"Hey everyone, welcome back to the fourth and final event of our Making Soils Data Actionable webinar series. I'm Danny Gilardi, senior soil scientist at the Washington State Department of Agriculture, and I am so excited to welcome you all today to talk yet again about soils data. All month long, the Washington Soil Health Initiative has been showcasing projects across Washington that use soils data to make real on farm decisions."

"We've been doing this because we love soils, but also because we know that soils data can be confusing. More soil test and data are available to farmers than ever. And while this can be empowering new information on soil chemistry, biology and physics can also be difficult to translate into action. And so we first featured Adam Peterson from Thurston Conservation District to talk about his soil testing nutrient management program."

"Then Lindsay de trois from Washington State University to speak about how she uses of used cerium wilt bioassay to help her growers determine what variety of spinach to plant and where. And then Troy Peters from Washington State University helped us demystify soil moisture monitor sensors. If you missed any of those talks, they were all recorded and available on our YouTube channel."

"And Molly will be posting the link to those videos in the chat. But let's move on to why you are all here today. Today we have a special edition of. This is the series for users of the R programing language. JD Ryan is here to talk to us not just about making soils data actionable, but making it accessible and making it fun."

"JD is a data scientist for the Washington State Department of Agriculture, where she manages the state of the soils data set, finds new ways to automate workflows, and builds data driven decision support tools for everyone in the audience. There will be a Q&A at the end, so feel free to post your questions into the chat feature as we go."

"You can find the chat at the bottom of your screen in a little thought bubble icon. Thanks so much for being here today, JD. And feel free to take it away."

"Awesome. Thanks so much for the introduction. let me just get situated. Okay, so today we're talking about the soils R package for soil health reporting. This has been a huge effort between the Washington State Department of Agriculture and Washington State University. as part of the state of the soils assessment, for providing reports to all of the participating growers and land managers."

"So, there's a lot of co coauthors and people who have been involved with this project. whether that's the very, very first R markdown, file that Teel created, then Danny and Molly, reiterated on that in 2021 and then, sort of the whole team has come together to really do a literature review and synthesize all the latest science so that we have the most comprehensive as possible reports that we're sending out."

"from 2022 through to, 2023, with the new publishing system called quarto. So, a quick overview of, the presentation today. I'm going to

first just do a really brief background on the state of the soils
assessment and how this project came to be. our three sort of goals
for how we're using reports to, make soils data actionable."
"And then we'll go through each of those goals and show snapshots or
screenshots of, how our reports are attempting to achieve those goals.
And then we'll talk about our process, and then how you all can use
soils to make your own reports for your own survey projects. I'll do a
demo of how you can install soils and, render your first template
reports, and then we'll finish up with, a quick wrap up and then go
into the Q&A."
"So the state of the soils assessment is a statewide monitoring
program. there's an interactive dashboard, that is linked here. You
can, in the resources tab of zoom. you should be able to download
these slides as a PDF. And if you click any of the QR codes, it'll
take you to the link. Or you can, scan with your phone."
"So the state of the soils, at the end of this season, that is just
getting started. We'll have over 1200 samples in all 39 counties, with
over 70 crop types or land use types and over 400 participants. So, so
far, we've sent out over 300 custom soil health reports to our
participants. and by the end of this year, we'll have sent out 400
total."
"So it's been a huge effort, to build capacity with all the
conservation districts that have been able to help us collect these
soil samples, but then also building capacity for the growers and the
land managers who are having their field sampled and then being able
to interpret their data and, make some informed management decisions
from it."
"So this whole Making Soils data actionable series comes down to the
question of how do we make soils data actionable? And this, webinar
for the series is specifically talking about using reports. So instead
of the traditional approach of providing, lab results as a spreadsheet
or a PDF, that's just, a sheet of numbers and measurement names that
you have to have, like an interpretation guide or, crop advisor or
somebody to help you walk through it."
"We're trying to create these reports that are comprehensive enough
and aim to help the participants first access their soil health data.
So whether that's a digital form or, a principal, paper that you can
print out and hold it in your hands. we want them to be able to access
to their soil health data and then also understand it."
"So minimal jargon and making sure that they, that the information is
presented in an accessible way. We also are trying to help the
participants interpret their data, specifically within their crop and
region context. So this includes, helping with the interpretation of
the, values in relationship to other samples that were collected from
the same crop or the same county."
"And then, also the the main crux of the issue is translating that
data into informed management decisions. And this is the trickiest of
these three sort of goals because the, fertility and like amendment,
management recommendations are more straightforward. But with the
newer soil health indicators it's not as straightforward. The science

