

Interview with Kristin Wilson Grimes

Interview Participants:

Melody Hunter-Pillion, *Interviewer*

Kristin Wilson Grimes, *Interviewee*

Jamie Currie, *Videographer*

[Due to climate control sensors in the room, occasional audible beeping occurs during the interview session]

Melody: So for the record, I'm Melody Hunter-Pillion. I am interviewing Kristin Wilson Grimes, and today is Thursday, May 31st, and we are at the International Institute of Tropical Forestry in San Juan, Puerto Rico. We're discussing experiences with and lessons from past drought and other extreme weather events, including hurricanes. We're also discussing management strategies to improve resiliency in the face of future drought and other weather events.

And so, now we can get started. And, Kristin, the first thing I'm gonna have you do is, again, just tell me your name. And tell me, you know, who you are. What is your title, the organization you're with, and what you actually do?

Kristin: Sure. So, my name is Kristin Wilson Grimes, and I'm Assistant Professor of Research at the University of the Virgin Islands. I have a joint appointment in the Department of Biology and the Center for Marine and Environmental Studies. I'm also the director for the Virgin Islands Water Resources Research Institute, which is a territorial and federal partnership between the territory and the United States Geological Survey.

Melody: In that role, or those roles, what do you do? What do you, I mean, what, sort of, what are you responsible for? Your—Do you know what I mean? Not sort of tasks or duties, that sort of thing, but what are you the basics of? What your, your goal or your mission?

Kristin: Sure. So, in my job, I am a 75 percent research appointment and 25 percent teaching appointment. So, I teach mostly in the Masters of Marine and Environmental Science Program at the University of the Virgin Islands. So, I help, um, master's students to—I teach in that program, I teach in, a, I team teach a course that's called “Physical and Ecological Processes Along a Land-Sea Gradient”. So, we explore the ecosystems of the US Virgin Islands from “ridge to reef” and understand the physical forcing factors and the ecological communities that define those. Um, in my research, my research expertise is coastal wetlands, but I work on a lot of different projects that look at human impacts in the coastal zone. So, that could be anything from the impact of cruise ship plumes in the near-shore and how we might change docking, um, behaviors of the docking process, to understanding blue carbon and the impacts of an invasive seagrass and how that compares to the ecosystem services in terms of carbon storage that our native sea-grasses are providing, to understanding contaminants that are coming out of our unlined landfill and into a mangrove and nearshore system, um, on the east end of St. Thomas. So I try to do stakeholder-driven science and do science that helps the communities make better decisions about the natural environment in the US Virgin Islands.

Melody: Lets, um--

Kristin: Oh, I also work on—Sorry.

Melody: Oh, yeah. Go ahead.

Kristin: I also work on a number of—Right now I also work on a number of marine debris initiatives in the US Virgin Islands as well, and so that has been a really fun project, um, and a lot of my work also has to do with diversity and inclusion in, in science, technology, engineering, and mathematics, so STEM. And so, right now we have a number of National Science Foundation projects that are focused on increasing diversity and inclusion. One of those is our NSF INCLUDES project which is called "Seize Your Tomorrow," so supporting emerging aquatic scientists. And that's a really neat program that's showing that there's a career path for students who are interested in the marine sciences from middle school through, um, undergraduate internships at that level through to a bridge to the PhD program at the graduate level. And so, that's been a lot of fun to work on. But we also have a NSF NRT [National Science Foundation Research Traineeship] infused project that's going on too, that's looking at the food-water-energy nexus and trying again to get more minority students interested and engaged in science, technology, engineering, and math.

Melody: This is so exciting to hear the stuff that you're doing. And you're doing a lot of things. But I like that. I like what you're doing for the, for the culture. Let's talk a little bit about hurricanes. So, you were not here for Maria. But you were here during Hurricane Irma. So, if you would for me, um, describe to me what it was like when Irma hit. And when I say that, I mean like where were you, who were you with, if you're with family or whatever, and what were you seeing and hearing, and then I want to hear about the aftermath as well.

Kristin: Sure. So, when Hurricane Irma hit, um, we had just come back actually from vacation. We had planned, uh, right, a, a vacation right before kind of the semester was beginning again. So, we were up in the States, and we curtail that for a vacation to make sure that we were back here in time. And we flew in actually on a red-eye flight from Puerto Rico to St. Thomas, arriving at 7:00 am in the morning or 7:20 in the morning, the day before Irma hit. So, luckily, we had networks of friends who were helping us, helping us prepare. We rent a house, so helping to prepare the house, making sure that we had gas in the trucks and different things, that we had water at the house. And then as soon as we got there, as soon as we landed, my husband and I went different directions. And he was starting, putting up boards on the backside of the house. And I was doing last minute, um, preparations, making sure we had an extra propane tank, you know, to bring it from three to four and [laughs] all different sorts of, um, things just to make sure we had enough food, enough water, those sorts of things.

When Irma actually hit, we, um, we live in a two-story apartment. And so we were on the top floor, and we were really afraid that the roof was gonna come off the apartment. So our landlord had come around that afternoon and his family—He's from St. Thomas, and his family had been there during both Hugo and Marilyn, and he said, you know, "The roof is gonna come off." So that afternoon, I was going around my house, trying to figure out, "Well, what, what do I save?" I have a limited amount of time, it's just, "What can I move in my house?" And he said, you know, "You can put stuff in the basement." The basement, half of our basement is cistern and the other is not, um, it's just a pit in the ground. So, it's dry, but it's open floor, there's not, you know,

a paved floor, anything like that. So, I was trying to decide, you know, "Do I save my—This painting my mom did?" or, "What photographs to move down?" or, "If, if the roof goes off, do I have—What do I have that I wanna try to preserve?"

