



Prairie Pod Transcript

Season 4, Episode 33, Part 1: Invasive Species Support Group: how to cope with Kentucky bluegrass and smooth brome

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

Guest: Managers talking through their struggles with these species: USFWS: Becky Esser; DNR: Rhett Johnson, Dustin Graham

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

Transcript:

((sounds of birds chirping and wind blowing))

Megan: Hey, happy Prairie Tuesday, everybody. Welcome back to the Prairie Pod. We're so excited you're still here with us listening, aren't we, Mike?

Mike: I'm excited too, absolutely.

Megan: I love when you're just like I'm excited too.

Mike: I mean it. I actually am quite excited about this episode.

Megan: Episodes. Not only - -

Mike: Oh right, right.

Megan: - - do we have one for you, but we have two of these right in the middle of this season just for you guys because you're special, and so we felt like you deserved two episodes, and really because we just had a lot of to say and they were super long.

Mike: I mean, we should be straight up, straight up with the listeners right and say we intended for this to be one, that was our initial intention, - -

Megan: Right.

Mike: - - we started recording with these, what our guests were saying, and we're like this is amazing stuff, we cannot cut this stuff.

Megan: It is amazing stuff.

Mike: And so we had to, we had to split it into two episodes and I think it's totally worthwhile, it's totally justified. It's a super important topic and you should tell us more about why it is, Megan.

Megan: Yes, Mike. I am super excited to tell people more about this topic. So what we're talking about today, we have for you an invasive species support group, how to cope with Kentucky bluegrass and smooth brome, the two prairie enemies. So we felt like, you know, in these times it's important to feel supported and to feel like you've got a team around you in this fight, and these two species in particular, they are two nonnative species that are just problematic in the prairie. They seem to thrive in nutrient-rich environments, they seem to thrive in wetter soils, and so we know that all the climate predictions for Minnesota, particularly southern Minnesota that we're going to get wetter and our nutrient problems are going to continue. So the goal like we always talk about, it's not to eradicate these species completely, because if we did that, we would be trapped in a cycle where we're just constantly dumping more and more and more chemical out there to try to get these things under control, so what we want to do is try to create a positive feedback loop where we use management tools strategically, do you like that, Mike? Strategically.

Mike: I like how you said it, yeah.

Megan: Yeah. Want to use management tools strategically so that we can start having a positive impact. And what I mean by a positive impact is that we make sure that the natives are dominant, that we keep that smooth brome and Kentucky bluegrass in check so it doesn't take over our prairie, and take away space from our other great native species, and we want to make sure that we're not doing harm to our wildlife species that live there, so we want to be really careful, really strategic, and really on point with how to deal with this. So we've got fabulous, fabulous managers that we checked in with today to offer you some tips and tricks for how to deal with these two problematic nonprairie species.

Mike: Nonprairie, well they are prairie species now, right? But.

Megan: They are but we don't want them to be there.

Mike: I'll just, I'll say that I was kind of, I was a little bit dubious about having two episodes focused basically on two species, two plants. At first, after listening to these guests, I'm no longer, like I feel like maybe we should have an entire season, I'm being slightly facetious.

Megan: I think we could in some ways 'cause this, you know, what we're bringing to you today is a combination, this is what we try to do in the pod on the regular, we're bringing you a combo of the science, the literature, and practitioner experience. You combine all those things together and it's gold in terms of how we make our decisions and how they are informed. So not everybody did the same thing, not everybody is trying the same thing, nor should they because as we say, diversity is important just as much in your seed mix as it is in your management choices. We should jump right in.

Mike: We should tell the listeners that these, these are guests we've, we've already recorded that we're going to be introducing one at a time.

Megan: Yes. So if you're familiar with our holiday episode, it's a little bit similar to that, -

Mike: That format.

Megan: - - so this is a little bit different format, just keep you on your toes on a Prairie Tuesday. So we're going to start with you U.S. Fish & Wildlife Service biologist Becky Esser, and what's the phrase she used a whole bunch, Mike?

Mike: Rest is death, which to me is scary because I rest all the time. You know, so.

Megan: Mike was like oh, boy. I'm going to need to get - -

Mike: Get up and do some, do some yoga.

Megan: - - some snacks at the top of a hill just like Jaime recommended so I can start doing my, my shimmying and my slithering up that hill a little bit faster. But we're going to let you.

Mike: I don't shimmy, okay? (Laughter)

Megan: I couldn't think of the word slither, so I said shimmy. All those snakes out there shimmying around. (Laughing) That's all I can think of. Oh, dear, okay. We're going to let you listen to Becky because she does a great job of explaining what she means by this concept and we hope that you will enjoy it.

