Prairie Pod Podcast Transcript

Episode 5: What goes in the mix makes the cake.

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

Transcript:

((sounds of birds chirping and wind blowing))

Megan: Hey, welcome back to another fun week on the Prairie Pod. Jess, how are you?

Jess: I'm really well. How are you Megan?

Megan: I'm ok. It's been a lot of field time.

Jess: Yeah…

Megan: It gets kind of like overwhelming where you feel like, I don't know, I mostly go through a lot of snacks when I'm in the field.

Jess: Snacks are necessary.

Megan: So necessary, but I find that I'm extra tired at the end of the day because I've probably carried like 10 pounds of snacks during the day. ((Laughter)) And... I've eaten all of them, so by the end of the day I should feel lighter, but I'm not because I'm so full of all the snacks and water.

Jess: They're important though. You have to stay hydrated out there in the prairie, especially when it's hot.

Megan: I know. ((Tone of anguish))

Jess: You can't let your blood sugar get low because you're using a lot of energy so you got to put back that energy and the water, you got to put it all back, because you're using it.

Megan: Look at this, it's like a bonus safety message, at the beginning of our podcast. We don't normally do safety messages so it feels pretty good. ((Laughter)) Feels right, feels right. Well we're fresh off of our last episode, where Drave Trauba basically invited himself to every subsequent episode. I hope you catch that one now because we had a lot of fun just teasing Dave and hearing about his legacy at Lac qui Parle, which we now know how to say.

Jess: Yes we do, for the most part I think. It's still a little fuzzy in my mind.

Megan: It's La-QWA-Parle ((laughter)). I got to say it right! ((Chuckles)) Oh man… so it seems appropriate that we're starting out talking about snacks because our episode today is called what goes in the mix makes the cake, which if you're me that is a legitimate snack when you're in the field. Everybody needs a slice of cake in their field pack. So this is one of our restoration series podcasts. Where we're going to talk about building a seed mix and I just I mean Jess you know like this is my all-time favorite subject.

Jess: Correct.

Megan: Jess is going to reel me in on this episode because I love building seed mixes. This is where the real math nerd in me gets to shine and I can't wait for you all to see more of her because she is special. ((Laughter)) She's REALLY special. I just, I don't know. So Jess is going to be interlacing this podcast, keeping me on track, asking me lots of questions because this is like my bread and butter; my jam.

Jess: That's awesome!

Megan: See what I did there? Bread and butter… my jam. ((Laughter)) I just cracked myself up! Okay… so should we jump in?

Jess: Yeah let's do it! Tell us more about how we start thinking about building a prairie from scratch.

Megan: Okay, so we're going to do a quick review if you remember from our pilot episode we talked about what a prairie is. We want to make sure we all remember what a prairie is because this is the beginning, this is the building block. They're open communities, they're dominated by grasses and they have a species rich diverse forb component. Usually they have about less than 10% tree cover. Remember we talked about in our first episode, that we have these things called climax prairies. I guess I should say that we have these communities, they're not things, and we have these communities. Just like a climax forest there are THOUSANDS of different organisms. We've got plants, animals, invertebrates, (which Jess loves) bacteria, soil fungi or (fung-e) depending on where you're from. All of these things work together… Jess is laughing

Jess: I like fun-gee.

Megan: Oh, I haven't, I've never heard somebody say fun-gee in a really long time ((laughter)). Usually you just hear like the dad joke where people say, "He's a fun guy hahaha". I don't even know the beginning of that joke, I only remember the end of it where it's like "he's a fun guy..." okay… ((Laughter)). Back on subject, so all of these things including the fungi, fun-guy, fungusamongous, they have all these complex interactions where they're using nutrients, there's moisture, there's energy flow, and they're trading food, water, and shelter. At this successional stage a prairie has everything that it needs. It's incredibly efficient and it needs minimal input. All of these

organisms are living off one another-- it's in balance. So that's what we think about when we talk about our prairies, so that level of complexity is what we're trying to build back.

Jess: Trying to achieve.

