Prairie Pod Transcript

Season 3, Episode 9: Land Manager Takeover Part 1, answering listener questions!

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Guests: Paul Charland, Fire Management Specialist/Prairie Reconstruction Initiative co-Coordinator, Nina Hill, TNC Science Fellow, Ian Lane, UMN PhD Candidate, and Gina Quiram, MNDNR Restoration Evaluation Specialist

Podcast audio can be found online at mndnr.gov/prairiepod

Transcript:

((sounds of birds chirping and wind blowing))

Mike: Hey everybody, this is Mike. I am reporting from the prairie. I am out here doing pollinator surveys. Looking for bumble bees and butterflies mainly. You know so this is why I am not with Megan on this bonus episode. I am out here working in the prairie. Not to imply that Megan isn't working. She is also working as a host on the Prairie Pod. A couple things I wanted to pass along quickly. Number 1: get out here! Get into the prairie. It is so nice out here right now. ((Bird calls in the background)) Did you hear that? That was a Dickcissel right behind me. Secondly, I want to encourage you to support the Minnesota Nongame Wildlife Program. An amazing bunch of people—very passionate, very hard working, and critical for prairie conservation in Minnesota. To do that, go to the Minnesota Nongame Wildlife website and donate there. Or donate on your state tax returns. Enjoy the rest of the episode and remember get out here! Bye-bye.

[00:00:06] Megan: Hey, welcome back to The Prairie Pod. I know you thought it was over, but it's not over. We're still going, oh my gosh, I'm so excited.

Sorry for yelling in my microphone. I just can't help myself because we are offering you not one but two bonus episodes of The Prairie pod this season.

That's right. We wish that we could be on the prairie with you. That would be more majestic and beautiful and let's face it, more fun for all of us. But we wanted to make sure that we had the learning train continue – I don't even know what a learning train is - *woo-woo*, learning train.

[00:00:43] Megan: Well, we're going through it. So we have brought our normal prairie and pollinator restoration field day team together, and we're going to offer you this virtual field day. So we have tons of guests on The Prairie Pod. Let's just go ahead and round robin through all these wonderful people who are going to share some awesome knowledge with you today. Paul.

[00:01:05] Paul: Good morning, I'm Paul Charland with a fire management specialist with US Fish and Wildlife Service in Interior Region 3. And I'm also a co-coordinator for the Prairie Reconstruction Initiative.

[00:01:19] Megan: Nice. Nina.

Nina: Well, hello, this is Nina Hill, I'm calling in from Fargo, North Dakota, and I work here with The Nature Conservancy as science fellow.

Megan: Nice. Ian.

Ian: Hey, I'm Ian Lane and I am a PhD candidate in the Cariveau Native Bee Lab. I study landscapes and prairie restorations and how they affect bee communities.

Megan: Ian, what's a Cariveau?

Ian: A Cariveau is an adviser who helps me become a scientist.

Megan: So he's a real-life person.

Ian: He is; Dr Dan Cariveau is his name.

Megan: Yes.

Ian: ...his full name.

Megan: Gina.

Gina: Hi, I'm Gina. I work with the Minnesota DNR on the Legacy Fund Restoration Evaluation Program.

Megan: So as you can see, all good things happening with partnership, and I'm biased here because this is The Prairie Pod, but the best things happen with prairie partnerships people. That's right. Alliteration is a great way to start off our virtual field day.

So thank you, first of all, to all of our listeners, because this episode wouldn't be possible without you. We reached out to you. We asked you what your questions were. And then this is going to be a two series podcast where we answer those questions. So we broke them up into groups. You guys ask the best questions.

So this episode today is going to be on reconstruction planning, establishment cost and climate change. I know the big one, climate change. We're going to do our very best to

answer each question in 10 minutes or less. And you know how I like to talk. So this is going to be a real struggle for Megan Benage today. But we're going to try to do it because we just want to get you answers and we want to get them to you fast. Right. There's nothing worse than like waiting for your question to be answered. OK, we're going to jump right in with the establishment part of this. And here we go. Ian.

[00:03:20] Ian: OK, so, Megan, how do you balance the instant gratification factor for a landowner by having enough species that will bloom early in the restoration process versus ensuring that the restoration has enough species to remain diverse in, say, 10 years?

[00:03:39] Megan: So I love this question because it's something that I think I've struggled with throughout my whole career. Right. Like, there's this idea that we want this insta-prairie, like we want it to be like cup of ramen. You put it in the microwave, you add a little water and boom, you got a prairie people. And that is just not how prairie works. It is not Ramen. It is amazing, delicious Italian pasta. I really should have eaten before we recorded this, that should have happened.

But it is; it's this amazing, complex thing. So I'm going to use-I'm going to recycle an analogy here. You wouldn't plant a tree seedling and expect to have an old growth forest in the next year, right? You wouldn't. And the same is true with prairie, even though you might see cover when you plant it.

We need to start recalibrating the way we think about how prairies work and how prairie reconstructions work. So you're not going to love this. But the answer for how do you balance, is really starting to reshape how much patience you have and how much time you have. You need to give it time and patience.

[00:04:47] Megan: So now let's break it down. OK, I really think this is kind of two different questions. So one's about early showiness and the second is about how do I maintain diversity? These two things actually go together. So hashtag winning over here. So that's good. The best thing you can do is stack the deck. So if you want something that's showy or that makes it look like you actually planted something put in species that are early, successional or pioneer prairie species and that are going to show up and grow in your first year.

So things like partridge pea, Canada wild rye, black-eyed Susan, bergamot, yellow coneflower, yarrow, hoary vervain, milkweed--that's just for you Ian.

Ian: ((laugh))

Megan: That's the milkweed. 'Cuz it grows real quick.

Ian: Yeah.

Megan: But there's a challenge here, right, if you put in all these showy things, the biggest mistake that I see people make is they put these things in really heavy so that their planting is just full of all of these early successional pioneer species right away and they're like "wow this thing looks great!" But the problem is for a lot of those species like rye and black-eyed Susan and bergamot yellow coneflower those things can easily dominate your later successional species or your climax prairie species.

So if you put in too much of them well it might look showy early on it's really not going to look great in the long term which is exactly what this person's asking about.

So you want to make sure- our friend Karen Jokela over at the Xerxes Society she says no more than one-to-two ounces per acre, or less!, of black-eyed Susan and bergamot. And then I think I usually put in no more than a pound of Canada wildrye, and I think even that is too much. So I shoot for about a half pound, and you're gonna get plenty of it in your planting.

So you also want to make sure that if you're going for long term diversity [right?] that you fulfill the guilds. Fulfill the guilds! That's important, right, Ian?

Ian: Yeah, definitely.

Megan: ((laughing)) Ian, I was expecting for you to drop some like amazing knowledge on me.

Ian: You know, I was thinking about it and I didn't want to interrupt you. Like, I didn't want to talk over you.

Megan: Okay, that was very gentlemanly. Wow, thank you. Ok, drop some knowledge on our listeners.

Ian: Well the thing I was thinking about when you were talking about [you know] not having these annuals or these quick growing perennials dominate, was just [like] in remnants how you have this balance. [You know], I don't walk into [kind of] this really nice quality remnant that maybe The Nature Conservancy, or whoever, is taking care of, is see these giant fields of black eyed Susans [right?]. It's had so much time like you were saying, to [kind of] adjust. And the individuals move around, they find the places they like. And opportunities for them arise and just disappear. And so when I walk through these [like kind of these] classical remnant prairies it seems like everything's in balance and it just takes time for our restorations to come into balance too. Just like you said, you know. It's this kind of long process that we're eager to see get to the end, but it does need to go through some of these cycles where some things are doing great, some things are not doing great, but it all shifts around based on the weather. So yeah, I was thinking a little bit about that when you were [kind of] talking about these different factors.

