I understand that everything is connected, that all roads meet, and that all rivers flow into the same sea.

Paulo Coelho. If you know anything about Texas State University, you know that our San Marcos river is a point of pride in awe. A crystal clear river running right through the middle of Texas state's campus at a consistent 72 degrees Fahrenheit.

This river, like Goll Rivers really is special. It has served and sustained people and wildlife for thousands of years, long before San Marcos was ever given its current name. Rivers are vital to human plants and animal life. And maybe we can learn a thing or two about life from rivers. Maybe rivers can teach us the importance of connection between humans and the environment we live in the future of our ecosystem, and the need for human connection to build a brighter future. Join us today as we discuss Rivers research and relationships. Well, welcome to Research Outside of the Box, a podcast for unconventional, unique and out-of-the-box research happening at Texas State and the innovative research approaches faculty use along the way.

I'm your host, Kamarie Carter, training specialist for faculty development.

Thanks for tuning in today. It's our first episode.

So a little bit about this podcast, faculty development hopes to bring attention to some interesting research that's happening at Texas State, and we know there's a lot. We also want to highlight some innovative approaches to research and hopes that we can inspire others to well research outside of the box. All right, so with that said, joining us today in the studio is Dr. Weston Nowlin. Weston, would you mind introducing yourself? Hi, my name is, uh, Weston Nowlan. I'm a professor in the Department of Biology and, uh, I'm a community and ecosystem ecologist, and I work primarily in rivers and aquatic systems around the state of Texas and in this region. What does it mean to be an aquatic researcher? Yeah, I think so. I can comment on just being an aquatic researcher versus an aquatic researcher at Texas State, which has, um, sort of, sort of twofold thing. Aquatic researcher is, um, somebody works in, in my particular case in what we would call inland aquatic systems.

So, um, mostly freshwater systems.

And, uh, there's a, you know, entire societies dedicated just to that the Society for Freshwater Science or, um, um, the society for Limnology and Oceanography.

Um, and so, uh, we primarily work in rivers, streams, ponds, lakes, reservoirs.

My particular area of research, especially over the last about 20 years, is, is in streams and rivers. Um, though I do stuff in lakes and stuff too. Which we're at a perfect location for the work that you do. Yeah, absolutely. Which leads us to the Texas state thing, which is basically, um, Texas State is centrally located to study aquatic ecology.

I think, uh, the department of biology and the university, other departments in the university, including geography, have a long history of aquatic research and doing work on aquatic systems. And so in many ways, the work that I do plays into the strengths are already here at Texas State. So, um, and because we are loca, I mean, we literally have a river running through campus and, um, we can leverage that and utilize that for research purposes and also for public outreach, et cetera. So. Yeah, cuz your, your office is located, what, maybe a hundred feet from the river? Yeah.

And it's also located from one of the tributaries of that upper river, which is, um, Sessom Creek, which flows directly underneath our building. That's right, that's right.

So, yeah, I mean, uh, it is very rare that I can, that any researcher could walk out their front door in their office and then be down at their field site in five minutes. So let's take it back to young, young Weston .

Okay. What, what did Young Weston want to be when he grew up? What did you know that you wanted to be an aquatic researcher and a full, a full professor at Texas State in X amount of years? Um, so think about this.

So this, this actually, it's funny, we actually have a seminar in the Department of Biology that we, we've done, uh, multiple times about how I became a scientist. And so I was asked to talk about this before, but we often, you know, but so, but it's always feels awkward talking about this, but when I was a young person, I was raised in largely rural environment, um, and, and, uh, in, in, in north Texas. So I'm originally from Texas. Um, I didn't really have designs to come back here, but I, I did, um, sort of where that's where the opportunity was.

But, um, uh, when I was a kid, I was raised, we had horses and goats, and my parents had a lot of land and we, and my brothers and I would go off for the day and, you know, just run around outdoors and stuff and have a, have a great time.

Um, I was particularly interested in, uh, insects when I was a kid. I had an insect collection.

I would collect insects, I would use, uh, old pill bottles and, uh, catch, uh, grasshoppers or other insects and put 'em in the pill bottle. And I made a necklace out of it, and I would carry bugs. I was, you know. So you were curious. I a curious. Young age was curious.

Yes. Yeah. And I had a fossil collection. I love fossils. Um, yeah, I, I loved it.

And then I, you know, and I was involved in Boy Scouts and all of that, and so, um, I really loved biology.

I wasn't sat on aquatic ecology yet, but I went away to university of my initial year thinking, I'm a biologist, so I wanna be, I wanna be a

medical doctor. And it turns out those two things, while you use biology, medical doctors is very different.

Um, I did not enjoy, um, study of, of medicine.

I didn't realize that was something I, I just, I just didn't want to do that. And so I felt pretty kind of, I knew I liked biology, but I didn't know what, what I wanted to do. And then I met an entomologist when I was an under undergraduate. And, uh, that person really inspired me.

