At this time, I'm pleased to turn the webinar over to our moderator, David Lamm. David is the team leader for the National Soil Health and Sustainability Team. David is headquartered at the East National Technology Support Center here in Greensboro. David, you may now begin.

Well, thank you, Holli, and I appreciate the opportunity to be with everybody today, and I look forward to an excellent presentation on this topic of soil health and the science behind it, and the literature review that's been conducted. And I think I've been involved with the soil health activity for the last three or four years, and we're constantly striving to provide and demonstrate and document the scientific support principles that we're talking about when we go around the country and advocate for soil health. And the work that Mike Kucera will be sharing with us here in a minute just, again, continues to help support that.

But before we get started with Mike, I want to introduce Dave Hoover, and allow him to make a few comments. Dave is with the Soil Science Division out at the National Soil Survey Center in Lincoln, Nebraska. He's a national leader for the Soil Quality and Ecosystems Team, among other jobs that he does out there. And he's been around in that position a little over four years.

Formerly, other jobs he's done-- he was State Soil Scientist and Assistant State Conservationist in Idaho. And Dave is like me. He's been around for a long time. He's got about 37 years of excellent experience. So Dave, I'm going to let you take it over here for a second.

Thank you, David. Welcome, all, to the webinar, and to the International Year of Soil. There was a celebration of this significant 2015 event last week in DC at the Department of Agriculture. Several prominent officials, including the Secretary of Agriculture, USDA Chief Science Officer, the Chief of the NRCS, and the Chief of the Forest Service, all spoke. And a common theme in all their talks was the importance of soil health. So you're in good company as we talk about this today.

The need to have an easily accessible science based documentation site for improving soil health through our design and implementation of conservation practices was first brought up by Chief Weller, and then was supported, developed, and promoted by our deputy chiefs for soil science and resource assessment and for science and technology. It was then researched, written, and developed by the Soil Science Division and brought here to you today as a true collaborative deputy area venture.

We're pretty excited about the potential for this website and SharePoint, and look forward to supporting its growth as more professional articles are evaluated and are added to it. Right now, I'll turn it back over to David Lamm.

OK. Thank you, Dave. And again, I think that's one of the exciting things is the collaborative effort between science and technology and the soils division in making this happen.

Next, we want to hear a few comments from somebody I'm excited to introduce. As many of you know, several years ago, when former Chief White announced he unlocked the secrets of the soil campaign and elevated soil health to an agency-wide priority, along with that came the idea of developing a division of soil health that was focused primarily on the soil health activities and soil principles that we've been talking about, and how to incorporate that and weave that into the fabric of the agency.

Well, we've been talking about it for a long time, and now we have some evidence that the division is underway with the hiring of Dr. Bianca Moebius-Clune last November. Bianca, previous to coming to NRCS in November, was on the staff at the Cornell University, in their Crop and Science Department up there. She worked a lot with the Cornell Soil Health Test and helping improve that. She did a lot of work with Adapt-N. She received her Degree, Bachelor of Science from the University of New Hampshire, and Masters and her PhD from Cornell.

And one thing to say about Bianca-- when we were going out and doing the Soil Health 101 training last year, Bianca was a major role player and helped us out in the state of New York, not only doing the 101 introduction training, but helped us do a second day workshop at one of the Cornell research farms. So with that, Bianca, I'll turn it over to you to make a few comments.

Thank you very much, Dave. Thank you very much, everybody, for having me. I'm really excited to be here.

I'm really excited to be part of this collaboration with the Soil Quality and the Ecosystems Branch Team at the National Soil Survey Center with the Soil Health Initiative that has been started in Greensboro, and has been started at the grassroots, really, across the country. Very exciting to see that. I'm actually right now calling in from Indiana, where I've been participating in some meetings here, and will have further meetings later in the week.

And it's very exciting to see what is happening on the ground, and how really, what's happening on the ground with soil health, what farmers all over the country are doing right now-- that information is filtering up. We're managing to get that all the way to national headquarters, where that can then inform policy and the way that programs are run so that we can spread that kind of ability to make a difference across the nation. So very excited to be here. Very honored and inspired to have joined such a great team-- an agency that goes across the country that has skilled and passionate people. It's really very exciting to be on board.

So the new soil health division has ultimately the goal to increase implementation on the ground across the nation. Now, how do we do that? There are so many different factors that influence how we need to manage for better soil health. Different climates, different soil types, different farm backgrounds, different status for where soil health

is at currently. That certainly influences how we can transition to a healthier management system.

Farm background, in terms of management, in terms of the farmers' interests, in terms of the technical skills that people carry through to the system and the interest in that. There's so many different factors that influence this, and ultimately, it's often our knowledge-- our knowledge of how management influences soil health, how that new soil health management then influences other factors like profitability of the farm, resilience of the farm, water quality, air quality. There are a lot of factors that we are dealing with here. And for the soil health division to be able to collaborate with a project like this one, where we have a really very broad effort to review the national literature, and then make those available to everybody. Make those available to our NRCS partners. Make those available to farmers on the ground. Whoever all needs access to these peer reviewed literature.

It's really important to get that information out there, to have access to it, because often, in different places, different things work. And sometimes the basic concepts need to be understood first, and then they can be modified to address different issues and different states and different soil types and different region.

So I'm very excited to be part of this project. As has already been alluded to, what we have in place right now is just the start of it. I think we will be continuing to expand the data set. We'll be continuing to expand the literature that are available online. And there's a lot of new research being done currently. Our land grant system increasingly is putting efforts toward soil health, and that's really exciting to see.

There are various foundations that are getting on board, wanting to help partnerships at the national scale bring this forward. We're going to need that research. We're going to need to immediately bridge from that research being done to put it on the ground. And we will continue to move that forward.

