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SPEAKERS

Ethan Tapper, Liz Woodhull, Alison Adams, Katie Kain

A **Alison Adams** 00:05

Welcome to Restoration Roundup, a monthly podcast that explores recent research on, new and emerging best practices for, and stories about riparian forest restoration. I'm Alison Adams. I'm the Watershed Forestry Coordinator with University of Vermont Extension and Lake Champlain Sea Grant and I run the Watershed Forestry Partnership.

L **Liz Woodhull** 00:22

And I'm Liz Woodhall, a junior at UVM's Rubenstein School of the Environment and Natural Resources setting environmental studies and minoring in geography and English.

A **Alison Adams** 00:42

Restoring riparian forests can be a lot of work for already busy landowners and farmers, but maintaining them can pose an even bigger challenge. Invasive species like reed canary grass, wild parsnip and barberry, to name a few, pose serious threats to the biodiversity within riparian areas due to their ability to spread rapidly and outcompete native species. Today we're talking with two practitioners who work extensively with invasive plants, Katie Kain and Ethan Tapper. Katie is with the US Fish and Wildlife Service in Essex Junction, Vermont, serving as one of the biologists with the Partners for Fish and Wildlife Program. She works with watershed organizations, conservation districts and state and federal partners to restore riparian habitats with private landowners. The partners program offers financial and technical assistance to design and implement restoration projects. And since those programs started in Vermont in 1995, they've worked to restore more than 2500 acres of riparian habitat. Ethan is the Chittenden County Forester with the Vermont Department of Forests, Parks, and Recreation. He advises private landowners, municipalities, conservation organizations, foresters, and loggers on the responsible stewardship of forest land administers Vermont's Use Value Appraisal or "Current use" program in the county, and manages over 4000 acres of town forests. One of the largest threats to biodiversity, ecological integrity, and forest health in the county is non native

invasive plants, as well as non-native pests and pathogens, which we won't be talking as much about today. And Ethan leads events and advises forest stewards and landowners on how to manage these plants. So Ethan and Katie, welcome to the podcast!

E **Ethan Tapper** 02:10

Thanks for having us.

A **Alison Adams** 02:12

So we're gonna jump right in. I know both of you do a lot more than just manage invasive species. So I really appreciate you coming on to talk about this specific topic today. But Can each of you share sort of what brought you to your current work?

K **Katie Kain** 02:23

Sure, yeah, I'd say, you know, it doesn't take too long to be working in the restoration field to realize that invasive plants can have a really big impact on both project success and just project feasibility when you're looking at whether to do a project or not. But in my previous job, I managed the invasive plant program with a national park. So kind of for better or for worse, I came in to my current position as a biologist with the Fish and Wildlife Service with that background in invasive plant management and an understanding of how big a role invasives can play in habitat restoration. And definitely, you know, a big challenge that we see out on the landscape with our projects every day.

E **Ethan Tapper** 02:59

I think-- this is Ethan-- I think that uh, one of the things about being a forester, as you become more involved in the management of forested systems, you come to understand that forests are really dynamic, and they change all the time. And I think every forester is really a sort of disturbance ecologist, we study the way that disturbance and change affects this natural community. And so one of the things that you see across our landscape is that what's really important to protecting not just biodiversity, but also, you know, the future health of our forests and our ability to manage them and manage them for all different kinds of things from recreation, wildlife, to forest products, and stuff like that is their ability to regenerate and to renew themselves and to be resilient and to adapt and to respond to disturbances. And what you'll see in especially a lot of parts of my county is that their ability to do that is hobbled by invasive plants. So these plants that come in and take advantage--they're opportunists--they take advantage of these disturbances, whether human caused or natural, and they are a major, major threat to the sustainability and to the resilience of forested systems. So it's really important that we get a hold of them for a whole bunch of different reasons, but just in general to protect our forest health.

A **Alison Adams** 04:14

So Ethan, you sort of started down talking about this a little bit just now, but for our listeners

So Ethan, you sort of started down talking about this a little bit just now, but for our listeners who might not know much about invasive species, can either one of you explain sort of how invasive plants get into and subsequently disrupt ecosystems?