is still developing. So it's it's a little harder to provide cut and dry management recommendations."

"So we'll, go through each of these three goals and showcase how our reports are trying to help. so we'll start with accessing the soil health data. And, as I mentioned before, like we're providing the report in multiple formats. So we have an interactive HTML file that you can open up in a browser. And it has a lot of cool features, like when you're looking at the plots, you can hover over each point and be able to, see the value as you're hovering."

"you can download the raw data as a spreadsheet. So there's these really cool features that, make it more fun and easy to explore and engage with the data. But then we also are making sure to have something for those who may not want to look at their results on a computer screen and instead want to have something tangible that they can hold in their hand."

"And so we provide the reports in this HTML format, but then we also send a PDF that they can either print off, or the conservation districts can print off and mailed to the grower. so we're just making sure to, make the the reports themselves accessible. And then the other part of, the report accessibility is making sure that our reports are self-contained."

"And what I mean by self-contained is instead of having to send out a, Excel spreadsheet or PDF with just the table of results and then having to also send off or have the the participant hunt down their own interpretation guide that also should be specific to their crop and their region. We want to make sure that we're providing all the information to understand what soil health really means."

"some qualities of what agricultural soil is when it's healthy, as well as just the general, latest science on the, soil health. terminology rather than, the previous terms like soil quality or soil fertility. especially with all of these new indicators that we're using and most importantly, we're trying to use plain language. We're trying to minimize the amount of jargon so that the actual vocabulary is accessible and, easy for the growers, land managers to understand and even go as far as communicating their results or what they've learned with other peers in their communities and networks."

"So then the next stage, or our goal is to help them interpret their data within that crop and region context. So we talk a lot about soil health being very, very specific to the production system and the specific region. So it's really important to be able to understand the, the results in, in those contexts. and then it's also important to be helping the participant understand, the soil health indicators that we're measuring in their fields."

"So there's some, you know, chemical measurements like the fertility macronutrients, micronutrients that are old people know about them. But then there's also these new ones, like potentially mineralized carbon that are still up in the air. And science is still developing on like, what do these things mean? So what we've done is, especially the soil scientists on the team at USDA and WSU, have done a lot of, synthesis of the latest research, the latest literature out there and