So with that, I want to turn over to Mike Kucera, or probably back to Dave Lamm for a moment. And thank you very much for having me. I'm excited to be part of this team.

Thank you, Bianca. Again, welcome to the agency, and we look forward to you having a long and fruitful and prosperous career with the NRCS here. Now I want to take a minute to introduce our featured speaker. Mike Kucera is currently an agronomist on the National Soil Quality and Ecosystems Branch out at the National Soil Survey Center. He's been doing that since 2012.

Previous to that, Mike was the State Resource Conservationist in Nebraska for about eight years. He's done such things as be a soil quality specialist. He was an agronomist before that, area resource conservationist, district conservationist. Mike is apparently having a little trouble keeping a job, but he likes new challenges.

And so with Mike, I'll just turn it over to you. And we look forward to hearing your presentation. Again, I want to remind everybody, if you have a question, type it in. And we're going to be pausing it two or three times

throughout the presentation to allow questions to be answered. So go ahead, Mike.

OK, thanks David. And I appreciate all the collaborative efforts of the folks, and I'll share a few of the names here in a second. But my intro slide here just shows some of what's already been talked about. On the left is Soil Health 101 training, where Gordon Mickel and myself are doing some of the demonstrations. The runoff, the flake test.

And then Gordon provided me a nice slide of a crimson clover cover crop slide to show how there is an on the ground photo of what can happen, even in South Carolina. A slide there with some very sandy soil to show how we can even build soil health in those settings.

One of the primary reasons-- we're doing a lot of things with promotion of soil health, the planning principles, intertwining that with our programs, all of the things that we're doing on the ground. Producers like Bianca mention that it's one of the best ways to sell soil health.

But this is a little different facet, where we wanted to see what kind of literature was out there to support these planning principles. And everything we do within NRCS-- of course, we want to be scientifically sound. Me as an SRC, when we were writing tech guide standards, we would work very closely with our regional land grant universities. We'd work with our ARS to take some of the research and the information they had and put that into our tech guide and into practices, the conservation planning and the programs that we do. So that's how we see this as being very important.

It's already been alluded to that this was a collaborative effort. And just want to mention here at the National Soil Survey Center, the staff that I've worked with-- Skye Wills, Faustin Iyamuremye, and Craig Busskohl, and myself all did a lot of the literature review, and writing up the summaries that I'm going to describe further, Chris Smith, who is a retired textile services soil scientist. And then we work very closely with Holli Kuykendall, I did, to develop the database and the structure so that we can then share it with partners both on our public website and our SharePoint. And there's many others that have given us support and input, et cetera, through the whole process.

OK, just a few features to talk about in sideboards, if you will. Everything that we put on the website are peer reviewed papers. And we're really after the scientific underpinning for the practices of soil health management systems, the planning principles, what changes-- either positive or negative-- might occur from those in different settings across the country to our dynamic soil properties. The initial search that we did as a group here was focused primarily on physical properties, and we also, of course, when you pull papers and review papers, which-- after a while-- they get a little bit old, I've got to admit, looking a lot of scientific papers.

But we, of course, found limited chemical and biological properties that were also studied in some of those. So the database has the ability to expand to all three of those properties. Primarily, we looked at cropland practices, but

also, the other land uses-- pasture, range land, et cetera. It's set up so that we could include those appropriate practices and research papers. So I want to encourage you to submit and improve what we have for those other land uses as well.

We see this as being a tool that can be easily used by NRCS staff, no matter what level-- if you're a DC, if you're at an area office, a state office, a Tech Center, a national office, both internally and externally. So that's important. Future improvements or additions-- we want to add biological properties. There's some limited data right now for biological properties in the soil health matrix that I'll talk about more. But we want to expand that.

Also, some of the economic impacts. And that's a big thing, I think, with producers is what do these things do to my yield? What do these things do to my bottom line? So that's a big part of our promotion effort across the country as well.

A few more features. And I've got Faustina and Skye here with me, and they can vouch for this. It was totally unbiased. We weren't really selecting for certain papers from a certain land grant university. We were focusing on practices, and primarily physical property.

+ whatever we found that we thought would fit, we didn't try to skew what we found. We just wanted to search that literature. As long as we felt that it was valid, we included it.

The literature was definitely not all inclusive. The database is dynamic, and we intend to grow it. Bianca hit on that well. We really feel that this can grow and provide you information for your locale or your region of the country. There is a middle process that staff, and for that matter, partners that have access to our USDA SharePoint could submit. Or you can work with your partners, your land grants, your ARS, whoever it would be locally to submit papers.

Again, we target it by practices and properties. And so you can see with USDA, we have access to National Ag Library, which gives us access to Digi top, Google Scholar. Also, we have a library here in the Center.

And the research is not only limited to within the US. We actually have some papers that come from abroad-- from Australia, from Europe, et cetera.

Going to give you a few slides just on the definition, because we have a pretty big audience. And so it's important that you know Soil Health 101 and the other training and the promotion efforts we do. Get your head around what soil health is and the definition.

I've been at lots of different meetings. I was at a meeting over at the University of Nebraska, and some of the ARS regional folks from around the region and the Climate Center here. And they talked about, what is a good

measurement of soil health? And so we threw out the definitions, and like Bianca said, it could vary across the country on what's really important and what's really the most important thing for your locale.

The bottom line is that this is a function. The functions of a living ecosystem sustain plants, animals, and humans. And then we're looking at how chemical, physical, biological properties in sync optimize nutrient cycling, water, water cycling, the hydrologic cycle, filtering and buffering of things like pesticides and other solutes, physical stability, the structure of our soil to support plants, structures, et cetera. And of course, the bottom line is the habitat for the biodiversity, because that's really the key or the new thing, if you will, about soil health compared to what I learned about soil quality when I started with NRCS in the early '80s.

