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SARAH BECK

You're listening to Garden Futurist, a show about innovative thinkers contributing to a climate resilient future through the power of gardens. I'm Sarah Beck with Pacific Horticulture, here with Adrienne St. Clair. Hi, Adrienne.

ADRIENNE ST. CLAIR

Hi Sarah. Today, we're talking about how wild plant populations are responding to climate change and what humans, both ecologists and home gardeners, might do to encourage healthy and diverse ecosystems.

SARAH BECK

I interviewed our guest, Tom Kaye. He's the executive director at the Institute for Applied Ecology in Corvallis, Oregon, where his team is working to conserve native species of plants and animals and doing ecosystem restorations.

Hi, Tom. Nice to talk to you today again.

TOM KAYE

Hi Sarah. It's great to be here. Thanks for having me.

SARAH BECK

So you're seeing declines in certain plants. I know you've also said that climate change has fairly complex impacts on plants. I'm really curious about this idea of ranges, plant ranges changing, and what that really means. I know that plants don't have the ability to walk. I know that from all of my plant science background, so what is going on with plant ranges changing right now?

TOM KAYE

Well, I'll give you an example from trees. This is a really interesting study that some folks did a few years ago, Monleon and Lintz, and it's published online in PLOS One. So you can look this up. They looked at data from forest tree plots that were recorded by the Forest Service and other agencies.

They had tens of thousands of plots to comb through and detect change. And what they were looking at was how often there was a disconnect between the ability of adult trees to be present at a site versus seedlings. And what they found was, after looking at a whole bunch of different species of trees, a good number of trees, maybe a third of them that they were looking at showed us a trend that worked like this: the seedlings preferred cooler temperatures than the adult trees.



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And what that means is as climate changes and becomes more warm, the mature trees can hang out there and flower, make seeds, and look great, but they're not making seedlings. You have to go further north to find populations of these trees that are actually able to fully reproduce and make seedlings in the understory.

So you end up with sort of ghost populations of trees that eventually will die out because nothing lives forever. And they won't be replaced by their progeny because their progeny long ago lost the ability to grow there. So that's an example of how some organisms are being forced to shift their ranges.

SARAH BECK

I'm just feeling so bad for these trees that are down at the bottom of the slope right now. And they're not making any offspring. How do we find that plant that can now sit at the base of that that slope now?

TOM KAYE

I don't know that we really know the answer to that very well yet, but there are some tools and approaches out there that we can use. For example, there is an online tool called the Climate Smart Seed Lot Selection Tool that allows you to say, well, here I am now, now map for me where the climate of say, middle of this coming century or the century we're in or late in the century, where is that climate that we're going to have currently today?

So where on the landscape is our future analog climate? And theoretically you could go there and collect the genotypes of the plants you want. And move those to your location today so that you have tomorrow's plants. So it's back to the future. You pick the plants from where our future climate is and start growing them here, and not necessarily like saying we're not going to plant the local type anymore. We're only going to plant some future climate guests. No, no, no, no, no. You're going to plant a high diversity of the plants we have currently and then add mixture, a dose, a sprinkling of those genes that we're going to need in the future.

And in one project we've been collaborating on, we were looking at trees that might grow in riparian areas around Portland. And it almost came up kind of jokingly because we were looking at these climate maps and thinking, should we be planting redwoods? Oh yeah, ha ha. Redwoods. And then wait, are we serious? Maybe we are serious.

So who knows? We're going to have to have that conversation and be thinking about how we change the assemblage of species we work with to fit the new environment. And some of that may have some



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discomfort for some of us and some challenges to our understanding of what a native plant is and what our ecosystem is supposed to look like.

But so far, these conversations that I'm having are focused on plants that are native to this region. And when we're looking, say, further south and selecting plants and species that might not currently be here, they are native species. We're not talking about bringing in invasive plants from another part of the world, but leveraging those plants that are in our broader sense of what's native and trying to assemble something that will be successful.

Again, this is kind of an area of ethics and can create some interesting and uncomfortable conversations with people not agreeing with one another.

SARAH BECK

Well, the biodiversity loss is a pretty crushing thing to face, so it's interesting, whatever approach ends up working in these different scenarios, it seems like we're now involved.

