
# Prairie Pod Transcript

## Season 6, Episode 53: Bur Oak Folk (Restoration Series: Savanna restoration)

### Hosts: Megan Benage, Regional Ecologist; Sara Vacek, USFWS Wildlife Biologist

### Guests: Rebecca "Becky" Esser, Wildlife Biologist, U.S. Fish and Wildlife Service; Dr. Greg Hoch, Prairie Habitat Team Lead, and Neil Slifka, Parks and Trails Area Resource Specialist, 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, welcome back prairie peeps, Prairie Pod listeners. We haven't really decided what we're going to call you. Sara do you have any ideas?

Sara: I kinda like prairie peeps.

Megan: I mean it's only season six, I feel like this is something we maybe should have discussed before.

Sara: One of the (laughter.)

Megan: but I like prairie peeps, it was kinda nice. Oh my goodness, we're, we're back today on Prairie Tuesday, to talk to you about some pretty amazing prairie things. I know, on the Prairie Pod. Who knew? It's happening. We're going to talk about a very exciting subset of prairie or at least, I mean Sara, I don't know how you feel about this, but I think of what we're going to talk about today as a subset of prairie.

Sara: I do.

Megan: What do you think?

Sara: Yeah, same here, yep.

Megan: Yes. They're part of the - - an integral part of the prairie landscape, we're going to talk about savannas. That's right. We're bringing in the trees and Sra came up with this first line but I'm going to say it anyway because I think it's pretty good. So today, we're going to spend some time in the shade. No, not throwing it around but basking it in. We're talking about savannas, the unsung hero of the prairie landscape. When I think about prairies, we just talked about it, savannas are a subset of them, right? They're the special class of habitat. I even named my dog after them that's how much I love them, or really, you just can't name your dog, Prairie, 'cause that's just mean – prairie dog, get it?

Sara: Ah-ha-ha budda-boom.

Megan: Lalalala. Wow, I really need a laugh track. (Laughter.) We need to have one for these, for these awkward moments to go a little bit faster. (Laughter) While we are talking savannas and their, we're going to talk about what they are but I'll just give you a teaser, they're these transitional communities, they're constantly changing on the landscape as we get, as the landscape goes for succession and moves towards an oak forest, we can savannas somewhere in between and in fact, oak savannas are one of our rarest habitats in Minnesota. We often talk about the prairie being super rare but savannas are even more rare than that and we'll talk about how much more rare. But we know, like we always say diversity is an important indicator of health in any system and so it's really important to have all these prairie pieces and I don't mean to diss savannas by calling them a subset, I just mean that there's this big prairie landscape and within it there are savannas. Right?

Sara: They're one type of prairie, yeah.

Megan: One type of prairie. Sara, what I love about you is I can say something with about 700 words and you can say it with 10, that is what I love about you.

Sara: Well thank you. (Laughter)

Megan: I'm trying to say I make things way more complicated than they need to be. (Laughter) - - It's ultimate.

Sara: Well usually I have the benefit of listening to your long explanation and then it's a little easier to come up with a succinct summary.

Megan: Look at that, alliteration, strong, I like it. Well, without any further adieu, we have got three fantastic guests with us today to share their savanna knowledge and so we're just going to jump right in and have them tell us a little bit more about themselves, you know, what they do, why they love prairie conservation. All the good stuff, and Becky, we're going to start with you.

Becky: Great, hi everybody, my name is Becky Esser. I am a biologist with the U.S. Fish and Wildlife Service. I've worked with the service for nearly 24 years, all within the prairie eco system. Um my name job as a biologist is to monitor our management and restoration actions and part of that is monitoring savanna. I was first introduced to savanna when I worked in northern Iowa and was just amazed by the sheer enormity of the big bur oaks and, and just love the look of savanna in the landscape and the feel. So I'm excited to talk about savanna with you all today.

Megan: We're excited you're here. Neil, tell us a little bit about yourself.

Neil: I'm Neil Slifka, I am the area resource specialist with the Division of Parks and Trails, office'd out of Rice Lake State Park. I cover the southern region of the state. I've been with the DNR since 2017 working on resource management for the division. Prior to that I spent about 10 years out on the west coast doing a mix of forestry and wildlife biology out there.

Megan: Okay, Greg, your turn.

Greg: Yeah, Greg Hoch, Prairie Habitat Team supervisor. So I spent about eight years in graduate school down in the flint hills of Kansas, which is hundreds and hundreds of square miles of native prairie, beautiful. I did a lot of work with the bison herd, burning. My actual research was on eastern red cedar, a species which I'm still not real crazy about. Moved to Minnesota about 22 years ago or so, did some teaching. I actually worked with Becky for a couple years up in Detroit Lakes and then I've been with the DNR for the last 12 or so years. Do a lot of, a lot of primarily office work, a lot of funding, a lot of policy work, some legislative work, etcetera, etcetera. So I tell people that nothing I do is exciting but hopefully, my efforts allow the other people in the real world to get the real work done. So.

Megan: It's always a good way to started to you know, set that bar low, nothing I do is exciting. (Laughter) So that, that tells the listeners that they're definitely want to - - gonna want to hear what you have to say. (Laughter) Greg, don't set the bar so low, you're going to share some great ecological knowledge today. People are excited to hear it. All right, Sara, are you ready to jump right in?

Sara: I am ready. Are you ready?

Megan: I'm ready.

Sara: Okay.

Megan: Let's get shady.

Sara: Well we'll, we all (Laughter) - -

Megan: I'm just kidding. What's a different podcast? What (laughter) - -

Sara: Uh yeah. (Laughter.) Neil, would you kick us off and just give us a feel generally for what exactly counts as a savanna?