E Ethan Tapper 04:27

So one thing that's interesting about invasive plants as a contrast between invasive plants and invasive-- non-native invasive pests and pathogens, is that almost all of the invasive plants in our ecosystems were introduced intentionally. So there are ones like Japanese barberry and burning bush and honeysuckle that were ornamental plants. They were ones like multiflora rose and common buckthorn that were planted as living fences. They're planted for all these attributes that were supposed to be really positive and really helpful and in some way make our lives better, but they just happen to be really virulent and really good at invading our, our ecosystems. So they were sort of brought here intentionally, and then they're spread through a whole different variety of different mechanisms., There are invasives, like Phragmites, and Japanese knotweed that are primarily spread mechanically. So pieces of rhizome pieces of stem are getting swept into waterways, are getting transported by construction equipment, and sort of planted into new areas. In the case of the the invasive plants that I work with, which are largely the woody invasives, like barberry and honeysuckle and buckthorn, they're transported by animals, they're producing seeds that animals eat, and then they deposit them out into our ecosystems. Some of these seeds also have the ability to remain viable in the soil for a certain period of time. So when there's a little disturbance, a little bit of light is allowed to hit the forest floor. Sometimes you see this flush of regeneration of these invasive plants that are sort of already in the seed bank of that soil, they're already there. So yeah, it's human initiated, but largely wildlife dispersed, although there are instances also of mechanical dispersal: tires transporting pieces of these invasive plants and stuff like that.

A Alison Adams 06:07

So you mentioned a few of them, Ethan, but what are the main invasive species that you encounter in forest restoration work, both riparian and otherwise? And I know, Katie, you work in a lot of riparian areas and Ethan you work in a lot of upland areas as well.

06:20

So I would say for forests, and then I'll pass it over to Katie to talk about more of the riparian zones... In forests I'm primarily dealing with those species that I mentioned. So the worst ones that I have to deal with on a daily basis are Japanese barberry and to a lesser extent, European barberry, common buckthorn to a lesser extent glossy buckthorn, shrub honeysuckle, multiflora rose, and Asiatic bittersweet, you know, and there's some up and comers, there's some other ones that are sort of regionally important in parts of the state they really struggle with black swallow wort and in parts of the state I know they really struggle with burning bush, and others, but those are the big ones that I deal with.

06:55

We have a good bit of overlap, I think. I mean, riparian forests are still forests. So we see a lot

of the same species Ethan just said, but I think our big three, it's buckthorn, shrub honeysuckle, which is the same in the forested landscape, and then Japanese knotweed in riparian areas is hugely impactful and can be hugely devastating. And then, also, if when we're working on agricultural restoration sites, reed canary grass is a really common challenge. But like Ethan said, I'm also-- I'm always keeping my eye kind of further south to see what's happening in southern New England, and what might be the next thing because there's, there's always something else coming. So we're always keeping our eyes open and trying to be prepared so that we can react quickly.

A Alison Adams 07:37

So what do you see coming from southern New England at this point? What are you anticipating in the future?

K Katie Kain 07:42

One of the big ones is Japanese stilt grass that's been on my radar. And I know Ethan, you probably have a lot of feelings about that from a forest health standpoint, that one I've you know, seen, kind of where I'm from further south along the east coast, the effects that that's had in forests, and it's really, really tremendous.

07:59

I'm worried about Tree of Heaven, Ailanthus, there's a few populations in Vermont, but not a lot. That's one that I'm thinking about. I always say that if you want to see what Vermont would be like should we fail to control invasive plants and also fail to control forest fragmentation and deforestation, fail to control our deer population, you don't have to imagine what that would be like, you just have to drive south and go to the southern parts of New England. And you can see where a lot of these invasive plants are really prominent. And as our climate changes, we expect that they will become more of a problem where we are as well.

A Alison Adams 08:35

This is sort of a tricky question, but I'm wondering how the invasive species that you tend to see are they sort of the cause of the disturbance or I know that invasive species tend to move into disturbed areas, are they more taking advantage of existing disturbances? Can you kind of parse out which of those tends to come first?

08:51

I think in general, we see them as opportunists. So they are taking advantage of natural disturbances that are already occurring, natural disturbances, which by the way, from an ecology perspective, both in terms of riparian ecology and forest ecology, disturbances that are really positive, that bring so many good things and so many positive elements of our forests sort of arise from these natural disturbances from the death of trees from tree mortality. It's

beautiful, but they're opportunists. And they take advantage of that. You know, one example to that that I've seen is the effect of bittersweet buying, you can see as you go along highways, and my understanding is that actually bittersweet was planted in road right of ways and powerline right of ways to suppress vegetation to sort of do that thing that it does on the side of our highways, which is pull everything down and sort of create this just big mass, where you know, it's just bittersweet vines everywhere, and no trees are able to sort of reach their full height. And so I think to a certain extent, bittersweet is causing tree mortality and damage that way but I don't see that to the same degree with other invasive plants.