basically summarized, in plain terms, what these measurements mean and how they relate to soil functions in management."
"We try to do this with, text as well as graphics for the visual learners so that they can also understand, they can see more of a visual representation of, how these measurements will also interact with each other or correspond to one another. And we also provide some additional links. if, the grower or the participant wants to dive a little bit deeper into any of these measurements."
"We also are providing context for interpretation. So again, this is the result of a lot of literature review and research to understand the the soil function and the scoring curve type, which basically means is higher value, better is a lower value better or is there sort of an optimal range, where the soil function is at its best."
"So we provide this table, in our reports that just has the soil health indicator, the function and the scoring curve type. And I will call out that the familiar scoring curves from Cornell, and others, mostly from like the Midwest, they're not as relevant to Washington. And so, we're currently not having a, any specific numbers."
"We're just, specifying whether or not it's higher or, or, lower is better rather than a specific value that you should be reaching. We also are, providing additional resources. So again, this kind of goes hand in hand with the self-contained aspect where we're making sure that the growers don't have to search too far for, the information that they might have."
"Because even with these reports, there's still always going to be more questions than answers. So we try to provide some, extra information as far as like the cornerstones for, how to get quality results from soil testing as well as, webinars and other resources that Mitsubishi has put out. as far as understanding and interpreting soil health, results."
"And then the, the crop and region specific part of this goal is, mostly achieved by providing these comparisons so that, a farmer or grower can understand how their sample cam, matches up to others collected from the same crops, the same region, or the same project. And again, this is sort of also that multiple formats were providing table and plot, data visualizations."
"So in this example we can see our biological measurements table where we have the field name. then the, the county average, the crop or land use average and then the project average. And we've tried to help with the visual aspect as well by, color coding the cells so that it's really clear if the value is higher or lower than the project average."
"So in this particular example, the, the growers fields plus the crop and county averages are higher than the project average. And we can also see that in the, the plots. So in the interactive reports that HTML report, if you hover over these points, you would see little pop ups of the actual volume. And you could even toggle off, some of the other groups if you just wanted to see, the samples from the same county or the same crop."
"And so it really provides, extra visual. yeah. Extra visual for those

who are better learners with, are more visual learners. Okay, so then here's the tricky part. In the, making soils data actionable is how we're actually translating these reports or translating the the results into informed management decisions. And, this is more straightforward for like, amendment recommendations and is the easiest way to actually go from a number, a lab result number to a specific action on the field."

"And so there's this little Asterix. And I just want to call out that, you know, these recommendations are, from lookup tables and equations that are specific to a crop, specific to a region. And so, we personally, as a statewide, assessment, don't have the capacity or the qualifications at the moment to be providing these kinds of recommendations."

"But, the first webinar in this series from Adam Peterson, this example is from his presentation where at their student conservation district, they actually create these reports that are, beautiful and are super actionable, where, he is using Python actually to calculate, the recommended rates and whatnot. So again, this is more straightforward. There's more data available, there's more resources for finding out the specific equations to use."

"But it's not as easy when we're talking about new soil health indicators like active carbon or epoxy or a protein or these new ones that we're still trying to learn and understand how the soil health indicator relates to management and how that relates to the soil functions. So we are there's just not enough science to confidently be able to recommend somebody to start cover cropping based on their Ace protein result or so on, so forth."

"So it it's a lot more challenging. And, I'm trying to be very careful to not overpromise what soils and what the reports can do here, because this still is one step towards making the data actionable by helping growers understand, interpret and access their data. But, to provide specific recommendations is still, always out. So in the latest washi newsletter, there was a blog post from Danny, the state of the state of the soils."

"And in this blog post she talks about sort of this next phase as we're wrapping up the sample collection and moving towards the analysis of the data that we've already collected so far. And understanding more about how these indicators relate to soil functions and relate to management decisions. So, recommend checking out this blog post, to learn more about the next steps and how we're trying to, advance the knowledge on how these indicators relate to management and get closer to being able to recommend specific, management practices."

"So we created over the last few years, over over 300 customized reports in both the HTML and the PDF formats. And did we do this? Penn staking lead by hand in Excel and Word and generate each table and do all the summary statistics and all of that tediously by hand? We did not, and probably obvious because we're in in our webinar."

"So we did use our and initially used our markdown for that very first report where teal had originally started the idea for using parameterized reports to generate a report for each participant,