And, and I became really then, oh, I see. I, this you can actually study bugs for a career. And then I took an aquatic ecology class my junior year of university, and it, it sold me, it absolutely sold me, um, not only just insects, but all the invertebrate fauna that's there, the functioning of those aquatic ecosystems themselves.

You just fell in love. I fell in love with it. I didn't, I could not imagine doing anything else. So can you tell us about the research that you're doing or the projects that you're currently working on? Yeah. The big project we're working on right now is a collaborative research proposal with the US Army, uh, Corps of Engineers.

And, um, that was funded through it's funded, um, through congressional appropriation. Um, that project was about a year and a half to two years in the making. Um, that was started with initial discussions with US Army Corps. We actually have a co-op office here at Texas State University, um, with Todd Swac.

And Todd is a, uh, researcher at US Army Corps that, uh, leads the ecological modeling group. And I can talk about that in a second, what that means. But we started that project, wrote the initial proposal, and got funded for initial three years of funding.

Uh, we're now in the, that was sort of the phase one of that project. The second sort of phase of that project.

We'll come online, uh, starting in the fall.

And so, um, it's the, I want to really acknowledge my collaborators at Texas State. In addition to Todd, um, also, uh, Dr.

Uh, Astrid Schwab and the Department of Biology is involved in that project, and she will actually serve as the PI for phase two of this project. I think I've, I'll have about six years in and I'm ready to kind of tap out and yeah, let somebody else, um, um, take, take the lead on that.

And then, uh, Dr. Benjamin Schwartz, who is in Department of Biology, but does, he's also the director of the Edwards Oxford Research and Data Center. And so between the three of us, um, you know, we, we work on this large project, and so that project, again, is working with the core of engineers and folks say, well, what you're working with engineers and, and to some extent we, we are. But, um, there are certain things that are, that make this sort of collaboration between eco aquatic ecologist

like myself and Astrid and Ben working with the core and their, their mandate as laid out by, uh, legislation in the United States.

Um, the US Army Corps, um, is a broad group, and they're mostly composed of engineers, and a lot of what they do is hard engineering projects, right? They operate dams, they build dams, they have to engineer, um, inland waterways for the safe travel, safe travel of goods and services and stuff. So that's part of their mandate. But because they're relating, because they're regulating flows and modifying rivers, they have a significant environmental component in what they do. If you're releasing water from a dam, what does that mean downstream for the biota? What is the environmental impact of that? How can they time dam releases in order to facilitate spawning of certain fish species or prevent the spread of something maybe downstream like zebra mussels and so on.

So they have a big environmental, uh, component, what they do, and they have researchers just do that. Everything from species management to contaminant research, et cetera. So the group we're working with is actually the Ecological modeling group, and that is a group of mathematical modelers that try to, um, make predictive models to look at the consequences of eng uh, US Army Corps of Engineers, uh, practices, and then also think about how things may change in the future and how they may modify their practices.

And that's where we came in basically, to work with them on that last bit. So. This is a huge, huge collaboration. It is, it's a collaboration with the core.

So, um, in the Corp, we probably are working with at least 20 to 30 folks, I guess in total. Um, you know, we have annual meetings with the US Army Corps.

Um, we had probably at least 50 people here at Texas State last summer. And then this year we'll travel to Vicksburg to go, um, where their main waterway station is, and we'll, uh, collaborate with those folks there. Um, so it's a collaborative project with the core, but it's also collaborative within Texas State. Mm-hmm. . So we have basically three PIs.

We also some other sort of co-collaborators. I'm working with, uh, Camila Carlos Shanley in the Department of Biology who does microbial ecology. She's working on some microbial questions in rivers, um, and then, uh, and other folks in the Department of Biology, and then other folks in other departments. But we're also collaborating with other folks at other universities. So that includes folks from like Texas A and M University, um mm-hmm. , uh, university Tennessee, Knoxville, uh, St.

Kate's, which is in, um, uh, Minnesota, uh, Guelph, which is in Canada. So we're bringing in expertise and collaborators from a diversity of other institutions also.

So it's, in many ways it's like herding cats, you know, as a pi, and you can understand why. Yeah. You understand like, you do this for six years, you're kind of like, maybe someone could try to do some of this. And

then, and there's all the appropriation side of it too, um, that sort of, those responsibilities.

But, um, it is so much fun to go into a meeting and to be in with folks that are really good at what they do.

Super smart, fun to work with. And then you get to, I, I get paid to do this for a living. I get to think up cool projects, cool questions, and then we collaboratively then get to, uh, determine how we then attack each of those questions in more. So. You're living the dream. Yeah, it's, yeah, I just, um, I dunno. Gravy train made a with biscuit wheels. I have never heard that saying. Before. You're welcome to use it for here on out. Noted.

So for folks who aren't in this field, what makes this research project out of the box different, unique? Yeah.

Um, so there's sort of two, I would say there's sort of two things. Uh, most of the folks I work with are what we would call empirical, um, ecologists in the sense we collect data either experimentally or in the field. We analyze those data and we present those data at meetings. The really out of the back box part of this is we're working with people that, um, speak a very different language than us. They're, they're modelers, they basically speak sort of language of, of math, and they also speak the language of, um, uh, more of a management type approach in terms of how do we want to think about things into the future? Uh, how do we manage our resources, our aquatic resources, uh, in Texas and the United States.

