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SPEAKERS

Amy, Stump The Chump, Jamie, Guest

Jamie 00:10
Welcome to Two Bees in a Podcast brought to you by the Honey Bee Research Extension Laboratory at the University of Florida's Institute of Food and Agricultural Sciences. It is our goal to advance the understanding of honey bees and beekeeping, grow the beekeeping community and improve the health of honey bees everywhere. In this podcast, you'll hear research updates, beekeeping management practices discussed and advice on beekeeping from our resident experts, beekeepers, scientists and other program guests. Join us for today's program. And thank you for listening to Two Bees in a Podcast.

Amy 00:53
Hi, everyone, welcome to this episode of Two Bees in a Podcast. Today, we have Dr. Kelsey Graham, who's a Research Entomologist with the USDA ARS in the Pollinating Insect Research Unit. She is located in Logan, Utah, and we found a publication that she just published and it really deals with the effects of extreme weather on bee species, so looking at bee species decline and recovery. I feel like Jamie and I talk about this all the time, but the Bee Informed Partnership, one of the causes of honey bee decline is weather. And so we're excited to have Dr. Graham on the call today to talk to us a little bit about her research with the different bee species. So thank you, Dr. Graham, for joining us today.

Guest 01:41
Yeah, thank you for having me.

Amy 01:43
So we always ask our guests to tell us about themselves. And so can you go ahead and just tell us about your background and how you originally got started in bee research?

Guest 01:54
Yeah, so I first started working with bees during my graduate work at Tufts University. So my PhD work was mostly focused on an introduced solitary bee, Anthidium manicatum, the European Wood Carder Bee, and its interactions with bumble bees. And then during my postdoc at Michigan State University, I

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began working more broadly on wild bees and doing surveys across the state and in different landscapes. I also did a lot of work on commercial blueberry farms, both documenting the wild bee communities there and then documenting pesticide exposure in managed bees. So managed bees are brought into the farms' pollination services, primarily honey bees, but some growers will also bring in bumble bees. Yeah, but I'm not really a honey bee person. I've always partnered with wonderful collaborators who work on honey bees. And now I'm a Research Entomologist with the USDA ARS, as you said, and my work is largely focused on integrated pest and pollinator management within alfalfa seed production. And alfalfa is primarily pollinated by alternative managed bees. So mostly alfalfa leaf-cutting bees, but also alkali bees, which is a bee that I am particularly fond of. So yeah, so not much honey bee specific work. But I'm really excited to continue learning about honey bees and thinking about how farm and land management can be used to improve honey bee health. So I really enjoy listening to your podcast.

Jamie 03:31
So Kelsey, I really am grateful that you joined us. You mentioned that you're not a honey bee person. But nevertheless, you are doing something that's very important to honey bee research and beekeepers in general. Now, just like Amy said, the Bee Informed Partnership surveys beekeepers and asks beekeepers, what do you think is a principal issue facing your bees? Weather shows up every year in the top five and you and your colleagues just published a manuscript where you're actually looking at the impacts of extreme weather on bee species and general decline and recovery. I think it's a really good model for the type of work we need in the honey bee world. So could you give us a little bit of background about this study? Why did you guys determine it to be necessary? And how did you conduct it? Where did the idea originate?

Guest 04:17
Sure. So this was really, I would say a study that was a study of opportunity. So my postdoc advisor, Rufus Isaacs, he's been working on blueberry farms in Michigan for two decades and has had several projects that have documented the wild bee community on blueberry farms during bloom. So then, when I arrived as a postdoc in 2017, I jumped on this project and wanted to, again, go back to these same farms that we've already been documenting wild bees at and do it again. So we really didn't necessarily, specifically, do it to look at weather issues. We really just wanted to see what are these long-term trends in wild bees because there's been substantial concern around declining wild bee populations, something that's been documented in other areas around the world. But documenting decline can be really, really hard to do. Many projects are only funded for a few years at a time at most, and with natural winter annual variability, it can be really hard to capture these trends. So it was a really unique opportunity where we could actually go and have this 15-year timespan looking at these wild bees during bloom in blueberries. And it just happened to be that we then kind of captured this unique weather event in 2012 and were able to kind of use that to help explain some of the trends that we were seeing in the populations.

Amy 05:42
That's so interesting. I mean, 15 years of data. That's a pretty intense amount of data.