Comparing the two terms. They are often used interchangeably. A lot of the research that we looked at, and the historical research, uses the term soil quality, because we're doing specific measurements of parameters-- dynamic soil properties. Soil quality does tend to refer to inherent properties-- things that don't change, typically, like texture, for example. Where soil health, the management we do, the planning principles that we're applying on the lam producers would optimize or improve those dynamic properties such as bulk density, porosity, aggregated stability, organic matter content, which is really, really the core or the hub of soil health, if you will.

What do we gain with soil health? We're after being more resilient. Are soils being more resilient or bouncing back from abuse?

And if you think about it, if we have soils in North Central Iowa that are really high in organic matter, they're much more resilient, and they'll bounce back and continue to produce even if we abuse them. Compared to, for example, an organic muck soil in Western Nebraska, Eastern Colorado. It's not as resilient, and they're not as resistant to degradation. So that's important.

The dynamic properties for healthy soil would be near optimum. Typically, that's what we would term reference condition. In a tall grass prairie, if you think about it, our soil organic matter and our functioning of our soils was probably at an optimum.

Soil health. We think about a living ecosystem versus soil quality. Again, specific indicators or measurements that you might do. And in one way, you can think of soil health similar to how you would think about your personal health.

If I go to a doctor for a checkup, they do specific indicators, and he asks me questions. Are you eating healthy? Are you doing your exercise? How's your blood pressure? They'll do other blood work, for example. So you can kind of equate it that way as well. If you do the right things, you're going to have a healthy lifestyle, hopefully, or hopefully life, versus the indicators that you might look at for the risk factors.

The planning principles. And these are really important with the Soil Health 101 that I talked about, and what's being presented across the country. There's four main things that we present.

And that's disturbing less, which could be chemical, could be physical like tillage, or could be biological disturbance. The diversity of plants. If you think about it, in our reference condition, a tall grass prairie, a native forest system-- we have a diversity of plants that add diversity of soil microorganisms. Also, we try to have living roots throughout as much of the year as possible, and keep the soil covered, which is really important for various functions.

Also, kind of a fifth planning principle, if you will, is integrating livestock, and then managing compaction and managing erosion, as well as the other things you would do with your nutrient management, your pest management. But the goal is to create the most favorable habitat possible for the soil food web so our soil functions as well as possible.

This is just a brochure that you've seen. So what? We're applying these practices. Farmers are applying these practices. What do they do, or how do they help?

And so that's really important. And if you think about it, practices don't operate in a vacuum. We're going to apply multiple practices so there's some synergistic effect if we apply more than one practice. And to make a system work, we need to think about the entire system.

As we started searching for literature that fit within the scope of what I was talking about earlier-- our physical properties-- we looked at the practices in our field office tech guide. Which ones were being used the most, or most important, if you will, for soil health, primarily on crop land? But again, we could look at grazing lands.

And we stored those in these folders. Initially, we did the search, stored them in the folders, and then I also looked within each of those practices. We were trying to get research that supported the major physical properties of soil that are important to soil health.

To select which parameters or properties to look at, a lot of you have had soil health, soil quality training in the past. And we look at selecting indicators to give us an indication, much like for your own personal health you have indicators. We have some chemical, physical, biological indicators.

And so the ones that you see in red are the ones that, at this time, are included in the database. And within some of those-- for example, available water capacity and water retention with our soil health practices-- so we will group or aggregate. For example, aggregate stability. There could be things within that. And again, this list of indicators, there is approximately about 30 columns in our current database that we'll be showing here in a

second.

These are the soil properties. The abbreviations or the acronyms, as you get into the database and look at it and work with it and search it for your region, or specific practices or properties. And you'll notice those acronyms, like BD is for bulk density, soil water would include available water capacity, water retention, Ksat, infiltration, et cetera, et cetera. So again, these all have definitions to make it work better in the database, make it more presentable.

Now, that gives you the background on why and what we're promoting, what soil health is, et cetera. And now we want to jump into the public website. And then the last part of the webinar, I'll go over the employee SharePoint and the features of both.

So in the public website, we have five primary documents that have been generated. The first is a summary of effective conservation practices on soil properties. And I'll talk about that more and go through an example, but from the literature that we reviewed, there was five of us that wrote up the different practice and summarized all of the literature we had looked at-- close to 200 different literature articles. What kind of effects does no till, does mulching, does crop rotations, have? And what parameters drive that? So that's a document that's available to the public.

The second document, the Excel spreadsheet, is a matrix that's exported from our Access database that's on our SharePoint. So all of the properties-- the soil, the citations for all the papers-- so that is available for download for everybody, for the general public to search those articles using the spreadsheet.

The next item is a data dictionary, which is more or less our Webster's Dictionary of the information that's in the matrix. All the properties, the different climate sorts, all of the different things that you can sort by that there's a dictionary for so that you know exactly what was intended for that specific item. And then, most importantly, when we reviewed all of these papers-- and we have more of them coming in as we speak-- there's a short summary and citation to the paper. So I'll talk about that more. And then there's a link to our employees' SharePoint right from the public website.

OK, the first thing is the Soil Health Summary. I'll talk about that briefly. The five practices we looked at from our field office tech guide, our national practice standards are crop rotation 328, no till 329, cover crops 340, mulching, 484, and then nutrient management 590. And then depending on the priorities, et cetera, that we consider this a dynamic document, we may be adding practices in the future. And as we add literature to the database, again, this is a summary of what we're seeing for impacts or effects on soil properties with these different practices would be summarized.

This is the table of contents on that document. And you can see the different practices. In the case of the no till,

it's the practice that I wrote up. I have a table in there of literature that I'll go through here in a second, just as an example of one of the practices. And then I looked at and grouped some of the primary soil properties that we were looking at.