Megan: Well I love that you said weather. That's a really important thing to think about. I think sometimes we definitely have bias. I have my own biases. If I could see a prairie with leadplant, and purple prairie clover, and all dropseed--I'd probably be happy. I mean, look at that! That's beautiful, it's amazing, because those are my favorite species. But really there's going to be different weather patterns that favor those species in some years and don't in others. And so we need to give the prairie space and room to grow. Think about it like raising kids. okay? This is going to be a great analogy, I just know it. So [like] when you have a baby--congratulations Ian! When you have a baby [like] you want to give them more care, you want to nurture them. When your prairie is young [it's your] it's your child you want it, you really want to get in there and you want to help it and give it all the tools it needs to succeed. But sometimes the best thing you can do is

let that baby fall on its butt and wait and see how it gets itself back up, [like] pulls itself back up. This is solid parenting advice from Megan Benage...(laughing)

Ian: ((laugh))

Megan: ...who has no children. You're welcome parents.

Ian: So if my kid is screwed up, I can blame you. Right?

Megan: Yeah, be like, I listened to this episode of the Prairie Pod, she told me how to do it. Now everything's ruined.

Ian: ((laugh))

Megan: Oh gosh. But really, [it's kind of] the analogy I'm trying to give you is this idea that, yes, you need to give your prairie the tools to succeed. And in this case, and every case, it's diversity. You need to make sure that you fulfill these guilds. Give the prairie diversity, because diversity gives rise to diversity in the long term. And not just for plants but also for other things like insects. if you have more diversity then you bring in more diversity in your wildlife. And so it's really important that you start with that foundation. That's the right tool that you're giving your baby prairie, and then [you] also as it's growing and becoming a teenager and adult you need to step back and give it the time and space to use those tools to best effect. Nature is more resilient than we give it credit for and prairie plants definitely know what to do if you give them the right foundation to do it.

Ian: So if someone were to say [like] I'd rather have [like] a giant field of black-eyed Susans, than a giant field of [you know] first year weeds what would you say that?

Megan: I would say--okay, I forgot I was on a podcast.

Both: ((laughing))

Megan:Yeah I shouldn't say mean things. Okay what I would say is I think that's normal, in real life. I was making jokes. But I I think it's normal to want that color, to want it to look good. And especially if you're working with landowners or on a landowner's property--I'm a landowner, I get frustrated when my planting looks like it's mostly foxtail. I want those flowers and I want that right now, people. I think the best thing that you can do is just say that those early weeds are providing really good wildlife food. We don't give foxtail enough credit for how delicious it is. We don't give ragweed enough credit for how delicious it is to our upland wildlife.

And they're really doing an important job for the prairie. So they're essentially helping with your soil structure. They're helping mop up nitrogen. They're doing all kinds of things and they're also providing some shade for some of your prairie plants, which is great. so I think people just need to realize that weeds are going to be part of your prairie and that if you gave it diversity then the weeds are going to drop out through time. That's what I would say, Ian. (giggle)

Ian: I like it.

Megan: I like it.

Ian: Just like the black-eyed Susans, I'll probably drop out or at least become less abundant overtime.

Megan: They will depending on how heavy you seeded them and how [like] the thing that you're trying to prevent... Its balance, [right?] it's diversity and balance. You're trying to prevent planting so much black eyed Susan that it out-competes everything else and doesn't give it a chance to establish or even grow. So you want to make sure that you're [kind of] reducing some of that shade competition. But yeah, balance, diversity, put in some showy things but make sure that [you] that's not the only thing that you put in. And that even though you're stacking the deck that you don't put those in at such a high rate that you've limited yourself for that long term diversity. That's the sum.

All right let's move on to question number two. This is our question--what plants and the layout of said plans would offer the best long term support for all pollinators. Well that's a big one, because we know that "all pollinators" includes thousands of different species with different biologies and needs. But I'm stealing Ian's thunder. Okay and there's a second part to this question--what plant species should I be including my in reconstructions that bees really need [they said "like" but I like "bees really need"] including egg or larval host plants.

Ian: Yeah, so this is a lot of different questions. But embedded in there are some really [kind of] common questions that we get when people ask about bees and other pollinators. So the first thing I really want to hammer is just that grass is an important part of all of this. I think there's a lot of pressure for people to support pollinators and that often takes the form of seed mixes that are more and more forb dominated. And I just wanna make sure that, in the midst of all that, we recognize that grasses are incredibly important [for] for diversity and to pollinators too. So grasses often serve as nesting habitat for things like bumble bees. Clump forming grasses, bunch grasses produce all this thatch that a lot of species of bumblebees will use and form into their nests. So they nest above ground unlike a lot of the other types of bumble bees, and grass is part of their habitat. So there's other types of animals that we would consider pollinators, like hover flies whose larvae are predaceous on things like aphids. And you know aphids use all sorts of plants including and especially grasses, so they need multiple kinds of animals and plants in their habitat to survive, to become that pollinator. So grasses are there supporting a lot of pollinators and their different life cycles and different things other than just food. So it is important we not just focus on flowers and we talk about all types of plants that pollinators need.

Megan: Amen, brother! I'm so glad that you mentioned grasses. I just wanna slip something in here really quick. And you said it, but I want to make sure that people heard what you said. It's not just about including just grass [like, as a thing]. It's about the diversity of grass. And Ian said that. So if you're just planting the same Big Five that you've always planted, you are not fulfilling your grass guild. So you can't just play any grass (big blue, side oats, little blue, and switch) and be like "woo-hoo! It's a prairie!" That's not how it works. You need to make sure you have cool season natives, and those warm season natives. And you also need to limit things that are going to be super aggressive and that are going to dominate and create these walls of grass in your prairie like big bluestem and Indian grass. Those should be seeded at no more than one

percent. So it's not just about having grass it's about making sure you have lots of different species of grass because all those different species are used differently by insects. Okay.

Ian: Yeah absolutely. And different grasses do different. Do better or worse in different climatic years, too. So if it's a really wet year maybe some grasses are doing better. So if you have that kind of resilience too and that insects will always have some of those even if they're themselves really generalized. So yeah, diversity is key to all of this. like you said before. And so moving past grasses to [kind of] the forbs, I really want to [I really want to] hammer two species specifically. Those are golden Alexanders which are plants in the genus *Zizia*, and purple prairie clover *Dalea purpurea.* They're both species that attract not only a high abundance of bees, they attract a high diversity of them as well. [And that's important] that distinction is important because you can get some plants that are very attractive to certain species. And I'll give you an example. [so like] *Monarda fistulosa,* which is bee balm, is really attractive. and people always [always] talk about it as this bumble bee magnet in the mid-season. And it is. It is really great at attracting bumblebees but it [it] doesn't have this really huge profile of species that visit it outside of bumblebees. There are some, but they don't attract nearly the diversity of these first two I mentioned. And so I just really wanted to throw those two species out there as kind of a starting point in where people can [kind of] build off of that based on their site and the kinds of things are available to them and seed mixes. [so too] Besides *Monarda* I wanted to point out that one of the other really common species, yellow coneflower *Ratibida pinnata*, is really attractive to longhorn bees. They're these specialist bees that are really great at visiting asters and they are really attracted to that specific species. We know things like blazing star are really attractive to monarch butterflies. And we know that *Amorpha canescens,* which is leadplant, is a species that's really attractive in remnants but not so much represented in restorations because of that time component. So that's one to include even if you're not seeing it show up immediately in your restorations.

And to [kind of] make sure I touch on the host plant components I really want to [I really want to] hammer that when we think about host plants for butterflies typically we're thinking about violets for Fritillaries and milkweed for monarchs. There's so many more butterflies out there that use prairies but they have a really diverse range of host plants that are usually included when you just create a diverse mix. So a lot of our endangered skippers like the Dakota skipper use grasses as a host plant. And they're relatively flexible which grass they use, they may have preferences, but they do use a lot of different kinds of grasses. The one exception would be the Karner blue butterfly which people plant lupine for and that you will have to [kind of] decide if that's an appropriate plant for you or not. And so...I'm gonna skip that thistles part, 'cuz I don't have a lot of time.

Megan: Well and if you want to learn more about thistles as a nectar plant you can tune into season one episode seven "What you do now matters later".

Ian: Yeah that's good, that's a good point.

Megan: ((laugh))

Ian: Plants...yeah, I think...