Guest 05:48
Yeah, it wasn't consistent. It wasn't all 15 years, but it spanned a 15 year time.

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Amy 05:53
Yeah, absolutely. So what were some of the results of that? What did you all observe as far as the decline in some of the populations? And do you have any ideas for maybe why there were declines, if there were any?

Guest 06:07
Yeah, so the first collections were in 2004. And then we went to about 2018. So between 2004 and 2013, we saw a 61% decline in wild bee abundance, but then this was followed by an increase. So then, so if you compare between 2004 and 2017, it was only a 30% decline. So we found similar trends for species richness as well, this kind of decline happening around 2013. I should also say, though, that when you look at specific species, the story is a lot more complicated. So some species follow this general trend with a decline around 2013, while others don't at all. So some species mostly increase in abundance, while others declined most years. So I should say that, so the general trajectory was kind of similar, and that we found kind of a widespread decline around 2013. But that one's for all species. And I think that's kind of important to say, because we often kind of group all wild bees into this one big group. But there are so many different species, and they're all kind of unique. So I think that's a really interesting finding coming out of this study. In terms of potential causes, yeah, as we've kind of alluded to before, there was this extreme weather event in 2012. So the year before, we saw this big decline in abundance, and it was a really warm spring year. So we had blueberry blooming in March, which is not normal, it's usually blooming in May and June. So then we had normal season freezes in late March and April, which then knocked out a lot of the crop flowers. So this was really devastating across the region for a lot of crops, including blueberry, that were just flowering way too early. And so our hypothesis is that this also caused a lot of bee food, flowers, to all of a sudden not be available because of the crop damage. So I think this could have made the landscape really tough for bees, especially bees that are super dependent on spring flowers, such as mining bees, Andrena. So many of the species of Andrena are only flying for a few weeks in the spring and it really doesn't give them much time to find floral resources and make their nest. A species example that really fits with this is Andrena carolina. This is a mining bee that's a blueberry specialist. And it was the most abundant bee captured between 2004 and 2006. It made up 16% of all the bees that we captured, which is a lot. But then it declined around 96% to be only 1.5% of bees in 2013 and 2014. So that was one of the most dramatic declines in abundance that we saw. But encouragingly, we did see an increase in abundance following that where they then made up around 4% of the specimens in 2017 and '18. So that's really encouraging. And it, again, points to this potentially unique stressor around 2013 that caused this decline, but then recovery for some species. And you'd expect that if it was more of a persistent stressor, like from pesticides, or something else, you wouldn't necessarily see recovery after that. You wouldn't have this U-shaped abundance trend. So a potential cause, but it's not definite, but it was definitely a very unique weather event that happened. And our data really seems to fit with that hypothesis pretty well.

Amy 09:42
So I have a really silly question. So with honey bees, there are beekeepers that feed their bees either sugar water or will use pollen substitutes. For wild or native bees, do people feed them somehow, beside just whatever is blooming at the time?

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Guest 10:01
Not really. Yeah, I think that would be tough to figure out a way to feed all these different species. Right? In Michigan, we have over 350 different species, and they're all really unique, and they interact with flowers in different ways. I think coming up with a kind of feeding mechanism that would work for a lot of different species would be really, really difficult. So yeah, I think we just have to protect flowers in the landscape. I think that's the main way to kind of protect all these species.

Jamie 10:33
So Kelsey, I had your manuscript open prior to the podcast, I was looking at it. While you were talking about some of your results, I was having a look as well. And for all of you who are listening, we're gonna make sure and link to this manuscript in the show notes so you guys can check it out. When you're talking about this wild bee abundance declined 61% following this unique weather event that you were discussing, but then this bounce back, it speaks a little bit to be resilience. I mean, that seemed pretty significant. Right? A 61% abundance decline. Yet, shortly thereafter, they're back. So can you talk a little bit about this resilience? I mean, I know it's going to be maybe purely speculative. But how did they bounce back? Is it built into them to weather these kinds of stressors? I mean, what were you and your team's thoughts about this when you when you saw this bounce back?