Becky: Well my name is Becky Esser, I am a wildlife biologist with the U.S. Fish & Wildlife Service, and I am stationed at the Detroit Lakes Wetland Management District, and I've been there for just a little over 12 years. And I guess talking about Kentucky bluegrass and smooth brome, when I first arrived in Minnesota, I'll be honest, I didn't worry much about these invasive grasses at all.

Mike: Really?

Becky: We paid way more attention - - yeah - - way more attention to Canada and plumeless thistle, we were spraying common tansy and crownvetch and not that these weeds aren't important, I mean, hey, they may deserve their own show too, but the two grasses we're talking about today in my mind are really sneaky and elusive. And what I mean is if we're not looking for them, it's like they don't exist and they're not a problem. And I honestly think because of that, we maybe have lost decades in the fight against Kentucky bluegrass and smooth brome. So until I had an established monitoring program in place, like participating in projects such as the Native Prairie Adaptive Management Project or using the GMT Grassland Monitoring Team protocol, I never fully knew what a problem they were. So I'm not saying that if we're not formally monitoring our prairies, we'll never notice them, but for me, formal monitoring forced me to take a closer look, and when I did, I was surprised at what I saw. So I not only saw the extent of the grasses in our native prairies, but also how quickly these prairies could take over. I've seen prairies with 70% native plant composition flipflop to 30% in a matter of a few years postburn. Now the bright spot was that after we correctly timed a

burn, it flipfopped right back to being dominated by natives again. So luckily in that case of that prairie, I think we haven't lost it, and we can still make strides towards nurturing that native plant community. But unfortunately, I don't think this is the case for each and every prairie, and some may be far too gone. Rest is death. Sounds harsh but it's true. This adage I heard first conveyed by Todd Grant, a wildlife biologist with the US Fish & Wildlife Service in North Dakota. When he is, he and his colleagues were describing how prolific Kentucky bluegrass and smooth brome were throughout the Dakotas and Montana prairies, and then through the work of the Native Prairie Adaptive Management Project, we're regularly reminded that rest is death. So in other words, I mean very simply put, we need regular or recurrent disturbance. We've learned through NPAM and other scientific literature, for example, that maybe a late spring burn on a regular interval generally during the time of tillering may be the best time to knock back smooth brome. I'll give you an example. It was mid-May in 2019 and we implemented a beautifully timed burn on a 60-acre tract. This entire burn was based on the objective for a tiny four-acre remnant hill prairie that was dominated by smooth brome. We shifted that brome to almost nothing, and by midsummer, that hillside was a rich stand of porcupine grass speckled with midseason native forbs. And luckily, I was able to visit that prairie just last year in the spring of 2020, and it was covered with more pasqueflowers than I've ever seen in my career in Detroit Lakes.

Megan: Nice.

Becky: So as a biologist naturally, I reveled in the success, but what I forgot and what commonly I forget about is how difficult burns like this are to carry out. For example, houses surrounded the unit, a major highway was less than one mile away, green vegetation takes forever to consume, and the smoke of a growing season burn is so difficult for our fire specialists to manipulate. It takes a lot of trust from neighboring landowners, it takes meticulous planning, and puts firefighters in some pretty precarious situations. So there's a true balance between our biological gains and our potential social or political losses. So we have to ask ourselves is it worth it for a 60-acre unit or is it worth it for a four-acre remnant prairie, and knowing full well that unfortunately, we know that in a few short years, the grasses will probably be back, so what are our options?

Megan: Or let me add something too, Becky. Or is there a different tool in the toolbox that could accomplish the same thing, which is probably right where you're headed.

Becky: Yes. So what are our options? So we could look at burning in a different window, okay? We may not get the effects that we want or meet the objectives fully, but it is an option. We rely on burning a lot, but what about grazing or even haying to expand the time interval before we can manage it appropriately? So what it's come down to for me and, you know, my coworkers in Detroit Lakes is that we have to make some pretty tough decisions, and we have to set realistic expectations. The first one and probably the most difficult is prioritizing. Some prairies will never see the fire they need to bring it back. We have to make choices and sacrifice some units for the benefit of others. We also need to accept that it may be years before some prairies see any management at all. We have to compromise mainly on timing. For example, late spring burn doesn't fit every potential unit out there. We may have to burn it a little earlier and we may not

meet our objectives fully, but some fire is better than no fire at all. Rest is death. And we can't make every prairie perfect, but we also have to remember that we can't make any prairie perfect. So these are the things that I lose sleep about at night, not necessarily Kentucky bluegrass or smooth brome.

