Transcript for "Pam Knox, Director of the UGA Weather Network and Agricultural Climatologist in Athens, Georgia"

Clear Skies Ahead: Conversations About Careers in Meteorology and Beyond

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Kelly Savoie:

Hello, Clear Skies Ahead listeners. This is Kelly Savoie, and I'm hoping you can take a moment of your time to rate and review our show wherever you listen to podcasts. We have produced over 60 episodes, and you can help us reach even more individuals that will benefit from the diverse experiences shared by our guests. Thanks so much for listening, and I hope you enjoy this new episode.

Welcome to the American Meteorological Society's podcast series, Clear Skies Ahead: Conversations About Careers in Meteorology and Beyond. I'm Kelly Savoie, and I'm here with Emma Collins, and we'll be your hosts. We're excited to give you the opportunity to step into the shoes of an expert working in weather, water, and climate sciences.

Emma Collins:

We're happy to introduce today's guest, Pam Knox, director of the UGA Weather Network and agricultural climatologist in Athens, Georgia. Welcome, Pam. Thanks so much for joining us today.

Pam Knox:

It's a pleasure to be here.

Kelly Savoie:

Pam, could you tell us a little bit about what sparked your interest in science and how it influenced your educational path?

Pam Knox:

Sure. Well, let me start more broadly with general science, and then I'll jump into meteorology after that. Both my parents are math teachers. And so, I was never afraid of math, and always liked doing science, and was very interested in just learning about the world around me. So I'd go out and I'd learn about clouds. I'd learn about landforms. And just kind of on my own, got really interested in what was going on outside of the windows.

And then as I went through college, I actually ended up majoring in physics and in math, because they didn't have a meteorology program where I went to school, and physics was something that I just really enjoyed. I liked solving equations. But by the time I was a senior in college, I looked ahead and I saw, for physicists, either they go into something at the atomic scale, really small scale, or they go into something at the universe scale.

And I wanted to do something where I could look out the window and understand what was going on out the window. And so, from that, meteorology was just a natural jumping-off point. And so, when I went to graduate school, I went to the graduate school at the University of Wisconsin at Madison, and started learning about meteorology there, and that was when I was working on a master's. So I was really quite far into my education.

Kelly Savoie:

So when you were an undergrad, were there any mentors you had or influences that made you really start to get interested in the meteorology side, where you decided that you wanted to pursue that for graduate school?

Pam Knox:

There was really nobody at my college that was interested in doing meteorology. I mean, they were certainly interested in supporting people doing science, whatever they wanted to do. But I lived in Grand Rapids, Michigan, where weather is a very big business on television. And so, watched a lot of meteorologists on television. And there, they don't put the meteorology later in the program. It's right at the beginning. So that shows you how important it is.

And we had meteorologists like Bill Steffen and George Lessens, who won an award from AMS this past year for his work in broadcast meteorology. And so, I mean, I just was really steeped in looking at the weather and understanding what was going on from the viewpoint of the broadcast meteorologists.

Emma Collins:

So what opportunities did you pursue inside and outside of school that you knew would be beneficial to securing a job in your profession? Were you thinking that far ahead yet, or were you still kind of getting your footing with the meteorology?

Pam Knox:

My whole career has been based on bouncing from one thing to another without a plan. And so, you don't have to have a plan. Some people do, and it's great. My husband has known he wanted to be a meteorologist since the time he was five years old. But for me, it took a little bit longer. I was interested in the weather, I would say, probably first of all, because a tornado went two blocks from my house when I was in the third grade. Not such a frequent occurrence in Grand Rapids, Michigan, but we did have one.

I remember it was a Friday night. So it was in April. It was after dark, and we were not at home. I was with my mom at a church banquet about a mile away, and the tornado warning went off. We were at this giant gym, so we all had to leave there and go into the hallways to get away from the wide span. She said she heard the tornado. I did not. But I remember the mess that it made when we were crossing to go back home, and there was a church that was a couple blocks from our house that the tornado hit, hit right in the middle of the span. And so, the two ends of the church were standing, but the middle of the church was completely destroyed.

Kelly Savoie:

Oh my goodness.

Pam Knox:

Yeah. And I heard later that... It was a Friday night, so there was a wedding in the church. But fortunately, they were in the basement. And so, no one was hurt from that. But I got home. We were without power for the whole weekend, and trees were down. One just barely missed my grandpa's new car. And so, it made a big impression on me, but I never really thought about it as a career until I was in college, thinking, "I got to do something besides just standard physics."