And so, uh, that's the sort of out of the box part. Part of this for me is that I've had to learn how to communicate with people that may do things like, um, uh, that may be doing some sort of interesting modeling using ai mm-hmm. . And I have to think about how we're gonna be, how do I communicate, you know, what do you wanna get outta this? What do I wanna get outta this? Here's the empirical data that we're collecting. How can you use the data that I'm collecting to inform your models? And then you then can say, uh, but, you know, it'd be really nice to have this piece of information to inform our models in terms of forecasting into the future about, um, the, the spread of a non-native species, um, in rivers.

And so, okay. All right. So then how do we collect those data? How would we get that information so that they can then parameterize their model mm-hmm. and they would run that under various climate change scenarios or whatever.

So that's the fun part of this, is I, um, I had a little bit of sort of that kind of modeling work as a postdoc, not much. But, um, I collaborated with folks like that, but this is much more sort of digging into that and I've had to learn how to speak that language. I was. Gonna say, so you're having to learn on top of being the educator, being the representative of this field, you're also learning on top of that. How is that affecting your either career development or just your knowledge as a researcher in general? Um, yeah. It's, it's really impacted the way I view things and, and I am reading and exploring areas.

I didn't think I would be, I, I would be focused on, um, I was so focused sort of in my little lane, and now I have to go, oh, but I can see now how this is broadly applicable. If I read these other things or I work on these other questions, I, I now have to, there's a whole new sort of area of research that I have to think about. And that's certainly relevant for my students too. So my students, for example, Todd is teaching a, um, uh, um, ecological modeling course just this summer for graduate students in the department.

And my students are taking that so that they are facilitated. They, they, it's facilitates their communication with members of the core mm-hmm. . So whenever they work on their projects with folks from the core, they know how to speak that language. Um, yeah. That actually brings me to my next question is Uhhuh, how, so you do use students within your research.

What does that look like? How do you engage with your students? What does that dynamic look like? Especially because most students are only here for a limited amount of time. They're not gonna be here during the entire research project. Cuz I think you said it might go beyond six years Yeah. Plus after that. So what does that look like for you? Yeah.

Um, so most of the students that I have that are actively doing research, um, we have some undergraduate projects and undergraduates, um, help us in the lab and in the field. And they're a super valuable part of things. But most of the people that are running projects are master's students or PhD students.

students. I also have postdocs too. Um, but you know, the folks that are primary, the most numerous folks in the lab, they're primarily driving these research questions or graduate students. And so inside the proposal we have certain deliverables that we have to do. We wanna do X and Y and Zed, and that's important that we do those things. Um, but a graduate student, and I will start the, start this process super early in the sense that, um, whenever they get here, even before they get here, we start thinking about what is interesting to you? What are the things that you find interesting?

What are the things that you find interesting? And they say, well, I'm interested in it all. That's always what they say. And you go, that's, well, that's great. Everything's exciting, everything's exci. Yeah. That's a great place to start.

Right? Because they're, they're, they're, the world is your oyster.

That's right. Yeah. Yeah. And so you get to, you get to take that student and say, okay, well, uh, let's just meet and we'll meet for over the course of semester or whatever it is, and just brainstorm and read, uh, the scientific literature and think about what inspires you and what are interesting questions that you could nest inside of this overall, uh, project with the core.

Um, so, you know, with my students, meet with them on a weekly basis, um, try to, you know, we set up timelines and try to keep them moving forward

as best as we can. You know, master students have about two years to get something done.

And so, uh, most of very short amount of time, very short amount of time. And so they, I like to try to get them to hit the ground running as quickly as possible. Uh, sometimes they're setbacks or whatever it is, and sometimes they get, things get delayed. But in general, like if you get them moving and you define a, you know, a project clear sideboards, here's what we're gonna work on. Here's our question, here's our hypotheses, here are the methods we're gonna use. And once they get comfortable with that, they're off to the races. And so master's projects are really nice. Uh, PhD is a whole other thing in the sense they're here for, you know, four to five years.

Um, they have several projects they'll be working on. And at that point, you know, once that PhD student is advanced to candidacy, in my view, they're all, they're more of a colleague. There's somebody I can collaborate with. And that's the, that's the intellectual development and mm-hmm. academic development, you wanna see in those students by the time they're ready to graduate. I mean, you're basically making a, a potentially a colleague in the field that'll be there forever. So it sounds like you have quite a few students who are playing fairly significant roles within this project, which I imagine is a really good opportunity for them at different levels. Cuz like you said you had undergraduate Yep.

Cuz like you said you had undergraduate Yep. Masters, PhD students. Um, how many undergraduate students do you utilize? Because currently there's not a lot of undergraduate researchers, so what does that look like for them? For them?