Megan: You mentioned some really good things there and I want to make sure we bring these points home for the listeners. So two things. Like one, you can't make a prairie perfect. What does that even mean? Like what even is perfection? You know, the prairie is a shifting mosaic of change. We talk about this a lot on the podcast, and so when we say perfect, are you talking about perfect in the eyes of Mike Worland where it's rich with grassland birds? Are we talking about perfect in the eyes of Megan Benage where we have so much purple prairie clover and bumblebees everywhere? Like how a prairie is seen and viewed as being perfection depends on the viewer who is doing the viewing in some ways, and so we need to allow the prairie space to adapt, to be itself, to change. I've said this how many times on this episode, Mike, but it's true. Just repetition is good for the listener. (Laughter) And so the second thing I want you to weigh in on is you said rest is death, and the way I heard that is we never want to take management fully away from the prairie for too long. That's how I'm interpreting what you mean, not that we shouldn't allow a prairie to rest and recover and to have time for like skippers and other things that need to biologically reproduce, they need that space without that disturbance in there for a period of time. I'm taking it to mean that we need to understand that this is an active system that relies on disturbance for survival, not that we should never have periods of rest in its life. Is that what you mean?

Becky: Correct, yes, correct. That rest is death was looking at the history of some of the prairie management or lack thereof in the Dakotas and Montana where we as the Fish & Wildlife Service would idle these prairies for decades at a time, and what happened is those prairies just, you know, they lost their integrity. I mean, they lost their ecological functioning. They got overtaken by Kentucky bluegrass and smooth brome and, you know, it was thought back in the day, I'm going on and on about this, but that disturbance would negatively impact our wildlife resources, primarily nesting waterfowl, and so we used to idle our prairies and let them sit and in 1990s, when these extensive surveys were done, you know, it opened the eyes of a lot of biologists and managers to what exactly that did, but it really is as Megan said, you know, allowing those prairies some rest time and time for recolonization of pollinators and for, you know, differing plants to express themselves, but, you know, there is definitely a threshold there where we need to continue to implement management on a regular basis or we're going to shift that plant community in the wrong direction over time. - -

Megan: Or how people interpret it.

Becky: - - What we want to do is we want to continue to shift that plant community, you know, in the positive way towards being dominated by more of a native plant composition. And it can't all be done in one year and, you know, again, it's thinking about managing across years but not necessarily every year all the time.

Megan: You're playing the long game with prairie.

Becky: Playing the long game.

Megan: I think people sometimes think, you know, oh, well I planted this prairie and I saw something grow in a season, and so I'm there, and the thing that we need to remember as managers and as people in this fight to save the prairie landscape is that the prairie is complex, it's as complex, if not more so, than an old growth forest, no offense, Mike. And so if, you know, I'm not trying to pit resources against each other, old growth forests are important, prairie is important, but we need to give it that space to understand that this takes time. Just because you can see grass or wildflowers in a season doesn't mean you're done, you are in a perpetual dance with the prairie trying to find that threshold like Becky just said or that balance point to make sure that, because any type of disturbance you introduce is going to be at the detriment of some species and at the benefit of others, and so just to make Mike happy, you know, we don't want the skippers to go away, but at the same time, we don't want the brome and Kentucky bluegrass to get such a foothold that it's no longer prairie.

Mike: It's eliminating their habitat then and it's just, the results are just as bad as if you're burning up the skippers, yes.

Megan: You see that? Mike's getting so good at this, he just completes my sentences for me. Incredible.

Mike: That is spooky. That's spooky.

Megan: Incredible. Wonderful, Becky. That was wonderful. Oh, that was awesome. I love hearing Becky talk.

Mike: Me too.

Megan: And now we're going to shift gears a little bit and we're going to turn it over to Rhett Johnson, our private land specialist for the Scientific and Natural Area Program, and he is going to take a little bit different tack with this where he's going to talk about some of the unique biological traits of smooth brome and Kentucky bluegrass that lead to their, are you ready for this million dollar word? Invasibility, and so how invasive they are, so he's going to talk about some photosynthetic pathways, if you've been wondering what is a C4 plant and a C3 plant.

Mike: Photosynthetic pathways. You know, after listening to Rhett, I was like this, I really wish he had been my college biology or zoology teacher, botany teacher, college botany.

Megan: Your botany, your botanical instructor.