09:55

I would agree and in riparian areas like Ethan said, disturbances are a really natural part of that landscape, between flooding and erosion and ice scour, and that can--when you're working in an already disturbed landscape like we are--beyond that, you know, a lot of our restoration sites not only are disturbed by those natural forces, but then are also disturbed and that their former agricultural ground and that that land was cleared from forest originally for agriculture, and then it's coming back. So it's a lot of disturbance happening at once. And I think that that can make those riparian areas-- That is why we see a lot of invasion happening in those zones are definitely taking advantage of that, and moving in. Japanese knotweed, in particular, Ethan already mentioned is really good at being dispersed by floodwater. So that one is one of the reasons it's such a huge challenge. It's hard to get your arms around that one when it just keeps getting swept downstream and establishing somewhere else in another disturbed area.

A Alison Adams 10:46

And Ethan had mentioned climate changes as sort of exacerbating the effects of invasive species and potentially making their ranges further, spreading them further. And that seems like yet another way, if you have more frequent major storm events, or tend to have more erratic behavior with big storm events, then I could see that ending up in more Japanese knotweed spread as a result.

11:06

There's a lot of other feedbacks with you know, we talk a lot about climate change. But of course, the real sort of volume of changes we're seeing on our landscape we call global change, right? It's like all of the things plus climate change, invasive plants, pollution, all this stuff, deforestation, forest fragmentation... and invasive plants majorly also benefit from forest fragmentation, and parcelization, splitting up a forest into tinier and tinier pieces, and those edges that are created when you do that. And also from deer overabundance because deer tend to browse native plants and to not browse invasive plants. Deer over-abundance is also linked to climate change, to warming winters and to lower amounts of deer mortality over winters, and also to forest fragmentation and deforestation.

A Alison Adams 11:52

Right, so feedbacks between all these different pieces of the system making the whole thing sort of spiral worse and worse. So, more specifically, Katie, can you explain some of the

sort of spiral worse and worse. So, more specifically, Katie, can you explain some of the different impacts of invasive species on riparian buffers?

12:05

Yeah, I mean, like we just said, for riparian buffer restoration, we're already working in these really active and dynamic floodplain areas. So the opportunity for invasion can be really high, but also because of that dynamic nature of floodplains, these are really, really important places to protect and to try to keep invasives at bay. So aside just from, you know, the challenges of restoration itself of getting trees and shrubs established, and you know, these invasives crowding out those trees and shrubs that we plant, there's a really big loss to the ecosystem itself if these areas turn into a monoculture of invasives. These floodplain forests provide really important wildlife habitat for a big range of species as well as general ecosystem services like reduced erosion and cooler water temperatures through the shade that mature trees provide. So with all of that in mind, you can see how if you start to lose the diversity of those native plant species to a select few highly competitive, non native species, you're going to see a reduction in meeting the needs of all those wildlife species that use those areas. And you'll also start to see reduction in those ecosystem services as well. One of the things we're trying to do with riparian restoration is to get trees established to put shade on the river and cool down the water temperatures, which is important not just for cold water fish species like brook trout, but also for water quality overall--the warmer that water is, the more it promotes the growth of algae and unhealthy blooms. And species such as Japanese knotweed really do a poor job of providing any sort of root structure to hold banks. And in fact, there's been some research showing that it actually destabilizes banks and contributes to more erosion. So that's, you know, one of the reasons that it's kind of one of our primary targets in these riparian restoration areas, we're really-- we're not seeing a lot of benefit coming from that one. And the loss that that it creates on the landscape is really big.

A Alison Adams 13:52

Yeah, that's an interesting point. I have heard some people say, "Well, isn't it good to at least--referring to Japanese knotweed--at least have something growing on the banks? Does it help stabilize the banks?" And I appreciate you bringing that up, that there's actually some evidence that it might make the situation worse. Are there specific species that tend to be more detrimental to riparian buffers, either in terms of the ecological impacts or the success of a restoration project, for example?

14:16

Yeah, I'm gonna keep it going with knotweed, and then I'm happy to take it to Ethan to hear what he has to say here. But knotweed is so detrimental in our floodplain forests, other than honeybees, which do use it, it's-- it's what we call a food desert. It's not eaten by herbivores, it's not used by nesting birds, it has really low insect densities, and that translates to lower food source both for birds and also for fish. You know, one of the primary food sources for fish and aquatic organisms are the bugs that fall off of plants and trees that hang over the streambanks. So, if you have knotweed hanging over your bank, and there aren't bugs, living in the

knotweed, eating the knotweed to fall into the stream, then there's nothing for those aquatic organisms to eat. So you're seeing a big decrease in the food and input to the animals in the stream. And it has cascading effects on the food chain there.