Each of the practice write-ups has the purpose of the conservation practice from the practice standards. Talks about things that are important for how effective that practice is and what the literature said, in a general sense. This is the table, as an example that I put together. And the first column basically shows the impact on the soil property that had. In some cases, there's a negative impact, and that's underlined.

In this example, when we first implement no till, for example, bulk density is usually slightly increased. So it doesn't strictly look at positive impacts. It looks at the overall impacts.

And then the system that was along with no till, for example, how effective that practice is is really highly dependent on the other practices. For example, the first one listed there-- it had perennial grasses used in rotation. That was evaluated along with no till. So the rotation, whether we're using cover crops, the other practices within the system.

And then typically, with most of the papers we looked at, they were comparing different types of systems. For example, the first one looked at CRP, no till with corn, soybean rotation, wheat rotation, for example.

And then the other things that I found that were important on how effective that practice was at improving properties was how long was it in place? Because as we know, with no till, there's a transition phase.

The moisture region. The climate region is very important. So we have anywhere from arid to humid, et cetera. Also, the soil temperature. Also, any limitations on that site.

So if we had soils that had a claypan, a fragipan, sandy, low cation exchange capacity, for example, those soils may not improve as readily as some of the better soils, or vice versa. And then, of course, the reference or the citation.

The no till-- what we found to this point, no till as an example, the keys are, again, the limitations of the site, what kind of management was applied to that site prior to the study or the research being implemented. The soil temperature and moisture regime played a big role in how effective that practice might be and what considerations. Diversity, intensity of the rotation. So if we had more intense rotation, no till, for example, along with that practice, are going to typically improve that property even more, especially something like soil organic matter.

The type and amount of crop residue. Did we remove it? Did we graze it? How do we manage it? Was it irrigated

or rainfed? As we all know, how farmers implement this and why we're really focusing on farmer implemented systems is they need to adapt their management to that given year and the climate that's occurring.

The other things-- the amount of disturbance. Not all research looks at the amount of disturbance as being the same. I show a photo there of manure being injected. And so is that no till? Is that strip till? And so as you look through these articles, it's important to consider those things.

Again, the synergistic impact was really important. What other practices? The protocols used and the variability. When they were comparing systems, were they on the same soil types or different soil types? All those things, really, you need to look at as far as that particular literature.

Weather impact. Plots versus field size research. Some of the papers are on plots. Some of them are field scale. And again, the transition of that practice.

OK, in the [INAUDIBLE] website--

Mike?

Yeah, go ahead.

You got time for a couple questions?

Sure.

I have a question concerning the definition of practices. NRCS has a very purposed definition, criteria, those types of things. When you were considering that, was it just a linkage more between the main type of crop or what have you, or was there actually a looking at how the paper defined the practice that they were using? Or did you run into any issues there?

Yeah, the naming convention on papers isn't universal. Researchers don't always use cover crop as a term. The biggest inconsistency was what is no till? What is conventional tillage? What is reduced tillage, et cetera.

So what we had to do to determine what practices we put in column B and what you see on the screen was recent. And make an interpretation as to what practices applied to our standard. So yeah, there wasn't a direct crosswalk. We had to use some professional judgment.

Also, I had a question about the brochure. One, is it accessible? How can folks get a copy of it? Or is it is on the web, or can they send away and get a copy of that brochure that you showed earlier?

By the brochure, you mean the practice summary? Just our overall summary of what we--

Yes, yes.

Yeah, that's on the website. It's on the public website. Yeah. Everything I'm showing right now is on the public website and available for everybody.

OK. All right, well I'm going to let you go. Continue going there.

OK. Spreadsheet. This is basically just downloaded from our employee SharePoint database. And you have the ability to filter it, sort, do whatever you could typically do with a spreadsheet.

Again, you've got to-- so you understand what each of those abbreviations are in the column headers, there's a data dictionary. Things like the standard, the name of the practice. Data dictionary continued slide here. The different properties that we looked at.

And we have a short definition of those. So you'll see as you look through those that we tried to, in some cases, include multiple things that were maybe researched as far as properties. For example, infiltration and drainage-- we put those together. A lot of times they looked at those.

Sometimes they looked at runoff along with infiltration. Those types of things.

To make this work-- and again, anybody can use this. The public can use this right now. It's on the database. You have to enable saving and save it to your computer to make it function.

Real quick, what you can do with this-- this is just an example where I filtered by practice. So you notice that I filtered so that any particular paper that included 329, which is no till, strip till-- so I basically narrow down the list of papers. Then I can narrow it further. In this case, I'm looking at Ksat, the saturated conductivity.

And then if I'm interested in, for example, semi-arid areas or whatever climate region, moisture region, or temperature region, I can narrow it down even further. And in this example here, from just short of 200 papers that we have in there now, I narrowed it down to 13 papers that applied to the no till practice in semi-arid regions of the country. So I can take a look at those 13 papers, and if I was interested in a specific soil property, I could narrow it down even further.

So this is a really good way for our employees and partners, if there's holes or gaps, which there definitely are, where we want to add to this database, you can submit papers. I'll talk about that more so that we can support the different regions of the country and the different purposes, for example.

OK, one of the things that took a lot of work on our part was to read those papers, make sure we wanted to

include it, first of all, in the database. And then we did a quick summary of the paper. And this summary is not the same thing as the abstract.

What I would say is this could be a combination of the abstract, the conclusion, some of the findings within the paper. But it's in a layperson's terms so that as an SRC-- I can pick on myself-- when I was an SRC, I wanted research that supported a certain practice or system that I was applying, I could go do a quick search. I can take a quick look at this paragraph summary, and then if I wanted to, I can pull down the whole paper, with the exception, on the public database, we cannot provide because of agreements with USDA-- we cannot provide access to the full citation. So anybody that accesses this from the public site only gets the short summary that was written up.