Mike: I really wish it'd have been him. I think he'd have done great.

Megan: Did you take a plant class in college?

Mike: Of course I did.

Megan: Okay, I was just double checking.

Mike: Habitat.

Megan: Habitat, habitat. We're going to hear about some habitat and we're going to hear about photosynthetic pathways, and you are going to enjoy it. Well, I hope you will.

Mike: Yes.

Megan: Take it away, Rhett.

Rhett: Hi, this is Rhett Johnson. I'm a prairie private land specialist with the Minnesota DNR. I work in the southwest region, primarily with the Native Prairie Bank Program, which gives me an opportunity to work with private landowners to help them with managing their prairies. And I guess what I thought I'd talk about a little bit is so the cool season grasses, Kentucky bluegrass and smooth brome, and also some others, those are the two big ones, so we hear a lot about, you know, controlling the nonnative cool season grasses, so I thought I'd talk a little bit about just what is a cool season and warm season grass and because that really kind of knowing the biology of these plants kind of helps explain why we have some of the problems we do with them. So first off, all plants, well except for some rare examples like parasitic plants, but almost all plants have photosynthetic pathway that binds carbon dioxide to a carbon chain to form three-carbon atoms, which later are made into sugars, and all plants have this. It's the what they call the C3 pathway because the first thing that's formed are three carbon chains, which are later turned into sugars. And it's kind of a couple things that are important to remember, plants need a lot of different nutrients and such but they need three things more than everything else, so really survival for a plant depends on the balance between these three things, and those are sunlight to kind of drive the photosynthetic process, water, which is used for all kinds of stuff in plants, including the photosynthetic process, and carbon dioxide, which is what plants take out of the atmosphere and use to make sugars, and almost all life on earth depends on photosynthesis. That's the process it turns the sun's energy into organic material. So it's a balance between those three things, water, sunlight, and carbon dioxide. And in this photosynthetic process, there's a very important enzyme, probably the most, well definitely the most important enzyme in the world, and it is called rubisco, which is short for ribulose bisphosphate carboxylase, which is a big word, so we'll just call it rubisco.

Mike: I like rubisco better.

Megan: Yeah, you didn't even stutter over that, Rhett. Way to be. Say it ten times fast, I'll give you a bonus point.

Rhett: So rubisco is the enzyme that hooks the carbon dioxide molecule onto the carbon chain in the first step of making sugars, which are then made into all kinds of other stuff by the plants too, so it's a very important enzyme, and plants have a lot of it, and it takes a lot of nitrogen to make that enzyme because it takes a lot of nitrogen to make proteins and proteins make up enzymes. So anyway, so rubisco is a very, very important molecule or enzyme molecule. Now the problem with Rubisco is once oxygen levels get really high in a plant's tissues, it kind of binds in there and messes up the enzyme so it's not working so well, and they call this photorespiration. So to avoid photorespiration, plants have to open up the little pores in their leaves to let the oxygen out to get more carbon dioxide in, but opening those holes in their leaves means they also lose a lot more water, so there we come into the balance again. Plus they need

sunlight that warms up the leaf that makes the water evaporate more, so there's this balance that's involved here. And with the problem of photorespiration where oxygen binds up the enzyme, that's a big problem for the plant because then the plant has to actively use energy to fix the molecules, and that can reduce photosynthesis by 50% or more in different conditions, so especially in hotter and dryer conditions, the C3 pathway has some problems.

Now warm season plants, they have the same pathway but they've got an extra one, and warm season plants sometimes called C4 plants because they have an extra enzyme, which is PEP carboxylase, which actively takes carbon dioxide and concentrates it in certain cells, so warm season plants don't face that problem of photorespiration because they kind of compartmentalize where they have the rubisco. So it's a real big advantage to those plants in warmer, dryer conditions, and it's found, the C4 pathway is found in about 20 plant families, 1% or 2% of plants have it, but in the grasses, it's about half of them, and the warm season plants that have the C4 pathway, they're really important. They contribute, even though there's only 1% to 2% of the plants in the world, they contribute about 25% to the global primary productivity, so they're really important in that respect. Now like you said, there's this balance between, you know, getting the, you know, between the sunlight, the water, and the carbon dioxide, and so C4 plants have a big advantage in some conditions. It takes, they need a lot less water because they're more efficient with opening up the pores in their leaves, they can handle higher levels of light, they can do better at higher temperatures, and a real important thing is they don't need as much nitrogen because they don't need as much of that rubisco. Now that's kind of important because the cool season grasses, they're going to do better under cooler conditions, their light saturation point is lower, so they do a little better in lower light levels, like in shaded areas and stuff, but they really benefit if they get more nitrogen, so additions of nitrogen will really help the cool season plants, but doesn't really help the warm season plants so much.