15:05

I've been through, you know, sort of a process of thinking about, I call it reimagining the forest, you know, sort of expanding my definition of what a forest is, from what we all think a forest is, which is trees, to think about the forest as this entire community. So the forest is the trees, the forest is also everything else is living within that system. So the trees are like the coral in a coral reef, the coral reef is not just the coral, it's all this other stuff, all this other all these other forms of life that are swirling around it. And in order for a forest to be healthy, it needs to be able to change. And when it changes, when tree mortality occurs, nothing is ending, right? That process, that organism, whatever that reimagined forest is, is just sort of continuing and it's very similar with rivers; rivers are dynamic, you know, they need to be able to change and they need to be able to grow and the river is the entire community that surrounds it. And if you're talking about a big river, like the Winooski floodplain, I've started to try to think about that entire floodplain as the river, like that's the river, and just like a forest, the river needs to be able to change. And so anytime you impede a river's ability--and by the river, I mean that entire community that surrounds it--its ability to be healthy, and to change, and to engage in all those different processes from something as fundamental as the ability of a tree to fall in the river, and all of the things that that brings in the way that that helps that river change over time, and to regulate itself and to provide habitat, you know, to something as profound as that playing out over thousands of years, anything that that impedes that process is a threat to our rivers, to our waterways. And you know, you can't sort of like pull it apart and be like this one thing affects this other thing in this exact way. But I think that practitioners like Katie and myself really think about these things as systems, it's more than just restoring you know, one thing, we're trying to restore the-- all of these processes. And the more that we work in these systems, the more we see that these invasive plants really undermine those processes.

A Alison Adams 17:02

I appreciate that point. I feel like I'm hearing that more and more from the restoration sort of practitioner community here in Vermont, and maybe more broadly as well, that, like, trying to think about how to not just, in the case of forest restoration, put the trees back in, but actually think about how to restore the processes that are supported by that ecosystem, and that happen in that ecosystem. So that's a really good point, maybe some of this trying to pull apart like, is one species worse than others? It's like it's all kind of affecting how the system is operating. Katie, I wanted to say on the point of a food desert, and Japanese knotweed, if anybody is looking for creative things to do with knotweed to get rid of it, apparently it is edible. I've never eaten it, but I hear you can use it kind of like rhubarb. So it's spring now, it's rhubarb season, maybe think about going and taking out some knotweed and baking it into a pie.

K Katie Kain 17:46

All you can eat folks.

A Alison Adams 17:48

Exactly. Don't intentionally plant it for food! But please take it for food.

E Ethan Tapper 17:53

It's a great you know, the eat your invasives thing, it's a big thing people talk about, you know, eating garlic mustard, knotweed, and all this other stuff. It's great. And it's also never going to be enough. You know, people also talk about the knotweed because I guess knotweed has a medicinal purpose with respect to Lyme disease. And so people are like, you know, maybe knotweed is just supposed to be here to help us with our Lyme disease. And I'm like, well, you can harvest all the knotweed that you want, don't worry, it's always going to be here, we don't have to worry that we're gonna get rid of it. It's incredibly virulent. And those things are helpful, because they draw our attention to it. But they're also not enough.

A Alison Adams 18:30

Yeah, absolutely not enough. Where I live in Burlington, I just moved to this particular piece of land. And last year, I noticed that I have a little bit of knotweed growing in my yard. And it was like maybe 10 little stems, and I spent like my whole summer going back and cutting it down, and going back and cutting it down, and going back and cutting it down. And that's just the tiniest bit. And I'm not right on a river here. And so to the point of it's not enough, I could have eaten so much knotweed last summer, and I have such a tiny bit of it.

E Ethan Tapper 18:58

I have seen one study, Alison, that says that in order to control knotweed mechanically. So by mechanically I mean by not using herbicide, but just by cutting, or pulling, specifically with respect to cutting you need to cut it every month of the growing season for the amount of years that it's been there. So if it's 20 years it's been there, you need to cut it seven times a year for 20 years, and then it'll eventually die.

A Alison Adams 19:21

Oh my god, okay. Well, that leads right into our next question, Ethan. What can be done to control invasive plants and sort of what's the best method? Maybe there's different ones for different kinds of plants?