Guest 11:29
Sure. Yeah. Yeah, that was really encouraging to see. When the study was done, when they were collecting bees in 2013 and 2014, there was this massive concern that like, what if this knocked out the population in this region? But no, I mean, we are seeing a recovery, which is really great to see. And I think that points to the fact that if there's these kind of unique stressors, then followed by the stressor either going away or becoming less, I think that wild bee populations are pretty resilient. I mean, as long as a stressor doesn't take out all individuals, I think they do have some ability to build back. There should be pockets in the landscape where, in this instance, where maybe the freeze didn't damage a lot of flowers, and then they can kind of be a source population to come back in. So I think in this kind of unique scenario where you don't have complete wipe out of all bees, I think, as long as there are some pockets of bees remaining where they are successful at nesting, then that can feed in the population the next year, you do see this recovery. We were hoping for a bit of a steeper recovery. We want to have them completely bounce back within that time frame and we didn't see that. We definitely have some species that seem to be lingering still at really low abundances. So definitely digging into that a little bit more and kind of understanding why are some species able to recover relatively quickly, while others aren't. Yeah, I'm not sure we really know the answers to that. But I would say it's generally encouraging to see. My only hesitation, in terms of being super excited about that, is that we are likely to see more extreme weather events happening. And if you have kind of back-to-back extreme weather years, it might be harder for wild bee populations to recover in the same way that we saw.

Amy 13:28
Yeah, I feel like that makes a lot of sense. Weather is just something that we're not able to control, right? And so we just have to kind of wait and see. With what you had said, we might have more extreme weather events in the future. And so what are some of the possible effects on the environment and some of the crops that we use as these bee populations experience these weather events?

Guest 13:51

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Yeah. Losing wild bees, it kind of removes some of the safety nets that exist for crop pollination. So in Michigan, blueberry, we've calculated honey bees are responsible for around 80% of pollination services on large blueberry fields. So the rest of that 20% is generally attributable to wild bees. And of course, some years will be better or worse for honey bees, as we've kind of talked about, honey bees are also impacted by weather. In cold rainy springs, it can be really hard to get enough sunny, warm days in Michigan for honey bees to go out and pollinate the entire crop. So this can lead to pollination limitations, whereas some native bees like bumble bees, they're much more likely to be out foraging in these colder, wetter weathers. So I think having diversity of bees helps buffer that and protect against these bad instances where honey bees might not be able to pollinate the entire crop. I should say there's also evidence that it was actually synergism between honey bees and wild bees when visiting crop flowers. So having more than one species visiting the flower increases pollination more than just having many honey bee visits. So certainly losing wild bees could lead to some issues with pollination, even in these cropping systems that are highly dependent on honey bees. And then, of course, losing wild bees is also potentially devastating for native plants that have co-evolved with native bees, where again, honey bees can't necessarily replace loss in wild bees.

Jamie 15:29
This is a fantastic discussion, and I'm about to ask the million-dollar question. Given that it appears that in the near future, we're going to potentially experience more extreme weather events, and just given your data from this manuscript where a single weather event in a single location was potentially responsible for this 61% decline in abundance, what can we do about it? Right? What are recommendations that we can make to pollinator managers? I'm kind of representing beekeepers but I'm kind of broadening this question. What can we do to protect pollinators from these extreme weather events if they become more common?

Guest 16:13
Yeah, that's a tough one. Certainly, growers can do things to protect their crops from freezes, which a lot of them are already doing. And this would, of course, help protect the food in the landscape and protect the crop yields as well, which is good. But I think one of the most important things at this point is just accepting that extreme weather events are going to be happening more often. So having these kinds of natural safeguards and buffers in place. And that means promoting a really diverse community of bees, because as I said before, some bees seem to have been more affected by this weather event than others. So having a diverse community of bees will help kind of buffer those impacts. And the way to promote diverse bee communities is by having diverse landscapes with diverse floral resources and nesting areas for bees. And this is certainly important for crops that depend, at least somewhat, on wild bees, having a diverse group of wild bees, again, the different stressors that could be impacting the community. It's likely that you'll have winners and losers. So having a diverse group will help buffer some of those negative impacts.

Amy 17:29
Awesome. I think those are great recommendations. Do you have any other questions or anything else that you want to share with our audience?

Guest 17:39

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I think the only thing is to just continue spreading the love for wild bees and managed bees. They're all amazing and unique and deserve attention and resources toward protecting them. And I think beekeepers, especially, can be wonderful ambassadors for all bees in educating others on the importance of managed bees and wild bees for crop pollination and sustainable ecosystems. There are many practices that benefit all bees, like we talked about, having diverse floral resources that can benefit honey bees and wild bees and reducing pesticide applications on farms and residential areas. Again, that's a broad benefit to all bees. So I think just being advocates for managed and wild bees is a huge thing and really important.

