Prairie Pod Transcript

Season 4, Episode 36: Beyond the Wall of Grass: the importance of structure in a prairie (Restoration Series)

Hosts: Megan Benage, Regional Ecologist and Mike Worland, Nongame Wildlife Biologist

Guest(s): Chris Helzer (The Nature Conservancy)

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

Transcript:

((sounds of birds chirping and wind blowing))

Megan: Hey everybody, welcome back to the Prairie Pod. It's season four all season long, Mike, stop laughing and we are just so excited to be here today. I know, you've been listening and we've been excited to, you know, have you guys listen, because we've got all kinds of prairie knowledge to share. And today, Mike, are you ready for this?

Mike: I, Megan, I was born ready for this, you bet. You know, I was wondering, have you had coffee or sugar this morning?

Megan: You know what Mike, we don't need to judge my life choices. That's not part of the Prairie Pod.

Mike: I'm not – there's no judgment involved, I was just wondering like. (Laughing)

Megan: And day we talk - -

Mike: What is your ca- -

Megan: - - any day we talk about prairie is a good day and so the amount - -

Mike: Right.

Megan: - - of excitement that you have is fine. You are a person who expresses your excitement as I'm so excited I can't - -

Mike: (Laughing.)

Megan: I am a person who expressed my excitement as yay! Unicorns and wizards!

Mike: Exactly. (Laughing.)

Megan: So okay. So I'm extra pumped today because we can finally unveil to our audience our surprise guest. Mike, that's where you're supposed to, I feel like you should have a kazoo or something and you could be playing it.

Mike: (Laughing.) Well that, I had to wait, you don't even want to hear me imitate a kazoo that would be bad.

Megan: Okay, we hinted at this last time and so now we're just going to tell you who it is, if you didn't guess, we gave you an awesome hint, remember when I said that this episode was going to be swellzer? Okay, that was kind of a hint.

Mike: Swellzer.

Megan: And so Mike and I can't wait to introduce to you Chris Helzer. (Making noises.)

Mike: Prairie rock star.

Megan: Chris, welcome to the podcast, life goals achieved Minnesota DNR.

Chris: It's, it's very nice to be here.

Megan: We're excited.

Mike: Yeah, it's awesome to have you on Chris.

Megan: Yeah, we're pumped. Do you want to go ahead and introduce yourself for all of our listeners?

Chris: Yeah, I can do that. I am the director of science for the Nature Conservancy in Nebraska. I am also the author of The Prairie Ecologist Blog, which is how a fair number of people know me. I'm a scientist who was a land manager first, so I was, I've managed prairies for about 10 years full-time doing nothing else really and then slowly edged myself more and more into science, more into outreach and communications, and I'm in an amazingly fortunate position right now where I can still be involved in land management, I do a lot of research and evaluation of what we're doing as land managers, and then I do a lot of communication about what's working and what's not, what we're learning, and then also just trying to convince people that, you know, they should pay attention to prairie in general.

Megan: But you're all things we can definitely get behind and we're so excited to have Chris here because we have quoted him on the podcast probably more than any other guest, and some of that is just confirmation bias, like I'll just come out and say it, some of that is because he says things that we are thinking and that we are puzzling over this beautiful, big ecosystem called the prairie is so complex and it is going to take all of us putting our heads together, sharing our experiences, and learning from each other to try to figure out even a small fraction of it so that we can get better at restoring it and hopefully making sure that it's here forever and ever and ever and ever. And so - -

Mike: Yeah. For our listeners, if you're not familiar with the Prairie Ecologist Blog, I strongly encourage you. I mean, if you're listening to this episode, you ought to be reading that blog. Sign up for it and get it in your email because it's excellent. And Chris - -

Megan: And you'll notice on that blog I just want to interject this, Mike, but there are lots of discussions in the comments from land managers all across the prairie region. So whether you're in midgrass prairie, tallgrass prairie, or the shortgrass prairie of the west, there are all kinds of land managers just having these great discussions about well what about this or how did you make this work or what about this piece? Some of it, you know, as we always say, prairie when you're trying to restore it, you're making a cake, you need the same basic ingredients but you might be making a lemon cake and I might be making a delicious chocolate cake. Some of our ads that we put in there are slightly different, so our approaches can be slightly different, and that doesn't mean that we won't end up with a resilient prairie at the end, it just means that there's lots of ways to get there and so that means that there's lots of things to learn from each other. Go ahead, Mike, you were going to say something.

Mike: Oh, he's got some excellent books, something, it's funny because Megan and I, Chris, have struggled to keep a copy of your book, the Ecology and Management of Prairies. Have you had two copies stolen, Megan?

Megan: I bought it when it first came out and it was on my desk and I was reading, my goal is to read a chapter a day, I think I got one chapter in, not because it's bad or anything but just because time gets away from you and you can't, you know, find time to read, and then it was gone. Somebody took my book so then I was like okay, I'm going to give the benefit of the doubt, maybe I just misplaced it, so I looked in all of my bookcases at work and at home, no Chris Helzer book. So then I reordered it and a day later it was gone again. So Mike bought me at the end of 2020 a new copy and if it goes missing, I only have myself to blame because I'm keeping it at my house.

Mike: For my copy Chris, I spilled a pot of coffee all over it, so the mark of any well-used book that I have, it's bound to have a couple of coffee stains. This one I spilled an entire pot on it and yeah, so had to get another one.

Chris: I guess that's a compliment?

Mike: It is absolutely a compliment.

Megan: Basically we're trying to say we really want to read your book but life is against us. Maybe we're not supposed to read it.

Chris: I'm just glad to know that our, you know, they talk about planned obsolescence where you're supposed to make products that, you know, stop working so people have to buy them again. And we were trying something new and apparently Megan got both of our experimental copies and they worked as planned.

Mike: Nice.

Megan: I love it so much. Well, the topic that we're going to, that we have brought Chris here to talk to us about today and we're very excited to dive into, it's not Diversity, I know, shocking to everybody who's listening, but it's the - -

Chris: But it is, Megan, it is in a way, it's - -

Megan: A kind of diversity.