Neil: Yeah, so you know, just structurally speaking, I think we look at a savanna as a, a system with kind of widely spaced, open grown, typically fire-tolerant species of tries. They don't form the, the, they're not the dominant vegetation in the system, the dominant vegetation would be grasses and, and forbs, so when, when earlier we mentioned talking about that it's a kind of this combination of prairie with interspersed oak trees, that's really what it is, but the, the structural form of the trees usually kind of the ratio of crown height to crown width, these trees have a kind of a, a very notable form, kind of regal form there. They're very round and part of that is has to do with kind of how they've all done the landscape oaks or the typical species and bur oaks are when we think of when we think of oak savanna and, and part of that is because they've evolved to, to, to grow out of grubs or they can spend a long time underground, they can be top killed, but they'll, they'll keep coming back, so whereas other species will not so fire tolerant in terms of woody vegetation, these persist, but they're also allowing in enough light for that prairie vegetation, that herbaceous vegetation to, to persist underneath. So they kind of have little combinations of, of both woodland or edge species but also those, those prairie species that we, we typically think of.

Megan: I love how you describe them as regal because I kind of think of open grown bur oaks as regal too. I always think of them as like stretching their, their branches out, their limbs out, like they can really fully be all of who they are. Like they're not crowded into a little forest, they can just stretch and reach and just get those magnificent, you know, wide crowns, which - -

Neil: Well, I describe myself as regal often. (Laughter.)

Megan: Oh, goodness. So Becky, give us a little, that was a great summary, by the way, but tell us a little bit about specifically in Minnesota some of the common types of savanna that we might encounter here.

Becky: Yeah. So in Minnesota, we mostly have two overarching kinds of savannas, and it's similar to prairies other than the wet prairie, but we have primarily dry savannas and mesic savannas, and the dry savannas in the north and the south have a mix of plants that are similar to dry prairie, along with these gnarly bur oaks a lot of times they're short and stunted with twisted trunks. Oftentimes they're, they're almost described as looking windswept and a lot of times they're associated with dunes or hills or bluffs, and with these, besides bur oak in southern Minnesota, pin oak is also common in these dry

savannas. And then in our mesic savannas, they're dominated mostly by large bur oaks, and these are those stately regal bur oaks, big open grown structure along with the prairie grasses and forbs and spring ephemerals that grow along with it. With these mesic savannas, many of them have either been converted for other uses or they have degraded so much that oftentimes they're not recognizable as they're trending into more of woodlands and closed canopy forests, and many of our savannas are, are very rare and some of them are even considered globally imperiled.

Megan: And you said something there that I want to make sure you understand. You said that our mesic savannas, so the ones that are in between dry and wet, are degraded. Like what are the common things that are degrading them?

Becky: Often with these savannas besides the conversion to other land uses, because we are not necessarily aware or understand really what a savanna is, they've been left to just sit there. Historically, similar to prairies, these savannas could withstand regular fire and grazing pressure, oftentimes, you know, multiple times of the year for sure annually, and with European settlement and fire suppression, these savannas have sat and degraded over time and the vegetation ultimately converts from a light loving fire necessary, fire-adapted vegetation to a shade loving and fire insensitive vegetation.

Megan: That's a perfect summary. Thanks for that.

Neil: So, so one point I wanted to make was that, you know, while we still see some of those larger oak trees on the landscape, those open grown oak trees that are fairly indicative of what could have been mesic, mesic savannas down here at least in my area. We, we've lost that, that herbaceous or ground layer, so we no longer have the, the dominant grasses or forbs that, that accompanied those trees. So there is some evidence of, of what had occurred on the landscape close to pre-European settlement.

Megan: So basically they were talking about that degradation, both of you are saying this, it's land use conversion or just the absence of natural ecological processes that would be at work in these systems like fire and grazing.

Neil: Yeah. And, and one thing is, is that the rapid pace at which these communities can shift from, from being mostly open oak savanna moving into more of an oak woodland over the course of maybe 20 to 40 years. It doesn't take very long for them to get pushed, pushed to that state and absence of, of their disturbance.

Megan: Nature and prairies are always changing, right, Sara?

Sara: Yes, ma'am.

Megan: I like when you say yes, ma'am. Makes me very happy. The only other quick point I was going to make is Becky, when you're talking about southeast Minnesota savannas, you mentioned pin oak and another one we just want to make sure to touch on is that we also might pick up some black oak and jack pine, believe it or not, in some of those systems in Minnesota, which is pretty eat. We don't, we often think about oak savannas and that's really most of them, but it's interesting that you have a pine species I always think of as highly flammable be able to come in and be the overstory tree in a savanna system, which we also get when we move into southern United States, we'll

see that as well when we talk about longleaf pine, other source of systems that have prairie in the understory. Anyway, waxing on.

Sara: Let's stay in Minnesota, will we, how about that? (Laughter.)

Megan: I mean Minnesota's pretty nice, so all right.

Sara: So those are, those are great, great pictures, I guess. I think you both painted really nice pictures of what, what savannas look like and, you know, what you can expect to see out there sort of why they are where they are, but Greg, I was hoping maybe could you, I know you're a real history buff and always, I always appreciate the sort of big picture that you can provide through that lens, so could you sort of zoom out for us and just give us an idea of the, the role or the extent of savannas historically in Minnesota and, you know, what, what do we have left compared to that, why are they important, why do they matter as an ecosystem that we should worry about? Big picture stuff.

Greg: Yeah, so some of the big picture stuff is where they're at, and I'm going to arbitrarily break, break the statement to three different types of savannas. Probably the first and the biggest is that prairie forest transition that kind of goes diagonally from northwest to southeast Minnesota. There has been a ton of research on the dynamics of that boundary over, over the years. Many, many publications.

Megan: Greg, as you're talking about that boundary really quick, give me some, give me some markers as I'm looking at a map of Minnesota that I can, like any towns or cities that that boundary is close to, or is it right in the middle as you're making that divide.