For them? Um, totally depends upon the, what the student wants to get out of it. Um, I usually, right now, over the last couple of years, we've had somewhere between four to five undergraduates in the lab. Um, some, sometimes they just want a, a job, um, picking bugs, that's what we call it. So you just, fun job. A fun job. But they can come in and they can do that 5, 10, 15 hours a week if they want to. And, uh, part of it is they get the experience of that. They may not go into ecology, they may not go into stream ecology. They may end up being, you know, an MD or they may end up being a dentist, or they may end up being a molecular biologist mm-hmm. That works on eye development or something like that.

So, you know, uh, but the important thing is they get that experience and they have the opportunity to work in a lab, but that's something they think would be potentially rewarding for them. There are other undergraduates that, um, come into the lab that say, uh, this is what I want to do as an undergraduate. And at that point you can start to say, what's a nice little project we can do as an undergraduate that would be something that would ultimately be presentable to scientific audience and that you could put a nice sort of feather in your cap as you develop your career and as apply to graduate school, whether it's here or someplace else.

Uh, so yeah, those undergraduates are, are absolutely key.

Uh, they make up, I mean, you, you don't want to have all your undergraduates in the lab washing dishes. That's, I mean, that's an important part of science, but it's also not what you're there to do.

Mm-hmm. You're there to mentor those students, give them those opportunities. Mm-hmm. . So. So I was actually able to chat with a couple of Dr. Nolan's students who assist with the Army Corps grant research. You'll hear a couple of short clips about their experiences with this research and how it fits into their larger career goals. So I am Kira Derman, uh, so I'm a master student under, uh, Dr. Wessin Nowlan, um, who is, uh, under the Army Corps grant.

And, uh, I help with, uh, the lab work.

So processing, uh, the macroinvertebrates, um, that we collect out in the field, as well as, um, filtering, um, and doing any nitty gritty lab work as well as my master's thesis work is gonna be focusing on, um, doing data analysis with the macro invertebrate, uh, communities that we collected out in the field.

So, and I think it's also, um, really cool, um, being able to collaborate with so many other universities and also collaborating with other pro professors within Texas state too.

Yeah. So I started a master's program because I wanted, um, to learn more skills related to data analysis, um, as well as, um, just learning more like how to do independent research, um, with the help of an advisor of course.

But, um, so that definitely helped, like fits in with my career goals as I, I wanted to want to be a, be a biologist and, um, either the state or federal government. So I want to be able to be as capable as I can be in conducting and analyzing, uh, different projects, um, from start to finish. Um, my name's Miranda Sams, and this is my first official year completed. I'm working on my second year and I am in the aquatic resources department in biology. So I'm currently working on the Army Corps grant and I'm just a student researcher, so my thesis is just a slight focus on freshwater macro and birds. In your eyes, what makes this project unique? So the biggest thing is just the collaborative network that goes on with the research. So we have a lot of people in the Army Corps that are working together and then a lot of universities within that that help on the research. And there's also within Texas State specifically multiple labs working on the research. And so it's really cool to just get a bunch of different perspectives and then also be able to interact with different professors and see what all's going on on a big scale and then also in your focused area. So I think that's the biggest unique thing. I had the privilege of visiting Dr. Nolan's in Development River Systems lab at Freeman Center, or known as Freeman Ranch. The Freeman Center provides 3,500 acres of hill country habitat and onsite facilities as part of Texas State University. The main objectives and the management of the Freeman Center are to protect its ecosystems and enable research and educational opportunities within the

Freeman Center. This lab is new to Texas State and one of only a handful of its kind in the United States.

As you approach this outdoor lab, you see rows of gray and blue tanks, roughly four to five feet in diameter connected to each other by a rectangular channel.

Currently there are 24 tanks, but the end goal is to have a total of 36 tanks.

These tanks allow Dr. Nowlin and his team to conduct mini river experiments. Here's a clip from my visit, and please excuse his team's enthusiasm in the background. So, as an empirical ecologist, we often go to the field and then we make observations about, um, uh, occurrence of species or density of, of, of particular taxo groups, whether that's fish or invertebrates or freshwater mussels. And we see an association or, or not.

Uh, and that could be a positive association or negative association with certain kind of conditions, certain water quality conditions, habitat types, um, flow conditions.

Does this river dry up frequently? Mm-hmm. or does it not dry up? And so we can infer some relationships about, um, uh, occurrence or density of, of individuals of certain species that we may be interested in. Mm-hmm. or community types may be interested in, but we really don't have the mechanism for that cuz we're not, we can't experiment, we can't experiment in a live reverse . Yeah, you can. And, and, and in some, in some cases folks have that ability cuz they have like a research station where they have experimental streams, they're allowed to manipulate, but we really don't have that luxury, uh, here in Texas, uh, you know, for a variety of reasons. And so, but what we can do is we can build artificial systems like this in which we can model stream dynamics. And so these are basically fiberglass tanks and they're set up into, uh, paired units that we would call geomorphic or habitat habitat units. So if we go out to a river, we often segregate things into different habitat types. You have a pool and then you have a fast flowing shallow area called a riffle, and that's what we call those. And so these systems are set up so they're compartmentalized so that I can put a baffle between them so that I have a pool and a riffle couple coupled together and it recirculates together. And so, so it's its own separate, it's own separate system, experimental unit.

