

University of Minnesota Nutrient Management Podcast Episode “Part 1: Soil and nutrient loss in southeast Minnesota”

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(Music)

Paul McDivitt: Welcome back to University of Minnesota Extension's nutrient management podcast. I'm your host, Paul McDivitt, communications specialist here at U of M Extension. Today we have a special episode of the podcast. Extension educator Greg Klinger will facilitate a discussion about the Root River Field-to-Stream Partnership in southeast Minnesota. He is joined by Kevin Kuehner, from the Minnesota Department of Agriculture, and Ron Meiners, retired Root River Soil and Water Conservation District Manager. Greg, can you tell us a little bit about yourself and the partnership?

Greg Klinger: Sure. Thanks Paul. I'm an extension educator at the University of Minnesota. I really focus on nutrient management in my work and especially on how different nutrient management practices on farms can affect water quality. And I also live and work in Rochester in southeast part of the state. For anyone who's listening hasn't been down to this southeast corner of the state, I'm pretty biased, but I'd say it's a really special area. We have lots of big hills and bluffs, sinkholes, caves. Also have lots of corn and cows as well. And we're lucky to have some of the most agriculturally productive soils in the world really. But our soils also tend to be both highly erodible and our groundwater is unfortunately fairly easily contaminated. Which really brings us to the Root River Field to Stream partnership.

Greg Klinger: A little background on this project and our guests can correct me if I missing any of this, but since around 2008 our guests today have been monitoring the water quality of streams and ground water in these three different fairly small watershed areas that are located within the larger Root River Watershed that's in the southeast corner of the state. And they're looking at things like soil, phosphorous, nitrogen, moving through those watersheds. Now at the same time as this water monitoring has been ongoing, our guests have also gotten to know just about every farmer that farms in those small watersheds, and I've worked together with them to see if there are any management changes on their farms that they can make that might improve water quality in their area.

Greg Klinger: And this project is, it's really quite unique, certainly in Minnesota and perhaps in the country. Because it includes almost a hundred percent of the farmers and the acres within those watersheds. You get to see not only, okay, what the current impacts are from agriculture in those watersheds, but also how

those impacts change both over time and with changes in how the land is managed. And because of this project we all have a better sense now of where we're at in terms of nutrient and soil losses from agriculture. And also how soil, phosphorous, nitrogen can move from farm fields in some pretty unexpected and surprising ways. So we'll discuss some of that today.

Greg Klinger: All right, guys. Want to introduce yourselves?

Kevin Kuehner: I'm Kevin Kuehner and I'm with the Minnesota Department of Agriculture and based in Preston, which is about four to five minutes south of Rochester. And grew up in northeast Iowa, a dairy farm, and been working in soil and water conservation and water quality work for the past 20 or so years. And in my current position with the Department of Agriculture, I'm a hydrologist. And I'm in the clean water technical unit. So, a lot of the work that we do is working with farmers, crop advisers and other partners to better understand practices that can improve water quality. And a lot of our work is on farm types of demonstration work and the Root River Field to Stream is a good example of that.

Ron Meiners: I'm Ron Meiners. I'm a lifelong resident of southeast Minnesota. Grew up farming and we had an active beef and hog farm down in southeast Minnesota. And so, then I took a job with the River Soil and Water Conservation District about 25 years ago. And worked there until retirement and then took this private contracting job with the Department of Ag working on the Root River Field to Stream project. And so I'm, I guess I'm busy with this project and I've enjoyed the project and look forward to seeing the outcomes.

Greg Klinger: Great. So, I think the first thing I'd be curious to hear about is how this project actually started.

Kevin Kuehner: Yeah. So, this project started little over probably about nine years ago or 10 years ago now. We, basically a small group of us got together to help answer some very basic but important questions about water quality here in southeast Minnesota. And in my years of working in various watershed projects across the state, one of the first things when we start to engage farmers on some of these water quality challenges that we have is, there's a lot of very important questions that arise during those discussions. And one of them being just, what are the relationships between agricultural practices and in water quality? How much soil are we losing? When are we losing it? And so, looking back about 10 years ago, we didn't really have very good answers to those questions. And so, this project really came about as a need to provide additional science-based information and helping provide some of those answers to those, to some of those questions.

