

Dr. Robyn Wilson full interview with Field Day's Jordan Hoewischer, OFBF director of water quality and research

Jordan: We'll start with, you know, who are you, like, where have you been? How long you've been here? What are you working on? A kind of synopsis.

Robyn: What's my story. So I have been in my faculty position here in natural resources for, I guess, this is my 11th year. Doesn't seem right, but I started here in 2007. So yeah, and I actually grew up in northwest Ohio on a farm.

Actually my own my family still farms up there and I went into an undergrad degree in environmental studies at Denison University and got very interested in interactions of humans and the environment. So I went to grad school actually here at OSU, worked with a decision scientist who's not here anymore, he is actually at the University of Michigan. I can say that. I got into this kind of world of decision science and so my position here currently that I'm in is associate professor of risk analysis and decision science.

And so I have traditionally done a lot of work in a variety of applied contexts from environmental to agricultural to public health which are obviously very interrelated. But I find myself now in the last probably couple of years at least working almost exclusively on agricultural decision making related to nutrient management and water quality. So that's the kind of world, that's who I am now. I feel like it's working on these interdisciplinary teams of engineers and economists and other people working in that space. And I do the piece on, you know, how are farmers dealing with these sorts of tradeoffs and how are they dealing with the risk and uncertainty around the management decisions that they have to make in their operation.

Jordan: My next question is going to be what is risk analysis and decision science? It is probably a new term for people. I mean is there a better way to kind of wrap that in a bow and say "that's exactly what I do?"

Robyn: Yeah, so I definitely would identify myself as a behavioral decision scientist which just means that I really come from a psychological background so I'm really interested in the individual level decision making.

So when an individual whether it's a farmer making land management decisions or it's a member of the public making like a consumer purchasing decision or whether it's a student deciding where to go to grad school, right? Just the idea on an individual level there are certain things that matter and don't matter when we make decisions. And so what I study is really at that scale. The risk part, a lot of what happens in decision sciences dealing with decisions under risk and uncertainty. So it's dealing not with the really obvious choices where you know exactly what's going to happen when you act in a certain way but it's dealing with the ones where you don't really know what's going to happen.

And so in the farm context that's certainly true for a lot of conservation-related decisions. Cover crops are like a classic risk and uncertainty problem because they can have, a lot of good things can come from them and they also can become a tricky and a management challenge and there's a lot of uncertainty about what actually comes out of that. So I'm interested in those sorts of decision processes and how people choose to engage in new behaviors or in this case new management practices when they're dealing with those

difficult tradeoffs between risk and benefits. And, you know, across time for instance things that are going to happen now versus things that might happen in the future.

Jordan: So along those lines like what's the biggest challenge or challenges you see with your field of study?

Robyn: The biggest challenge, so I guess I could answer that in a lot of different ways but I will interpret that question this way, that I study human decision making as it relates to the kind of big environmental problems. And what I kind of consistently come up against as the biggest challenge to improving human decision making as it relates to big environmental problems is that as a kind of as a species right, so I'm not pointing to any particular person or group of people, but as a species humans are really short-sighted.

So we have this tendency to be very focused on the present and very focused on, you know, what are the kind of risks or cost I can avoid. Now what are the benefits I can achieve now, so when we looked at a lot of environmental challenges they're often the result of us kind of acting in a fairly short-sighted kind of present-focused way. And I don't judge that because that's a very smart and adaptive sort of way of making decisions for a lot of things, right? As to kind of worry about now and then worry about the future later. But for a lot of the environmental challenges this doesn't work so well. And so we need to know better how to manage those trade offs across time and to know you know what are the costs that I should or could take on today because those benefits down the road are going to be so great that it will be totally worth it.

Jordan: Which is interesting when you're dealing with farmers because the they have a weird mix of short and long term.

Robyn: They do.

Jordan: There's literal futures on all commodities. There is generational planning. Sometimes they don't do that, but you know that's an interesting mix to me. I would assume that that's a tough ask sometimes when you're dealing with the psyche of the farmers?

Robyn: Yeah it's a really tough ask because there, you know, in some ways they're kind of unique but then they're kind of similar. I do a lot of work with the Forest Service on forest management and wildfire too, which is kind of similar because forest managers also have to deal with the land management decisions often on big scales sometimes where they're dealing with kind of like short term threats to property and public safety and things that they have to worry about now, but then they also have to think pretty long term about managing risk over time and it's a really tricky balance to be able to find.