And so then, uh, one of the keys to this is replication of a bunch of treatment types. And so I can discreetly manipulate a particular condition and then I can get that mechanism response.

So like for example, if I think drying is something that really is causing a pattern that we see in, in community types or something across rivers, I can take half of these units and I can dry them out, and the other half I don't dry out. And I look at the consequences of that. So it's a, it's a rigorous experimental approach. They're not very many of these facilities in the United States. There's just basically kind of a handful. So the cool thing about this is then this allows us to assess

mechanism. And, and one of the big things we're really concerned about with regard this US Army core grant is we wanna know how communities are gonna change in response to conditions. But we have some scenarios that are pretty well understood about what's gonna happen to rivers into the future. And one of those is via climate change. So you could run any number of experiments. A nice thing about this is you set them up, you run the experiment, you break them down.

Uh, we can put any number of organisms in here. And, uh, and yeah, you basically set up a little community, a model community that you can manipulate and do experiments on.

It's, uh, it's, it's, it, the only thing that will limit you when you have this is just your imagination. Oh my God. Right. That's it. In, in addition, just as to the research instrumentation that we build, um, having a nice experimental facility is something that I've always aspired to. And I, I was, I won't, I mean, I'll go ahead and say it. I, my job started here in 2005 as an assistant professor.

And, um, I had come from, um, a lab when I was a postdoc that actually had an ecological research center. And we had, you know, all these experimental facilities, outdoor, indoor, um, that was one of those things that you really aspire to, to get, and I really wanted those. But finding a funding and the amount of funding and the proper funding sort of mechanism to invest in that, pardon me, finding the proper infrastructure and stuff to invest in that is another, is another matter altogether. Because you have to convince somebody we have to spend, you know, $120,000 out of a grant in order to just purchase these things and whatever. And some funders are like, well, you have no pilot data or that's too much, or, um, we can't buy you infrastructure because we have to take it back at the end of the grant. There's all those kinds of things that happen. The, this collaboration we have with the core was absolutely the opportunity and it's not a small amount of funding. We could dedicate that to the, to investing in that infrastructure.

Um, and so the immediate thing myself and, um, Astra Schwab talked about was an experimental stream facility that is something we have to build.

So, um, you know, credit to Mike Blanda and Chris Thomas, um, director and the ranch manager out at Freeman Center. They have really facilitated us doing the work there.

They have really facilitated us doing the work there. And it's been fantastic. And I, I'm I'll, I keep talking about students, but this is one of those things where it's perfectly designed for students, right?

right? Because an experiment could the last 60, 90 days or something like that mm-hmm. , um, you get effects fairly quickly in those things.

Uh, very clean, often experiments, um, you know, in terms of, you don't have a lot of noise in the data and stuff that you get if you make a bunch of field observations. So this, it's like, it's, it's, it's perfectly designed for, for a student. These and dissertations perfectly

designed. So I'm curious, research as most things in life don't always go as we expect.

Mm-hmm. , what turns or twists has this research project with the core taken? Oh yeah.

Oh, the big one that we had, uh, was the initial start of the project was, and the last part of the development of the project, especially whenever we were writing the proposal, and the first year of the project was, was in the middle of Covid. And that was a big one. Um, that was really one where we were trying to write a proposal collaboratively to collaboratively together with folks at different institutions. And within Texas State, our ability is to sit down in a room and draw things out on the board was pretty limited. It's. Gone, essentially. It's gone.

Um, now, I mean, zoom is zoom and we can do some of that work remotely. And I think our lives have changed as researchers because we now have the ability to work with sort of in that sort of remote context a lot better than we used to. Um, but that was a big one. Another one was, um, we had an initial kickoff meeting with the core and it was all remote and sitting down in the same room with the folks from the core and brainstorming over the course of couple of days. And even the simple thing of just going out and getting a cup of coffee or drinking a beer, I mean, there's more fun fundamental science that's done just at meetings, professional meetings when we go out into the lobby of the commission center or the hotel or wherever it is, and you drink a beer and there's lots of little drawings that go on the back of napkins and stuff. It's so much fun. That's. Where science is born. That's the back of. Bar napkins.

Back of bar napkins. Yeah. Just, yeah. I, I you think I'm kidding, but it's true.

And it's, and it's, it's really fun to do that. And we didn't really have the opportunity the first about year of the project. And so Todd and myself, um, uh, as, especially over the last year, two years, we said, uh, that communication coordination really needs to be improved.

Um, and it's not really our fault because of Covid, but we're gonna make a really concerted effort. So we had a meeting here last summer and August, and we had as many folks from the core. We had remote folks from the core that were basically zooming in.

Um, we had people come in from all over the us, our collaborators at their universities, and it was super awesome. Was that the first time that y'all were together in person since the, the birth of this project? Absolutely.

