Jeff Crooks:

I'd say the biggest challenge is the fact that there's this physical barrier that- it cuts across a natural landscape, right?

It means nothing in the broader sense, biologically, ecologically. It's just a fence that's there. And then to collaborate or to work with colleagues in Mexico, or to go down there and visit sites, you have to get through that barrier. So I'd say the biggest challenge here is just crossing the border and trying to get back and forth.

Anne Marie Tipton:

This is the ancestral land of the First People, the Kumeyaay.

In 1982, the Tijuana River National Estuarine Research Reserve was established. Its goal was, and still is, to enhance scientific collaboration and research within the watershed that is split between two countries, Mexico and the United States. Three quarters of this massive water basin lies in Mexico, making this collaboration even more necessary and important.

Over time, various research partnerships were created to study erosion, sedimentation, and tropicalization. More recently, geography professors have studied erosion and sedimentation in Los Laureles Canyon in Tijuana, a sub-watershed that flows right into Border Field State Park. When it comes to the ocean, tropicalization is another significant collaboration topic.

In this episode we'll hear from some of the geographers and scientists working back and forth across the border, some of the challenges and rewards they've encountered, and ways to make studying this landscape and marine environment more accessible.

I'm Anne Marie Tipton, the Education Coordinator at the Tijuana River National Estuarine Research Reserve, and I'll be your guide.

AMT:

The voice you heard to open this episode is Jeff Crooks.

JC:

I run the research program here at the Tijuana River National Estuarine Research Reserve.

AMT:

Jeff studies tropicalization and why it’s an important subject to be paying attention to in our current times.

JC:

Tropicalization is this idea that with warming waters or warming air, it doesn't really matter, as conditions get warmer we're going to see species expanding from the equator where warmer air is and moving into colder areas.

We live in an era called the Anthropocene. Humans are dramatically affecting the systems around us and there's all sorts of things that we're doing to change the types of organisms' presence in an area, the plants and animals.

AMT:

As Jeff and other scientists are discovering, this is happening in a couple different ways.

JC:

Some of that is we intentionally move species around, so this issue of non-native species, introduced species, that we take species from where they're native and move them on a boat or on an airplane and release them into a new area. So that's one way that we are changing the plants and animals that live in certain areas.

The other way that we're changing it is by changing the ecosystem, the planet itself, and warming it up. And when we do that species naturally respond and it can change what we call the distribution, the areas in which they're found. So we see these organisms that live in lower latitudes, warmer areas, being able to push northward as the climate warms.

AMT:

The negative effects of tropicalization don’t stop at the border, either. This creates a challenge scientists like Jeff are working hard to overcome. However, these challenges *can* be overcome and it begins with a good transboundary partnership.

JC:

I would hope that you could almost remove the word transboundary and it's just a good partnership, right?

The goal of what we're trying to do is make that barrier invisible into the work that we do. Now, it is there, and there are challenges on working on either side of the border. But a good partnership should be a good partnership. And so for us, that means sharing information, contributing information. Again, the reality of the border, it is there. And a lot of what we're focusing on and this issue of tropicalization, what we need is eyeballs on the system. I say what we're trying to do is we're trying to take the pulse of the estuary. We're taking the vital signs of these systems, and the only way to do that is to be out there and to see what's going on. To have eyes on the place, to pay attention to the physical conditions, be out there measuring the temperature or how salty it is, whatever, but also trying to look at the plants and animals that live there. And because of that impediment of the border, we need to be out there looking.

So this transboundary partnership, just the fact that they're down there working in these systems that are more challenging for us to get to, and they're out there and they know what they're looking at and they're paying attention to what's there, and then we're doing a similar thing up here, that's what we're really hoping for.

AMT:

A little help from the public never hurts, either.

JC:

So with the advent of things like iNaturalist, these web-based platforms where people can take pictures and they can say, "Hey, this doesn't look right. This isn't supposed to be here," we can start using that information to pull together this story of how plants and animals are shifting around where they should be.