Megan: Let's do plant layout.

Ian: Yeah, I think I hammered diversity. Okay so the second part of this question I'm going to [kind of] touch on it is a plant layout, which I think is a really interesting question. And I think that it has a relatively easy answer but it it's a really complex topic. So I think typically we create the density of plants we want through our seed mixes. And that's kind of a combination of [like] "what is our tolerance for a given species" balanced with [you know] "how much we want to allow other species to thrive" [right?]. [like] We don't wanna over-crowd our restoration with black-eyed Susan so we [we] control that through seed mix. A higher density of black-eyed Susan's may be better or worse but we're not trying to make this something that is taking over restoration or is so patchy [you know]. So we're trying to create [like] an even distribution based on our seed mixes. With that being said we do have some plant material that is limited. So when we think about things like host plants violets for [for] regal fritillaries we're often put in a position where we don't have enough plants to cover an entire site. So we want to maybe think about "okay do we want to just spread what we have over a large area? or do we want to [kind of] aggregate them into one small space?" And in this case aggregating them will help out the regal fritillary a lot. [and so] This is for two reasons. One: it'll make violets a little bit easier to find because the density will be high so if they pass through the area they're not going to miss the violet. And second: the caterpillars will probably eat through an entire violent and they need to move to a new host plant. So having the host plants close is important for them to find new host plants as they are navigating their environment. The higher density you have the better. And also having these higher density of plants near nectar plants that are going at the same time as the butterfly is [is] probably a really good idea. And there's some evidence to back that up. Though is not widely studied so it is something that we are trying to figure out more. And these caterpillars that are using host plants they're really fragile and they really just need as much support as you can give them in these dense areas.

Megan: What's the...you used a great phrase the other day. You called them--what did you call them?

Ian: (laugh) Tubes of meat.

Megan: (laughing) Hashtag tubes of meat. So you want to make sure that you make those tubes of meat harder to find. All right, how do I plan for nesting sites? And I think that I should mention that they were talking about for bees. So we want to make sure that we...we're going to focus on bees here.

Ian: Yeah, yeah. Nesting sites for bees. [so it] this is a really tough question because we really know so little about nesting. [we] We have naturalists that have been [kind of] out there laboring to understand bees for you know a hundred plus years, but [you know] they haven't even scratched the surface of the [the] thousand plus species we have in our [in our] nation. Not to mention just the four hundred plus species we have in Minnesota. So when we talk about managing for nesting resources, we could say, manage for [like] one species in particular, but there's not one solution that [maybe] would help all bees simultaneously. It's just a really tough thing to [kind of] do as a [as a]

bulk without a specific goal. So there's a couple things we think we know about bee nesting. One of those is that we know that ground nesting bees, which make up approximately ninety percent of the bees you would see in prairies, typically like bare ground in sandier soil. So this isn't something that I would necessarily tell you to "go out and [like] you should make bare ground" because we're trying to put plants in the ground. But, or, that you should put sand in your sites. These are [kind of] things that are [kind of] hard to [to] manage for.

Megan: Hey, I would tell people to make bare ground. Not by hauling beachy sand onto their prairie site, but by making sure that they have diversity in their seed mix. And they limit those aggressive species like big bluestem and Indian grass, so that they can create space. That is the hardest thing to recreate in a reconstruction: the space that a remnant prairie offers us. Remnant prairies have bare ground in them.

Ian: They do.

Megan: They have places for you to put your feet. So yeah, I mean you don't need to haul in [like, like] or have [like] a reconstruction with a lovely beach next to it. But you do need to try to make your seed mix so that you've got diversity.

Ian: Yeah an interesting story is there is a person who it does work out in Ohio that carted in [you know] ten thousand cubic yards of sand to create micro dunes for bees and that's [that's] crazy, [like] nobody should be doing that. That was [like] more of a fun thing.

Megan: I admire their effort though. I have a landowner here in southern Minnesota who had turtles that were nesting adjacent to his prairie. so he hauled in sand to make them a nesting beach. I thought that was pretty cool. But anyway, I digress.

Ian: The cautionary tale from this person though was that they seeded this June with this particular sand-liking species *Colletes inaequalis* and they all died over the winter because the sand dune wasn't large enough to buffer them from the cold temperatures. So it [it] was [kind of like] an artificial habitat that didn't work for them outside of giving them the kind of texture they needed but it wasn't [it wasn't] natural enough to protect them. So anyway, I'm digressing.

Megan: You're...but it is a digressing thing, but I just want to point out that you're bringing up a really important point that I feel like it's important to hammer home with this. With everything that we do, nature is really complex and we're often trying to figure it out and build that Lego [right?]. But even something like, that trying to create a nesting site we didn't have all the instructions and so we made a big mistake in that case. So it's kind of like you have to operate like a doctor: first do no harm, and then learn as much as you can to make sure that the choices that you are making are good ones that are going to serve the prairie well in the long term.

Ian: Right yeah. [It's definitely] it's hard you know, especially with something that no one's really tried before [you know]. It's just [like just] going for it [is you know it] can be awesome or it could be sad like for this guy. But I do want to point out that we do have a graduate student who did some work in remnant prairies where she was looking at--her name is Julia Brokaw--she found that areas of remnants that were burned had higher

amounts of nesting compared to unburned sections. And that was really cool because there's probably a lot of things that happen when you burn to the actual area, [you know] opening up some bare ground, things like that. That I think would probably apply to restorations too. [like] having a burn would probably open up some of those things. There could be other things that we don't know is stimulating them to nest more in these burned areas, like maybe there's just more flowers, because some flowers do a lot better after a burn. But it's something that just for your natural management of these areas you're probably are supporting nesting to some degree. And that's true for the other guild of nesting bees too, which are the stem nesting bees. [which] they nest in these, I guess you could say, [like] if you took a grass, a blade, like an old grass stem you just cut it off [you know] you'll see that it could be hollow or maybe still have some of the pith, but bees will use those hollow broken-off old stems and create nests out of them. And some bees will go as far as to excavate that pith in the middle of those stems and create nests that way. They won't wait for the weather to remove them [so].

Megan: Here's a question I have about that. So you said that they're broken off, do they have to be broken off from the plant or will they use them if they would [like] if the stem is left standing and attached.

Ian: From what I know they need an access point. [so] they can't [like] cut a stem that's [like] fully intact they need some surface from which they could enter the stem. so yes some break point, and that's [like] something [that's something] that a lot of people are suggesting [oh] if you want to create nesting resources for stem nesters in your garden just [just] cut off the old vegetation from last winter down to about five inches and bees can use that. And then the regrowth will cover it and it will be like a natural nesting area for these types of bees. it's so yeah to our current understanding is that it's best if you can [you can] remove the tops for the bees. We don't know very well if they use [like] nesting [like] stems that have fallen on the ground and if they'll nest inside those stems that are not standing, but it's possible. Leaving the stuff on the site might be not a bad idea. So more guessing, than true knowledge in that regard [but].

Megan: Well that's really interesting. it might make some of our home gardeners really happy. Because when you have native plants [you know] one of the things [like] right in spring or right in fall that people want to do, is they want to clean up (in quotes) in their area they want [they want] to cut back all that vegetation. So maybe the message is cut it back high and you'll be doing a good service to the to the cavity nesting bees. Interesting, I never thought about that before, that it needed to be broken up. I just imagined that they just [you know] chewed through it.

Ian: Yeah, no, it's for some bees out there. There's these carpenter bees (we don't really have them in Minnesota, yet; they're classically these eastern species) they’re, and they bore into people's decks, into fence posts, into trees. They're really intense, and they're really big too. People get freaked out by 'em, but they're really gentle and they're really cool. And that's something that if you go online and Google you'll see [like] [*in weird voice]* "how do I get rid of these bees in my deck?" and…

Megan: Is that…((laughing)) I'm sorry, are those audio files that we're going to find? And that's how people are talking? [*in weird voice*] "How do I get rid of these bees?"

Ian: You should. We should see if we can find... That's how I say it in my head [like] [*in weird voice*] "how do I get rid of these bees?"

