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Living Shorelines: Building Resilience with Nature

JULIA KNISEL: So, we're not only dealing with rising seas and the storm impacts, but we're bringing back all of the natural system in this place.

JAY FEINSTEIN: Did you see that duck that just dove over there?

JULIA KNISEL: Yes! The buffle heads are so cute–

EMMA GILDESGAME: They're so cute–

JULIA KNISEL: You always see them in a male and female pair and this is the time of the year they start to come into the cove.

JAY FEINSTEIN: What are they called? They’re called buffle heads?

JULIA KNISEL and EMMA GILDESGAME: Buffle heads.

JAY FEINSTEIN: Buffle heads, okay.

JULIA KNISEL: They're adorable [laughs].

[music]

CHRIS MCGUIRE: You're listening to *Nature is The Solution*, a podcast from the Nature Conservancy. It's a show about how nature could solve some of our biggest climate challenges. Because doom isn't the whole story.

JAY FEINSTEIN: Those buffle heads–it's just the way that they dive–they just go straight down.

JULIA KNISEL: You'll actually see loons in here as well sometimes in the winter time, and they're even better fisher ducks [laughs] than the buffle heads.

EMMA GILDESGAME: Winter loons confuse me so much because they don't have that loon pattern and so I'll look at them and I'm like, why does that bird look familiar and why can't I figure out what it is? It's just a loon that is wearing grey.

[music]

CHRIS MCGUIRE: I'm Chris McGuire, the ocean program director for the Nature Conservancy in Massachusetts, and you're listening to our podcast producer, Jay Feinstein, out in Collins Cove in Salem—the site of a recently established living shorelines project.

He's out with Julia Knizel from the Massachusetts Office of Coastal Zone Management, and Emma Gildesgame, the climate adaptation director for The Nature Conservancy. In our next episode, you'll hear more from her.

EMMA GILDESGAME: Oh, is the next episode talking about the fact that we have to have a lot of different solutions to rising seas and coastal flood risk?

JAY FEINSTEIN: That's it.

CHRIS MCGUIRE: Today, though, we're focused on living shorelines like these. In a moment, we'll get more into what those are, but we wanted to start this episode by illustrating what a truly healthy shoreline could look like.

I always liked the imagery of standing at the water's edge and looking out at the beginning of a huge ocean, but by turning around, you're at the beginning of a huge continental land mass—it's incredible to be standing at a boundary like that! In a few steps or days in a car, you go across mountains and valleys and cities, and in the other direction, you go out into the vast untamed ocean.

The shore is a dynamic place, always shifting and moving, it's a transition zone. It's supposed to be that way. The trouble is we live in that zone with the things that support us like roads and houses, hospitals and businesses, power lines and driveways. How do we thrive when that infrastructure and people are at risk?

EMMA GILDESGAME: I mean there, it's also just from standing in this one spot, you can see we've got industrial space, we've got multifamily homes, we've got community institutions—is that the school?

JULIA KNISEL: My son went to–

EMMA GILDESGAME: The power plant–

JULIA KNISEL: Pre-school there.

EMMA GILDESGAME: Amazing [laughs] but really just from this one spot, you can see this huge range of life along the coast in Massachusetts, which all of us have to think about how we deal with rising seas. That was a weird way to say that [laughs].

CHRIS MCGUIRE: That's exactly why shorelines matter so much. They're the meeting point between our communities, our infrastructure and the natural world. How we care for them doesn't just impact wildlife, it shapes the safety, resilience and future of everyone who calls these places home.

In the recording studio, Jay asked me about this. We talked about why resilient coastlines are so important, what's at risk and the steps we can take to safeguard these places for the future.

JAY FEINSTEIN: Why should we even care about shorelines?

CHRIS MCGUIRE: Yeah, I think in Massachusetts—and really across New England—we love the coast. There's a $3 billion coastal tourism economy on Cape Cod alone and people come to the shoreline because it's beautiful, it's relaxing, it's nature and as we think about what that looks like going forward, we want the same things to still be there. We still want there to be beaches, we still want there to be beautiful marshes, and thinking about how we do that in our changing environment is really important.

JAY FEINSTEIN: And Chris, when did you start caring about the coast? When did you start working with it?

CHRIS MCGUIRE: Yeah, I grew up, I was fortunate to grow up pretty close to the coast and I have a lot of memories of being a little kid standing in the water, knee deep with a little net and a bucket, trying to catch little hermit crabs and, and think about what is going on in this amazing place at the coast?

JAY FEINSTEIN: It sounds like you had a sense of wonder.

