Research the Resonates
Villanova CLAS Podcast
Episode 2 Transcriptions
Sustainability: Can Nature Adapt? The Phenomenon of Mangroves

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Guest 1 (EG): Emily Gahagan, '19 MS
Guest 2 (LO): Libby O'Brien, '19 CLAS
Guest 3 (SC): Samantha Chapman, PhD

EG: When a lot of people think of mangroves they envision the Everglades. When you're kayaking or canoeing down a river in tropical Florida and you're looking along the sides of the river, instead of seeing sandy or muddy banks, you're seeing all of these roots coming down into the water and supporting trees. And these trees are mangroves.

Host: That's Emily Gahagan. She's a second-year master's student in the biology program at Villanova University. Central to the research she's been working on are these mangroves, which you may not immediately know by name, but you may be able to picture them.

Libby O'Brien, a senior at Villanova with a double major in environmental science and philosophy tells us what they look like.

LO: You might think of mangroves as these giant trees with big roots that come out of the coasts; And some look like that, but some look a little shrubbier too. They can vary in height and size. They also provide a lot of ecosystem services like flood protection in vulnerable areas, and they cycle carbon in the ecosystem.

Host: This is Research that Resonates, a podcast from Villanova University's College of Liberal Arts and Sciences that takes you inside the labs and classrooms to learn from our distinguished faculty and students. I'm you're host, Chelsea Gerrard.

In our first mini-series, we're talking about sustainability. Villanova researchers are looking into some of the most pertinent issues affecting our planet today, including renewable energy, rising sea levels and climate change.

Emily and Libby have been working with Villanova biology professors on research about a new, natural phenomenon that suggests these mangroves may be adapting to climate change.

SC: I'm Samantha Chapman. I'm an associate professor in Villanova's biology department. So, we are interested in understanding how these mangroves, which are as Libby and Emily said, are these forests that line our coasts, primarily in tropical areas. As our climate is changing, the one thing that keeps these mangroves from being around here and in other temperate areas of the world are freeze events.

CG: Freeze events, or impact freezes, are when temperatures drop below freezing for several consecutive days. In Florida this this would most likely happen at night in the wintertime, and when these freeze events occur, it kills mangroves.

SC: There's not as many freeze events anymore and so these mangroves are starting to move into areas where they weren't previously. This has all types of implications for the types of things that these mangrove forests do for us, including: protecting us against big storms like Hurricane Urma, and also doing things like scrubbing greenhouse gases out of the atmosphere, which helps to control the earth's climate.

Host: These mangroves are moving into marshes that have more moderate climates. Both Emily and Libby are conducting research to help us understand how that's going to affect the marshes that the mangroves are entering. Here's Emily explaining her piece of the project.

EG: I'm trying to see how the presence of mangroves is going to change below ground processes. What I mean by that is—I want to see how the presence of mangroves and mangrove roots coming into these systems that are so heavily packed with marsh roots; I want to see how mangrove root production, and also decomposition, is going to affect soil elevation. Soil elevation is really important in these coastal wetlands because it's what allows these wetlands to keep pace with sea level rise. As the rates of sea level rise are increasing exponentially, it's really important for these marshes to build up more soil than is being broken down through decomposition.

Host: While Emily is looking at the mangroves' effect on soil elevation, Libby is studying how they react to a milder climate in these more northern ecosystems.

LO: What I'm specifically looking at is how different humidities will affect the mangroves. So we think that they're able to collect moisture and water through their leaves based on different pressure gradients and gravity. We want to see how those change as they move into different ecosystems. For example, a mangrove from a really humid climate might act differently than a mangrove that is invading a dryer climate.

Host: This research has been an ongoing project in Dr. Chapman's lab, and one of their early findings has received significant coverage in the media and press outlets.

SC: One of the things that we've found is, it seems like these mangroves may be helping these ecosystems keep up a little bit better than they would with sea level rise under warmer temperatures. And that's a pretty big finding. That is a… perhaps way that shows us that nature can adapt… if we let it, right? So, I think we are at the beginning of this research to some extent. We have a new grant that we're starting. You know, and we're in the first year of that still, so we're trying to figure out whether that finding happens in other places, right? These mangroves are really special places—both for doing things for us as humans, but also for the animals that live in them, and for people—as we talked about earlier—to kayak through them. So, I think we're at the beginning of our research in terms of what we can understand about how these places are changing with climate change.