E Ethan Tapper 19:32

So there definitely is. So each of these plants is unique. Each requires a little bit of a different approach. And you know, dealing with them is really nuanced. It depends on the situation. It depends on the severity of the infestation, it can depend on a lot of different things. So this is

where I run into a lot of nuance that needs to be expressed to people specifically about the use of herbicides. So the reason for this is because with most of these plants, the reason they're here and that they're so virulent in our ecosystem is because they're really virulent, they're hard to kill, they're very aggressive, they take over, they're prolific seeders, they're really good at layering--so sprouting from little pieces of stem--they're just really rugged in a way, very impressive plants. That said, most of them are physically possible to control mechanically by cutting or pulling--cutting, usually not pulling--maybe a little bit. The problem is that in order to control them without using herbicide, you have to display an amount of tenacity that most people don't have, and a level of commitment that most people don't have. And so in my work, and this is not a joke, and I would love to be proven wrong, but I have never seen an invasive plant control of any species of any kind, bigger than like a backyard patch, controlled without using herbicides successfully. Ever. I've never seen it. I used to know one example, and the person whose property that was that I used to use as that example, where I was like, "You can control these plants mechanically, if you're this person, because, you know, she's just really tenacious." She asked me to stop using it because she gave up. So what I say is that you can control these plants mechanically, totally, if it's just like a few plants 100%, you can control them mechanically, but you won't. Because the level of tenacity and commitment and time and energy is so great that it just won't happen. The alternative that I've seen a couple times is people with big properties, 100 acres, will commit themselves to dealing with these plants, deal with them mechanically, and they'll control a quarter of an acre, and the rest of their property will still be untouched, you know, and will still be harboring this massive invasive plant infestation. So a lot of what I do with invasive plants is trying to help people understand the use of herbicide as a restoration tool to promote biodiversity. And in that way I think of it as sort of subversive, you know, we're using this tool that was created to suppress biodiversity in our agricultural systems to promote biodiversity in our wild systems. And when you start to use it as a practitioner, it is profound, it is beautiful to see your ability to solve that problem, which has seemed unsolvable for so long. It's incredible. I can't say enough about it. And it's also gross. And it's not something that any of us like. And if we had a better tool, we would use that. So yeah, so I recommend judiciously and again, there's a lot of nuance, different species, different infestations, a lot of nuances to how we do this. But I recommend we're applying tiny amounts of herbicide to individual plants within our ecosystems. And again, I cannot tell you how surreal it is knowing me as the person that I am that I tell people to use herbicide all the time. And I carry it with me all the time. Very strange.

A Alison Adams 22:43

Yeah, I really want to dig into this issue, because I think it's super interesting, given that like, who the audience of this podcast is, given who I sort of know you guys are and that I know herbicide feels like it shouldn't be what we use, I think people who have been trained up in environmental sciences, environmental studies have this knee-jerk like "No, not that we shouldn't use that." And it can be hard to have that conversation in a way that's effective. I know a lot of people still want to do their restoration projects without herbicide. And that still comes up a lot. So I just have a lot of questions and thoughts about this. But Katie, I'm wondering if you could talk a little bit about how you use herbicide in your work in riparian buffer restoration. And what is your experience?

K Katie Kain 23:21

You know, Ethan, I think have had a really similar trajectory. And I wanted to chime in and just

say that that process he was describing of going through, like, what is the species? How big is the infestation? What tools do we have? What's our budget, how much time? Like that's what we call "integrated pest management." And so a lot of the people listening to this, whether you realize it or not, that's what you're doing, you're using integrated pest management when you run through that decision making process. And it is the unfortunate reality that a lot of the landscape, we deal in just the size of the projects we have. Like Ethan said, you know, manual control, it's not without its merits, and there are cases where it can be successful, but often our time or our budget, or just the project planning doesn't allow for that. And same as Ethan said, herbicide can be such an important tool in just getting the landscape to start to change back to what we want it to be, you know, if you have a site that's dominated by reed canary grass, you can plant trees, and you can plant trees, and you can plant trees. And in some sites, that's never going to be enough. It's not going to change back to that forested landscape unless you come in with some other tools. And it's often a really limited upfront application, and then you start to see it change to something else. And we're also like Ethan said, I think a lot of people just have that knee-jerk reaction to herbicide and we don't love it either. It is definitely not my favorite thing that we use, but it's so important. Like people have that response, and I think they're thinking about industrial agriculture, and they're picturing fields and fields of corn and soybeans, and those are two very separate uses of this tool. I think a lot of people just kind of get twisted up thinking about that and all of the issues with herbicide that are completely warranted. But it's not how we're using it in these projects, we're being really, really judicious in a lot of instances we're trying to do, if it's a woody species, you know, where we always opt for cut stump before foliar. Just because it's so much less herbicide, it's so much more targeted, you can really control where you're putting that. And I've started to remind people in terms of the small footprint versus massive herbicide use, that's going into other, you know, industries, and all of that, if you're wearing cotton, just through your daily life, you know, some of the food that you're buying, you are contributing to a lot of herbicide use, and separating that from these really small amounts that are going on to these projects in the service of wildlife habitat restoration of forest diversity, I think it's really important for people to think about that, and the reaction that they have to it.