Megan: (laughing) [*in weird voice*] "How do I get rid of these bees?" ((laughing))

Ian: ((laughing)) [And I just think I was, and you know] A lot of times it's just a matter of painting the deck or treating the wood. Those are things. But...I...that, this is a big digression. But yeah, there are some bees that can, and do, just make their own opportunities; they just won't bore into wood or other substrates. There are some that nest in stone, some that nest in sandstone, and things like that too. So it…

Megan: Cool.

Ian: A lot of those aren't bees that we necessarily have here. [Like] In a prairie situation I believe it's gonna be mostly [like] stem or ground nesting or cavity nesting, which is another actually really interesting one and one that I did not plan on talking about, and one that I could get into. With planning for bumble bee nesting is edge sites against forest is [is] thought of as being great but because that helps with mice. Mice really love edge sites and bumble bees use old rodent burrows. So that's…

Megan: You taught me something last year though. I didn't realize that bumble bees, [like] I always think of them as ground nesters, and you taught me that they basically sometimes [like] they'll nest in the ground, they'll nest in cavities, sometimes they nest on top of the ground. And I love your phrase that you use and sometimes you're like "sometimes they nest in really weird places that are like 'eh, this will work' ".

Ian: Yeah it's true.

Megan: ((laughing)) Oh, bumble bees, so weird and wonderful.

All right we're gonna move to our next question. You're gonna hear a new voice. Paul do you wanna read this question? You might have to paraphrase it, 'cause it's a real long one.

[00:32:50] Paul: Sure. Ah, we'll start with the beginning. I have historically drilled my prairie plantings in the spring into soybean stubble. But they're [experiencing, ah] experimenting with broadcast seeding in the winter over snow. Do you know the percentage of seeded species that show up in dormant season or winter broadcast seeding versus spring seedings? It seems like they got better diversity when they did the dormant season.

Megan: Okay, let's start there and answer that one of them and then I'll answer the other pieces. Okay really quick answer for that, no, I don't know that percent. Next! No, I'm just, I'm just kidding.

Ian: Thank you.

Megan: Thank you for the question. No. So okay, here's the good news, I don't know the percentage but here's the thing about dormant seeding. A lot of times our seeds have a particular [strateg-] stratification process that they need to go through. That's basically how they break dormancy. Some seeds need moisture, some seeds a need freeze-thaw cycle, some seeds need a little bit of warmth. It's different depending on

who you are. Seeds are their own individual selves. And we like to empower them to be that. So what I often notice, and what this person is [is] noticing too, is that sometimes it seems like more things come up after you dormant seed because you're letting nature do that stratification process for you. Instead of you having to do it, you're basically like "Yeah nature, figure it out. Make sure that these seeds grow." It also is helpful with a lot of our wild flower seeds, or our forb seeds, because some of those have a really hard seed coat and going through that freeze-thaw and that moisture that you get over the winter here in Minnesota really helps break dormancy.

But now here's the real talk part of this. Okay. So the best time to seed a prairie is right when those seeds would normally be so naturally. So right when the plant set seeds and is dropping them into the prairie. But for most of us, we don't have the time, staff, or resources to go out and seed a prairie 6, 7, 8 times throughout a season. Right? But that's really the best time. Just look when [when] is nature seeding porcupine grass-- and then that's the best time that you should seed. Because that's ecologically what would be correct. Right? But again, [we don't] we're limited. We try to compress those seeding times into 3. The other good news…

Paul: So Megan,

Megan: …going to say something…

Paul: Yeah, Megan, so is this just a matter of time and expediency? I mean, if I put the seeds in the ground during the summertime they're going to go through that same process the next winter, right? So they're going to get that. So, do, are you just talking about trying to speed things up? Is that really what it comes down to?

Megan: Well, I don't know if it speed things up. I think it's just how, the kind of resources we have. Like I said, I mean, most of the time [it] if you look at the philosophy of "I'm going to seed when the prairie is seeding" that means that at a minimum your seeding 3 times. Early, mid, and late in the season. And most of us just don't have the resources or staff to be able to do that. So we compress and seed all of our seeds either dormant or during the growing season. And we either do it through drilling or broadcast. And so I think for a lot of people that dormant seeding and broadcast is really beneficial for a couple different reasons. One, that natural stratification. But then, two, it's really easy to get your tiny, tiny little forb seeds too deep. And if you get them too deep they're not gonna grow. So the good news is our friends Diane Larson, Pauline Drobney, and a whole bunch of other amazing scientists just put out a paper in… Gosh, when did they do this? 2017. "Persistence of native and exotic plants 10 years after prairie reconstruction". And one of the things that they found is that there's no establishment difference after 10 years [So even though it might look] based on seeding method. So even though you might be seeing things that's like "oh, when I dormant seed it seems like it's better." They did dormant season broadcast, growing season broadcast, and growing season drill for a couple different seed mixes. And after 10 years all of those, [like] planting method wasn't a factor in changing how those plantings looked.

Paul: So are…I know we're focused on [on] seeding method here, but, so then, are we. Do we need to think broader too [in] with respect to our establishment in long term [ah]

status? So then we're going to have to start thinking about management, too then. But we just want to focus on seeding now?

Megan: Yeah, I think [um] you always have to be thinking about long term. I mean, you always need to be thinking about what choices are you making in establishment phase management? What choices are you making for long term management? How did you build your seed mix? But [you know] this question wanted to know in particular about seeding. [What] Is there a method that's better than another method. I would always argue that you need to be thinking about diversity.

Paul: Ok, so. Let's get to the second part of the question too. 'Cause this is, so… When thinking about dormant season seeding, [um] how about timing? This person had broadcast in late February early March, and they said on the first few nice days before, above freezing, to lock the seed into snow. And they want to know if there's benefits into having that seed out there longer. So if they did a broadcast seeding there in the winter, earlier in the winter, does that make a difference?

Megan: Yeah, I think it always, this…people hate when I give these kinds of answers…but tell me what kind of winter we're going to have I'll tell you how it's gonna go. Tell me what the weather's going to do and I'm gonna tell you exactly how this is gonna work out for you. So I think that there could be benefits. Because some seeds would take longer than that spring warm-up--in that [like] couple months that you're giving them if you're seeding in February and March. But I also want to applaud this person 'cause I think their premise here is exactly right. So instead of thinking about it in terms of a month, I'm going to give you a rule of thumb. I typically think about seeding after soil temperatures fall below 50 degrees for a consistent period of time. And this is so that your seeds will remain dormant and that [that] you don't suddenly have a pop up prairie in November, and then it goes into frost, and that would be very bad. But before freezing. And they mentioned this. That is that so you can lock, I'm gonna use their phrase, lock the seed in. Because you want that soil to still be sticky so that the seed… when the soil is frozen it's not very sticky, and your seed is just kind of sitting on top. Which means it's not really attached to the soil. So you want to make sure that you do it [you know you] 50 degrees, but before it's frozen. The other good time to do it is right before a snow. Because the snow will do that locking bit for you; it'll lock the seeds in, and then as that snow melts and does a freeze-thaw it'll actually carry the seeds down into the soil and plant them for you. Which is a beautiful thing. So tell me when it's going to snow and that's when you should seed. (laughing) Well, I just…Yeah. So the other…

Paul: So you've got one more small part. Oh, sorry.

Megan: …thing. Oh, go ahead.

Paul: You've got one more small question here and they want to know if they need to be inoculating their seed.

Megan: Oh yeah. So I'm gonna turn that one over to Gina and Ian because I don't really know. Like, this fascinates me, this idea, but I, my experience with it is that there's a practicality aspect. Like, how do you get the inoculant, keep it cold, and get it from the

factory to transportation to the field and have it still be alive? Like, have all those good bacteria be alive that you need? And I don't really know what the answer is.

Gina: Yeah. So this is Gina. [And] I think largely there is still a big practicality issue. I think a lot of this is [is] still early research. You know. We know that over time as these [these] soils have been cultivated, and we've been doing all kinds of stuff to the microbial community is different. There's different bacteria, there's different fungi. It's [it's] totally different than it was in the remnant prairies. And there is a lot of research showing that if you can get that good mix of microbes on your seeds they do better. Especially if it's the mixed microbes from a native prairie. But at the moment there's not really a good mechanism to [to] get that into a large scale restoration. Ian, I just jumped in; do you wanna take over?