Mike: Yeah.

Megan: See Mike, you read my mind. How scary was that? Frightened for a minute. So we normally talk about diversity a lot and Mike and I last season mentioned quite a bit these different nuances of structure and then we realized we've sort of been sprinkling the idea of structural heterogeneity having lots of different types of structure in your prairie throughout everything that we talk about, but we haven't really explained it very well or dedicated an entire episode to it, so we thought it would be neat to bring Chris on and to really dive into why structure matters. And if you remember way back in season 1, we talked about structure when Jess and I were chatting about it and I said and I still stand by this, I think at least in Minnesota it is one of the hardest things for us to achieve in terms of getting that heterogeneity and the reason I say that is because we are, we do not have vast expanses of huge connected prairie, we have a lot of fragments and many of them are quite small, and so trying to figure out how you're going to get variation when you're already dealing with a really broken up landscape in a small scale is something that is incredibly challenging, especially if at the onset of reconstruction, we're only planting one seed mix across that site. Like it's hard to get, we're going to have to use management to get that variation. So.

Mike: Structure to me is kind of an amorphous difficult to think about. My worry is that to a lot of people, it's difficult to wrap your brain around and so maybe we should just start off, Chris, if you would help us understand what structure is and what we're talking about when we say structure.

Chris: Yeah, I mean I think about it as the architecture of the prairie vegetation. Right? It's the way that, that vegetation varies in density, it varies in height, it varies in complexity, and there are different layers of that complexity up and down in the profile of the grass, and it's all of those sort of things, and it's important because, you know, every animal species, whether it's a little tiny invertebrate or a larger mammal has its own either, either requirements or at least their favorite types of structure and by creating lots of different types of structure, you know, you're enhancing diversity of those animals, but it also affects plants.

Mike: Sure. One thing I was thinking about structure that's if you comment on this, is how important it is to consider scale when we're thinking about structure. You know, really when we talk about structure, we're talking about really many different scales all the way from like a regional perhaps even continental kind of scale down to like square centimeter, right? I mean, we can kind of think about it and it matters across that entire continuum.

Chris: Yeah, exactly, and you know, unfortunately there's a lot we still don't know about how scale matters and how animals and plants respond to scale, but yeah, for example,

you can have patchiness of structure in a way that is you're walking through the prairie, you take a step, and you step in prairie grass that's very tall and dense and your next step might be in a patch that's very short and sparse, and that's patchiness at a relatively small scale, even though within each of those steps, you know, that might be in a universe for some tiny little creatures, but then there's also the scale of, for example, you know, grassland nesting birds and you have something like a grasshopper sparrow that has its own requirement for the kind of habitat structure that it likes, but having it's not going to nest in an area that's, you know, two feet by two feet just because that's the right structure, it needs a much larger area, something, you know, that it can establish a territory, so there's a context there. But then beyond that, that grasshopper sparrow might also want to nest where there are other grasshopper sparrows, which means you have to have the right structure at the scale that multiple grasshopper sparrow territories can be in the same place, and that's what birds, which we understand fairly well and we still have a whole bunch of questions about how that works.

Mike: Sure.

Megan: You're talking Mike's language right now because you right away went to grasshopper sparrows, so Mike's probably just, he's just having, I saw his tiny little smile there. He's just having a little moment of like ah, yes grass - -

Mike: Well Chris is right. When we talk about structure, there's been a lot of work done with grassland birds, but that is misleading to some extent because it probably matters equally for about everything else, we just know less.

Megan: Well and I like how you described the footsteps and how that could be an entire universe for something that's very small and doesn't really have a giant home range, and so I want to quote you, I know it's embarrassing, but just roll with it. I want to quote you to kind of frame the rest of our conversation because I think it's really important as we're talking about structure and what makes good quote unquote structure that where good is such a kind of charged qualifier because good is in the eye of the beholder and you said it really nicely in one of your recent blog posts. You ended out 2020 with this really nice quote that sums it up, so I just want to repeat it here, I'm going to do my Chris Helzer voice. Well regardless of our initial paths, each of us looks at prairies from our own perspective, influenced by the species and groups of organisms we know and like best. This is from my blog post through the eyes of others.

Mike: Chris, that was great.

Chris: That was impressive, yeah. There's an echo on my end like I'm hearing my own voice.

Megan: How did that feel? No, but I think it's a really - -

Mike: I do really like that quite, regardless of the terrible impression, that was a great question.

Megan: Well it's a really nice quote because I think so often we think about prairie, we just take for granted our own cultural experience and our own favorites when we talk

about prairie, even the notion of structure, and so Mike who is a very good scientist and a very good grassland bird scientist, and that's kind of his niche expertise. When he looks at a prairie, if he doesn't hear a Dickcissel or Grasshopper Sparrow, he might be like this place is the pits, but somebody else coming to it who might be looking, as you said in your blog, for plants or maybe they're looking for insects, then the prairie is suddenly good, and I think the danger is narrowing our lens too much to only our favorites and we really need to be thinking about the whole scale and the whole suite of everything, especially as we're talking about structure. And I am guilty of that too because I obviously am a plant person and I have my favorite plants, and when I don't see them, I get sad that they're on the prairie, so I just think it's an important framing as we like kind of start from the ground up here and move through our discussion. So speaking of the ground up, tell us, we're going to, I did originally think about soil as part of our structural conversation when Mike and I were first putting this together. Originally, I was just thinking about the aboveground and that's where we're going to focus the majority of our conversation, but I want us to just spend like one or so minutes ish talking about the importance not just aboveground but also belowground because the soil really is the foundation of the prairie. So if you want us to lead us through that, Chris.