OK, that's kind of a good breaking point on the public side. Everything I showed to this point is available on the public site. And again, we've got our summary of five of the practices based on the limited review we've done to this point. We've got the spreadsheet that's downloaded from the database. We have a data dictionary, so you know what's included, or the definitions of what's in the matrix.

And those are the primary things that are available. So David, do we have any other questions at this point?

Yeah, Mike. There's a couple here. There's one related to wanting to know-- there's holes in the literature review, I guess, maybe based on a geographical region. Are there plans to try and fill some holes? Might be weighted more to the east or the west or vice versa. You got any comments related to that?

I've got Dave in here, too. I can probably put him on the spot.

OK.

But the idea is, yes. If there's areas or holes, gaps, as I called it, yeah. We want you guys. You guys are our eyes and ears.

I think that's the key is that we really want involvement from our cooperators and from our field offices to help fill any of those perceived gaps.

And then you're going to go over later on in the presentation the process to submit an article for review, and inclusion into the review. Isn't that correct, Mike?

Yeah.

OK, so I'll hold off on questions like that. And then there was another question related to is there a possibility of searching by cropping systems, like for a small scale diverse cropping system? That's not really a category. Or is there any kind of categories related to cropping systems in your search function?

No. The only thing we have for search functions are in those column headers. And those are our tech guide practices. So if rotations were evaluated as part of that study or that paper, that's just listed under 328. And so what they would have to do is basically sort by 328 for the climate, the soil region that applies to them, and take a quick look at those short summaries to see if there's any that apply to what they want. Now, if there's a hole or a gap, and they know of some good literature that would apply to this project, we want them to submit that.

OK. Then I had a question. How far back in time did you do? Was there a cutoff? Did you take stuff, papers from the '30s, '40s? Or was everything focused primarily on, say, 1980 and forward?

Did we say there was a cutoff? It had to be digital.

There's no cutoff, to my knowledge.

Yeah, but we didn't go looking for old stuff, either. So it was stuff that was in the citation indexes.

Yeah, the stuff that we found was primarily what we were able to get electronically from computer searches. 1980s and earlier. There might be a straight 1970 paper. But most of the literature, I would say, would be the '90s and forward.

Yeah.

But it wouldn't preclude somebody having a valid paper that's from the '70s or '60s. If it was submitted, went through the review, could be included. Of course, if it had to be digital, that would probably be one of the criteria, I guess.

Yeah. A couple more questions. Your database-- did you primarily search out papers from land grants or schools like that? Agro, ecology schools, that type of thing? Or did you include papers from ARS, ERS, and those types of folks also in the search?

Yeah, all of the above. Anything that would be in the National Ag Library would probably be our primary source. Anything that's there. Because that's what USDA has access to through our computer searches.

So you relied a lot on the Ag Library there. OK.

There was some limited review where we went over and grabbed some actual journals. We have a library here at the Center.

So there was a few articles that we pulled from some of those.

And let me ask you one or two more. This one I'm going to have to read, for me. Could the Land Grant Institution Library get bulk access to the articles, or would a researcher need to access each article one at a time? Does that make sense, Mike?

Yeah. What you're asking is if they wanted a group of articles we had listed, for example, in our database, can they get those in group? When you do it online, if you have access online, it's basically you search and it's one by one.

You can make requests to the National Ag Library, and send to them multiple. Anybody else want to comment on that one?

I don't.

Let me ask one more question and I'll let you move on, Mike. The explanation of the difference why the public access and we can't provide a direct link to the article-- could you expand on that? And then maybe offer up how someone could use that to go actually get the article?

I'm going to defer to Dave on access. One of the questions was why they can't get access to the actual article. And then if they wanted to actually go get the article.

Other people will have to go through whatever their own agreements are through their institutions, or through participation in a professional organization are going to have to find out their own arrangements for looking at the actual articles. It's contractual with us that we can only share internally with Department of Agriculture when we get the full articles. So that's why we have to put the full articles on the SharePoint and just the summaries and references on the public website.

[INTERPOSING VOICES]

Well, but if somebody would take the article and they could do their own search and find their own source and get a copy of that, that would--

Yeah. What we did is on purpose. In that matrix, we have a full citation. So they have all the information they need to go to the entity or wherever it was published to request it. A lot of times, that journal may want $5.00 or $10.00 or whatever it is for a submission fee. So that's the other thing.

And then the other thing we did to help those folks out is the short summaries. They really need to go take a look at that short summary. They're in there alphabetically.

Very easy to find. And so they can take a look at that short summary in our little team's viewpoint. We tried to

summarize it for you to lessen the work.

OK, why don't we to go ahead and keep moving, Mike, and we'll have time for more questions at the next break here.

OK. We're going to jump into the SharePoint. And just to reiterate again, all the things that are available on the public site are available here. The big difference is there's a link to the full article. That's a big thing. And of course, the database that we used to create the spreadsheet that I showed you.

So again, four main things here that are featured on our SharePoint. First of all, there is a link on the public site to this. So if you know how to type in Google or Bing, you can still help literature. You can type that in. You'll be able to find the public site, and there's a link there for employees and partners that have access.

So it's a sortable matrix. That's a database. Includes climate, properties, practices. There's about 30 different things.

Journal summaries and full transcripts. And then the overall summary of five practices that I covered earlier-- that's also available. The data dictionary as well.

And then any announcements or new things or literature review. And it functions just like any other SharePoint. You can get notices. You can get those types of things that you would-- the functionality of other SharePoints that our employees are used to.

Along the top, there are different things. This is just a click on the link for the Science of Soils and Technology for Soil Health, our collaborative project. . And you can click across the top. Get my arrow going here. Click across the top, and you can get to the different parts of the SharePoint.

