Episode 68

# [00:00:00] Introduction to the Podcast

**Lauren Grand:** From the Oregon State University's Extension Service, you are listening to In the Woods with the Forestry and Natural Resources Program. This podcast brings the forest to listeners by sharing the stories and voices of forest scientists, land managers, and enthusiastic members of the public. Each episode, we will bring you research and science-based information that aims to offer some insight into what we know and are still learning about forest science and management.

Stick around to discover a new topic related to forests on each episode.

**Jake Barker:** Thank you for joining us for another episode of In the Woods.

# [00:00:38] Meet Your Host: Jake Barker

**Jake Barker:** My name is Jake Barker, extension Forester for the North Willamette Valley, and I'll be your host for today's episode.

# [00:00:44] Today's Topic: Assisted Migration and Gene Flow

**Jake Barker:** Today's episode is all about assisted migration and assisted gene flow for plants and trees.

These are big topics that are being discussed by managers, practitioners, and foresters in the Pacific, Northwest and beyond. In this episode, we hope to define the key terms associated with assisted migration. Explore the connections to best management practices and climate change, and provide some tools for landowners, managers and community members to refer to when thinking about new plantings.

# [00:01:17] Guest Introduction: Jess Shamek

**Jake Barker:** Joining us on the podcast today is Jess Shamek, plant enthusiast, PhD, and an engaged member of the public Jess's research at Portland State University focused on the adaptive capacity of Oregon White Oak. land.

I heard Jess give an informative presentation at the 2025 climate adapted Plants working group meeting, and I thought the concepts and tools that they presented on would be highly relevant for our listeners. So Jess, welcome. Why don't you tell us a little bit about yourself and how you interested in field ecology and.

**Jess Shamek:** Thanks, Jake. Thanks A little bit about myself. I grew up in central Oregon between Central Oregon and the Valley. I learned plant ID from my grandfather who whose family homesteaded in Foster, Oregon. And then I did youth Conservation Corps in the high Lakes of Central Oregon.

But I was a first generation student, so it took me a few extra years in a roundabout sort of way to become a field scientist. That being said, I've been a field botanist in the Portland Metro region for 10 years, and I love practicality. So it just was natural that I ended up learning about climate change and trying to answer questions about climate change that land managers had for me as a scientist.

**Jake Barker:** Can you talk a little bit about the connection between being a botanist and being a farmer?

**Jess Shamek:** Yeah. Yeah. I mean for me it was just I needed work and I knew how to. Work on a farm. So between field seasons it was easy to find work as a farm hand or organic farms in the Mo Valley. I've also traveled around doing worldwide opportunities on organic farms. So wolf, some people call it and just love plants, love growing plants.

I don't, I see nurseries, native plant nurseries and organic farms as in similar. Industry, so seems like a natural connection there to me.

**Jake Barker:** Cool. Yeah. It feels like, in natural resources, especially in forestry, we often forget about how all those things are highly interconnected and linked. Both as land uses, but also as ways to. Feed and sustain our communities and people. So it's great to learn more about your background and your passion.

I'd love to dive into the kind of core topics and focus areas we wanna talk about today. To start, I'd like to define and clarify some of the key terms for such a popular topic. 'cause I think that's pretty important.

# [00:03:54] Defining Assisted Migration

**Jake Barker:** So can you start by giving us a definition of assisted migration?

**Jess Shamek:** Yeah, absolutely. And I wanna just upfront say that people have different definitions for assisted migration. And for assisted gene flow. And when my colleague Adrian St. Clair and I sort of started on this journey of thinking about best management practices for climate adaptation when I was in graduate school, we met with the Nature Conservancy and their best advice to us was you have to define the terms for yourself. So the terms that I'm using today are terms that I am defining based on how I've read the literature, but other people might have other definitions. So the most important thing when you're talking about assisted migration is that you.

Define how you're using the terms before you start talking about it. So I'm really glad that you are having me define the terms. So, when I talk about assisted migration today, what I'm talking about is the movement of individuals from an area within the species range to an area outside of the species current range.

So again, moving individuals from an area within the current species range to an area outside of the current species range. So that's assisted migration.

**Jake Barker:** Okay. Where before we get to the next definition, when you talk about species range, is that coming from a national or agreed upon? that defines the ranges of given plants.

**Jess Shamek:** Good question. Yeah, so there's a lot of different data out there to investigate a species range. So you could look at iNaturalist if you were a citizen, if you were working for the feds, you could look at USDA plants. For for me, a lot of the work that I use, I look at the Pacific Northwest Herbarium Consortium and that shows me where all the locations of the species that I work with have been over the last since herbarium specimens have been collected in this area.