And so, meteorology was something that I was always interested in because of that tornado experience. And I really think there's a lot of meteorologists who have a similar kind of experience. And so, I think if you do a survey at an AMS meeting, you'll probably find maybe 30% or more of meteorologists who had some sort of precipitating weather event that happened to them that got them interested.

Kelly Savoie:

So when you graduated, what was your first job in the field, and how did you end up where you are now?

Pam Knox:

Well, I got my master's in meteorology. My advisor was Vern Suomi, who was a satellite meteorology guy. And he wasn't around very much because it was quite late in his career, and he had some health issues. But I interviewed for a bunch of different jobs and ended up teaching at my undergraduate school as a sabbatical replacement for three semesters. The summer in the middle of all that, I worked for the National Weather Service at the headquarters in Fort Worth, Texas, and did studies there with Dan Smith on probability of precipitation forecasting. So that was really the first research experience that I had as not a student, but as a working professional.

And so, that was really very interesting to me. I was interested in how they measure rainfall and how they evaluate it, and how it falls differently over time, and how people perceive it. So then after I finished that three-semester teaching load, I worked for the Weather Service for two years. I actually worked at the Office of Hydrology in Silver Spring, Maryland, and that was before they were in their current building. I was in The Gramax building. For anybody who's an old-timer, they might recognize that name.

And what I did there was study extreme rainfall. So there was a group there that was involved in doing these estimations of 100-year rain events. This particular group was not just looking at those, but they were also looking at what we call probable maximum precipitation, which is more like a one-in-a-million-year event. And those are used for things like designing these big dams that they have out west, because they have to be concerned with the worst of the worst cases.

And so, by looking at the worst of the worst cases, what's the worst possible rain you could possibly imagine? Then you sort of get a sense for, what are all the ingredients going into creating this really extreme rainfall? And I really, really enjoyed that, but I decided at that point, I wanted to go back to school and work on a PhD. And so then, I went back to school to get a... Not to get a master's, but to get a PhD, and worked for John Kutzbach in climate studies. He was a big climate person, and worked on ocean modeling. We were trying to do an ocean model of the surface currents in the ocean of the last ice age.

Unfortunately, I am not a good programmer, and I did not like it. So I was starting to look around for something else to do, and the job of Wisconsin state climatologist opened up, the same building, and it was a much better fit for me because I like talking to people about it. In a way, it's kind of like being a reference librarian, because people come to you with questions about the weather, and you have to know where to find the data or how to understand what's going on with that.

So it was a really interesting position that I worked at from 1989 to about 1996, while my husband was there working. He wasn't my husband at the beginning, but later he was. And so, he was working on his PhD in meteorology. And then when he graduated, then we moved for his job. So we've been a two-career couple where we're kind of juggling this back and forth.

So, I mean, the state climate job was one I just loved, and I still keep in touch with state climatologists around the country. We have meetings every year, and a lot of those folks I've known for 30 years or more. And so, they're all very helpful people for the most part. They know a lot about different things. And I think my background has really been good for that, because not only do I have classes in meteorology and some in climatology, although not that many, but I also have classes in hydrology. I have classes in fluvial geomorphology and geophysics, and a lot of other things like that that are related to meteorology, but not necessarily meteorology itself.

In fact, probably the most valuable course to me of all those courses has been a class in civil engineering, and the civil engineering course was about surface water hydrology. So once the rain hits the ground, then what happens to it? And that's something that's been very important also for my work as a certified consulting meteorologist, which I understand we'll probably talk about later.

So all those courses... For me, the variety of courses was really important for learning about a lot of different things. I have never been a real specialist. And so, being able to learn all those different things and to pull them together into one body of knowledge has been really useful for me, and it's something that's come back over and over again, because when the phone rings or you get an email, you don't know what the question's going to be. And so, having that broad background really helps with that.

Kelly Savoie:

That one course, fluvial geomorphology.

Pam Knox:

Fluvial geomorphology.

Kelly Savoie:

So what is that about?

Pam Knox:

That's a course about how water moves across the land. So it's about river valleys, and it's about... There's some about soils or there's some about just how rivers form, whether or not they're straight or they're bendy. The fluvial is the river part, and the geomorphology is landforms.

Kelly Savoie:

That sounds pretty cool. It sounds interesting. The title is a little frightening, but...

Pam Knox:

It was a very interesting course. I mean, if you're interested in why things look the way they do, and what happens to the rain after it hits the ground, then it's a really neat thing. And it actually relates back to a lot of what you learn about in climatology, because it's the same equations of motion. It's physics. It's just applied to something different.