Greg: I would actually I would say it is very close to draw a line from the northwest corner to the southeast corner of the state, it's going to wiggle a little bit, but that's actually a fairly good probably historic boundary. Then, and the reason I'm going to, I'm going to quibble on your question, Megan, is because, is because we know that boundary probably shifted tens to hundreds of miles back and forth east and west over, over the, the decades and the centuries. A dry period, a wet period, that prairie forest would, would shift and then the savanna would also shift kind of the, the buffer or boundary or ecotone between those two. So that's probably - -

Megan: That's a perfect quibble so I'll allow it.

Greg: Thank you. So that's, that's probably the biggest, that's where most of the oak savanna, especially the oak savanna was. You hear people talk about the big woods area, that was probably mostly savanna kind of around the area in just north of what we today think of the Twin Cities. So western Minnesota dry prairie, eastern Minnesota wet forest, and then the savanna in between. On a regional scale, if you look at a local scale, quite often are savannas around the hilltops, and there's a, could be a couple, couple reasons for that. One thing people have talked about is hilltops have much less grass, therefore much, much, much fewer fuels, and so the fires would not have been intense. I know some of my favorite prairies, Becky and I were playing rock paper scissors yesterday to see, pick who got to pick which is their favorite, their favorite savannas, but a lot of the savannas I'm familiar with are on hilltops. So those may or may not have been a little more stable, I'm not sure I like that word, talking about the

prairie, and then the third place we're out in the prairie where, where you would have seen either forests or savannas would have been on the south and especially the southeast side of a lot of our larger wetlands and lakes. That would have been the fire shadow. Our fires probably would have come primarily from northwest, so the southeast side of our, our larger water bodies, they would have gotten fire, but it would not have been those intense head fires. And again, a lot of the, a lot of the oak savanna that I'm familiar with in Minnesota lines up perfectly, especially the savannas on our WMAs and WPAs, so that, that I kind of visual or virtually walking around the state in my mind, that's where I see a lot of them is coming on the backside or on the fire shadow owe of a lot of those large lakes and wetlands. So.

Megan: And just so folks know, the WMA is Wildlife Management Area and WPA is Waterfowl Production Area. And so those WPAs are managed by the US Fish & Wildlife Service and WMAs are managed by DNR. Just for folks not in the know with all of our acronyms.

Greg: Yeah. And then as far as the importance, I think I could just kind of go back and, and, and kind of touch on what Neil said a few minutes ago in that all, all types of kind of boundary ecosystems, ecotones, you got this really nice mix of prairie species and forest species, so these areas are quite often have much higher diversity than the prairie itself or the forest itself. And so that, that biodiversity is probably one, one reason these, these habitats or ecosystems are, are so important out there.

Sara: Sure, that's a really great point. I like that. And so we talked about, you know, we mostly we think of savannas being oak, especially bur oak in much of Minnesota, but there are a number of other trees that can make up that, that upper canopy. I was wondering if, and this could be for any of you, if you could talk a little bit more about specifically what some of those understory plants would be. I liked that Neil explained it as like a, a prairie with some trees scattered around, but so, you know, what's, what's the prairie component. Are there specific kinds that we see in savannas? Is it just anything you could see in any old prairie?

Neil: I can maybe give a, a few examples. You know, to, to speak on one thing would be other tree species and if we think about as Greg was mentioning, some of that continuum of things like bluff prairies that grade into woodlands maybe on the north or the backside of some of these bluffs towards the top in ridgelines you might get communities of more open grown oak with that understory of prairie vegetation still, but also some things like shagbark hickory and things that are a little bit more fire tolerant. When we look at understory species, some things that typically show up are, are at least in, in my area are species like leadplant, these semiforbs or semishrubs, so things like leadplant, prairie rose will show up, but then we get other things, you know, it's not very shrub dominated in there, but indicators that you might have something would be things like hazel as well. Hazel and some things like that. We do see a lot of snowberry wolf, wolfberry, but then when we look at some of the forbs, we get cool, some cool season grasses, porcupine grass, but also Indiangrasses, and then we get other kind of things like puccoon, hoary puccoon and then you get interesting things that come from the woodland edge like, like hog peanut would be something that typically shows up in a savanna, a savanna-type setting. So yeah, it's kind of a mix of, of things, but somebody

had mentioned some of the ephemerals but other things like full Solomon's seal and things, and showing up in there, so you get this kind of nice mix of, of cool, warm season grasses, but then all these unique forbs. So and then if you actually move into some of the, those oak barons, these black oak barons, these things down in southeast where you might see components of, of jack pine, you, you get things like lupine, wild lupine, and some of the rarer species like seaside three-awn or fame flower and things like that, so there's some, some really unique plants that grow with it but there's also, you know, what we typically think of as more prairie dominated plants.

Greg: Yeah. One, one question I've seen in the literature is both in the world of plants and as in the world of animals is are there species that are unique or specialized to savanna or is the savanna just a mix of species from the two prairie and forest and most of what I've seen people are more coming to the conclusion that it really is a mix, there isn't like a species that you can only find in, in savanna or primarily in savanna and very rarely in the other two, so but the, the story isn't closed on that. There's still people poking around and, and analyzing those plant communities.