Kevin Kuehner: It's unique in that it's made up of a lot of different groups, both private and public. Ranging from the various state agencies, University of Minnesota and Extension and Department of Natural Resources, pollution control agency, water, water and soil resources to of course our farmers here and and local soil and

water conservation district offices. And then we also the Minnesota Ag Water Resources Center, which makes up, represents a lot of the, most of the commodity groups here. Minnesota has been a valuable partner and we also have the nature conservancy has been a part of this from the beginning as well. So, but really the ultimate goal when we started this back 10 years ago was to really focus in on three main questions. The first question was just simply what is the range of sediment and nutrient losses coming from representative farming systems and small watersheds here in southeast Minnesota?

Kevin Kuehner: Number two, the second question we had is how effective are existing practices that farmers are using and new practices that farmers are employing on their farms? And then the third and last question was more of a longterm question, but just to try to answer this question about what are the longterm trends and relationships between Ag practices in water quality. And so, with the way we organized the study is to basically break it into three main phases. So, the first phase is an eight year, what we call a benchmarking or baseline period, which is just to answer the question, what is the water quality like today? And we just recently completed that phase of the study. The second phase of the study is to work with farmers and landowners within these particular study areas and to target additional practices and to see what effect that may have on the water quality. And then the third phase is just to continue the monitoring to measure the performance of those practices.

Kevin Kuehner: The way that we kind of designed this study was to, selected the Root River Watershed, which is a very large watershed. It covers over a million acres and in southeast Minnesota, covers, spans six different counties. And it's a very large complex watershed. And probably one of the more complex watersheds in the state. And the reason for that is because of the geology that we have here with the thin soils in over fractured bedrock. But we also have areas of the watershed that benefit from subsurface tile drainage. So we have kind of a mix of both poorly drained soils and very well drained soils. And we also have, we get the most amount of precipitation throughout the state. So, runoff and flooding and movement and transport of nutrients and other contaminants is of course a primary concern for residents down here in southeast Minnesota.

Kevin Kuehner: So, because of the size of that watershed over a million acres, what we did is we selected three very small sub watersheds within the greater Root River Watershed that represents each of these kind of unique landscapes.

Kevin Kuehner: And so, starting from the west to the east, over in the Mower County area near the headwaters of the Root River, we selected a small watershed, what's represents what we call the glacial till area. And so, this area basically is a very, this area is basically relatively flat. Typically less than 2% slopes. The area typically has a very poorly drained soils, so they benefit from subsurface tile drainage. Typically a corn, soybean rotation, average field size is about 140 acres over in that area. Not as much livestock production, typically just commercial fertilizer in that area.

Kevin Kuehner: The second watershed that was selected represents what we call our karst area, and that's an area that would basically kind of be the corridor along Highway 52 if you're familiar with that. In the southeast corner of the state. And this area is a, again, a small watershed less than about 4,000 acres in size and a good mix of corn, soy beans and alfalfa and also a mix of both hog and dairy production in that watershed.

Kevin Kuehner: The last watershed represents the bluff land area and that's closer towards the Mississippi River. And it's the, very similar to the karst, it's just that we have much deeper topography, smaller field size, and kind of a little bit more mixture of alfalfa, small greens and then also more forested area over in that location. So, I always kind of use the, the roads Highway 63 again kind of being the corridor in the far western part of the watershed being the tail. Highway 52 being the karst area. And then Highway 43 being the area that represents more of our bluff land area.

Greg Klinger: Great. I'm also curious, these small watersheds represent larger areas, a very horizontal, a very flat landscape. I always describe it as going from horizontal to vertical depending on where you are in the watershed. But a flat landscape in the west, it's much larger than this small watershed to a more forested steep landscape in the east, which is again much larger than the study area. So, what I'm curious about is how did you end up picking or falling into specific watersheds to do this study versus other ones that are equally representative of that particular area?

Kevin Kuehner: Yeah, so how these study watersheds were selected were really based on a couple of main criteria. Number one, they had to be a relatively small size. We were shooting for less than 5,000 acres. And the main reason for that is when you're conducting a water quality study, you want to try to minimize the amount of variables that are involved. And so, smaller is better that way and plus it's just more manageable working with a smaller group of farmers rather than a much larger group of farmers. And the other factor was it had to, we had to be able to monitor it. And not all watersheds you can actually monitor because we have to have access to the stream itself or the outlet of that watershed where all that water, it gets collected and conveyed. And so, we have to, usually have a road access with the culvert that we can actually measure the quantity of the water coming out of the watershed so we can actually calculate how much, how many pounds or mass of sediment or nutrients are coming out of the watershed.