So we were able to move a lot of things down—Some things down there, but, of course, you can't do everything. You only have so much time. And we're also trying to prep, you know, our "oh, shit" bags. So, this was something else that, um, people had told us to do, especially because as we saw the ramp up and the escalation of Irma. So, you know, what do you have that you can carry? So, all of your important papers in there, some food and water, food and water for our, our pets, um, you know, change of clothes or a couple changes of clothes, our sneakers, you know, things that—So we're prepping all of this in the afternoon. And eventually, though, it got to the point—We boarded up, you know, we have hurricane shutters, so we put all those down, we boarded up. Those are just some three-quarters of the house because we're kinda built into a hillside. So we—Then we boarded up the backside of the house. Um, we had put plastic on, and duct-taped all the beds so that if, you know, something came off, we were trying to save the mattresses and same with the, the couches and that sort of thing.

So, there was a lot of work. I mean, by six o'clock that evening, we were exhausted. Um, and so we stayed with our downstairs neighbors. So, um, that's basically a concrete—So, there's concrete above us and concrete all around us. And there were seven of us, seven people. So, it was our downstairs neighbors and his—Joe and Kristen, and Joe's brother and sister-in-law, and their two-year-old daughter. So, there were seven of us, plus four dogs and four cats that were hunkered down in there. So, what I remember, you know, for a long time, the guys were outside, and they were watching the storm come in. And then, you know, it started to get a little bit more intense. And, you know, there was a point where we decided to come in. And we barricaded the door. We had built this, um, a plywood piece that would insert in there with a crosspiece, and we put it all in, and we kind of hunkered down in there as the storm came in.

And it was pretty scary. I was scared. My husband wasn't scared. I was scared, um, but it was helpful to have—It sounds funny, but it was helpful for two things, like to have your pets there. Um, it's also kind of stressful [laughs] because it was a little bit like a zoo, um, but also for my friend, my friend's daughter because you felt, I felt like, you know, you couldn't be outwardly scared because there's this a little two-year-old who doesn't really know what's going on, who just thinks all of her favorite adults are there in the room and, you know, this is like a camping party a little bit. So, the Water and Power Authority, at some point, they cut the power before the storm really comes in to try—I guess for a number of different reasons. So, it, it went dark and, um, the storm came in, and you could hear it. You could hear it.

Melody: Was that scary, hearing it? What did, what did you hear? If you could describe it.

Kristin: It was just loud. Um, my husband, who was there for Maria, said that Maria was a lot louder, which is interesting that there could be, you know, differences like that, you know. Like, his impression from that storm, from Maria was that it was so much louder. But it was, it was, it was loud, you could hear things banging. And you weren't sure, you know—It's like, "What was that?" [laughs] Things coming up across on the house, um, just big crashes. And you didn't know kind of what, what was going on 'cause everything—You can't see outside, and, um, you just, you don't know what's going on.

Melody: When it was all over, in the aftermath, and not even just immediately that day, but, you know, that day, the next week, and before Maria, what were you able to gauge of the devastation especially to um, plants, animals, that sort of thing, the differences that you saw? And as a professional, what was your thinking about what you—the damage you saw?

Kristin: Well, when we first went outside, it looked like a bomb went off. I've never been in a war zone or a place that's actually been bombed, but that's the closest thing that I could tell you that it, it seemed like. I'd never—You know, I grew up in the Northeast, so we'd had some smaller hurricanes. I remember we boarded the house for Hurricane Gloria when I was a little girl, and then Hurricane Bob came in. And those were, I don't really—I think those were maybe Category 2 or 3. Somebody might need to check the facts there. But, um, they were smaller storms. And I remember for those storms, you know, the trees tipped over. And there were power lines and things down, we lost power for a little bit.

But this was unlike anything—this, meaning Hurricane Irma—when we went outside, it was—The landscape was unlike—I don't know what I expected, but it was not what I saw. And so, the trees were torqued like halfway up. There wasn't a single green that you could see anywhere. All of the vegetation had been denuded, it was stripped off. And, again, the trees were like torqued like halfway up. It was like somebody had wrenched them and twisted them. Some of the trees were — eventually, we learned — some of the trees in other areas had, were tipped over. But that was just...I wasn't expecting to see. And then, and then, afterwards, we learned that, you know, in these big, big storms like in Irma, you can actually have tornadoes that, that are part of those storms. And, you know, I'm a science professional. I, I didn't know that, right? [laughs] Maybe I shouldn't admit to that on the record, but that was something—I didn't really know that that could happen in these really big storms. And then you heard the stories, and you saw the physical evidence of these neighborhoods where water spouts came ashore, where tornadoes ripped across.

You know, that was what was just so shocking because you saw concrete structures that basically had exploded, um, been lifted up, moved and kind of just dropped and blown apart. And so, that was something that was just, um, so shocking to see. And then you heard the stories. Eventually, you know, as people started to come out, as curfews started to be lifted—So that's something that the US Virgin Islands does that's definitely different than the mainland, um, is that we have curfew. And the governor dictates the hours of curfew which means when you can and can't leave your house. So, um, eventually as, you know, people started moving about and you could get out, you know—It took us four hours to cut probably 150 feet from the house to the main road. So just to get out our driveway took six adults or, I guess, five adults, you know, four hours to chop and move and clear so that we even could get out to the mainland.

But even, not even driving around, but, you know, people started exploring, especially in those first couple days, to try see, well, what did people know about what was going on? And you heard the stories. Like we had friends who survived the storm by hiding in their bathtub with a mattress over them, um, huddled with their dogs. We had other friends—My, my veterinary technician, you know, she, she told stories. She had a horrific story where, you know, her husband was trying to keep the door from coming in. She's in the bathtub with two little children that are under the age of five and a new, pretty new baby, and her animals, and the bathtub's filling with water, and she's trying to hide under the mattress. And her little kids are shivering.