And so, when you look at changes in, for example, the temperature gradient between the equator and the poles, as we get warmer, we expect that temperature gradient to go away. So that could be like a river moving into an area where it's pretty flat. There's not a lot of gradient. And what happens with the

river is that you get a lot more bends in that river. It kind of moves back and forth across this pretty flat plain.

And so, that's what we think might happen eventually as that temperature gradient between the equator and the poles changes with atmospheric flow. We expect there to be more bendy conditions in the future, more waviness in the atmosphere, and it's all physics.

Emma Collins:

So this might be a tough question, by the way. Could you walk us through a typical day on the job as the director of the UGA Network and agricultural climatologist, if there is such a thing?

Pam Knox:

Well, I would say that most of my time is spent sitting in front of a computer. So you got to keep in mind, I've got two distinct jobs here. Okay? My job as an agricultural climatologist is a lot of what I do, but I'm also the manager of the weather network. So let me start with the agricultural climatologist part. In that job, I am an extension climatologist. You might know that extension is part of land-grant universities, and extension is the part... It's the people that really take the research that's done at the universities, translated into commonly understood and actionable decision-making that farmers and other people can use.

And so, extension agents typically are located in each county. They go out to farms, and they talk to the farmers about how much water they need for their cotton or what kind of bugs they might see on their peanuts, or something like that. And so, all of those things are what extension agents do. And I'm an extension specialist, so I'm specializing in climate.

So anybody that's got a question about how likely are we to see a certain kind of insect this year, or are we going to see an El Niño, and is that going to affect our winter conditions, and how is that going to affect the next growing season? That can be a kind of question that comes up. So all of those things are part of that agricultural climate work.

I also talk to a lot of reporters. For example, with Hurricane Debby, which just happened a little while ago, Hurricane Debby, a lot of people wanted to talk about the impacts of all that rainfall, especially, because Debby was really a rain producer more than wind, and the impacts of that on agriculture. Well, you get that much rain, and here in Georgia, some places got over a foot of rain. It's pretty flat. The water just sits there, and it suffocates the roots of the plants.

And so, depending on how quickly that water moves off, you can have some real damage. It turns out for Georgia, the biggest damage probably came not from the rain, but from the wind, and it affected tobacco crops. Tobacco, mostly in the United States now, is grown to send to other countries, because smoking has gone down here a lot in the United States, but it's a very lucrative crop. You can make more money growing that than you can almost anything else.

But there was enough wind from Debby, even though our winds probably didn't get much above 50 miles an hour, even in the gusts, and that would be in the southern part of the state, was still enough to shred the leaves. And once you do that, you lose a lot of the value. And so, that was a problem. I noticed some cotton had a lot of the bolls that were knocked off onto the ground. Well, that's cotton fiber that you don't produce. So that was a loss to farmers as well.

There were some power outages, which caused problems for dairy cattle, because most people use electricity when they're either milking their cows or refrigerating the milk once they have it. A lot of

them have generators, because they know that's going to be an issue, but it's still something that can affect farmers. So I am kind of a spider trying to get information from all these other places, and figuring out how is it going to affect...

Now, I don't do all the work. There's a lot of people that are collecting that information, but I am part of the process of doing that. And I'm one, because I talk to the reporters a lot, that ends up talking, giving interviews to newspapers and CNN and National Public Radio occasionally, or other groups like that. So since I'm sitting at my desk, I'm an easy target. They can get me pretty easily, and I do a lot of that, and I enjoy it. And so, that's good.

So now, let me jump to the other side of my work. Okay. The other side of my work is as the director of the weather network. There are a number of private or state-run weather networks around the country. Not every state has them. I think Oklahoma is kind of the biggest and one of the oldest in the country. They have a whole set of these stations that are around, and those stations will observe temperature and precipitation and humidity, and a whole bunch of other variables, and that's collected and used for decision-making for agriculture as well as for other things. And so, it's mostly archived.

In Georgia, our network started in 1991. So we're one of the oldest. We've had over 30 years' worth of data. We have 90 stations right now. And so, all these stations report this data, and then we have some tools that we provide on our website for things like growing degree days, or the likelihood of frost, or the frost frequency, because we have blueberries and peaches here, both of which are highly affected by frost in the spring.

And so, my job as that is to make sure that we have enough money coming in to support the personnel that we have, to make sure we have an operating website. And number one is keeping that network going, because invariably, it goes down right when you need it. There's going to be a frost or something for blueberries. So our number one job is to keep that network going. And so, I do all this management of personnel and money-raising and data, and then the other half, when everything is working fine with the network, then I can concentrate more on the extension climate work and looking at more longer-term things.