Kevin Kuehner: And then proximity to Preston was another factor. We didn't want to get too far away because just logistics of getting samples to the labs. But out of the, I would say probably 30 or 40 potential watersheds, it really narrowed down pretty quickly based on those criteria. And there's probably only maybe 10 that we could actually select. And these happen to be the watersheds that met a lot of those criteria. And we really didn't know any of these landowners to start with. And so, we were kind of really starting from a blank slate and, but the other

really critical factor was that it had to represent what we felt was representative each of those unique landscapes, the till, the karst, and the bluff land.

Kevin Kuehner: And by doing that, even though these watersheds represent only less than 1% of the area of the whole entire Root, by strategically selecting these watersheds, we can take what we're learning from these and then apply it to other very similar landscapes throughout much of southeast Minnesota. So, for instance, the Cannon River Watershed to the north, or the Zumbro, that have very similar landscapes and farming systems, we can apply these data to those areas as well.

Greg Klinger: So, I guess another question I have about this initial process of setting up this project, how did, actually, let me take a step back and rephrase that. It's very unusual to get everyone that lives or works in a specific area to all agree to something and that goes beyond farming to just anything, right? So, I'm curious what the process was by which everyone came to the table and agreed to work together on this project.

Kevin Kuehner: So yeah, I'll kind of provide a little, I guess a background on that. So, when we first started this project one of the first things we did was just, we had an informational meeting for the farmers within each of the watersheds back in the fall of 2009. And we really just wanted to run this project past them, and talk about the monitoring and what we wanted to do with that and really garner their input. And make sure that they were comfortable with what we were planning on doing. And in our conversations with some of the farmers in those watersheds is that it was very rewarding to just hear their genuine curiosity and their genuine interest in this study. Of course there's always going to be some reservations. I think for many of us that might partake in a project like this in terms of what are you going to do with the data?

Kevin Kuehner: How's it going to be used? Is this going to result in additional regulations or additional enforcement? But always from the beginning we really explained this project as a way to really help us all understand and learn together through this process of really, help address some of these questions about runoff in southeast Minnesota. And also address some of their questions about, again, how effective our existing practices, and what is it going to take to reach some of these water quality goals that are set forth throughout the state. So, I think the process of installing monitoring equipment at both the watershed, small watershed scale but also at the edge of field scale was really important. And over those eight years of doing that, we've all learned a lot through that process. And that kind of I think provided the foundation for the next phase of the project, which was to work with farmers within those watersheds to implement additional practices.

Kevin Kuehner: And one of the key things that we did is we, within each of those watersheds we had what we call water farmer leaders. And typically most of these cases are, these are the farmers that actually we have edge of field monitoring taking place on their farms. And so, they of course have intimate knowledge of all the monitoring that is going on and they know exactly some of the numbers that

we're seeing. And so, they've been very big advocates for the project itself as they've gone along, through the project. And that I think really lended itself well and complimented to that second phase of the project, which is to conduct walkovers, which is what Ron was hired to do. And so, through those meetings, frequently we would meet probably at least twice a year to go over data and review information. And that process led to sort of developing this walkover approach.

Ron Meiners: I'm glad that question came up because the land owners in these watersheds, you know, are significant stake holders in water quality issues. And I would use that to my advantage when talking to these landowners and made them feel like a part of a group. Everybody had a little bit to give here to make this project work. And I think that even led to a lot of the projects going in that they felt like they were all contributing and they all worked together on this. And when they saw their neighbors implementing a new conservation practice, I think that just led to more and more and more. And they wanted to do their part. So, that was a very important part of the project.

Greg Klinger: Yeah, yeah, absolutely. It sounds, sounds great. So, let's talk a little bit about these field walkovers. And I know Ron, you really led the charge on this aspect of the project. So, the idea being that you actually went out and looked at all the fields of these landowners within the watershed areas for areas where there might be potential for erosion or loss of nutrients. And that was kind of the focus. Now I know you guys didn't just go in there blindly, you had maps, right, that gave you a pretty good sense of what areas the field to look at first and all of that? Can you, from both of your perspectives, kind of talk about that tool, that agricultural conservation planning framework tool and what information it provided you and how you used it?