And she tells the story, you know, that they urinated just to kind of keep warm because they're trying to do this for hours as the storm's coming in.

We had a friend that we went up – an elderly friend that – eventually, in that first, probably on day three, we were able to get in touch with him. And we asked, you know, "Kevin, how are you doing?" And he's like, "Not very well." And he was basically trapped at his house. And we had this caravan of cars, um, going out because that was like another thing that was a little bit scary, is you'd heard these stories about safety and looting and other things following Marilyn. And you didn't really know how much of that was true or not. And there had been some early, although isolated, um, like, carjacking attempts on St. Thomas, at least. And the police kind of put the kibosh pretty quickly. And then when the military came in, um, I think they got that more – at least from my perception, it seemed like – more under control.

But we would go out in these caravans [laughs] so that, you know, if one, one car had trouble, there was kind of support there or something. And we eventually made it to our friend, Kevin's house. And his whole house, the roof had come off and this–The walls had blown out. And he had survived the storm, again, by hiding under the same mattress that he had hidden under for Hugo and Marilyn, [laughs] clutched under there. And when we got there, you know, he'd just been having a little bit of water. He'd been eating mostly handfuls of peanuts. And he was totally in shock. And we, we took him with us and his little dog, Jenny. And he came back and stayed at our house, because in those first few days, especially, we, we were kind of living like kings, right? Everyone's eating down their freezers, so we're, we're frying things up and grilling things on the grill. And, um, we felt very rich in friendship and in resources at that time. And that was something that we were—I was really glad that we were able to help him in that time.

Melody: So, as you–The more and more go out and you see the, um, what is typically a very lush and green island, is pretty much not green anymore?

Kristin: Right.

Melody: What does that mean or say to you as a scientist? What are your worries at that point about just the island itself, and the, and, and the ecology, the ecosystem?

Kristin: To be honest, at that time I was not thinking about the science all, really. Um, and maybe if I were a different type of scientist, I, I would have been. You know, there were a lot of people that responded really quickly with being able to do that. But, for me, it was so shocking to see the humanitarian crisis that was happening at that time and amazing stories of community and community support that emerged in those days following Irma, the support that we saw from Puerto Rico, the support that we saw from St. Croix. But I wasn't thinking about, "Well, let me go out and measure the forest," or, "Let me go out"—I mean, I kind of wandered, we had equipment out in the field. Um, and eventually when I got out to my office, that was probably one of the worst days. That was probably one of the worst lows. At the University of the Virgin Islands, there was over \$50 million worth of damage just on the St. Thomas campus alone. And the Center for Marine and Environmental Studies, the roof came off and kind of peeled back. And then there's also—That building sits right on the ocean. You know, it's one of the great assets of that facility but also one of its greatest vulnerabilities. So all the labs on the first floor flooded, um, because of the storm surge and then because of all the rain that came in from up above as well.

Melody: Is that near the airport?

Kristin: It is right near the airport.

Melody: Emerald? Is it Emerald? Lindbergh?

Kristin: It's on the other side. So, Lindbergh is on this side. And then Brewers Beach is on the other side. So it's on the Brewer Bay side, but you see it right when you fly in, and there's a temporary roof on it now. Um, but that was one of the worst lows. And I remember, we had been so busy helping other people that you almost didn't have time to break down and reflect on what the storm meant for you. We were pretty lucky at our house. We had some damage. We had had some, um, multiple roof leaks, and we had a window come open that had a lot of flooding. So, we had a lot of water, but we were able to get in and clean that up and, um, get back in there pretty—We weren't like a lot of people. We were really lucky.

But when we got to the—And we were busy helping like our friends, businesses and helping at friends' houses and, you know, helping Kevin, and helping all these different—That it took us a few days to get over to the university. And I remember that was the first time I really broke down. And I was sobbing, not so much because of what you saw which was horrific, you know, like, but also knowing what it would mean for the next few years. That's like you knew. You just thought about the amount of work that had gone into things and how long, you know, things take longer in islands. We talk, we joke about island time, [laughs] island time is real, it's a real thing. And, um, and you, you know, that's under the best circumstances. And so I think, um, when we thought about—When I realized just, "Gosh, this is gonna take so long for us to really get back even, even if we have the resources to be able to do it," that was, that was hard, hard to kind of stomach.

And so, I remember my husband, like, just put his hand on my back and rub my back. And he's like, "It's gonna be OK. You know, we'll figure this out." And, you know, now, the recovery plans from the university, what we're hearing for the rebuild is that for that building which is kinda—They've made different tiers of recovery, um, that have different timing and priorities. And that building is, fortunately, in the first tier which means it's a priority building, but they're still estimating that it may be 2019 before that building is rebuilt. And to me when I hear that, that seems optimistic, you know, the best, that's a best-case scenario. So probably that really means that, you know, it's gonna be 2020 or maybe, hopefully, not longer, but before we really see a working facility again.

So, um, right now, our unit is just spread out in all of these different places on the, on the university campus. You know, our Environmental Analysis Lab which was a two-story building, the windows blew out in the second floor. And so, and there was damage in, all sorts of damage that happened on the first floor too, but we were able to clean up the first floor. And that went from a, a lab facility to basically housing about eight people in different bench spaces. And, you know, we're making the most out of it. But it's, it's hard to, hard to do it.

