



Prairie Pod Transcript

Season 6, Episode 54: Hey! Prairie Hay! (Restoration Series: Haying prairie as a management tool)

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

Guests: Dustin Graham and Fred Harris, (DNR)

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

Transcript:

((sounds of birds chirping and wind blowing))

Megan Benage: Hey Prairie Pod listeners, I'm Megan Benage, regional ecologist with the Minnesota Department of Natural Resources.

Marissa Ahlering: And I'm Dr. Marissa Ahlering, lead scientist with the Nature Conservancy in Minnesota, North Dakota and South Dakota.

Sara Vacek: I'm Sara Vacek, wildlife biologist with the U.S. Fish Wildlife Service, based out of the Morris Wetland Management District.

Mike Worland: And I'm Mike Worland. I'm a wildlife biologist with the Minnesota DNR Nongame Wildlife Program.

Megan: We are part of the Minnesota Prairie Conservation Partnership and we're here to help you discover the prairie.

Marissa: Discover the prairie.

Sara: Discover the prairie.

Mike: Discover the prairie.

((music playing and sounds of birds chirping))

Megan: Hey Mike, welcome back to the Prairie Pod to all of our listeners. Woo hoo! It's another great episode, or we hope.

Mike: Good morning, Megan.

Megan: Good morning, Mike.

Mike: How are you, are you, you seem caffeinated up this morning.

Megan: You know I'm not, I only had non-caffeinated peppermint tea.

Mike: Sugar?

Megan: No, I don't drink sugar in my tea only honey.

Mike: (Laughing) okay.

Megan: I support the bees even the ones that are technically classified as livestock like the honeybee.

Mike: Right.

Megan: I supp- I support all bees. (Laughing.)

Mike: Nice job.

Megan: Thank you very much.

Mike: Yeah, I'm happy to be here. I'm looking forward to this topic today.

Megan: I know, me too. It's going to be a good one.

Mike: So this topic today made me, makes me think I, I should, I should qualify this, very memorable experiences in my youth that were also some of my most hardest, unpleasant days of my life probably. Throwing hay on, on – for local farmers when I was a kid and that - -

Megan: Okay, I wasn't sure where this was going at first, but I'm glad too - -

Mike: Yeah, throwing hay.

Megan: - - sure to clarify.

Mike: Back in Missouri and - -

Megan Back in Missouri.

Mike: - - and that 100 degree high humidity heat, real character building back then.

Megan: There's a lot of good you know farm life hay stories. I personally don't have a lot but let me tell you what, my mom is one of seven kids and they have a lot of shenanigans that they got up to as they were supposed to be doing their hay related chores.

Mike: Yeah.

Megan: Anyway, lots of, lots of interesting choices made as they were trying to get out of doing their chores on the farm.

Mike: Understood.

Megan: Lots of funny stories but funny stories for another day 'cause we just we need to jump in, we need to learn. I'm ready!

Mike: That's right, I mean in learning mode here.

Megan: Okay, let's start with this. So we talk a lot on the podcast that prairies are disturbance based habitats and we know that they need fire and grazing in order to persist. They, they are intricately connected to these processes, they need them. WE also know sadly that in Minnesota we've lost much of our connective native prairie as well as our large grazing mammals like bison. So while there are some places, we want to give a positive note to this, right, there are some places where we're working hard to reintroduce bison back to their prairie home, what about the other places? The places where we can't have bison, or where it might be really challenging? What do you do about that? What the hay, Mike! What the hay!

Mike: Yeah.

Megan: That's just what we're going to find out.

Mike: What the hay.

Megan: You know how I like to have a good little segue there - - what the hay?! We're going to find out is what we're going to do.

Mike: Do you think the listeners know what we're talking about today?

Megan: Yeah, we're talking about haying obviously. We're going to hit the hay and we're going to chat with two awesome DNR scientists as we learn from them about their research on haying prairies as a management tool, in order to tackle invasive cool season grasses and promote overall prairie biodiversity. It's one of my favorite words – biodiversity, diversity for short.

Mike: We call can tell that, yeah.

Megan: Yeah, well Mike don't act like it's not your favorite word too. Always trying to be cooler than me. All right, let's jump in, we want our guests, we want everybody to know who are fabulous guests are, so how about we start and you all introduce yourselves and a little bit about why you like to study prairie so much. So Fred let's start with you.

Fred: Okay, I'm Fred Harris, I'm a plant ecologist and botanist for the Minnesota Biological Survey. I've had the great privilege of spending most of my career scouring parts of Minnesota to document what's left of native prairies in the state, and then in the last 10 to 12 years, I've been also involved in monitoring the effects of different management practices on native prairies as well. Been a really eye-opening experience. The diversity of native prairies is tremendous and it's always a thrill to find a new one that is, that we didn't know about before.

Megan: The discover, the thrill of the discover.

Mike: Dustin, how about you?

Dustin: So Dustin Graham, plant ecologist with Biological Survey as well. I think the thing that I like the most about working on the prairies is that there's always something new to learn and discover, always stuff to learn from the prairie, questions to ask.