CHRIS MCGUIRE: I think there's a piece of that. I always think of the ocean as there's a question that needs to be answered—you never really know what's gonna come up. I spent some time fishing as a kid and fishing is exactly that, you cast your line out there and you never know what's gonna happen—could be nothing, could be something exciting. And I think that that is kind of the magic of the coast, is that some of it is invisible. You know, when we think about the ocean, a lot of people think about the water as the blue expanse from the beach, but as soon as you look underneath, it's really different. The habitats are different, the species are different and there's always something new to discover.

JAY FEINSTEIN: So, shorelines are important, they benefit people and nature, yet they are changing. Chris, can you share a story that illustrates the immediate impact of shoreline change on communities, wildlife or nature?

CHRIS MCGUIRE: Yeah, so I live on Cape Cod in Falmouth, Massachusetts, and for folks who know Falmouth, there is one part where there's a coastal road called Surf Drive. It's right next to the water, it's absolutely beautiful, tourists flock there and about two or three times a year, the ocean swallows it up. All of the sand on the beach gets washed in a nor'easter onto the road and the town Department of Public Works goes in with their front-end loaders and shovels the beach back onto the beach and on we go.

You know, that's probably unsustainable in the long term and we really wanna understand, and the town is doing a lot of great work to think about, what could they do to be a little bit more proactive about managing this changing environment where again, you have a piece of infrastructure—a road that people love—that is slowly getting threatened by changes in sea level and increasing storms.

JAY FEINSTEIN: So, walk me through that. Why exactly is that happening? I assume when they built that piece of infrastructure, it wasn't. So, how long has this been a problem and why?

CHRIS MCGUIRE: The coast has always been an incredibly dynamic environment and for most of people's lives it's been relatively stable. We haven't seen a lot of sea level change and we haven't seen a ton of huge storms, luckily, coming crashing through New England, but in the land of environmental change that we live in now, we know that the sea level is gonna continue to rise more quickly. We know that we're gonna see more storms and that occasional washing over of the road has gone from once every few years, to once a year, to a couple times a year and people are beginning to see that this is a problem that we need to solve as opposed to an occasional once-in-a-lifetime experience.

DAN GOULART: Chris' story really relates to something we call “coastal squeeze”, where over time we've slowly built closer and closer to the water's edge. Sometimes we've brought in artificial fill material, other soils or other things to build that up, so that we could build houses essentially right on the water's edge.

CHRIS MCGUIRE: That's Dan Goulart. He's the coastal project manager for The Nature Conservancy here in Massachusetts

DAN GOULART: That also includes roads and public infrastructure like power lines and I think what we're seeing all over New England, essentially, isn't sustainable anymore because of sea level rise, because of more frequent, more intense, storm events.

What we're seeing is erosion creeping in and starting to impact public infrastructure—roads, power, bridges, people's personal properties—and I see that all over Buzzards Bay where I live.

JAY FEINSTEIN: What are the consequences—economic, ecological, social—if we ignore these changes? If we ignore these impacts?

CHRIS MCGUIRE: I can start with some of the ecological ones. So, in addition to being this boundary between the ocean and the land, the coast is an incredibly productive habitat. Something like 70% of fish species use salt marsh and the coast as a nursery habitat and so, in essence, as you lose coastal habitat, you're losing the productive grounds that build the small fish or the large fish like striped bass that people chase as anglers, or that provide a really important ecosystem service.

And even down to something that's tens of millions of years old, like a horseshoe crab. Horseshoe crabs depend on sandy beaches to come up and lay their eggs. If we were to build all concrete walls and close off those sandy beaches, those species would have a really difficult time surviving. And so, as we change the landscape, we're not only changing the landscape for us, but we're changing it for all of the other species for which the coast is really important.

JAY FEINSTEIN: So, this podcast series is about solutions, specifically nature-based solutions, and the solution here to all the problems that we just discussed is living shorelines. So what does that mean? And we can start with Dan.

DAN GOULART: Yeah, living shorelines, I like to think of them as sort of an engineered shoreline. Living shorelines are generally introduced where you have erosion in place and just like natural shorelines, the living shorelines that are being designed and built, they're gonna be able to flex and move and even migrate landward as the sea continues to move forward and encroach on them.

JAY FEINSTEIN: So the term here is interesting because they're called living shorelines but these aren't natural occurrences, these are manmade.

DAN GOULART: They're manmade but they're manmade with natural materials, so when we go in and we look at a beach to build a living shoreline, we tend to only use the materials that are currently in place, backing it up and creating more buffer zone to protect the people, property and wildlife that are behind it.

[music]

CHRIS MCGUIRE: “Buffer” really is the key word here. A living shoreline protects coastal communities and habitats from the water by creating a buffer zone, all without cutting off the connection between land and water. And as Dan said, this buffer is made of natural materials, like marsh plants or oyster reefs, any sort of transitional landscape.