rather than having to create one, each one by hand. And then, we switched over to carto, which is the next generation of our markdown."
"for those who haven't heard of quarto yet, and our, our markdown users, our markdown is not going away. It's just not being actively developed anymore. And quarto is sort of the new, the new shiny tool, that we are, that, the developers are recommending people to start migrating to. So the general workflow that we have had over the last few years and sort of streamlined and adopted, as we've learned, this process is first, we get our results back from the lab and an Excel spreadsheet."
"We have our field forums where we're collecting the information like the latitude, longitude, the crop that's planted at the time of sampling, as well as those management services. so we're using ArcGIS tools like Field Maps and Survey one, two, three. And we're exporting those, data into Excel format. So the spreadsheets and then we process this data, go through some quality control where, we're doing a combination of algorithmic quality control and, expertise domain knowledge."
"So the general workflow is I'll process the data and then make a, quality control summary report that calculates the z scores. And then we'll flag any sample results that are suspect. And then that gets sent on to Dani, who uses her soil scientist wizardry to qualify any of those samples. And we then have this clean data set that we're ready to use to create reports for each of our participants."
"So then we, use these quarto template files, QML files. we have our functions and scripts. We have all the images that you see in the reports and then style sheets, which is basically a word document template that has predefined styles that, correspond with the washi branding and then access Cascading Style Sheets for the HTML reports, which is basically how you style HTML files and web pages."
"And using all of this, we then have our 300 plus HTML and word document reports. Then we'll review, usually the sort of, extreme cases of the reports just to make sure everything the formatting looks right and everything looks as expected. And when I say extreme cases, I am looking at, a report for a grower that maybe only has one sample, so everything's going to be really short."
"And then I'm also looking at a report that has many, 8 or 10 samples for one grower. And so making sure those page breaks and the formatting and all that looks good. And then once we're happy with all of the reports, we convert the word document to a PDF using Adobe Acrobat and then save to box.com. And then since we are working with conservation districts, we then we'll send a link to that folder for the districts to, distribute those reports to the growers."
"And there is a little bit of, additional instruction that goes out, like for the HTML files. Many folks don't know what to do with an HTML file. so we just instruct the grower to download the HTML file to their computer, and then they can double click and open it, which should open it in their default browser."
"And then they get all that interactivity. So I'm trying to keep this more high level. So if you want more of the technical details of, how

the functions and scripts in the quarto templates to work, I'd recommend watching this 20 minute talk that I gave last year at Posit Conf, which is a data science conference. and it goes specifically into the code and the different features of quarto that we're, that we're using to create these reports."

"So why you're all probably here is to learn how you can use swales to make your own customized reports for your own projects. So who are you? Who is our our target audience? scientists, technical service providers, extension staff, anybody who is willing to learn or is already comfortable with R and portal. And again, if you're unfamiliar with quarto, it's it's a pretty smooth transition from our markdown."

"And at the end of the presentation, I have some resources for learning quarto, especially for users of our markdown to learn how to migrate over to Porto. And then the second part is having soil survey data. So there's a couple of caveats for the, template that are provided in the soils package. generally we have replaced any of the Washington specific or state of the soils specific content with boilerplate text in guidance for how you can, basically provide the same information but for your particular project."

"So you don't have to be in Washington state, you don't have to be affiliated with the Soil Health Initiative. soils is for any organization in any region. And the, the template itself is for creating a different report, a different custom report for each participant within the survey. So there's some other, you know, core use cases for, these parameterized or customized templates."

"so like if you had one farm that was doing different experiments, different time periods, trials, whatever, this package in this template as it is right now is not going to work. So this is really for, when you want to when you have a bunch of different farmers or growers or land managers that you want each to have their own report, that's when soil comes in handy."

"So soils helps with this process because it has packaged all of those templates, all of those functions, all of the scripts, images and style sheets into an R package. And within that R package, it also has the tooling to easily create a new RStudio project, which basically copies over all of these files that you need to your computer."

"And, with the website, for the documentation and tutorials that I'll talk about a little later, you'll be able to customize the reports for your own project. So soils when you install it on your computer, given you have the requirements, like the, recent version of R and quarto, then you'll have everything you need to create an RStudio soils project again, that includes all the template files."

"it also includes an example URL, data set, and data dictionary so that, you can use that as a template for when you get to the second step of importing your own soil health survey data. And then you can modify the content and the styling to match your own project. And then lastly, automatically generate all the custom soil health reports for each participant in your survey."