Mike: Fair enough.

Megan: We always say that it's like a new frontier. Like you know, we talk about space as being like the uncharted frontier and how much we have to learn in space. We have so much to learn right here in the prairie. There's so much what we don't know. And so we have to treasure what we have left so that we can, those life lessons aren't lost, because we're connected to this prairie. We need it in order to survive and thrive, so just like that you guys are on the same page with us.

Mike: I like what Fred said about finding a new one that hasn't been documented. That's got to be a really amazing, I don't know if I really ever have.

Megan: I found new fends, new-to-use fends. I mean, it's hard to something to call something that's 10,000 years old new, you know, but like new, - -

Mike: Good, good distinction there. Yeah.

Megan: - - new to us, (laughs) new to science. If you will. Well, okay, wait, let me amend that. Not new to science because there are certainly native people who were here who probably knew about this, but just new to me.

Dustin: Prairies used to cover 18 million acres of Minnesota, and in parts of the state, less than 1% of it is left, so it's really relatively rare vegetation type in the state. And so it's cause for big celebration to find another one - -

Megan: It is.

Dustin: - - or one that we didn't know about.

Megan: I just found one last year that we didn't know about that is unmapped, and it was exciting because you went up to it and it was like, this isn't going to be good, it had some challenges, you know, and then we just like crested the hill and walked down the hill, and I was like, oooooohhhh, like it was, it was beautiful, there was blazing star everywhere, there was cocoon, there was all, I mean, it was nuts, it was amazing, I loved it. Okay. Fred, we're going to start with you with some hard hay questions today. I did not realize that rhymed. Hay questions today. Okay. Why does a prairie need management at all? Like can we just leave it alone, especially once we get it into good shape? What's, what do we know?

Fred: So Minnesota is at the eastern edge of the Great Plains, and the native, the prairies covered most of the plains, and this western part of Minnesota and much of southern Minnesota. And the reason one of the main reasons the prairies is there because they had wildfires, many of which were set by the native people who lived out here, or wildfires that started by lightning. And they had massive wildfires that raged

across the landscape, and the other thing that happened out here was there was a lot of grazing from herds of animals like bison. And as a result, you had this vegetation type that's adapted to those kinds of disturbance, which is native prairies. And we've seen that if you don't have disturbance like that, that they get colonized by shrubs and trees and basically succeed to a different kind of vegetation like the woodland and get lost. So it's really important if you want to keep prairie around to continue to have those kinds of disturbances to maintain the existence of a prairie.

Mike: Yeah, that helps, that helps set a context for what we're talking about here, Fred. Thanks. So Dustin, you know, do we, what are our alternatives for this disturbance and what niche does haying fill? Why, why would we use it as opposed to, say, grazing or fire?

Dustin: Yeah. So I think another thought in addition to what Fred has said is that, you know, our prairies across the landscape are all in different conditions, and there's some that are really heavily invaded at the current time, and some that seem to be doing fairly well and, you know, are maintaining their native biodiversity with lower levels of management. And I think that's a big question as to the differences between the sites and why some are doing so well and others aren't. It may, you know, do with past management histories or nitrogen deposition or some soils, but so for the sites that are kind of currently what I think of as unhealthy, so maybe heavily invaded with stuff like smooth brome, the idea is that those places probably need a lot more intensive management to get them shifted back into a healthier state where they can be more competitive, or the native biodiversity can be more competitive. And so when we start thinking of, you know, more frequent management, there are a couple of models kind of like more frequent fire or adding a different type of disturbance like in a patch burn graze system, where you're combining fire with cattle, or switching to something like haying, which in comparison to some of the fire-based management can be easier to pull off on some sites with certain topography, you know, sites without big rolling hills that our farmers have to go up down, or cooperators have to go up and down, and might be easier than some of the grazing stuff depending on the local cooperators. You know, it depends who's around and if you have partners that are willing to graze or hay for you.

Megan: Access. You need access basically to somebody with cattle or you need to have an area that you can successfully and safely pull off a prescribed burn, which can be difficult with highways and development and all of the different things that our land managers and stewards to the land have to contend with because you want to make sure you're doing that responsibility as well as do it in a way that's advantageous to the prairie in the long term can be challenging. So we looked at haying as maybe another management choice that we could make. Go ahead, Fred.

Mike: Fred, do you have something to add?

Fred: So yeah. I mean, like Dustin said, haying kind of mimics that kind of disturbance that it used to get in the past because all that biomass gets cut and taken off, and it can be a lot cheaper than investing in all the infrastructure to put up fences and stuff for grazing, and safer. One of the benefits is that it reduces soil nitrogen by harvesting all of that biomass, and that's really an important thing to do. Some studies have found that

haying can remove up to 300 pounds of nitrogen per acre per year, and that's an important thing because nitrogen is accumulating in our soils, and that promotes nonnative invasive weeds like the smooth brome that Dustin mentioned, and studies have shown that with higher nitrogen that those weeds have a competitive advantage, and so profit - -

Megan: Didn't you say too Fred that we have, that nitrogen deposition from the atmosphere is six times higher than it used to be in preindustrial times?