Kevin Kuehner: Yeah. So, what we did is we, I like to describe it as we try to do as much of our homework as possible before, talking about these, these walkovers. And we're fortunate in Minnesota to have a lot of really detailed elevation data. This is what we call Lidar and Lidar data, which is just really detailed elevation data throughout the state. And over the years various organizations have been developing tools, various computer tools that allow you to leverage that elevation data or that detailed elevation data. And one of them, as you mentioned, is the Ag Conservation Planning Framework, which is developed by the Ag Research Service. And basically what this does is just allows you to look at fields in terms of where there might be potential risk for soil loss or greater risk for soil loss. And also identify maybe potential practices that might fit on the landscape within those particular areas.

Kevin Kuehner: So, we did, we created a series of maps from that, but also some other tools. One of them being the stream power index, which is another tool that can be used that helps you identify where there's areas of concentrated flow. And we developed a lot of those maps and then Ron and I would sit down and go through those maps and that would be used as a basis for before he would go out and conduct these walkovers.

Greg Klinger: Can I ask just a question here to elaborate on that. So, how sensitive is that Lidar data? So, for instance, I'm regrading around my house and it involves, changing the elevation of soil around my house, probably about a foot, foot and a half. And then regrading backwards a foot lower in other areas. Would that be something, could that Lidar pickup something that little in terms of elevation, or how sensitive is it?

Kevin Kuehner: Yeah. So, it's very sensitive. So, it can pick up minute differences in elevation and it's centimeters actually is what the ...

Greg Klinger: So, you can see reels potentially with Lidar?

Kevin Kuehner: Yeah, potentially. But it's, I mean like down here in southeast Minnesota you can see sinkholes of course very easily. And the benefit of the Lidar data is it actually can strip away the surface vegetation. So, for instance, tree cover, those types of things. So, then you can actually get a better sense of the elevation, but to the naked eye, it's actually difficult to discern some of those differences. So, that's why some of these tools that are being developed, they actually do a lot of that processing and allow you to easily visualize, let's say where water may like to concentrate and may like to potentially cause additional erosion concern.

Greg Klinger: Right. And so those concentrated flow areas, when you've used that term, you're basically saying in a field you got water kind of moving off the rounder parts of the field and then you get in those low areas and that's where water is going to concentrate and flow. So, it's kind of along the lines of where your grass waterways are going to be typically?

Kevin Kuehner: Yeah. Yeah. And in southeast Minnesota, that tended to be what we found, and we see this in the monitoring data as well, is that these concentrated flow areas are really those areas on the landscape that really are kind of like the conveyor belt, so to speak. That actually can move the soil off of your field. And if a grass waterway is not in place or other supporting practices are not in place, those are the areas of the field that pose the greatest risk for actually delivery of those, of the sediment and nutrients off of the field. And based on the water quality data that we had and some of those tools, like you mentioned, that was really critical for Ron when he went out and did the walkovers. And so when he was out looking at those fields, he was really honing in on those specific areas based on what was identified on those maps. So, it was an efficient way for him to quickly really hone in on those particular areas and focus in on.

Greg Klinger: Yeah. So, Ron, when you get out there, you're visiting with the landowner, you have these maps to give you some sense of where there might be potential for erosion. What specific things did you guys talk about with the land owners and what specific things were you looking for in the fields when you're doing a walkover?

Ron Meiners: You know, before I started the walkover I would visit with the land owners and out of all the resources that Kevin gave me, all the mapping and different tools that I had to use. It was that stream power index map that I would pull out and lay on the pickup hood, or on the kitchen table and talk to the land owner about. And again and again, the land owners would agree, yes I'm having trouble in that area or maybe this area wasn't quite as bad. But those maps were so important to me because I could start my walkover process and head right to those areas. And they were spot on. They would even identify things that to the naked eye, you probably wouldn't even pick up because tillage tools had come through and maybe leveled out some of those concentrated flow areas.

Ron Meiners: But once you had the map and in front of you and you took a good look at it, you could pick them back out of there again. They may not be giving the land owner a problem at that particular time of the year or during that year. But during the course of time, that's where the problems were going to show up. And so, it made my walkover process just much easier and much quicker that I could go to those places that were having visible eroded problems, non-visible, and even sediment deposits and stuff like that. So, it just made my work so much faster.

Greg Klinger: Okay. And the specific things you really looked for in the field were formation of gullies or reels or what was the, what were you really keyed in on?