Jordan: Have you seen the Forestry Service stuff spike at all? We've had fires in the middle the country and, you know, huge wildfires in California. Has that evolved at all?

Robyn: I don't know that the decision making has evolved. There's been critiques for, gosh, a decade or two of the way those decisions are made, and really just from the perspective that people have critiqued managers in the public lands period. So whether it's park service or forest it doesn't really matter, but people have critiqued managers in those positions for being too short-sighted and being very averse to kind of short term risk, but taking too much long term risk. Then from an ecological standpoint, you know, forest

ecologists and fire ecologist would argue "That's why wildfires are so bad now because we, we spent like a solid 70 to 100 years suppressing fire to protect short term interests and resources."

Jordan: Promptly burning down some of areas then letting it regrow.

Robyn: Exactly. So now we've created this kind of catastrophic situation when a fire happens it doesn't happen on a small scale because the fuel loads are too great and then some of the forest systems that are actually adapted to have fire haven't had it for so long, but then they burn too intense and too hot and too big. So there's been a lot of critiques of that and it is a challenge because there's more and more people you know living in those interfaces between public forested lands and urban areas, and so you do have a responsibility to protect them.

Jordan: It will be interesting to see if anything comes of that.

Robyn: There's a lot of money being spent trying to understand how to make those decisions better, right? Like how do we deal with that better and it's tricky.

Jordan: Well, back to farming. I know your bigger study recently has been on the Western Lake Erie Basin and I think it was a 2014-2015 survey that kind of was just recently published last year. Can you tell us a little bit of what that was all about? What was the framework of that survey?

Robyn: So I've done, gosh, we're in the middle of our fourth survey right now in the Western Lake Erie Basin. The first one was in 2011 and the majority of that work to date has been kind of funded through two projects. One was a project through the National Science Foundation and their coupled Systems Program and the idea of that program is to try to understand the human system in the natural system for some issue and to try to model how they interact. And so my role in that project was again to really look at that farmer decision making piece and to ask a couple of questions.

One of the driving questions of that project was whether or not we could offset offset the impacts of climate change on Lake Erie through changes in farmer behavior. And the idea behind that is that what's going on in Lake Erie is a function of two things. It's a function of nutrient runoff from agricultural landscapes. It's also a function of changing weather conditions, right? So it's a function of bigger more variable rain events and warmer lake temperatures in the summer and so the logic is that those two pieces are probably equally responsible or at least both responsible and some form or another.

Jordan: One magnifies the other.

Robyn: One magnifies the other, exactly. But if we want to address the issues in Lake Erie we can't fix the climate. We can't turn off big rains. We can't spread them out over longer periods of time. We can't cool off the lake in the summer so the only leveler that we have in that equation, right, is to adjust our practices across the landscape. And so the point of that project was really to say you know we can we can run for instance hydrological models and run scenarios and say "OK what if farmers across half of the Maumee watershed put cover crops in?"

What would happen and we can run scenarios and say what if 75 percent of them use

subsurface placement through strict tillage or whatever method and the hydrological models are really good at looking exactly like what would happen as phosphorus loads into the lake change. If so how? And so a part of that project is doing that and then the other part is recognizing that it doesn't matter what those hydrological models say. If nobody wants to do it, right? It doesn't matter if we know exactly what it would take to fix the lake.

But if the public doesn't support policies that are going to support farmers and farmers don't respond the way that people want them to respond none of that matters. So in that project we're trying to look at those kind of interactions like what are the publicly supported policies that could be put in place whether it's incentive based programs or even just outreach versus regulation. How are farmers going to respond to those different sorts of programs that might be in place. And then as they respond how did those changes on land use and land management translate into changes of phosphorus coming into the lake.

So that was the big focus of that and then we've had some other surveys that have focused more explicitly on the four Rs of nutrient management and trying to better understand farmers willingness to change practices within that particular suite of recommendations.

Jordan: Yeah and I saw in that study that 69 percent say they're willing to consider conservation, new conservation practices on their farm. There seems to be a disconnect between what farmers are willing to do and what they're actually doing or even like what the public thinks that farmers are doing or not trying to do. Is there a disconnect between actually doing it and, like, thinking I will and how do you correlate that?

