PLANT PEOPLE Season Two Episode Eight 'Mangroves: Earth's Coastal Caretakers' Transcript

JENNIFER BERNSTEIN NARRATION: You can find mangrove trees in some of the most beautiful places on earth, where calm waters hug the coast. Each mangrove contains a mini ecosystem, as animals use them for nurseries, food sources, and more. But studying mangroves isn't very glamorous.

BRAD OBERLE: If you haven't tromped around a mangrove, it's tough. And I'll say it sucks. Like it sucks on your feet they sink into the swamp.

There are mosquitoes flying around everywhere, and there's the stench.

JENNIFER NARRATION: Brad Oberle is Associate Curator at NYBG's Center for Conservation & Restoration Ecology. Among many other things, he's an expert on mangroves. He says a mangrove swamp's smell tells us why they are particularly effective at an indispensable task.

BRAD: The stench comes from microorganisms that work in places with lots of water and no oxygen like our guts, right? And those microorganisms sometimes make aromatic compounds that we might not find super appealing.

You can definitely smell sulfur compounds. Think stinky brimstone kind of things. And this is partly how those microorganisms are doing the best they can in that habitat.

And that stench, frankly, is part of the story for how they store so much carbon.

JENNIFER NARRATION: Even though Mangroves are only found in certain places, they are responsible for storing a whopping 10% of the world's carbon. As Brad explains, the smell is one of the clues that everything is going well.

JENNIFER BERNSTEIN: Sometimes when we do the fish emulsion in the Garden, as a sort of plant health measure, Todd Forrest, our head of Horticulture, will say, "Smells like a healthy garden" and he's really selling it.

So, I guess next time I'm in a mangrove, I'll think “Smells like a healthy mangrove.”

BRAD: Smells like a healthy mangrove. Yep. No doubt about it.

JENNIFER NARRATION: This is Plant People from NYBG. I’m your host Jennifer Bernstein, CEO & The William C. Steere, Sr. President at the New York Botanical Garden.

In this episode, we dip our toes into the carbon-filled soils of mangrove swamps. They are the superheroes of the tropics, sustaining global food webs, protecting coasts against storm surge, and perhaps most importantly, capturing our carbon. We'll break down the importance of these rare and intricate ecosystems, as scientists race to restore one of our best natural defenses against the climate crisis.

JENNIFER: Brad, I'm so excited to have you on the podcast today. So we're going to start right off the beginning with one of the questions I like to ask our guests. What makes you a plant person?

BRAD: Gosh, it's almost in my DNA. My mom likes to tell a story of when I was a baby.

When I got fussy, she would put me in my car seat and put my car seat under a tree. So that was just the way to get me to calm down. And I have been an avowed tree hugger ever since. And then, when I was in middle school, I think that's when professionally I started getting oriented to plants because of a hike through the woods.

Saw so many wild flowers. I counted 12. I remember that number to this day. And the next week I went out and bought my first wildflower guide. And then the rest is history.

JENNIFER: And now you're one of our botanists working here in NYBG Science, right?

BRAD: Dream job. It's a great place to be and great place to work with.

JENNIFER: That's great. Well, we're thrilled to have you and one of the areas among others that you focus on is mangroves. So we're gonna have some mangrove talk today and I recently had one of your colleagues tell me that mangroves are not a species, they're a lifestyle.

BRAD: It's beyond a lifestyle. It's almost kind of like a living space too. An easy definition would be: it's a marine swamp and the trees that grow there.

So, that's kind of their living space. And people can use "mangrove" either way.

What I find so cool about mangroves is they're really interesting and they're really important.

They are actually pretty rare. So, if you take all the forests on the planet, about one half of 1% are mangroves. They only grow along coasts and they only grow in the tropics. And it's not even every kind of tropical coast where you can find a mangrove.

And then if you're talking about the lifestyle, the actual plants that are mangroves, we're talking 40 to 80 species of plants. So, it's a tiny fraction, whether you look at them as a habitat or a kind of plant lifestyle, the kinds of species that grow there.