So that's part of it as well, to have the scientists down there, but also to be able to pull in the broader community who is out there appreciating nature, taking pictures of nature, sharing what they find. Then as experts, folks can go in and begin to identify these species and say, "Wow, that's not right. That's not supposed to be there." And that's actually how we're finding some of these things. This little species of crab that appeared within the last few years, this tropical, warm water species appeared because, we were alerted to it by iNaturalist. Someone up in Orange County took a picture of this big fiddler crab, which is much different than our typical fiddler crab here. And actually a colleague of mine from the East Coast emailed me and said, "Jeff, you should pay attention to this thing. People are starting to find this." And within a couple months, Julio and I actually found it down here.

Julio Lorda:

Yes, hi, my name is Julio Lorda. I'm a professor at the Autonomous University of Baja California in Ensenada and I'm a marine coastal ecologist.

AMT:

Even though they are now separated by an international border, Julio and Jeff have been able to spend a lot of time together over the years studying the region.

JL:

So when I came in the Tijuana River Estuary, we had this projects about looking at the past, looking at the present and trying to look at the future. So since I got here in the estuary, a lot of the work that I did with Jeff Crooks was looking at understanding what has happened through time and potentially start planning into the future to help managers to deal and to manage the natural resources here in the estuary.

So basically now that I'm in Mexico and that I finished my post-doc, I've been very lucky that people in California and Jeff and other people want to have these collaborations with people south of the border. We are really interested in having these collaborations with people north of the border because we know it's beneficial for both of us. I've been very lucky in that regard that I was part of the Tijuana River Estuary for a few years and some of the projects that we work when I was here are projects that we'll continue to have collaborations, that we'll continue to understand better what's happening with climate change, and likely will help us to manage the coastal resources in Baja, California and in California.

AMT:

Julio also has his own personal experience when it comes to tropicalization.

JL:

One of the very interesting things that I observed, what we observed here at the Tijuana Estuary is right when we were going through those heat waves and the water temperature was really warm, one was that the water and the ocean was really warm and I was surfing in my shorts, my board shorts in March, which is typically they call this part of the year, but in 2014 it was really warm and it was very interesting and really weird. And then we were working on the estuary doing our yearly monitorings, we started seeing all of these critters like swimming crabs, some

kind of Gobi, some this kind of fish, some shrimps also that typically we don't find around in this area. Maybe historically they have been found when we have another big El Nino, like 20 or 30 years ago. There was one or two years that we or some other people found them, but then they're absent from all of the monitorings.

So it was just very interesting just being there, picking up the nets or picking up traps and seeing these big crabs that are a little more tropical or these fishes and these shrimps. It was just something that it was happening and it was happening fast, and we were just seeing it right on the field, which is very interesting.

AMT:

And during his research, Julio discovered just how much the northern Mexico region has been studied scientifically and it dates all the way back to the Spanish explorers. Unfortunately, California Native American traditional knowledge wasn’t written down and they weren't consulted until recently.

JL:

What we found out is even before scientists were publishing papers, we looked at most of the literature and most of the knowledge that we know about coastal ecosystems here in Northwest Mexico was done first by Spanish explorers, or at least whatever is printed, and then as time goes by a lot of people from the US in California started working and doing these discoveries down south in Mexico and Northwest Mexico.

But when through time or as time happened and more universities and more research institutions were created and advanced in Mexico, we started seeing that Mexican scientists were publishing more of these papers through time, to the point that the last couple decades more Mexicans are producing more marine science articles in journals than Americans. This doesn't mean that there's no collaboration between Mexicans and Americans, or Canadians for that matter, or other countries, but it just means that science and marine science in Northwest Mexico has advanced and has developed to the point that a lot of the science is done by Mexicans.

AMT:

Still, Julio knows and understands the importance of cross-border partnerships.

JL:

We know some of the ecological problems are global problems or problems at large scales. So

just having collaborations between different countries or different areas on the globe or on the hemisphere, it help us to understand what's happening at different scales.

AMT:

Baja California is in a transitional zone between tropical and temperate areas, and Julio believes understanding what's happening there can help the rest of the region prepare as the climate heats up.