Chris: Yeah. I mean, so there's different ways the soil can influence structure, right? The easiest one to think about probably is soil texture, if you have sandy soils versus a lush soil or something like that, you're going to have different plant communities establishing, have different levels of productivity, right? So if you have less productive soil either because of soil texture or the amount of organic matter or both, you're likely to have a short, sparse vegetation growing out of that soil versus something in maybe a lowland valley where you've got a lot of nitrogen and there's a lot of organic matter and you're going to have very lush growth because there's a lot of moisture as well, and that's how structure varies across space just because the soil below it. But that's, so that's almost like the foundational layer, right? That's the first thing that influences structure is the soil because that's what influences what plant species are going to grow there and how they grow, and then you get beyond that and you get into things like management and you get into things like the way animals are interacting with those plants and changing the structure by eating them or stomping on them, all those other things, but yes, absolutely, soil is the foundation for all of that.

Megan: And I always say this thing and people are probably tired of me saying it, but I'm going to say it again anyway, I don't care. So one of these things I say is that we often treat prairie and prairie seeds as if they're magical beans that you just throw them out into soil that has a history of abuse for years and years and years or a history of degradation for lack of a better word, like when we till the soil, we know that inside the soil that's like setting off a bomb because we're basically destroying the structure, destroying the organic matter, and destroying the home of all the microbial organisms and connections that live in that piece of soil or whole soil ecosystem if you will. So my whole kind of soapbox when we talk about soil is that we have to start doing a better job of thinking about how to fix some of these soil problems and build our soil back so that we're creating a better environment for the prairie seeds to go into because they aren't magical. I often hear people say to me well they're native, so they'll just do fine. Okay,

well that's like saying I'm going to send you into an area where there's been an atom bomb or something and you're a person and you know how to adapt, so you'll figure it out, like the resources have to be there and we have to find a way to build it back in order for those seeds to thrive. Right.

Chris: Right, so I have two things I can say about that. One is part of, you know, all of us who work in prairies have a limited range of expertise. There's no way that all of us can know everything about how prairies work, so soil is one of my blind spots. You know, I know a little bit about soil, I'm trying to learn more, I'm certainly not an expert in soil, but the blog post you were quoting from, one of the points I was trying to make there is that because none of us are experts across all of this, we need to make sure that we're talking to each other and making sure that we bring all that expertise in a restoration project is a perfect example, right? I mean, we don't know everything we need to know about how to build a prairie in a certain place and you can't second point is like you said, you can't expect just because you look across the street and there's a prairie that looks really similar to what you want to create on your side, you can't say well okay, so there's compass plant, you know, growing halfway up that hill so I'm going to put compass plants halfway up the seed on this side because the soil if it was farmed is going to be very different, the soil conditions are very different and then, you know, the conditions of today, you know, between different climate, different invasive species pressure, and, you know, something that I'm hoping to write a post about soon but I haven't yet is nitrogen deposition. You know, most places we're adding, we're fertilizing these prairies just through nitrogen deposition that comes from cars and industrial sites and things we're adding 10 or 20 pounds of nitrogen per acre in a lot of places, that completely changes the growing environment. So it makes it really hard to predict where species might establish in a brand new start when you're starting from scratch.

Megan: Right. And so we just wanted to kind of mention that to start us off, you know, how any time you have altered soil structure, the prairie is essentially playing catch up with the million of years that went before it of trying to build those prairie soils and kind of evolving together and working together and building all of the connections that need to happen both below and above ground. So now we're going to jump into the main part, the part that Mike is most excited about.

Mike: Hey, I get excited about dirt, Megan. Come on.

Megan: Okay, Mike. This is where you've already failed me. It's soil when it's alive, dirt when it's dead, oh, my gosh, we're going to need to have a whole soil health training workshop for Mike.

Mike: That's right. I forgot that. Okay, so Chris, we've touched on structure and why it's important for wildlife and maybe we can say more about that, but what else can you tell us? Why should a manager or anybody that cares about prairie, why should they also care about structure?

Chris: Well, structure is what, I mean, because all these animals have their own individual preferences or requirements for the habitat structure, if you want the kind of diversity of animals that we want, I think everybody wants in prairies, you have to manage for the structure that they need. And then in addition to that, like I said earlier, it

does matter for plants. You know, if you're a little tiny plant that needs a lot of light, structure becomes very important because if the architecture of the prairie is such that, you know, there are these big skyscrapers all over the place above you, you're not getting the light that you need to survive at least for that year, you're not going to be able to bloom, you're not going to be able to grow much, and if that happens too many times in a row, then you're probably not going to survive. So if we want to maintain the diversity of life that we want to maintain in prairies, that diversity has to be reflected in the structure that that diversity of animals and plants needs to survive.

Mike: I was thinking that, you know, Megan and I, we got a episode last season focused on species diversity and it's kind of hard to talk about structure without also talking about species diversity it seems like that we kind of hinted at that, the relationship. But to me it seems like this is something that should be emphasized, I don't know, equally at least to species composition. You know, they're related but it's a very different measure and when it comes to wildlife habitat, when it comes to perhaps other functions, I don't know, what about water storage? Structure, you know, density of grass probably affects that, right?

Chris: Absolutely, yeah, for sure.

Megan: Especially the interception of the rain even as it's falling. So if you've got, you know, how much different species are able to capture more rain as it's falling depending on the surface that's exposed, you know, to the rain droplet itself and then also if you get too sense and too rank, we see this sometimes it's why we typically in the NRCS guidelines talk about mowing grass waterways because if the vegetation gets too rank or thick and then around it you have this farm field that's sort of below it, what happens is the water seeks the point of least resistance and so it just goes around the vegetation instead of being intercepted in the vegetation, and then it creates a new path, which is not really what you want, so that's why they talk about the emphasis of mowing with that so that you can keep a point that's close to the rest of the ground structure to actually capture what you're trying to capture and funnel it the way they want to funnel it with that particular practice.