K Katie Kain 23:25

I think herbicide is like a chainsaw. Certainly, it can be used to degrade ecosystems. And it can also be used in a way that's incredibly positive for them. The discussions that I have with landowners about using herbicide on invasive plants parallels in many way the discussions I have with landowners about managing a forest, where it requires us to delve into such a level of nuance where we want to think something is good or bad. You know, herbicide is bad, we don't ever have to think about it again, or logging is bad, we don't ever have to think about it again. But you know, the world that we're in, in this moment of time with the world that we have, and the legacies that we have in our landscape and all the stuff that we're dealing with, and we're in the midst of a climate crisis and a biodiversity crisis. And you know, our ecosystems are shrinking everywhere. And it requires us to get creative, and to use the best tools at our disposal to try and save the world, save our ecosystems. And not all of those tools will be tools that are 100% feel nice to use all the time. But there is a reason why we all use them--

A Alison Adams 27:06

Which is that they work.

E Ethan Tapper 27:07

They work.

A Alison Adams 27:08

You've sort of alluded to this in saying that herbicide isn't your favorite thing, if you had something better you'd use it... What are some of the drawbacks to using herbicide or any other methods that you might use to control invasive species?

E Ethan Tapper 27:20

I mean, the drawback to any different approach that we might take is that it could start to be like we're a hammer and everything starts to look like a nail, you know, whereas the nuanced approach we want to have is that we don't think that herbicide is going to solve all of our problems. The goal is not to even to kill the invasives; the goal is to foster healthy, diverse functional ecosystems. And so herbicide is a tool to help us get there. It's also not the answer. The answer is whatever gets us to that place. It's the same thing as the work I do in upland forests. Logging is not the answer. Forest Management is not the answer. That said, there's types of forest management, we can do ecological forest management, that can really help beyond simple forests become more like old forests, become more complex, become more diverse. But there's a risk with any of these things, I think of missing the forest for the trees, you start to develop a less nuanced perspective with something and you lose sight of what you're actually doing. And then the only other thing I would add about herbicides is that obviously, we know that there are risks, you know, we know that there are potentially human health risks, we know that there are potentially environmental risks, should they be applied incorrectly, or should we use the wrong ones. And we need to be lucid about that and clear about that. That it's not that we don't think that there are risks to these chemicals, it's that we think that we can apply these chemicals, while minimizing those risks, and where the rewards that we're creating in our ecosystems are much greater.

A Alison Adams 28:52

Yeah, and I think that what you said about like herbicides, a hammer and everything looks like a nail or logging or any other kind of management approach kind of comes back to the idea of integrated pest management that Katie was saying, that you want to assess the situation and what is the appropriate tool to be using? And are you going to get the results that you see from using that tool. And I did want to acknowledge, you know, a potential drawback of using mechanical removal is exactly what you said before, Ethan, that it might not work. It's very likely that it won't work. And you'll have to invest a huge amount of time and energy and resources into something that in the end may not get you where you want to be depending on the specific circumstances, the size of the patch...

E Ethan Tapper 29:28

Ethan Tapper 29:28

And I say there's also a risk, you know? Most of the work that I do and that Katie does as well is with private landowners. You know, there's a risk that, you know, we have to manage these people. And so, when people are trying to deal with something, and it's too hard, and it's not working at all, the risk is that they give up, you know? They're not seeing results, why should they do anything about it? They might sometimes even create a elaborate story about why they shouldn't have to do anything about it or whatever. But we need those people to remain engaged and to remain productive as far as continuing to, on a parcel by parcel basis, to deal with that problem. And I would say that, you know, sometimes, and this is true for for a lot of different things that I talked about, but sometimes I almost don't even want to mention mechanical removal if I'm on a property where they have an invasive plant infestation where I don't think that they can get it done using mechanical removal. I don't want to mention goats, I don't want to mention any of these other methodologies, because I don't want to give them an out, I want them to have to confront the difficult decision that we all do of using herbicides. It's similar to, you know, we do forest management, and again, forest management can be done really, really well and have all these positive benefits. And everybody asks me about people logging with horses all the time. And I say, yes, there is a horse logging company in Vermont. If everybody that wanted them to work for them did, you know they would be the busiest and most productive horse loggers in the world. But you know, the fact that we want to do this thing requires us to confront the fact that we need to have equipment and to just be like, yep, you take a deep breath, and you're like, this is what we're doing. And this is the decision that we need to make.