So Pacific Northwest Herbarium Consortium is what I use often in my work to define a species range.

**Jake Barker:** Okay, so that helps you establish the baseline for where those plants are today. And then assisted migration is thinking about moving those individuals outside of the range.

**Jess Shamek:** Yeah, exactly. So a good example of that would be in the Portland metro region we have white alder. This is sort of the northern extent of al this Rho Folia. And a lot of people wanna move it. More north. And so we would look at the Pacific Northwestern Bearing Consortium and we would see that there's a collection in the Willamette Falls area, but we want to migrate that.

Not saying that we do, but as an example, we, if as an example, you wanted to migrate it up to Washington, that would be assisted migration.

**Jake Barker:** Thank you. That's great to have an example. So the other key term is assisted gene flow. Can you define that?

# [00:07:02] Understanding Assisted Gene Flow

**Jess Shamek:** Yeah, so assisted gene flow is the movement of genetic information either by moving individual plants or seeds or pollen from one area within the current species range to another area within the current species range. So you're simply moving populations within the current species range. So a good example of that would be.

With Doug Fur, if we wanted to have a more drought tolerant Douglas Fir, we could go get seeds from down in southern Oregon, grow them out and plant them up here. Doug Fir, it's current range is still in the Portland Metro region where I'm at right now. So that would be assisted gene flow.

**Jake Barker:** Gotcha. Another term that I've seen as I've been doing my own research or helping landowners is this term phenotypic plasticity, which is a mouthful, but I think it's related to this idea of gene flow. I'm wondering if you could talk a little bit about that and define that as well.

**Jess Shamek:** Yeah. So phenotypic plasticity, all plants have phenotypic plasticity. Basically, when you have a phenotype, it's the range of visible conditions that a plant will show. In response to different environments. So for instance you can have a leaf that grows bigger in the sun versus in the shade. And that is the difference in that sort of leaf shape or leaf area is the plasticity of the leaf.

So all plants have within their genotype the ability to respond to the environment. And that's something that's really amazing about plants is that you often don't see. How responsive they can be. Phenotypic plasticity is a trait implants that evolved in response to them being Cecile. So humans have phenotypic plasticity, like for instance, in the amount of hemoglobin that we have.

I'm not a human biologist, so I'm sorry for any human biologist. If I butcher that. But human humans also have phenotypic plasticity, but plants and other cile organisms have more phenotypic plasticity because they can't move around. So they need to be able to respond to the environment. And phenotypic plasticity is just one way that they've evolved, being able to respond to the environment.

And so what that means for climate change is that often when you're thinking about a plant the phenotype that you see or the leaf size shape. Plant height that you see is not the range, the full range of possibility that's within that plant's genotype.

**Jake Barker:** So when we're talking about gene flow and we're pulling. Say, growing from the southern part of the range up to the northern part of the range we are exploring, basically we're exploring the different phenotypic expressions that are possible within that given species. Right.

**Jess Shamek:** I would say so I, I don't think that's necessarily the goal. I think when you're talking about gene flow and assisted gene flow, what you really wanna do is find something with a phenotype that's better adapted to the future. So you're not necessarily caring how about how plastic it is or how changeable that phenotype is, but you are caring about whether or not the specific phenotype from that area is adapted to the future.

So you might have a Douglas Fir that has a phenotype that's better adapted to drought, and you're moving it up to an area where you're increasingly experiencing drought. And by up I mean northern into the northern, areas. And that would allow you to have a better adapted plant. The phenotype would be better adapted to the future, if that makes sense.

**Jake Barker:** Gotcha. Okay. I think those are the main terms. Do you think there's anything else that is important to define before we talk about best management practices or climate change?

**Jess Shamek:** I think one thing you could throw in there is assisted population expansion or assisted range expansion, so that would be sort of pushing the northern limit of species ranges. Creating it's sort of like assisted migration light. You're going to the end of the range and just going like a little bit farther.

**Jake Barker:** So it's almost something that the plants might do on their own.

But over a slower or longer period of time just kind of creep, creeping, creeping up or out a little bit more.

**Jess Shamek:** Exactly.

**Jake Barker:** And I'm sure there's the converse of that, which would be range contraction. Yeah. Okay. All right. I feel like we've got our good working terms.