Click down below on the announcements. For example, the webinar that we're having is announced. An earlier notice when we first put it up on the SharePoint.

We have literature review products. Those are the things that are available on the public site as well. But we also store those here, and you can just simply open those documents up, save them to your computer, and just view them on screen if you want.

There's some key web links to soil health. For example, our soil health, our general soil health website, a link to this literature web page, the various SharePoints that are available, et cetera. So they're all nice and handy there for you to click on and take a look at.

Across the top, again, we would click on-- if we wanted to look at the matrix, this has all of the features that the

spreadsheet has and more. This is our actual database, where we can export it from this to create our spreadsheet. As we update and add papers, or make corrections-- again, this is dynamic-- this is where you're going to find it.

You can filter column headers in this example. You just simply click on that column header, and it's got a filter capability, just like you would have in a spreadsheet. And I clicked on this example, 329 no till.

So this is what it looks like. I narrowed it down from close to 200 papers to less than 100 that have no till included in them.

I can click on the short citation here-- the first author listed in the paper. And then the date. For example, here, I clicked on Benjamin 2008, and so I can just use this database interactively and take a quick look at this paper, and see if it's something that-- in this case, it's out in Akron, Colorado. It might fit the High Plains area of the country. And so I can real quickly take a look and use the features that way.

If you click on the second column there-- for example, I used Benjamin again, Benjamin 2008-- you'll get the full article, like this. In this case, it was a paper looking at carbon effects on soil's physical and hydraulic properties in a semi-arid climate out there in Akron, Colorado.

And then what we would do when you submit these papers, to kind of give you an idea of why the different properties and practices would show up in the database, the matrix-- in this particular case, they looked at different crop rotation. They compared no till to 345. And also, there was a comparison to conventional tillage.

They had some 512, or more perennial plants, in their crop rotation. So 512 was included. And then the properties that they looked at in this study, along with soil organic matter, were bulk density, compaction, soil water impacts, Ksat, aggregate stability/

So as we review that, those particular properties were part of that study. Then it would show up as a yes in the database for that property. If there's a lot of properties that were not looked at, they would show up as a no in the database.

Then we got climate, both semi-arid, and we also have our soil temperature regime. In this case, it's semi-arid, mesic conditions out there in that part of the world. And this was a non-irrigated study. Within this, we also have in the database whether it was irrigated or non-irrigated or both were looked at. So you can sort that way.

In this case, they did not compare it to conventional tillage. It was simply the crop rotations, the crop rotations that were longer term with grasses in the rotation, and then our mulch tillage systems. And again, they were primarily comparing grass to no tell wheat corn millet rotations to wheat fallow rotations, which are the typical for that part of

the country.

OK, a short summary. Again, we talked about that. As we review these, we will be going into the database for those articles we'll add. You simply go into the database and click a new item, and we'll add that.

Now, there's only a limited number of us that would have access to this to actually edit the database from the SharePoint. That's what's unique about this project is the database can actually be edited right within the SharePoint from those that have permissions to do so.

Things that everybody can do-- there's an actions tab. This case, I'm in the summaries. But I can export those to a spreadsheet, or I can view in different manners. So you can play around with those, and use those however you want for your uses.

You can do general searches anywhere within the matrix. This case, I was interested to see if I wanted to submit some articles from ABAS. And before I do that, I could go into this general search and type "ABAS" in there and see what's there.

In this case, you can already see we have a couple articles from that author. And so that way, you don't duplicate effort. So you might do just a simple general search by author, or you can use a keyword such as the soil property, that type of thing, and do general searches. And then it provides you the link to that article or information.

OK, submitting papers-- and this is really, really important. You are our eyes and ears out there in the field. Where we have gaps, where we have holes, you can simply go in here and click on submit a peer reviewed paper, and you see some examples here that an agronomist, Susan in Montana, the agronomist Candy in Kansas, and then some that I submitted myself as some examples.

So you simply click on New, and you're going to get a screen like this. And you simply fill it in. Paper title, the length of the paper. Or if you already have the PDF file, you can attach that as well. The author.

And then we have a list of things that you check-- which practices you feel apply, what region of the country you feel it applies to, et cetera. So kind of a fill in the blank. And then we plan to basically look at these probably at least semi-annually to update this database.

But again, do some screening for us. Don't submit papers that we already have in there. Make sure it applies to practices in our dynamic soil properties that we're interested, whether it's biological, chemical, physical. And things that we have holes. That's what we're really looking for.

This is an example that Susan Tallman in Montana submitted to me, doing some emailing with her, on a field scale study that was done in Montana on summer fallow with single species legume cover crops and wheat rotations. And part of this paper, you can see the photos here of the field size plots that's summarized in this.

And this is just an example where Susan completed. She did a very good job, by the way, if you're listening, Susan. So she talked about basis, what it's comparing, checked off the properties and the practices that were evaluated.

OK, we're just about done here, David. And we'll take some questions. But this is kind of my ending slide before we go to questions.

Summary of the project. The website and the SharePoint-- the key to this project is the updates, and adding important literature that you guys are aware of out there. We're not only looking at positive, but negative impacts.

Me as a conservation planner, I want to know what systems work, what the research says, as well as I'm interested in what producers are doing on the land. That's not going to be peer reviewed research, but that's going to help me support the science behind what I'm recommending so that I don't make the mistakes.

SharePoint updates. We plan to do a matrix addition as we get some [INAUDIBLE] and time, of course-- staff time. Semi-annual updates, I mentioned. Update practice summaries. We may, if you have an interest in other practices, as we get additional research and information, we can update those and provide more information. I mean, it's kind of almost endless, depending on staff time, et cetera.

Additional properties. We plan to probably do-- and I've talked to Dave and David-- Dave Hoover and David Lamm about this, but do one major update where we add other properties and possibly some economics. So we want to do that one time, because you can see it's a lot of work to go back to all the papers we already have in there, and does it apply to this property or not?