Ian: Yeah, and I think it's just [it's just such a, it's just] a frontier for us. You know. Because there's so many different kinds of soil organisms. So we have [you know the] these symbiotic soil organisms that we [we] know are really important like the [like the] arbuscular fungi that colonize plant roots, and the ones that [pea] the pea family plants have [that], and then there's other ones that just, we just have no idea. They're probably a part of this really complex web and it's just, we just can't know how to recreate that. [And so] We know that some parts of this are [are] important and we can demonstrate that. But “how do we recreate the original?” is [is] far on the horizon. And so yeah, there's the practicality part, and then there’s just a general lack of understanding. It’s such a frontier in terms of what we know about the soil and what kind of organisms are there. So yeah, it's, it's hard. And it's important and it makes a difference. But it's yeah, we're just starting to understand it.

Megan: It take time, too. To build your soil health back. Right? [Like] If you are working on a reconstruction, and that site has a history of soil disturbance, that is going to take a lot of time for you to build it back and have it be what it should be to make your prairie work. I’m gonna use a phrase that I normally use, prairie seeds are not magic beans so we need to stop treating them like they're magic beans. You can't throw them out onto a really degraded site and be like “you’re native, you’re gonna do fabulous”. Like you still need to give them the right site prep and the right biology bacteria, micro-organisms to survive, which means you're going to need to put some energy into building back your soil health so that you have a great prairie.

Okay, one last thing that I didn't say and then we'll move to the next question. Just circling back to the seeding thing really quickly. I’m gonna use this phrase, bet on nature. So look to the prairie for answers on what is best and always put…[like] if I'm gonna place a bet tomorrow, I'm always going to bet on my prairie seeds and how they're working naturally. So I don't know if that helps you, but. Bet on nature to guide you in how to build it back.

Ok, Gina, let’s move on. Question 6. But really, it's like question 29. Because all of these questions were like 20 questions in one question.

Gina: ((laughing))

Megan: So we're doing…there's, we just want to point out that there's a lot more that we could say about each of these topics. But in order for it to be a little bit easier for you all who are listening to consume, we try to limit ourselves to these 10-minute responses. 'Cause we could talk about this, we could talk about one question for the whole podcast.

Okay, how do we make the best reconstruction we can with a low budget? We can build a beautiful plan and then find out that it's highly expensive and out of our budget. How do we accomplish this theme with limited funds? Okay, real talk.

Gina: This is such a good question Megan.

Megan: It is.

Gina: I get this all the time. And people talk about this all the time when we go out to evaluate restorations.

Megan: They do, and...

Gina: So what's the answer?

Megan: ((laughing)) What's the answer? You know it's gonna be a diversity word in here somewhere. It's gonna…okay, I'm gonna have to have, we're gonna have to have, like this is like, I'm going to channel my inner Norma Benage and talk about budgeting. That's my mom. We're gonna talk about, ah you know, if you, if you're balancing your checkbook and you're buying more things than the money that you have coming in. You're doing it wrong. [Like] You're living outside of your means. So that's from Norma Benage, "Quit living outside your means!" So if you're building a plan, the first thing I would say to this person is, you should be considering cost when you're building that plan. That is a critical piece. Site conditions, your goals, and your budget are going to ultimately determine what you can do. And while you're going to hear me talk *so much* about diversity and how important it is, because it *is* important--it's your foundation, you also need to make sure that you have that check and balance in there of how much you can actually spend.

Okay, first thing. This person said "best reconstruction". Gina, what do you think when you hear the word best?

[00:46:15] Gina: Arm I [I] think I don't know what you mean.

Megan: Oooh.

Gina: I think people mean different things.

Megan: Such a good answer. So proud of you. Okay, what are your goals? What what do you mean by that? I'm gonna assume for this question that you mean that you want the most resilient, most functional, and I'm gonna make up a word diversity-est, showiest reconstruction around. That that's what you want. That's what you mean by best. But if you don't define your goals, you'll never know if you've met them. And if you don't define your goals if you're talking with landowners, you won't understand their expectation. Sometimes landowners signed up for a program and they definitely have an idea in their mind of what they want that site to look like. And then they get something that doesn't at all match their expectations because you've never had a

conversation with them about goals, and how much things actually cost. So doing it right costs money. It just does. And we're gonna have to get away from this idea that we can plant a prairie and it's going to cost $100 an acre. That is not a prairie. You might have planted some prairie things but you have not planted a prairie. I would say on average if I want a showy best resilient functional planting I'm looking at $1000 an acre. And I know for some of ya'll who are listening you're like (laughing) "Whoa I don't have that kind of money. Shoot, that is crazy talk." And I get it. You can also build a really nice prairie that is functional for $500 an acre. But we're just gonna have to kind of divorce ourselves from this idea that we can do it for 100 bucks an acre. So the thing is I totally get it. I don't have $500 an acre; I don't have $1000 an acre. Do it in pieces. Do it right and do it in pieces. Because what you're trying to do here is you're trying to make sure...if you're telling me you want the best thing out there, then you need to make sure that you're putting diversity in. This idea that...we used to have this idea that you could plant [like] all grass and interseed forbs later, and it would be cheaper. Or you could plant like a really economy mix and it would...then you could interseed later. That only works if you...okay first of all the only planting grass and interseeding forbs does not work, because once the grass gets established there's no room. The other idea for these economy mixes could work as long as you limit those dominant species. But you have to remember everything that you're putting in there initially you're giving it a head start. You're [you're] basically starting that race for them at the half mile and everybody else is back at start to run the mile. So you have to know that the new stuff that you're seeding in is going to have that much more competition and struggle. So I really like the idea of doing it in pieces.

Make sure you follow your basic rules of thumb. You need a minimum seeding rate of 40 seeds per square foot. 7 or more native grass or sedge species. At least 2 species of bunch grass. Fulfill the guilds, fulfill the guilds, fulfill the guilds--warm season grass, cool season grass, sedges and rushes, legumes and non-legume forbs. If you don't fulfill those, nature will fill them for you with something I guarantee you you don't want. And then...

Ian: Can I jump in, Megan?

Megan: Yes.

Ian: I know it's not my question but I just couldn't help myself.

Megan: ((laughing))

Ian: It's just, I love the idea of doing it in smaller pieces and doing it right. You know? And there's [there's] a lot of papers out there about spill over and how during these [like] high species richness micro-plantings benefits the areas that you're not restoring too. So it yeah, it's [it's] not a bad idea. I think we get into the mindset of all or nothing. And it's [it's] not...it doesn't have to be that way. So...

Megan: I love that you said that. The all or nothing piece. That's so important because we do. And it's the, it's again, it's, we need to, it's that insta-prairie idea. It's the cup of ramen. I want to eat; I want to eat right now; I want to go into the microwave and I'm ready in 2 minutes. Okay yeah. You might be eating and you might have grass cover

and you might have some wild flowers. But how much better would you be eating if you put in the work to make a well-balanced, healthy meal? And that's what you're trying to do. You're trying to put in the work to make a well-balanced, healthy prairie that is diverse so that it can withstand all the pressure it's going to face. Climate, invasion, there's a lot of things that are stacked against a prairie. And so we want to give it again those tools to succeed. And Gina you mentioned something, we were talking about this earlier about location and scale, so I want to make sure you get to talk about that a little bit here too.

Gina: Well I'm totally distracted now by this "doing it in pieces". And I just wanna give a shout out to a lot of the amazing land managers in Minnesota who are already doing this. You know as the restoration evaluation program we go out and gather stories about how people are using legacy funds and [and] what's working. And we want to promote those! And we've seen a lot of awesome examples of where people are [are] doing the right stuff, doing the hard stuff, spending the money they need to spend, taking the time and doing small pieces and then building on it. And it's working. It's working all over the state. So I just want to put in another plug for that. You don't have to do this all or nothing. Like I'm gonna plant this *ginormous* prairie in this one season it's gonna be amazing. It'd be awesome if we could do that, but sometimes it's just not possible.