Robyn: Absolutely. So, the takeaway is that, I would say have really come out of that survey research, and this is again since 2011 we've done three surveys and completing our fourth so we've got actually a nice kind of snapshot of over time, like kind of how opinions have changed and what people might be doing differently and we've actually seen increases in a couple conservation practices. So we've seen a reported increase in soil testing as a means of determining rates, which is great because that is one of the kind of you know recommendations for precision and application. We've also seen some positive changes in subsurface application of fertilizer where more farmers are reporting over that period of time that more of them are doing that as opposed to just broadcast applying and then not incorporating it or something like that. So we've seen some positive changes in a couple of them. We have also seen no change in other things or limited change. Like cover crops are a good example, which are a way trickier management challenge. So that's not surprising even at face value.

What we've also seen over time, and this gets to this kind of gap between good intentions and action which is a classic behavioral gap, right? We can all reflect on our lives and say I have lots of good intentions I just haven't acted on them yet. So again farmers are not unique in that sense. They're just humans like everybody else.

So we are seeing these really high levels of willingness among the farming population, right? So, minimum probably 75 percent up to 90 percent depending on the practice of people who say "yeah I would do that in the future. I'm considering doing that in the future" and then over time we've actually seen significant increases in the farmer's knowledge, awareness of the issues, concern about the issues.

So we've seen all these positive changes in kind of the way they think about the issue

where we've seen no change, and this is the interesting part, is in their perceived ability to implement the practices successfully and their confidence and whether or not they'll work, which again I can't blame, I can't blame them because even I go to, you know, events where I'm hearing agronomists and engineers and soil scientists talk about, like, what's the state of the science on these sorts of recommendations and there are often mixed messages.

So there's just a lot of reasons why it's probably not surprising that even though we're like 90 plus percent in terms of positive awareness, education, concern, willingness for a lot of things, we're hovering at about 50 percent of farmers who say I could actually do this work. And again I can't blame them. I think we have some improvements to do in the science, period, where we honestly don't know the answers to some of the questions yet because there are complex systems, right? And so you can't just say "if you plant cereal rye on this date and, you know, like everything's going to work perfectly" you can't do that. And we know that certain practices work better under certain types of conditions but we don't have all of that complexity really sorted out to be really predictive about it yet and there are great people working on those sorts of challenges. Part two of that is that in some cases we do know more, but the messages haven't been as clear as they need to be and so that's more of a communication challenge for scientists and for places like Ohio State to figure out how do we get on the same page with what we are confident about and how do we instill that confidence in the farming population. So I think there's those two things and then I think the third thing is like, even if we know exactly what's going to work, right, there are still these like significant barriers that could be cost related.

But this is what you know cost sharing programs are for and so that's where we could dedicate that for things like cover crops that have those higher levels of uncertainty about what those benefits will be and when they will come from a farm perspective. But then there are other things like with subsurface placement people will say "I'm willing to do it but there's not enough of that equipment around and not enough time to do it." And so until from a kind of structural standpoint someone steps in and adjusts those sorts of things, you could have all kinds of willing people who want to do it but they just quite literally cannot because they don't have access to the equipment or the window in which that can be done by commercial applicators is not big enough for them to do it for everybody.

Jordan: And you know the top number was 90 percent there is still a 10 percent that is like "no way, not at all" like upfront. How do you move the needle on that percent. Because we're already getting, you know, a certain percentage that think they aren't going to be successful but this is like no way, I'm not even going to start.

Robyn: Yeah. So yeah I would say 10 to 15 percent depending on the practice are in the never. and I joke. over my dead body kind of category of I'm just I'm not interested. I don't want to think about these things and I'm not going to consider it.

My advice is we don't worry about them, to be quite honest. And there's a lot of reasons why. One is that from a communications standpoint you don't change people's opinions when they feel that strongly about it. And so we would be kind of kidding ourselves if we think oh "through the Extension system we can just go out and get those people on board" like, no, it's not going to happen. And then part two is the hydrological models that run scenarios looking at what does it take to clean up Lake Erie are saying we may only need 50- 60- 70-percent of farmers to get on board with any given practice, so there's no scenarios where you know 100 percent of people must be doing X or Y in order to address

the lake. So my opinion as a behavioral scientist who worked closely with the physical scientists is like that's a waste of our time probably to worry about that 10 to 15 percent. There are plenty of willing people that want to do their part and see a window of opportunity to do it but they're probably being held back by a handful of these things related to kind of their ability to actually put it in place.