Megan: Yeah. We're trying to achieve that. So when you start thinking about seed mix basics, we tend to think about what's going to be blooming and what's going to be above ground, but what is below ground is more important than what is above ground. We've said it once but we're saying it again. Our soils are full of life, especially if they are healthy. There are literally billions of organisms right under our feet. We've got bacteria, algae, microscopic insects, earthworms, beetles, ants, mice, and our favorite; fungi! Or fun-guy ((laughter)). I can't even say it now without laughing. All of these need to be fed. So if you think about it, when a prairie is converted, and it's no longer a prairie anymore, all that nutrient energy cycling is completely disrupted. It's destroyed. A lot of times the soil structure is also destroyed, so now we have to figure out how are we going to build this back to get to that climax prairie where all these complex interactions are happening when we have maybe disturbed or damaged soil, we've got to figure out how we're going to build it back. Just a spoiler alert here: you cannot just throw a whole bunch of seeds out there and be like, "well... prairies are basically magic, so it's gonna be fine. It's all gonna work out. Prairies have been around for thousands of years, we're just gonna put them in this compacted earth and it's gonna work". That's NOT how it works. So before you can even get to build your seed mix, and picking the species that you want out there, you have to know what your goals are, and we have different goals for different sites. A landowner's goal for their property, as we all know, not all landowners are the same. Shocking. So they're not all going to have the same goals. Maybe somebody wants pheasant hunting opportunities, maybe somebody else really just wants to do things for pollinators. It's our job as natural resource professionals to figure out how we can marry their goals and make sure it's the best fit for the land, so they get what they're hoping for and we need to be honest about what the limitations are and the realities of building this prairie and the cost is also a limitation. So you have to analyze your site and be able to define your goals because this is your foundation. If you don't do this, if you don't analyze your site properly, you're going to fail and not in a good way. Good failures-- you try something and you hope that it works and it doesn't. Bad failure to me is like when you don't study for a test. Even though you know you're going to have the test. Right? ((Laughter)) The test is still going to happen and you go and do it and fail, that's bad failure. Good failure is when you're like, "I've done the research, I've thought it through and I think this will work. Although sometimes it just doesn't. That's ok, that's good failure because you laid the groundwork. So remember this: time, patience, and knowledge of the natural successional steps are things you need to keep in the back of your mind when you're trying to recreate a prairie community. Time and patience are the ones that I think we're not particularly good at. So we want these instant native climax prairies, we want bluestem as thick as it ever was. We want to be walking through that in 3 months' time and have pheasants running

around in there and we want to be done. Three months and done, because we're impatient. We believe we can force nature to do what we want on our time schedule, but nature doesn't work like that.

Jess: How many times has somebody (land manager, owner or private citizen) called freaked out, "Help! I just have weeds!"

Megan: So many times. This is that natural succession. Weeds are important for your prairie, especially in the first few years. That's just succession, that's just nature doing its work to build that prairie back.

Jess: Now let's define weeds. Dave Trauba and I have had long conversations about this as well. It's good to define what we mean as weeds.

Megan: That's right. When I'm talking about weeds… I'm not sure how Dave defines them we'll have to invite him in here to be a guest on this episode as well, he would love it. When I'm talking about weeds, I'm talking about something that is not a core part of the prairie community. So something that I would not define as a prairie plant. It could be something that is unwanted or it could be something that's beneficial. So somebody said… what's that quote, "anything growing in a place where you don't want it is a weed". So you could have things like a rose bush be a weed because if somebody doesn't like it or want it then it's a weed. So the thing is, I have categories for weeds. Not to go down too big of a rabbit hole here. I have ones that are problems for my growing prairie and ones that I'm really not worried about. Things like ragweed for example, I'm not worried about it. Same with red clover in small amounts, the prairie is going to overtake these things and do fine. Canada thistle is debatable as it depends on how you approach your seed mix. It's one that I'm actually not super-duper worried about. It is a noxious weed so we have the responsibility to take care of it, but if you have a diverse seed mix then I'm not super worried about it. There are things like that that you just want to keep in mind. A lot of those massive seed producing weeds like ragweed, are hugely important for baby chicks and other wildlife. On to some more things that we need to think about. You have landform, so that's your topography (what does it look like). We know that prairies are different at the top of the slope, middle of the slope and bottom of the slope. Why is that? Moisture. Moisture and nutrients change as you go downhill. This should come as no surprise. Water tends to run which way?

Jess: Down, I believe.

Megan: Oh my gosh, you just passed the test. You're amazing! I knew that you did not have that PhD in vain! ((Laughs)) I knew that you're a smart cookie.

Jess: I studied, I studied for the test.

Megan: Yes, water runs downhill unless something real weird happens in our lifetime, but as we know it, it runs downhill so it is going to be moister when you get into those depression areas. Soils, we already talked about how important your soils are. You don't want to just start in sterile soil. We've had this idea for a while that we like to start

a reconstruction in bean fields, because bean stubble degrades really readily and then we have this sterile environment in which to plant a prairie. I challenge this idea because if you have a sterile environment you have not given your prairie any of the things to feed it well. You need that biology happening in your soil. If that soil is sterile, you're asking an awful lot out of baby prairie seeds. They're not magic jumping beans and they're expensive so you want to make sure you give them the best chance. I really like prepping your site with a cover crop, but that's a whole other podcast that we're talking about to help draw in some of that soil biology. Then we have to go to the field, this is your best chance to go to the field. You need to look at your current vegetation, what's going on now, and your past vegetation. This is the question I always get, "how do you know what it was in the past?" Air photos are super helpful, you can look at that. There is also the Marschner layer which shows you the pre-settlement vegetation. This you know, take the Marschner layer with a grain of salt. So, he used in 1929, Mr. Marschner used surveyor's written descriptions of the landscape and he created a map of the original vegetation in Minnesota. He did this while he was in Washington D.C. To my knowledge I don't even know if he even visited Minnesota.