TOM KAYE

Yeah. And the biological diversity loss is real. For example, a study about 10 years ago in the Siskiyou mountains in Southern Oregon, had this a really great approach where they went back to ecological plots that had been placed 50 years before and resampled them. So they had data from a different climate, a former time and were able to go and resample what was there. And what they found was that the species diversity of plants had dropped between two thirds and three quarters. In other words, the amount of species there was like a third or quarter what had been there previously, that's a huge loss in biological diversity.

And when you think about, well, what does that do to pollinators and birds and other organisms that are interacting with this species richness? You know there's concurrent losses in those other groups of organisms as well. So climate change isn't just happening in the future. It's happening now. In fact, it already has happened and we really need to be considering actively how we're responding, not going to respond, but responding today.

[Break for Underwriting]

SARAH BECK

There's gotta be a sign of hope here. Let's talk about that.



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TOM KAYE

Yeah, well there is, there is hope and that hope is that we can take action. I mean, we have a choice. We can do nothing and let the ecology just shift as it will. Or we can take action and start making informed decisions about maybe moving species or genes and making communities of plants that do perform well and maintain diversity and that have resilience in the face of a rapidly changing climate and also weather events that are extreme: more fire, more freezing, more ultra heat, those sorts of things.

SARAH BECK

This idea of a climate resilient world. It sounds to me like you're saying we are only going to get there by being involved.

TOM KAYE

That's right.

SARAH BECK

This isn't about standing back and allowing nature to heal itself. Right?

TOM KAYE

Well, we need to work with nature to help it heal itself. Let's put it that way. The pace of climate change is really going to outstrip and has outstripped the ability of plants to migrate themselves as they have done over Earth's history since plants evolved.

It used to be plants just moved with climates. They shifted ranges and there's great evidence of that during the Pleistocene and after the Pleistocene and we know these things have happened. But now we have fragmented and isolated much of the natural landscape so that the plants can't just incrementally migrate across the landscape.

They have to hopscotch, there's big jumps they're going to have to make. So we have to be the catalyst for some or most of that, I think. And so how do we do that in an organized manner and in a way that works? I mean, do we need to be bringing soil microorganisms with these? Do we need to be bringing their pollinators?

There's a whole big, wide open section of ecology on how to really accomplish this in a way that will be successful, that we're still learning. There's a lot of great scientists doing research on this, for sure. But we don't really know how to just, say, do this on a large scale.



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There's going to be maybe a new generation of ecologists that are able to come along and think in terms more flexibly than perhaps folks like me that learn this is the, history is the way it's supposed to be. The future should look like the old times. And we just may not be able to have that.

SARAH BECK

It's fascinating though, this futurist vision you're talking about for a resilient world doesn't necessarily look like something we've seen before, but it could be a resilient world.

TOM KAYE

And a lot of conservationists like me get really upset when we hear terms like novel ecosystems that incorporate a lot of invasive species into them. And it's like, well, let's just accept invasives as part of these systems because that's what's growing here and that's what's coming.

SARAH BECK

Because they're so tenacious, you mean? They're so capable of being there?

TOM KAYE

Yeah, and they do well in lots of environments, and that's true, but their diversity is lower than the native diversity. And when we have invasive plants come in and become dominant in an area, we generally lose the diversity of the native species.

And when we lose that diversity, we lose a number of ecosystem functions, from pollinators to soil health, to all kinds of things. So there is a trade off, a very real trade off, when we abandon our natives and just give over to invasives. So I come at this with some anchorage into the past in wanting to help those native plants transition to a future world where they can still exist, because they're so important, because they represent the real diversity that gives us ecosystem function.

And when I say ecosystem function, I mean, functions that are important for human survival. This is not just because I think ecology is cool and native plants are neat, but I think I want a world where my children and my grandchildren will survive. And I am convinced that that involves using high diversity of native plants in the future.

And it comes down to the basic productivity, the ability of Planet Earth to convert sunlight into vegetative, vegetable material and have that productivity sustainable through time so that you don't have a good year where there's lots of growth of plants and then a bad year where everything dies out. That's what happens in a low diversity ecosystem.



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SARAH BECK

We can't afford that.

TOM KAYE

We can't afford that. That means whole ecosystems shut down. I mean, we know what happens with COVID when we tried to shut everything down, it's terrible. We don't like it. And then wild systems are the same way. So the way you build a resilient system is to have a very highly diverse, with many different kinds of species and genetic diversity among those species.

So that when you have an extreme year, there's always some species that are able to step up and maintain the productivity, maintain the growth, and in a different kind of year, it'll be a different set that step up. That's called complementarity.