Jordan: Yeah that's a good point. You know you said future adopters are more likely to move the needle. That's probably the case in any scenario. But is it harder when it happens in an industry that is, is the hierarchy is almost multigenerational in place or the age of the decision maker is so high cause the future adopters are young, maybe the younger kids might be a little bit more the progressives, but does it change at all when it's this industry.

Robyn: You know it's a really great question. What's kind of tricky about like farm decision making relative to even the other world I live in a lot, which is like the kind of resource management world on public lands versus private lands which is the majority of the land.

Then when you think about it is that, in that case you have still a single decision maker typically and they are maybe existing in a hierarchy, but there are people with kind of clear autonomy and responsibility for that decision. What's kind of interesting and kind of cool about farm decision making is you get up to two or three people more than that, but even a smaller family run operation who are kind of working together to make a decision and there are certainly different opinions sometimes within the group about what to do and how to do it when to do it. Anecdotally we haven't looked at this really closely in our survey research but in interviews and other kind of anecdotal ones we do hear a lot of you know, like if you have a father-son combination farming of the father saying "well my son keeps telling me I should."

Jordan: It's almost like clockwork.

Robyn: Oh yeah right. You hear that one a lot.

So there certainly is this generational difference I think and how maybe they think about these kind of trade offs between production and conservation or kind of short term annual, you know, financial goals versus these longer term kind of sustainability goals which they all have.

I mean, this is one thing we have looked at on our research pretty closely as this kind of productionist versus conservationist identity among farmers, and what we've found is that all farmers share a very strong production of identity because of what they do and it's their living and that's their occupation and so they all kind of share that, and to what extent you hold that identity has no real impact on your conservation choices. But what we find is that when you look at the conservation, this kind of aspect of how farmers think about themselves and what they think is important and their kind of occupation as a farmer, that those that do have that stronger conservationist identity, who feel a sense of kind of social responsibility to think about soil and water issues to be a kind of a responsible member of society that sort of thing. They are much more likely to be doing these practices and we do sometimes see a generational gap there where some of the stronger conservation identities are among the younger generations. We do also see among our 10 to 15 percent that are not so on-board with things that they do tend to be older sometimes and again can't really blame them. Who wants to shift up everything you've been doing for 50 years

when you don't imagine you'll be doing it for that much longer.

And then they also sometimes have more rented acreage. And that's one of the other big kind of institutional or structural challenges that I think no one has paid enough attention to yet.

It's like why would I invest in cover crops if I'm on a year-by-year rental agreement with someone because if it's going to take me five to 10 years to see the full benefits of that management practice then there's no way I'm going to do it. So until we get landlords probably more involved in that conversation or we change rental agreements such that people have longer term commitments to pieces of land I mean, that's half of the acreage in Western Lake Erie.

Jordan: Yeah that's like 2 million acres or something like that.

Robyn: Yeah. I think it's about half that's rent. So that is to me one of the big challenges is that, again, I don't want anyone to walk away with an impression I think that 10 to 15 percent are lazy or acting inappropriately or I think they're not facing legitimate challenges related to like I'm going to retire and so why would I learn something new or I'm farming a lot of rent and land my proportionate rent and land is bigger than some of the other folks in our sample and so like I'm just not going to be as committed to investing in these sorts of things.

Jordan: That's a good point. So I noticed one of the other stats you had in the study you know 58 percent of farmers had heard of the algal bloom, I think was the stat and this was in 2015 which was literally less than a year since the Toledo water (crisis). What does it say that in that 11 months after the water shut off in Toledo that only 58 percent had heard that? What does that interpretation say to you?

Robyn: Well, that's a really good question. It just makes me think of the fact that I gave a talk about this research to a group of AP environmental science students from Dublin Coffman High School and I was like "So how many of you know what's going on in Lake Erie right now?" and they all just stared at me.

I was like "OK I know you're in Central Ohio. You know you're in an urban area and whatever but like what do we know about northwest Ohio?" Like what's happening in northwest Ohio and they all just kind of stared at me. I finally got someone to look at me and go "agriculture?" It just kind of struck me that sometimes we make assumptions that people are really paying attention to and aware of things that are going on.

Because it's important to us but a lot of people are just not engaged in those issues and they're not thinking about it and so I think initially the fact that a year after that event, you know 60 plus percent, 60 percent plus or minus farmers were aware of that thinking about it is just a reflection of kind of human nature like we, we have lives we're busy we don't pay attention to all of these issues. And that number again has gone up a lot.