Ron Meiners: Yeah, that's right. I was keyed in on the visible erosion and like Kevin had mentioned, if you can see the erosion, it's too high. It's, you can't, I guess you can't make more topsoil that fast as you're losing it. It can't sustain that kind of erosion. And so, if you can see it, it's beyond tolerable limits. And so, that's, yeah, that's the thing that I was looking for most of the time was visible erosion. But then I would look at the other smaller contributing factors like contouring and stuff coming into those watersheds and stuff. And so.

Greg Klinger: So, just one of the things that really pops out when I'm looking at the data from this, all right. 2015 is that when you did the walkovers or 2016?

Ron Meiners: Started in 2015.

Greg Klinger: 15, all right. You walked 583 fields, over 8,000 acres, three months. So, did you start seeing waterways in your sleep?

Ron Meiners: Well, I know when I started the walkovers, because I'm very sensitive to what I'm doing on someone else's property when I'm going in to do a walkover and stuff like that. So, when I started in 2015 it was early in the year, and I didn't want to cause any problems to the landowners. So, I started a lot of that work by foot. I was on foot trying to cover those fields and it was going pretty slow. And then once I got going, I started visiting with landowners and I said, you know, I've got a Ranger that I can bring that would really speed this process up for me a little bit to be able to drive on their land tenderly. And the landowners were very

cordial and saying, that's fine they didn't see any problem with that. So, that sped things up a little bit.

Ron Meiners: But yes, when you say you're seeing water waves in your sleep, it does get to be to that point, because I've visited with a lot of landowners and they know this. It's not just the identifying the waterways and discussing to them about putting projects in and getting them to install a new waterway. It's every time you get these practices started on these fields and it rains a little bit and then you have to go back in again and touch them up and then you go back in again and you touch them up. I've been on waterway projects with land owners that have probably had to been repaired four or five times. And that's unnerving when you've got that much land opened up and you're trying to install new practices that are going to help. In the meantime you're seeing all this devastation going on. So, once land owners have a practice, like a new waterway established, they're very reluctant to go in there and damage it at any, because they know how long it took to get that thing constructed.

Greg Klinger: Absolutely. When you're doing these walkovers were there, what were the main issues that you saw that either needed a repair or improvement and on the flip side, what was really working well? Generally.

Ron Meiners: Most of the waterways in the area, from a drive by aspect, you can look at a lot of these fields and see the green grass growing in these concentrated flow areas, and think to yourself that everything's working fine. But when you get on the land and you actually do the walkover process, a large portion of the waterways were not functioning properly. Were either running on both sides of the waterway, one side or the other, and or just weren't deep enough or they're just, the vegetation wasn't a good enough. And so, there's just a variety of problems. But that was the major issue on most of the landscapes were the grassed waterways were not functioning properly.

Ron Meiners: The good things I saw were still a lot of the structures, the ponds that were holding back the flooding waters and stuff like that, were still operating well, and there were a lot of those in place. Just, there's been a history of conservation in these watersheds. You can see the practices that they had put in years back, whether they were terracing systems, or contour strip systems, or a variety of things. Were still functioning pretty good. Just maybe needed a little touch up here and there. But I'd say for the most part landowners are good stewards of the land and you can just kind of see it. Them I'm trying to blend, being able to make a living and still be good conservation stewards, and taking care of things. So, it's, but they are doing a good job and I saw a lot of that when I was out doing walkovers.

Kevin Kuehner: Yeah, I would just say add that. I think what was really interesting, you know, on the conclusion of Ron doing these walkovers is that, every single producer and farmer that Ron worked with, they've all had a variety of practices that they're using, ranging from contouring to terraces to waterways. But at the, on the flip side, every farmer had at least one or two areas on their farm that poses a high

risk for runoff and could utilize some additional attention. What's really remarkable, and again, it's a testament to these farmers in these study watersheds, but we are so thankful for them to allow us to do this and allowed us to do this walkover. And what's remarkable is out of the roughly 50 farmers within these three watersheds, 100% of them allowed Ron to go onto their property and do this walkover assessment.

Kevin Kuehner: And that really is asking a lot because it, I use the analogy, it's like allowing someone to come into your home and snoop around and sort of tell you maybe what you're doing right and what you might be doing wrong. And how you approach that and how you have that conversation with the farmer is really important. Right? And like Ron said, all the farmers they want to do the right thing and they want to minimize loss. And as many of our farmers tell us, they're paying for the nutrients or they purchased that soil one way or another and they want to keep it there. And so, but what was really remarkable too, I would say another thing with the walkovers is that of the a hundred percent of the farmers that participated, 70% of those farmers have been working with Ron and the local soil and water districts and other conservation organizations to help to install additional practices. To basically kind of heed what Ron had recommended and pick and choose some of those practices to address some of the high runoff risk areas.