JENNIFER: Where have you been to see mangroves?

BRAD: My first experience in mangroves was my first experience in the tropics.

I was super lucky to study abroad in Costa Rica as an undergraduate, and we did a field trip through the mangroves on a boat to a coastal national park, and it was like being on a spaceship. Such a different place…

JENNIFER: Yeah, it's a wild ecosystem. It looks different than anything else that you see? Is that when you first got interested in mangroves?

BRAD: I was, but there was so much interesting stuff on that trip. It was drinking from the proverbial fire hose for a botanist. So, really it was when I moved to Florida when I worked most intensively with mangroves. And I should say that some of my work on mangroves there was actually inspired by people here at the New York Botanical Garden.

Before I took that job, a good friend of mine worked in the Center for Plants, People, and Culture. And the Center was doing a lot of work in Oceania and some of the work they were doing was on the mangrove ecosystems there and how people depend on them. And at that point I was learning more and more about forest ecology and forest carbon cycling.

And he encouraged me to start doing research on mangroves and started it when I was in Florida and it's very fun to be bringing it back here to the New York Botanical Garden.

JENNIFER: That's great. So, rare, a small fraction of the ecosystem. Why are they important?

BRAD: They kind of punch above their weight. That's one way of putting it. I mentioned that mangroves are maybe a half of a percent of all forests. They store between five and 10% of all the carbon that's stored in forests globally.

So, they store more carbon per unit area than any other habitat on Earth. And that's really interesting from just a basic biology perspective; how does this one weird habitat have so much carbon concentrated in it? And it's really important from an applied perspective cause the more carbon we can put in places like mangroves, the less carbon is in the atmosphere cooking the planet.

JENNIFER: Yeah. So, I wanna come back to the carbon sequestration in a minute, but let's unpack a little bit more about how these systems work. So, mangroves must have unique adaptations that allow them to thrive in the salt water. How do the plants that live in mangroves live, grow, and thrive?

BRAD: Great question. Pretty inspiring, at least to me. But like I said I'm a big tree hugger so I'll unpack it a little bit. So, really what we're talking about is saltwater tides. So I'll take each one of those things. Salt. Bad for plants, right? Think back to Romans. If you really made them mad, what did they do?

They salt your fields, right? Salt is terrible for most plants and it sticks around for a really long time. And obviously mangroves grow in salt. So they've two really important adaptations for growing in the salt.

They can either exclude it, so that means keep the salt out of the roots. They can excrete it. That means let it in, move all the way up through the plant, pack it into their leaves, or even push it out of their leaves through specialized glands. And an interesting and important thing about that adaptation is it actually results in some really exciting, biologically inspired designs.

So, teams of engineers at Yale and at Carnegie Mellon have looked at the salt-excluding mangroves. These are in the Red Mangrove family. They've looked at the chemistry and the anatomy of the roots, and they've actually designed passive water filtration systems to exclude the salt from saltwater purification areas.

JENNIFER: Desalination plants can use this technology that the plants have created?

BRAD: That's exactly right. So, that's the salt part. Mangrove roots need air to breathe just like animals do; makes it really hard when you're stuck underwater. They don't have gills. They have different adaptations in the roots to get oxygen to the roots through the water. So, depends on the species of mangroves, but some of them basically have snorkel roots or pneumatophores. They kinda look like pencils. If you have ever been in a mangrove swamp, scattered everywhere, somewhere between four and about 14 inches tall.

And when the tides come in, they actually poke out above the high tide level to let the oxygen diffuse down to the roots so they can keep growing. So, that's one of the examples of an adaptation that they use to deal with all the water that's coming

in and out all the time. That's the last part. Tides: water in and out. That's pushing, lifting, pulling the mangroves twice a day every day.

That's a lot of force. And for mangroves to deal with that force, they have very dense and resilient wood, and that's really important for some of the things that mangroves do. I'll give an example from a place where I used to live in Sarasota. Sarasota got absolutely nailed by a couple of hurricanes this year.