Jordan: Do you guys ever do any like, I don't even know what the correct term is like, like spatial representation of where the surveys come from in the basin because, you know, I feel like judging from talking to some farmers they hear information sometimes or not depending on if they are in the Toledo TV market, or Columbus kind of stretches up there, so if you're in the southern basin you get almost the Columbus news and if you're in the

Toledo basin you get almost inundated with that information. Do you guys ever break that out?

Robyn: We do. So your kind of comment about media coverage is interesting because I haven't really explicitly looked at that or thought about that. Like what's the spatial boundary of the Toledo versus Columbus. Like my parents live out west of Findlay, Ohio and they watch that Toledo news they don't get Columbus, but my grandmother and my uncle live in Hardin County and they watch the Columbus news and they're one county apart, so it's got to be somewhere in there where that shifts around.

But we have looked at spatial distribution of farmers opinions and even practices.

So we have looked at you know are there certain counties or townships or locations where we see just big differences and kind of awareness of the issue or current practices, intended future practices and to be honest there aren't a lot of clear patterns there. There are kind of randomly some counties where adoption rates of conservation seem a lot higher than others. And we've had some theories for why that is.

And most of that to me comes back to what's going on in that county in terms of the Conservation District and the Extension agent and you're going to get a lot of variation county by county. You know those sorts of things because there's going to be people who are perhaps better or worse at that form of engagement who are thinking more about those issues and so you may have, you know, Extension folks that are more engaged than that when they're closer to Lake Erie and they're talking more about that with their kind of local constituents, right? Versus maybe further south you see less of that.

So we do see it. But again it's not a lot of clear Lake distance from the lake pattern or distance from Columbus pattern that we haven't seen and we have tried to look at very explicitly. Like for the individual farm, how far are you from the lake and does it matter? And there was no effect on that. We did see an effect of distance from the river, from Maumee River, and there were higher levels of concern and action for farmers who were in counties that contained part of the Maumee River, which is kind of interesting. So, to me that maybe is a reflection that that's a water body you're more engaged with intentionally than you would be with the lake.

Jordan: Do you think the opinions that you surveyed in the Western Lake Erie Basin differ as you get further out from the Western Lake Erie Basin and northwest Ohio. I mean we have Grand Lake St. Mary's which is obviously a hot bed and even western Ohio as a whole understands both of those issues. But do you think as we get further out, you know, people are paying attention?

Robyn: That's a great question. I don't have off the top of my head any kind of data that would back up an answer to that. So I'm hesitant to kind of say. I haven't done research in like areas just south of the Western Lake Erie Basin that encompass Grand Lake St. Mary's for instance. I imagine there all kinds of levels of concern there because the focus there has been more intense in some ways in the past than it has even on Lake Erie.

So I don't know about that. I imagine there are quite a few things that vary because there has been a lot of focus you know on farmers in the Maumee watershed for instance and so I imagine there are some differences in awareness and whatnot just because they're going to be inundated more with the four R outreach efforts, these sorts of thing.

I do know that when we look at like Western Lake Erie Basin versus even kind of eastern corn belt or other parts of the upper Midwest that there is definitely a higher level of awareness and concern and motivation in that group than there are in a lot of other areas in the Midwest from data that I've seen and that kind of makes sense again because there's been such a focus on it.

Jordan: Yeah, yeah and one of the things, I guess probably my last question about the Western Lake Erie Basin study. There was a breakdown of where the farmers received information be it from Farm Bureau, Extension, their neighbors or wherever. Is there a difference between who farmers are receiving info from and who they like actually take that information into action? Because they receive info from Farm Bureau on a monthly basis. They get stuff from Extension on a monthly basis. But is it really a YouTube video or their neighbor that did something that really make them do that. Do you have a feel for that?

Robyn: I have a feel. So we haven't extensively looked at that with our data either or really studied that kind of particular question.

But I do know that based on aspects of what we've asked and based on what I know generally, another I think kind of missed opportunity in that realm is that we should be partnering - we being Extension, we being scientists working on that issue, we being decision makers - should be partnering more with the agribusiness sector because that's the first place farmers are going for advice on a lot of things, is to their crop consultant or their ag retailer.

Yeah and there hasn't been a big focus on that in the past. There's an increasing focus where people are starting to survey more like nutrient service providers and how do they think about these issues and there's obviously the certification program now for, for commercial applicators and so there is more attention being paid to that. But, I think like where they are getting information that they're using, it's probably there first over anywhere else.