Kelly Savoie:

I was going to ask you, when you said the fundraising, is it a nonprofit, where it's grants that keeps it going? How is it funded?

Pam Knox:

Yeah. Everyone is different. Some states will fund them fully. Oklahoma was funded by a... It was started at least by a utility kickback, because the utilities charge too much money. And instead of giving each person five bucks as a payment, instead, the state went into putting that money and pooling it together, and creating this network for the benefit of everybody.

So, some states, it's like that. New York has a state-funded network. Many other states, it's a mix of different things. Here in Georgia, probably about 40% is funded by the university, and that's mostly just personnel. They don't give us any operating money. The other 40% is funded by data sales, especially to the National Weather Service, because they use our stations as extra help when they're looking, especially at severe weather. So that's more operational, real-time weather. They're looking for really heavy rain. They're looking for wind gusts of a certain amount, and that can help them to determine whether or not severe weather was occurring. And so, there's some of that.

And the other 20% or so comes from smaller data sales. We provide data to the Georgia Forestry Commission, to some other private groups, also a lot of commodity groups. Agriculture is the single biggest economic driver in Georgia. And so, we have plenty of commodities, like cotton and peanuts, and peaches, and blueberries, and so on, and they also help to fund the network by providing some amount just to keep things going.

And if it was just the commodity groups, I think we'd have a hard time, but the combination of all those things has been pretty stable in the last few years. There was a time period, before they started selling the data to the National Weather Service, that we thought this network might die, because there was just not enough money coming in. So that's been a real good partnership for us, is to provide this information for the Weather Service.

Kelly Savoie:

And what's the difference between a network and, say, the state climatologist offices? Do you work in conjunction with them, or is it completely separate?

Pam Knox:

In Georgia, it's completely separate. And there's a long history in there, and I don't know if you really want to go into the history of the state climate program in Georgia. In a lot of states, it is the same. The state climatologist office also has a mesonet. We're one of the few states where it's separate. In most cases, it's the same group of people.

Obviously, they have their own set of personnel to run these two things, but they're often co-located and managed out of the same office. It makes some sense, because a lot of state climate offices are located in agricultural universities, where they're already working with farmers. So it's just a natural extension of that.

Kelly Savoie:

And what are some of the biggest challenges you face working in your fields?

Pam Knox:

Money has not been an issue lately, but it's always on the top of our mind, and we hear rumors from time to time about the farm bill cutting money, cutting funding, or the National Weather Service losing funding for things, and we worry about that, because if we don't have money, we can't pay our people. And to keep the data going, you have to have not only technicians put the stations out there and manage it, but you also have people to run the databases. You have to have people that run quality control, because sometimes the instruments malfunction, and you have to figure that out and clean up the data or you can't use it.

And so, having enough personnel to manage that is an issue. Right now, my two main technicians are... One is already retired. The other is going to retire at the end of this year. So we're hiring new people. There's not very many people who have instrument experience. It's not something that's taught at a lot of meteorology schools. And so, you have to train them, and some people are better at electronics and doing that kind of work than others are.

And since the number of mesonets is going up, there's a real demand for people who know how to do that, but it's hard to find the training because a lot of schools just don't teach that. So that's really one big challenge. Like I said, funding. Sometimes I think lack of understanding about where weather data

comes from. Everybody thinks, "Oh, well, it's just there if you need it." But the fact is, it's not. And if you have an accident or something and you need to prove what the weather was at a particular location, there's probably not going to be a weather station right at that intersection.

And so, you need to find people who can figure out where the data is, and then how to use it. Sometimes you have to interpolate between sites, or you have to be able to read radar and figure out if there's a thunderstorm going through. But people don't understand the value of the data, and the fact that you have to pay to maintain it to make sure you have good data. And so, that's a real frustration to me, just because I think if people understood it, maybe it'd be a little easier to get funding.

Kelly Savoie:

Yeah. And it sounds like it's a service that's needed for the public and farmers and lots of audience members. But hey, listeners, did you hear that? Pam's hiring, if you need a job.

Pam Knox:

Well, hopefully, by the time they hear this, we'll have our two people hired, but you never know.

Emma Collins:

You may not know this, but it's curious that you said schools don't necessarily train people on how to use this equipment or how to maintain it. Do you know why that might be? Is it just so niche?

Pam Knox:

Instrumentation is a class that not very many people know how to teach. It's not taught. And so, if you go to school and get a meteorology degree, there's probably not something there that... There's not very many people on staff that could handle. They're better at computer modeling or something else than they are working with instruments, because instruments, you have to have more of a physics or electronics background a lot of times, and it's something that's sometimes offered as an elective but not a required class in most meteorology programs.