So when you asked the question [laughs] you know, what was I thinking? Now, I think more about it. You know, we were able to get—We have a longer-term project that's happening in St. Croix. We were able to go out in the field in November, so we had like a little bit—And we did some kind of initial assessments. But, to be honest, my head wasn't, wasn't in the science. It was

really about, "What can we be doing to help the community?" and, "Are my family, are my friends OK? Am I OK?" you know.

And then the university went back to teaching and went back to classes really quickly. That happened in October. Um, and that was something that was hard. At that point, I had evacuated. So I went, um, I made the decision, my husband stayed and was there for both Irma and Maria. After I had, after we had secured our home and done what we could there, and, um, we secured, I secured my lab, what was left of it. So, we moved—We probably salvaged, you know, half a million dollars' worth of equipment from the labs. And at the time that we were trying to do that, we knew that more storms were coming. So, we forget, like in between Irma and Maria, you know, that is unprecedented to have two category five storms hit the US in a single 12-day period. But we forget there was a near miss for the US Virgin Islands with Hurricane Jose. And that was at a time when we didn't have communications. And I can remember asking, texting family members, and asking, "Are we in the cone?" you know, like, "Are we—" 'Cause there was no way—We weren't getting updates from the territorial governments. We had very little, limited communications. And we didn't know if we were gonna—About to get hit by another storm.

So, after that happened, we, we helped, um, secure the lab. We moved, my technicians and I, salvaged as much equipment. We moved everything out, 'cause we knew that anything that remained, with inches of water on the floor, would just get rusty. So, we tried to move as much equipment as possible. We actually ended moving it to a colleague's house because, at the time, the university couldn't provide us a dry, lockable space. So we moved, we made the decision to move the equipment that we could and then everything else, 'cause we knew if we didn't do it, no one else was going to do it for us. You know, the, the university, the support staff that stayed for the storm, is doing an am-, really an amazing job, but they were overworked trying to take care of the students that, that were there. Um, they weren't gonna take responsibility for that.

And the Center for Marine and Environmental Studies, while it has a hurricane preparedness plan, doesn't, didn't, at that time, at least have, like a recove-, like "what happens after" plan, right? What am I supposed to do if this happens and what am I—Who—Should I be making these decisions? Should my director be making these decisions? Where should the stuff go [laughs] if your lab is destroyed?

So I think everybody was trying to do the best they could, and everybody was dealing with their own stuff on top of kind of the professional stuff, too. But, um, the University made the decision to go back to classes very shortly, um, in October. And they did that because they wanted things to have a sense of normalcy for the students. Um, but that was really difficult because it wasn't normal. It wasn't normal for the students, it wasn't normal for the faculty. Um, but we tried to make the most of it, you know.

Melody: That sounds horrible, actually. No, really it does. It sounds horrible.

Kristin: Yeah.

Melody: In fact, and I hadn't thought about what you just said about those two back-to-back in 12 days. Wow, that, that's been, uh, cat five storms and that Jose was—I didn't even think about the fact that Jose was looming out there.

Kristin: Right.

Melody: And what a frightening prospect that was for folks here, especially since you guys, you really didn't have the communication to figure out, "Is that storm coming, too?"

Kristin: Right. I mean what happened after Irma, which was amazing, too, it was, you know, eventually the territorial agencies stepped up and eventually the federal government came in. But it was really the community that stepped up so quickly right after Irma. And it was amazing to see the networks of private boats, for example, private flights, private individuals, um, and of course, and even some of the, the national airlines, too, that we're doing emergency flights and that sort of thing. But it was those private boats and a lot of private boats that were doing runs back and forth to Puerto Rico. Um, friends of mine who were organizing networks, giving there and figuring out how to set up ad hoc distribution centers to get those materials into the hands of the people that needed them the most. Um, and then from St. Croix, too. Because St. Croix, of course, its airport, in that time was open before Maria came in then took out the two lifelines, being St. Croix and Puerto Rico. That had been the lifelines after Maria for St. Thomas and St. John. So, the airport on St. Thomas, you know, that closed for over a month--

Melody: Didn't know that.

Kristin: Yeah, so that also, thinking about, well, how do you coordinate relief supplies that are coming in. Um, you know, there were emergency flights that came in but you're not, it's not the same as, you know, the commercial or being able to get people in or out, or supplies in or out. The airlines lifted some of the baggage allowances and weight allowances when the commercial flights started first coming in and out. Um, but thinking about that and even--So at that po-, when Maria hit, I was in the States, I went to my sister's house for a little bit. And that was because I, I wasn't OK, you know, and I recognized that, too, and, um, I needed, I needed to be in a place where I could be the most helpful and the most effective. Um, and so even figuring out, well, how do I, how do I get goods to my husband and all my friends that are still there and having to ship to shipping companies that are now inundated and overwhelmed because they're not just dealing with the US Virgin Islands but at then Puerto Rico, then also with, um, uh, St. Croix, and then also the other islands in the Caribbean chain, because a lot of the shipping companies, you know, make stops as they, they go down, they go down, so.

Melody: So did ferries, because when you mentioned the airport, what about the ferry service, did that sort of, kind of, uh, you know, stop for a few days or weeks or?

Kristin: Yeah, so they have the same--The port authority makes the decision on whether it's safe, um, to operate the ports. And so, they also decide, I think in consultation with the coast guard, but someone would have to check, uh, I'm sure it is a coordinated effort, but, um, they make the conditio-, the decision about the safety conditions of the ports on whether they open or not and what sorts of vessels they're open to. So, in the days after Irma, I remember seeing coast guard cutters coming in. And then in the next few days, too, um, the, the, I don't know if it was the National Guard, the Army or who, but the, the Army presence, the military presence, and these big helicopters. [laughs] I had never really seen like the big, I think they're like Chinooks or the, the ones--It was almost like in "Star Wars." So, we were working at the university, right, to try to clean up the lab. Well, that's right by the airport and so that was where they were doing all the different, um, military landing and they took over some of the, the fields at the university

for setting up the home base for those and, uh, there was an amphibious landing that happened right on Brewers Bay, and they were unloading, obvious, and all the influx. And I remember thinking like, Oh, that's, like...OK. You know?