We see pretty positive impression still of Extension and Conservation Districts and all of that. You know places like the nature conservancy tend to be a lot lower on the list even though they're very actively engaged for our efforts.

So yeah, I mean I think from our data we have a good sense of where they're getting it and it probably correlates fairly well with who they're paying attention to. But I don't think we've been as proactive about working with the ag business world as a partner in promoting conservation, right, and in thinking about those sorts of solutions being part of how they talk to their clients about the farm operation.

Jordan: Especially in the Western Lake Erie Basin, if you multiply, you know, the rented acres and a fraction of those are going to be, a big fraction of those are what agribusiness, ya know, the co-ops are actually applying fertilizer, too. There's a big fraction that either the farmer doesn't own or they don't apply their own fertilizer and that's probably the most representative fraction of that land. So yeah, I would definitely agree with both of those points being the absentee landowner and the agribusiness. That might be the biggest part.

Robyn: I just feel like it's not talked about enough. And you know and they should be and

this isn't, again, like to speak poorly of people like the agr-retailer or agribusiness world because a lot of them are doing probably a really excellent job. But my dad farms in Hancock County and he is not a very big operator, they live on about 500 acres but he has been in continuous no till and covered, like 100 percent cover crops. He's so funny cause the other day, he likes to like share with me what he's working on and whatever, and he was like "well, I got my new recommendations for new rates for my fertilizer" and I was like OK.

So when you find out he's like "all my rates went down" and I was like well "that's great. Why do you think it is" he's like "I don't know. Could me my continuous no till and cover crops" and he does that solely because he thinks it's important and he believes that there will be benefits and not because it was being promoted to him by his crop consultant or anyone he was working with any by his crop (consultant), me or anyone else working with him, and in fact when he got those recommendations back what he was told was "I don't know what you're doing, Mark, but something's working."

So I just think there's, you know, there are a lot of missed opportunities there where people who could be kind of talking about "hey like here's some evidence that these things are working for some people." And those conversations should be happening between farmers and people in the, you know, the ag retail world. And I don't know that they are always happening.

Jordan: So the answer is probably obvious, you know, but like how is it having family sounding boards for your research? I would assume that's a nice thing to have to say "hey is this word right? Or like, is this something you would care about?" Is that good to have some sort of like a check, almost, in the family?

Robyn: It's great. I mean, I feel like at one level, and this is good for the Farm Bureau audience, that it probably makes my research as someone coming from a school environment and doing kind of environmental work quote unquote. It makes probably what I have to say something people are more willing to listen to because they feel like "well at least you know where we're coming from and you grew up in that environment and you interact with people on a regular basis."

I'm not an outsider. Just like some crazy urban person that works at OSU and does environmental stuff.

Jordan: Yeah, you can send them a picture of like your 4-H project...

Robyn: Exactly. These are my first two lambs that I cried about at the sale and then I got hardhearted about it.

So I totally get it right? I understand all of it which I think, one, gives me more credibility with a lot of the people that I work with, which is great. Also gives me a better just kind of understanding of what's going on that I wouldn't have otherwise.

And then, I definitely call my dad all the time or my uncle or various people and be like "What do you think about this?" Or I'll take a draft of a survey we're working on and say "fill this out and we'll talk about it." And I think that's great and good researchers do that anyways. But it's easier for me to probably do that when I have people I can call as opposed to try to round up.

Jordan: Does it work against you at all? Do you think it's too much insight sometimes?

Robyn: Oh that is a good question. I don't think so. No I really can't think of anything negative. I wish my grandfathers were still alive so we could talk about this because my one grandfather, I worked for the EPA for a couple of years before I went back to grad school, but for air quality so nothing water-related, nothing that really even impacted agriculture, but in vehicle emissions testing. But every time I come home for a family event my grandpa be like "I don't know if I can trust you. I'd better not tell you what I'm doing." Like he would just tease me all the time. I think, oh I'm finally doing stuff that I think he would probably really appreciate. He's not here to talk about it.

But, no I can't, yeah I don't really see any (negative). I think it's just been helpful to give me, like, a more grounded reality of like where my research center intersects with kind of the reality of the ag sector and what people are dealing with.

Jordan: That's a good point. I have a couple questions about one of the studies that popped out to me that I think is applicable to the audience is about the weed management and weed management study. It's been a while, I think, since you started one of them. You cited that farmers are more likely to control weeds after they germinate then with prevention. Do you think that sentiment has changed over the last 10 years?