And a few important things to keep in mind is our growing season in Minnesota has lengthened, so we have longer springs and falls. That's good for these cool season plants because they aren't facing the midsummer temperatures as much, so they have a couple extra weeks of growing where the conditions are better for the cool seasons. Also, and this is something people are starting to look at more is because of air pollution from a variety of sources, the fallout of nitrogen from the atmosphere has increased a lot, and that's probably pretty beneficial to these cool season plants and doesn't really have much of an impact on the warm season plants, so with some of the changes that we're seeing, you know, a lot of them are kind of beneficial to these cool season plants and not as good for the warm season plants. Not necessarily hurting the warm season plants, it's just given the cool season plants a little more of an advantage, and so that's a little bit on the background of what is a warm season plant and what is a cool season plant, and it's important to keep in mind too there are native and nonnative species of both cool season and warm season plants.

So smooth brome, Kentucky bluegrass, flat stem bluegrass, a lot of the annual bromes are all cool season plants, but then we've also got native ones like most of the sedges, the needlegrasses like porcupine grass and, you know, thread grass, so and a lot of the small panic grasses are all cool season plants, so we have a lot of native cool season

plants too. And there are some nonnative warm season plants. They haven't really been a huge problem in Minnesota yet but we'll see what happens with some of them, especially some of the ornamental grasses that look all pretty and stuff, but they have potential to be potentially pretty invasive. There's some that we know of and some we'll see what happens in the next 10 years or so with some of this stuff, but yeah. You know, a lot of our efforts in maintaining prairie health is really any more focused on invasive species. Smooth brome was planted really widely as a pasture grass and it's spread through road ditches and it's, you know, it is definitely invasive in prairies. It seems to be, you know, it's one of our bigger problems. Kentucky bluegrass obviously it's probably one of the most widespread plants in the world. You'd be very hard pressed to find anywhere in Minnesota where you're more than 50 feet away from Kentucky bluegrass. It's just, I mean, you could find places like the bogs and stuff but it's just ubiquitous, it's everywhere, and so, you know, these are things that are present in our landscape in different conditions, they can get really bad. You know, some grazing regimes are really good for knocking back the invasive cool season grasses but other grazing regimes really benefit the invasive cool season grasses. Kentucky bluegrass for example, it can handle getting chewed down really, really short and a lot of the native grasses won't handle that long-term very well, so these are definitely things we consider. We, you know, a lot of times we plan our burning schedules around optimal timing for control smooth brome in particular, so this has a pretty big impact on how we manage prairies.

Mike: Rhett, that was super helpful. I really appreciate you going into that biology. I was going to say basic biology but much of that I didn't know, so I don't want to say.

Megan: Yeah, that's biology 2.0, Mike.

Mike: Good. Thank you, Megan. Rubisco, that's going to be in my head for hopefully for the rest of my career I think.

Megan: It just makes me want a cracker every time you say it.

Rhett: Yeah, I was going to say it sounds like a snack cracker.

Megan: Yeah, like every time you say, I'm like hmm, I could, I could have a snack, that'd be all right. Like which maybe is okay because you're talking about enzymes in the plant and how it's essentially, you know, functioning and getting its food, so maybe that's okay to associate it with a snack.

Mike: There you go. It's super helpful to get a good understanding of why these cool season grasses have advantages in certain, and it sounds like many situations that we're dealing with now in the state and country for that matter. Rhett, thank you for that. Again, I wish you were my botany instructor, not that I want to insult the botany instructor I actually had, but yeah, he really laid it out clearly for me and that was very helpful for me. Thank you, Rhett.

Megan: Super helpful. We hope it was helpful for all of you as well. Now we're going to take a little bit of a different tack, see, we just keep taking different tacks through this. We're going to take a little bit of different tack with Dustin Graham, who is a plant ecologist for the Minnesota Biological Survey, which is part of the Department of Natural

Resources, and he is going to focus on a particular management strategy, and he is going to talk about a haying study that they've been doing, and we're going to get to see some interesting results using that as a management strategy to hopefully make some headway with our smooth brome and Kentucky bluegrass woes.

Dustin: I'm Dustin Graham, a prairie ecologist botanist for the Minnesota Biological Survey, and yeah, that's me.

Mike: Welcome, Dustin.

