - commercial and recreational fishery earlier - we may have been able to control the populations and they're kind of doing that a little bit with blue cat, with snake head - snake heads could - they're concerned, very concerned about snake heads and their impacts so you know DWR - Department of Wildlife Resources - has been basically promoting - you know - hey look if you catch one of these things, don't throw it back. Whatever you do. Don't throw it back. You know it's - and they've kind of promoted - it's like hey, it's a good eating fish if you want to take it home and eat it. If you don't, just do not put it back in the water if you catch it. And I think that's a healthy thing to do when you start seeing these exotic species come into the system. Get over that quickly. I know when snakeheads first showed up, I guess it was in a pond. I think it was in Maryland, a couple of ponds in Maryland, and then they spread pretty rapidly to some of the systems. So by keeping up with it, having folks looking at the spread and getting the word out, it's almost like just having an educational program. If you see these species and you catch them, do not put them back in the water. I think some states would say, "Just chop the head off." But in the case of blue cats, we're never going to eradicate them at this point because they are so well established. It's been over 50 years. So the best we could try to do is manage them and manage and try to control them so that they don't cause too much harm to the rest of the ecosystem.

Interviewer: Right. Okay. And then I want to ask a similar follow up to when you were talking about forage species and you were saying that if it's a forage fish that's managed or that's caught, that's caught, then it's managed well, but not so much for the fish that aren't being targeted? Are there actions that you think would help better manage that component of biodiversity, those food web support?

BD021: There are some efforts to have forage species management plans. The council has one where they have a series of species that they don't really do a whole lot with. It's just a monitor, you know, whatever data is available. I mean, it's, you know, sometimes there, you know, some of these species some of my stuff harvesting anchovies you just don't know I mean that's just they may say, “hey, I can make money I'm gonna go ahead and do this and I'm using a legal gear,” but the idea behind it is we have a lot of surveys that are seeing these species we have a lot of trawl surveys that see those species I mentioned we have sane surveys that see them and making sure that the people doing those surveys are providing annual relative estimates of abundance. So if you have those relative estimates of abundance, you can kind of see, hey, is there population going up or it's going down? You know, it's like, and you know, if it's, if it's, if the species is caught commercially and recreationally, you have something you could do to manage. You can say if the population is going down, you could curtail the harvest. But something like anchovies where it's not harvested, if the population is going down, you just have to figure out why. You might not be able to do anything about it, but understanding why that population is declining or increasing is important to know. And there's a lot of species like that. Like I said anchovies, that's a big food source, silversides, some of the smallest sciaenids like spot croaker in there too, shrimp can be a foreign species. And that's kind of an argument. Can it be a forward species but also be a viable fishery? Some people say no and I'm like I don't know because in Georgia everything eats shrimp. Everything eats shrimp and shrimp is the biggest fishery in that state so it's both a commercially and recreationally important species but it's also important to ecology as a forage species as well. but I know in the council's process if the species is managed because it has a fishery, they don't consider it a forage species, which is kind of weird. Even if it is ecologically. Yeah, it's a little weird. It's like, you know, I think a species can be a forage species and also be, you know, have a recreational or end or commercial fishery with recreational commercial fishery with it. So, but yeah, I mean some of the things that the Northwest Pacific has a has a pretty good forage species management plan where they're using surveys to come up with you know estimates of abundance and then somehow they use that information to come up with you know an overall estimate per year of biomass and so they can see you know what's happening among those species that are in that group of species that they look at. So it could be that, you know, hey maybe anchovies go down one year but silversides go up. So overall the amount of forage base in a given system may remain stable from year to year. So I know they have a pretty good one. We're kind of trying to look at one in the Bay. I don't think how much foothold it's got so far. They've been working on it. The Mid-Atlantic has one that's, Mid-Atlantic Council has one that it's just tracking the species at this point. They're just looking at them and just keep keeping a track of, you know, any kind of commercial fishery that it might have as well as, um, any service that they have that are, you know, monitoring their abundance.

Interviewer: Right. Right. Okay. Okay. Um, okay, great. I think that that was, those are my questions. Um, unless there's anything else that you want to add about biodiversity as a whole for within fisheries management context?