Chris: Yeah. Well and Mike, back to what you were saying, I think the thing about structure is we all want diversity but it's really hard to manipulate diversity. Right? I mean, the only time you really got a big opportunity to do that is when you're restoring a prairie from soil up. And even that, we can talk about that but it's, you know, you can do some things but there's a lot of other things that have to happen, but structure is what we have control over. You know, as land managers, we can change habitat structure through all the different types of management practices that are available to us, and then the other great thing is you can measure it much easier than you can measure diversity. I mean, it's pretty hard to measure all of the species diversity in a prairie because again, you got to bring in all the different experts and it takes a lot of time and but structure, we can agree to some metrics on structure that are fairly easy and they're pretty easy to measure and a lot of you can do it just by looking. Right? You can say okay, we've got about half of the prairie is tall this year, about half of it's short, within that tall, some of it's sort of dense and some of it's not. You can put that in your mind and you can measure that and then if you assume that the diversity of plants and

animals is going to reflect the diversity of structure, which I think is a reasonable assumption as long as you test it now and then, a lot of times at least the way I think about this, I can evaluate the structure of a prairie and the dynamics of that structure, is it changing every year, all those, which we can get into more, I use that as a way to measure how we're doing as managers much more than I do, you know, trying to count butterflies every year and birds every year and because you can only do a couple of things if you're lucky, right? There's no way you're going to count all the dragonflies and all the ground beetles and all the mosquitoes and all the flies and so you have to at some point use something as an indicator and structure is a really good way to do that. It's not perfect but it's something that is easier, and again, it's what we're trying to manipulate anyway. So if we set our objectives based on structure, we can measure that to see if we're, you know, having any luck achieving those objectives.

Megan: Well two quick things. One, I've measured a lot of mosquitoes on my arm as they're now deceased in the prairie and then two, like I, see, I was trying to be funny then I forgot what I was going to say (laughing) that's a problem. This is what's the problem with this. Always lead with the information, not the joke. I got to learn this. So I was going to ask a question when you said it's easy to measure. When Mike and I were first talking about this, I had a question about how you actually measure structure because Mike was talking about horizontal versus vertical structure and I was like what are you talking about? What do you mean? And so he was referencing horizontal structure as the how dense the vegetation is, how thick it is in a patch, versus that vertical structure, which is really just a measure of heights and differences of heights. So when you're measuring it, how are just walk me through a little bit how are you all doing it and teasing out those two kind of aspects of structure.

Chris: Yeah, and you're right. Both of those are really important. We'll again, you can do it very quantitatively where you're measuring with measuring sticks and, you know, we do things like we'll set down a quadrat and we'll look at, you know, average height by measuring the vegetation in several places and averaging those together. We'll also measure what the tallest plant is to get a maximum height, and then we can look at the depth of the litter, we can look at the ratio of standing dead material to live material, which is important because there are some insects and other animals that really need a thick layer of dead stuff versus some that don't want any. You can look at the ratio between grasses and forbs, you know, just by either doing percent cover of grasses or forbs or whatever, or by, you know, kind of doing like a footprint, so you can do all those quantitative things and then if you want to look at density, there's a couple of things you can do. One is a lot of times what people have found is that if you do the height, there's that's pretty tightly correlated with density, depending on how you're managing. But if you really want to look at density, you know, there's some standard things like a bell pull measurement or a oh, shoot, what do you call it? There's a, you know, you put a something in the ground and you see how much of it you can see from different distances. There's various ways to do that, and that gives you a measure of density. A lot of times for us because we know that there's a tight correlation between density and height, we don't do both, we do one or the other depending on what's most important, but the other thing about measuring structure is that you want to measure it based on what you're targeting for your management, right? I mean, if you're really focusing

mostly on grassland birds, you want to look at habitat structure from the perspective of what grassland birds need, but if you're looking at insects, if you're looking at, you know, ants or something that's living on the ground, that might change what variables are important to you to look at, and so you don't have to look at everything, you just try to figure out what's important for the whatever it is - -

Megan: What if I said to you we're trying to build or rebuild a prairie reconstruction that is functionally sound and resilient and diverse through time, then how do I measure structure?

Chris: Well, I think if you have, if you feel like you've got scale to expect, you know, most reasonable animals that you would find in a prairie to show up, then I think you can look at structure and say okay, then we need to have, we need to be able to find in this site habitat structure across the entire spectrum of possibilities, right? So from very, very short and sparse areas to very, very tall and dense areas with a lot of different variation in between, we should be able to find representative areas of all of that within this area. And the question of that gets back to the question we said earlier about scale because we don't know, we just we really don't know how much of each of those types we need, but I think it's very fair to say we need to have some of all of it, and that's where a lot of reconstructions tend to fall down is that for various reasons, a lot of them kind of look the same all the way across. Right? They're all, I mean, typically they're all fairly tall, fairly dense all the way across the whole site and so you got one type of structure out there with a little bit of variation because of slope and soil textures and things like that, and so you're really managing for a subset of the habitat structure and the species that could be there. And so I would say to your question that what you really want to do is you want to make sure that you can find as much variety of habitat structure as possible. And again, it doesn't have to be hard. You know, you can do it with quadrats and you can look at standard deviations between all the different quadrats and all that, but you can also do it just by walking around the prairie and have a mental checklist of okay, are there some really short, sparse areas where a snake could sit in the sun and warm up in the morning? And are there areas where if I got a grouse chick or a quail chick, it's going to be able to wake up in the morning, move around in the sunshine but still have overhead cover but it's not too dense underneath, so walk, I mean, think about it from the perspective of all these different types of animals and do they have a place to live and feed and survive, and if they do, you're doing great.

Mike: I really like - -

Megan: We describe that as different animal eyeballs, Chris, that you need to use when you're looking at a prairie, so you need to have your Dakota skipper eyeball on and then need to go up and have your prairie chicken eyeball on, and then you need to have your bison eyeball on.

Chris: Which, which brings us back to that blog post I wrote again not to keep harping on it but none of us has the ability to look through all those lenses effectively ourselves, right? And that's where it's really nice to make sure that you're either talking to people and say hey, what do I look for, for the species that you're familiar with or would you come look at my site and give me an opinion? Because yeah, the other way to do that is

just what I said before, which is just make sure you have something of everything, and that's a pretty good way to go.