Jess: I have no idea.

Megan: He was very technical I think and did this very detailed work of compiling the visual of the landscape from these written documents and a bearing tree survey as well. In 1930 he completed this map and he sent it to the director of the lake states in St. Paul and that's how he determined what the vegetation looked like. That's why I say there's nuance in the landscape, so you want to take that with a little bit of a grain of salt. Another good source are native plant community field guides. These are just a wealth of information. If you want to know what a community looks like, this is a good starting point. The one that we use most often down here in the southern part of the state is the tallgrass and aspens parklands one, it has a maroon cover. I had a professor in college, he'd call everything that was maroon magenta, but he couldn't say the word magenta so he called them mer-gen-sha. Every time ((laughter)) I see anything that's maroon I'm like "its mer-gen-sha!" because we used to repeat it all the time. We used to try to find things that were maroon so we could call them mer-gen-sha because it's not a word. ((Laughter)). Jess is just laughing.

Jess: I haven't heard this story before.

Megan: I had no idea it was in our podcast script, how about that? So another good source of information, the DNR has done a great job of taking relevant information primarily the Minnesota biological survey who's going around mapping the state surveying, there are other DNR folks who do this as well but they do a lot of it. They have this relevé layer, which is basically vegetation plots. They've collected plant data about what is in those plots. They've used that to also piece together what type of prairie it is, what the landscape looks like, these sorts of things. It is a protected layer, you cannot access it on the MN DNR geospatial commons because sometimes it contains rare plant information and that is protected under Minnesota law. Last but not

least in our list of things: field visit. Go to the field, soils maps the way that they are mapped and the scale that they're mapped. They do a very nice job of giving a good big landscape picture of what's going on. In order to get that nuance for your site, whether its 5 acres or 65 acres, you need to walk that site. You need to become familiar with it and figure out what your hurdles are going to be and what your challenges are going to be. Try to envision in your mind what this prairie is going to look like 30 years, 50 years, or a lifetime from now. You get one chance the way our funding works to restore these. Remember when we told them this in our restoration training? This really freaked people out.

Jess: Yeah.

Megan: I said I made this whole big deal of that you get one shot to do it right. Make sure you put in the preparation in order to do it right. Then a US fish and wildlife service person in the back of the room goes, "geez… no pressure!"

Jess: It is a lot of pressure, so you want to do these up front. Laying out your objectives, you want to make sure that you get it right because it takes a lot of work to redo it. You want to make sure that you've laid out your goals, that you've done your homework and checked all these boxes on the different characteristics that you should look into. Then move on from there. It's super important. I would add to this list, since the relevé layer is unavailable for the most part for most people, go to a nearby prairie and if it's a similar landform type that's going to be super helpful. Just take a walk through, write some notes down on the species that you're finding that are the most common. It's going to be super helpful, especially if it is a similar landform.

Megan: That is excellent advice! That's perfect, when you're in the field like why not go to a prairie? Most of the time what we're visiting is bare soil, it's agricultural land that we're going to try to convert back to a prairie. Visit a prairie nearby and get a feel for what it looks like. Not a restoration… visit a remnant prairie. Then that's a question people ask, "Well how do I know that it's remnant?" Use your air photos and look and see if it's ever been plowed, because remnant prairies are unplowed land. You want to look at the air photos as far back as you can and see if there has ever been any kind of crop. Usually it's really obvious with the air photos we have now. It's not that people are magical and can step into a prairie and they're like, "Ahh! This is clearly a remnant!" Sometimes you can tell because the structure is just much more complex than a lot of our restorations because we're still working on how you get that diversity not just in your plant community, but in the structures that they have. Remnant prairies are not homogenous, it's not just uniform across. We tend to do things where we're like, "Oh, this needs to be square and perfectly the same height.", but that's not how a remnant prairie looks. It's hard, it's challenging. Like jess said, there are going to be all kinds of things that you need to look at. You have to think about your management, your edge effects, and differences across the site along with how many seed mixes are you going to use. So many things! There's no substitute for going to the field. Now we're getting to my favorite part.

Jess: You're going to make your cake?

Megan: I'm going to make my cake! I love making cake! I probably love eating cake more than making it though.

Jess: But you have to do some work though.