Amy 18:29
I cannot agree more. Thank you so much, Dr. Graham, for coming to speak to us today about your research and thank you for all that you do.

Guest 18:38
Thank you for having me. This was great.

Amy 18:40
All right, everybody. That was Dr. Kelsey Graham, the Research Entomologist with the USDA ARS in the Pollinating Insect Research Unit in Logan, Utah. Thank you so much for listening into this segment of Two Bees in a Podcast. Happy New Year everybody. We are releasing this episode in January of 2022 and we are starting a new year. So for this segment, we've kind of decided, I think, this year that we're going to do a little bit of everything. So we're not just going to stick with a Five Minute Management but we'll also stick in maybe some special segments in this spot as well. So stay tuned. But for now we are going to do a Five Minute Management and for the next couple of episodes we'll be doing the Five Minute Management on queen rearing. And so Jamie, you've got five minutes and the topic for today is queen rearing selecting your colonies. Let me know when you're ready for me to start.

Jamie 20:01
I'm ready. Let's get this new year started.

Amy 20:04
Great. And go.

Jamie 20:05
Sure, good. I almost started before you gave me permission, Amy, that's how much I wanted to do this. Okay, so a lot of folks, when they're thinking about producing their own queens, they get excited. Perhaps they heard someone talk about it at a bee meeting, they realize that bees naturally want to produce queens anyway. And so if you can manage them a certain way, they'll produce you ukus and bukus of queens and you'll be so happy. You can requeen your colonies, you can sell queens, etc. But as you might guess, Amy, it takes a lot of work to rear queens successfully. So I will start by saying, usually queen rearing is best done when you have 10 or more colonies. I don't usually recommend it for folks who only have one or two colonies. So if you've got 10 or more colonies, you've got to do two things when selecting which colony to use. Think about it from a cattle perspective, right? If you're a cattle breeder, you're going to pick a really good bull that came from a long line of very productive cows in the past, they grew to a big size, they're very marketable, all of this stuff. Well, with regard to

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selecting your stock colonies, you're looking for something similar. For example, you don't want to rear queens or select queens from colonies that aren't productive or that swarm too much or that are defensive. So really, what you want to do is you want to look across your apiary or apiaries and identify those colonies that are overachievers. They're super strong, they're super docile, the queen in those colonies produced lots and lots and lots of brood. Those colonies grow big, perhaps theeir swarming tendency is low, they're just a pleasure to have, they're productive, they're nice. More importantly, they're disease and pest resistant. You are looking for those types of characteristics when selecting queens from which to graph. Now, so many folks just focus on queens, but queens are only half of the equation. Inasmuch as you should be selecting for queens with good characteristics, who had colonies with good characteristics, you should also be selecting for drone source colonies. You're going to need colonies in the future that produce drones. And those colonies have to also be productive, strong, gentle, disease and pest resistant, etc. So you're going to look across the apiary. As you manage, you're going to look for your best colonies. Number one, because those are colonies you'll use to produce queens, and number two, the other half of those colonies, you're going to use to produce drones to mate with the queens. Now, I will tell you, it is not very good to do this selection subjectively, right? It's real easy to say, "Oh, that colony produced a lot of honey this year." But maybe it's because they were never quite strong enough to swarm. Maybe their population didn't explode in late winter, early spring when you would expect it to happen so it was just a lucky year for them. They were strong when they needed to be kind of by accident. Or maybe you say, "Well, that colony survived. Maybe they're resistant to Varroa." You can't be subjective when selecting your queen stock and your drone stock. You must take notes, careful notes. So for example, let's just paint this picture. It's going to be 2022 when this episode is released. All of the 2022 season, as I work with my colonies, I would keep notes. How much honey did these colonies, each of them, produce? What was their temperament when I worked them throughout the year? What was the brood pattern of the queen? Did I see a lot of chalkbrood or evidence of viruses? Did I see European foulbrood or American foulbrood? How did these colonies handle beetles? What was the longevity of the queen? Were they gentle? Right? Did I see them very active? Were they early risers and went to bed late in the evening because they worked hard and foraged all day? How was their swarming tendency? I'm not just guessing and relying on memory, I'm taking careful notes throughout the year. And then at the end of the year, I'd say, "You know what? Colonies 117 and 35, those would be good for producing queens. Colonies 8, 46, and 112, those were equally good and I'm going to use them for my drone source colonies." So don't be subjective. Be very meticulous in how you take notes of performance, all types of performance characteristics, and I might even say go a step further and measure some of these things. For example, don't just say, "I think that they've got hygienic behavior and will probably do well against Varroa." Sample Varroa populations throughout the year and see if they kept them low. Perform hygienic tests on the colonies throughout the year and see if they're very hygienic. All of these things that I'm talking about are easily measurable. And there are lots of ways you can find out how to do them online. But don't just guess. Be meticulous note-takers and select the best of your best to move forward into your breeding program. Awesome. Well, thanks for that Six Minute Management. I guess we should have started with six minutes. Happy New Year.