Mike: Much of what you're saying to me, much of what you're saying to me, sorry Megan, is that you're just driving home the importance of the idea that you don't do the same thing everywhere, either very often within the same prairie you shouldn't do the same thing everywhere but also between prairies as managers, we should not do the same thing everywhere. So burning on a three-year rotation throughout all your properties just as an example is probably reducing structural diversity.

Chris: Absolutely, as well as favoring some plants because they are adapted to whatever that pattern is that you've established, yeah. Yeah, I agree.

Megan: I just threw a little bit here. We're going to shift gears and talk about so we've talked about what structure is, we've talked about why it's important, now we're going to jump into how do you create structure. And we touched on it a little bit but I want us to go through some management. And again, these could be like three separate podcasts all on their own but we just want to scratch the surface here of the management side and we can sort of start with diversity I guess if that works for you, or you can start wherever you want to. You're the guest.

Chris: In terms of management. Yeah, I mean I guess I would start with the different tools that are available as managers, right? You can most of us have some way of mowing vegetation down, whether that's with hay equipment or, you know, something smaller, you know, bushhog behind the tractor or even just a riding lawnmower or a weed whacker. There's mechanical ways that we can reduce the height of vegetation, so that's one. Prescribed fire obviously is one that's really important in prairies. We can do a lot with different things with prescribed fire, and then there are different kinds of grazing, cattle grazing is what I usually use, but, you know, there's different other animals you can use for grazing. So anyway, all of those are different ways to do it and I think the key is no matter which tools you have available and hopefully I mean the more tools you have available, the better because it gives you more options. But you know, not every site is going to have all of those available, whether it's because of size or just because of logistics or expertise in something.

Megan: Or the industry itself.

Chris: Or the industry itself.

Megan: You know, if you happen to be a grazing state, like Nebraska, or if you're not really a grazing state like Minnesota. We certainly have a cattlemen's association and lots of really good grazers in the state but I don't think it's our top Ag commodity.

Chris: Right, well and grazing is not right for every prairie anyway, right? I mean, especially small prairies, the logistics get tough, it's hard to do the fencing and infrastructure at a basic level, and the fact that cattle have, I mean, it provided disturbance and disturbance is generally a good thing for prairies, but they also have a disturbance that if you have a small area can be maybe a little more disturbing than you'd want on your small area, right? I mean, in the big area, you can absorb a lot of that variation, which is too bad because grazing really is probably the most flexible of all

the tools that I just mentioned because you have, you know, with mowing, and this is important, with mowing you have the ability to vary the height, right? I mean, you can mow it right down to the ground or you can mow it fairly high, and I think people tend to forget that sometimes because you just kind of get used to how you mow and you just mow like you mow. You're going to mow this or I'm not going to mow it and you forget well I can mow it at three inches or six inches or 12 inches, and you could vary that, right? Some areas you mow short, some areas you mow tall, and you just created heterogeneity and structure, that's fantastic. With fire, it's a little bit more difficult because a lot of times it either burns or it doesn't, and you can have patchier burns if you burn on a day where the humidity is a little higher or the wind is less strong or the vegetation fuel is, you know, patchy in the first place. You can get a patchier burn but it's a little trickier with fire, but with grazing, you're dealing with animals that are making choices every time they take a bite, so there are going to be some plants that they eat more than others, they're going to have favorite places that they want to eat either because it's up on top of the hill and the breeze or down below where their favorite plants are, or it's close to water or it's on the south end of the fence where they stand in the summertime to catch that breeze, I mean, all those different things drive what cattle decide to feed on, bison the same way. And so there's a built-in heterogeneity right there and then as managers, there's a lot of ways we can control that through stocking rate, through stocking density, through timing, when do we allow the grazers on, when we take them off, it's such an incredibly flexible tool but it works best on larger sites, and even there, like you said, Megan, I mean, there's places where there just aren't animals, there's not livestock, there's not large grazers available to use, and so that's when you have to become creative with whatever tools you have, and there's lots of ways to do that. I mean, last thing I'll say on that, like if you're using mowing as a tool or haying, there is no rule out there that says you have to make squares or straight lines. You can mow weird little patterns in the prairie and create heterogeneity there and as long as you're not afraid of somebody laughing at you while you're doing it, it can be really valuable. You can make little trails through dense areas, which can be really useful for wildlife. You can mow some areas that are tall and some that are short, you know, do as much as you can to get away from these straight line sort of agronomic focused ways of employing the tools that we have available to us.

Megan: Chris, maybe we didn't mention to you that this is, you know, we're in Minnesota and we were settled by Germans and by Norwegians and we really prefer for things to be square, so I don't know about these kind of squiggly lines. This is really hard for my brain to take this suggestion, no I'm just kidding. This is the first of a great - - .

Chris: Well Helzer, Helzer is a German, Helzer is a German name and the other half of my family was Swedish, so I'm pretty close to where you're at.

Mike: If you can do it, we can all do it, okay.

Chris: I'm trying to.

Megan: If Chris can do it, we can all do it, don't be afraid to color outside of those lines, we're telling you to do it, there is no prize for coloring within them.

Mike: Can I, so what is the bottom line we can give to managers for, for what they can do for structure and how they should approach it?

Chris: It really comes back to that variation and making sure that you're providing as wide a range of variation as you can, and that includes, that's going to include some things that maybe you're not used to doing or you're not comfortable doing and so especially for example with grazing. Right? There's a lot of value in an area that's been grazed really hard for a while because after that grazing happens, the recovery phase of that creates some of the most interesting and valuable habitat structure we can where you have very short grass, you got a lot of forbiness in there from a brood rearing standpoint for a lot of birds, it's fantastic, but that's one example, right? And there are some people that are not really comfortable seeing bare ground out in their prairie for a very long period of time, but there are species that need that, right?