Yeah. Wow. And so, um, and it was, it was, uh, fundamentally, uh, like a game changer. Like everybody started to see how the pieces really could fit together much more because we were in the same room together. And so that, I'm sure. There was a tonal shift of collab of collaboration as well. Yeah. I mean, you get to know somebody on a computer screen, but you don't really get to know somebody on a computer screen. Mm-hmm. And so, um, you know, and I know some folks, um, I knew some folks on the,

you know, uh, personally prior to this project, and it was great, but some of these folks, especially some of the researchers at the, at the US Army Corps, I did not know that well mm-hmm. . And so yeah, we hosted 'em out at, at our house and, you know, we sat underneath the trees and, and August heat in Texas and Oh, super fun. Just straight introduction to Texas Heat. Yeah. Yeah, yeah. Well, most, a lot of these folks are in Mississippi, so they're, so they, yeah, similar, similar.

But yeah, it was, that's, that was, that was sort of one of the big challenges.

And, um, you know, that personal interaction, connection, uh, the Covid thing was really a big one.

Um, um, and then Covid also did some other things too, like availability of supplies, timing of when you can get things.

Um, you know, I took you to the experimental stream facility that was, you know, delayed because of manufacturing issues and availability of resin to make those tanks and so on.

So, I mean, that's all sort of a covid thing. Um, but, you know, having gone through that, I now know like what that is like, and how to sort of navigate my way through some of those things.

Mm-hmm. , but it's sort of a learning thing, and you're like, how do I get this done in a timely fashion? And you just sort of have to rest, rest, sit, sit and say, it's not gonna happen in a timely fashion. It's gonna happen in the time that it takes. And so, which can. Sometimes be a hard pill to swallow. , that's hard, especially whenever you have deliverables mm-hmm. , and you have a timeline you've laid out in a proposal, and that's where you have to communicate with your funder very clearly to say, uh, we need an extension on this, or, I know this is what the timeline says, but Covid has done this and I, and we're not unique. I think that happened across the board all the way across the board from NSF and IH to other state and other federal funders.

Um, COVID really kind of threw a spanner into the works with everybody in terms of getting a lot of stuff done in a timely fashion, especially if you're having to interview people or do field work, you know, we were told we couldn't basically do field work for a while. Yeah. And, and that, and that, that's okay.

and that, and that, that's okay. Right. That's understandable. But, you know, a lot of people are really sort of raring to go and, and chomping at the bit to go out into the field, but it takes, it just, that's the constraints you have to operate under, and that's the reality of it. I kinda wanna go back to something that you had talked about. You work with politicians, right?

You work with politicians, right? Mm-hmm. , would you tell us a little bit about what that experience is like? Yeah, it's entirely, it's, it was, it was a big adjustment for me. And that was one of the things that I think is, is kind of outta the box with this in the sense that the

funding mechanism is through via congressional appropriation every single year.

Um, so that means then I have to work with lobbyists from the, uh, from the university, basically. And so the university has lobbyists that work to, uh, ensure that these items are included in, in the appropriation on an annual basis. I was not used to working with lobbyists.

I was used to writing a proposal. And that proposal usually goes to scientists and the scientists review that, and then they look at that. And whether that's the National Science Foundation or whether that's with, um, you know, the, uh, uh, like Texas Parks and Wildlife or something. I write these, I write these proposals.

I write these, I write these proposals. They're very focused, very in depth in the scientific language. Now we have to write and help write these language related to the appropriations that then get sent up that the lobbyists then take into congressional offices to discuss those things. And then I may get contacted by congressional offices to say, um, this is what we're looking at is what is the level of funding here? Can you clarify X or Y?

Can you clarify X or Y? Or, or whatever. And so that's something that like, I can't launch into, well, you know, we're gonna use a redundancy analysis to look at the data with they don't they. That is, that's not what they're there for. That's not what they're there for. They wanna know what the, sort of like literally the three or four sentence, three or four bullet point importance of this. What is the importance of this? Why is it so critical to understand this? How does this relate to the core of engineer's mission? How does this relate to enhancing, uh, research at a a state of Texas, uh, university? Those are the critical things you have to be able to translate in a very short period of time. And that's not easy to do, um, if you're not trained in that way.

And so, you know, yeah, it takes some, takes some time to get used to that. I. Imagine.

I know that if I got a call from, you know, congressional office, Uhhuh, I would be very scared. Usually they'll ask you questions about what's the importance of this? Why do you think, how does it enhance the CO's mission? How it enhance your mission, um, as a Texas university.

How it enhance your mission, um, as a Texas university. And then lastly, what is the budget? What are you looking at? And so, you know, you get your 15, 30 minutes at the most and then you're out the door. And so it's, it, it can be intimidating, particularly whenever you think from a research budget perspective, this is a lot of money. But when you start thinking about it from the congressional perspective, um, congressional budgets are. Enormous. Enormous, yes. Unthinkable. So, or at least for me, I don't know, when I'm thinking Yes. Of the money that goes into the government, I, I'm like, Nope, I. Yeah, yeah, yeah. And, but I mean, at the same time then at the end of that, you're still steward of, of tax dollars, right?