"So how do you get started? there's this package website that I mentioned, which I'll demo in the next step here. But overall this

page is where I would recommend you start. it includes the requirements for and links to install RStudio in quarto. It also includes primers for understanding or learning more about quarto and markdown syntax that is used within the templates."

"And then it also includes some tutorials so that you can follow along, step by step to, basically go through this entire workflow and adopt the reports for your own needs and projects. And then there's also, a functions reference for all of the functions that are included in the soils package. So with that, I will hop into the demo and and so this is the live website."

"And like I said there's requirements section, the installation code and our general recommended workflow, as has some demo videos as well. And some troubleshooting because this is all code that was adopted from our specific project. So the hardest part likely is going to be getting the data imported correctly. and like I said, there's primers on Quarto and Markdown, some tutorials, the example reports."

"So if you just want to see what they look like, the HTML version and. And the,"

Word version. And then the function and sort of reference guide so that you can and.

It's taking a little bit to load. So I'll just jump in. So I'm going to load Tori. I don't know if my internet looks like it's fine.

"So we'll scroll down to the soils, installation here and we will, copy the installation code. And then we'll go back to our studio and paste that into our console."

"And, when you first run this the first time, it's probably going to take a lot longer than, it how long it just took me. Because this package uses a lot of other packages that you may or may not have. So it'll be downloading a bunch of other packages as well. So everything, all the packages that are used in the package, so it might take a little bit."

So we now have it installed. And after installing a package I usually recommend just restarting r you can do that by going to session and then restart. And then you should be able to go to file new project. And then new directory. And then if you scroll down you can see all the different project types. And now there's this quarter soil health report. So we'll click on that. And then you can name the directory which is basically the the folder. So I'll call the soils demo. And you can also change the location of where you want this project folder to be.

I have a R folder and then a projects folder. So then I will leave that as is and click create a project.

"And once you've created the soils project, the this zero one producer report UMD like UMD extension. is that just a quarto file? should be open as well as this render reports, our script should also open. so this is the main report content. And you can do, control s to, search through the document."

"So we've included some placeholders for or some notations for where you need to edit. so like adding your own logo, adding your own project name. So you can, go through and find all the places that you

need to edit by searching, edit. So once you have, the, quarto file open, you can click this render button up here."

"or this drop down, little arrow. And you can choose to render to the HTML or the word. It will default to the HTML version. And so I just click that. And now we can see in our background jobs that it is processing. And this is using all of the example data in dictionary. So so you should be able to immediately install and render this example report without changing anything."

Just to make sure that your system is set up the right way. And it takes a bit because it is doing a lot. It's creating all those figures. It's creating a map. It is screenshotting things. so it's doing quite a bit in the background. So it takes about a minute or so per report.

"in our studio, we can also click on the files pane and just see all of the files that get downloaded. When you install Swales and create us little holes, our studio project. So we have all of these key on D files. We have a data folder that includes our data dictionary and our example washi data. And then we have, these little images that you'll see in the reports."

"I'll point those out in a minute. as well as this render reports are script. So when you're done iterating over and editing the report for your own project, and you're ready to render all of them in your entire data set, you can again follow the edit instructions, and then click source, and then it will run the, run this script and render all of the reports."

"I think last year it took about an hour, an hour and a half or so to render about 100 plus some a dozen or so, reports. So this is something that I'll source and then like leave overnight to run. so what happened? Was it the HTML report popped up in this new window. and so you can see that it's in our browser, it's a local copy."

"It's localhost 5390, which is, yeah, just your local browser. you can also access that if it doesn't pop up for some reason. it will when you click the render button, it will have the same name as the QML file. So we can see that we have a new HTML file. And it has the same name as the q amp file."

"So we can click on that and then view in web browser. And now we can see that we're looking at an actual file. the other I'll scroll through this really quick to so you can see the general HTML reports that has these tabs. That's where we can click on the different, measurement types and that and the figures."

"You can see a map that's interactive. You can switch from Street View a text triangle and then the tables and plots. We'll skip down to download your data. And you can see we have this download button. So if we wanted to download this as a spreadsheet so that for the raw data, you can click that and it will download."