Megan: We got you through the homework, so now we want to make sure that when you're making the cake… I have become obsessed with the Great British Baking Show. This is relevant, I promise. ((Laughter)) Jess just laughs at me. No, I'm obsessed with it, but sometimes because we're on a different weight system they say things like, "Oh I'm measuring out so many grams and liters" and I'm like, "Gosh I wish I knew what that meant". ((Laughter)) I'm sitting there like, "How many cups is that?" and they're weighing everything, which is the precise way to do it. Baking is a science and so there is precision and technicality in that. The reason that I'm saying all this is because I want to make sure that when you are doing a restoration that we're all using the same scale. There is nothing worse than getting a seed mix sent to me and somebody is like, "Can you evaluate whether or not this is well balanced and a good mix?" and it's in a scale that I don't understand. With that in mind you need to be using seeds per square foot. I know it's scary, I know it's hard, which it's actually not that hard. You need to make the switch now. Do yourself a favor and make the switch now. It is much easier to be speaking the same language. Alright, why seeds for square foot? Okay, think about it like this. If I have a pound of little bluestem and I have a pound of big bluestem, one's in my left hand and one's in my right hand. A pound of little bluestem has 240,000 seeds per pound. A pound of big bluestem has 160,000 seeds per pound. So a pound does not equal a pound, which is why we want to think about number of seeds per square foot because you're actually thinking about how many plants can occupy that space. Now there are other things that come into play here because just that straight metric would seem like if you planted more pounds of little bluestem, you would get more little bluestem than big bluestem. We all know that's not how it works because big bluestem is what we call a restoration aggressive species. So you also have to take into account the species' ecological behavior. Is it a superior competitor? Is it not? Generally speaking, species that produce more seeds have less chance of establishment and so they are generally categorized as restoration conservative species. Think about this not from a plant prospective, sometimes it is easier when it's not from a plant prospective. So if I'm a sea turtle…

Jess: The mama sea turtle.

Megan: The mama sea turtle. How many baby sea turtles do I have jess?

Jess: Lots!

Megan: So many! Why do I have so many baby sea turtles?

Jess: Because not all of them are going to survive, sadly.

Megan: Very few right. They're lunch for many, many things, and breakfast and dinner and linner and second breakfast and snack…

Jess: This is true for many species of plants, animals, insects, etc., that produce a lot of offspring, but the reason for it is that they are not all going to survive.

Megan: It's a survival strategy. The same is true for most of our plants that have little tiny seeds and they produce like 200,000 seeds per ounce. Things like that, they're producing that much seed because not all of them are going to make it. We need to think about those kind of things when we're building our seed mix. Now so we're all on the same page. I know everybody has a pencil, if you're driving please don't pick it up. ((Laughter)) It is like the worst thing you could do. Seeds per square foot = (ounces per acre X seeds per ounce)/43,560 sq. ft. That is how you get to seeds per square foot. You basically make yourself a category in your excel spreadsheet where you're picking your species and you have that formula already in there. Excel is awesome, you just drag that formula down and it already calculates for you. It's a way to visualize what your prairie is actually going to look like. Instead of saying we're going to have these weights and I don't really know what that's going to mean, I don't really know how my cake is going to taste, I have no idea. You actually can visualize a square foot and think about how many plants can fit in there.

Jess: That's why I like it. It helps me compare between species more easily. Also you're comparing apples to apples because you're eliminating this seed size issue, this perceived weight issue. So when you're getting these numbers of seeds per square foot, what kind of numbers are we talking about here? When we had pounds, we had in the hundreds of thousands. What kind of numbers are we generally dealing with in seeds per square foot?

Megan: So in your column you're going to see anything from like 1 to .5 to 2 maybe 3. It's little because think about how big a square foot is. It's not that big. So you're going to have for each species a very small amount of seeds per square foot that can actually fit in there. This is so you don't have overcrowding. Another thing that we do, that we might get to later but I think is appropriate to talk about now, is that we do minimums for seeding rates. We don't do maximums because when we start getting up into these species that have 200,000 seeds per ounce, they can skew your seeds per square foot because it looks like you have a really high number, but you don't actually because you have to up the rate for restoration conservative species. June grass would be a great example of that. You can never plant enough June grass. ((Laughter)) If you plant 6 pounds, 7 pounds or whatever, 15 seeds per square foot you're not going to get that because it is not a restoration aggressive species. It is one that is conservative and it is not as competitive as other things that we tend to plant as grasses. You can up the rate for that and it may look like you're planting a lot but you're not actually. Alright, what should we talk about next?

Jess: Well, I think we should talk about building the mix.

Megan: Oh yeah that's the whole point! ((Laughter)) We're getting there! You've heard us say this, I think every episode, we should make it a goal that we say it every episode.

Jess: I don't think we need to. We do it anyway.