Sarasota is one of the few places in the United States where mangroves grow. At Marie Selby Botanical Gardens, they were almost directly hit by a category three storm. They have a mangrove boardwalk. The storm surge that came in pulled the boardwalk out of the ground, but not the mangroves. They're so tough at dealing with tides that they can actually slow a storm surge better than almost anything else that we can put by the ocean. That's another really important thing that mangroves do.

JENNIFER: Yeah. And that can be important for the resilience of communities that are increasingly subjected to storm surges and tsunamis. Sometimes mangrove restoration has those kinds of ends in mind. Is that right?

BRAD: That's absolutely right. So, mangroves protect billions of dollars of coastal property from the harmful effects of storm surge.

And other studies around Florida have found that for about every kilometer of mangrove habitat that you have, you reduce storm surge heights by about 10 centimeters. 10 centimeters might not sound like much, but if you've lived through a hurricane like I have, 10 centimeters can be the difference between being safe and losing your home.

So, it's a very, very important service they provide.

JENNIFER: Are there different kinds of mangroves depending on how close they are to the coast?

BRAD: There are. Closest to the open water are red mangroves. These are mangroves that have these prop roots that form an incredible web of life, of trees right along the coast. That's really what you see if you're on a boat. On the upland end, the species of mangrove you see there is the white mangrove. And it's a species of mangrove that doesn't have prop roots. It doesn't have pneumatophores roots and so…

JENNIFER: Are the prop roots the snorkels?

BRAD: Oh, good question. So, prop roots are a little different. Those go from up to down so…

JENNIFER: Oh, those are the ones that look like big legs reaching into the soil.

BRAD: That's it. Yeah, the walking dangling roots. And they do a lot of the same things that the pneumatophores—little pencil roots do. They help aerate the roots, and then they also help slow wave energy and tidal energy that keep the mangroves a little bit more stable. So, you've got the red mangroves by the open water, the white mangroves by the upland transition, and then you have black mangroves in between.

JENNIFER NARRATION: Black mangroves have abundant, pencil-like pneumatophore roots that stick up from the surface of the soil. They're the most salt-tolerant species of the three, and as the name suggests, they have dark, nearly black inner wood.

So those are the different lifestyles. For the three most important species of mangroves that live in this part of the world.

JENNIFER NARRATION: Mangroves also provide shelter for all kinds of animal and plant life.

BRAD: When you go to a mangrove swamp, those aren't the only plants you see because there are plants up in the canopies of those mangrove trees.

There are many different species of epiphytes–plants that grow in plants–that you'll find in mangrove swamps too. Bromeliads, orchids, the whole host of things that can grow in another plant's canopy, often can grow in a mangrove plant canopy.

JENNIFER: And what kinds of fauna or animals rely on these ecosystems?

BRAD: So many. I think they're probably more important for animals that live in the ocean than they are animals that live in land, but they're a kind of bridge between those two major types of biomes. So, if you look into the oceans, about 10% of all the particulate carbon that's floating around the oceans comes from mangroves, like half a percent of forests, and that's feeding fish everywhere.

So you can make an argument that a lot of the marine food web depends on mangroves and their productivity. But, specifically many different kinds of fish have to start their lives in mangrove swamps. All those crazy roots I mentioned before make for an incredible nursery. It's like a filter that keeps predators out.

So baby fish start their lives there, they grow until they get big enough for the next stage and then they migrate out into the oceans where people catch them, people eat them, and they play other really important roles in food webs. So mangroves are really important fish nurseries, and that's just one of many groups of species.

There's a super cool study that was recently published from Singapore where they were looking at insects that live in mangrove swamps. And it's a place where not many people have looked, cause generally you get more insects where you get more species of plants. That's kind of the rule in the tropics. And there aren't very many species of plants that grow in mangroves.

They found almost 10,000 species of insects growing in the mangrove swamps of Singapore and some adjacent areas that more than doubled. The total tally that was known. And what was really cool is that they found completely different insects doing completely different things. In most tropical areas, all the insects eat the plants, but in mangrove swamps, all the insects are eating other insects.