Absolutely. And so, um, the importance of that is saying what pro? And then you have to then update folks what is the, what is the progress we made?

what is the progress we made? Um, what, what have we provided that's useful? And then where are the gaps into the future in terms of, um, what is the core? And what are the core and its collaborators still need to, to need to suss out or work on. And again, it's tough because that's a two or three sentence little thing that you need to be able to put together pretty quickly.

And, uh, um, you know, the core is not allowed to lobby the core is not allowed to, uh, talk to Congress about their own funds with regard to this stuff. Um, but so you have to, so the core is not allowed to do that. So that really kind of falls, falls on Texas state to, uh, to, to, uh, to work with those offices to do that.

And, you know, the lobbyists, we have the lobbying group here, the Normandy group, have been fantastic to work with. I really like working with them. They're really great.

And you know, we have about, think about two meetings, two discussions per year to make sure things are moving forward and stuff. And so, uh, the minute sort of the budget hits in July, I'm sorry, sorry, uh, January, February, we're already talking about the next year.

And so, um, uh, that's, uh, one of those things that you sort of never falls off your radar screen. I imagine you didn't foresee yourself maybe 10 years ago working with lobbyists and Rivers and the core and all of these other groups. No, certainly I didn't, um, 10 years ago I would've imagined myself still sort of applying to Parks and Wildlife, NSF doing those kinds of things, um, uh, engaging in sort of this sort of standard activities. But this is. A whole nother level. Yeah, it is. It is. It comes down to me being able to, uh, talking to diverse audiences is, is never easy. And then you have to understand who your audience is, and you have to understand the languages that they use. And so if I'm talking to a congressional office, it's a very different language that if I'm talking to modelers at the core, which is a very different language than I have sitting down talking to somebody who's doing a podcast at Texas State. So learning how to , you don't wanna say you're disingenuous. You're not being, yeah. You're not assuming a role. When you're adapting and you're, you're, you're meeting people where they're at. Yeah.

And that's, um, and as scientists, that's a real struggle for us cuz we often, especially academic scientists, um, we often sort of dig into academic speak. We dig into, um, our own sort of narrowly defined research interests in many way many ways.

And, um, uh, you know, the question we often, I often get as an ecologist is, so why do I care? What do I care about? You know, I spent whatever, about a decade working just on a, um, an endangered species of, uh, riffle beetle in, in, uh, in, in Kamal Springs and in in this area.

And, uh, uh, you, the question you get all the time is, so why do I care? Why do I care? And that's the general public. We're not trained very well to interact with the public.

I would argue. It's not an easy thing to do.

And, um, being skillful at it can be, can be hard, and you learn by trial and error.

Right. So. So you mentioned having to explain why it's important mm-hmm.

, what are the larger implications of this research and why is it important to you? Yeah.

Um, the larger implications. Oh. So, you know, from sort of a global perspective, I'll put it this way.

Uh, aquatic ecosystems and river ecosystems, um, I don't use the term lightly, uh, but we've known for a long time, a lot of aquatic systems on this planet, um, inland aquatic freshwater systems, um, are in, are in crisis. Part of that has to do with human impacts on those systems.

Um, now changes, change is inevitable and things change. And there are natural disturbances that occur also, or natural changes that occur.

But humans have, uh, really altered really the biosphere fundamentally in how we do things. Freshwater is a limited resource for humans and human societies, but it's also a limited resource for the animals and plants and organisms that use it too.

My perspective is, um, that inland systems are inland, freshwater systems. There we're really kind of at as sort of, I would argue, somewhat of a tipping point globally in terms of our impacts. We spent literally, um, decades of the last, um, de we spent the last few decades trying to understand systems and how to repair them or at least, um, do some sort of restoration on them, um, quite a bit. Now that's, it's a challenge, right? Because we've heavily modified, um, all of our rivers, uh, again, uh, particularly in the United States and in, and in and in, uh, uh, and big parts of the world, and then some parts in developing countries, they're now starting to greatly modify them. They're putting dams up on the Mekong or in parts of Africa and these huge river systems that are gonna fundamentally change the ecology of these systems. Mm-hmm. . So, uh, now you lay in all the challenges we're facing, whether it's over exploitation of resource, of resources like fisheries, or whether that's, uh, modification of the land cover patterns around rivers, or whether that's the big one is alteration of flow and the flow regimes in rivers. Whether we do that by extracting water out of them, or we do that by building a dam or whatever it is. Um, you know, you can think about introduction of non-native species into rivers, extra extrication of native species into rivers, pollution, all of those things. There's so much that could happen. So, so, so much that goes on. So, um, understanding the interactions, understanding the impacts of that, um, are important.

are important. So from a sort of the importance of this is that, um, of this project is, if the fundamental question ecology is what is the abundance and distribution of species and organisms through space and time, and what is their interaction with the environment that is, it's like red fish one, was it red fish, blue fish, one fish, two fish? Like yes. That's basically what it is, right? And so, uh, we just need to know, uh, patterns of why are they here, why are they not here?