Fred: Yeah, that's what they found.

Megan: So it's huge.

Fred: Falling out of the air onto our land.

Mike: What is that do to? What is that? Why is that?

Fred: It's industrial field combustion, nitrous oxides, - -

Mike: Okay.

Fred: - - and from agriculture.

Mike: Gotcha. This reminds me of another follow-up question. So is it a potential weakness of haying compared to, say, grazing in particular? Because, you know, grazers, yeah, they take the grass down, but some of that energy and some of those nutrients get returned to the soil with grazers, whereas haying it's just completely removed and it's returned to the soil, what's the right way to put it, Megan?

Megan: Well, it's recycled how we all recycle food. It comes out eventually as waste, basically it comes out as waste and gets returned to the prairie in that way, but I mean, this, okay, so we heard this on our climate change episode as well that this is really complicated because there's also different plant responses that are triggered by an animal physically munching on a plant and how they graze because different animals - -

Mike: Oh yeah.

Megan: - - eat in different ways, and they prefer different plants, and so there's, they've even done studies where like the saliva and the enzymes in the saliva of an animal can trigger a different response in a plant than say a mechanical cutting. So, I mean, this is, question stands Fred like is it - - do you think it's more advantageous? But I'm setting you up that you can give the standard ecologist answer of well it depends.

Mike: Complicated. Yeah.

Megan: Complicated

Fred: Well, nitrogen accumulation is a problem, and that's one of the distinctions between haying and grazing is that studies have shown that with sites that are under - just undergoing grazing tend to accumulate even more nitrogen in the soil, whereas sites that are undergoing haying or burning, fire, those treatments have the effect of reducing nitrogen. And that really - -

Megan: Oh Fred, what about sites with fire and grazing as in - - I know-- he throws his hands in the air. I'm just curious.

Mike: It sounds like yeah, haying actually could have some advantages in this, in this modern day context of high nitrogen.

Fred: The other thing that haying does and one of the benefits of haying is that it reduces the dominance of the warm seasons grasses and really enhances the diversity of wildflowers and the floral diversity. So that's another benefit to haying - -

Megan: It is.

Fred: - - you might not get with just doing spring burns.

Megan: I think we should encourage our listeners too because we say this all the time. So let me add some caveats. There's no one recipe to managing a prairie successfully, and so while our brains want that recipe, you know, like okay, I have a prairie, every three years I do this and this season in this way. We know that you need to be changing up your management, you need to be adaptive in your approach, and so it's just not going to be that simple because prairies aren't that simple. They're incredibly complex and we still don't understand everything that happens after a disturbance like fire, grazing, haying is introduced. So I just want to encourage our listeners that maybe instead of thinking of it as to hay or to graze or to fire, what they should think of maybe instead is that what's the best option for your site, what's feasible for your site, what can you do, and how can you diversify your management because diversification is key in the long term. So maybe that's, I don't know if that's helpful, but I just think sometimes we get stuck thinking that only one way is the best way, and so we're presenting today like an option for you where you, grazing is maybe not feasible, fire is hard, there's another choice. Go ahead, Fred.

Fred: There are lots of, a lot depends on what kind of site you have and how big it is, right? I mean, there are a lot of places where you can't really hay it, they're too rocky, they're too steep. It's not an option.

Megan: Fair point. So, oh go ahead.

Mike: I'd just like to add a quick point as well that one reason haying seems very appealing to me and to others, I know, when we think about how we are going to restore or save prairie, we're not going to do it only on these protected, pristine, relatively pristine prairies we have, we have to integrate prairie conservation in a working landscape. We've got to have people that are producing a commodity or making money off of a land use to save prairie. I believe that strongly. And so here's an option where you're harvesting hay and you are getting a commodity off the prairie that you can feed to your livestock and at the same time it serves as a management tool. So I think that's an appealing thing.

Megan: Yeah. I'll just add to that, Mike, that there's also in addition to the economics, there's also food, traditional indigenous food that comes from the prairie, and so that's another way that you can be integrally connected to it. I'm having trouble saying the word integrally today. - -

Mike: I noticed that.

Megan: - - I'm not even sure if that's really a word, so I'm going to look it up. I made it a word. I don't know if that tense works, but whatever, it's going to be fine.

Fred: I, when I first started doing some research into the haying management for prairies, I went back and tried to find some data on how much of the landscape used to be hayed for what they called wild hay, which pretty much was just hayed prairies. And used to be really common to have a, you know, mesic prairie that you would just hay every year as part of the smaller farmsteads. And I didn't find great data on the amount that was produced, but it is one of the reasons why we still have a lot of our mesic examples of prairie in the state. A lot of them were managed by farmers as hay land for a long time.