And so, there's just not very many people to teach it. There's not very many people who want to take it, because they're more interested in doing other things, like the computer modeling. I mean, if you're going out and doing storm chasing, or if you're doing broadcast meteorology, you probably don't really need to know that much about the instrumentation. You need to know that it's working, and that the numbers are reasonably accurate, but you don't necessarily need to know the details of how a rain gauge works or anything like that. And so, it's something that's not perceived of as necessary to a meteorology education, but it certainly is valuable.

Emma Collins:

So you have done many presentations on the topic of drought impacts on agriculture. Could you tell us a little bit about what those impacts are?

Pam Knox:

Sure. Well, there's a lot of different kinds of drought, and drought can be just the lack of rainfall, or it could be rainfall combined with high temperatures and heavy evapotranspiration. It can be shorter-term drought. Sometimes we call it flash drought or rapid onset drought, where you get no rain at all for three weeks. And usually, it happens at a really critical period in the growth of a particular crop.

For example, in the 2016 drought here in Georgia, we had a complete lack of rainfall for the first three weeks in May in 2016. That happened to be the period when corn was pollinating. So corn is putting out the stalks, and it's got tassels on it. It's got silk on it. It was so dry that the silk dried out before the pollen could stick to it. And so, they didn't get any ears of corn that year. The ears didn't have any girdles on.

And so, it was just the timing of when exactly that dry spell happened at a really critical time for that particular crop. Just like this year, with Debby hitting the tobacco crop, the timing was so important, whereas if it happened in the life cycle of another plant, it might not be nearly as dear. Of course, a lot of farms now are irrigated, so they can kind of overcome some of those dry spells. So it really happens the worst in crops that do not have irrigation. That is a major risk reducer for farmers.

And then there's the longer-term droughts, the hydrologic droughts, which can last for multiple years. When I was here in 2007 to 2009, we had a really bad drought, where they were talking about Atlanta running out of water. I mean, we're talking about millions of people with potential lack of access to water. And here in Athens, our reservoir was down 10, 14 feet. I mean, so it was really low, and they had to send people to the football games, monitor the bathroom so people weren't flushing the toilets too often and wasting water that way. It was just crazy.

But, I mean, fortunately, we got back into a more rainy period. And so, the reservoir started to refill, and we had a little bit more success. But while we were in the middle of that drought, river levels were down. TVA was having a hard time producing enough energy through the hydropower, and some manufacturing plants had to shut down because they didn't have enough water. If you're making Coke and you don't have water, then you have a lot of trouble, or if you're burning coal and you need the water to cool down or scrub out the coal particles from the air, then they have to shut down.

And it's usually a bad time, because usually, a drought is also accompanied by really high temperatures. So people are running air-conditioning and everything else. And if you lose that source of energy, then you have to figure out where or what you're going to use to get it. And so, drought has a lot of those impacts. It can certainly affect ecosystems. If it's really dry, the streams will dry up. And little critters that live in the streams, they can't leave the stream, so the stream dries up, and that could really affect things.

Many ecosystems are adapted to having occasional droughts. And so, usually, if it's a short enough term, they can last through it, and it'll be fine. But in the process of having that drought, it's just an amazing stress on the environment, both for farmers and for cities, for utilities, and, of course, for the ecosystems as well. So droughts have all those impacts in different ways, depending on whether it's a short-term drought or a long-term drought.

Kelly Savoie:

Yeah. I was reading an article recently about some of the most stressful jobs, and farming was one of them, and now I can see why, because not only do you have to worry about drought, then you have to worry about too much rain. It's almost like the weather has to be perfect to get the best crop.

Pam Knox:

Right. Well, with farmers, then there's all these other factors too. You have to pay for diesel fuel to run your tractors. So you have to worry about the price of diesel fuel and whether it's available. You have to worry about how much you can sell that crop for once it's done. This year, I mean, some of the prices are so low that even if they have a perfect crop, they're not going to make any money off of it, because they put money into fertilizer and diesel fuel, and watering if they've got irrigation. And so, it's not just even

deciding on the weather, but it's deciding on all these other market factors too. I just can't imagine doing that. That would not be something I would want to do.

Kelly Savoie:

Yeah. It's a tough job.

Pam Knox:

It is.

Kelly Savoie:

You have a daily blog called Climate and Agriculture in the Southeast. So how did that come about?

Pam Knox:

Well, in around 2014, I was working as a grant-funded scientist, so soft-money scientist, and I had two different grants that I was working on. One was looking at climate in the Southeast, and they were looking specifically at climate change impacts with some other folks from around the Southeast. I think the main part of the grant was from Auburn, but there were people from all around the Southeast that were part of this grant.