Amy 25:21
Those are great things. I think those are great things to consider when you're selecting your colonies, not being subjective. And so in the next couple of Five Minute Managements, we will be looking at queen rearing and establishing the types of hives you need. We'll look at grafting, the process, what

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that looks like. And then, selecting drone and queen source colonies. I'm excited for the next couple of Five Minute Managements but looking forward to all of the segments that we have in 2022.

Stump The Chump 25:55
It's everybody's favorite game show, Stump the Chump.

Amy 26:07
Welcome back to Stump the Chump. Alright, so the first question we have today, this person is a new beekeeper and like a good beekeeper, this person is going to all the classes and lectures that they possibly can go to. So this person just went to a lecture and decided to start overwintering nucs. So they're doing single nucs, they've purchased some Russian queens, and they're wondering, how often should they check them and guidance on building them up to overwinter and survive the wintertime?

Jamie 26:37
Yeah, Amy, I love nucs. I give a whole lecture on nucs, and I even wrote a big long document about using nucs in beekeeping operations. Of all the things that I've talked about over my couple of decades of educating about bees and beekeeping, two and a half decades now, this is one of the things that people just really like to talk about and like to gravitate towards because they just want to use nucs. So I also have used nucs in the past, I've also overwintered nucs in the past. There are many reasons one would want to overwinter nucs. But the question here specifically, is if I'm overwintering nucs, how often should I check on those? So nucs are a little bit more sensitive to winter-related issues than are full-size hives. That's largely because they don't always have the critical population necessary to thermoregulate a hive, especially in a super cold place because there's a compromise in a nuc between having enough place to store honey and having enough bees to keep that nest warm. And for those listeners out there who might be new to this idea of a nuc, a nuc is basically short for queen nucleus or nucleus colony. Usually, nucs are named by the number of frames that they hold. So a standard nuc will accommodate the same frames we use in full-size hives, but just fewer of them. So for example, the most common nuc is a five-frame nuc, that would be a deep box that accommodates five frames, rather than a standard hive that accommodates 10 frames. So you can get deep boxes for nucs that accommodate five frames. You can get medium supers for nucs that accommodate five frames, shallow supers for nucs that accommodate five frames, you can get three-frame nucs, four-frame nucs, etc. So specific to this question, five-frame nucs would be the ones that you would most want to use, because anything smaller than that, and you've really got this potential problem of having a critical mass of bees necessary to overwinter, especially in colder climates. So again, you get this balance between enough space to store honey and enough bees to heat the nest in that box. But assuming that that balance is okay, you're going to want to hoist the back of that nuc, at least monthly, to ensure that it has enough food to survive winter. I mean that's the key kicker right there. The two things that help bees get through winter are enough bees and enough honey. So what I like to do with hives through winter is just go to the back of the hive, there's usually a handle on the bottommost box, I grab that handle, and try to rock that hive forward. If it's really easy to rock forward, then it probably doesn't have enough food, and I'm going to have to feed it. If it's really difficult to pick up off the stand and rock forward, then it's probably got enough food to survive, at least for the next month until I do that again. Maybe on warm days, days that exceed something in the neighborhood of 55 or 60 degrees Fahrenheit or higher, I might crack open the lid for just a quick peek to see that the critical mass of bees is there to heat that hive. Maybe if it's 60 to 70 degrees or more on a warm day I'll go out and go into the hive to

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check the mass of bees again just to visualize it and make sure there are enough bees there. On a standard day, that it's warm enough for my full-size hives to have worker bees going out, maybe foraging, or perhaps, on cleansing flights where they're defecating, I would want to see that the activity of the nuc is matching the activity of the full-size hives. And so otherwise, I don't really treat it all that much differently from how I would inspect full-size hives, I just know that things can go south in a nuc much quicker than they can in a full-size hive. That said, a lot of folks love to overwinter them, because when they come out of winter, they are ready to explode, a lot of folks like to overwinter them for the purpose of having them available to sell before anybody else can otherwise make nucs in spring. So, experiment around with it. I will make sure and link to that document on nucs that I've written in the show notes so that you are aware of it and you can have a look at that for some more pointers.