A Alison Adams 31:14

I like the point about forcing people to confront this difficult decision, because we go back to thinking about, early on in the episode, sort of what is the cause of this problem in the first place? And it's like, for the most part, it's an anthropogenic problem. It's come from human activities. And so I think in some ways, that's the reality of a lot of the environmental change and destruction that we're facing, we sort of got ourselves here. And now it's uncomfortable to get ourselves out of it. And I think it's going to be pretty much impossible in any case to find a perfect, wins-all-around, really comfortable solution. Speaking of anthropogenic problems, we did mention this a little bit earlier. But I was wondering if either or both of you could elaborate a little bit on how climate change interfaces with invasive plants, what are the changes we might expect to see in terms of tenacity or abundance of invasive plants and why?

E Ethan Tapper 32:04

I mean, I think, you know, mentioning some of those feedbacks is really important. It's not just that it's warmer, the growing seasons are longer, these plants do better. But it's also everything. It's also all of those different elements of global change, deer over-abundance, deforestation, forest fragmentation, suburbanization, a lot of these different things sort of feed back, a lot of these invasive plants are really disturbance adapted, so you have more disturbances, you potentially create more opportunities for these invasive plants. I think the benefit to invasive plants that most specifically ties to climate change, not as an element of global change, but climate change itself is increased growing seasons, because, you know, as we're recording this, a lot of these invasive plants are starting to green up, they break. bud before all of our native plants, for the most part, and they retain leaves after all of our native plants. They're really good at this sort of indeterminate growth pattern where they can just

keep on growing and growing and growing and growing and growing. And, and uniquely well suited to sort of capitalize on longer growing seasons more so than our native species. If you want to, either yourself or with someone that you're working with, go out and be able to really clearly visualize where invasive plants are, and how bad they are, this is a really, really good time to do it. Because you can see that I call it like the green haze and the understory. Now, in the late fall or times when it's really easy to visualize. And you know, as carbon increases in our atmosphere, we think that they're in a way, there's a benefit to plants, because carbon is a limiting nutrient for them in some cases, and so they will be able to grow faster. And I think that that will disproportionately benefit some of these invasives as well.

A Alison Adams 33:38

So I guess given that-- given that this is already a big problem on the landscape, and that it's in many cases likely to get worse. What can farmers, other folks who are restoring forests on their land, or even just sort of average people who may not be doing that, what can folks do to prevent the spread of invasive species or even fight back a little bit?

K Katie Kain 33:58

I would start by saying your well established natural areas are going to be naturally more resistant to invasion. So protecting what you already have, but then particularly with farmers in mind, those edge areas, when you have active management right up against the edge of a forest, that's one of the problem areas that can be really susceptible to invasion. And so I would just say, you know, stay vigilant and pay attention, learn the natives and invasives in your area so that you can notice what is there and if something new shows up. You know, I think, Ethan, we probably share this in common that it's really often I'm out on somebody's land, and I'm pointing out different species and they're like, whoa, whoa, whoa, what? What was that? Show it to me again, like that's buckthorn, and it's bad. Why is it bad? Tell me all about this. And then they're like, oh my god it's everywhere. And I'm like, yeah, if you have an issue here. So just learning how to read your landscape and to keep tabs on that, I think goes a really long way and then also, not getting overwhelmed. Invasives can be really overwhelming and so starting small, finding the small populations before they become big problems and working on those. And then also, you know, maybe you just pick a patch and start pushing back, it can be like firefighting, you know, you've tried to hold the line and push it back in.

E Ethan Tapper 35:13

Some psychologists should write a study on people's psychological relationship to invasive plants, because there's all kinds of weird stuff that goes on in their brains. One of the biggest arguments I hear for people not dealing with invasive plants is that their neighbor isn't dealing with invasive plants. So they're like, why should I? My neighbor's got buckthorn really bad over there. And I'm like, well, but maybe your neighbor isn't dealing with the invasive plants, because you're not! And if we never get started, we're just like, never gonna get anywhere. The other thing that I really see is what I think of as the inconvenient truth argument where it's just like, it's too hard. You know, it's, it's not something I can deal with. So I'm not going to deal with it. And I found that it's really helpful in my communication with people to help them see that if they use the right tools that there is hope, and that it is possible. So like, I go out with people,

we're looking at this just like endless mass of invasive plants. And I'm like, right here, between here and the brook, I could solve this problem with herbicide in two hours. I could come out here, and I could spend two hours and I could use herbicide, and this problem would be solved. Stuff like that I feel like is so powerful, because it's hopeful. And it's just something that we need. But even so that "inconvenient truth" argument is so strong, and there certainly is a community of people that I think of as invasive plant deniers, they fight against the concept of invasive plants. Countering, of course, all the ecologists and the wildlife biologists and everybody in the scientific world that studies ecosystems, you know, they challenge the very concept of that with a similar level of scientific rigor to like, climate change deniers. And I get it, it's really hard. And it challenges us in such profound ways to make these massive compromises and, you know, change the way we think about herbicide and all this other stuff, I get it. But also, it's like, we just got to be where we are, and use the tools that we have and accept the science that we have and move forward.