Megan: Well, I think too and we talked about this a little bit in our prep, right? Like any time you diversify a community, and so in this case with the savanna you have prairie underneath and then you add mast trees, essentially trees that make acorns, nuts. And so then you're going to have species that benefit from that additional source of food. And so while they might not be only occur in a savanna, they might have an enhanced quality of life if those habitats exist because they've got additional food sources. Basically living their best life in the savanna because they're shade too, which is awesome. This is a really great overview in general of like what makes a savanna different from a prairie and then what might we expect as we're walking in it. So I wanted to shift gears a little bit from the ecology of the site and talk a little bit about restoration. We all know because we have all spent many hours trying to rebuild and restore prairie. It is complicated. It is really hard. And so now we're going to talk about restoring savanna, which I think is even harder because you have all of these dynamics at play of first I have to get my prairie established but now I also want trees in it. Now I have to make sure as I'm applying fire and grazing and all of these things that I don't kill the trees that I want to be my mature shade trees for my savanna. It's this whole balance of techniques and process and it's, it's really complicated. So and you guys have a lot of experience in this, so we want to make sure that we're picking your brains here and really understanding some of the tips and tricks that you've picked up along the way. So we're going to start with how do you know like the very beginning, right? Like I have come to a site, how do I know if I should consider that site for savanna restoration, prairie restoration, or woodlands? What are some of the things that you look for? And let's start with Becky.

Becky: Well, I think one of the first pieces of information to have is thinking about that general map that Greg was describing of, of Minnesota and are you in that, that tension zone, that transition zone area that, that could, could, you know, could host, could support savanna ecosystems within those prairies. So if you're out on a site and you are in one of those general locations, you know, we've, we've talked about those big stately oaks. So depending on where you are and if you've got the, the soil type, so there's the same things that we look at with, with prairie, we can, we can think about with savanna.

Old, old maps, soils maps, GLO or General Land Office plats and survey notes, et cetera, et cetera, these all are helping paint that picture when we're out on the land. So if we have those big stately oaks, whether they're, whether they're filled in with shade-tolerant growth of other trees, if there's a midstory shrub layer, or you see some, some prairie speak, species peaking out, I would say there's a good chance that you are potentially in an area that could be restored to oak savanna. A lot of things that we look for in those oaks besides in, in addition to those open grown low-hanging branches, if, if, if the oaks are, are kind of unhealthy or dying, they may start shedding their lower limbs, they may have grown some healing nubs over them, we may see where some of those oaks have been cut for firewood or to build houses during European settlement, so they can have multiple stems, so those are cues that you're in a savanna area. Again, you can look at the understory vegetation in a lot of these degraded savannas, some of those, some of those key species, some of the savanna indicators may not be present, but if you look at places where roads have been cut or edges of where land use changes occur, or maybe where little patch of sunlight is still flowing in through that closed overstory, you can look for some of those prairie species and, you know, you may have the potential to restore the savanna there. Those are just some of the things I think about when I'm out on the land asking whether it could be a savanna or not.

Megan: Neil, what do you think? Anything to add?

Neil: Yeah. I agree with Becky there on everything she said. It's, it's kind of, you know, in, in a lot of these, these historic savannas, trees, some trees may have been cut, but there's also evidence of these open grown, open grown character of the trees, and a lot of the tree spacing might still be there if, if the main, the main driver of that current state was removal of disturbance, removal of that disturbance regime and that, that frequency and severity. So in some cases, it may be that the savanna is still there. In some cases, your site might not historically have or really have been able to support savanna. I mean, really, it comes down to what was the historic disturbance where you were and is, is that, is that something that can be reintroduced to that landscape. So we look at these oak savannas as being reliant on, on fire and a frequency and a return interval that, that supports that vegetation and that community. We, we wouldn't go through and oak savanna in a floodplain if it's not going to receive the appropriate disturbance at, you know, while fire might come through periodically, it might be at such a long return interval that it, it, it's not going to support that community is going to shift towards more of a closed community or something else, so yeah, I think there, there are indicators species that we can look for, there's land forms and soil types that we can look at that would support our decision making, but also, you know, as that disturbance historically there and can it return. The other thing would be is I'll give a plug for DNR Land View and using some of the 1938 or historic, historic aerial photos that are available online too. And sometimes you can pick out the trees that were there in '38 that are still there on the landscape and help kind of cater, cater your approach towards restoration.

Megan: Absolutely. And I like that you both mentioned the history of the land and also put in a plug for the current state of the land, right? Like we're, we all know this, we're not going back to a fixed point in history, we have to operate with what we have now and what we might think if facing that piece of land right now, so I also like to look at okay, historically what's going on, but then also what's the current situation today and

how much time, energy, and resources do I have. So and everybody's nodding, you guys can't see that because it's an audio podcast, but I promise you it's happening. So but it's just one of those things like maybe you're at a point where the understory is gone, the bur oaks, while you can tell that they have those big, wide crowns, they pretty much filled in to a solid bur oak forest, and they've closed that canopy together, and so the question then is, you know, it's, there's not necessarily a wrong answer here, I guess is what I'm saying, but you have to ask yourself as a resource manager or a landowner, do I have the energy, time, and resources to thin this stand, to bring the prairie back here, and if you're me, my answer is yes, but you may not, and that's okay. Like we need to make space for that change that happens with land as we're looking at restoration and how we connect the landscape, so and, and Greg has comment here.

Greg: Yeah, and part of that is like I said, these, these transitional areas are so dynamic that, we don't need to go all the way back to the glaciers when mastodons were running around. But even go back the last 300-400 years, you know, pick a point on the map and I can probably find a decade if I had my way back machine where that was open prairie savanna and closed canopy forest. So arbitrarily pick which one you want. I say arbitrarily somewhat facetiously. The other thing that I know is getting a lot of attention these days when it comes to restoration is in the context of climate change. So we just mentioned going, we're not going back in time, we may want to be thinking about going forward in time. And, you know, should we be restoring any habitat that we know the climate is going to not favor in, you know, 50 to 100 years, and then on top of that is as we've said is the management is yeah, if you don't think you're going to have the time, staff, resources, etcetera to, to manage that land to get to that particular desirable endpoint, things to think about.