We've defined these ideas keeping in mind that they are specific for how you are using them and that. Especially the definition of assisted migration is gonna look different for different places and for different communities and practitioners. So I think that's a really helpful place to start.

# [00:12:17] Best Management Practices in Climate Change

**Jake Barker:** transition to talking about best management practices. So we've defined these terms. Let's dive into your thoughts on best management practices, especially in the era of climate change. As well as. I that.

**Jess Shamek:** Yeah, absolutely. I love talking about this. So I work with a lot of land managers who ask me questions like, should I do this? Should I, should we be doing assisted migration and should we be doing assisted gene flow? And so that's primarily where my research has come from. And the work that I do just trying to answer specifically like project managers.

Portfolio managers who are managing these restoration projects at the regional scale. If they should be doing assisted migration or assisted gene flow and using the research that's available out there. 'cause there is quite a bit of research a lot of it is still academic. It's not proven. Or field tested at the moment because this is such a, climate adaptation is such a new field, but the majority of the work that I do in terms of best management practices comes from this sort of pragmatic place of trying to answer these questions from lane managers.

**Jake Barker:** What are some key questions that you ask these land managers who you're working with?

**Jess Shamek:** . That's a good question. Primarily what is, what level of risk are you comfortable with? Because a lot of these management practices, specifically assisted migration and assisted gene flow come with risks to the ecosystem. And they also come with financial risk. So, when I try to answer questions for these land managers and when I ask them about the sites that they have we're talking about what do you need?

What are you trying to accomplish here? Are you trying to replace one species with another because it's dying off? Are you trying to transition this ecosystem to a completely different ecosystem because you don't think it's doing well? We, I try to help them work through sort of understanding what the point of them doing climate adaptation is because the most important thing I think from my perspective is that we first define like the level of risk that they're comfortable with, and then what is the point of their climate adaptation practice that they're doing.

**Jake Barker:** Are most folks that you work with pretty in touch with those parameters for themselves or for their organization or do you feel like those parameters are changing or evolving?

**Jess Shamek:** Yeah, I feel like most people don't even know what questions to ask at this point, and or, and there's so many details associated with climate adaptation. I mean, whenever you're doing any type of natural resource science. You're moving plants around, there's all kinds of things that you need to think about.

So I try to help them think about like, if you get trees from another place, are you gonna be introducing any phytophthora or any other pests that you might not wanna be introducing? Are you going to be destabilizing the ecosystem in a way that might be irreparable in the future by introducing a different species?

So primarily like helping walk through the risks. Because a lot of people are just overwhelmed when they think about climate change. And it really helps to get detailed into that to help people make decisions and decide what they're comfortable with in terms of climate adaptation.

**Jake Barker:** So you mentioned that a lot of this. Still is. A lot of the research that is coming out is theoretical or it hasn't been tested on the ground or there haven't been field trials. Are there cases where people are actively making decisions to move a species into a new place where there it's completely novel.

Are they also developing research in conjunction with that or what are your thoughts generally about the sort of ethics around what a manager should or shouldn't be doing in terms of supporting the ongoing exploration of impacts of assisted migration?

**Jess Shamek:** Yeah. That's a great question. I think it, it depends on the organization that you work for. So there are like nonprofits who are doing assisted migration. There are some public utilities who are testing assisted migration. And there are some like private businesses and farms and consulting firms who are testing assisted migration at the moment.

That being said. I think what you decide about assisted migration, and especially like the folks that I work with, it really depends on the type of organization that you work for. So, for instance, if you're working with taxpayer dollars you are, you have a lot less like risk tolerance than someone who's working with nonprofit dollars.

For and public utility dollars. So for instance, if I'm thinking about moving a bunch of trees and I'm. Going to plant these trees using taxpayer dollars, and I don't know if they're gonna survive in the long term because we're moving trees across across the range. And it's a huge environmental difference between where they came from and where they're gonna go.

A bunch of them might die and we just don't know what the mortality is. Does that answer your question?

**Jake Barker:** I think so. And it makes me also curious about if you've had experience working with small landowners or even homeowners who are making decisions about plants and trees, and if you've had about. Risk tolerance and planting species outside of their range.

**Jess Shamek:** Yeah I've had a few. Conversations with folks mostly through the climate like climate change working group that you first came across my presentation on. But not often with pub members of the public. I think that. Assisted migration and assisted gene flow are both very new for scientists and for land managers and so they haven't quite filtered out down into the public sort of lexicon and climate adaptation in general hasn't really filtered down to this plain language that people most often need to understand it.