Mike: Right, right.

Chris: And so when you think about the variation, it's really all the way from almost bare ground to something that's really hard to walk through, and a lot of that, there's something that's going to need every little bit of that from one end of the spectrum to the other.

Megan: Can you do a quick fact check before we move on into our next section? One of the things when you said bare ground, one of the things that I hear managers say a lot is well I have to fill in all that space because then I'll get weeds. And I sort of push back against that idea because bare ground is a component of a remnant prairie and it's about figuring out a way to create that space but also not overwhelm your prairie with some new invasion, and so just speak a little bit to what you've seen in terms of allowing for that structure even at that bare ground level.

Chris: Yeah, absolutely. I mean, there's a couple things there. One is what do you mean by weeds, right? I mean, if you're talking about noxious plant or a real invasive plant, that's definitely something to worry about. What if you're worried about ragweed or, you know, something like curly-cup gumweed around here, some of those annuals or disturbance oriented plants that kind of come and go based on, you know, level of competition? That's, that's good stuff and we want that, and in fact I look for that as I evaluate our prairies. If I'm not seeing some parts of my prairie where I have that kind of weedy flush happening, then I feel like I'm not doing the range of disturbance that I want to make. So that's one thing. In terms of the bare ground, it's interesting if you really look at, if you take a prairie and you look between the plants and see where the soil is, there's a lot of times you'll find a lot of bare ground where there's really nothing germinating or nothing growing. You know, just because you create soil exposure to the sun doesn't mean that there's going to be plants growing in there because a lot of it has to do with what's going on beneath the plants in the soil, right? The root competition from those surrounding plants may still be strong enough that a new plant's not going to have a shot. And so it's, yeah, I definitely agree with you that it's not a sure thing that creating bare ground is going to create weeds of any kind, and then again, if it does allow for the germination of some of those short-lived or opportunistic plants, a lot of times that's really good and it creates some of the best habitat conditions that we can find.

Megan: Wonderful. Thanks for speaking to that because I think that's going to be something that's really going to be useful for people to hear. Foxtail is one of our early disturbance weeds and it's delicious to wildlife, so it's one that I just don't worry about at all.

Chris: Well, right, and it's also not a strong competitor, so it's not going to be there very long. If you have perennial plants nearby and they're just temporarily suppressed, that foxtail will do great, but it's not going to keep those other plants from coming back, it's the opposite, right? As soon as those plants start coming back, the foxtail shrinks up and goes away.

Megan: It just looks scary because it can be like oh, my whole site's foxtail but it's really not, it's just an artifact of time and we just have to be patient, which is really hard to do as people, so. All right, we're going to jump into our next section.

(Music)

LET'S SCIENCE! TO THE LITERATURE!

SCIENCE!

Oh this is, we could talk to you about structure all day long but now it is time for the part of our podcast where we recommend a book, a blog, or a paper and of course, we would be remised if we didn't recommend did you hear it at the beginning of the podcast, the Prairie Ecologist Blog. Yes, we have to sing it for impact, Mike, that's what we're doing. So my pick today is Chris Helzer's Prairie Ecologist Blog, unsurprisingly, and the two blog posts that I want to mention, the one that I talked about earlier through the eyes of others I already mentioned it, so just we'll put those resources on our website so that you can see that one but the second one that I thought was really good for today was two ideas for what makes a high quality prairie, species composition versus structure, and process. And when I first read that, I was like well bang, there it is, like we're about to talk about this stuff today on our podcast. So we talk about a lot on the podcast about diversity, which is that species composition aspect of things, and the second is something that we kept mentioning and then decided we need to have a whole episode about this. So we've already talked about all this stuff but this blog post basically just reinforces everything you just heard in this episode about how it can't really be just species composition or having structural heterogeneity, structural differences in diversity across the site, heterogeneity is just a fancy word to impress all your friends at a dinner party. So it's really, really important to have both because they funnel into each other, and I think Mike, you said it best earlier in this podcast where you were like you can't really talk about one without talking about the other. They really are the left and right hand of prairie management, if you will, and so. - -

Mike: Good analogy.

Megan: - - Yeah, left and right hand. So if you're left handed, you don't have to feel bad, if you're right handed, you don't have to feel bad, you're in the mix together, yay. I clap my hands together so you know you're together. So and both of these things together, which is what the post is talking about, funnel into the processes of a prairie, which I know we talk about ecological processes, that's sometimes for a lot of us, our eyes sort

of glaze over and we're like I don't know, the prairie is great, it's doing good stuff, that's all I know about it. But what it's really doing that good stuff that it's doing is called primary production, it's basically just photosynthesis, it's converting the sun's energy into organic matter through photosynthesis, and then with that comes cycling of carbon, cycling of nutrients, hydrogen, oxygen, all these other things, it's essentially the exchange of energy through everything that is living on earth, and it's happening in the prairie and I'm doing a great thing with my hands right now to show what it looks like when energy flows within each other, I'm really sad you guys can't see it. But the point is, is that all of those energy processes are very, very important to having a healthy, functional, resilient prairie, which is something that I want and that is kind of the goal of what we often talk about, both with the prairie landscape and within an individual site. So check out that blog post, it's a great one, I think you'll really, really enjoy it, I think you'll enjoy both of them, and now I'm going to turn it over to Chris to talk about his picks for the day.