JL:
So what's happening down there in Baja California is what's probably likely going to happen here in Southern California and in California in a few years, as we're expecting to things get warmer and warmer. Understanding really well what's happening down there, it will help people from Northern California- Northern Baja California and Southern California to ameliorate and understand what might be coming. I think it's a great example, how, especially with climate change and global warming, having these transboundary and international collaborations are very valuable to understand better what's happening and what's going to happen in the future.

AMT:

When it comes to studying the region in order to understand and protect it, there can never be enough scientists and researchers on hand.

Napoleon Gudino:

My name is Napoleón Gudiño Elizondo, PhD. I am a researcher at the Oceanological Research Institute of the Autonomous University of Baja California.

(Mi nombre es Napoleón Gudiño Elizondo, PhD. Soy investigador en el Instituto de Investigaciones Oceanológicas de la Universidad Autónoma de Baja California.)

AMT:

Napoleon is based in Ensenada, Mexico and has been living in and studying the region for two decades.

NG:

I have been in Ensenada for 20 years because I moved here to study a degree in Oceanology at the UABC.

(Yo tengo 20 años en Ensenada porque me mudé para acá para estudiar la licenciatura en Oceanología en la UABC.)

AMT:

Some of Napoleon's work was focused in Los Laureles Canyon, a canyon most likely named after the bay laurel tree. A majority of the canyon is located within Baja California but it begins in Tijuana and spans to just north of the US-Mexico border where it is called Goat Canyon, near the entrance to Border Field State Park. This canyon went from 8,000 to 80,000 residents in ten years during the 2000s. It is filled with legal settlements to the north and south and slap dash illegal settlements on its steep slopes. It is largely inhabited by former central Americans who emigrated to Mexico in search of a better life, and more recently some Haitian refugees. When Napoleon first began working on the canyon, he realized just how ripe the area was for research and study, and mostly for the people that currently live there.

NG:

My impression is that the Los Laureles Canyon is a very suitable natural laboratory to precisely establish monitoring programs and also establish mitigation programs on problems of--on the one hand, faced by the population in Los Laureles who, up to a certain point, are so resilient in this relationship that they have with slope instability, landslide risk, hydrology, sediment transport and poorly planned constructions, so that people also-- many times I have heard, "If they know that it's a risk area, why do people live there?" Obviously, there is that need, it is because they have nowhere else to go, for convenience, whatever.

(Mi impresión es que el Cañón de Los Laureles es un laboratorio natural muy adecuado para, precisamente, establecer programas de monitoreo y, asimismo, establecer programas de mitigación sobre problemas de--por un lado, el cual se enfrenta la población en Los Laureles hasta un cierto punto resiliente en esta relación que tienen entre la inestabilidad de taludes, riesgo de deslizamientos, la hidrología, transporte de sedimentos, con las construcciones pobremente planeadas que la gente también-- Muchas veces he escuchado, "Si saben que es una zona de riesgo, ¿por qué la gente vive ahí?". Obviamente, está la necesidad, es porque no tienen otro lugar a dónde ir, por conveniencia, por lo que sea.)

AMT:

During this time and also while in school, Napoleon was fortunate enough to collaborate with others.

NG:

Along the way, I had professors who encouraged me to work closely with US scientists during my postgraduate education, master's and doctorate degrees that I did at CICESE.

(En el trayecto tuve profesores en el posgrado, en la maestría y doctorado, que estuve en CICESE.)

AMT:

That's the Ensenada Center for Scientific Research and Higher Education. And while he collaborated with professors, like his main advisor Thomas Kretzschmar and others like remote sensing specialists such as Alejandro Hinojosa and Stephen Smith, he still didn't encounter many other partnerships.

Still, that didn't stop Napoleon from forming important bonds with other researchers and scientists in the region. Because of it, he was able to put into practice the knowledge and information gathered on the other side of the border.