Melody: Let me, um, we're going to switch now to drought. And then we'll come back 'cause I watched your presentation yesterday and, and maybe you could talk about how these things sort of weave together, the, the overlapping, drought, hurricanes, the extreme weather together and what it means, um, for the islands and what it means for preparing for the future and for resiliency. So when, when I talk about the drought of 2015, and I know I've been interviewing people from Puerto Rico, but did the USVI also have the same sort of drought situation in 2015? Were, were you here during the 2015 drought?

Kristin: So, I had just started my position. So, I came in in August of 2015, so it's kind of in the middle of the 2015 drought.

Melody: Right.

Kristin: So, yes, I was here for part of it. Um, but, so, the 2015 drought hit St. Croix the hardest. So, all of St. Croix and then the eastern parts of St. Thomas and St. John were most heavily impacted by the 2015 drought. One of the things that's interesting about the US Virgin Islands, and that people may not realize the importance of the drought, US Drought Monitor, is that right now the US Virgin Islands are included as part of the US Drought Monitor. What that means is there's only two ways you can get a drought declaration, which means that you're opened up to the federal funding or the federal funding mechanisms that fact can provide relief and resources under drought conditions. One is that the drought, US Drought Monitor declares that there's a drought in your region. The second way to do that is to have the governor of your state or territory personally appeal to the Secretary of Agriculture, or the USDA, to come in and say, "OK, yes. There's been a drought."

One of the, one of the things that's so important and why we're advocating for inclusion, at least even experimentally for the US Virgin Islands in the US Drought Monitor is because of this. So, what happened during the 2015 drought is we basically had a retroactive drought declared due to our governor, congressional representatives, other sorts of things, advocating at the federal level, that we should have a drought declaration for the US Virgin Islands, which then opened up the federal funds for relief for our farmers, and for other sectors as well. So, that's why these conversations about the Drought Monitor and whether or not we have enough data in the US Virgin Islands to be able to support even inclusion on experimental basis, why that's so important.

Melody: Oh, so the USVI is not included in the US Drought Monitor.

Kristin: Currently, it is not included in the US Virgin Islands. So- or currently, the US Virgin Islands is not included in the US Drought Monitor. And what that-We have models for experimental inclusion. So, for example, in the US Pacific Affiliated States, they have kind of an experimental-Because they face similar sorts of data gaps, um, limited data, data sets. So, one of, one of the things that the Drought Monitor uses to figure out if there's-There's many kind of data layers that go into the drought declaration. At a minimum, we need enough precipitation data to be able to calculate something called the Standardized Precipitation Index. And there's different

kind of lengths of time that go into a valid SPI calculation. And at a minimum, they like to see about 50 years, which is basically kind of what we have, but for a very limited number of stations. And we have huge data gaps. You can imagine, for example, when a hurricane comes and blows your weather station away, that there's data gaps. And right now, um, we, there's not enough redundancy in the system to be able to deal with that. And so, again, that's one of the reasons that we're really advocating for, can we be included even kind of experimentally?

Melody: So, and, and I'm curious about this, because I'm wondering almost like a chicken and egg thing too. Once you become part of the US Drought Monitor, then does that sort of kick in the mechanism where, uh, there, there is just more data being kept anyway? Beca-, Do you know what I'm saying? So, um, but you got to have enough data to get into it. But once you're in it, then probably there's a thing where then more data is always being collected because you're part of this there. Does that make sense, what I just said?

Kristin: It does make sense. Uh, yeah. I mean, I would hope so. Um, I know. Yeah. We're not in it, so I don't know. [laughs]

Melody: I was surprised yesterday when you said that that there—But now I'm understanding why the data is not there just because of, uh, the weather circumstances, um, not having the tools all the time available, um, and ready to go, or they might be damaged. Because I was so surprised when, when you said there, that the data wasn't there. That was surprising.

Kristin: Right. One of the things—It's hard to get long-term monitoring data in any place. Um, but the US Virgin Islands, in particular, doesn't have a lot of long-term data, whether it's on environmental parameters or the condition of our ecosystems or on wildlife populations. There's very few long-term data sets that are continuous. And that's one of the things that's a real challenge for trying to come up with management plans for trying to create a plan that would allow for greater resiliency. If we don't understand what the history has been in a place, how can we use that to predict or plan for the future? It's, it's, it's difficult.

Melody: You were, um, talking yesterday about, you know, the, that, that sort of hard data is not there. But what you guys have right now, um, are, are sort of anecdotes. So, this anecdotal information. What are you hearing from residents, farmers, people who are connected to the land about what is going on with plant life, with crops, with wildlife? What the anecdotal information that you do have, and what might it mean?

Kristin: [long pause] Well...[laughs]

Melody: I asked a lot. Yeah. What's the anecdotal information you have on plant life and wildlife, both?

Kristin: Um, so from what we do know in the US Virgin Islands is that climate change, and the impacts from drought and other hazards, that we see and feel them from the top of the mountain down to the reefs. And while we might not have as much hard data as we would like, we know that we see and feel those, those impacts. And that's on the ecosystems, but it's also in the human communities that are a part of these systems as well. And so, we know in some of the forested, terrestrial forested ecosystems, that we think that we're seeing changes in species composition to

some of the more drought-tolerant tree species in particular. Um, and those are from some long-term forest plot data that are coming out of St. John.