I think we're just getting there. So I don't often have conversations with members of the public about it. When I talk to friends and family about it, they're, they glaze over and they're like, cool, you're working on that. And then they change the subject. I guess climate change.

Climate change is really sad. People get really sad about it. And, it's hard for emotionally hard for people to deal with thinking about changing ecosystems around us. 'cause they're, they exist in like this cultural context. Like they don't exist apart from us. We live within them every day. We work in them.

They're economically important, they're culturally important. So oftentimes people change the subject when I talk about climate change. 'cause it's difficult. Yeah. With that being said I do really think that it's important that we have these conversations with people, and I think it's really important that we talk about the risks of assisted migration and assisted gene flow because they're there and we don't have proof of concept yet that assisted migration and assisted gene flow will be effective.

But the theoretical research says that it could be. Both of those practices could be effective for different purposes. But even then the research is a little sparse. We need more information. But that being said, we also need to act at the same time. So we're sort of in this hard, in between a rock and a hard place where we don't have all of the information, but we need to be making decisions now.

And that's why I really try to talk with land managers. About what level of risk are you comfortable with in terms of like ethics, in terms of, ecological risk, in terms of financial risk and what are your goals? Do you need to. Do you need to change this ecosystem? Or is it actually gonna be resilient?

Because that's one thing I think a lot of people don't even start thinking about. A lot of the assumption is that people get really emotional and say like, oh, a forest are dying and all these trees are gonna die, and we have to replace 'em. And I have to sort of be like, whoa, pump the brakes.

Like, do we know that for sure. Have we looked at the research on that species and that ecosystem Because it's possible that. It is resilient to climate change because there are a lot of species and ecosystems that can deal with big differences in temperature and precipitation. Now that being said, all of that is theoretical.

We don't know for sure until we get there, so stay tuned. But it's important to look at it from both sides.

**Jake Barker:** Seem like we're sort of trapped in this paradox where ideally we would wait around for 10, 20, 30 years to see what happens with these trials, but we don't have time because we need to make decisions about what we're planting right now. And I imagine that, yeah, for some people it's very stressful and there's a lot at stake.

I have several things that I'm thinking about in response to that.

# [00:21:41] The Role of Large-Scale Disturbances

**Jake Barker:** One of my questions is something that I came to mind as you were describing that was large scale disturbances. So something that's really important in forest ecology and forest management. And forest science is. The role that large scale disturbances play on forest communities, and I'm thinking especially about disturbances that are acute and very large.

So the two that I had just thought of were the Missoula floods. So the LA end of the last ice age, we have a series of massive inundations from the Columbia River that flood the Willamette Valley. And then more recently, a series of large wildfires in northwest Oregon known collectively as the Tillamook Burn.

And so these are two kind of separate disturbances. First question is about something as cataclysmic as the Missoula floods, which radically shifts the soils and plant communities. Are we, and so the floods happen. There's a lot of water. Then slowly it recedes and there's this new area for plants to move into. They're gonna come down off of the mountains and the ridges and repopulate into what, what is slowly becoming a floodplain is that when you're thinking about your. Questions around climate adaptation?

Are you looking towards these past examples where acute events happen and change landscapes and plants have to recapture a site or regrow into a new place? Is that relevant?

**Jess Shamek:** Yeah, it's relevant and I'm glad you brought that up because that is one BMP that I came up with. One best management practice as a recommendation. I think it came from the forest service that these plants that you're talking about that move into these disturbed areas, they're called disturbance tolerant plants.

And they have a high degree of phenotypic plasticity so they can adapt to these really harsh environments. And you see these in areas of primary succession, like, like after the Missoula floods or after Volcan eruption or. Or after a wildfire you see this certain type of plant that's very well adapted to that really harsh environment and really good at coming in and beginning to grow and sort of setting the stage for other plants.

So those types of plants, those disturbance tolerance plants are predicted to do better in climate change. And that, that's a whole group. So when I think of those, I think of like willows, a really disturbance tolerant. 'cause they can move into new areas very quickly and colonize, for lack of a better word, colonize the area and set up an ecosystem in a very short timeframe.

Yeah, I think when you think about primary succession research it's interesting that you say that because that's one of the ways that I got into this work was I took a class at University of Victoria in British Columbia. On Earth history through deep time. And I learned about Moss primary succession and how the early Bria fights like the ancestors of the Bria fights came onto land during the Orde vision and cooled the Orde vision and created like, they changed the climate.