Megan: That's an important point because I just, just a thread, like is that we often think or sometimes we get into this trap of thinking of ourselves as separate from the prairie, and people have always been integral to the prairie. They've always been part of it. And so whether that is through our long history of native tribes that were here, or the choices that individual farmers were making, like people are going to be as Mike said, part of the success of this landscape. Like we can't ignore that human component. So, because we're connected, we're part of the ecosystem. It's here. Okay. Let's ask, just pivot a little bit, see what I did there? So why do you think Mike and this research, this is Mike's question but I'm going to read it as if I'm Mike. So do you think that haying gets overlooked in prairie management? When Mike was doing his prep for the Pod, he only found a few papers about the impact of prairie, and we don't typically see it from Minnesota DNR context as a management tool that we use on public lands. Why do you think that is?

Fred: I would agree that it tends to get overlooked. Like Dustin mentioned, there used to be a lot of it, and we could tell that when we look at old aerial photos of the landscape, we can see places being hayed, hay meadows. And I've been given various reasons for why. I don't think managers in general understand that much about what some of the benefits of haying have been. But when you look through what different prairie remnants we have in the state, there are a number of ones that were originally hay meadows, and they're mostly in places like the Minnesota River Basin, the flat level places like the Minnesota River Basin or in the Agassiz Lake Plain that were covered by Glacial Lake Agassiz that were places that were for one reason or another not selected to be cultivated. Generally because they were too wet, seasonally wet to convert to cultivation and they were never drained. And these places were then maintained for hay, and we have a number of outstanding prairies that originated as hay meadows like that. Mentioned a few of them such as Butternut Valley Prairie SNA that's southwest of Mankato, parts of Chippewa Prairie near Appleton, Minnesota, originally hay meadows. And then up in the Glacial Lake Agassiz Lake Plain, there's Miller Prairie, which is Nature Conservancy Preserve in Traverse County, and then there's Malmberg Prairie, which is southwest of Crookston, and one of the things that stands out about these places is they have extraordinary diversity and abundance of native wildflowers. So hay, and these are all relatively small tracts. So they didn't lend themselves to large scale grazing operations or things like that. They tended to be too wet to plow up. But the

question that you were getting at, Megan, I think is why aren't more managers doing haying now. And one of the answers I get in places like Chippewa Prairie is that the landscape is a little bit different from the way it was back then. They used to have haying parties that hayed part of Chippewa Prairie where everybody had their own little 40-acre tract and they went out there and hayed them in August. And the equipment is different now. They don't have the same equipment that they used back then. Back then, they used small sickle mowers, they're like five to seven foot long wide sickle mowers and square bales. And I'm told that the landscape is a little bit rougher now because of gophers, all kinds of gopher mounds that make it much more difficult to drive around and cut to a depth of three inches or so. So people don't have the equipment, the landscape is a little bit different, I don't know, otherwise, I don't have a good explanation for why more managers aren't going to using haying as a management tool.

Megan: We also heard from some farmers last year when we did a tour of the haying site that we're going to talk about today that haying is also somewhat of an art, especially if you have topography or you have, you really need to be, know every piece of that land where you're taking the hay equipment over, and so we, that could be something too that it's difficult to anticipate all of the hurdles, like rocks or there's a new one, gophers. Just it's a funny visual for me. What prevents haying all those gophers that are out there. I'm just picturing them popping up as the hay equipment is trying to go by. I know that's not what you're describing, but in my mind, it was a little funny, funny image.

Mike: Dustin, how about we start talking about how effective haying is. I know you've done some research, you and Fred are both involved in some research on this. So how effective is it, first of all, at controlling invasives, particularly brome?

Dustin: So that is a good question, and there is not a lot of stuff in scientific literature about that. What is in the literature is there is some stuff on when you hay your prairie, you get kind of a similar response to fire. So if you were to burn a prairie, in terms of the natives that you see, so we get increased, you know, expression of natives and native diversity sort of similar levels to fire. I have some questions about that in the long run especially with some of our bean plants, but so we after kind of checking what was out there in the literature that other folks have done, put together a project on, with our partners in SNA, scientific and natural areas, to find a couple of sites that were heavily invaded with brome and set up a kind of middle range or middle time, oh, my gosh, five-year study looking at a couple of different types of management, so did split those types into four areas, one of them spring hayed every year between May 15th and June 15th. One of them fall hayed between October 15th and September 15th, September 15th and October 15th, one of them burnt every other year, and then a control plot. And so most of what I think I know about the effects of haying on our prairie is coming from that work, which is in its fourth year right now, and it looks like we're starting to get some decreases in brome abundance, so I had me and Fred out there and Brett counting the number of brome tillers and little plots for the last number of years. It looks like we're starting to get a decrease in the amount of brome tillers in the spring plots. The other two treatments look like they might be at least slowing brome invasion down, but I think the goal here is maybe not to see what can slow brome down, but what can get us to a

point where we're starting to recover prairie health, which I think reducing the amount of brome is really the goal.

Megan: Dustin, do you have a target for like, I mean, just maybe it's a ballpark target, but like what is your, okay, I don't want to say your ideal number of brome because I mean, I know the answer to that is zero. But like what's your ideal number to achieve balance in the prairie to like once like is it 30% brome, is it 20%, like when do we, is it 50/50, is it some other ratio where we feel like okay, we're really making a difference and we've recovered health?