And then the other grant that I was working on was a national grant that was looking at livestock and impacts of climate change on livestock production. And so, part of the thing was you had to come up with ways to do outreach. And because, I mean, there were some that were more regional and some that were national, it made sense to me to try to do a blog to try to capture some of these things.

And so, I started doing the blog in April of 2014, just because I spent a lot of time reading different scientific literature and popular literature, and looking for examples of ways that climate and weather affect agriculture. And so, I don't spend a lot of time in my blogs writing all these long articles, but I say, "Here's an interesting story. You should go look at this. If you're a livestock producer, they're developing white Angus cattle, because white cattle reflect more light. And so, they don't get as hot as black Angus do," or you might look at a new kind of crop that they might want to develop in the Southeast.

Here in Georgia, they're now growing cold-hardy citrus plants, like satsumas and olives, which is something you would never have thought of in Georgia before. But it's a way of responding to changes in the climate, as well as taking new advantages of market for some of these new products. And so, I could say, "Well, here's somebody that's been doing it. There's an article about this. You can go check it out."

And in the meantime, I'm also doing all this other information about, what's the latest climate summary for the Southeast? What do we expect? Is it going to be an El Niño or a La Niña? Because in the Southeast, that's really critical for determining what our climate... It's the number one factor in looking at climate variability in the Southeast. So we spend time looking at that, and sometimes I'll do explainers that explain what is the difference between El Niño and La Niña, and how that might affect agriculture.

Sometimes I say, "Here's a new data source. There's some really neat maps here. You can go see that." So it's just a variety of different things. For a while, I was doing it every day, but I have a big enough number of people that get it now that I can't do it every day and keep it free. And so, I cut it down to a couple times a week. I do it a little bit more when there's a weather event, like Debby, because people need to know where Debby is going to go and what kind of impacts they might need to see.

And so, I use that as a chance to remind people, "If you're going to get a lot of rain, you don't want to park your car down at the bottom of a hill, because it's more likely to get flooded out, or you don't want to put your hay down there, and you want to keep your livestock away from the low-lying areas as well," or I might say, "If you're going to get a lot of wind, you want to make sure that there's no dead limbs that are hanging over your house." And so, it's a reminder of things that people can do to reduce their risks from weather and climate, and the blog is one way of getting that information out to other people.

Kelly Savoie:

Well, that's a great service, and I commend you for keeping it up for as long as you have, because that's-

Pam Knox:

That's a long time. Yeah.

Kelly Savoie:

It is a long time.

Emma Collins:

And then on top of everything else, you're also an AMS Certified Consulting Meteorologist. In what ways has that certification been beneficial to you?

Pam Knox:

I got my CCM in 1998, and I did it while my husband was doing a postdoc in New York City, and I had a little baby, Evan, who is now 28 years old. And I was trying to figure out what to do in the time when he was sleeping, and I had had some discussions with some private consulting companies about the possibility of doing some consulting. So I thought, "Well, I can work on a CCM while I'm on maternity leave."

And so, in three-hour or two-hour chunks while Evan was sleeping, I worked on the questions for the written part of the test, and then went and did a regional oral exam in Chicago, because by that time, I was living in Indiana. And so, that was the most logical place to go. I have to be a little bit careful, because the university has some pretty strict guidelines for how you can consult.

You're allowed to do some consulting, but you can't do a lot, because you don't want to be seen as competing with private industry. And so, generally, I get most of my referrals from the AMS site. I mean, I don't do advertising or anything like that, but AMS has this listing of who's the CCM and what their specialties are. And so, that will tell you what they're looking for.

There aren't very many people in Georgia that do expert testimony, which is what I do for the most part. And so, we'll get these cases. A lot of times now, they're from people who've used me before. I just do probably maybe a half dozen or so cases a year. And any court case, you've got intense time period of activity when they're gathering data, then there's months where all the paperwork is working through the system, and you don't do anything, and then they have another intense burst where you're doing depositions or so on, then there may be another long period before it actually goes to trial, if they don't settle first.

And usually, the lawyers are trying to settle, because they don't want to go to court. But it's a really interesting problem for me to look at, because it's very much a puzzle-solving kind of thing, where

somebody says, "This happened," and I have to figure out whether the weather conditions were contributing to that, and how they were, and where I can get data to support that, because you can't just say it. You have to be able to prove everything.

And so, you have to know where the data are, whether it's certifiable, because some courts will only take data where you can trace where the data came from, and then be able to figure out a way to explain it to a jury. I mean, most of the jury people don't have any training in meteorology, or in science for that matter. So you have to figure out how to do that at a pretty basic level.