We know that some of the wildlife populations, whether or not it's some of the reptile populations, like the blind snake, which is a ground-burrowing snake that likely with the compacted dry soils that some of those populations, at least we think, are declining as a result of the drought. There's been some indication that for our native amphibians, so, some of the native frog species but also some of our non-native frog species is that the breeding season was delayed in 2015 because of the drought and that some of the breeding season was also likely curtailed as a result.

We know that for some of the ungulates, so our non-native ungulates that are especially, um, prevalent on St. John, so things like the donkeys, they were, um, they suffered from the drought and had difficulty getting access to forage and water and so there were movements among the community there to try to "Save Our Asses", that was the campaign, um, to put out a donkey watering stations. But they're also affecting some of our other non-native ungulates like the white-tailed deer population, which isn't native. That was an introduced species that Rockefeller actually introduced to the national park, or what became the National Park, but there's anecdotal information too about dead, dead deer in the, in the bush from some of the Park Service employees as well as some of the US Geological Survey employees that are based in St. John.

And then down into the mangroves themselves, um, this is something that I'm a little bit more familiar, but there were areas that were stressed or had standing dead trees as a result of the drought. And we saw this manifested in a couple different areas in St. Thomas, but also most notably in St. Croix and one of the systems that I'm most familiar in, which is in Great Pond on St. Croix. And what was still so amazing, we got some funding from the Department of Planning and Natural Resources to understand that Great Pond system for a number of kind of other management decisions that are, are being considered right now. But we started studying that system monthly in October of 2016. And what might be kind of surprising is that those, even though those mostly red mangroves that were standing there were standing dead, you know, bone dry, snap dry, they were still providing some ecosystem services that we might not think about. And so, we know that they were providing habitat for fish that were in the ponds, some non-native fish, mostly tilapia, actually, um, but that they were also providing roosting and nesting habitat for many bird species. So we know some of the different egrets that use that area, the green-backed herons, white-crowned pigeons, um...I'm trying to think what else over there. But still kind of a viable habitat.

What happened after Hurricane Maria hit St. Croix was all those standing dead mangroves basically laid down flat. And the remain-, remaining smaller area of what had been living vegetation was basically stripped of all its leaves, which is pretty stressful if you're a plant already living in a stressful environment and trying to make a living there. So only time will tell, and we are monitoring that system to understand how it may rebound or if it will rebound, or how quickly, or in what ways, or will there be changes in species composition, will there be whole scale changes in how that, um, ecosystem works. Maria cut a new inlet, which is pretty common in a back-barrier setting. So, they cut, it cut a new inlet. We're are monitoring that to see if it remains open, it's already starting to fill in. So, um, likely, there's also all sorts of different dynamic changes that are happening in the physical environment there as well.

And then, you know, to continue, so, that gets us to the edge of the, the boundary in the interface of the land water. But we know too that droughts are probably having impacts in ways that we might not anticipate in the nearshore environment as well. So, during, under those drought conditions, we might hypothesize that there would be reduced inputs of sediment into the nearshore that would decrease the water turbidity, that would decrease, um, chlorophyll that's being put into there. Without those nutrients, there might be declines in larval fish, so, we might see reductions in those fish populations. Anecdotally, we hear from some of the fish-, fishermen that there may be declines in some of the fry and spat populations. They're having a lot of trouble collecting those bait fish that, which are then used for both commercial fisheries and some of the recreational fisheries as well. Um, and so those are the anchovy and herring species that we have.

But we don't know. We don't have enough, particularly for non-commercial fish species, we really are very data limited. This is something that the National Oceanic and Atmospheric Administration provides a lot of funding to the US Virgin Islands, actually, to understand kind of basic fish information, because we, we don't understand the basic age and maturity sorts of relationships for many of the species. And those are just for the important commercial species.

So, when it comes to these kind of other species, but that are supporting the commercial species that are there, we lack even less—You know, we have even less data. And what that means is that we don't know, you know, is this actually a drought connection or is it that the natural variability in these populations is something that we might expect to see anyways?

At least for some of the fishermen, there seems to be a connection, though, between what they perceive from impacts from the 2015 drought and connecting it to what they're seeing in their local fisheries. So, that's something we know, too, um, that we, at least anecdotally, that for some of our, um, protected species, like the Nassau grouper, there may be some, some recruitment pulses that we're also seeing kind of correlated with some of the drought years, which is interesting as a hypothesis if that actually holds true. But, again, we don't have kind of long-term, um, data sets that would allow us to understand if that correlation is one that manifests, or what is actually driving that, you know, what are the fish responding to? We know that for some fish species, changes in salinity can trigger or not spawning behaviors, but I'm not a Nassau grouper expert so I don't know if that would be true for that species.

But these are some of the sorts of things that we're hearing about. We know too, that for—There are connections between Sahara dust populations and some marine diseases. So we know that, um, there's been some evidence to suggest that the Sahara dust may be a vector for some of the diseases that we see that affect Gorgonian - the sea fans - um that are pretty popular, or pretty populous in the nearshore environments in the US Virgin Islands. And so it's interesting to think about, you know, if these droughts are being driven more by, by that, by the Sahara dust and changes in the patterns of what's going on there, that there could be connections, these teleconnections, across continents and across oceans that are bringing disease and other sorts of things that are affecting our nearshore environments.

Melody: Kristin, what do they, uh, you know, just for the basic person who's not a scientist - I'm one of them - what would be the big deal about, you know, a species of any type of animal, fish, or whatever, or plant, uh, either populations decreasing or maybe the species goes away in this habitat, so what are the concerns about, "What if we lose one?"

Kristin: Sure. So why should we care about--?