Megan: Yeah, welcome. Tell us a little bit about some, you've got some cool research projects going on, you've got some things that you found out about your brome study, share with us, walk us through a little bit of your knowledge. Share it with the listeners.

Dustin: One of the things that we have noticed on the landscape while we've been doing surveys and other things is that a lot of our prairies that have gotten regularly hayed are still getting hayed actually have some less problems with invasive cool season grasses, and we wanted to try to figure out why that is and see if we could replicate it to manage for brome or other species, and so with our partners in SNA, we set up a project to try to do haying for a number of years and see if we could get any impact on smooth brome abundance and then also monitor for what that does, what kind of impacts that has on the native prairie community.

And so there's a number of reasons why we're interested in haying. One is sort of the mechanics that make smooth brome a really aggressive invasive, and that has to do with things like it's a cool season grass, which have gotten advantages recently, but smooth brome also has a few other things going for it. There's been a number of research papers that have looked at things like the way that smooth brome interacts with nutrient cycling, so it actually has a different carbon nitrogen ratio in its leaves, and that makes nitrogen kind of more accessible for the plant itself. So when you get a really dense patch of brome, it's actually cycling that nitrogen and reusing it a lot faster than our natives would, and for our natives, that's part of kind of a survival mechanism because they're used to really low nitrogen environments, so it's not a very, historically has not been a great strategy for them.

So now that we've got more nitrogen in these systems from human activities, the brome and its little mechanism to take advantage of that is really doing quite a number. And that change in the nutrient cycling also tends to also ends up impacting the microbial community, and so there's a number of layers that are end up changing the system to favor really dense brome patches. And so we're hoping that we can use haying to start to counteract some of that by well if you remember the material that's causing these changes, remove the material that's letting brome cycle nitrogen quickly, well then that is another factor that is no longer that brome can no longer take advantage of. And we end up taking some of the extra nitrogen out of that system as hay, which is great, because then, you know, we can, we've also got this product off of the prairie, and one of the things in the literature that stands is a really unique way that smooth brome stores its carbohydrates. So a lot of plants and especially plants in the prairie hold on to their carbohydrates really tightly, especially in their root system. Brome is a little different in it stores a lot of them during the growing seasons in its stems, and so that's nice because

they're up above ground where we know we can chop them off or cows can come nibble them off, and so trying to get our timing so that, trying to get our timing.

Megan: I'm sorry, I was just laughing at nibbling. Like I was imagining cows being like ooh, look at this brome.

Mike: That's what they do Megan.

Megan: I know, I'm sorry, I'm, okay, continue, we can cut that out.

Dustin: I mean, that's the plan for some of the grazing stuff is if you put them out there, that brome is really nice carbohydrate treat for them, they'll go for it. Yeah, so that's kind of the general idea, and so we came up with some dates from the literature for spring haying and fall haying. So if you remember what the cool season grass is, you'll get a pretty big flush in spring but then they tend to come back and green up in the later season as well, and so we're hoping that we can hay at either of those times, measure the impacts we're having. Hopefully, we can reduce that brome abundance to a point where it is no longer getting these feedback mechanisms so that it's extricating native plants. I mean ideally, we would get it gone from the system. First goal, let's make sure our natives are still there and are doing well. So some early results from it, the study has been going on for about two years, we did get some pretty, we did kind of get the responses that we were looking for, for the spring and fall hay plots, we did see declines in brome, the number of brome stems per one meter point one meter square. However, we also saw kind of a dip just overall in our control plots, and so it wasn't statistically significant this year but we planned it to be a long-term project, so that's not really a surprise. But our results for native species diversity actually were quite good and we saw increases in both of the hay plots for native species diversity while the control plot pretty much sat at no change.

Megan: Can I ask you a question about that, Dustin? Because it is encouraging, and so one of my questions is when you saw an increase in native diversity overall, obviously, you know, we talk a lot on the podcast like if you do the same thing over and over and the same season, then you can expect some of the same seasonal impacts, like you're going to favor the same group of species and you're hopefully going to target in this case the brome the same set of other species. But what about native diversity in terms of like cool season natives? Like were those being hit just like the brome and other things or, you know, what are we seeing as far as impacts there.

Dustin: You know, I think it's too early to tell from the data. What I've seen in the field with these spring hayed plots is actually kind of really early especially forbs and sedges do really well under hay management. So if there isn't a big brome or redtop problem, you actually get some really cool looking prairies where the spring forbs are just going nuts under these haying regimes.

Megan: Nice, that's interesting.