Megan: Well, and I like that you said what, when you were being facetious and talking about arbitrarily, I mean, really what you're talking about is what you said right at the beginning is that they're dynamic systems. And so we can restore something to a savanna but we know it's constantly going to be in that transitional state of change where depending on the management that's applied, they're either leaning more towards the prairie or they're going more towards an oak woodland. I mean, that's the nature of being in transition, like nothing stays the same. And so hopefully we're not confusing you. Basically, we're saying you have options. You got choices and the land is going to tell you things about what was there, what is there right now, what might be able to be supported in the future, and then you just have to make a decision. And even if you choose oak woodland or you're going to take it to a prairie or a savanna, you're probably all right because somewhere along the way there's going to be different decisions that are made that will push that community either one way or another.

Neil: Can I piggyback on Greg there? Yeah, and I think if we look at it, you know, at a longer time scale, you know, 8,000 to 3,000 years ago, we would see that and, and up to the present, we've had iterations of everything like Greg said. We've had forests here that succeeded to oak woodlands that succeeded to prairie that's, you know, come and gone a little bit over, over the, the centuries, and, you know, it's not like we pick one spot. The climate's going to change and the climate's going to have some dictation as long as we allow things like fire to occur on the landscape as to what the assemblages of these species are and, and when they're occurring and where they're occurring as

well. So it's, yeah, it's, it's evolved over, over the centuries, so and it continues to evolve.

Sara: I really appreciate that long view and I think that's, I don't have a lot of savanna in my work area, so tell me if I'm wrong, but I feel like that might be an extra important, it might be extra important to, to really think hard about what you want to do in some of these locations that, you know, maybe could support a savanna just because if you want to plant the little baby bur oak tree and hope that it becomes one of those regal masters down the road, that's going to take a long time, that's a long commitment as compared to restore a totally herbaceous prairie system. You know, there's maybe a little bit more give in your timeline and in managing sort of early successional plant community like a prairie, so I just like that idea of really being thoughtful about what you want to have and what makes the most sense for any given piece of ground, and I think that makes a lot of sense to me, so.

Greg: And Sara, I don't meant to just - - but we, we, we, you know, we talk about these long timescales. If you look at the literature, they talk about prairies converting to closed canopy forests and as much as in as few as 30 years, as soon as the euromerican settlers came in and basically stopped the fire regime. You know, for, yeah, Sara, as you just said, you don't have much savanna in your work area. Becky's work area, though, just a few miles north of Detroit Lakes, there are all sorts of signs out there about where the, the prairies meets the pines and the prairie to pines to prairie birding trail, that transition especially there kind of in Becker, Mahnomen County up into Polk County, that transition belt is really, really narrow. So you can have really, really fast shifts over the course of years to decades, we don't need to talk about centuries and millennia when we're doing this, so yeah, there are parts of the state where those, those transitions can probably happen and probably did happen historically very quickly.

Sara: Well, let's shift gears a little bit and talk about some of the nuts and bolts, and Becky, I want to ask you this question just because my, my friend to the north who does work with a lot more savanna, and I know I've asked you these questions before this, too, before this podcast, but, you know, so, so we say we do all that hard thinking and, and long-term thinking and decide yeah, okay, this is a place I want to try to establish a prairie, can you talk through just some of the, you know, like I said, more of the nuts and bolts sort of steps that you take in initiating a, a savanna reconstruction project and, and maybe as compared to a prairie, prairie restoration?

Becky: Well, I will start with saying that we should maybe land on terms a little bit as far as reconstruction I haven't reconstructed a savanna when I think about reconstructing something. It's from scratch and we talked about everything that goes into maybe reconstructing that savanna from the ground up and, and literally like planting the acorns and planting the trees. I have no, I don't, I don't have any, any experience in that right now at all, and I don't necessarily plan to because of some of the things that we had talked about, but when restoring savanna, again, it's back to, you know, walking the land and really listening to the land, and I like how Megan put it. I mean, the land is going to tell you what it should be. Up here, I'm, I'm fortunate. We, we have a lot of those stately oaks that are still present on the landscape. We've got a good feel of where our savanna restorations, where we have that potential to, to, to save that, that

savanna in some of these locations. Our savannas here, you know, range from those oaks with, with really no pressure in the, in the midstory with shrubs or a canopy of, of shade and tolerant or shade-tolerant trees, just a really degraded herbaceous area to, to that ladder where the canopy's all filled in and we have you know, box elder and aspen and, and some other trees that have, have been able to take over. The first thing I think about, and we've talked about the importance of space and we've talked about the importance of light in these oak savannas. These are sun-drenched communities. They need light. And so first things first, I would look at those bur oaks and look for that structure, that, that is like the backbone of the savanna. It's not the most necessarily the most important component of the savanna, but it's the backbone of the structure of the savanna. So when we restore savanna and we have the, the shade-tolerant, you know, shade-loving fire-insensitive trees, the first thing we do is remove those trees. The light needs to penetrate the ground because right now the only light that's reaching that understory is in the springtime when there's no leaves on any of those trees, right? And that's not going to produce the type of herbaceous community that these savannas once supported. But you have to be careful because when you remove these trees, that light all of a sudden floods into that understory and we all know what typically happens. You're going to, we'll probably get a, a, a big flush of noxious weeds, invasive weeds, maybe some weedy or some weedy natives, but likely it's going to be all nonnatives. So then it's just about kind of, you know, then it's taking it slow, and, and slowly reintroducing fire, you know, thinking about whether chemical is, is something that you want to use to combat some of these nonnatives. I know some folks use grazing to bring back those herbaceous communities. Of course, a shrub, a midstory shrub layer is going to potentially be problematic especially if it's nonnative. So it's going to be a long battle. But, but allowing that sunlight to penetrate that understory to me is that, that first important step. And then you can start managing and restoring it like we do our, our tallgrass prairies or our, you know, with fire and grazing and, and other treatments.

Megan: Neil, what do you think about that? So Becky was describing kind of like I already have my trees, and so now I need to figure out how I'm bringing my understory layer back. Is that most of the savanna restorations that you encounter or have you done any where you're starting from scratch?