Take Collins Cove, where we visited at the top of the show, it’s a great example of a place where a living shoreline is beneficial. Community infrastructure here is built right up to the shoreline, there’s a multi-use path, a municipal park, a school and historic homes just feet from the water.

JULIA KNISEL: This house was the first house along this stretch that was built, it was actually built in 1800. Most of the other homes along here were built between 1875 and 1915, roughly, so these homes were built when the tide was much lower. Over the last century, we've seen roughly a foot of sea level rise, so you can actually see where the project area is so critical now to proactively get established in order to provide that buffer for these king tides and nor'easters that we see in here.

JAY FEINSTEIN: So, sea level rise is not hypothetical in this situation, we could see it with our own eyes.

JULIA KNISEL: Absolutely, you can see it based on the location of that house to the cove, you can see that that house is actually closer to the water than the rest of these homes that were built 75—100 years later, and you can even see records of sea level from salt marsh cores as well.

CHRIS MCGUIRE: At Collins Cove, erosion made it impossible to ignore the need for a buffer.

JULIA KNISEL: The beach prior to this project looked horrible. It had chunks of asphalt from the multi-use path that was getting eroded out, there was a lot of gravel that was left over from the railroad bed when it was here connecting Salem Harbor over to the North River, and there's also just a lot of trash that the project team cleaned up when we brought in all of the sand and plants.

CHRIS MCGUIRE: Without a buffer, these homes were at risk of severe flooding. The multi-use path could have been washed away and local habitats threatened as well. So, sand was brought in to create a foundation for new growth. Then native plants were carefully planted—species like black grass, seaside goldenrod and sea lavender. The marsh plants slow the force of waves during nor'easters, reduce flooding from storm water, provide a resting area for sea ducks and add beauty to the neighborhood.

EMMA GILDESGAME: I know what it looks like in the summer, I do not know what it looked like in the winter.

JULIA KNISEL: It's so pretty.

JAY FEINSTEIN: I don't think I've ever seen sea lavender before.

JULIA KNISEL: Do you see the reddish-colored branching shrub there in the middle of the marsh?

JAY FEINSTEIN: I do now.

JULIA KNISEL: In the summertime it'll have beautiful little buds on it and now that we're here in the winter, it actually just provides a nice aesthetic component to the landscape.

JAY FEINSTEIN: Beautiful.

JULIA KNISEL: And you're leaning on a seaside golden rod right here. The pollinators love this. It's great fuel for our pollinators in the fall and even now into the early winter.

JAY FEINSTEIN: Yeah, it's November, almost December, and it's still flowering.

JULIA KNISEL: Yes, and all of these flower buds are gonna create seeds and help expand all of the, the golden rod into the rest of the high marsh area.

CHRIS MCGUIRE: Jay, Julia and Emma saw so many people out enjoying the project area, an area that's going to last and be protected because of the living shoreline. There were dog walkers, bikers and families, and if it was warmer perhaps they'd see some kayakers too.

JULIA KNISEL: It's a great place to put in a kayak. I actually will launch my kayak down the other end of the project area at high tide.

JAY FEINSTEIN: Do you kayak a lot?

JULIA KNISEL: I have an 11-year-old, so I don't kayak as much anymore, but [laughs] he actually helped plant this project. He came out and helped put in some of the high marsh grasses down there.

JAY FEINSTEIN: What was it like for him?

JULIA KNISEL: He loved it. He came down and sat on the sand, dug holes with his little trowel and stuck in the little plugs. It was fun. His class also walked down here with safety scissors one time and cut off the phragmites seed heads down the other end of the project so that the phragmites seeds wouldn't end up taking root in the sand after it was dumped here.

JAY FEINSTEIN: And those are invasives, right?

JULIA KNISEL: Yes, we didn't want that stand of phragmites over at that other part of the cove to seed in this area before all of the native grasses got established.

JAY FEINSTEIN: So he would've been like five years old.

JULIA KNISEL: That's right. He was in kindergarten at the time.

CHRIS MCGUIRE: So, a living shoreline connects the land and the water for plants and animals and also people. It offers an alternative to building hard barriers between the ocean and the coast. Take a seawall for example, while solutions like that can help protect infrastructure on land, they also come with downsides.

DAN GOULART: Seawalls in general, they really only bring one benefit, which is temporary protection. Really expensive to install and becoming increasingly difficult to permit all over New England, really all over the East Coast, I would say. Living shorelines come with a whole host of secondary, but also sort of primary benefit of protecting from flood and coastal erosion, but all these secondary benefits that, uh, improve people's quality of life, public health and offer access for recreation and a lot of other enjoyment.