Megan: Well yeah we're going to do it. Diversity, diversity, diversity. I had a professor once in college that said you have to underline things three times so that you can understand them. I'm translating this to you, you have to repeat them three times so that you can understand it, diversity, diversity, diversity. It's like Beetle Juice, only good things happen when you say diversity, diversity, diversity. Diversity--What're we talking about? It's a measure of richness (count of number of species) and the evenness. This is the part that people forget when they're talking about diversity. Evenness means the relative abundances of each species, so do I have just one Penstemon in the middle of my prairie and I have a hundred big bluestem. That prairie is not very diverse.

Jess: Right. The evenness is incredibly important especially when we're developing seed mixes because of all these issues with competition and really aggressive species that can be in the mix. This evenness aspect of diversity in addition to the richness (the number of species) is incredibly important.

Megan: Right, and that's also why when we go to evaluate seed mixes my biggest issue is that a lot of times in the research we address this idea of the number (richness) but we forget about the rate, which gets at evenness. Like, how many did you plant? Were you hoping that you were going to get to this level of evenness? We evaluate, "This prairie had 27 species and this prairie had 50, which one is better?" Well what rate did you plant it at? We're missing half of the diversity component, HALF of it! You have to have both and you have to be thinking about both. I know it gets overwhelming when you're building the seed mix and you're like, "Ok, so now I don't only have to jam as many species as possible in here or Megan is going to yell at me, but now I also have to think about making sure I'm getting them in the right ratios to each other." Yes it is complex, but you're building a prairie for a lifetime. That's what you're doing, the way our funding strings work we don't get these second chances. Rarely do we get to go back and do it again. Yes, that US fish and wildlife person is right. It is a lot of pressure, but you can handle it. This is what you're made to do, you're a natural resource professional. You're like Dave Trauba from our last episode, you're on your own poster minus the baby bears. You're holding that prairie in your hand. This is how we're going to get it back, if we get this diversity message drilled into us. Okay, I'm going to quote one of our favorite people. Jess and I have like a huge crush on Chris Helzer, not like a romantic crush, but like a science nerd work crush. We just think that a lot of things that he is doing with his blog, The Prairie Ecologist, he hits on all these issues that we struggle with daily. Someday it is our goal to get him on the podcast because we just really like the questions he's asking. We feel like he is asking the right questions and he seems like a good dude. Okay, here's the quote from Chris. "Every species of plant and animal plays a certain role within the prairie community. High species richness provides redundancy of function and helps ensure that if one species disappears or can't fill its

role, others can cover for it. This contributes to ecological resilience, the ability for an ecological community to respond to stress without losing its integrity. Ecological resilience may be the most important attribute for any natural system, especially in the face of rapid climate change, continuing loss and degradation of habitat, encroaching invasive species and many other threats. The hard truth is that we don't yet understand enough about ecological systems to make these kind of decisions confidently. I understand the impulse to manage conservatively sticking with what seems to have been working for a long time, especially in small and isolated prairies. At the same time, I also think we need to build as much diversity and resilience in our prairies as we can, focusing on both plants and animals. Especially in landscapes where we don't have many left." I just think this is a humbling quote because yes it is complex and yes there is a lot going on and we're always worried that we are making the wrong choice. Our managers' worry about this kind of stuff all the time, it keeps them up at night. We have to make sure we're making a prairie and not just putting plants on the landscape, not just putting cover.

Jess: That is one of my most important things that I think about on a regular basis is that are we building resilient ecosystems or are we just planting gardens? I think that in a lot of cases we are building resilient ecosystems, but it's this aspect of that we don't know a lot about them and we have these cases where we have these black boxes. We don't have a good sense for this evenness aspect in terms of seed mixes. That's a big black box, we don't know rates of establishment. If we put this species down in a planting at a certain rate in terms of seeds per square foot, how does that translate to establishment? We don't know, so that's our best guess, our holy grail.

Megan: If we knew that we'd be REAL good at our jobs! ((Laugher)) We'd be winning some awards.

Jess: One of the reasons that we follow Chris Helzer's blog is that he's doing a really good job documenting some of these questions. He's asking some of the same questions that we're asking and he's doing a really good job evaluating if I put it down at this certain rate or whatever and also looking at management questions. That's what we need to start doing is doing a little bit better with documenting.

Megan: So, yeah. Basically we like him because he's doing what we're doing, so we're basically kind of complimenting ourselves. ((Laughter)) It's like a veiled compliment to ourselves. We're like, "that Chris guy really knows what he's about because he's doing what we're doing".

Jess: You're basically just sitting there patting yourself on the back.