And so, that has been really interesting to me. There's a lot of people that do synoptics that are CCMs. Not so many who do climate. That's been a problem, that the CCM exam is really more geared for people who do synoptic meteorology rather than climatology, although I know they've really been working hard to try to change that. And so, that's something.

I think over time, there's going to be a lot more call for work in climate, because now people are having to do climate studies to show what the impacts of climate change are likely to be. And there actually are some other groups now that certify climate, which I think the AMS probably needs to look at at some point, to figure out if there's a way for them to do something else. And I'm sure there's probably groups that are looking at that now. So it's been a long time period of discussion for how to really involve climate in the CCMs.

But it's been very interesting to me. I've done some interesting court cases, most of which I can't really talk about. But in Georgia, we don't have too many problems with slip and falls. There's not a lot of snow here, although I've done a few. But I've done a lot with hydroplaning in heavy rainfalls, where people are driving and they hit a puddle or something on a road, and they slide off the road, and there'll be an accident or they'll go into a tree, or something like that. And so, they need to have somebody be able to quantify how much rain fell, when it fell, whether that was typical or not typical for that.

I mean, we get heavy rain all the time here, but it's usually pretty short. So you have to figure out how often does something like that happen. And so, it's all a big puzzle, and I'm good because I work with data all the time. So I know how to find the data, and I can find it in places that you might not think. It's not always very certifiable, but it's really good background information. I know something about whether or not the numbers are reliable, because you can have information that's measured, but the instrument was bad. And so, the rainfall amount wasn't accurate. So you have to be able to defend that as well.

So there's a lot of different things that all work, and it's probably kind of 50/50. Some of what I do here as an agricultural climatologist and the director of the weather network helps me as a CCM, but the CCM also shows me how to present it in such a way that people can understand all the different thought processes that have to go into it.

Kelly Savoie:

Well, your consulting work has paid off, because you just received the AMS Award, the Henry T. Harrison Award for Outstanding Contributions by a Consulting Meteorologist. Congratulations on that.

Pam Knox:

Yeah. Thank you. It was a surprise. And I was the head of the CCM Board for a while, and that was during the time period when we had to switch from in-person exams to online during the pandemic, and it took a lot of work to do that. I told my husband it took 400 hours of my time to do that. And so, I'm sure that that was probably a reflection.

At the same time, people were at home. So the number of applicants for CCMs went way up, because people didn't have anything else to do with their time. And so, that was really quite an interesting process, and we came up with a lot of suggestions for things that could be improved, I think, over time, and then I know that the board has been working on making a bunch of those changes since I rotated off.

Kelly Savoie:

And we're still doing those virtual exams. So the groundwork that you laid paid off.

Pam Knox:

Yeah.

Kelly Savoie:

So, Pam, do you have any advice for students or recent graduates interested in working in the field of agricultural climatology besides learning how to use the instruments? Because that sounds like it's a big one.

Pam Knox:

That is an important thing, although some of that can be... I mean, for what people do with us, a lot of it could be trained. You don't necessarily have to have a huge background in meteorology to do that. I think in general, in meteorology, there's a book that I like from science fiction called Time Enough for Love. It's by Robert Heinlein, and he says somewhere in there, "Specialization is for insects." And that certainly has been true of my life, because I know a little about a lot of things.

And so, for the kind of work that I do, it really has helped to know hydrology. It's helped to know fluvial geomorphology. It's helped to know astronomy, because people think, "It's meteorology. You're studying meteors." And so, you have to know a lot about different things. So I'm probably more broad than I am deep. Now, obviously, if you're going to be a research scientist, then that wouldn't necessarily be true, but it also helps to have other skills, like GIS, like programming.

I wish I could program. Of course, then I might have been a PhD student, but that's the way it goes. Right? I mean, everybody talks in numbers now and uses programs to really do those numbers. And so, having skills like that, and communication is another one. Either written or some kind of oral communication skills is something that's really valuable.

I think students need to keep in mind they don't have to do everything at just one job for the rest of their life. In fact, that's very rare now. I have jumped over time. I mean, I was a college teacher. I worked for the University of Wisconsin as a state climatologist, so that was academic staff. I worked for a while as a CCM when I was sort of between jobs, and my husband was working when he was teaching at Valparaiso, and then came here back to a university, and has worked as a state climatologist.