Neil: In general, we, we're similar to what Becky is doing. I mean, we've got the, the structure is there in a lot of cases in terms of the, the trees and, you know, if you actually go out even in some of these savannas that have succeeded in the oak woodlands and have grown in, in some cases it's, you know, the, the trees will tell you their spacing in a lot of cases. So you can go in, remove some of those more mesic or less fire-tolerant species that have grown in like weeds. What we usually end up also having to contend with is as Becky pointed out that, that mid shrub layer, which in my area ends up being a lot of buckthorn or honeysuckle. And then we end up doing a lot of either handwork, mechanical work, just to try to, to bring that down to a level. There's often some form of herbicide treatment follow-up, whether it's cut stump or fully retreating resprouts if necessary. You know, ideally reintroducing fire into that landscape as soon, as soon as it'll carry is, is going to be pretty critical and, and that'll do is allow you to, that's just a, a very cost-effective and useful management tool. It's the natural disturbance regime. And then, and then kind of what we look at is, you know,

do we need to reduce some of the, the oaks due to just how, how dense they become in there, and a lot of people get reluctant to start culling oak trees, but, you know, in order to get the structure and that light availability down to that ground layer, you're going to need to suck it up and, and remove some of that. And some of these oak trees that have, again, they've, they formed from grubs, they can be cut, they'll regrow, fire is keeping them in check. Their, their belowground structures might be there for a century, you know, getting large and large and large and just hanging out down there waiting for us to stop, you know, burning the landscape or grazing in certain areas, so it may be down there, they may be present, but you know, that community and, and that, that character and, and that, that ground layer is, is kind of the result of that disturbance and I think when folks can do a combination of more intensive management up front and getting fire out into the landscape, that's really where you, you can kind of start to accelerate some of, some of that management, but I wouldn't, as a practitioner, I wouldn't, don't rush, you know, and don't have your expectations set, you know, too narrow and expect to see results right away. Becky pointed out usually you see weeds your first few years, and that is usually what comes up, so or you let light in and all those robins have been pooping out buckthorn berries under your, you know, your big oak trees for however long and you just release all that, so it's, you know, expect some, some prolonged effort, but it's worth it.

Megan: I never had someone, you know, paint robins as the villain of their story, so (laughing…) what you know,

Neil: [says scientific name] *Turdus migratorius.*

Megan: - - you know, you usually just hear these nice like they're the harbingers of spring - -

Neil: Yeah.

Megan: - - but in (laughter) but in Neil's world, he does not appreciate it. (Laughter.)

Neil: I can hear the berries dropping now.

Megan: You can hear the berries dropping. Oh, man. A few things that I want to follow up question ask, wow, that's a weird way to say, follow-up questions I'd like to ask is like I said, the whole sentence in reverse. It's mostly about how do you manage tree regeneration basically you're both describing these situations where you have these beautiful, mature trees, and you're basically figuring out what do I need to thin here to maximize my light. But what about do you let nature kind of plant those seedlings for you, or are you actively going in and trying to plant and protect some baby oaks so that you know that you're going to maintain that habitat through time? Because we know that's, you got to have different age classes in there if you're going to continue the savanna journey.

Becky: I'll start with that. We have I think I've already said it but we, I have not ever planted oaks, but it's important to remember that oaks are also sun-loving plants. They need sun in order to regenerate. And so until you open up that, that ground layer, open up that canopy and allow that sun to penetrate that ground layer, those oaks and those, and then the, the, the acorns, you know, there's not going to be any regeneration until

you do that. So, so that's one important thing to remember. We've gone as far as in our savanna restorations when we still had contractors or been out there, you know, spring some of the noxious weeds after, after the, the first, first run through of, of tree thinning is we've gone as far as protecting those young oaks. We've been lucky enough in most of our restorations that we still have active regeneration. But we do protect, you know, we will, we will mark them, we will keep people out of there, we don't, we don't protect them from being depredated, you know, or predated maybe is the better word by a deer or mice or voles or anything, but we do.

Megan: So basically be eaten by those things.

Becky: Yeah, yeah, so we don't keep that from happening necessarily but we do keep them from being trampled from human disturbances if we are actively restoring because that is, that is, you know, your next generations of, of oaks as, as those older, older oaks start, start becoming unhealthy and, and dying. You know, you, you do want many age classes in there.

Yeah, for us, we, we get a lot more cases where we do have some natural regeneration, and usually it's advanced to the point of, you know, these, again, oaks are adapted to, to be burnt, to at least, you know, especially bur oaks, but pin oaks as well to some degree, and white oaks, and things, kind of grades down, but, you know, they're adapted to persist under the ground, you know, after being burned, so they can still, they can hang on, so even though their top is lost, they can hang on. So we end up with a lot of these once fire was taken off the landscape and fire prevention became really prevalent in the '20s and things. We had some hanger on oak trees and they were to a point, I think it takes 12 years or so, 10 to, 10 to 15 years maybe for 10 to 20 years for oaks, bur oaks to become more fire-tolerant where they're not just getting completely top killed, and so we've got those kind of shrouding these larger grown oak trees, and, and we're able to kind of selectively maintain some of those. So we're getting that recruitment in, we'll get a next, you know, a next cycle of oak trees that will, will come up and, and support that community, but we're, we're kind of able to also make the commitment to, to reduce a few, so we're not getting a growth form that is, you know, taller than it is wide substantially or a closed, a closed stand growth form. And again, I will say that it is hard for a lot of folks to say I want to go in and cull out a bunch of oak trees just because it's there's I don't know it's sentimental maybe.