A Alison Adams 37:14

Yeah, I've had some conversations with farmers and landowners who've done restoration projects somewhat recently, and definitely did hear that "inconvenient truth," kind of like, you know, I was supposed to manage invasive species, but I just knew I wouldn't be able to do it. So I just didn't do it. And these are people who like care and do a lot on their land, and are really in tune with these issues. And they, too, are like, I just don't I don't think I can tackle this. And I do think-- I didn't intend for this episode to be about herbicide, but here we are. And I think you're right that to some extent, people have ruled that out as an option, and as a result, the only option available is impossibly difficult in many cases. Not in every case. In some cases, maybe it would be appropriate small patches, whatever, as Katie said, assess your options, assess what's going on in that particular location. But I do think there's some hope to be gained from using herbicide. And if you had told myself 10 years ago, I'd be saying that sentence, I would be very surprised.

K Katie Kain 38:09

You look at it at the lens of what are you willing to lose on your landscape? If you're willing to accept invasive plants, then you're willing to lose a lot of biodiversity and I think of everything kind of through that wildlife lens with my work. And so it's not only you know, I think we talked about this a little bit, but honeysuckle and buckthorn, like those berries are really poor nutrition. And so a lot of people on the surface will say like, oh, well, those have berries, birds can eat that. But the reality is they're really poor quality for our native birds. And they don't provide the same amount of nutrients that our native berry-producing trees and shrubs would, and similarly on the food desert. It's not as extreme but with like buckthorn and honeysuckle, a lot of our native trees and shrubs are hosts to caterpillars. That's a really specific relationship. And birds rely heavily on that. And when you have these non native invasive shrubs, you're losing that component, too. Japanese knotweed coming in and invading on sandbars, not only is that a food desert, but it's also just a structural issue, like wood turtles, one of the high priority species for the Fish and Wildlife Service, that's their prime nesting habitat, often that gets invaded by knotweed. They lay their eggs and then knotweed grows up, and then there's a shade issue that's creating a temperature differential from what it should be. And it's

destabilizing that area. So it's a lot more complicated than just saying, I do I don't want to use herbicide or I am or I'm not accepting to just ignore the invasive plants. You know, it's, we're all connected in this food chain, and it has really far reaching implications.

A Alison Adams 39:41

Yeah, I really appreciate that point, that you are accepting loss kind of no matter what. And I guess that's again, there's no comfortable answer, no easy answer to this at this point in time.

E Ethan Tapper 39:51

Yeah, I think a lot about, in her book Braiding Sweetgrass, Robin Wall Kimmerer talks about the fact that we think about landownership as owning like a bundle of rights, and that's how even you know, we talk about it, sometimes you have a bundle of rights, and you have the right to mine your land and to log it and whatever. But we don't ever think about it as a bundle of responsibilities, and what if we did think about it that way? And what if we were just like, we're just here, and these are the legacies that we have, and we have a responsibility to this place. And of course, remembering that we also remain biological organisms, which are completely dependent on the Earth's biological and geochemical systems to survive, that our survival is linked to the health of our ecosystems, not to mention the fact that humans are the cause of everything that's wrong with them. And so there's a lot of responsibility there. And I think a lot about--I had this experience, I'm a deer hunter. Couple years ago, I killed a deer. And I just had this moment where I was like, the people that I grew up with, you know, if I would tell them that I was like, emotional about killing this deer, they would be like, "What do you care?" It's a deer." You know, same as you're talking to a logger about cutting a tree, they're like, "What do you care? It's a tree, it's doesn't matter." And to me, it increasingly feels like why can't it just be like something is hard, and that doesn't mean that we don't do it. It's hard, and we take responsibility for the world that we have. And we do what we can. And that's a lot of what, when I'm out there killing invasives and I'm using herbicide and it feels at times so surreal. And at times, it just feels like this is hard, and that doesn't mean that it's not okay. This is challenging me and it doesn't mean that it's not okay, this is what we've got to do, where we are in this moment in time, with this world that we have.

A Alison Adams 41:58

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