And that was sort of my like, moment of like, oh, like plants. Plants have been changed in the climate for, millions and billions of years. And that's awesome. Like, could we use plants to reverse climate change? Now? That's sort of how I got into this, is I thought that was like a super cool idea that mosques could change the atmosphere 'cause it's such a small, tiny, significant plant.

But yeah those plants like that, those plants that exist in areas of primary succession. Are predicted to do really well in climate change. And I think they give us a lot of hope because they have that plasticity. But not all plants have that. So it really depends, I think, on the environment. And it really is one of those things where you're like, I guess we'll just have to wait and see what comes after those plants after the big disturbance.

# [00:26:09] Climate Change and Plant Communities

**Jess Shamek:** And if what comes after in climate change is the same thing that we would've. Thought that came after, before climate change. Because plan communities are changing, rapidly and right before our eyes. And there, we have to accept a certain amount of change there, but we can really look towards those ecosystems to sort of guide how as managers we can utilize plants and particular types of plants.

So, those disturbance tolerant plants, give me a lot of hope.

**Jake Barker:** Yeah. That's a great story of hope of optimism. So that, thank you for that.

# [00:26:42] Best Management Practices (BMPs) for Ecosystems

**Jake Barker:** What's what are some other examples of BMPs? Like you said that one of them that you have been thinking about was related to to. Stress tolerant plants. What other BMPs do you think are important?

**Jess Shamek:** I think for ecosystems that you're trying to conserve and I mean, it all depends on the goal of your institution. So like the institutions that I work for, we have some rare, ecosystems like oak savannahs and things like that. And we really care a lot about bringing those through climate change.

# [00:27:15] Increasing Genetic and Species Diversity

**Jess Shamek:** And so one that I often think of there is increasing genetic diversity of the current types of plants that are there. And it's important to remember that, species diversity and genetic diversity are different. I think when I talk to the public, I often have to define those things, but maybe many of your listeners already are familiar with the difference between genetic diversity and species diversity.

So I'm talking specifically about genetic diversity. So making sure that when we buy plants from. A native plant nursery, that we're not just getting one genotype, we're getting like a mix from all over our seed transfer zone. So that one's really important. And then the other side of that is also increasing species diversity. So when we're planting an area. Say if we're reforesting an area, making sure that there's not just like three types of trees and one type of shrub, we're including a wide array of species because we don't know how these species are gonna adapt to climate change.

We, and we don't know what genotypes are gonna do well in climate change. So when you increase the species diversity and the genetic diversity, you make your ecosystems more resilient.

**Jake Barker:** And they're, the key definition of resilient, or one component of resilience would be options. Basically like having a suite of different characteristics. That are on the site ready to respond to.

**Jess Shamek:** Exactly. Yeah. And the, and like for me, that's like the most fiscally responsible way to go, because you're like, you would want that anyway in a restoration planting. And many people already do that climate adaptation practice without even thinking about it. They want their restoration plantings or forests to be diverse and they want them to be species diverse and genetically diverse because it's good for the forest.

**Jake Barker:** Right. So for you, it's almost like you would be codifying it. Saying this is good, and maybe you're already doing it, but here's another list of potential benefits by taking this approach.

**Jess Shamek:** Yeah.

**Jake Barker:** maybe it's more complicated, maybe it requires a couple additional steps, or you need to change your supplier or go to a variety of different nurseries.

But that doing that now is setting your you up to have a more robust. Group of individuals on the site. Yeah, it seems like a good move.

# [00:29:45] Challenges and Testing of BMPs

**Jake Barker:** What I'm curious if you have any examples where BMPs have worked and if you have examples of where BMPs have failed.

**Jess Shamek:** Yeah, that's a good question. We have not tested our BMPs yet, so that is where we're at. Yeah, we, I don't know. Yeah. A lot of the BMPs that I get come from the Forest Service from USGS from the Climate Adaptation Science Centers, the casks around the region. And it's basically just making them more, taking that research that those other scientists have done and there's a lot of information that they've collected and making them more accessible for land managers and more practical for land managers.

But yeah, a lot of these have not been. Ground truth. So we're currently working on that. There's quite a few organizations that are currently testing them. I think Institute for Applied Ecology currently has an assisted gene flow assisted migration trial going on, and they, I don't think they have data to share with people yet, but hopefully they will in the future.

I know that Bonneville Environmental Foundation has. A newsletter where they collect all of the assisted migration trials that are happening across the Pacific Northwest. But that being said, a lot of them have been started within the last two or three years. So we really can't say whether or not these practices are successes or failures quite yet.