So, it's kind of a biodiversity surprise.

JENNIFER: So, it's a surprisingly biodiverse ecosystem, these mangroves. And that's important in and of itself, and there's a lot that it sounds like we're still learning about that. You've mentioned carbon a couple of times. Why is it that mangroves are so good at sequestering carbon?

BRAD: So, some of it is about the trees, some of it is about the habitat, and some of it is about the other organisms that live there.

If you look at where the carbon is in a mangrove ecosystem, about 80% of it is in the soil. Mangrove soils are very deep. You can find places where it's 30, 40, 50 feet deep. So deep that it's very difficult to get to the bottom of all of it. So, they're storing a lot of that carbon underground.

How does it get there? Mangroves act as a filter for particles that are floating around in the ocean. So, mangroves trap sediments that come from other places. Now what about those other organisms?

They're all there for the buffet. Plants are laying out a menu of leaves and wood and litter and all kinds of other things for them to eat, but a lot of the organisms that are really good at eating up what mangroves are producing can't do it as efficiently for the same reasons that mangroves have trouble growing in the first place: salt and water.

So, we'll talk about fungi for a second. In most other forests, there is a certain group of fungi that decomposes wood. And they do it using a chemical wrecking ball that requires oxygen, right?

That wrecking ball can't work in a mangrove swamp just cause there's no oxygen in the soils. So, those organisms are less efficient at breaking down the material that comes in.

And that means that mangrove soils are very organic and very peaty. And it also means that the kinds of organisms that tend to break it down are very different, very unusual. And we're just seeing the tip of the iceberg of what's really present

there. So those, I think, are probably the two main reasons why mangroves have so much carbon in them.

They can filter it out of the water, so it comes from other places, and organisms are not very good at breaking it down. So, it just piles up year after year.

JENNIFER: Yeah, so, if the carbon is sequestered there and we don't disturb it, does it stay there forever? Is it a sort of permanent fix on the carbon?

BRAD: There's a study by a group of researchers from the Smithsonian on a mangrove island in coastal Belize. It's one of these places that has extremely deep soils.

So, they were coring and coring got all the way to the bottom. It was about 30 feet down. You can sift through it and figure out what's in there. Little bits of mangroves. They did radioactive carbon dating so they could figure out how old these peat soils were when they got to the bottom of their core…9,000 years old.

JENNIFER: Wow.

BRAD: Right? That's a long time for storing your carbon. Basically forever. But, another really cool thing about that is that. 9,000 years ago, sea levels were about 10 meters lower than they are today. So, these mangroves have been in this Goldilocks growth for thousands of years. They haven't been growing so slowly that they get swamped and they haven't been growing so quickly that they become an upland where other plants get established and knock them out. So, it's this really important kind of complexity that can store carbon for a really long time. It can actually build land underneath it.

But then, not every mangrove can stick around that long. People can change them, and natural forces can change. So we've lost about 3% of global mangrove cover since about 1990. Of that, about 60% of the loss has been because of direct human habitat conversion. People in Southeast Asia converting a mangrove to a shrimp farm or an oil plantation; habitat conversion, just getting rid of them to put a sea wall or a condo.

That's a lot of what's happened in Florida. But another big chunk of it, about 20% of the loss, has been due to natural causes. Basically, we just can't figure out what happened. Tides change, coasts change. These conditions that make it just right for this special place to become a mangrove might change for reasons we don't know.

And so it's in those situations where you can't necessarily count on the carbon being stuck forever. Because mangroves, like any other kind of natural habitat, can change.

JENNIFER: Yeah. Som habitat loss, of course, is affecting all different kinds of ecosystems. Is sea level rise a special challenge for mangroves or is it happening slow enough that it's not?

BRAD: If sea level rise is slow enough, many mangrove ecosystems can rise with the tides. It's an amazing power that they have. And sequester more carbon along the way.