Megan: Well, it is hard because, you know, they've just taken so, we're connected to everything and I think we tend to feel that with trees because we can feel how long they've been living that life and so it, it is difficult sometimes to make those management choices. But a good target to sort of keep in mind, we get this question a lot, you know, how many trees per acre in a savanna, and you're really only talking about 11 or 12 mature trees per acre, which is always a shocking number to because they're like 11, you know as they look at this area where they've got many more trees than that. That doesn't mean there's a spectrum there, right? Like there's a spectrum with how far you want to push towards the, the shadier side towards the more woodland side, or if you want to push back to a prairie. But if we're talking about, you know, real savanna with lots of light and big gnarly, beautiful oak trees, we're really, it's a pretty

small number of mature trees that we're looking at, and so just like Neil said, it can be tough to make those, those choices.

Neil: Yeah, and it's not really agreed upon what, what tree density and what canopy closure constitutes a - -

Megan: Absolutely.

Neil: - - and so it might vary by state, by researcher, by practitioner, you know some estimates were as low as one tree per acre.

Megan: Right, yeah.

Sara: And it probably is just part of that transition, right? Like it's, it's a, we'd like to draw neat little boxes and make things straightforward and yes or no kind of answers, but we've talked all through this whole episode about how oak savannas are this transition between more, more woodland communities and so Neil and Becky, you both talked a little bit about just the level of patience that's needed for someone embarking on a, a savanna restoration or a savanna reconstruction, so I was just wondering if, if either of you have any other advice for a, a brave manager who's thinking about taking on a project like this. Becky, why don't you go first if there's anything else that you think about.

Becky: I would just again recall that these are transitional very dynamic types of systems, and to take it slow. If anything, and if you have the luxury, you know, play around with, with starting at a, a smaller chunk of, of a savanna just to see how things respond because there are going to be times where you may, you may go too far and then not be able to continue that management, or continue that management on an interval that you need. So if you again, if you do have the luxury not a lot of times we do in inland management, I mean, if we have a, if we have a site and we have money to restore savanna and we have a, you know, we have the ability to take down 15 acres of non-bur oaks, it's going to be a lot of work to follow up, so just plan ahead and go slow if you have to take a small amount at, at a time, and then monitor.

Megan: Was that your monitoring voice, Becky? Because it's real good.

Becky: That was my monitoring voice. Monitor.

Megan: Really it's frightening, as opposed to absolutely necessary to know what's going on. (Laughter.)

Becky: It might be frightening if you don't monitor. If you monitor, it's a way to go.

Megan: I like it.

Becky: Ease and be more relaxed. And understand what's going on.

Megan: I like it, and you can change it to monitor. (Laugher.) Neil, how about you?

Neil: I would just say, you know, look at the resources that you have available to you. You know, not everybody has the, the, the same capacities to get some of this work done, and, and, and scale your project like Becky said, scale it accordingly and, and try

to monitor, but yeah, temper your expectations as well. You know, it's not, it sometimes you have a seed bag there and you're surprised at other times you, you know, you need to look at what you're starting with and, you know, what, what you have your disposal to, to do it with. You have the equipment, do you have a budget to do it with, it's going to be multiple years, so I mean, just be realistic and yeah, just take a look at what you have at hand and plan accordingly.

Megan: Nice. Greg, you literally wrote a book on prairies, so what do you think are the most important things we should know when we're thinking about savanna restoration?

Greg: Yeah. Thanks for mentioning the book. So when I, when I started this book, it was, it started out this really nerdy science-y plant community dynamics, chaos theory, et cetera. And what it kind of turned into over, over the period of writing was the role that people have in natural systems. And I tried to make the argument that probably people play a bigger role in the prairie than arguably any other ecosystem in North America, and I'm going to lump savanna in there. So restoring, managing prairies and, and oak savannas, it's probably the best example out there of how people and natural communities can work together to do really interesting and really productive things, and I just, I'm not sure there are any other habitats in North America that we can say that as clearly as we can with, with tallgrass prairie and savanna.

Megan: And just for those of you who are like a book, I love books. So Greg's book is called To Find a Pasqueflower: A Story of the Tallgrass Prairie, and it came out in spring 2022. Ironically, it was published by Bur Oak Books, and it's no accident that we're talking about savanna today with a bur oak species. Greg has also written several other books as well, Booming from the Mists of Nowhere, Sky Dance of the Woodcock, arguably one of my favorite birds, and With Wings Extended. So if you want to do a little light reading, here's a few good ones to try. Neil, you were going to jump in and had a comment quick.

Neil: Yeah, it was just back to one more quick comment on, you know, what, what people can do and, and what they should expect. I, I think one real important thing would be is if, if you have the ability to do it is get fire, return fire to the landscape, that's going to, again, it's one of the more cost-effective things if you can start to implement it. If you've got the fuel, fuel base there, you know, I want to give a plug to fire, that was it.

Megan: I like it. Well, there's a lot of things that happen when you bring fire back, so that just happened for you, like you're describing. I always, Sara, we always get to this point of the podcast and I want to do six more podcasts about savanna because there's so much to unpack, so this is basically just a, a little beginning primer on it, but we have got to move 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, and Becky, we're going to start with you.

Becky: All right. Well, the paper I chose for today is out of Bioscience. It's from 2008, and the title is The Demise of Fire and "Mesophication" of Forests in the Eastern United States by Nowacki and Abrams. And this is a really interesting publication. It's, it's where the term mesophication was first coined, and it's a really interesting explanation of how the suppression of fire over time has really caused that change in vegetation in our savannas and, and our prairies and even our woodlands, so that with the lack of fire, these shade-tolerant plant communities start to dominate, and then it becomes even harder to reintroduce fire because the microclimate has shifted so much to more cooler and moister conditions. Highly recommend.

Megan: And you got a second pick too that's in the progress, not yet published, but we want to let people know about it.