**Jake Barker:** Interesting. Yeah, it kind of, it comes back to that notion of being stuck between a rock and a hard place where

**Jess Shamek:** Yeah.

**Jake Barker:** we'd like to know what will work and we don't yet.

**Jess Shamek:** Yeah.

**Jake Barker:** So I think I kind of transitioned since you've just mentioned a few of them.

# [00:31:37] Tools for Climate Adaptation

**Jake Barker:** What are some tools that you are using to explore.

**Jess Shamek:** Yeah, there's a lot of publicly available tools out there, and I try to sort of give them to land managers because I didn't make these tools, but they're free. Many smart people are work. In this area in climate adaptation. So the first one that I try to bring to people's attention is the RAD framework, which comes from the US Geological Survey.

So that's the resist, accept, direct framework. And that's really a decision making tool to help people create informed strategies for responding to ecological change. So you would use it for a site or a species to determine if you want to. Resist, accept or direct the change that you see happening on the landscape.

So a good example of that would be like if you had a trout species that is adapted to really cold waters and you had a lake that was no longer within that variation, the temperature variation that was acceptable for that trout. So that trout is going to die out if you don't move it. You could direct that change and move that trout to a colder lake.

And that would be directing change. And that, again, that comes back to like what level of risk are you comfortable with? And as a land manager, as a scientist and what are you gonna do? Do you need to do a climate adaptation practice? You actually have to decide that before you start doing something.

I think that's like really hard for people to sit with sometimes. 'cause they're like, I don't. I don't feel qualified to make this decision. It's like, well, I don't know who else is gonna make it if you don't make it, so let's work through it.

**Jake Barker:** Wait, can you say that again?

**Jess Shamek:** Yeah.

**Jake Barker:** Just that last part about, that people don't, they're, they don't feel experienced enough.

**Jess Shamek:** Yeah. Because it's, there's a lot of uncertainty, right? And like you're making a big decision for an ecosystem like. Like people are uncomfortable with that. Land manager are uncomfortable with that the ones that I work with. And that makes sense. Like you wanna have the most informed decision possible.

And you really need a framework for deciding if you're gonna do something or not. And that often, I think people often skip that step. It sort of goes un unask of like, are we gonna do something or not? And the RAD framework really, it seems really simple, but it makes you sit down and think like, oh, like we need to do something.

Or like, oh, we can just accept or resist change in whatever way, or we can direct change.

**Jake Barker:** Okay. What are some other tools that you.

# [00:34:16] Species Distribution Models and Climate Data

**Jess Shamek:** A personal favorite is climate and a, so that's a free Microsoft. Desktop package and that generates scale free climate data for specific locations. So you can use GPS points of your sites and look at exactly how your site is predicted to change over the next a hundred years. And that is incredibly useful because when you're thinking about a restoration planting and you're thinking about climate change.

You can go into that desktop application or they have a web application that you can use and you can look at like vapor pressure deficit. You can look at precipitation changes, temperature changes, and figure out if your site is gonna be like hotter or drier in the future, which is really important when you're planning.

And that comes from the University of British Columbia, I believe. But it's free freely available, and yeah, I highly recommend it.

**Jake Barker:** I haven't heard of that one. That's great. Something that we've talked a lot about in my program is the CBO selection tool, and I'm curious if you are familiar with that and how you use it or how you've seen it evolve over time.

**Jess Shamek:** Yeah, that's a great one. I just started using this for restoration seed lot selection. And that means that I haven't used it. I've used it theoretically to like tell people where to collect seed. But the gist of it is that it's a GIS mapping tool that was created by the USDA and it allows you to predict where to collect genetic material for a given species.

Based on future climate scenarios. So like if I wanted to plant, again, just going back to Douglas Fir because that's a big one with fur mageddon and a lot of the die off that's happening. If I wanted to collect Douglas Fir that would be adapted to the Portland Metro area in the future. I would go into the tool and select the climate variables for my species, the most important climate variables.

And then I would set my geographic constraints and run the tool and it would be able to tell me where I could collect the seed from. That would be adapted to the future, future conditions. So. For instance, a lot of people are finding that like around Acadia, California, I'm not super familiar with California, so I apologize if I mispronounce that around.

Like Eureka, I guess is a climate analog for a lot of our plants today. So, and again, that's all theoretical. We don't know for sure and that is different by each plant because the climate variables that you put in there. Are based on species distribution model. So they're based on the specific environmental variables that species evolve to be happy in.