NG:

Not so much with colleagues in Mexico but rather implementing this type of technology such as erosion and sediment transport models in Mexican territory due to the severe limitation of local data available for places as Los Laureles Canyon. There are maps, for example, of geology, soils, etc., but at larger scales such as for the state, or maybe at the scale of the main Tijuana River watershed.

(No tanto con los colegas en México sino implementar ese tipo de tecnología como los modelos de erosión y transporte de sedimentos en territorio mexicano debido a la severa limitación de datos disponibles tan locales como es el Cañón de Los Laureles. Existen mapas, por ejemplo, de geología, tipo de suelo, pero a escalas más grandes como del estado, de la cuenca principal del río Tijuana.

AMT:

But the benefits of collaborating across the border didn't just benefit Napoleon and others on the Mexico side. This was a big help to American researchers and scientists, as well. He helped streamline permission from CONAGUA, the Mexican National Water Agency, and IMPLAN, the City of Tijuana's planning department, for instance.

NG:

Also, from the point of view of obtaining permits, to speak with the authorities, and also to speak with the residents themselves, I made it much easier for them to access that as well.

For example, as a Mexican graduate student, it was easier for me to ask for access to the local and regional water commission facilities (CESPT, CONAGUA), for example, to install

hydrological equipment. Talking to the residents also because in Los Laureles at the beginning of the project there were many issues with equipment vandalism, for example. I was also in charge of getting people to have "extra hands" for the fieldwork. Christian churches, in particular, were super friendly and useful to achieve our research goals, in fact, I became very good friends with several people who took care of the field equipment.

From a local and regional perspective, in CONAGUA I also streamlined some procedures with IMPLAN, for example. I also served as a link with the local authorities as well.

(Sí, claro. También desde el punto de vista de para conseguir permisos, para hablar con las autoridades, también tanto para hablar con los mismos residentes yo les facilité mucho el acceso también a eso.

Por ejemplo, yo como estudiante mexicano fue más fácil pedir acceso a las instalaciones de césped, por ejemplo, para instalar equipo hidrológico. Hablar con los residentes también porque en Los Laureles al principio estuvo en muchos problemas de vandalismo del equipo, por ejemplo. Yo me encargué de conseguir gente, por ejemplo, iglesias cristianas en la cuales yo fui, hablé con ellos, de hecho, me hice muy buen amigo de varias personas quienes me cuidaban el equipo.

Desde el punto de vista local, regional, en Conagua también yo les agilicé algunos trámites con IMPLAN, por ejemplo. También fui como un vínculo con las autoridades locales también.)

AMT:

For American geographers, it's difficult to collect samples as non-Mexican nationals. Napoleon, however, was able to help collect field samples. Still, it wasn't easy.

NG: It was a lot of trouble to cross the border with the samples and analyze them in San Diego, and also more expensive. As a graduate student, I had access to Mexican laboratories to analyze the samples right here in Ensenada and I only sent back the data and/or my own calculations. Therefore, I streamlined the collection of samples and analysis of results, and that was part of my dissertation. In fact, I could cross the border, present all the results to them in scientific language and get feedback, and it was like a mutual benefit

(Era mucho problema cruzar la frontera y analizarlos en San Diego, además que es más costoso. Yo como estudiante graduado, yo analicé las muestras también aquí mismo en la Ensenada y solo le mandaba los datos o eran mis mismos datos. Por ejemplo, yo les agilicé la colecta de muestras, análisis de resultados, básicamente fue mi tesis. Casi yo podía cruzar la frontera, presentarles todos los resultados en el lenguaje científico y así fue como un beneficio mutuo.)

AMT:

One of those beneficiaries of the collaboration was Trent Biggs.

Trent Biggs:

Yeah, I'm Trent Biggs. I'm a professor in the Department of Geography at San Diego State University.

AMT:

Napoleon and Trent also formed a bit of a friendship during their time working together.