Dustin: And I think a lot of that has to do with that carbohydrate mechanism that we're talking about because those plants aren't as vulnerable to getting nipped off because they have evolved under that, so.

Mike: At this point it sounds like there's reason for hope, that it's encouraging at least, right? Even if things are early. I mean, mowing is appealing I think for a few different reasons.

Megan: When you say mowing, you mean haying, right, Mike?

Mike: Yes, that what I meant, yeah. Haying involves mowing, I guess. So for those reasons, it's appealing. At a minimum to say that it's at least another tool in the toolbox -

Dustin: Right.

Mike: - - that managers can apply and avoid doing the same thing all the time everywhere.

Megan: And one quick caveat for listeners. So while mowing and haying both certainly mechanically clip vegetation, mowing typically leaves that vegetation onsite whereas haying bales it and then takes that vegetation off, and so then you decrease the smother effect, so haying and mowing do typically have two big differences in the sense that usually with mowing, we're leaving all that cut vegetation onsite, and with haying we're taking it, removing it, and using it as forage elsewhere.

Mike: That's a good point. I mean, is that potentially also a drawback in addition to a benefit - can it be a drawback that you're removing all this organic matter from the system?

Megan: I think generally it's a good thing.

Dustin: Yeah, it's usually not a problem for prairies because typically they'll have enough things like, they'll have enough legumes to replace the lost nitrogen and we've done research that shows that even under a pretty intense haying regime, the plant can be a pretty diverse plant communities is still adding soil or adding carbon to the soil, so it's still enhancing the soil with carbon and nitrogen enough that that community is completely fine. Yeah, the issues when you get a lot of nutrient buildups, you start to lose plant species and lose diversity from the system, and so oftentimes at least under current situations, removing extra nutrients from the system is actually really beneficial.

Mike: Okay.

Megan: And Dustin, that brought me to Mike Worland-style question here. So you mentioned that the plant community is okay and it might even, haying might create some open space and might create some sun to some patches that didn't have sun before that might have been covered with some rank or dense vegetation, but I was thinking about things like skippers or tiny bees and other things that rely on flowers to be in bloom during specific time windows when they are emerging, and so I'm wondering you don't, don't feel pressured to have the answer to this, but as you're steady looking at like a phase two at wildlife response at all or are you seeing just from that haying and taking the vegetation off, are there still blooms out there for these other little guys to take advantage of or is there a delay window? You know, it's always like it's never a recipe, right? Like it's always the devil's in the details and when do you do it

exactly and we're trying to find that balance for everything that's using the prairie, not just the plants.

Dustin: Yeah, that's a really good question and it's one that I have been wondering about a little bit too. Initially when we put the project together, we had kind of just spitballed the idea of adding an insight component, but we ended up just keeping the project simple to start with. What I have noticed going back to resurvey the plot is that in the hayed stuff, a lot of stuff is a little bit slower than the unhayed stuff, and so you'll get flowers that look like they're going to bloom later than those out there where they might be blooming already in the control plots. You know, it's really hard to kind of for me a plant person to kind of predict what that means for insect communities, - -

Megan: Sure.

Dustin: - - it might mean that their seasons expanded, it might mean that they're totally missing those resources. But I think our recommendation for practically using hay in the field would be to kind of treat it like prescribed fire where, you know, you're really focusing on one-third or less of any given habitat patch and maybe, I mean, there's a little bit difference with haying in that we're kind of thinking about repeating it over a number of years to really get impacts, and so maybe you focus on this third of the property for a couple of years, move over to another third, and, you know, one of the big questions of this project is well how long does it take to get back into a state where the natives are really outcompeting the brome or at least competitive with the brome. And I think if we can kind of figure that out, you know, get a recommendation like you might need to do this for three years to really get somewhere, I think that'll be a really helpful tool for our managers.

Megan: Absolutely. So some targeted, okay, quick summary. So targeted haying good in general from our early results of what we're seeing, still need to find a way to get balance in the management so that you're not treating every single acre exactly the same, and so that you have balance for the plants, you have balance for the wildlife, all those things. Heterogeneity is also what I heard you say that we're trying to get a bunch of different structures and different conditions out there so that again, that prairie is serving lots of different species. Yeah, that's what I heard.

Mike: I'd like to break on that heterogeneity that. It's interesting to me that it could be another beneficial aspect of haying is the level of control you have over manipulating structure in the prairie with haying seems to be a big advantage. You can mow exactly where you want, mow whatever kind of pattern you want, and Megan, I'm saying mowing as part of the haying process.