Megan: I like what you did there, your pun. I'm gonna plug this. Did you do that on purpose?

Gina: ((laughing)) I did not catch that.

Megan: I'm gonna plug it like a prairie. Ok, sorry.

Gina: I don't even remember what it was supposed to talk about now. Can you remind me again?

Gina and Megan: ((laughing))

Megan: Location and scale. And okay, before you do location and scale, I'll just add the other basics in there because I forgot to say them because Ian and I got excited. This is what happens, we're getting excited! So include species from different families and then make sure you have at least 20 or more native forbs with at least 5 species in each bloom period, which is early, middle, and late. And that's like a minimum. This is a bare minimum. People in Iowa are planting 100 plus species every time they're doing a planting. And you c...I know that's terrifying but sometimes... I love Karin Jokela said this when we were doing our seed mix clinic. She said sometimes people believe there's an [there's an] economic constraint. And they...but really there's no...wait, what did she say? Now I'm messing it up.

((laughing)) I'm ruining it. Sorry Karin. You said that sometimes people confuse an ecologic constraint with an economic constraint. And so you need to make sure [like] is it really economics that's holding you back? Is it really ecology that's holding you back? Like what is actually the barrier here? Because I hear all the time people are like "Well I can't plant 100 species seed mix because that would be too expensive." But what

species are you picking? You know? And how, I mean, you can do it. You can do it affordable. By gummy, if those fine folks of Iowa can do it, so can we.

Okay Gina, really quickly before we move on. Talk about location and scale in one minute or less.

Gina: In one minute or less. Pass. No, I'm kidding. So, we're gonna talk a little bit about location later when we talk about some of the climate related questions. So maybe I'll just emphasize again the scale piece where, you know, we don't have to be doing these huge, huge parcels and do everything all at once. But we also want to make sure that we're [we're] putting in a big enough piece of land that the party has a chance. There's enough room for things to move around, there's enough room for some diversity in there. You know there's a lot of [there's a lot of] emphasis on things like [buffer] buffer strips and some of these smaller plantings along roadsides. And getting the native vegetation on the ground is great there, but we also want to be cognizant that, you know, kind of aware that there's gonna be some limitations to what these really small parcels can offer us. And so maybe on these really small pieces that aren't near other larger remnants or restorations it doesn't make as much sense to put in $1000 an acre. Sorry, Megan.

Megan: I know, I know. It's alright. Connection is important is what you're saying.

Gina: Yeah.

Megan: Like connection.

Gina: Yeah. Thank you.

Megan: Yeah. Connection is important. Okay I'm gonna give my Karin Jokela quote the right way. Because I just felt, that way she won't hate me forever. Okay Karin, here it is for real. We often confuse economic limitations with ecological ones. For example, you don't actually have to wait 10 years to get prairie dropseed, you just need to seed more of it initially. What you start with when you plant determines the results for years to come. And one of our U.S. Fish and Wildlife biologists said-- when we were doing this presentation in the seed mix clinic, I was like, you just need to remember that every choice you make now you're setting the trajectory for that piece of land for the next 100 plus years. So you really need to put in the time and energy into planning, site prep, and seed mix design so that you're doing it with the best available science, with diversity, and you're doing it right. And he popped up from the back to class and he's like "Yeah, thanks Megan. No pressure." Like, hundreds of years. No pressure. But it's true. Okay.

Let's move on. Nina, Gina take it away. Climate change. I really think there should be intro music.

((singing)) Climate change. doo doo doo doo. With Nina and Gina, their names rhyme. But they're not the same person. Woo-hoo.

Okay, sorry. Go on.

Gina: I want a recording of that. I'm gonna pull it out of the pocket. Great. So, I'm going to read the question.

Megan: Alright.

Gina: It's [it's] nice and, it's a long one. It's got a lot of pieces, so we're gonna break it down. Just curious, how you all feel about this: should we be planting different varieties of trees from the next warmest zone (assisted migration)? Especially shade trees. Trees can take a long time to amount to the tree that you're wanting. You know I'm planting this bur oak so my great, great grandchildren can enjoy it's shade-type thing. There's a little more and we'll come back to it. But I'm gonna stop there because there's already a lot.

Nina: Yeah.

Gina: And I want to start by breaking down this idea of assisted migration a little bit. Because when we go out and talk to landowners and land managers and [and] people about assisted migration people think about it in really different ways. So I'm gonna kind of describe 3 ways we've seen people think about it. First: moving genetic material. Moving plants that are adapted to one place for...moving them to a new place where we think they're gonna do well in the face of climate change. This is all around the idea that things are changing and we're trying to put in plants that have a good chance of being able to persist. So moving material around, that's kind of the first one. And there's a lot of information, there's more information about this than other ways people think about assisted migration. And I'm gonna put in a plug for season one episode 3 where Megan just talks a lot about this mix and match strategy. Of bringing in a variety of locally adapted seeds. So moving genetic material around, and you should dig into that episode if you want know more.

Nina: So Gina, when...in this example of assisted migration you're talking about moving plant material around but you're talking about moving genetic material around, right? Not species?

Gina: Yeah, so like within [within] the range of where the plant already exists. Moving some plants, some seeds, or some [some] individual plants to a different part of that already existing range. Thank you. And you queued me up great.

The next kind is moving things outside of the range. So this would be an example where maybe there's a species that's native to Iowa, like *Echinacea pallida*, which we don't have in Minnesota but people...we've seen some people think that this species has a better chance of making it in a future climate. So they've moved it into Minnesota. There's really not a lot of research around this. There's some, for sure. But this is really complicated. Because when you're thinking about moving a species outside of its range, it's not just the climate pieces that are...like the obvious ones temperature and moisture. There's all these other things we were talking about: the microbial community, the other plants that it's [you know] already living with in its [its] normal habitat. So this is a, this is one where, there's, we just know a little less. But we're seeing some people do it, so it's important to talk about. And then the last way of people [kind of] think about assisted migration is [like] migrating whole habitats So maybe there's a reason that what existed historically in an area can't make it anymore. And there is an example that just came out in Minnesota Conservation Volunteer about Nerstrand State Park. Where essentially, the whole park is getting wetter. They've gotten a lot more rain, the soil [soils] are

holding it, and the trees that were [like] iconic to this park are dying off. And so the land managers are trying to figure out what assemblage of trees, what habitat type can we put in that's going to make it in that area. So moving things within their range, moving genetic material, moving things outside their range, and moving whole habitats. Those are all the ways that we see people talk about assisted migration. So with this question it really sounds like they're talking about moving species outside of their range, potentially, or the genetic material piece. Right, Nina?

Nina: Yeah I [kind of] interpret this question...to maybe enhance...encapsulate the moving genetic material from a warmer seed zone or a different [you know] climate-adapted area within the species' range, or also moving species outside to a new, what's becoming a new future climate range.

Gina: Awesome. So Nina what [what] has TNC been doing and what are they learning about answers to this question.

Nina: Yeah.

Megan: TNC, a.k.a. The Nature Conservancy. Ok, sorry, continue.

Gina: Oh, I've only been with the government for 3 years and I'm already using the acronyms.

Nina: Yeah, The Nature Conservancy is doing a lot of research and on the ground projects to try and understand more about these different types of assisted migration. So en route of talking about this, answering this question I want to share with you about what we're learning. So heading up to the boreal forest, our forest ecologists in Minnesota are [are] working to test different approaches to enhance their methods or use different strategies towards climate change adaptability. And these are [kind of] encapsulated by resilience and transition.

So resilience, in the terms of...we use have used this term a lot in the podcast today and I guess what I think of it as...setting up a system to be able to persist into the future and withstand changing conditions. And so we're trying to use different tools that are available to identify where places [you know] have micro climates that are resilient or changing [or] less quickly than other places that we've seen. You know that might be buffered...

Megan: Nina, real quick. What do you what do you mean by a micro climate? Is it like a really tiny rain storm?