Another way that they can move is inland. Tides rise. That means that the tidal zone shifts further inland, and that means that mangroves can actually migrate up slope. The problem with both of those is what's happening in terms of the rate and what's happening in terms of the surroundings.

Sea level rise right now is projected to be even faster than it was at the peak of sea level rise over the last 9,000 years. And might be so fast that even some of these really special mangroves effectively get swamped. In places like Florida, a lot of what's right behind the mangrove is not a scrub forest or a slash pine flat. It's a condo, right? It's somebody's house. So they're being squeezed. And that's gonna make it more difficult for mangroves in many different areas to actually migrate up land.

JENNIFER: Yeah. So, for all of these reasons, there's increasing concern about keeping these ecosystems intact.

And I know that NYBG has recently joined the Global Mangrove Alliance. Can you talk a little bit about that alliance and the broader efforts to conserve mangroves?

BRAD: Yeah, absolutely. So, the Global Mangrove Alliance. They've got three really important goals. They want to, by 2030, halt mangrove loss worldwide. Goal number two is restore half of what we've already lost. And goal number three is to double the protected areas from what's currently about 40% to about 80%. And those three goals would take us a huge step towards addressing the climate crisis and the biodiversity crisis through this really special kind of habitat.

JENNIFER NARRATION: After the break, we look to the future of our coasts in the tropics. We'll also discuss why mangrove forests were decimated at popular beach towns and how scientists are working to restore them. We'll be right back.

[BREAK]

JENNIFER NARRATION: Welcome back to Plant People. I'm speaking with Brad Oberle, Associate Curator at NYBG's Center for Conservation & Restoration Ecology. Before the break, Brad and I were discussing NYBG's partnership with the Global Mangrove Alliance, in an effort to protect these essential mangrove ecosystems.

Part of the work we're doing also includes supporting researchers who are looking for clues that could inform conservation and restoration efforts. Some of the answers may very well be in our Herbarium right here in the Bronx.

BRAD: A local graduate student was curious about our Mangrove fungi collection. Before this question came up, I didn't have a good idea of how many kinds of fungi actually live in mangroves and whether they live there at all.

Of course they do, and it turns out that a lot of what we know about them is because of a collection here at the New York Botanical Garden. We have the Kohlmeyer Marine Fungal Collection. 25,000 fungal specimens, many of which described new species and marine habitats all over the world. About a thousand of

these were collected from mangroves, and when the graduate student asked this question, he was curious for us to use our herbarium digitization information to actually try to associate these different kinds of mangrove fungi with the species that they grow on. So, we've got probably about a hundred species of fungi that were exclusively collected from mangroves and maybe from 10 species of mangroves overall. So, 10 times as many kinds of fungi from a mangrove ecosystem, as you have mangrove trees that are growing there, and this is just a small slice of the mangroves and a small slice of the collection that comes from a person in the community who had a great question that hadn't occurred to us, and it was fielded by our great people in the herbarium trying to address it.

And this is the kind of information that we can generate locally and then serve to people who are part of the Global Mangrove Alliance who are trying to rally the planet to address these kinds of questions.

JENNIFER: Yeah. There's lots to continue learning about and doing. Let's talk about the human component of this. In a place where mangroves are threatened, is there an interdependence in terms of livelihoods. Is there a sort of built in incentive structure? We've talked a little bit about protection against storm surge. What motivates people to care about these places?

BRAD: It kind of depends on where you are. I think because mangroves are so critical in the climate crisis, everybody depends on mangroves because they help keep our climate stable the way that we need it to be.

But that's pretty diffuse; there are many other people who depend sort of indirectly on mangroves through the food that they eat. As I mentioned before, mangroves are very productive habitats. Many different commercially and recreationally important fish species live part of their lives on mangroves.

Some of them are rare. Some of them are the kinds of fish that you would have at a restaurant here in New York. And then there are many people who depend directly on mangroves for their livelihoods. And in some situations it is mutually beneficial.

So, there's some really inspiring examples of communities, for example, in Colombia who protect and restore mangroves because they are an essential part of their livelihoods. Then there are other communities, especially communities in Southeast Asia where opportunities for economic development are more limited.