CG: This is a significant finding, but the team stresses that this still the beginning of their research and there is a lot for them still to uncover. Here's Emily again.

EG: I guess theoretically if these mangroves are able to produce more roots and build up soil elevation, it could be a really good thing for marshes because they're going to be able to keep pace with sea level rise, in the north as well. However, the presence of mangroves could also be bad for marsh, if for some reason the presences of their pneumatophores

increases oxygenation of the soil and increases decomposition. And decomposition is going to do the opposite effect where it's going to take down the soil elevation.

SC: Yeah, I think one of the things that we're trying to understand is how natural ecosystems are adapting to climate and how that can potentially help us adapt to climate via the things that they do for us.

Host: Integral to their research is studying the mangroves themselves. So, this summer, Dr. Chapman, Emily and Libby, alongside other Villanova researches, went to Florida to do some hands-on fieldwork. Here's Libby talking a bit more about that experience.

LO: As an undergraduate student, being able to go travel with a professor and do fieldwork in the area that they do their research is incredible and something that I think Villanova's really special to include undergrads in that kind of research. So I feel very fortunate to have gone down to Florida. We were in the northern part of Florida and we looked at different marshes at different latitude sites, and so they kind of went, as we were talking about this gradient of latitude and temperature, from a less developed mangrove community into a more developed community, across the sites. So, it was really interesting to see. We got to take some soil cores and set up plots for future research. And these plots that we have set up, near Saint Augustine, Florida are currently towards the very northernmost edge of where we find mangroves on the East Coast. In fact, during our trip down to Florida this summer, we found the very northernmost mangrove, I believe an hour and a half above Saint Augustine. So, they are still continuing to move northward at a very fast pace. But we're trying to document the changes that mangroves are going to bring to wetlands right as it's happening.

SC: Yeah, I mean, for me being a field-based scientist is one of the most fun parts of my job, right? Going with people like Emily and Libby and we go out there, and we take boats out, and we get muddy, and, you know, there's a lot of bonding that occurs when you do these sorts of things together.

Host: I asked the team, what are the untold stories of their research that they want others to know? Here's Dr. Chapman.

SC: So, I have to say, I think that the debate about climate change is over, and so I do think that some press outlets are moving in that direction and are wanting to tell both sides of the impacts of climate change. How these things can be scary and devastating for island communities and for epidemiology, which introduces new diseases, but also the hopeful side, right? So now that we're here and we have this climate change that's occurring as we speak, what do we do about it, right? What are some of the cool things that we can do to adapt to this climate change? And so, I think some of the untold stories are still that piece of things. That in areas of the world, there's a lot of restoration that's going on with mangroves. I've talked to shrimp farmers in Indonesia and people in the Gulf Coast, which are essentially restoring wetlands after the BP oil spill. And there's a lot of this work going on to rebuild these green barriers that line the world's coasts. So, we're just a small piece of that, trying to understand how these plants are going to react in a warmer future, but I think that our research can really inform those restoration efforts and help us more forward in a changing climate.

Host: As Dr. Chapman explains, there are many pieces to this puzzle. Coming up with solutions to climate change requires collaboration across the world and across disciplines.

SC: Yeah, I mean research is a team effort, right? I could not go in the field and do all of this and build these chambers and do all the work that Emily is doing in the greenhouse by myself. No way, right? So this is why we need funding for research, is to pay people to help them do this type of work. And it's also what makes it really fun, in doing this team effort because everyone brings their own expertise and their own questions. And these questions are really what motivate science to move forward. So without students with great ideas and big questions, a lot of this research couldn't happen and move in the great directions that it is.

EG: That's actually my favorite part about ecology and environmental science is how collaborative it is because you need to collaborate with other people, like you said. There are so many different parts of how ecosystems are going to be affected by climate change, like: how the fish might change in size or what the plants are going to do. So I think one of the best parts about ecology is the teamwork, the kind of comradery that comes from that. We're all working towards a common goal of understanding how environment around us is going to change.

Host: Thanks for listening to research that resonates. Check out all our episodes on sustainability as part of our first themed miniseries.