Dustin: Yeah. Well, I think there's two kind of metrics that go into. I think the native diversity and the native expression of that diversity is one thing that you want to think about. And so if you're seeing that recover, then you know you're kind of on a good trajectory. In terms of the amount of brome, there seems to be kind of this tipping point, and there's a couple of papers about this where a certain abundance of brome you start to get feedbacks in soil like nutrient cycling and changes in the microbial community, and those things end up helping brome kind of become extremely dominant and start not only kind of suppressing the native diversity, but start eliminating it. And so we definitely want to stay under that amount of brome, and it seems like somewhere in that like 10 to 15 tillers per tenth of a square meter is where that tipping point starts to happen, maybe above that, maybe below that.

Megan: Okay, wait, let me just some math here. So tenth of a square meter is like a tipping point. So if you're looking at a for most people, this is a metric they might have trouble looking at their prairie and being like is this a tenth of that, I'm not sure. Like is there a landscape view of that? Like if you're eyeballing the prairie that you're looking for, or is that hard to extrapolate?

Dustin: Well, yeah. I mean, I think that's the first goal. I think, I mean, a lot of these sites are kind of in triage mode where we need to do some pretty intensive management to get them back to a healthier state where we could manage them less often. And I think that's maybe the first step is getting it to where our native biodiversity is competitive, and then management for a little longer than that where it's going to take time for the brome to reestablish itself, or we can maintain it with less frequent management and I don't know if I have a great concept of like where that state is. I think that's really more, it's just more about like the kind of wisdom of the land manager at that point of where they feel like that site is.

Mike: That makes sense.

Megan: No, it does make sense, and I think at Minneopa they have like a it's either 20% or 30% target is what they decided was reasonable. And we're getting these percentage because basically the what we're not saying is that you're not going to get rid of it completely. Like brome is there to stay. So, you know, if your goal as a land manager, a steward to the land is I'm totally annihilating brome, that's probably not the best goal for you to have, given what we just heard earlier about nitrogen and everything else. So think instead about what's a percentage that I'm headed for like Dustin said, this tenth of a square meter, so that way you can get back in some better balance, but that's, which is a more realistic goal. Fred, you had something that you wanted to add.

Fred: Yeah, well, the context for this discussion is the fact that brome has become an ever increasing problem in prairies in southern Minnesota over the last couple decades, and I really think that this is an offshoot from some climate change effects where we're getting much heavier rainfall in the early parts of the season that really promotes these cool season invasive grasses like smooth brome, and because of what we've already talked about, all the nitrogen. So one of the main things that managers are facing is how do we suppress brome or at least keep it from continuing to increase and take over stuff. And so even keeping it at bay or keeping it from increasing is a victory in my mind.

Dustin: And I'm going to add something. I think there's kind of a question floating around in my mind and maybe to some of us where I'm not sure where our objectives are really managing brome or if it should be more focused on managing nutrients on the prairie. And I mean, we do a lot of management that tries to target brome when it's most vulnerable to kind of get rid of its carbohydrate reserves, the spring especially, and I think that kind of works a little more with the theory that like well, if we just get rid of the brome, the prairie will be fine and come back. And I think there's some issues with the amount of nutrients that are now getting added to the system where, you know, we might have a bigger problem than just if you cut off the brome, it'll be fine. And so I think thinking a little bit more about that nutrient problem as well might be really helpful for us, and it does lead a little bit to some differences in management, timing, you know, you might, if we can figure out a way to, you know, change the amount of nitrogen in that system, we might not be as contained to, you know, do spring fire on, you know, June 1st and hay during that really small window and might be a little more flexible in terms of management if we're thinking about nitrogen instead of brome. How important those two thoughts are compared to each other I think is a really big question.

Megan: And one that remains, this is what guys talked about in the beginning. This is what you like about prairie, this moment for discovery. And so just a quick note about reconstructions too. Brome is arguably an invasive cool season, but there are also many native cool seasons that are part of a prairie, and it's a niche or a functional group that often gets missed when we work on reconstructing prairies. So my argument here is that's probably even more important to make sure that you include those species when you're reconstructing a prairie. If for nothing, then if you get a handle on your bromes, something else needs to replace it because nature hates a void. And so you want to make sure that you have other cool season species that are there. Doesn't solve the problem that Dustin's describing and Fred's describing with too much nitrogen on the prairie, but it's still an important piece that you want to make sure you have.

It's important to think about which of those are nitrophilic species that really respond to increasing nitrogen and not all those cool season natives might be in the same category as those nitrogen-loving invaders like smooth brome and Kentucky bluegrass.

Megan: You just gave us a great new word for everybody to use. I'm looking for a nitrophilic native.

Mike: Fred, you mentioned forbs. Can you talk about that again, please? Because it is so important for our prairie management, especially when we start thinking about pollinators and other wildlife, and just, and plant diversity in general. What's the deal with haying and forbs?