Amy 30:39
So in the question, the person was also specifically asking about Russian queens. So I guess my question would be, does it matter if it's a Russian queen versus another queen?

Jamie 30:50
Yeah, so every stock of bees has different overwintering tendencies. I believe the DNA more than I believe someone's designation of a stock. What I mean by that is a lot of people think that they have bees that they don't really have. Now, there are some great breeding programs out there that are maintaining the purity of this case, Russian bees. I know there's a Russian Queen Breeders Association, great program producing great bees, but there are a lot of folks who are selling Russian bees outside of that program. And the same thing is true for Italian bees, etc. Just because it's got a name on the bee doesn't necessarily mean that that's what it is. So if you're wanting to make sure, you're wanting to ensure that you're, at least in the US, using bees of Russian stock, you would want to make sure you purchase queens from the Russian Queen Breeders Association. Now, outside the US, you're going to run into similar problems. Why am I saying this? Because the biology of the different stocks of bees, all these stocks of bees originated somewhere. So Italian honey bees came from Italy. They make strong colonies, they tend to overwinter big colonies, and they tend to use a lot of honey through winter. So some folks, whether warranted or not, have complained about the overwintering ability of Italian honey bees in much colder climates. So there's this belief out there, well, maybe Russian stock can do better in colder climates because they come from colder climates. And so there are some stocks of bees that can maybe help tilt the scales in your favor, specifically Russian bees, maybe New World Carniolans here in the States, etc. But if you're outside the States, and you have truly wild populations of honey bees where you are, maybe Europe, Africa, you're obviously going to want to use stocks that are native to your region or indigenous to your region, because they're going to have been produced in a way that can survive the climate there. But to answer your question specifically about Russian bees, I kind of worry less about what stock I'm using in the US because most stocks available here are reasonably good at overwintering. So I worry less about the stock and more about the number of bees and the amount of honey available to them. And also, of course, going into that winter cluster, were the diseases and pests controlled?

Amy 32:57
I think that's fair. Alright, so the second question we have, so this one we've discussed before in the past, but I don't think it's a bad reminder. And I know that I always need the reminder. But what are the best techniques to use to clean and disinfect frames from dead outs?

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Jamie 33:13
Yeah, I know this idea comes up, it seems, I don't know, every other episode. But the way this question was asked is really easy to answer. There's currently no good ways to disinfect combs. That's easy. Now, if we're talking about storing combs, we talked a lot about freezing and all that stuff. But disinfect combs, people have looked at irradiation, right? Irradiating your frames is a good way to get rid of pathogens, and for that matter, pests, but it's often not a practical way. A lot of the irradiators out there cannot accommodate pallet loads of boxes and may be expensive. They may not be close to you, but it's effective. Right? That's the catch 22. It's effective. But there are these drawbacks. So some folks have looked at ozone. Ozone can do some disinfecting. There's certainly some research projects that have shown that. The problem is getting high enough concentration of ozone that penetrates the cavity where the ozone is being generated, like a shed as an example, and using it in a way that doesn't hurt you because ozone is toxic to humans.

Amy 34:23
Okay, so what is what is ozone.

Jamie 34:25
Ozone is a gas composed of three oxygen atoms, and it's very reactive. It's created, for example, during thunderstorms with lightning. Ozone can be used to disinfect a lot of different things. As I shared, though, the problem is concentration, its safety and all of that stuff. We've done some research with colleagues with ozone and I just don't know how practical it is at the current levels. Maybe some of you listening out there will tell me that I'm wrong and show me all the reasons. I know what it's capable of doing. It's just hard to achieve that level of control with the current ways of generating it in the containers that we would have to be able to clean combs. There are people who've talked about, perhaps, washing frames or boxes with bleach, perhaps singeing them with fire, maybe a little type of torch that you scald the inside of a box with. All of these things are things that potentially work, but it's just not supported by tons of research at the moment and may not be one of those things that's a great management tool. So long story short, if I suspect American foulbrood or pesticides killed the bees in that box, I do away with the combs. If it's anything else, then I worry less about disinfecting. We obviously would love to have a way to clean combs from viruses, Nosema, all of these other residues. Usually, if I'm worried about that, I just give those frames a two-month break before I use them again. I'll throw them in the freezer, for example, for two months before I just pull them out and use them again. But at the moment, the shortest answer to that question is there's really no consistently good way of sterilizing frames.