Robyn: I don't know because when I did that initial work that was in conventional systems. And all the work I've been doing recently has been in organic systems. The weed management challenge is much more complex in an organic system. And so, yeah, my bias is towards what do organic farmers think about the way to manage weeds and that's a whole different story.

Jordan: The word "burn it down" has an actual literal connotation instead of just a chemical one.

Robyn: Actual flame. Yes. I really can't speak to whether or not that has changed. Yeah it would actually be an interesting kind of follow up study to see if there is more of a prevention versus control focus that shifted or not, I don't know.

Jordan: I thought it was interesting because you talked about kind of the lack of understanding around the human role of dispersal with weeds. And you know I would assume like with organic farmers they probably have a little bit more hands-on or a little almost like a ground level view, no pun intended, of how that works because there's a little bit more mechanics involved and not as much automation. So now I thought that was a really interesting point, you know, that we just kind of think "well, you know, it is what it is. It just germinates and then we spray it and then we're good."

Robyn: Yeah, yeah, yeah, and organic farmers definitely can't approach it that way.

And I would imagine, I would hypothesize, that opinion has changed because the super weed problem has gotten so big, and so I would imagine in conventional systems there's a realization that you can't always control it afterwards because of what's been going on with the evolution of some of these weeds to our forms of treatment. So yeah, I would imagine that that's a challenge. In that organic system they're just always worried about this trade-off between kind of like soil health and weed control. Because the mechanical forms

are effective for them but then they're destroying the soil and that's one of the things they worry about as well. So, so, yeah it's a different sort of set of decisions that they're thinking about.

Jordan: I've got some wrap up questions here. I know we've gone all over the place here, but one of the things that kind of popped up in my head when I was reading through some of your studies are, are the results affected by the type of people who are more likely to respond to surveys? Because for me I'm like over, forever, RSVPs for weddings, because I'm unorganized. So, like, that doesn't mean that I'm not going to show up or not going to give a good gift. But it's just always late. So does, is that influenced by the type of people who are like "I'm going to follow up with this survey and do my share."

Robyn: Sure. That's always the concern, right, with any sort of data collection like that?

So the way we try to manage for that is we randomly select people from within whatever spatial boundary that we want to study so that we're hopefully getting a mix of all those people, right? The people who never respond, the people who always do, the people who have again a really strong like conservation connection, people who maybe are in that 10 to 15 percent who don't care, so we try to not be biased in the way we recruit people to participate.

And then from there we do rely a bit on getting a good response rate to then feel like we've gotten a good cross-section of those people. What we do to make sure that who responded isn't biased one way or the other and happens to be really kind of, again, like we don't want to over-report, you know, use of particular practices we don't want to under-report certain things. So we usually do non-response follow up surveys where we go to the list of people who didn't respond and we'll call them as opposed to mail it with a very short list of questions, five to ten questions, that are really key questions that will help us be able to tell, for the people that didn't respond, are they much more averse to risk maybe than the others? Are they the bigger farms? So we can ask questions. It's like a check to make sure that there's no non-response bias, so that's just kind of standard practice to make sure that we aren't misrepresenting what we're hearing from the people who choose to participate.

Jordan: And this is like along the same lines, and I hope it's not repetitive, but is it tougher to, like, correlate the study results based on just the reluctance to give out the information period? They may fill out partial things. They may leave out their acreage or they might leave out a soil test response. Does that play a factor in some of the results?

Robyn: It does. I mean, you always look through your data and identify how many missing responses you have for individual questions. If you're missing responses at the, like, 5 to 10 percent range, we don't usually worry about it too much. You can also look at if they're randomly missing versus a pattern. And so we can look at that and get a sense of whether or not that's a potential bias. If there is a question, for instance in one of our surveys we asked like "how likely are you to do a particular set of practices in the future" and then we ask on what proportion of your acreage. And that was a hot mess. No one was answering those questions. Either they don't know or they just don't even want to try. And so we just dropped it. So if we have questions that just performed poorly and the missing data is so big we just get rid of it.

And there are also fancy statistical methods you can use to fill in some of the blanks based

on patterns of responses across people who participated. And so that's always an option, too. If there's enough missing data that we're concerned and we really want to use that variable in our analyses or it's important to our understanding of what's going on. We can sometimes work around that.