"And you see that we have our complete data set and the dictionary that explains what the, abbreviations are and the units. And it's an example of like the edit text. So again, you're, we're providing some guidance on like how to edit this for your own project. So that's the HTML report. And then you can also render the word report by again

clicking this little down arrow."
And then render M-word.
And then in the background jobs again it will start rendering the report.
"And when you are ready to render all the reports, what I'm going to do right now that you don't need to do, but I'm just doing so it doesn't take forever is I'm going to, subset the data so that I'm just getting the first two samples and then, once the word report is done rendering, I will click source and run this script so that you can see, what it looks like when we render all the reports at once."
"So the background jobs, it just prints out like what's happening at the same time. if there's ever any errors you'll get, the error message is in this, in this tab, and it usually will direct you to exactly where that error occurred. So it, popped up in my downloads tab so I could click this download file."
"I could also go down to my files pane and click on this, produce a report doc X. Or I could even navigate with my file Explorer to that folder. So if I go to our projects and then it's called soils Demo. And now I have the zero one producer report. So there's a few different ways to find your reports once they're rendered."
"And so here is the the word report. And so it's the same as the HTML. just slightly different formatting and interactivity. Okay. So then let's source our render report script so that this will render all of the reports at one time. And what's kind of nice is, once we get through one of the reports, we'll get a little progress."
"Bar and, estimate at time of completion, which is kind of a neat little feature. but while this is running, I want to show you the data, the example data and the data dictionary. So once you have rendered the example HTML and word document, make sure that everything is set up correctly on your system. then there's the hard part of, getting your data in the correct format for everything to work without errors."
"So you'll want to go to your project folder and then open the data folder. And then there's this washy data CSV and data dictionaries CSV. So we'll open both of these. And this is what the data format looks like. So it's in wide format. And I know this is like a lot to look at. so I just wanted to just briefly show you that it's one, one sample or one field per row."
"And then all the measurements are in their own columns. and then the dictionary is where we're getting sort of, like nicer formatting for the reports. So instead of, organic matter, showing up in the tables and plots as, oh, underscore percent, it will look pretty with this abbreviation unit columns so that you can format that, nicely for the, for the reports."
"and then it's important for this dictionary to match up with the columns that are in your, exam, in the data spreadsheet. So this again, the whole process and workflow is detailed in the package, package website. specifically this import your data tutorial and it will provide more specifics on like what are the required columns."
"And the general process for this. So, I don't know if you could see

we have, this little progress bar and, ETA of four minutes, I think it's because I'm on zoom. It's going even slower. So this is just generally the, the process. So like I again leave this to run overnight. And then you can see down here in our files pane that we're getting these new HTML reports that are populating."

"And if this does finish in time, the end of this script, it moves all of these rendered reports into its own folder called reports. So that way you kind of keep your, your inputs or your template files separate from that output in the finished reports. So with that, let's hop back over to the slides and finish up."

"So, the whole series is about how we're making of those data actionable. And this particular webinar is how we're using reports, and how you can use the Soyuz package to make your own reports to, help growers or your survey participants access to soil data and interpret it within their crop and region context. So, again, soils packages up all of the templates and the our functions, and images and style sheets and everything you need to then deliver those comprehensive reports that have all the background knowledge, the latest science on the soil health, the new soil health indicators."

"And this way we can make the data, accessible and, interpretable by not only the soil scientists, but also the growers and people who are making the decisions on their land. So, we are currently working on, sort of the next step of, more concrete, recommendations for management decisions. again, recommend looking at the blog post for more specifics."

"But some of the things include Washington specific scoring curves so that instead of just a scoring curve type, we can provide a little bit more refined, qualifications on the data. And then, also creating more crop specific or region specific decision support tools. So as promised, there's a bunch of, resources here to learn are in the soils package."