Because we want to have it pretty accurate so that when you guys do searches, that it's of value to you. We don't want to have a poor product out there for you.

Again, the uses-- and I'm thinking back when I was in field office, area office, state office, standard development, designing my local soil health management systems, having background for program priorities like EQIP program priorities, good technical background for what we're recommending, program targeting. And I use this a lot of times for presentations-- my PowerPoint presentations and things that we do for soil health presentations around the country.

OK, this is my last slide. We'll take a few questions, David, and then I'm hoping that you and Dave and Bianca will

go ahead and give a closing summary as well. If you have any questions whatsoever about using this, or anything, feel free to email me or the others on our staff. And again, it's this easy to find the public site in the links. In Google or Bing, just type Soil Health Literature Review, and it'll be the first one listed, typically.

Finding the SharePoint sites.

The SharePoint site is linked on the public website. It's down on the lower right. You can click on the link right there.

OK, Mike. Just a couple questions related to the SharePoint. First, thanks again for doing a great job as we know you always do, every time we get you on here doing a webinar for us. But how do you know if you've got permission? And if you don't have permissions, how do you get permissions to access the SharePoint site?

I think every NRCS employee has access to the SharePoint site. We set it up for every domain for USDA can have access to it. No restrictions there.

Also, employees like conservation district employees that have logins-- they would have access to some of this, if they're in our office. Also, other USDA agencies can get access to this.

The one problem that our IT folks shared with me is the way their servers are set up at ARS. Not all ARS-- the servers aren't set up. But even ARS can get access to this. But Forest Service, the Farm Service Agency, the other USDA agencies can get access to this as well.

OK. Another question is related to your database and the discussion about practice. Does the data dictionary include the practice number, and maybe a definition of what that practice is as NRCS would define it?

It has the practice number and the name. There is a definition on the far right hand column. I've got Dave Hoover looking. But I think everything that's listed, we have on the right hand column on the data dictionary, there's a definition.

OK.

And again, that's a dynamic document. If you see some improvements that you would want in that data dictionary, that Mike's layperson write up in that data dictionary. If I was a DC in Oakland, Iowa or Stanton, Nebraska where I worked, that I would know what that meant.

OK. What about activities or practices that we don't know exactly-- maybe the paper's done on an activity or a practice that doesn't necessarily fit a 328, a 329, a NRCS practice code? What would you suggest on the submittal of an article related to that?

That's a real good question. I would say the way that we looked at it, if we thought that it was a really good article that impacted the planning principles and the management and the soil health management systems-- we used a broad definition of the conservation practice, and tried to fit it under the closest practice standard.

For example, livestock integration. Where does that exactly fit? There is a practice standard that's in the database, and if you sort through it, called Forage Harvest Management, which can include grazing, can include hay, can include all those things. So anything related to that, we included under that practice.

But again, this is dynamic. We're going to do one major upgrade to this database, so we would like your ideas, if there's something that would be simple and consistent. And working with Holli, she did really an excellent job in making sure that what we put in that database was consistent, and had consistent information.

So I'm looking at the articles right now. There is one in here that doesn't have any practice standard associated with it, but it relates to soil water retention. So we have cited something like that in the past.

Yeah.

OK.

So we could include them. You can leave any of the columns blank, or any of the data entries.

So when you're submitting an article, if you don't know which practice, you either take a guess or just leave it blank if you're not for sure? Is that kind of what you're saying?

Yeah. Because for quality control, there's a few of us that would actually review that article and then fill in the appropriate columns.

OK. I had a question-- again, [INAUDIBLE] keep typing them in-- related to your review process. Did you review the quality or analyze the actual methodology that was done in the research or in the development of the paper? How much of that did you get involved with?

We read the paper in its entirety, for the most part. And we didn't include it in the database, but we had originally had some notes. So if there was some specific things about whether it was crops versus field size, or something-- there was some notes to go with it. But for what the employees are going to see, we did not do that, other than we tried to include those types of thought processes in the summary. And that short summary, that's your friend. Use that short summary, and that'll lead you to the well.

OK. OK. Another question, again. Can CCAs get access to the information? That would be through the public site,

correct?

Yeah. CCAs or the general public-- yes, absolutely. They can go to the public site, get access to the spreadsheet, download that to their computer, search whatever articles are for their region of the country or however they want to sort it.

And then of course, they can look at the short summaries. Those are available to them.

OK. And this was primarily-- well, as physical and chemical properties relate to soil health, can you speak a little bit about the biological component? And then you also mentioned something in there about maybe some soil health economics, kind of like future plans type of thing.

Yeah, we didn't spend a lot of time on that, but ARS currently is looking at biological property impacts of practices. And once they provide that to NRCS, it's our plans to try to incorporate that into this system. And then also, some look see at economics.

And primarily, there, it would be things like yield impacts. I don't know how deep we want to get there. Dave, if you have any additional thoughts on that.

But the main discussion to this point has been primarily adding more biological properties, because most of the papers we searched are going to show up primarily in physical. There's a fair amount of chemical properties for how it impacted nutrient cycling and SAR, sodium, salinity, those things.

But I think the biologic component is very important. I know one of the questions was offered on site here that are you going to look at soil enzymes? And I think that is an important component that we can certainly work into this in the future.

OK. And I guess that's probably about the end of the questions, other than a couple leading questions. Maybe I'll throw this one out, and that might be a good way for Bianca and Dave to close, make some comments to include that. The question is how long is it going to be before NRCS incorporates soil health into our NRCS practice standards in such a way that it's very visible, I guess, would be the way to put it.