Jordan: You talk about modeling with the different practices and the phosphorus that might hold up in farm fields and there's modeling in weather patterns. And then you have this survey work. Do you think it's hard for farmers to put stock into those things as opposed to maybe the more traditional, more tangible things? That they'd like to maybe hold their hand a little bit or kind of understand a little better? I mean it seems like climate change models and weather models and all this can get a little bit distracting and distrusting from the agricultural side of things. Does that play a role in kind of how believable the information is?

Robyn: Yeah. So again, agriculture and farmers aside, yes people, period, distrust models and what models say. Their models are always wrong. It's just how wrong they are, right, because they're not meant to predict the future. So I think you have to go into it with that assumption that they're not meant to be predictive of the future. They're supposed to paint a kind of set of potential futures that then help us maybe make choices today to avoid worst case outcomes. Right? That's one way to look at it. So I think it's important for, again, whether it's farmers or anyone who's being presented with information from a model to keep that in mind. I do think that a lot of the modelers that I work with are these like watershed modelers who do hydrological work and most of that is validated with field data. So, like Kevin King at USDA ARS does a lot of edge of field work that is then used to validate the models, so that we know when we're running the scenarios that they are accurate. So a good model will be validated and will be tested against kind of concrete real data that people are collecting at the edge of field or in the field.

So you know I've learned a lot about that side of the modeling, the physical modeling side and it's increased my confidence, I think, in what what they're learning and what those models say. I always am just more skeptical because there's still this tendency to say "OK yeah" you know the best scenario out of one of those recent multi-modeling projects between several institutions running the same hydro model was we can get to the 40 percent reduction in Lake Erie if we just get - I'm going to approximate I don't have the numbers quite right - but like 50 percent of farmers to do cover crops about 65 percent to the subsurface placement and I'm like "okay, okay." And then 77 percent to do filter strips, and I was like "oh, that's not going to happen. Do you have enough money to do that? I don't think you do."

I'm actually quite trusting in what their models say. I'm just more skeptical and this tendency to take those out and then just go "look problem solved, this is all we have to do" because there are a lot of, again, behavioral and political and other factors that come into whether or not those targets, those even behavioral targets, right, management targets are feasible.

Jordan: What do you think the biggest changes are in your work you've done? You said you've been here for a little while, a decade or so. What's the biggest change you've seen in your work?

Robyn: This is not probably answering the question that you're asking. The biggest change in my work as I used to work on lots of different things. Now I just work on this.

Jordan: That means you're you're more of a point gun, your specialty is being used for probably one of the biggest issues in our state/region maybe our country.

Robyn: Yeah, yeah, no and I think it's as an interdisciplinary scientist who works on lots of diverse teams of people. It's kind of nice yeah. It's kind of nice to work on the same problem over and over again, because before you know it was like climate change here, water quality here, wildlife conservation there, wildfire. You have to learn all those systems and it is probably too much, so it's kind of like professionally kind of rewarding to be able to more consistently be working in an area that also allows me to get to know people working that area and more. You know like, I'm finally after several years of working on these sorts of issues getting to know, like, all the individuals running the commodity organizations and just other people in the kind of ag networks that you know I would know the OSU-affiliated ones but I never worked enough on these issues to really get integrated with some other kind of players in the in the context. So that's been nice, too, I think to really go all in on something and just know the landscape better than I would have otherwise.

Jordan: Last question for you. What does the future hold for human studies? You know is it going to get harder or more hurdles, less hurdles? I mean we can get the people quicker, information comes back quicker, but what do you think the future holds for the middle to the back part of your career in human studies?

Robyn: I think it's pretty bright, because I feel like when I started especially in interdisciplinary settings it was, you were always just the token social scientist, right? There was like, well we needed someone to tell us something about humans. And the focus was always on the physical side or the ecological side. You know fill in the blank. And so I think over my career I've seen a big shift and just legitimate interest in social science. Legitimate realization that that's at least half of the puzzle to solving the problem, and so if we keep running around ignoring that piece of the puzzle then we're not going to solve a lot of these problems and we're going to put out policies and solutions that aren't going to be effective. And that's a waste of everybody's time and so I think there's been a legitimate increase in people's understanding of that and it's reflected not only in funding opportunities that require that you have more than a token social scientist involved who is just going to magically communicate your results to people apparently because that's what people often think we do. But who is actually going to be with you from day one, helping define what the research is going to look like and how we're going to integrate these things. And that's really exciting. So I think there's just going to be more opportunities to better bring this into the way we think about problem solving. So I know I'm excited about that.