BD021: Yeah, like I said earlier, I think it's important. I mean, I used to, when I worked at VIMS, I used to, for my Charles service, I used to do diversity indices every year, just to see, we would do that as kind of an indicator of how healthy an estuary or a given area was. And it's like, I haven't done that in years, but it's like, you know, the more species you have in an area, you know, it's gonna be more stable. It's probably healthier as well. - Right. - You know, and it's like, and I really can't speak. I don't know if, like diversity as far as, you know, looking at, like looking at that St. Charles survey now that I ran 20 years ago, is the diversity that they're seeing as it increased or decreased. And if it has, or has the species composition changed? I can almost assure you that species composition has changed somewhat. But I just don't know how the diversity has changed. But it's important because it's, all these species, on an ecological approach, all these species rely on each other. And for 100 years, we've managed single species by themselves. And without ever looking at, hey, what's the effect of this species on something else? And we're just starting to do that. And we're realizing that it's very data hungry to do that. It's a lot of data. It's time consuming. Like I said, the ecological reference point stock assessment for Menhaden took about 10 years to develop. And they only looked at a hand-- I think they looked at striped bass as predators on Menhaden. striped bass, bluefish, and maybe weakfish, I think. It was all like three species that they looked at. OK. And they found that striped bass had the best fit with the model. So that's why they started using it. But you could kind of think, well, what would happen if you tried to throw 30 or 40 species into that net? Yeah, how would that work? And it's like, yeah, eventually we're going to get there. We'll get there eventually where, you know, we have enough data. And I'm a big proponent of, you know, I cut my teeth on doing fishery surveys. And I see the relevance of them and the importance of them because, you know, most of those surveys, if they're going out, you know, every trawl survey I ever was involved in, we recorded everything we saw. Everything. Anything that came up at that net we recorded. whether or not it was the tiniest clam up to a four or five foot shark. It got recorded and it got some kind of measurement and estimate of how many were caught in that given sample. And that kind of information is done up and down the coast from all the states. And it's like that provides a wealth of information of looking at, hey, what's changing? What's important? Are we seeing changes? What do we see as far as changes in diversity in a given system or in a given estuary because of climate change? Has it changed in the last 10 years? And I haven't looked at it, but I would almost guarantee we're seeing a change in composition and probably diversity. I would think that in the Bay right now, diversity is probably going down a little bit, because it seems like we're losing species quicker than we're gaining them. But I think if things continue the way they are with the forecast for climate change, we'll start seeing more of those species. We'll start seeing more of those southern species becoming more and more common in the Chesapeake Bay. - Right. And then it sounds like the next issue after that is like how to adjust management to regulate the changing species composition. - Yeah, especially when it comes to allocation. Allocation is going to be the big issue because whenever we talk about allocation changes, there's going to be winners and losers. There's just no way around it because you're taking the same piece of pie and you're splitting it up differently. In our case right now, we're splitting it up because mostly the New England states are starting to see species that they've never seen before and now they want a piece of it. And I can't argue with that, but sometimes it's been a little overzealous in how much they want it. Let's put it that way. Well, we have the opportunity to catch this much. Well, guess what? We could catch, you know, we could, you know, it's kind of like just because, yes, you can catch that much. It's there. But you know what? In a lot of regards, every state could say, well, we could catch more than our quota too if we wanted to. We just, we have a quota. Some of the New England states have been pretty pushy about, "Well, we want it and we want it now." - Right. - "Okay, well, we didn't get here in two years. How about we give you 2% now, we give you another 2% in two years, and we just reevaluate this every year." And the problem is with allocation, I'll let you know with Summer Flounder, they're still using harvest allocations from the 1980s. Which is like, that's ridiculous. That's just, you know. So that's why we have such a large allocation of Summer Flounder quota because we were the big players back then and we're not anymore. But it's one of those things they should be looking at that allocation. It should almost be a policy that they're required to look at it every five years and adjust accordingly. And then when you wait so long, everybody's so dug in that it makes it harder and harder to get the changes done. But it’s complicated like balancing the understanding of the data needs of the ecological changes with the socioeconomics of it is so complicated.

Interviewer: Yeah. Well, I know we're just about out of time, but thank you so much for your time today. This is so helpful and informative for me. So I really appreciate it.

BD021: Okay. You're very welcome. And let me know how things turn out.

Interviewer: Okay. I absolutely will. Thank you so much.

BD021: Take care, bye.

Interviewer: Thanks, you too. Bye.