The states realize that this is the only way that you can protect some shorelines and still maintain habitat, coastal aesthetic, recreational value, [and] economic value for tourism—limit the amount of coastline that's hardened. There's, there's gonna be places where you just, you just cannot do a living shoreline. You know, we need ports, we need harbors. There's certain parts of the coastline that are so highly impacted by high wave energy that a living shoreline would really have a tough time taking hold there.

And that maybe begs the question of, does the house that's right on the rock revetment at that high-energy site that keeps getting battered every year, should that house be there or should that, or is that first row of houses where we should actually have a buffer system? And I think that's a whole ‘nother conversation.

CHRIS MCGUIRE: That's actually the conversation that we'll have in our next episode, but Dan’s right, states are starting to recognize this. Here’s Deanna Moran, chief coastal resilience officer at the Massachusetts Office for Coastal Zone Management.

DEANNA MORAN: So, we have an enormous amount of coastal risk in Massachusetts, all up and down our coastline, and at the state we're really looking for ways to be cost efficient and effective at achieving coastal resilience statewide. And some of the best ways to do that are leveraging some of these more nature-based projects over hard infrastructure, which can be more costly and have shorter-term benefits in comparison to some of these nature-based projects where they make sense and where they're feasible.

CHRIS MCGUIRE: She says coastal resilience projects like these are a priority and the State’s ResilientCoasts Initiative incentives communities to work together to plan for resilience while using nature as a solution.

DEANNA MORAN: I think it's easy to think of climate coastal resilience—climate resilience—as an environmental issue, but it affects everything about our daily lives. It's a huge economic issue and we're working really closely with colleagues in housing and economic development and emergency management and just really across the board on the ways in which coastal hazards are impacting the work that they do.

CHRIS MCGUIRE: The economic impact here is significant and far-reaching. Storm damage, habitat loss and flooding can cost communities millions of dollars, disrupt local businesses and even lower property values along the coast.

On the other hand, protecting and restoring nature provides cost savings. Studies have shown that during superstorm Sandy, intact coastal wetlands saved $625 million in avoided infrastructure damage. Nature-based solutions, like living shorelines, are designed to harness the protective power of nature.

DEANNA MORAN: We're looking at a pretty big price tag for adapting to coastal hazards, but at the same time, the cost of not adapting is likely to be much higher. We have a study that was put out by the state a few years ago, the MA Climate Change Assessment, that estimated if we do nothing and things continue as they have been under status quo, we might be looking at a billion dollar a year bill for climate change by the 2070s.

[music]

CHRIS MCGUIRE: There are 70 coastal communities in Massachusetts on the front lines, facing some of the most severe impacts of climate change. That's why coastal resilience is a key part of the Commonwealth's biodiversity goals for 2050—and by the way, Massachusetts is one of the first states in the nation to have biodiversity goals. Here's Tom O'Shea, commissioner of the Massachusetts Department of Fish and Game.

TOM O'SHEA: So, we have essentially 25 years to make those kinds of investments, both in the resilience of our built environment, but also the resilience of nature along the coast, which is really part of how we help to absorb and handle the kinds of storms and flooding that we're about to see over time. Nature is so important to people's physical and mental health. So much of what we might be taking for granted lies in healthy biodiversity.

CHRIS MCGUIRE: Collins Cove in Salem is a great example of these kinds of investments. It not only adds resilience to the shoreline but also brings new beauty to the area.

JAY FEINSTEIN: What's your favorite part about this area?

JULIA KNISEL: It actually looks really pretty now. I'm telling you, it looked horrible. If I showed you a picture before we came in and worked with the community to restore this area, you just would be disgusted [laughs]. This area is coming back to life.

[music]

CHRIS MCGUIRE: *Nature is the Solution* is a podcast from the Nature Conservancy. In our next episode, we'll dig into climate adaptation and look at how our communities can change and adapt as sea levels continue to rise.

EMMA GILDESGAME: How do we bring nature into places where it's not? How do we bring human systems in line with natural and ecological systems, so that rather than constantly battling heat and water and all of these other elements, how do we create a system where we're working together where we have cool livable streets in the summer, where we are safe from winter storms that come through, where the extreme precipitation—those times where all of a sudden the skies open up and drop a month's worth of water in 20 minutes—that we can make it through and accommodate and live with those systems. And recognize where we need to really make some fundamental changes and where we can make some small tweaks, because we need everything in the climate toolbox.

CHRIS MCGUIRE: Stay tuned for our next episode. You can search for *Nature is the Solution* on Apple Podcasts, Spotify, or wherever you listen.