And, um, how do they interact with their environment? What causes them to be here or not here?

That's, that's ecology summed up. And so if we think about all the things that can lead to loss of native taxa or introduction of non-native taxa, um, there's a bunch of potential mechanisms. Some are natural, some are human driven, but understanding how those impacts affect those taxa are super important because if we have a perspective of, if we say that conservation or protection of native species is important, we have to say why it's important. What species are we gonna target? And then how do we make sure that we preserve them right in a natural environment? Mm-hmm. , if we say then also that the spread of non-native taxa is bad, or at least has some implications, uh, that are negative, then what facilitates their spread?

If they are someplace, how can we modify conditions in order to remove them or to eliminate them from the environment?

from the environment? Um, that's what it fundamentally comes down to. And the core and their questions are really related to how are their activities, um, going to facilitate the spread of non-native taxa, or how can they preserve native taxa in particular into the future? Because we have sort of, you know, land use changes and pollution and modification of flows, but we also have this sort of specter of climate change and the, and the impacts of that over long periods of time, 30, 40, 50, a hundred years in the future. What does this mean, rivers? There's an effect on everything. Everything. Yeah. So I mean, and whether you think about it from the perspective of like, you know, all Texas rivers drain in the Gulf of Mexico, well, you know, um, everything we dowhere in our, it goes somewhere and it goes down to the Gulf of Mexico and there has implications for fisheries, et cetera, but also has implications for all the human use of the water. Mm-hmm. has those implications for recreational activities also implications for protection of these taxes.

So it, it, I mean, it has, it has, uh, it, it's fundamentally important to think about if we're doing something now, what are the implications of this into the future? So as we're closing up, okay.

I am curious to know, what advice do you have for other researchers who are wanting to think out of the box regarding their research? Um, the first piece of advice I would have would be to, uh, talk and have discussions with folks that you may not think about having those discussions with in terms of collaboration or at least understanding where your interests are.

So, um, I had never really thought that I would be working with a group of modelers that maybe use machine learning to know how to fill temporal and spatial gaps in data, um, or working with hydrologists as much as I do nowadays. Um, you know, you can see where those two things sort of, you know, would be make sense, but, uh, that's not my comfort zone, right? Mm-hmm. , and I have to sort of get over myself and say, here are my research questions and here's what I find interesting. What do you find interesting? And how would we think about this? And that may include somebody, you know, relating to folks from the social sciences or economics or whatever.

Um, understanding how you build those bridges across fields to really tru truly have, um, multidisciplinary and inte interdisciplinary research. That's, that's key.

You have to have those discussions. And there are people you can even start with in your home institution. You can have those discussions, like, and people are really great, you know, they're wonderful to have those discussions with.

they're wonderful to have those discussions with. May include engineers, people in geography, or people outside the sciences, or even mathematics, chemistry, whatever it is. You, you know, you can have those discussions. So I think that's a big piece of advice is talk to folks and understand where those, um, ability, where you can find these sort of ideas and, and shared interests. The second part of that is we often really get sort of, um, embedded in our own research so much that like, we just don't ever step back and go, why is this important? And then what does this mean in a broad sense? Right? What does this mean in a very broad sense? And how do I then interact with the public more?

And how do I then interact with the public more? I know, um, for example, NSF has this, um, you know, they, they want your, you know, sort of the sort of the, the outreach implications, the sort of broadening participation, those kinds of things. Those are critically important, but we should be thinking about that with every single project we absolutely should. And so, uh, we don't, you don't wanna seek out the press or any of that other stuff, in my opinion. But, but, uh, how, how do I, how do I engage the public to understand why this is important? Mm-hmm. And why is this important? I think that that's the, that's, those are two. The last one I would say is, um, patience and persistence. Funding rates nationally for research aren't great for many in many, uh, agencies, but you're not gonna show up as an incoming assistant professor unless you're real super, super duper hotshot and build a world class research lab overnight. It's just not gonna happen. Um, and that's okay. You can have aspirations to do that, but you just have to have some patience. You really do. And understand that it's, it's something that is progressive over time, and you may have sort of fundamentally, you know, important shifts in terms of what resources you have and so on.

But, um, patience and persistence and finding really good folks to work with, just it's, you know, it's, uh, those are the, those are sort of the big three pieces of advice I could give to people that are thinking about doing collaborative broad scale research that is, uh, fundamentally sort

of outside the box. So thank you so much for your time, for the work that you do, the work that your team and the, the people that you work with outside of Texas State and within. Thank you all for this. It really is important. So thank you so much for the work. That you do. Thank you so much for having me. It's really been a pleasure. It's been fun. Thank you. Thanks for joining us today. This podcast project is sponsored by faculty development using Ustar Studios at Alkek One on the Hill in the bright and beautiful San Marcos, Texas. Thank you to all the faculty who are making amazing strides in your research. We hope you join us next time.

And until then, stay curious and dare to research outside of the box.