I don't know. If we don't have Norm Widman or a national agronomist on, but I'm on the National Practice Standards Committee, and yes. I mean, we're starting to incorporate especially considerations. And then there's some direct relationship to soil health on improving soil quality and those types of things.

There isn't, as you can see when you talk about soil health, any one soil quality parameter that applies to soil health. It's the overall-- all the properties being near optimum so that soil functions at its optimum level. So in

general, yes, the considerations within the national standards, trying to make sure that we have some good, sound criteria for some of those major considerations-- things like cropping systems and residue management-- so that we're not degrading the soil.

That's the big thing. Like soil organic matter, for example-- you'll see that quite often listed as a purpose, to improve soil organic matter. But it's more tied to some specific soil quality parameters in general, and then the considerations in the standard.

This last slide here is three slides, just to give you a closing. There are two photos of my farm in 2012, when we had a pretty bad drought-- the soybeans. And you can see we've been in no till for 25 years. In some cases, we started no tilling up to 40 years ago on my dad's land, and then that's the following year, some corn and the wheat.

And then a Nebraska photo there of the rainfall simulator. It's doing a real excellent job of some native grass, prairie soils on the far right. One with cover, one without. And then the same soils with mulch. And you see the difference in the runoff and the sediment loading. And the bottom line with what NRCS's purpose of soil health is not only improving the soil health, but those off site, and those resource benefits that our agency is all about.

All right, Mike. I think that kind of concludes all the questions. I appreciate, again, your foresight and your insights on what you're doing, and really, all the hard work that you and Skye and Faustina and others out there did in putting this together. I think you really did an excellent job, and I think it's something-- we've got 200 articles now.

Who knows what the sky is going to be on that? I could see it going up to thousands. And it's going to be a workload to maintain that. That's for sure.

So with that-- again, Mike, I appreciate that. And Dave, I'll offer you up, if you have any closing comments on that you'd like to add.

I'm just really glad for the participation that we had in this. Lots of good questions that showed a lot of interest. We'll continue here to support this site.

Let it grow big. I can see a lot of potential here. I did notice several questions in there about making the slides available. I think we can put those on both the public site and on our SharePoint site so that people can download those. So those should be coming up fairly soon on those two sites.

Thanks to all for joining. We're committed to this, and we're going to stay that way.

All right. And Bianca, do you have any additional comments you'd like to make?

Yes. Again, thank you very much for pulling all this effort into this project. I think it's a great project, a great start to something that, as Dave already said, I think will really expand. There's great opportunity to add the biological indicators, to add biological management practices.

And I think, really, as we move forward, yes, our conservation practice standards, we will be taking a longer, harder look at those once we get all of the division staff on board. Right now, there's two of us. There will be 20 of us once we get everybody hired.

And that is one of our priorities is to look at our conservation practice standards. Also, to really look at our conservation planning, making sure that we are enabling staff time for that on the ground, and for that to inform what we do further with this project for the project and the science based literature to inform what we do on the ground.

Looking forward to that. Thank you again, everybody.

OK. And I guess I have a few comments to add. There was a question that came in there. Where can you buy the rainfall simulator?

And just Google. I think it's Bud Davis, who was a former NRCS employee, I believe, in Kansas. Google that, and you'll find he's got a website which you can order-- he actually puts these things together and sells them. And we're finding them pop up all over the country.

I think what's interesting-- and I've had the privilege to be involved with this for the last four, five years. And where we started off running around, and we did demos, and these simple simplistic things with slake tests, the infiltration tests, rainfall simulators, things that we all can see and observe with our eyes.

And I think what the exciting thing is now we're getting the science that supports what our eyes and our intuition was telling us, and that was the key to what this project is. So it's grown more than just a feel good thing into a science based effort, and I really appreciate what's going on. And look forward to good stuff in the future.

And kind of some concluding comments here. We had over 550 participants on today's webinar. For those wanting to earn the CEUs, you might expect a little bit of a delay in accessing the post test due to the volume, so please be patient. You can leave the step two browser window open and step away a few minutes and return, and hopefully, maybe the traffic will slow down a little bit, and you can complete the webinar process.

And with that--

And with that, anybody else have any comments?

David? Yeah. David, real quick, you might share-- we do have a webinar next week, one week from today, on soil health nutrient tool and the soil health nutrient project. I don't know if you want to share anything on that.

Yeah. I actually did have a question in there concerning NRCS efforts or attempts to develop an aggregated soil health index that kind of cuts across the physical, chemical, and biological conditions. And yes, NRCS is working on that.

One effort is Dr. Rick Haney's soil health and nutrient tool, who's-- a lot of folks out there have been involved with that and aware of what he's doing, kind of looking at a new approach or a different approach to nutrient management. If you want to hear more in depth about the science behind Dr. Haney's test you can tune in next week. I think it's 2:00 on Tuesday. Go to the conservation webinar link, and you ought to be able to follow in, just like you got into this one today.

1:00 Eastern.

1:00 Eastern. OK. Excuse me.

So just, again, go to the conservation webinar site. That's not the only effort being made. I know that the folks out in Lincoln are working on a soil health rapid assessment type of tool. I know that, of course, Bianca and her expertise brings in what we're doing with what was being done at Cornell with her soil health test up there. We kind of looked at an aggregated thing between the physical, chemical and biological components.

So there's a lot. It's a really dynamic process. And again, part, I think, of what the vision might bring, working in collaboration with the soil science side of things to bring together this effort down the road. And hopefully, within a few years, we'll have multiple tools out there.

I kind of like the way that Ray Archuleta puts it. He says, when you go to the doctor, you get numerous tests to come up with a diagnosis of what might be out there. And I think that's kind of what it could be for a healthy, living ecosystem. There may be several tools out there that take us to a similar point.

So with that, I conclude my comments, and I guess we'll call it a day.

Thanks, everyone.

Thank you.