Megan: Hey jess, if we're not going to pat ourselves on the back then who will? ((Laughter)) We're going to have to. Okay, so the rules of thumb to help baby-step you into building a seed mix so it's not so scary. These are ways that can help you succeed. Just like making a cake, there are thousands of ways to build a restoration. THOUSANDS, but they all have certain components. If you don't put sugar in your cake,

what's it going to taste like? Real bad, it's not going to be a good cake! ((Laughter)) Flour and butter together is not a winning combination for chocolate cake. Things to keep in mind, your seed mixes should have a minimum seeding rate of 40 seeds per square foot. That is true whether you are in a dry, mesic, or a wet site and they will change. You need more the wetter you go because you're accounting for loss of seed and more difficulties. It is much more difficult to establish things once you get wetter. At least 40% of the total seeding rate should be composed of perennial forbs. This is the most common mistake I see in people's spreadsheets in terms of the math and how they figure this. You're taking the total seeds per square foot of your forbs and you're dividing that by your total seeds per square foot, which is your forbs plus your grasses, sedges, and rushes. Then to get your grasses, sedges, rushes one, you're taking that total seeds per square foot divided by your total seeding rate. That's how you know it's 40% of this that is composed of forbs.

Jess: You need to use the seeds per square foot, which is where the errors come in often.

Megan: That's where the error comes in, but a lot of times what people are doing is they're taking an individual forbs seeds per square foot and dividing it by the total forbs seeds per square foot. Does that make sense?

Jess: Yeah

Megan: Yeah, and that doesn't help you. You need to take that total seeding rate for all of your forbs combined. So sum it all up and divide THAT by forbs plus grasses and rushes. Divide it by the total. I know that's kind of confusing and if you're like me I'm visual so I have to imagine writing this math down, but you can always ask us questions too. Okay, seven or more native grasses or sedges with at least two species of bunch grass. This is also a common mistake, we tend to just plant the big four in a lot of our restorations. We plant big blue, Indian, little blue and side-oats. Sometimes we plant the big five and include switch [grass]. I guarantee you that our remnant prairies, that is not how they look at all. If you only plant those grasses we're going to be in trouble and so this idea that pollinators are in trouble we need to get more forbs out there so the way that we need to do that is we need to reduce the amount of grass that we're putting out there. It's more complicated than that, we need to make sure that we're building diversity in our grasses as well. That's why I have this minimum of seven or more. Two species of bunch grass. Why is bunch grass important, Jess?

Jess: It is important for some of our most threatened and endangered skippers. They build these really cool little nests. Megan and I got to see it at the Zoo [Minnesota Zoo], we felt really lucky, and we felt like superstars.

Megan: We did, we felt pretty cool.

Jess: They build these little nest down in these bunch grasses, these little cones almost, then they sit down in there and they climb up and grab a little piece of grass and pull it down there and nibble on it. They're so cute.

Megan: They're a little larvae at this stage. They're a fat little larvae, they're not flying. They're like sitting in their little couch hut made out of grass pulling down blades of grass. It's the most adorable thing I've ever seen. ((Laughter))

Jess: They like those bunch grasses, they're quite protected down there.

Megan: Bunch grasses create space in your prairie. In a remnant prairie a good rule of thumb, like how do I know if this is remnant or not, you usually have a place to put your foot where you're not stepping on something. There's open space in prairies and I don't just mean that in terms of like the sound of music "the hills are alive". (Singing) I mean it's like you put your foot down and get bare ground. We are not great yet in our reconstructions or restorations at trying to get that bare ground aspect. That's something that is really challenging, but you get that in a remnant prairie. Bunch grass helps you get there because just the way it grows creates space.

Jess: It is also important for pollinators to have that open ground so they have nesting area. The opportunity to get to that bare ground is really important.

Megan: It's hugely important for all of our upland game species. If it's difficult for us to get through, think about a baby pheasant chick trying to get through it. It needs to be easy for things that are small to move through the prairie. Fill the guilds, we tend to think about this as cool season grasses, warm season grasses, sedges and rushes, legumes and non-legume forbs. There are five main guilds. You need to make sure you have species in each category in your seed mix because if you don't you will have problems. This is why when people say to me, "I just have this huge brome problem in my prairie and I just don't know what to do about it!" Is brome always going to be a problem? Sure. If you didn't put anything in your seed mix that is a cool-season you have left yourself vulnerable and exposed because you have nothing in that prairie that you just built that is going to fight that fight for you against brome. You have nothing plant-wise that is going to fight that fight for you and you have limited yourself to an endless cycle of management because you haven't put something positive in that system to fulfill your cool-season [grass] niche. Alright, then we have some more minimums here, 20 or more native forbs with at least 5 species in each bloom period. So what's a bloom period? Early: April-May. Mid: June-August. Late: August-October. Can this shift depending on where you are in Minnesota or the world? Absolutely. As a general rule-of-thumb, early is spring, mid is mid-summer and late is late summer headed into fall. You need to make sure that you have things blooming all season long or else why Jess?