Melody: Why should we care? [laughs]

Jamie: Why is it, why, why do we care about extinction?

Melody: Especially to the ave-, do you know? For the average person. Why, what makes it relevant to, to everyday folk?

Kristin: So, right now, the world is going, undergoing the fifth mass extinction right now, right? So, why should we care about it is that there's all sorts of benefits that human communities derive from the ecosystems of this planet. And right now, one of the things that's happening is that individual organisms, individual species are going extinct at rates that we haven't seen before. And a lot of it is being driven by how we use this planet. And if we're losing that diversity, we're losing redundancy in our ecosystems, we're reducing the number of options that we have for how we can kind of get out of the mess that we're creating, right?

Melody: And because everything works together in a system that does matter though, right?

Kristin: Sure.

Melody: Because one species can impact, or it's like, it can be like a domino in some ways, especially in, uh, and everything and I don't know, in an island environment where it's very distinct and things might be dependent on each other, I don't know, I don't want to put words in your mouth, and I simply don't know because I'm not a scientist. But, um, you know, can it really have an impact when, um—On other species and on our way of life when another species, uh, is in trouble, or even just goes away, especially on an island?

Kristin: Sure. So, in island ecosystems, all of our, or—Let me start again. In island settings, all of our ecosystems are interconnected. So, what happens higher up in the landscape impacts not only what's there, but also everything that's downstream from it. So, if we have an impact, if we make a management decision that impacts those, those environments, we know that those—We're going to see those impacts downstream.

Melody: Talk to me about then how you—Your organization, your agency, what are you guys doing when you think about these things, in as far as planning for the future, and, you know, managing resources and trying to mitigate some of this, are you doing anything differently already over the last couple of years?

Kristin: Yeah. So, in the past few years, the work that I've been involved with at the University of the Virgin Islands, is really thinking about how these different disturbances, whether it's hurricanes, if it's droughts, possibly tsunamis, how those disturbances interface with the ways that humans use and live and think about the environments of the US Virgin Islands. So, how do the choices that we make about how we use the landscapes or how we use the seascapes, how do those impacts overlay when you then have a disturbance or when you have multiple disturbances in a short amount of time, or when you have a drought that sets up certain conditions that make the impacts from the hurricanes more or less, and it's—So understanding how all of these different and intersecting, um, conditions, how that works. And what does that mean for the people that

are also trying to coexist in these settings? What does it mean for them? And so, I think that those—That's really what we've been trying to do.

There's been a number—The Virgin Islands Water Resources Research Institute has been involved in trying to get us experimentally included in the US Drought Monitor, other actions at the, at the university in trying to help and support the development of a hazard and mitigation resiliency plan for the territory.

Um, we've—I've personally been involved also in the Ridge to Reef Task Force, which is something that's been newly formed as a result of the storms. Preceding the storms, I was also involved in the governor's climate change task force. So, this is also thinking about other sorts of creeping hazards. So, I think of drought as a creeping hazard. Sea level rise is also kind of a creeping hazard versus one of these things that's like an acute event that happens, like a large storm event, or if we were to be hit by a tsunami. That's kind of these punctuated events, right? So, these creeping and acute hazards work together, um, and we have to be thinking about and preparing for them, um, in the US Virgin Islands, especially because we are on an island, which means that we have limited resources. We have, um, limited capacity, and we wanna make sure that we're building in redundancies in our human infrastructure, in our ecosystems, which means preserving diversity, um, which means trying to protect some of our environments. Um, which means making sure that we not only have the rules on the books but that we're enforcing some of our environmental regulations, that we're doing those things so that we can really be thinking and shaping the future of the US Virgin Islands proactively, rather than just reactively—Um, well, reacting to the situations that, that come.

Melody: Ridge to Reef. What is that all about? I know you said it was a task force, you're on it, but what is that—What is the, sort of the goal and what's, what's that main vision for Ridge to Reef?

Kristin: So, the Ridge to Reef Task Force is a new task force that has formed since the hurricanes and the fall and it's a mix of federal agencies, territorial agencies, academia, non-profits, who have some sort of vested interest in what happens from the top of the mountains in St. Thomas and St. John, all the way out to, um, the, the reefs. It also includes, it includes all of our islands, so St. Thomas, St. John, and St. Croix, and stakeholders on all of those islands. But the Ridge to Reef is most, you know, St. Croix has a different geology and geography. The Ridge to Reef is most strongly, kind of, prominent when I say that the ridge lines in the St. Thomas and St. John.

So that task force, I think, is actually still trying to articulate its mission, but I think it is to think more holistically about how we're managing landscapes and the impacts of how that management manifests in the protection of our nearshore environments. But it's thinking about the people. It's thinking about the ecosystems. Right now, much of our focus has been on trying to clean out some of the ephemeral streams, locally known as “ghuts”, and trying to make sure that the drainage pathways are clear so many of those silted up or had obstructions as a result of the storms and the massive flooding that happened. There's massive flooding that happened in St. Thomas and St. John as a result of Hurricane Maria. And so many of those drainage pathways are, are blocked and not functioning which may increase flood risks and other sorts of things for the communities that may not have been normally exposed to those sorts of risks before.

Melody: So, um, you've talked about drought, hurricanes, even floods, too, and, um, the, you know, how the, um, the ghuts are, have been, I guess, clogged up with debris and other things. Um, so when you think about extreme weather events, what are you most concerned about with? And maybe for you, it sounds to me like, it's that combination of how these things work together, but, but, maybe I'm wrong about that. So, when you think of the different types of extreme weather events, what are you most concerned about, especially for the future?