Fred: Well, a number of these hayed preserves that we have were hayed late in the year, were hayed traditionally in September because they were too wet to get into before that. And because of landowners needed a gap between all the seeding and cultivating of their fields and harvesting later and things like that, so and we find that the floristic diversity and abundance of wildflowers in a number of these formerly hayed prairies is tremendous, and of course that's really important for pollinators. They hold way more native bees and support way more species of native bees than fields that don't have abundant native wildflowers. So I'm not sure I'm getting at all the aspects of your question.

Mike: No, I mean, yeah, just confirming that haying is a tool that can increase or form abundance in these prairies.

Fred: Everything depends on how you do it and on things like timing. So if you read some of the ag extension literature, they'll say that you should get out there and hay in July or early July because that's when it has the highest nutritional value for your livestock. But in terms of managing a prairie that's not really the best time to do it because you're taking out a bunch of plants that could be flowering or starting to flower at that time of year. So in terms of prairie management, it would be better to be harvesting it later in the year after more of those wildflowers have expressed and succeed and so on, and one benefit of doing that is that your yield would be higher because you got more warm season grasses coming up and becoming established in Minnesota that that really happens during July and August, and so later in the year you get higher biomass, but it's not quite as high as nutritional value as it would have been if you cut it in early July.

Mike: Okay. That's really interesting to hear, Fred, and it makes me think also about an important point I wanted to make during this podcast that we always recommend to people not to hay prior to about mid-July because the nesting grassland birds. And if you're haying before then, you're virtually guaranteed to be destroying some grassland bird nests.

Fred: Absolutely. You want to be haying after those birds have fledged, but even then, there are some insects and butterflies that are active in the fall in September like the Leonard skipper, which is still out there flying around and using nectar in September. And so.

Megan: And bumblebees too.

Fred: Really important concept is the same as what you would have with fire is that you should only hay a portion of the area at any one time in any one year, so ideally if you have a prairie that you're going to hay, you would hay two-thirds of it and leave a third unhayed each year, and then you rotate the haying, so you have rotational haying over the years. And also by leaving one place unhayed one year helps you produce enough biomass in that portion of the prairie to have a burn the next year in the spring. So a good management strategy is to rotate haying and include some fire if you can do it.

Mike: Cool.

Megan: So we talked about. Sorry, go ahead, Dustin.

Dustin: Oh, I was going to say my current conception is that fire, occasional fire is really important for a lot of our legume species seem to be respond really well, germinate really well after fire, except for leadplant. Leadplant is a bit of a duck. I am worried about long-term hay regimes and native legume species, and I think that's another question I have is what's the best guidance there in terms of burn frequency to keep our legume species around.

Megan: Well, and a few things I heard just to kind of wrap up before we ask you more questions here is that it's really important to make sure you're doing this judiciously, meaning that you're not haying the entire site, so you're doing it in pieces. It's also important to think about the tradeoff between livestock forage and haying timing to benefit the overall health of the prairie, that there might need to be compromises there, especially if you're working with a cooperator. We're concerned about wildlife because different wildlife are nesting or utilizing the prairie at different times, and then my final piece of that is we talk a lot about diversifying our management, making sure we're mixing it up. It sounded like we were suggesting that August haying is better and doing it rotationally in the context of you're not haying like your same third year after year after year, you're mixing it up, but could you also hay at different times to meet a diversification need or maybe to hammer brome in May or when you, I mean, I just have questions about the diversification.

Dustin: Yeah. I definitely think you could manipulate that timing to meet some objectives. I mean, occasionally there are prairies that have had histories of grazing and things, maybe season-long overgrazing where you end up with really abundant, really dominant like big bluestem, so, and I think you could definitely use haying or midseason disturbance to reduce that and get some other forms of native diversity in there.

Megan: So lots of considerations. Lots of like, I don't know, I was going to say considerations again, which is the same word. Lots of things to think about. But if you had to sum it right now for what we know, Fred, what's the best way to hay in Minnesota?

Fred: Well, I was going to say spring haying is often not an option because these sites are wet, and a lot of places are wet, too wet to get in and hay it. One of the most amazing prairies I know is a privately owned tract in the Chanarambie Valley near the town of Chandler in southwest Minnesota. It's on the bottom lands of the river valley, and the local, the owner of it, his family has had this as a hay meadow for generations, and it's tremendously diverse prairie. What they do is they hay it in September, they don't hay all of it, they hay part of it, they hay it in September, but there's a corner of the site that has this old farm equipment in it that they can't get in and hay because it's just sitting there in the corner. And when you walk out there, you look at that corner, it's completely dominated by smooth brome grass. You go through the rest of the place that's hayed, there's virtually no, hardly any smooth brome could be seen. So somehow, haying it in September that late time of year is also appears to be really effective at keeping brome from invading. That's one of the inspirations for us to launch this study of haying practices in SNAs. But what they do is they hay it for portions of it in September, and then maybe each part gets a burn, a rested part gets a burn once every five years,

so they do factor in some fire as well. I can't speak to the legume abundance there, but it seemed like it was tremendously diverse.