Amy 36:08
All right, well, so that leads us to our last question. And something that I just learned was that honey bees can communicate and vibrate through foundation. And so this person's asking -- wait, is that true, Jamie? Did I just make something up? Or is that right? Can honey bees communicate through vibrating?

Jamie 36:26

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You are 100% correct. A lot of folks know that the dance is a physical thing that you can see. But they are also sending vibrations out through that dance that the other bees can pick up and receive information through those vibrations.

Amy 36:37
So they could like send the good vibes out there. Right?

Jamie 36:43
That's exactly right, the good vibes, as it were.

Amy 36:45
So this person's asking if plastic foundations disrupt that communication between the bees.

Jamie 36:52
I love this question. Because if you had this question, and you wonder to yourself, who in the world out there would be the one who would try to figure this out? You would probably say, Dr. Tom Seeley from Cornell University, and you'd be right. He actually has looked at that. He's one of those individuals who has thought the same question, he and a couple colleagues of his, in fact. So the premise is simple. In a honey bee hive, bees make beeswax combs. And when they're dancing on beeswax combs, they are sending vibrations of a certain frequency through those combs. Those vibrations are received by other bees. Now, imagine changing the foundation of that comb from beeswax to the hard plastic that we have in today's more industrialized foundation. Is there a message reliance problem that occurs when bees are dancing and sending vibrations through hard plastic-based cells? And so Tom Seeley and colleagues looked at that, and he's got a great paper where he discusses this, we'll try to make sure and link the paper in the show notes. But in the abstract, Dr. Seeley and his colleagues say it best. So I'm going to read from the abstract that we make sure and link in the show notes for this great manuscript. "We found that combs built with plastic foundations are markedly poorer at transmitting the 250-hertz vibrations produced by dancing bees." So step number one, the plastic foundation does mess with the vibration that bees are sending through. But number two, and here's the big but --

Amy 38:35
I like how you just made yourself laugh.

Jamie 38:37
I heard it in my head. Once I said it, it was too late to take it back though. Here's here's the big change. "Nevertheless, we found no evidence of reduced effectiveness of dances performed on combs built with plastic foundation versus combs built with beeswax foundation. Evidently, a comb built with plastic foundation provides a fully suitable substrate for waggle dance communication." So just like collegiate students don't care where they dance, it appears bees also don't care where they dance.

Amy 39:13
Oh, my goodness. Well, I'm thinking about the communication between humans. I mean, if the wall is thicker, which, probably a plastic foundation is a little bit thicker than if you were to have a wax foundation or no foundation at all, it'd be like us trying to communicate through like, knocking on, I don't know, concrete, right? Or like a brick wall. Do you think that would be the equivalent? I don't know.

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Jamie 39:34
So I certainly think so. Right? Just to give you an example, I feel bad for Dr. Cameron Jack in our lab. We've interviewed him a lot. But he sits right on the other side of the wall. So everytime we record these podcast episodes he probably feels like he hears the whole episode. Yeah, anytime the substrate through which you're passing that communication information changes, it could impact significantly the message being shared.

Amy 39:35
All right. Well, there you have it everyone. Thank you so much for listening to this Q&A segment. Hey everyone, thanks for listening today. We'd like to give an extra special thank you to our podcast coordinator, Lauren Goldstein, and to our audio engineer, James Weaver. Without their hard work Two Bees in a Podcast would not be possible.

Jamie 40:29
For more information and additional resources for today's episode, don't forget to visit the UF/IFAS Honey Bee Research Extension Laboratory's website ufhoneybee.com Do you have questions you want answered on air? If so, email them to honeybee@ifas.ufl.edu or message us on Twitter, Instagram or Facebook @UFhoneybeelab. While there don't forget to follow us. Thank you for listening to Two Bees in a Podcast!

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