Becky: Yeah. Really quickly, right now the, the, there's a small team at the U.S. Fish and Wildlife Service, the U.S. Forest Service, and the United States Geological Service that are working on a protocol for monitoring vegetation of oak savannas and woodlands in the Upper Midwest, and so this protocol will be really helpful. It gives both quantitative and qualitative types of methods so that you can measure really important characters of a savanna in progress of being restored, and we hope to have it released sometime this spring.

Megan: And let us know when you do, and we will put that up on the website.

Becky: Thank you.

Megan: Greg, what's your pick?

Greg: I'm going to go historical, and I'm, I'm going to, I'm going to bookend Minnesota, and so the first one I'm going to mention is John Weaver Prairie Plants and Their Environment, which is kind of one of the classics of prairie, and then the other one I'll mention is John Curtis' Vegetation of Wisconsin, which really hits, oh, did I steal yours? I'm sorry.

Neil: Thanks, Greg. (Laughter.)

Greg: I'm just going to do - -

Megan: Neil was holding up that book to the camera, which of course, you guys can't see, but it was a little bit funny. That's okay. You can, maybe you like it for different reasons than Greg does.

Greg: I'm, yes, so I'm going to, I'm just going to stick with Prairie Plants and their Environment then. And the reason I like this is, is John Weaver is one of, kind of one of the godfathers of, of, of the prairie, did all his work in Nebraska primarily during the, the '30s, the, the drought, dirty thirties. A lot of what he says is still absolutely relevant. A lot of the science from what he says has actually changed quite a bit. So it's, it's, it's really interesting to me to see what still rings true and, and what sounds a little dated in, in the work that he was doing now almost, almost a full century ago, so I, I, I find it very interesting for, for that reason.

Megan: Neil, go ahead.

Neil: All right. Well, yeah, I, I had chose the Vegetation of Wisconsin by John Curtis, and like Greg said, it's, it's a bit on the historical end, but it's also great descriptions of native plant communities and Wisconsin that carry over into Minnesota. It's just a lot of good, natural history in there with some excellent historical accounts of, of, of this area around the time of European settlement. And it just gives us a good window into some of these, these plant communities and the, the dynamics that, that kind of help shape them as well as the species composition of, of some of them. So yeah, that's, that's all I have. I, I like it for reasons both ecologically but also historically, so it covers both.

Sara: Fantastic.

Megan: Hey Sara.

Sara: Yes, Megan.

Megan: Why don't you take a hike?

Sara: Only if you come with me.

Megan: Okay, deal.

Sara: Bring snacks. (Laughter.)

Megan: I knew you were going to say bring snacks. Why wouldn't I? Wouldn't be a hike with Megan and Sara if there weren't snacks. (Laughing) Let's all hike together. So Becky, where are we hiking today? Tell us about a beautiful prairie place?

Becky: Yes. We are going to take a hike to Rushfeldt Waterfowl Production Area in Clay County, and this is one of my favorite WPAs that, that are managed out of our office, and it's 650 acres of hills, of grass, and bur oak savannas, and wetlands all interspersed. And we have a hill that we've loving named Oak Hill, which has this big, beautiful bur oak of just over 91 centimeters diameter at breast height, or DBH, which is our standard way of measuring trees, and it's been dated to pre-1858. And it is the most gorgeous oak specimen I've seen, and although the prairies degraded, we're starting to slowly yet surely restore that savanna.

Megan: For those of you who can't see Becky right now, which is all of you listening, I particularly appreciate how she's describing because her hands and her shoulders are just getting so excited as she's describing the, the oak. A lot going on over here and I love it. You could tell the joy is just radiating from you, Becky, when you describe that place. Greg, where are we going?

Greg: Okay, so Becky stole my favorite savanna too, so I'm, I'm going to go to my second favorite savanna. So going heading south just south of Madelia or just west of Mankato, the Watonwan Waterfowl Production Area down kind of just a little south of where Megan is has some, again, just as Becky said, some beautiful wetlands, some native prairie, and this gorgeous oak hilltop, which I know the Fish and Wildlife Service did a pretty significant amount of work on about a decade ago, and they've continued to burn it and keep on it, and yeah, that's, that's my pick.

Sara: Neil, where are you taking us?

Neil: I'm going to head down southeast to Moore County and Rushford Sand Barrens SNA, which is more of a, an oak barrens type community with a lot of interesting species, much sandier soils, you got some of the bluff, bluff prairies in there, and it's just a, you kind of get the, the spectrum down there, the gradation of various plant communities that, that grade from those sandier tows of the slope, and you can just kind of walk through and get a picture of just about everything in there, and it's fairly close to some of those, those black oak jack pine type savannas as well, so do have little bits of jack pine down in that area as well.

Megan: I was thinking about hiking to all these places. They're just, I just love, part of the reason why I love this part of the podcast, lots of alliteration here, but I really do because people just, you just all sound so happy as you're describing these places, and you can just tell that the value, it runs deep, like we're just deeply connected to nature, and I love how that comes out when people talk about places that are meaningful to them.

Sara: It always just makes me feel so lucky that we live and work in this state and with all of these people who are so passionate about the lands that they manage and, and love and, I agree, one of my favorite parts of the podcast as well.

Megan: Same, same. Well, the podcasting doesn't end here. Catch us next Tuesday on Prairie Tuesday where we'll be hitting the hay and chatting with two awesome DNR scientists, Dustin Graham and Fred Harris, as we learn from them about their research on haying prairies as a management tool to tackle invasive cool season grasses and promote overall prairie biodiversity. What the hay. That's just what we're going to find out. So as always, you can find all 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 South Region under the Minnesota Prairie Conservation Partnership. It was edited and audio engineered by the fantastic Dan Ruiter and our web production team was led by Bobby Boos. All right. We'll see you all next week. In the meantime, keep cool in that shade.  (Laughter.)

Sara: Bye.

Becky: Bye.

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