And so converting a mangrove habitat to something economically productive like a shrimp farm, or an oil palm plantation, might be one of the few options that they have. And a lot of the mangrove loss that we've had, and a lot of the mangroves that we had in the first place are from Southeast Asia; places like Indonesia.

So, we all have a stake, especially those of us who eat fish. But there are people in communities who live in these habitats and who have a big stake, and there are different models for how they can work with mangroves and work with the rest of the global economy.

We can support them to conserve, restore, and protect so that everybody benefits, or we can passively buy the things that come out of mangroves and let people profit in the short term, but possibly all of us being a little poorer for it in the long term.

JENNIFER: Yeah, it's a complex set of choices that people are grappling with.

I remember when I was in Colombia for the Conference of the Parties on Biodiversity we went to see some mangroves on the Pacific Coast, and there was a community there that was planting clams in the mangroves and then harvesting them and creating a sort of bioeconomy there that I think the intention was that in the long term it would help protect that ecosystem.

So, it was a really interesting and wonderful thing to see.

BRAD: And those are such powerful examples, and it's not just there.

I know of examples of similar economies in West Africa and those win-wins for the environment are exhilarating. And promoting them and making those choices

more accessible to more people I think is a really wonderful way of supporting our climate and then supporting local communities.

JENNIFER: So, you mentioned earlier that you've done mangrove restoration and that it's not easy. I think you did it in the Sarasota Bay. So, what were the threats that you were seeing there, and then how did you go about that work?

BRAD: So, the place that I worked was one of the more extensive mangroves in Sarasota Bay and people had lived there for thousands of years. There's a really cool archeological site where you can see just how important this was in supporting local economies. An interesting thing about the place is that a hard freeze in the 19th century killed off all the mangroves.

JENNIFER: Just one hard freeze?

BRAD: That's all it takes. Tough as they are, they can't handle cold. So, rapid temperature drop, or freezing temperatures for more than an hour or two, will pretty much wipe 'em all out. And, that at least used to still happen in that part of Florida every once in a while. Happened then, got rid of all the mangroves, a lot of the soil washed away.

This peninsula turned into an island. But, then it got warm. Mangroves came back, they started doing their thing. They grew more sediment. They re-glued this island back onto the mainland of Florida and resulted in a funny name: Tidy Island.

JENNIFER: Tidy Island.

BRAD: So, it's messy. That's right. Yeah. It's like weird Florida-speak for "tidal," but it wasn't an island.

It definitely was not tidy. And this is a place where I did this work. Okay. So 1950s, a lot of folks move into Florida and really what happened in mangroves around that point in time where they were dredged to try to get rid of bugs because like I said before, bugs love mangroves.

And then also for coastal access. So, long story short, this mangrove got really torn up. A lot of dredging, a lot of habitat loss, a lot of habitat conversion. So, big piles of sand where lots of undesirable introduced exotic plants grew. And so the project I worked on there was funded by the U.S. Environmental Protection Agency to experimentally restore this entire mangrove ecosystem by focusing on what to do with those invasive plants.

We worked with other government agencies, both local, state and federal. We worked with local communities, condo owners, neighbors, folks with boats, students. And over the course of about four years, we learned what made this mangrove tick, and we used that information to make it tick better, to restore biological diversity and to try to increase carbon sequestration.

So, it was probably one of the more gratifying projects I've ever done in my career. I learned a lot. It was really interesting and it was really important cause it really affected the people in the community and it's the kind of small microcosm type project that is so exciting to learn from, to try to deploy here at the New York Botanical Garden because our reach is so much more extensive.

JENNIFER: So, what made the mangroves tick?

BRAD: Well, not invasive plants, I'll put it that way. So, there were basically three species of trees that were just duking it out and all the disturbed habitat, and one of 'em was winning. One of them from Australia called “carrotwood” kind of cracked the code.