"And with that, I welcome any questions or discussion. you can also if you have like specific suggestions for the, package, if you are already using GitHub, feel free to submit an issue on the repository. So this QR code will take you to the issues page of the repo. But also if, you don't use GitHub, you're also welcome to just sending an email with any ideas."

Thank you so much.

"Awesome. Thank you so much GD. That was really informative. I know a lot of people in the audience do use are some people are interested in using R, so I think this is an inspirational presentation for us to either start using it or get better at using it so that we can provide these reports. so I'm going to start us off with a few questions."

"And anyone else who has any in the chat, feel free to post them. you know, throughout your presentation, you talked a little bit about how these are reports, or how the soils are package can be used across state lines and across projects. I'm wondering if you could say a little bit more about the pieces that can be customized."

"Yes. So, a lot of the content and the styling can be customized very easily. as I mentioned, if you search for edit throughout the, all of

the template files, you can see specifically where we're asking you to, update your project information and and provide some, you know, questions to get you thinking about what kind of information you want to include."
"and then if you also want to sort of brand these reports, like, right now, they're sort of using the washy colors and fonts and, you can, adjust those colors and fonts. the statistics, the summary statistics and specific tables and plots are going to be more difficult to customize unless you have experience with R programing, because these are all created with custom functions that are built into the soils package."
"And so, you'd have to basically modify those, custom functions to, get what you want. yeah."
"That's great. So there's actually a follow up question to that in the chat, which is if you have results at multiple depths or multiple subsamples, or if you don't have data for all of the parameters in in the soils package, what happens to those, those parameters."
"Yeah. So, the import data tutorial, has a little bit more context. So if you're, you're basically your data sheet and your data dictionary have to match up, and there's a way that you can include, or exclude some of the measurement. So the defaults, like, you know, there's no specific parameters or measurements that you have to have."
"it's just a matter of you have to have your data sheet and your dictionary match up. So, the measurements don't matter. The depths, that's a little trickier. And something I haven't really thought too much about since, with the state of the soils data, are all of ours have been 0 to 12in, and so I can imagine it would just require a little bit of tweaking of the code to be able to sort of either use the depths as a group or, or."
"Yeah, I know I'd have to think a little bit further on the depth question."
"Thanks, Judy. So, you know, we have, scientists been collecting samples from soils and water and even humans since the dawn of research. And it's somewhat rare to actually let the folks who we sample from see the data or get to be part of the project. Why do you think it's so important to give something back to the stakeholders that we sample from specifically?"
"from my perspective, working with the state of the soils is we're asking kind of a lot from our participant, like, we're asking to go out on their fields. We're asking them to fill these management surveys. I feel like the least we can do is provide something that is useful. that's not just a Excel spreadsheet of some numbers that don't necessarily mean anything."
"So being able to provide that, the background information and everything that you need to really understand, the data in the, the broader context for the project, is really, really important to make sure that they are feeling empowered to be able to engage with their data, and possibly go from those raw numbers to an informed management decision."
"and the other thing that I consistently think about is how a lot of