Kevin Kuehner: And that's a really a remarkable number. And I think the other thing is I would say about, it's looking like about 30% of those farmers actually went above and beyond and fixed 100% of their resource needs on their farm. And some of those farmers use public cost share assistance and some of them didn't. They just did it out of pocket. And so, again, I think it just kind of shows that if approached the right way and if done the right way, that you can have a really high success in terms of participation. And the reason why that that was so important to get those really high numbers is if we are able to measure the actual improvements of in water quality at the small watershed scale, we need a very high density and intensity of practices to actually measure that. So.

Greg Klinger: And why is that? Is that just because there's always gonna be some level of variability or what's the reason?

Kevin Kuehner: Yeah, that's probably the biggest thing is that there's just so many variables at the watershed scale that are affecting the water and runoff. Of course, climate being the biggest one and the moderate precipitation. And so, for us to actually measure that and say that yes, there was a statistically significant improvement in the water quality, we need many years of data, but we also have to say that yes, we address many of these critical areas within the watersheds. And so, yeah. That's probably the biggest reason. And.

Greg Klinger: So, in other words, you might be able to, and we'll talk about the edge of field sites, but you might be able to measure, if I put in an extra waterway here, this reduces the sediment or I convert to CRP. This reduces the sediment loss and phosphorous loss this much at the edge of that field. But because there's so

much variability in weather and just kind of random things happening across the watershed, you might not see that impact in the water itself unless you have a whole lot of people doing it. Is that kind of a?

Kevin Kuehner: That's correct. Yup. Yup. And not only that, but making sure that we're targeting the right practices in the right place at the right time. And that was one of the key things through the walkover process was really being, really prioritizing and targeting practices, which kind of gets into this whole concept of what we call critical source areas. These are areas of the landscape that yield a disproportionate amount of the sediment or nutrient loss. And so, those were the areas that we really were really trying to target in this study. And by doing that, of course that can be more of a better cost benefit, right? So you're spending money where you're going to get hopefully the biggest bang for your buck in those watersheds.

Kevin Kuehner: Another factor that a reason why you need a high density of practices in especially those critical source areas is as you move up in scale, so move from the field scale to the watershed scale. There's a lag time effect that, just because we put this practice in doesn't mean that we turn that source off, that it takes time. And there's, it may take several years before you actually can actually measure that over time. And so, that's another factor as well.

Greg Klinger: Okay, I got it. We'll move into the edge of field data here in just a minute. But I had just one more question. So, from your background doing all of these walkovers and having done that sort of conservation work for a long time. If I'm a farmer, and let's say I'm sitting in my truck, at the bottom of the field looking up grass waterway looking up my field, what sort of things do I need to be looking for to make sure my conservation practices are working? And is that even, do I need to get out in that field and really walk it very closely?

Ron Meiners: I don't know if getting out in the field and walking it closely, because these land owners work this land every year and they know exactly where they're having problems. And that was another thing that I made sure that I listened when I went over the walkover reports with these land owners. Because they work this field every year. They know exactly what their challenges are and stuff and they may be having problems in a whole different area of the field than what I picked out as a top priority. So, listening was a huge factor.

Ron Meiners: Kevin brought up about the numbers of landowners that participated. One of the things that we've got going on that project, and I think a lot of that success for me when I did the walkovers was the fact that I've been there. I farmed for many years. I know the things that those landowners are up against, whether it's weather or financial or personal dynamics and things like that. So, I think that helped my success quite a bit, knowing exactly what they are up against. And so, yes. When we're sitting there looking at those grass waterways, I've been on that land and I've seen what's going on there, which I can share with them, but they know what's going on in their farms.

Greg Klinger: Okay.

New Speaker: All right. That about does it for part one of this podcast. We're going to take a quick break and then come back for part two. So be sure to tune in to that. We'd like to thank the Minnesota Agricultural Fertilizer Research and Education Council, AFREC, for supporting this podcast. For the latest information on nutrient management, you can follow us on Facebook and Twitter at UMN nutrient MGMT where you can also send us your questions for future podcast episodes. Thanks for listening.

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