And you really have to have a species distribution model to understand which variables are important for each species. And so, the way I've seen it, sorry, go ahead.

**Jake Barker:** The way you've seen it.

**Jess Shamek:** The way I've seen it evolve is that it's become. Better at using those different climate variables from those species distribution models.

**Jake Barker:** Okay. Very basic question. What's the difference between a species distribution model and a map of the species range?

**Jess Shamek:** That. Yeah, we're getting into niche ecology. Cool. So yeah, so a species range map or a species distribution is basically like all of the points where people have seen that species. And then a species distribution model is all of the like climate. You take all those points. That people have found. And then you find the climate variables that predict their occurrence.

So you would take like 15 climate variables and run them through a model. And then at the end you would be able to say like, for this species mean annual precipitation is the most important predictor of where the species occurs, or mean annal temperature or something like that, or vapor pressure deficit.

Then you could predict that allows you to predict in the future, based on future climate scenarios where those species would occur.

**Jake Barker:** Gotcha. So it sounds like a lot of these. or approaches to thinking about where plants are and where they might be in the future, relies both on data that's collected in the field, but also pretty large complicated model calculations that are happening on computers. And so a follow up question to that is, how are you seeing. Technology and these tools change, especially with the emergence of AI and the more widespread use of ai,

**Jess Shamek:** Yeah.

**Jake Barker:** and larger computing potential.

Can you just talk a little bit about your thoughts on that?

**Jess Shamek:** Yeah. It's not really my area. I don't really do a whole lot of like programming anymore since I got out of graduate school. But what I've seen is that those. Those tools become more accessible because it's easier to program, basically, like you need to have this really in-depth programming knowledge.

And I've, what I've seen with my fellow scientists is that AI and these chat bot tools actually allow people to learn more quickly if you can ask the right questions. And so people can learn how to use all these tools that are available. At a way faster rate than they used to be able to because they can use these AI assisted coding tools.

That being said I think we already had supercomputers, like you have to have a lot of computing power to run these models. And we already had supercomputers that could run them, but I could see in the future how it just would become easier the more computer computing power you had because you really have to have like a lot of data to do these things.

**Jake Barker:** Okay. I have a, before we move to our closing segment, I have sort of one follow up question

**Jess Shamek:** Yeah.

**Jake Barker:** that's a little bit of a tangent, so I guess it's not a follow up question.

# [00:40:42] Assisted Migration and Horticultural Practices

**Jake Barker:** So a tangential question to what we've been talking about that has been echoing in the back of my mind is, so thinking less about restoration practices or restoration management.

**Jess Shamek:** Yeah.

**Jake Barker:** A place that a lot of people go to is the arboretum in Portland

**Jess Shamek:** Yeah.

**Jake Barker:** As we're having these conversations around assisted migration and gene flow, and it seems like you, as you are being very thoughtful with how a practitioner or a manager should think about the risks and thinking about applying this stuff on the ground. Yet, I walk around a city or I go to an arboretum, I see a whole variety of plants and trees that have been brought from. All over the world. And are we, as we talk about assisted migration today, especially with regards to climate adaptation, are we refining a approach to moving plants that has existed for a very long time, or is this a whole new approach or. Did we make decisions about moving plants in the past, sort of haphazardly and not think too much about the ramifications?

**Jess Shamek:** Yeah, I think all of the above. I think. One thing that comes to mind is that those introductions, those past introductions, tell us a lot about the risks of the system migration. So we know that when we introduce, we know because of horticulture, because of horticultural practices and I say this as somebody who like has a garden and loves garden plants.

We know that introducing species can lead to the extinction of other species and does. At a very specific rate. I can't remember that rate off the top of my head but people far smarter than I have calculated the amount of possible extinctions every time you introduce a species to an area. So we know that's risky in and of itself, and we know that it's led to major problems like economically.

Invasive species management like Blackberry Management alone is so expensive. Himalayan Blackberry Management. And so we, we can use that information to sort of guide our climate adaptation practices. That being said, I think that introducing horticultural plants in introducing. Introducing plants in an area, like for garden purposes, is a lot different than intentionally changing an ecosystem.

Because when you intentionally change an ecosystem, you really have to think about people and how culturally that affects like the people who live within that ecosystem. Because we, I grew up in a family of loggers and to think, about forest changing and how that would economically impact those people.

My family members it's just important to think about the ramifications of species changing for people in general and not just, it's not just about maintaining like forest canopy, it's also about maintaining those cultural relationships and those economic relationships. And so I think that's why having like that broad suite.