Jess: Oh, or else our poor pollinators won't have a sustainable source of pollen and nectar throughout the whole season.

Megan: They die. That's what she's saying, they die. ((Laughter))

Jess: This is tough though, this early 5 in each bloom period is tough.

Megan: Ugh, the early one is so hard. It's just an availability thing that you have to do through hand harvest and other ways to make sure that category is filled. There is just not a lot of commercial availability for early-blooming species, but we have to try to get them, like at least 3. Try to get at least 3 in there! There are some easy ones you can get, golden alexanders tends to bloom a little bit earlier, and it's still kind of early-mid. If you can get pasqueflower, if you can get prairie violet get it, penstemon tends to fill that role, just going off the top of my head here, prairie smoke, any of the Antennarias. Alright, to wrap out this section, there is a great table that I want to recommend. It's from the Tallgrass Prairie Center out of Iowa. They actually have a table that goes through each guild, each of the ones that we just referenced, and then talks about (based on their research) the recommended number of species that you should be shooting for if you're planting a wet site, wet-mesic, mesic, dry-mesic, or dry. They also talk about that not just in number of species, but also your seeding rate, seeds per square foot that you should be shooting for as a minimum. We said 40 is your minimum, to give you an example, in a wet site they're shooting for 68 as a minimum. Just to give you a little bit of an example there. So definitely check that out. It's worth printing out and laminating and sticking on your desk so you can just have it with you because it's a really good guide. Okay, I know seed mixes are complicated, but I'm going to encourage you that as much as you can try to get diversity in there. Each seed mix you do, I guarantee you that it'll be better than the last seed mix you did. The seed mixes I did in my early career were like, "Oh well… that was not my best effort." ((Laughs)) You just kind of get better. Jess you know what we should do? Let's say it!

Jess and Megan: Lets science! To the literature!!

Jess: This is the time where we recommend a book, blog or paper. Literature that folks can read and reference too because well I love it, it's what I do. This is a really important time to be researching things, right? That's what you have to do, you gotta do your homework. You gotta do your research. Tell us about some things you found here today Megan.

Megan: So yeah, I don't normally do this section, Jess does this section, but I got so excited working on our outline that I came up with some things. Because we talked so much about soils and what a great foundation they provide for your prairie that you're going to build. We wanted to give a shout out to NRCS (Natural Resources Conservation Service) and their "healthy soils are full of life" fact sheet. They also have many, many, many good soil references on their page if you type in soil health USDA (United States Department of Agriculture)-NRCS, which is the Natural Resource Conservation Service. You're going to come up with videos, great factsheets about biology, how soil works. These are excellent in helping us understand them in a very consumable fashion. If we're going to be good at restoring prairies we have to

understand how our soil works. You can check any of those resources out on their website. Their videos that they have there are also really good and so you can kind of get the basics of your foundation, literally your foundation. The ground. Then we also have the Marschner map. The Minnesota Conservation Volunteer actually did an article about the Marschner map, it's called "Mystery of a map and a man" and I thought that this would just be something that we'd share again. It's a couple of years old but it's a really good overview of how that map was made. It helps you understand how he figured out the pre-settlement vegetation, I think that's important. Sometimes people hang their hat on, "Well the Marschner layer says this was prairie, but when I went out to the site it's all woods." Well, that's succession. Maybe it was prairie and maybe it's a pocket that was always woods. We have to use our context clues and our goals for that site and figure out what it really should be now. Okay, I'm going to let you talk about the next one Jess.

Jess: That's embarrassing!

Megan: It's not embarrassing! ((Laughter)) I'll talk about it.

Jess: No it's fine I'll talk about it.

Megan: She got over that so quickly. See? She's not embarrassed anymore. ((Laughter))

Jess: So a big part of my job is conveying recent research to DNR managers and our partners as well. I know managers are busy and there's a lot of research that comes out on a fairly regular basis and folks don't always have time to fully consume that. It's not that they can't, our managers are very capable of reading the primary literature, and it's just that it takes a lot of time. I wrote this factsheet on prairie restoration diversity planting and seed mixes. This is available on our website and gets into the research on why we should plant diverse prairies and how to plant diverse prairies. It goes into different planting methods, factors that increase diversity in prairies. It also covers the general rules of thumb that Megan has just gone over. Megan helped me a lot with this factsheet. Then seed mix diversity, talking a little bit more, just going over different functional guilds, it goes into detail about some different ways to think about functionality in prairies.

Megan: So what you're saying is that diversity is important! ((Laughs)) It's a really nice factsheet too. It just a couple pages. What is it total?