Chris: I'm going to talk a little bit about a grazing approach that we've been playing with the last couple of years, which I really like. We've been calling it the open gate rotation system, which because it's sort of like rotational grazing but it's not exactly and without going into the details, the basic idea of it is in a rotational system, you put cows in one paddock and then you open the gate and you move them into the next paddock, you close the gate behind them, and now they're over here. With the open gate system, what you do is every time you open a gate, you leave the gate open so the cows have the ability to flow backwards, and it's a way to create heterogeneity of habitat and get some more grazing intensity in some places than maybe it's than you can in a different grazing system that's still fair to the cows, the cows still get what they need out of it, they stay healthy, and you create a nice, you know, structural diversity out there. So you can read more about it. The blog post is just called Open Gate Rotation, and yeah, it's experimental, I'm not saying everybody should do it, but I'm saying I there's think some fun ideas there that sort of might help people break out of kind of some traditional ways of thinking about grazing and be a little bit more imaginative, and then play with it on your own and find your own ways to do something different, so I want to talk about that. But then in addition to that, I would recommend there's a whole group of research papers that come out of Oklahoma State related to patch burn grazing, but even more it's related to this idea of kind of a shifting mosaic of habitat, and what they're using is they're doing patch burn grazing as one approach to creating that shifting mosaic. The open gate approach I'm excited about because I think it is another way of doing it without having to use fire. You can use fire, you don't rely on fire. But the papers are really helpful because they provide sort of an underpinning for why the shifting mosaic is important, why habitat heterogeneity matters, so there's one by Sam Fuhlendorf and Dave Engle called Application of the Fire Grazing Interaction to Restore a Shifting Mosaic on Tallgrass Prairie, that's one, and that's in the Journal of Applied Ecology in 2004, and then there's a second one I think is just really interesting because it looks at invertebrates and how they respond to habitat structure, and there's just not a lot of information out there.

Mike: There's not, I agree.

Chris: Which I think this paper is so valuable. Yeah. And it's a Dave Engle and then a bunch of other people 2008, it's Rangeland Ecology, Invertebrate Community Response to a Shifting Mosaic of Habitat. Says everything right there in the title. And we're actually trying to do some follow-up to that right now, trying to look at, you know, how invertebrates respond because they're just, we don't know much about it. But what they found is there's a huge difference in what kinds of invertebrates and how many invertebrates you see in all these different kinds of habitat structure created in their case by patch burn grazing, so those would be my choices.

Megan: Those are perfect and I'm going to put a pin in this because you said shifting mosaic and I'm just going to wrap us up with a Benage/Helzer quote from 2020, so just because it includes shifting mosaic and Jessica Pedersen, by the way, would absolutely appreciate what you're saying about we just don't know a lot about invertebrate response because she would even say we just don't even know a lot about how many invertebrates we have, like there's just a lot to know when you're talking about orders that have thousands and thousands of species in them, and so it's hard to know where we're at because we don't even know how many we have kind of thing, so here is the quote just to sort of as you guys are thinking about prairie management, as you're thinking about restoring the landscape, this is sort of what prairie is and I think it's a really good way to kind of close out the LET'S SCIENCE section. So a healthy, I'm not going to use my Chris Helzer voice. A healthy functioning prairie just like an old growth forest consists of thousands of different organisms, plants, animals, invertebrates, bacteria, and soil fungi or fungi depending on who you are, all those organisms rely on complex interactions of nutrients, moisture, and energy flow to create and provide them with the food, water, and shelter they need to survive. Unlike forests, the abundance of individual prairie plant and animal species changes frequently in response to disturbances, such as fire, grazing, and climate. As a result, a particular patch of prairie can look very different from year to year and the prairie landscape as a whole is an intricate, here it is, shifting mosaic of change. And I think the thing that we are often most guilty of as managers is we do not want to allow that change to happen because we are worried that it means that something is wrong or that we have made a mistake or a bad choice if the prairie looks different than we thought it ought to look, and the thing I just have to tell you about that is if you're a parent, just think about a parent, you got a lot of dreams for your kids, I guarantee you they don't grow up how you think they ought to have grow up into their own unique amazing individual selves and we need to allow the prairie that same courtesy to expand within itself and adapt to everything that it's facing and just take a deep breath and know that change is part of every single day, even though we all hate it, it's a part of every single day and it's very much part of the prairie that we love.

Mike: So you guys jointly came up with this quote?

Megan: We did.

Chris: We did.

Mike: It's very nice. I like it.

Megan: Oh, thank you.

Chris: Can I jump in and say one more thing on that then?

Megan: Of course.

Chris: Because I don't think we talked about it enough earlier, actually, which is that the dynamic part of the shifting mosaic, the shifting part is really, really important. And you hear that with crop rotation, you do it in your own garden, if you have a garden, you don't want to do the same thing in the same place every year for a lot of different reasons, disease organisms, predators, all these sorts of things that sort of build up and if you're a plant and we talk about, you know, plants have their own requirements for what they need for growing conditions, fixed income they have the same growing conditions provided every year, you're always selecting against some plants and for others. But by changing the location and changing where are these disturbance things and these patches happening year to year, you're much more likely to make sure that everybody can survive, whether you're a plant or an animal or insect, plants get the different kinds of conditions year to year, some of them they like better than others, but as long as they get what they need down then, they'll be fine. And animals can move for the most part, right? So they can move around and they can find what they need. If they can't move far enough, they'll survive until it comes back probably but if you do the same thing every year in the same place, even if you have patchiness across your prairie, you're still reducing the potential diversity in each of those places because the patches stay the same year to year. That shifting part is really, really important.

Mike: Doing different things in space and in time both.

Chris: Exactly. Yeah, you said it in three seconds. I could have done that.

Megan: High five. With that.

Mike: Hey Megan.

Megan: Yeah Mike.

Mike: Would you please take a hike?

Megan: I will take a hike.

Mike: Burn off some of that caff - - burn off some of that caffeine and sugar.

Megan: I'm going to take a hike and today we're hiking on Chris Helzer's favorite pick, so I'm going to let him go through all of the places that he thinks we should visit and because he's our very special guest, we didn't limit him to just one place, we let him pick a whole bunch of places to hike.