Nina: A micro climate, yeah. Well. Possibly. Depending on the geo-morphology of a place or the soil type or condition. [kind of] The landscape context of what's happening on the lands next door. Places like, we're seeing [you know] resilient pockets of areas along, think of the the cliffsides or those granite outcroppings along the north shore of Lake Superior. So we've seen that some of those shaded bluffs are cooler and they are like buffered, protected zones that are changing less rapidly [than] to climate and than other places that we're seeing. So we can definitely help to maintain our boreal species, and our local species, our local ecotypes in those regions, in those resilient places. You know. And that's not to say we know, we know that those trees and those species are

adapted to cold conditions, but when it's not cold anymore [you know] we may also want to think about moving species outside of their range. So that's a reason to think about the assisted migration piece.

We're also testing this in transition strategies. So we've got several experimental plots up in the northern Minnesota region where we're testing different functional traits of the ecotypes of the species. White pine [you know], planting northern white pine to, next to a white pine that comes from maybe central Minnesota, more of the southern part of their range. And monitoring how well those plants grow and succeed and persist throughout changing conditions. So we're looking at this to see how do different ecotypes of the species compared to each other.

Gina: So Nina. Based on what you guys have learned so far and [and] other research that's come out, what would you say to this listener who asked this question? Should they be planting varieties of trees from the next warmest zone? How do they how do they approach getting those beautiful big shade trees? And they talk specifically about the context of public use areas.

Nina: Yeah well to apply this...what we're learning in the forest industry where there's a lot of motivation to learn more and try and experiment with some of these different strategies. We can parallel some of what we're learning in the community. [You know] By using what we're learning there and apply it to our systems. So for this question, in using different tree species there are tools available like the tree atlas so this is a great resource online where you can go and look up different tree species to understand their current range. And it's integrated with climate prediction information and then you can see the results there, see predicted range changes of different species. And talk with people to see if that would be a good [you know] choice for your restoration project.

Gina: So...

Nina: You always want to be using evidence, that we have information that's out there, to make a good decision.

Gina: And I think one thing that you and I have talked about quite a bit is the importance of documenting all of this. You know, we're [we're] trying some new things here and where people are trying to do the best they can do with the information we have. And the best way for us all to move forward is to document what we're doing, why we did it, how it went, and then talk to each other about it.

And Paul I'm gonna put you on the spot for a second because this is the Prairie Pod. And there is a very cool tool that exists for people to start documenting some of this information and share it. So can you tell us a little bit about that tool?

Paul: Yeah, thanks Gina. I appreciate the opportunity. Yeah that tool that Gina is referring to is the prairie reconstruction initiative database. Part of the goal of the prairie reconstruction initiative, our motivation was to bring together results and experiences of a lot of different people. But we all tend to do things kind of in our own way. We [we] document things in our own ways or we don't document them at all. So P.R.I. who's developed a tool called the prairie reconstruction initiative database where we can all record the same data with the same parameters of our reconstruction. From the seed

mix to our management strategies, management techniques. And then we [we] can assemble those all in a centralized database and that will give us the chance to objectively analyze the outcomes from our prairies to see which of those inputs--again, that site history, what we planted, how we planted it, how we managed it--how those affect the outcomes. So it's in, the intent is that over time is to be able to do an objective analysis to see what rises to the top. To see if there's lessons that we can apply or situations where lessons apply. Does that capture it for you Gina?

Gina: Yeah thanks Paul. I'm gonna bring it up again, maybe twice.

Paul: Good.

Gina: I think it's a really important tool.

Paul: Thanks.

Gina: So Nina, I've done a bad job time keeping and we're out of time. So I think we [we] should move on to the last question just so that we can wrap this up in a reasonable amount of time for listeners. And the last question is [is] kind of a big one and it, it is all about climate change. A listener wanted to know: what are the predicted moisture and seasonal changes for Minnesota? And what are other groups doing to respond to climate change? What should, what *should* land managers be doing? So Nina, I'm gonna talk a little bit about the predicted moisture and seasonal changes. We know Minnesota is getting warmer and we know it's getting wetter. There's a lot of information available in the Minnesota climatology office, a lot of great tools. You know, the in, a little bit more detail--the part of the season that's getting warmer the fastest are the winter lows. So we're having less really, really cold days. And those really cold days are not quite as cold as they used to be. We're also getting more rainfall, but it's happening in a really specific way. It's happening with bigger, crazy storms. I had one go through actually as we were recording a couple minutes ago, I had to mute myself. And spring is wetter on average, and summer is maybe going to have a little bit more drought. And it's going to vary a lot. Based on what we know from year to year it's going to vary [you know in] within the state. So there's some of these big trends but overall we're still gonna have a lot of that variation. Like Megan was saying, you know, if you can tell me when it's going to snow, I can tell you when to plant. That kind of thing is still going to hold true. When we're gonna have the first snow fall, how much rain we're gonna have, is going to vary from year to year. But there are some big trends. There's a couple cool tools that you can log onto and find out exactly what's happening in your area. So if you're [you know] out by Windom and you want to know exactly what's been going on, you can log on to the Minnesota climate trends tool. And this will be a resource that we have for you, for this podcast. And it's basically an interactive map where you can click on your area and get data about what happened, temperature-wise, precipitation-wise, over time. And it's got a lot of [a lot of] cool features you can compare years and trends. What it doesn't have right now is any concrete answers about how you use that information for management. So we'll circle back to that. Another tool that's available is the Minnesota watershed health assessment framework. And this is another map-based tool where you can [you can] click on your area and pull up what they call the climate summaries for watersheds within a watershed scale. And I think these are super cool, especially when you're trying to explain climate change to people because

they have these maps where you can, it compares what's happened in the last 30 years to what's happened over the entire climate record in Minnesota. And you can see exactly how much more rain has fallen on average in the last 30 years compared to historically. Or how much hotter it's been. And that can be really powerful when you're trying to talk to people about climate change. So I'd encourage you to check out those tools. But like I said, essentially Minnesota's getting warmer and wetter. We know things are changing and a lot of people want to know: what should they be doing about that, in terms of management? So Nina I know that you didn't get to talk about quite everything that TNC's been doing and there's a lot that they've been doing in [kind of] thinking about how to respond to these climate changes. Do you want to jump in here with a little bit more?

Nina: Yeah thanks Gina. Yeah TNC has been thinking about this a lot. You know, not only at resilience [kind of] throughout a big scale, but also small scale. So, you know, what do I put on the ground here? And we've touched upon these themes throughout the podcast of "diversity is great" and the tagline "diversity is forb-ulous".

Gina: I'm sorry, did you just say "forb-ulous"?

Megan: I love how much you're laughing while you're saying it.

Gina: (laughing)

Nina: Diversity is *forb*-ulous

Megan: Diversity is forb-ulous.

Nina: When it comes to the prairie. So, you know, even in the small bits, we want diversity out there. You know we want grass and forbs, you know flowering plants, and patches, and genetic diversity within our restorations. And you know, kind of the the go-to is I get me seed from, you know, we have kind of our patterns of where we like to source things. But we're working on a new project that will help us overcome "where do I get multiple sources of seed?" Where do I get that genetic diversity from? For my restoration. You know, we have sent teams out across the landscape and developed tools where we have mapped the locations of seed sources on really high quality remnant prairies. You know, so we can learn and share that information about where these really diverse, micro-climate-adapted, [you know] get all of that variability to be put and mixed together in our restorations to allow it to be the most adaptable, the most resilient that it can be moving forward. You know, no matter what changes occur on that piece of land. So for this multiple source seed project we went out, looked for the seed on the ground, mapped it, and we're sharing those resources. And we're also, you know, a big, maybe uncomfortable factor of this is, you know, we're still learning. But the time is now, and we're gonna learn while we do things. So we've got some experiments growing in the laboratory, and on the ground in small plots. You know, similar to what's happening in the boreal forest with planting different ecotypes and measuring their success. We have some small plots where we're actually testing these things on the

ground too, in experimental design and in some, you know, restorations that got planted this spring. So I'm really excited to continue sharing what we're learning, you know, from mixing these seed sources together.