NG:

Yes, that was something very key to the success of our collaboration. Trent, besides being a brilliant scientist, is a very nice person to work with. Besides always being willing to help, he is always answering emails on weekends. It turned out to be hard work but, in the end, we had our reward. In the end, thanks to him and that hard work, we managed to publish a series of scientific articles which enriched my CV, for example, to earn my postdoc position at the University of California and my position as professor at the University of Baja California. It had a lot to do with that effort we made over four years.

Maybe I didn't mention it previously, but since I am Mexican and he is an American, there is always a language barrier, of culture and all that. However, the good attitude as a person always influenced the positive side of all this.

(Sí, eso fue algo muy clave en el éxito de nuestra colaboración. Trent además de ser un científico brillante, es una persona muy agradable de trabajar. Él además de siempre estar dispuesto a ayudar, siempre estar respondiendo correos entre fines de semana. Se convertía como un trabajo duro porque al final tuvimos nuestra recompensa. Al final, gracias a él y a ese trabajo duro logramos publicar una serie de artículos científicos los cuales enriquecieron mi CV, por ejemplo, para ganar mi posición como postdoc en la Universidad de California, mi posición como profesor en la Universidad de Baja California. Tuvieron que ver mucho ese esfuerzo que hicimos de cuatro años.

Como a lo mejor no lo mencioné anteriormente, pero al yo ser mexicano y él estadounidense siempre existe como que la barrera del lenguaje, cultural y todo eso. Sin embargo, la buena actitud como persona siempre influyó hacia al lado positivo de todo esto.)

AMT:

Trent also had plenty of good things to say about Napoleon and other scientists and researchers across the border.

TB:

There's no way we could do any kind of work there without their help and expertise. They know the region very well. They've been here for decades. Napoleon has been in the border region for most of his adult life, and he knows it very well. He knows the communities. He knows the decision makers. And the universities that we're collaborating with are world-class institutions that have resources and expertise that are on par with any university in the US. And so they really bring knowledge, they bring subject expertise, they bring regional connections, and they know which questions are most important to ask, which is kind of the foundation of all scientific investigation is what are the most important questions.

They really help us be more efficient and effective in both formulating those questions, answering them, and translating them to policy makers.

AMT:

When it comes to collaborating across the border, Trent is very familiar with its long history that began around 100 years ago with San Diego State University.

TB:

SDSU has been conducting work across the border, starting with field trips that's- in the 20s, 30s and 40s. Then the first official collaborations that I'm aware of started with Richard Wright in the geography department, and Paul Ganster, who founded the Center for the Study of the Californias. They started collaborating across the border to try and harmonize geographic datasets on hydrology, soils, geology, that sort of thing to develop a cross-border information system that would be the platform and basis for solving environmental problems that affect both sides of the border.

So Paul and Richard spent a lot of what they call "Windshield Time" driving across the border and meeting with colleagues in Mexico at UABC, CICESE, COLEF, and the government institutions as well to try and figure out how to harmonize environmental datasets across the border. And then the second phase of the relationship was doing scientific investigations, a lot of which was funded by the EPA to answer questions about water quality, pollution, water availability, land use change, biodiversity, those sorts of environmental questions and the border. That research continued on through the 80s, 90s and 2000s.

AMT:

In more recent years, Trent and others have been collaborating with NOAA and other governmental entities on both sides of the border to conduct research in the estuary.

TB:

We have been working with the EPA on the water quality in the Tijuana River. SDSU has also been very supportive of those kinds of collaborations. Finally, the institutions in Mexico have been very generously offering their students' time and their own faculty expertise to carry out studies on, for example, landslides, on stream channel erosion, on water quality. There's been energy and resources invested from both sides of the border in terms of students and faculty, and institutional commitment.

AMT:

I was curious what Trent believed were some of the biggest contributions he and other geographers brought to the border region, which turned out to be something he was very happy to answer.

TB:

What a great question for a geographer. We rarely get a chance to expound on the value of our discipline. Geographers think about how humans and environments interact in space and time. One of the critical things that we can contribute are advanced techniques and remote sensing. We do, for example, three dimensional imaging and constructing three dimensional surfaces of environmental change in Tijuana. For example, rapidly eroding stream channels, landslides. We can get up to one to two centimeter resolution maps of how the land surface is changing, where erosion is happening, where that sediment is depositing so we can bring those sort of advanced remote sensing kinds of techniques.