Jess: It's 3 pages, but there are a lot of references too. If you want to dig into a particular paper more, you can do that.

Megan: Jess, you always do a really nice job. I loved it.

Jess: Thanks, I appreciate that.

Megan: You're welcome.

Jess: Hey Megan, take a hike!

Megan: Whoa, see I get a reward for complimenting you. You tell me to take a hike. ((Laughter)) So we would like to highlight for this particular episode, this is the part where we highlight your amazing public land. This is where you get to go out, hike, and explore some of these beautiful awesome prairies that we've been talking about. Because we're talking about reconstructions and remnants today, both as the model and as the target, and just the biggest challenge of my entire career, how do I build a prairie and do it the right way? We thought that it would be a great time to introduce you if you're not familiar with the Hole-in-the-Mountain complexes. These are in Lincoln County. There's a Hole-in-the-Mountain wildlife management area and there's also a Hole-in-the-Mountain Nature Conservancy preserve. Together they're about two thousand acres total. The DNR-managed unit is about 638 acres—it's grassland, it has remnant prairie, some wetlands, reconstructions and remnant working there together. It is pretty neat on the DNR side of things because we just started this patch-burn-grazing project. That's where you burn a section of prairie and then you bring in cattle (the grazers) and they graze that prairie for you. Then you do it again, you just move them with burn. Whatever unit or section of that prairie you burned, you move the cattle to that section after the burn. It's kind of an interesting project, the goal there is we want to cut down on brome, there is a lot of brome out there. Breathtaking prairie, the views are incredible. If you want to see hill prairie like you've never seen hill prairie before; Hole-in-the-Mountain. It is just stunning and you can just pop on over. The DNR property grades pretty much into The Nature Conservancy preserve. They work well together as a whole giant unit. I would say The Nature Conservancy preserve property is in a little bit better condition. It is a large prairie remnant, steep valley, we call this area the prairie coteau. It has a tremendous amount of wildflowers. What I love about both of these properties is that as you walk down the hillside you can literally feel the transition of going from an upland dry prairie to a mesic and then is some parts of those units, getting down into a wet prairie condition. You can just see the vegetation change, whether it's the blues of that dry hill prairie that kind of grade into a richer green and then the darker green of the wetter areas. If you could see me right now. My hands are going crazy trying to paint this picture. ((Laughs)) Jess knows what I'm talking about. Obviously you all can't see my hands, but I just get really excited because these two properties out there are huge units and they have a lot of what we're trying to build back and a lot of what we're trying to protect on them. Jess, what's a fun fact about Hole-in-the-Mountain?

Jess: My favorite part about Hole-in-the-Mountain is the site of the Dakota Skipper reintroduction. The Minnesota Zoo partnership with the Minnesota DNR is on their second year of reintroducing the Dakota Skippers at Hole-in-the-Mountain. It's a once in a lifetime opportunity to try and reintroduce a threatened species of butterfly. It's so cool.

Megan: It's amazing! Okay, so I know we're talking a lot about when Megan was in school today but… When I was in intro wildlife biology, I was brand new to college so I'm in my intro class. Our professor talked about California Condors and the reintroduction of these Condors. These wildlife biologists had to go out and grab the last Condors and not freak them out and get them to mate then do this reintroduction. I just get goosebumps when I think about I'm at this point in my career where we're doing our own California Condor [project], basically. We have these Dakota skippers… I mean the Zoo is really doing it, but to be a part of it and to weigh-in on which site you think is best, how the skippers might perform, and what we need to do to that prairie to make sure we don't destroy them, it humbling. It just feels crazy, at one point in your career you're sitting in class learning about this kind of stuff and at the next point in your career you're doing it! It's a pretty cool feeling. And there's regal fritillaries [too], which are one of your favorites.

Jess: They are.

Megan: There's a pretty good population on the DNR unit. I assume also on The Nature Conservancy unit as well. You can't pass up the chance to go there. They're great prairies. Alright, it's been a good one.

Jess: It's been a good one. Time to eat our cake now.

Megan: We made the cake, now we get to eat it! (Singing)

Jess: It's been a real good day.

Megan: It has been a real good day. I'm excited, I'm glad we did this episode.

Jess: So catch us next time on the prairie podcast! What're we going to be talking about next time Megan?

Megan: Next week on prairie Tuesday we will have special guest, Area Wildlife Manager, Bayonet Bill Schuna, Assistant Area Wildlife Manager, Kent Schaap and they're going to talk about their 640 acre restoration that they did at the Swessinger wildlife management area in Nobles County. That should be really good, a good follow-up to this episode because you've learned how to build a seed mix and now we'll see how well Kent and Bill did.

Jess: How they implemented it. It's going to be great! See you later.

Megan: Yup, bye Jess!

((sounds of birds chirping and wind blowing))