Kristin: I am most concerned, ab-, well [laughs] I am most concerned about hurricanes when I look to the future, and when I think about extreme events for the US Virgin Islands. I don't know if that's because of the proximity to having lived through these two Category 5 storms, and that it's fresh. And I'm sure some of that proximity is shaping that view, but especially, you know, thinking about the near-future, hurricane seasons starts tomorrow, June 1st. And when you look at many of the hillsides in St. Thomas and St. John, or communities in St. Croix, you see a sea of blue roofs right now. So, these are the FEMA [Federal Emergency Management Agency] tarped roofs. And when you look across that, and when you think about, "Well, will these communities—Will our communities be more prepared?"... I don't know. Is our territorial government more prepared now? Maybe. I'm not sure, you know. I think we have more resources right now. That's for sure. We know that there's a lot more resources that are literally flooding into the territory. FEMA is providing a lot of support into the territory.

We have these grassroots, long-term recovery groups have been formed on each of the three islands. So, the St. Thomas Long-Term Recovery Group, the St. John Long-Term Recovery Group, and one on St. Croix as well. And those—Between kind of the top-down approach, and the spot them up approach, I think that's really hopeful for the Virgin Islands. If a storm hit us right now though, I think it would just...It would be very difficult. I think it would be a blow to the communities that are kind of already down, and it would be really, really hard.

And when you look at the predictions for hurricanes in the Atlantic basin, and what climate change means for the frequency, the intensity of those events, it means that we have to be smarter about what we build, where we build it, how we build it, how we let people know about the risk to where they live, what the options are for what they could do to be more prepared, how they can be more resilient moving forward. And we need policymakers, and we need decision makers who know that science, and who are prepared to make the decisions that need to be made.

Melody: The mangroves, are they even ready for the next storm? 'Cause you were talking about how they, and then the trees that were there, even though they were dead, at least they were standing, and then Maria comes and knocks those down, so are they—Have they kind of bounced back enough to even help out with the next storm?

Kristin: So, I love mangroves. I love these smelly, squishy, forgotten places along our coastlines, whether it's—Of all coastal wetlands, whether it's salt marshes up north or mangroves, you know, as you get closer to the equator and where we live. But these, those places have such a special place in my heart. I love them. Um, and when I think about this next season and our mangroves, you know, I don't—They aren't.

We always think about ecosystem services kind of as these black and white, either they provide this benefit and the service or they don't. And I think what we're learning is that it might be more

useful to think about ecosystem services along a continuum. The mangroves are a nice example of this, right? So I mentioned earlier that these mangroves in St. Croix, while they're, they're dead, you know, before the hurricanes hit, they were dead because of the drought, but they were still providing some ecosystem benefits. You know, the roosting habitat, fish were using the, the, the root system, and using the detritus that was there, and being able—They were still supporting - whether or not those were natural, you know, functions or not, we could talk about that. But, you know they were still providing some services after the storms, and in that particular system, you know, with the, the, the mangroves down, you know, are they still providing those really necessary benefits that we think about mangroves providing? Are they still filtering water? Are they protecting our coastlines by buffering waves?

Well, that, you know, this, this first climate impact, the drought, basically kind of set them up to not being able to do that with the second impact from another, you know, another disaster. And so now, will they still provide that same benefit, that same service? Well, p-, probably not. Or maybe they'll be less efficient or less able to do that, provide that same service again.

So, I think that those are, when we think about, um, thinking about this hurricane season coming up like, "No. Our mangrove systems are not acting in the same ways that we, that they were before the storms."

But I'm hopeful that, um, you know, these, these can be amazing systems. They are the ones that have been around for thousands and thousands of years. That if we give them the space, we give them, um, the opportunity through restoration activities that these are environments that we can help and assist in bringing back and improve not only the ecosystem resilience but also the community resilience by reinstating their important benefits that they provide.

Jamie: Um, so I, I will also want us to talk a little bit more about your experiences, uh, in, in the hurricane. Specifically, actually, I, I wanted to know—So you said the, the lab had its roof peeled off. Um, and water wash, washed up beneath and also filtered down, or, filtered down from, you know, the roof coming up. What did it look like inside?

Kristin: So when we came up to the Center for Marine and—When we came up to the Center for Marine and Environmental Studies that day, we could see the roof laying on the ground out in front of the building. So, we knew that it had peeled back kind of like a can of sardines. And that top layer is basically all office and classroom space, um, some of my colleagues' office—You are inside but you are looking, if you looked up, there was blue sky. If you looked out, you're looking out [laughs] into the water, into the environment. Um, and you could just see skeletons of the walls. So just like somebody had taken all of your professors' offices and vomited them out in to this space that then, you know, kind of fell out into the outside space as well.

So that was on the, to kind of the top floor, exposed cables, um, walls that had collapsed, um, just paths of debris and papers. And you could hardly make kind of a path, a path through. When we went downstairs, most of the ceiling tiles had fallen through. There was probably about four inches of water. Cable, you know, the electrical cables were down. Of course it's dark so that you can't really see a whole lot. So, we're peering at everything with flashlights and trying to, kind of, assess what's going on and figuring out, you know, what is the state of different things. But that's really what it looked like.

Jamie: Um, last question, uh, for broad audiences. What is drought? I kid you not.

Kristin: Drought is the scarcity of water. And what that means is that we don't—Either there is not enough water, or we can't assess the water that's there.

Jamie: That's all I needed. Thank you.

Melody: Anything else you want to add that our questions didn't address that you thought, "You know, it's really important that I make this point, and I haven't made it yet"?

Kristin: I think there is just one last thing I'd like to share. And that is that I think in the face of disasters, or in the face of hazards, whether these creeping hazards like drought or these acute hazards like hurricanes, it's not to underestimate the power that local communities can have in the fate and outcomes in the recovery period.