soils data ends up just in peer reviewed publications, and that's not necessarily accessible or usable, by our growers and our stakeholders. So, more extension publications, more reports like these. I think it's really, really important to be able to provide as not just a thank you, but also just for, sort of advancing our community."
"Great. Thanks so much. kind of on a related note, what I really like about these reports is that the data is just kind of the tip of the iceberg in terms of what we are hoping they can achieve. You know, possibly the invisible parts are even more important. The the delivery vehicle for technical assistance provision or outreach and extension." So maybe you can talk broadly about how these reports fit into the overall capacity building elements of the project.
"Yeah. that's a really good question. I think like beyond, again, my perspective from the state of the soils assessment. So beyond, you know, the training agricultural professionals and conservation districts to, learn how to soil sample, but it also gets them connected with growers, in their, in their counties and regions. And it also gives them something like if they wanted to print out a report and then go over to, a growers house and sit down with them and sort of go walk through the report."
"and have those conversations about their results and sort of have this, this reference or guide, to the discussion. And it makes it more, I think, feasible and, maybe less intimidating to, to not have to know all of the information in your head, by being able to have this either, sitting down side by side at a computer or, having the printed paper report in front of you being able to just walk through it and, talk about what you're learning."
"click on, any of the additional resources and sort of do more research. it just it's a lot easier when you have something that's more, more comprehensive to, to walk through with the growers. Great."
"So, moving on to a couple more questions about just the, our community in general and specifically the, our community that exists within soil science. How do you anticipate the community being able to contribute to the ongoing development and improvement of the package over time?"
"Yeah. so I, a couple of folks, at WSU are already interested in sort of creating another template that is specific for, more like single participant or the, a single farm. and being able to show those plots and tables, comparing different trials or different, experiments from other than growers, comparing to different, or within the same crops and counties."
"So, there's, there's definitely a lot of potential for using this approach of the parameterized reporting, to basically generate a report for these different conditions or comparisons. if the community is first and are and GitHub and all of that, the, open source, the repository is a great place to start. you can clone or fork the package."
"play around with editing the functions and whatnot. submitting pull request, submitting issues. or if you just have an idea of like, I want to see this, additional feature or whatever, but you don't

necessarily code yourself, sending an email or creating an issue, for, for those ideas."

"That's awesome. Do you mind sharing, something about your experience and getting the our community to review the package before it went live?"

"Yeah. So there is a, there's a, pretty well known our developer, Nick Tierney, who is in Western Australia and he posted on Mastodon, which is sort of the social media account that a lot of our users, are, have navigated to from Twitter. So, he posted and asked, about any volunteer packages for review as sort of like a live stream, our package review."

"And so I volunteered the soils package, and it was a really awesome experience. Him and two other our developers, hopped on a call and basically worked through some of the files within the package. provided some recommendations and even submitted a pull request with some of those suggested edits. And so that's also a really good resource."

"I can put in the chat, too. I wrote up a little blog post about that experience of what it was like having, far more experienced our developers, review a package that, yeah, soils has been my first, like, big R package that I've worked on. So it was really, interesting to get the more seasoned developers perspectives."

"Thanks for sharing that. So I think we have time for just one more question. you know, you have an enormous skill set in R and and programing, and not all of us, myself included, are quite as advanced. So, for researchers and technical assistance providers who either can't use R or who can't commit the time to getting, kind of quite so advanced, and, and build something similar."

Are there principles from this project or other projects that you work on that could be applied to their work? Nevertheless?

"Yeah. So the first half of my talk today, I tried to focus more on the higher level, like you said, principles for helping our, our participants get the most out of these reports. And so regardless if you are automating the process or not, I think, making sure that we're minimizing the jargon and we use, including resources and, descriptions of the soil health indicators or the measurements."

"all of those things are really important, and fairly easy to do. Just maybe a little bit more tedious. but, all the figures, and graphics are included and, and are open source. So even if you don't plan on touching the code whatsoever, you are welcome to, download just the figures and include or adopt them."

"there's a little acknowledgment at the at the bottom of the, the readme me of the repository that, you know, acknowledges that this is, work from the Soil Health Initiative. So we would ask that you please include that, but, those sorts of additional resources and graphics, can be really, really helpful. and then I also want to not promise anything but at least maybe get some excitement for, our eventual plan is to create a drag and drop tool where somebody can just upload their data and a data dictionary and, and some context for their project, without having to touch code whatsoever and then just generate a

generate all"
"of their reports from a web application likely are shiny. But, that is a project that is in the near intermediate slash long future. So stay tuned for that."
"Awesome. Thank you so much, Judy. It was a pleasure having you with us today. And thanks for everybody who attended this fourth and final webinar in the Making Soils Data Actionable series. as Molly has reminded everybody in the chat, we have a three question survey that will pop up at the end of this. And just thanks everyone for your time."
We love talking about soils with you.
Thank you.