Mike: Fred and Dustin. Yeah, Dustin. Go ahead, please.

Dustin: I mean, I think it's interesting to think about that kind of our experience on the landscape with some of these hayed sites, and then compare that to the SNA haying study. So currently, we're only seeing reductions in brome tillers and stuff that gets spring hayed. And we went over, you know, the problems with spring haying in terms of other wildlife. And it makes me really, I mean, we're going back to that same question of what should we be managing for. Are we managing to chop off brome tillers or are we managing for system level stuff like nitrogen? And the sites like the one that Fred was talking about I think are really good evidence that that more system level approach works. I think the experiment we're doing might suggest that it takes a long time, but I think sites like that suggests that it might be more effective in the long run too.

Mike: Okay, go ahead, Fred.

Fred: Also hard to tell whether the reason the brome isn't there is because it never was there in the first place at all and haying has kept it from invading, which is a different situation from starting with a site that's already invaded all the way across it with brome, and now what you're going to try doing is haying, and you're at a different starting point.

Mike: Gotcha.

Megan: So you might have to experience. Might have to practice a little bit. Try some things. But September, - -

Fred: That's what we're trying to do.

Megan: - - yeah, we're trying to experiment, we're trying to learn, and every site's different, which makes it fun and hard.

Mike: I'm so glad you guys are doing this haying study because I think it's clearly needed. Megan, you're going to the literature, it's very limited what's out there. There's a little bit, but not much. And yeah, we really need to know more about this management tool. So good job you two.

Megan: Yeah, nice work. Is there anything else interesting that you learned with the study that you want to share today that you're ready to share?

Mike: Fred's pointing at Dustin on the screen.

Megan: Fred's pointing at Dustin. (laughing)

Mike: Maybe we covered it all, maybe we have.

Megan: Maybe we have. I mean maybe that's, that's it. All right.

Dustin: Give me one minute. I probably think of a thought in here somewhere. I think between the haying study on SNA and native prairie banks and combining that with some of the patch burn graze studies that we've been learning about those kind of tentative results, kind of all summed together is we're kind of starting to tune in a little bit

on frequency of management and intensity of management that's required to shift some of these triage sites back to more native dominated more competitive states.

Mike: You say triage, you mean sites that are currently--Go ahead.

Dustin: Heavily invaded, yeah.

Mike: Gotcha.

Dustin: And so the haying study, we know haying it every spring for four years seems to be getting us places. Patch burn grazing study it looks like at this point maybe, you know, management every three years might be getting us somewhere, longer-term patch burn grazing study it looks like rotations around five years aren't really doing the trick. So I think I continue to kind of tune in a little bit or figure out, you know, really what intensity we need or frequency we need to shift the stable state of these communities back to kind of the goals.

Fred: That's the thing about the grazing is that so much depends on the intensity of it and the timing.

Megan: The how, not the cow, we did an episode on that. We definitely did. And just so it's clear to our listeners. If you haven't listened to that episode or you're not familiar with patch burn grazing, the idea is that you burn one patch annually, the cattle are released to graze freely amongst all of the patches, but the idea is that they will hone in on the burn patch because it's fresh new succulent vegetation that's yummy. So just in case your - - .

Mike: One other thing I was thinking about that Fred and Dustin might comment on is that also some of our work, I'm thinking about the grassland, the grassland monitoring team results, they're quite often pointing out that the prairies are currently in pretty good shape, the best thing you can do is leave them alone, and you guys agree with that?

Fred: That's one of the conclusions from their model analysis of more than 80 to 100 sites across the state is that the really highest quality prairies seem to be maintaining their own diversity without intensive management. They still need some management, though.

Megan: Okay, though. I was going ask. I was like wait minute, we want to make sure we don't leave listeners with the impression that you leave a prairie alone, because that is disastrous for a prairie community. You still need to have disturbance in there. It just might not be at the intensities that we're describing today as you're in a recovery phase.

Fred: They tend to be sites that are managed with a controlled burn once every three to five years.

Megan: There you go.

Mike: Gotcha.

Megan: It's like general fire maintenance is what we'll call it. Well, we have got to move on to our next section.

(Music playing)

LET'S SCIENCE: To The Literature!

Science!

Megan: This is the part of the podcast where we recommend a book, a blog, or a paper. What the Hay, that is what these papers are going to be about for sure. Fred, do you want to start and give us your science pick for the day?

Fred: All right. My, I have two, and they're basically reports, they're not journal articles.

Megan: We did not specify it has to be a journal article, Fred. It just has to be good research.