But even here, I've switched from doing that to being a grant-funded scientist, to now doing the extension work that I'm doing. So you don't have to do the same thing your whole life, and it helps to have skills in a lot of different areas so that you can set yourself apart from some of the other people. The number of meteorology students in the U.S. has gone up quite a bit. There's good articles in BAMS about that. My husband has written some of them.

And now with *Twisters* out, I expect that's going to go up even more. He's already had one student that's coming in that said they were inspired to come in because of the new movie Twisters. And so, we know that after the original *Twister* came out, the number of meteorology students went up. So I expect it to go up again.

But if you're going to compete with all those other students, there has to be a way to set yourself apart, and having additional skills like reading or writing or communication, maybe digital communication. I think the new CDM, the certificate in digital meteorology, is going to be something that'll be nice. I thought about trying to do that too, but I'm kind of close to the end of my career now to worry about that. Having programming skills, having skills in engineering, or skills in emergency management.

We're really telling our students now, there's a lot of call for people who have emergency management background in meteorology, because a lot of the emergencies that happen are weather-related, either floods or droughts, or tornadoes, or hurricanes, or whatever. And so, if you've got those skills in addition to the meteorology skills, you're going to be much better positioned, I think, to get a job in the long run.

Emma Collins:

Well, Pam, we're so grateful for everything you've told us about your career. However, before you go, we always ask our guests one last fun question at the end of our show, which may have been hinted at. What is your all-time favorite movie?

Pam Knox:

All right. Well, I mean, there's a lot of movies I like, but the one, I think, that really has sort of permeated my meteorology and just my interest in general is a movie that's called Koyaanisqatsi. Koyaanisqatsi is a movie that probably most people have never heard of. It's a movie that's a musical, mostly, and Koyaanisqatsi is a Hopi Indian word that basically means life out of whack.

And so, it's about how industrialization has changed society, really done long before climate change was really as much a hot-topic issue as it is now. So it's more about industrialization and landform changes and things like that. But one of the early scenes in this, where they're really talking about the Earth as it used to be, are time-lapse images of clouds. And we see this all the time now, because they use it in movies. They use it in advertising. So it's very ubiquitous now.

But at the time, it was a brand-new thing. It wasn't used very often. And I was just mesmerized by those pictures of clouds pouring over the mountains, set to the music of Philip Glass, who normally I don't like, but it was perfect for this movie. And so, Koyaanisqatsi just really stuck with me as a way of showing how fluid the atmosphere is, because you could see the clouds moving over time.

We're so lucky now, we get to see that in satellite pictures and radars and everything, because everything is looping. But back in those times, it was much more static. And so, being able to see that and just seeing how beautiful it is really made an impression on me. And so, that's why it's one of my favorite movies.

Kelly Savoie:

Is it a documentary, or is it an actual—

Pam Knox:

Kind of. It's about 90 minutes, and it shows this whole pattern starting with the Southwest. So there's a lot of geology with that and some of the rocks, the Monument Valley, and so on. And then they start to show the movement of the clouds and movement of water, and then they start to show the impacts of people on that environment. And you get more and more people, and they have time-lapses of people walking through New York City, all set to this Philip Glass sort of frenetic music.

So I think you'd probably call it a documentary, but there's no words in it, except that there's somebody singing << Koyaanisqatsi >> in part of the movie, and the rest of it is all this music. And I've actually seen it done as a live concert, where they've had actual musicians on stage with the movie showing in the background. But it was just an amazing movie, really such a neat picture of the fluidity of the atmosphere and the clouds, and just how beautiful the environment is, and that really has stuck with me.

Kelly Savoie:

I'm intrigued now. I'm going to have to check it out. It sounds really cool.

Pam Knox:

It was cool. And for the time, it was just so unusual, because nobody was doing that kind of thing back at the time, and the pictures are just so iconic. You see them all the time now if you look at advertising, or you see a sunset against a building that's got glass on the sides, and you can kind of see the clouds reflected in that. That was all from Koyaanisqatsi. And so, that is really something that's been really interesting.

Kelly Savoie:

Well, thanks so much for joining us, Pam, and sharing your work experiences with us.

Pam Knox:

Oh, sure. It's been a pleasure.

Emma Collins:

Well, that's our show for today. Join us next time, rain or shine.

Kelly Savoie:

Clear Skies Ahead: Conversations About Careers in Meteorology and Beyond is a podcast by the American Meteorological Society. Our show is edited by Johnny Le. Technical direction is provided by Peter Killelea. Our theme music is composed and performed by Steve Savoie, and the show is hosted by Emma Collins and Kelly Savoie. You can learn more about the show online at www.ametsoc.org/clearskies, and you can contact us at skypodcast@ametsoc.org if you have any feedback or would like to become a future guest.