Of potential practice is important because you can think about assisted migration and you could say like, oh, it would be great if we could just replace all these species with trees that are gonna do better It, that would be really awesome. But we don't know if that's true, and we know from horticultural introductions that can be destabilizing to other species and ecosystems.

And we know that has ramifications for all kinds of people who use those ecosystems. So I think it's important to keep all those things in mind. But yeah, I love that you brought up that point because learning from horticulture is very important. Like we can learn from these, I wouldn't say like they're all past mistakes 'cause I love garden plants, but we can learn from these instances where there is lots of data..

# [00:44:50] Final Thoughts and Resources

**Jake Barker:** So over the course of today's episode, we have defined the key terms associated with assisted migration as well as common confusions. And we've also talked about assisted gene flow. We've explored how these terms and practices are connected to changing climatic conditions as well as best management practices, especially for restoration. To help with planning. We also discussed several tools including the Seed lot selection tool, climate na, as well as the Resist Act and direct framework. We hope that these conversation and these tools can help you make decisions about what to plant, where, when, and why. you were listening today, if any questions came up or we didn't cover a specific topic related to today's conversation that you were interested in, please drop us a comment or send us a message on our website in the woods podcast.org.

But don't leave us yet for next step is our lightning round

**Lauren Grand:** The In The Woods Podcast is produced by Lauren Grand, Jacob Putney, and Scott Leavengood, who are all members of the Oregon State University Forestry and Natural Resources Extension team. Other members of the team who've been involved in the podcast include Carrie Berger, Jason O'Brien and Steven Fitzgerald episodes are edited and produced by Carrie Cantrell.

Music for In the Woods was composed by Jeffrey Heino and

**Jake Barker:** .

jess, thank you so much for joining today. Before we wrap up, I have a few final questions for you that we ask all of our guests. So first off, what is your favorite tree?

**Jess Shamek:** It's definitely Oregon White Oak. Yeah.

**Jake Barker:** Is there a specific Oregon white Oak that you like most of all?

**Jess Shamek:** Oh yeah. There's one at Howell Territorial Park on SA Island. It's huge. It's beautiful.

**Jake Barker:** Great. Next up, what is the most interesting thing you bring with you in the field, whether it's in your cruiser vest or your field kit?

**Jess Shamek:** Definitely cold pizza. It's the best field food. Yeah.

**Jake Barker:** How do you feel about cold pizza in terms of the changing climate?

**Jess Shamek:** I mean, it'll be warmer pizza. It'll be like lukewarm pizza. I'm still a fan of lukewarm pizza.

**Jake Barker:** And lastly, what resources, I know we've talked about some resources and tools already, but do you have any other resources that you would recommend to our listeners if they're interested in learning more about today's topic?

**Jess Shamek:** Yeah, absolutely. I think the one I didn't mention that I think is really important is the Nature Serve Climate Vulnerability index. That you can do for species or habitats. So that's a really great freely available tool that I encourage people to check out. Especially land managers who are thinking about climate adaptation.

And then the other one is we have a climate adaptation working group. So it's our climate adapted plant materials. Portland Metro Vancouver Working Group. And we have a listserv, so I'll share that email with you. If you could post it you can join our working group and become a part of it. We meet twice a year.

And we're trying to just create community and share information and develop best practices about climate adaptation together. And this is a large group of people, so yeah, join us.

**Jake Barker:** Great. Thank you. So just to wrap up, I had a great time talking with you, Jess. Thank you so much for joining. Something that I learned were a few things. One was the application for the RAD framework and how you are thinking about it and talking to folks about it. I was grateful to get some clarity on phenotypic plasticity and how that relates to gene flow.

I've also, it was great to learn more about the importance of stress tolerant plants and how that is connected to climate adaptation and how past disturbances and how early successional plants are important players in this game around uncertain future climate conditions. I also was grateful to learn about the potential impacts of the climate on cold pizza, especially when taken out into the field.

I look forward to more lukewarm pizza in the future. But thank you so much for joining. We covered a lot and we probably could have covered even more, but we really appreciate your time. Thank you so much for joining, and we are grateful for your work out there in the field. So this concludes another episode of In the Woods.

Join us in a couple weeks to explore another topic on Oregon's amazing Forests. But until then, what is in your woods? Cool.

**Jess Shamek:** for the great.

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We hope you enjoyed the episode and we can't wait to talk to you again next month. Until then, what's in your woods?