Megan: You saw me giving you the stink eye.

Mike: Yes, you did. And then yeah whatever height you want, all these different variables that you really have complete control over and for me that's in a very - -

Megan: Mike, it makes me nervous when you say complete control. It always makes me nervous. You never, this is fallacy, people. You might have control over where you put the hay equipment but you never have complete control. Nature is in the driver's seat and so.

Mike: You can put a ruler next to those mower blades and - -

Megan: I just tell ya. (Laughing)

Mike: - - at 7.2 centimeters, you know.

Megan: We always want to control everything but there's still going to be things that we didn't anticipate that are, I understand what you're saying, Mike, but I'm just bringing this perspective.

Mike: You can't control the response, okay, - -

Megan: Right, there ya go.

Mike: - - you may not have control over that, there you go.

Megan: Thank you. You can control placement of where you're putting the equipment.

Mike: All right.

Dustin: Yeah, I mean, that's really interesting because one thing that we noticed was when we did this haying, and came back, the hay plots actually tended to be more variable in height than structure because they had things like this went like the Andropogon - the big bluestem and the control plots is really suppressed by this smooth brome, and so you get this little wispy dude just kind of hanging out like you know. - -

Megan: (Laughs.) Oh.

Mike: Wispy dude.

Dustin: A botanist can go in there and identify yeah, that's an Andropogon but after the haying, one thing we was just these huge like almost specimens, these like landscape specimens of Andropogon that were just really kicking it and just big clumps, and I thought that was really interesting that after just with even one treatment these things had really been released from that competition and were starting to recover, so.

Megan: Interesting.

Dustin: That gets done at like heterogeneity measurement gets done a lot in grazing studies, it's something that I wish I would have incorporated into this to try to get a measurement, see if it's comparable to some of the data that we're getting from the grazing studies that are going on.

Mike: Well you can still, you still can't put it in, right? Even that it's not at the start?

Dustin: I still can. I have to carry another pole around with me when I sample.

Megan: He's got to make a Robel pole now and carry it around.

Mike: Yeah that is a burden.

Megan: Generally works best with two people, I'll say that.

Mike: Thank you Dustin for that discussion on haying, not mowing, Megan. On haying, okay?

Megan: Yeah you really struggled with that.

Mike: I know, I don't know, I don't know where, what the problem was there exactly but yeah. We should, we want to stress to the listeners, Dustin mentioned this after we stopped recording, and we want to emphasize it to the listeners that he mainly focused, well, really all he focused on was all the study, this haying study focused on were benefits to brome, and he says there's every reason, I believe he said something to the effect that there's every reason to assume that haying would not be as effective or perhaps not effective at all on Kentucky bluegrass. Is that what you took from that, Megan?

Megan: It is, and I think he was saying that because while they're both cool season grasses, it has to do with their biology and how they grow and how they respond when they're cut, basically. And so - -

Mike: Yep, Kentucky bluegrass does fine getting nipped down to the ground basically.

Megan: Right, which is why it's one of our most popular lawn grasses across Minnesota because bluegrass is like that, are designed to be mowed, see there you go, or hayed repeatedly.

Mike: Yeah.

Megan: So good points there, wow. This is part one.

Mike: This is part one and we learn so much, I have at least, yes.

Megan: I learned a bunch. We just, the caliber of our guests, the work that we're all doing together for prairie conservation is outstanding, and I just have to say that in case I forget to say it later on, but I'm really appreciative of everybody who came on today as I know Mike is as well, and we're super excited to offer you part 2, so the support doesn't end here, it doesn't end today, you got to catch us next week where we are going to offer you some more help.

Mike: Commiserate, commiserated by these invasive species, yes.

Megan: Absolutely. And so as always, you can find all of the resources that we talked about today on our website at mndnr.gov/prairiepod. This episode was produced by the Minnesota Department of Natural Resources Southern Region under the Minnesota Prairie Conservation Partnership. It was edited by Dan Ruitter and engineered by Jed Becher. We'll be back next week. I can't wait.

Mike: I can't, either. Should we sign off saying rest is death?

Megan: That does kind of sound like it should be like a football game chant or something like rest is death, rest is death, get up, touchdown, touchdown, okay, sorry, I'm taking it too far.

Mike: You didn't cheer in high school, I can tell.

Megan: That's a sports reference for you, Mike, like probably the only one ever on the podcast from me.

Mike: Thank you, yeah.

Megan: You're welcome.

((sounds of birds chirping and wind blowing))