It took all of the dirty tricks of the other plants and turned into its advantage. It wasn't enough just to kill the invasive plants. We had to get rid of how they were messing with all the other plants in the ecosystem. So, we did a big experiment. We actually landed a forestry mulcher, think forklift with a gigantic lawnmower on the front. We had barged it over to the island and it went to town.

It mowed down these invasive trees, huge ones, but it did it in an experimental framework. So, in some places, it left the trees there, in some places we killed them a different way. In some places it chipped 'em all to mulch and we moved the

mulch around. And what we found was, if you get rid of the invasive trees and their mulch, native plants recovered spontaneously.

The problem though is that these invasive trees grow fast and store a lot of carbon, so it comes at a really big carbon cost. The mangroves that are next to these invasive plants grew more slowly, where those invasive plants were big.

They were basically getting shaded out. So, when you get rid of the invasive plants, you see a rebound in mangrove growth. But it would take decades or centuries for them to store enough carbon to offset all the carbon stored in the invasive plants that we got rid of. So, a little complicated. A little tricky.

JENNIFER: Yeah, it's interesting. I mean, I think in most examples, the biodiversity benefits and the carbon climate benefits are aligned. Most of the time those things work in tandem, but there are these moments, these kinds of examples where you're making a choice between carbon and biodiversity. and I guess it really depends on your timescale.

BRAD: It does, and it depends on what kind of biodiversity you like too. I like plants, right? So, I saw plant biodiversity increase, but we didn't even have the tools to look at the fungi or many of the other kinds of organisms. So, if we were to take a different perspective, we might see a slightly different story, and that's part of the reason why the Garden's work with GMA to unlock mangrove biodiversity is so important, so it can get a more holistic picture.

JENNIFER: That's really interesting. It sounds fun with that lawnmower on the forklift. Was it fun or just scary?

BRAD: It was intense. Like that thing got on there just a few weeks before my daughter was born, so I was a little delirious and like you could just feel it in your chest when the big trees would hit the ground. And they were so big, they actually broke the first one that they brought, so they had to barge on another one.

I never thought I would work on a project where I would use both a chainsaw and a wetsuit, but that's like a mangrove for you. So, I got decent at using a chainsaw. I'm glad that's not part of my job here at the New York Botanical Garden.

JENNIFER: So, what is it that you're still interested in learning? What are you focused on understanding now about mangroves?

BRAD: I'm curious to see around the world what other kinds of organisms live in mangroves. What's their holistic biodiversity like? And then a lot of it too, I think, is just about the communities.

The community where I used to live in Florida was one where many people supported mangrove restoration.

And there are so many different kinds of people who live in, depend on mangroves and who are necessary partners in our success. So, a lot of what I wanna learn is: learn what they know. Learn what best practices they have; and learn what they need to do their jobs better and how we can support them.

JENNIFER: Yeah. It's a profound lesson. We need people to restore and protect these places all over the world, so that's great. Well, thank you Brad. I really have enjoyed talking to you. We're so lucky to have you here at NYBG and we'll be watching what you do on mangroves with the Global Mangrove Alliance.

BRAD: Thanks so much. It's been a fun conversation.

JENNIFER NARRATION: To learn more about the Global Mangrove Alliance and how they’re working to protect Earth’s coastal caretakers, visit mangrovealliance.org.

In our next episode, two biologists have found a way to make plant science accessible for everyone. Jacob Suissa and Ben Goulet-Scott, the founders of *Let's Botanize*, join me to discuss how they’ve used the power of social media to make botany fun and approachable.

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From PRX, Plant People is produced by Jessica Miller, Courtney Fleurantin, Genevieve Sponsler, Adriana Rozas Rivera, and Pedro Rafael Rosado. The executive producer of PRX Productions is Jocelyn Gonzales.

From NYBG, Plant People is produced by Charlie Nork, Cosette Patterson, Matt Newman, Kait Tyler, and Michael Crowley.

Music from APM Music. Sound effects from Epidemic Sound.

Views expressed by guests are their own and not necessarily representative of NYBG.