Fred: So the first one I would mention, the first one I would mention is called Native Prairie Hay Meadows: A Landowner's Management Guide. And it's written by Kindscher and Byczynski, and it's published by the Kansas Biological Survey, so it's by counterparts who do similar things as us down in Kansas. And it's a really great paper that kind of a white paper that explains a lot of these issues we've been talking about in terms of timing and rotation and outcomes from haying management. The only caveat I would have is that you have to remember this is Kansas they're talking about, and the timing of things, it's a little bit different there than it would be up here. So and the other report I have is a report on a whole study that we haven't mentioned in this interview at all, which happened here in Minnesota, it was a study of biomass harvest from native grasslands. It was conducted by the University of Minnesota. It was a huge 10-year study funded by LCC Marr started in 2007. And they had a lot of information about effects on wildlife and insects and birds as a result of their studying of biomass harvest or essentially haying in native grasslands, and that report is by Satyschur et al. 2016 and the title is Lessons in the Management of Minnesota's Grasslands for Biomass Harvest Wildlife and Natural Communities and it's from the University of Minnesota.

Mike: Okay, thanks. Dustin, how about you?

Dustin: Paper I brought was Plant Soil Feedback Contribute to the Persistence of Bromus inermis in Tallgrass Prairie. It's by Mary Vinton and Erin Goergen. And it's a manipulative experiment where they found a tallgrass prairie with brome invasion and introduced nitrogen in a portion and carbon in a portion, and used a plot as control. And so it starts to get at that kind of systems idea of nitrogen's interaction with brome. I would love to see another study like this that it starts to introduce disturbance under the different nutrient levels, but I'll have to wait for somebody to do that.

Mike: Hey Megan.

Megan: Yeah Mike?

Mike: Let's take a hike through a nice little hay meadow.

Megan: Oh, a nice little hay meadow, a hay meadow prairie?

Mike: That's what I meant, you know, of course.

Megan: You always mean a prairie. It's better in the prairie. Maybe we can find a pasqueflower or.

Mike: If we're early enough right?

Megan: Right, if we're early enough, mm-hmm. Where are we hiking today, Fred?

Fred: I would, if I find myself in Mankato, I would go to Butternut Valley Prairie. It's not very big, it's just southwest of Mankato, it's a scientific and natural area. It's about 11 acres in size. The diversity is mindboggling when you walk around in there. Good time to go is late June, early July.

Mike: I did a bird survey at Butternut Valley. That is quite a place. Yeah, it's very small but it is beautiful, and actually it had pretty good birds, even though it's so small.

Fred: It's been used as a seed source for a lot of native restorations in the region.

Mike: I believe it. Dustin, how about you?

Dustin: I guess I will recommend Malmberg up north if you're by Crookston. Pretty similar story of a more mesic prairie, mesic wet prairie that was maintained by haying.

Fred: Malmberg is one of the only pieces of the Glacial Lake Agassiz lakebed that never got plowed up. It's surrounded by sugar beets and miles and miles and miles of sugar beets and corn and soybeans. It's an 80-acre tract, it's a lot larger than Butternut Valley.

Megan: We're going to have to check those out. Road trip, Mike.

Mike: Let's do it.

Megan: Let's do it. We could talk about haying all day. There's so many, even as we were talking, there were so many different things that we brought that were like what about this, what about this, what about this scenario? So as you can see, there's a lot to learn, but we just want to encourage you to not be overwhelmed, take a deep breath, remember that the prairie is resilient, even though we're worried about it because we don't have much of the tallgrass prairie left, we've lost 99% of it, it's still here, it's still persisting. And so I think we just need to lean into that. We often hear our managers say I just don't want to mess it up. And let me just reassure you right now, if you care, you're not going to, because you're going to make careful and calculated choices, and there are lots of people, go ahead.

Mike: I'm sorry, Megan. Go ahead. I didn't mean to interrupt your flow.

Megan: There's lots of people to help you on this journey. Lots of people to help you.

Mike: Yeah, very true. Like Fred and Dustin, they got me excited and really a lot more interested in haying as a management tool and yeah, I'm going to look into it more. Thanks, you guys.

Megan: Absolutely. The learning doesn't stop here. Next week on Prairie Tuesday, you're going to want to catch us on the Prairie Pod, where we're literally going to have an episode about learning to love the prairie. We're going to talk about how prairie first captured your interest, did you have an aha moment, a special place, or was a quiet,

slow burn kind of love where all of a sudden one day you realized you were hooked and you were never leaving. Prairies are absolutely amazing and we're going to be joined by some very important and special guests who are going to teach us about how to teach other people about our love for the prairie, how to educate folks about loving this wonderful and amazing landscape. As always, this, all of the resources and links that we talked about today are on our website at mndnr.gov/prairiepod. This episode was produced by the Minnesota Department of Natural Resources South Region under the Minnesota Prairie Conservation Partnership with partial funding from the Nongame Wildlife Program. It was edited and audio engineered by Dan Ruitter, our web production team is led by Bobby Boos, and our social media lead is the one and only Kelly Randall. What should we say to get out of here? Hey. See, that's a hi, and we want to say bye.

Mike: It's like aloha. It's either way.

Megan: It's either way. Hey, hey. Thanks for being here.

Mike: Thank you.

Fred: Thanks for inviting us.

((sounds of birds chirping and wind blowing)).