Chris: Oh, boy. I get to cheat. Well I'll start with two different Nebraska sites and I'm going to be a little biased and choose Nature Conservancy sites but I work a lot at the Platt River Prairies, that where I started as a land manager with the Nature Conservancy. It's right off of Interstate 80 west of Grand Island, so if you're coming through Nebraska and you're heading west on Interstate 80, it's a great place to stop, we have hiking trails, you can hook around, we have a lot of high-diversity restoration work that we planted crop fields to prairie with, you know, 180 different plant species, they're very diverse, a lot of this shifting mosaic is very obvious on those sites as you

walk around. Just a really neat place to stop and it's easy to find, easy to get to. The second one is the Niobrara Valley Preserve, which is on the north edge of the Nebraska Sandhills, which is, you know, the Sandhills is 12 million acres of contiguous prairie, it's just an astonishing landscape. And the Niobrara Valley Preserve is about 56,000 acres, which is mostly sandhills prairie but in addition to that amazing prairie and the bison herds we have there, we've got the Niobrara River itself, the valley, which has all these different habitat types from boreal forest and these little streams that come out of the sandhills that are cold and in the shaded areas, we still have things like paper birch, which is not something we should have in Nebraska but it's still provides, we got Ponderosa pine and bur oak savannahs, it's just incredible landscape and it's not a site right now that you have, you can't walk on all 56,000 acres of it but you can drive through and then we do have a big hiking trail that takes you through a lot of those different habitats over about a three-mile hike, and so if you come to Nebraska and you're looking for something to do like floating down the Niobrara River in a kayak for example, which is one of, it's a national scenic river, it's an amazing place, if you do that, this is a good place to stop and hike around a little bit before or after you canoe or kayak. Or if you just heading over south through Nebraska, choose your route wisely and you can stop in the Niobrara Valley Preserve. And then very quickly, there are a couple Minnesota sites that I really want to talk about and one is Glacial Ridge National Wildlife Refuge. I was able to see that when the Nature Conservancy is working on the restoration process and it's just such a cool, large scale restoration site, it's really inspiring to know that you can restore that many acres and it was done fairly quickly, and it's like any other restoration, it's not perfect, but the fact that we could convert that much land back to prairie I think is really cool and inspiring. And then the Bluestem Prairie in the northwest part of the state also is just I've only been there once and I cannot wait to go back partly because it's different than the prairies in Nebraska but partly because it's just a gorgeous place to visit. And then Chippewa Prairie is a site that, again, I've only been to once, I was there as part of a conference, and then both the scale and then just the interesting things that are being tested with grazing and fire, I just, it's such an interesting place I think for all of us to learn from, and I want to go back up and see what else I can learn there at some point.

Megan: There's a lot of rocks at that prairie, let you guys know.

Chris: Yeah, which is something we have almost no rocks in Nebraska, so that's always, that's actually kind of a fun thing to see.

Mike: The Nebraska places are great o hear, so we have someplace to stop at when we're heading west, like to go to the mountains. We'll just fly across Nebraska, there's some cool places to check out.

Chris: Yeah, I always tell everybody that Interstate 80 is our population suppression technique that you drive through Interstate 80 and looking out the side, there's no reason you'd want to stop and live in Nebraska, but we hide all the good stuff off the interstate.

Mike: There ya go.

Chris: So if you're interested in prairies, don't drive the interstate, but on the other hand, we don't want that many people to move to Nebraska, either, so interstate.

Megan: There's a little bit of mixed messaging here. I will tell you that I have been to the Niobrara Valley Preserve and I did not realize it was that large when I was there, so we stood there, we took pictures at the sign, we walked through it, and you know, of course, then we yelled to the wind Chris Helzer like just to see if you could hear us, I didn't realize that I was yelling across how many acres contiguous acres did you say? 54?

Chris: 56,000.

Megan: Yeah, so I'm sure you heard me as I was standing.

Chris: Absolutely. Well and if you do canoe, most people don't know that if you canoe the scenic part of the river, where most of the outfitters are and most people canoe, we own the south side of the river along most of that stretch, we have about 25 miles of riverfront the Conservancy has there, and so a lot of the waterfalls that people stop and hike around at are all on Conservancy land.

Megan: That's incredible. Take a hike, folks. Go explore your public lands, take a road trip to Nebraska, Mike and I said it's okay, pack lots of snacks. Oh, my gosh. This has been so much fun. I wish that we could do this every single day with you. Mike, did you have fun?

Mike: Yeah, let's do it. Every day, Chris.

Chris: I'm game. Let's do it.

Mike: I want to give, before we close, I want to give a quick acknowledgement to my nongame, I say my, I don't, it's not mine, it's ours, it's everybody's, especially if you're a citizen of Minnesota, it's the Minnesota Nongame Wildlife Program, I work for them, they help support this podcast, and they depend on donations, so please donate.

Megan: They do. We don't want Mike to go hungry, so make sure you write out those checks so that you keep doing good work on the prairie landscape.

Mike: I got to lose a few pounds, but let's not force it, you know, that way, you know.

Megan: Well as always, all of the resources and information, papers, blog posts, all that will be on our website so that you can go check it out, including all the links to the Take a Hikes so that you can plan your next road trip, catch us next Tuesday, Prairie Tuesday on the Prairie Pod where we're going to be diving into climate change consequences, are you ready for this? How the weather will determine how your prairie weathers. See what I did there?

Mike: Catchy.

Megan: I was real proud of myself. So Kenny Blumenfeld, he is our senior climatologist and then research scientist Fred Harris and then another Nature Conservancy friend, Marissa Ahlering will be with us to talk all about climate and how we can do our best to prepare in a changing world and adapt to that change in the best way possible. This

episode was produced by the Minnesota Department of Natural Resources Southern Region under the Minnesota Prairie Conservation Partnership that's you, that's me, that's all of us working together to make sure that we can preserve prairie for all the people through all the time. It was edited by Dan Ruiter and engineered by the fabulous Jed Becher. This has been so much fun.

Mike: Yeah. Thanks so much, Chris. It was wonderful to have you.

Chris: Oh, this was really great. Anytime.

Megan: Yeah, thanks. High fives all around.

Chris: Absolutely.

Megan: Virtual high fives. That was literally me just like smacking my hand together.

((sounds of birds chirping and wind blowing))