Gina: And Nina, I'll just say, from my experience talking with land managers, there's a lot of appreciation for those efforts to help make those diverse seed sources accessible. Because it's difficult to be able to have the time and the resources to go out and get these mix and match seed sources.

Nina: Right.

Gina: ...that we're all advocating for. It takes, it takes resources and not everyone has those. I've actually heard some land managers talk with envy about the lucky people who can tap into it. And they want it in their area.

Nina: For sure. Yeah, and also as part of this effort there's been...we want to support models like the northwest Minnesota seed consortium. You know, where it's a group of agency folks, NGOs, academics coming together, building this partnership, saying "oh, you need this kind of seed? Well, I have a tractor. Let's swap resources." And, you know, work together to get the work done on the ground. You know, some groups are better positioned to take risks and try new things. You know, there may be some various reasons why you're not able to take the risks on a piece of land, with trying something new. You know, that's why partnerships are so important. We've got different abilities. And we need to continue documenting and communicating, yeah, so we can test these things on the ground and see what works.

Gina: Yeah, and there's also a lot of, there's strong evidence that building [building] these prairies and putting these diverse, locally-adapted mixes in connected parcels and in coordinated pieces is more effective than these isolated pieces. And I would just encourage folks, if you haven't, I know you all have multiple times read the Minnesota Prairie Plan. But if you haven't there's a second edition out

Megan: Cover to cover to cover to cover to cover!

Gina: Cover to cover! My copy is falling apart. No, it actually is. But, there's a second edition out. You know. Check it out, it's got a lot of information about target corridors, and coordinated efforts. And again, like Nina just said, we need to document what we're doing, why we're doing it, how it's going, and talk to people about it. And again, that P.R.I. monitoring protocol and database--the Prairie Reconstruction Initiative, I won't just use the letters--is a great place to do that. So if you haven't, if you happen to have a chance to look at that, I really encourage you to. Because the protocol to collect the data is actually pretty, pretty quick and pretty straightforward. You don't need a lot of resources. And it's [it's] a way that we can start aggregating and putting this information together and learning. And I feel like I'm talking a lot. But...

Megan: You're doing great. If you don't write it down we can't learn from it. You're doing great.

Gina: And...

Nina: Continuing...The Nature Conservancy is continuing to develop those tools and developing them into public-facing, you know, available tools.

Gina: Yeah.

Nina: So, you know, we're working with this mapping effort on ArcGIS Online so that land managers can continue collecting information about where the seed sources occur across the landscape. And then, you know, identify where they may want to--with permission, seek permission--to go and, you know, collect some seeds of species that they're interested in.

Megan: And the tool, just to be clear, so the tool that Nina's talking about is part of that seed sourcing project that The Nature Conservancy is working on in partnership with others. And the tool that Gina is mentioning is the Prairie Reconstruction Initiative tool where it actually is migrating to an ArcGIS platform where you can enter your reconstruction data into it. So that we can learn collectively across the prairie parts of the state and the nation and the world. So, and, The Nature Conservancy is a partner in the Prairie Reconstruction Initiative. Because...I hope that you're getting these themes: diversity, connection, and partnership. If I could sum up the answer to every question that we've had so far, those are the answers.

Gina: For sure.

Megan: Diversity, connection, and partnership. We can do, Gina said some things are unattainable--we can do so much more and make things so much more attainable when we do them together. You know, we try to solve and work on these problems together. Just like we're doing in this podcast today! With our little partnership field day group. I don't know why I feel like I have to sing everything, but, (laugh), but like, I do.

Nina: Party on the prairie.

Megan: Party on the prairie people. Okay. That one is definitely going to be somebody's ringtone. So we're super excited that we just--that's a wrap, right? That's a, that's a wrap? Do you guys have any final, like, comments you want to say before we close out here?

No? Crickets.

Ian: One of the, one of the things I was thinking about, as you guys were talking about these new digital resources is just, how much information is just sitting in somebody's file cabinet of the past 50 years of management activity, and [and] plant surveys. Like,

stuff that's just not available to anyone because it's just it's in a paper format, locked in someone's cabinet. That could be really useful.

Megan: Ian, I love your optimism that you feel that it's even in somebody's cabinet. Like...(laughing)

Ian: I know, in a pile on the floor somewhere.

Megan: That's optimistic. That it's in a file folder.

Ian: (laughing)

Megan: I love that you feel that it might have even been written down, because our big struggle is that a lot of times our [our] managers don't write things down. They do really incredible things, they have so much pressure on them, so many work tasks that they're asked to do. Constantly asked to do more with less. And so I'm trying to...that...we need you to write it down. So that when the next person starts, at a minimum, it's in a file cabinet somewhere. And at a maximum we can get it into these collected databases. Which would be better for everyone. Because then the information is accessible, easily sharable, and then we can easily, like, what's the word, compile it all together and take a peek at it.

Nina: Bring all our treasures together.

Paul: Hey, that's a great softball. So one of the, one of the phrases we use on our PRI monitoring protocol fact sheet is that "monitoring is an investment in your prairie, but sharing your data is an investment in the prairie landscape".

Megan: Oh, that's beautiful. Way to go Prairie Reconstruction Initiative. I knew you were beautiful people. Just, bringing it home.

Gina: (laughing)

Megan: Gina, do you have any final thoughts that you wanted to say?
Gina: I just get so excited when things are well-documented.

Megan: (laughing)

Gina: And it doesn't have to be super fancy or take a lot of time. And that's, that's one of the things that, you know, as soon as we say "documentation" then everyone's like "NO! I have too much paperwork already." Which, is true. Everyone already has too much they're trying to do, but we can't learn from what we're doing. We can't learn what's best if we're not documenting. As my daughter would say, "it makes my heart happy" when things are documented well.

Megan: Amen sister.

Gina: So let's keep going.

Megan: Amen. Well thank you so much for joining us for the special...

Ian: Wait! One more thing!

Megan: Oh my gosh, Ian.

Gina: Oh Ian.

Megan: You just messed up my whole flow. I was going to do a commercial.

Ian: Sorry, I know.

Megan: Okay, fine. Go Ian. Go.

Ian: (laughing) Well, now I don't want to.

All: (laughing)

Ian: Wow. What I was going to say was that, just piggybacking off of your, like "let's all work together" kind of spiel. Was that, you know, there's like one of the themes that I've been hammering is there's so much we don't know. About what happens after we do it, or what, how does something that we do affect other animals and groups. And just forming those partnerships with people who can do that monitoring and things like that is just also like, I think something that is really important. And a great thing to do, you know? So I was just kind of like, we're doing more bumble bee surveys on different types of lands and things like that. And working with land managers to kind of look at their bee communities. I think that's just great. You know? We're trying to get together these like larger picture of like what's going on with these animals. Working together is [is] critical. You know, like, us poor bee people can't do it without everyone else. You know.

Megan: (laughing) ...these poor bee people.

Ian: No. We don't know anything over here.

All: (laughing)

Megan: That's not true. You know many things. You've taught me many things. Yeah, we do, we're better together. (singing) Better together on the prairie with our peeps. Okay, so, next week? Next week! We're gonna be back again with another special land manager takeover on Prairie Tuesday. Bonus episode time. So, I know that you're just, you're burning. You have burning questions related to management. And we're gonna cover them. See what I did there? Burning is a management tool--we're gonna talk

about it next time. (laughing) Okay, the puns don't end on the Prairie Pod. You betcha! You asked, we're going to answer.

Thank you again to our team. Thanks to the Prairie Pod for having this special guest takeover. And then, as always this episode was produced by the Minnesota Department of Natural Resources Southern Region under the Minnesota Prairie Conservation Partnership. It was edited by Dan Ruiter, and engineered by Jed Becher. You can find all of the resources that we talked about today--it's alot, it's a lot of resources--on our website at mndnr.gov/prairiepod. You can also go there or wherever you access podcasts to get past episodes of the Prairie Pod and just keep that learning and knowledge like the wind through prairie. We'll be back next week. We can't wait to see you then. Bye team!

All: Bye!

((sounds of birds chirping and wind blowing))