It's what you do when you're investing in the stock market for Christ's sakes, right? You have a diverse portfolio because if you only have one and the market tanks on that, you lose everything.

SARAH BECK

Right.

TOM KAYE

So you need to have an ecology that invests the same way that has high diversity so that when the market or the climate is difficult in one year, you've got some stocks, you've got some species that do well still and carry you to the next year.

And so you smooth out that variation. You don't want that year-to-year variation to hurt your productivity or your stock portfolio. You want to smooth it out. You want to dare to be average. That's what's going to create a system, that is resilient that is resistant to invasives and change, and is good for the earth, is good for human survival.

SARAH BECK

I like this vision. It's better than biodiversity loss by miles.

TOM KAYE



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So, you know, the home gardener is creating Eden on a small scale in some manner, right? They're growing food for themselves or for animals, creating a place for the plants themselves to be. And that is a huge gift to our neighbors, to our communities and our towns and cities and our Earth.

But also when a gardener connects with a plant, especially a native plant, they can then be an ambassador for that plant and start learning more about perhaps its ecology in the wild. I mean, I study plants in the wild, but I also grow them in my garden because when I do that, I learn much more about them than, say, I might with a few days of field work. I get to see them every day, understand how they flower and I learn new things that are interesting about them.

SARAH BECK

There's an intimacy there, right?

TOM KAYE

There's an intimacy and yeah, and really maybe a sense of developing commitment to the organisms themselves. To say, this is a native plant, and I want to see this not only in my garden, but I want to make sure it stays out there in the real world, the rest of the world, and survives.

So gardeners can become more conservationists because they've connected on that intimate level with a species that, if it's native, might be a species not many other people have connected with and then become a champions for that species and bring other people along to see, see this neat plant in my garden? Here's some seeds of it. I want you to grow it, too.

SARAH BECK

And share the futurist vision. I love it.

TOM KAYE

We all need to do it.

SARAH BECK

We all need to do it. Thank you so much. This is such a great conversation, Tom.

TOM KAYE

This has been my pleasure.

SARAH BECK



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That was really fun talking to Tom. I really love hearing his ideas.

ADRIENNE ST. CLAIR

It was such a great interview. I'm interested to hear what you found interesting about this interview 'cause he's talking a lot about things that I think a lot about, but I wonder what parts resonate with somebody who thinks about many other things.

SARAH BECK

The most inspiring piece for me was really getting to that place where we were, obviously there are lots of daunting aspects of where we are right now. We're going to experience loss of biodiversity, we're going to experience extinction, like those things are going to happen, but there's a version of that world, that future world, that is a better place, not necessarily better than where we are right now, but it's a better place than the doom and gloom version of where we might be.

ADRIENNE ST. CLAIR

Yeah. That was the thing that caught me too. I think that we've been told over and over again, that humans are bad for the environment. That humans only have negative impact, but if there's decisions that we're making that have negative impact, then within that reality has to be the opposite, also: there are decisions that we can make that have positive impact.

But as an ecologist, it is scary. It's hard. It's uncomfortable to think about making changes because we've been taught that making changes is a bad thing and that we need to be good with the status quo, but the status quo is not true anymore. It doesn't matter where you go. There will be an effect from climate change. And so there is no status quo anymore.

SARAH BECK

I think he really loves thinking about how what we're thinking today might seem extremely ignorant someday in the future in which, you know, the child today who is going to someday go into this field is going to have this totally more evolved perspective on all of these decisions.

So Adrienne. Did anything inspire you or give you hope?

ADRIENNE ST. CLAIR

The thing that inspired me the most about what Tom was saying was to be reminded that there are actions that we can take that do make diverse and healthy ecosystems and so we need to be willing and ready and informed to make decisions that we think might create the most healthy and sustainable landscape for the future.

SARAH BECK

Looking at some of our friends right now in doing the Garden Allies series, which is going to be coming out soon, they're using this idea of humans as garden allies, because of that very reason. This idea that



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humans can have this role and what we choose to do in our gardens, if we're leaving some plant material over a period of time, instead of cutting something back immediately and removing all of the, like say dried plant stalks, for instance, places where insects might be able to live or benefit. Having that role of humans being the ally, I think it's a really good place for us to put ourselves and it's more effective than sort of demonizing humanity.

ADRIENNE ST. CLAIR