We can also think more broadly about how societies are interacting with landscapes, so where are people settling in the landscape, what are their socioeconomic conditions, how does that socioeconomic condition feed back on the types of environments and hazards that they're exposed to that impact their lives as well as the environment on both sides of the border. Geography has a synthetic discipline, and is really well poised to answer questions about how humans are interacting with watersheds and the environment on the border.

Instead of looking at the physical system in isolation, or just the social system, geographers try to incorporate both.

AMT:

When it comes to the work Trent is doing with Napoleon at Los Laureles Canyon, they were interested in why there was an excess of sediment in the Tijuana River estuary, especially where

it was coming from and how to stop it, as it was burying the southern end of the estuary. The reason why stopping sedimentation is so critical, is that it only takes a few inches of soil to make a salt marsh wetland an upland habitat. Because California has lost 90% of our wetlands, we need to protect and restore the ones we have left.

TB:

We did a series of investigations where we drove around and mapped exposed soil and mapped erosional features like gullies, and stream channel erosion, and then developed a comprehensive model that describes where sediment is coming from in the watershed, and then how it could be addressed.

One of the main things that we found is that runaway stream channel erosion is a major part of the sediment delivery to the estuary. When you drive around, it looks like there's a lot of exposed soil on the hillsides, and that's also important, but it's really those stream channels that are incising very rapidly and if we can get a handle on that and prevent that from happening in other places that are urbanizing now, by protecting the riparian zone, by not grading and entering those stream channels into roads, which is sort of typical, then we could prevent a lot of future large deliveries of sediment to the estuary.

AMT:

Without these sorts of cross border collaborations like geographers Trent and Napoleon are a part of, as well as the collaboration between Julio and Jeff, our knowledge of the border region and how to protect it would be limited. To Trent, a large part of their collaborations involve community outreach.

TB:

One thing that working with colleagues in Mexico really helps with, is connecting with the community through the field work that we do. One time we were walking around the Los Laureles Canyon watershed and we saw a huge gully in the middle of a road. We were like, "How did that happen?" And of course, we all assume that it's happening because of rainfall concentrating creating a lot of runoff and gully erosion. The residents said, through Napoleon, talking to our collaborator Napoleon, made it clear that, oh, it was actually a water main that broke that gushed water all over the hillside and created this huge gully.

We were able to talk to the residents through Napoleon, because my Spanish is awful, and they really clarified what the problems are, and further through talking with the residents we found that they are just as concerned about this erosion as we are in the US from the estuary

perspective. It impedes their travel through their neighborhoods, it cuts them off from their work, from their school, it's a huge problem for their lives and livelihoods. By working with our colleagues there and with Napoleon in particular, we're able to really uncover those stories about how erosion is impacting their lives, the lives of the community, in ways that make it very real and very important.

(start closing music)

AMT:

In 2005, San Diego State University, El Colegio de la Frontera Norte (COLEF), and Southwest Consortium for Environmental Research and Policy worked together to create the Tijuana River Watershed Atlas. We continue to use this set of maps sixteen years later. If this publication is anything like Jeff and Julio's tropicalization study or Napoleon and Trent's sedimentation study, they will have a legacy that will last for decades to come. American geographic interest in Baja California, Mexico started with just field trips 100 years ago, but now we have U.S. professors acknowledging the value of their Mexican colleagues' local knowledge and the world-class status of their institutions. The US./Mexico border definitely creates challenges with researchers and soil and marine samples being unable to cross, especially during pandemic times. But both partnerships are able to effectively make that border invisible and penetrable. These collaborations show what can happen, despite cultural and language barriers, when each party brings something to the table and there is mutual respect.

Thanks to Jeff, Julio, Napoleon, and Trent for their time. Thank you for listening to Divided Together, brought to you by California State Parks Foundation, Parks California, and the generosity of an anonymous donor. See you next time.