

Episode 9 Mixdown PROOFED

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SPEAKERS

Guest, Jamie, Guest 2, Amy, Honey Bee

Jamie 00:05

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. Hello, and welcome to Two Bees in a Podcast. I am host Jamie Ellis, accompanied by --

Amy 00:48

Amy Vu.

Jamie 00:49

That's the best you can do, Amy Vu?

Amy 00:51

That's the best.

Jamie 00:52

Vu just rhymes with everything.

Amy 00:53

It does.

Jamie 00:54

Fortunately for us.

Amy 00:54

Zoo, moo, woo...

Jamie 00:58

Maybe we should stop, Amy. After that, it's important to tell our listeners that we have two fantastic guests today. First, we will be joined by Brandi Simmons who is an apiary inspector here at the Florida Department of Agriculture and Consumer Services. She is going to be talking about apiary inspection services and what they do for beekeepers. Then, we will have a segment on pollination ecology by our own University of Florida resident pollination ecology expert, Dr. Rachel Mallinger. So thank you for joining us for Two Bees in a Podcast, and I think you're going to enjoy this episode. Welcome to Two Bees in a Podcast. In this segment, we are going to talk about something that is important for a lot of beekeepers, certainly beekeepers here in Florida, but also, beekeepers elsewhere. Amy, do you know what that is?

Amy 01:46

The one person and thing that everyone is scared of?

Jamie 01:49

What's that? Who's that?

Amy 01:51

The inspector.

Jamie 01:52

Oh, the bee inspectors. No, in this segment --

Amy 01:55

I was about to say the police. But I didn't want to say that.

Jamie 01:57

The popo? The tax man? No, okay. Well, that's good. I'm glad you brought that up because that's what we're going to try to do. We're going to demystify the apiary inspection.

Amy 02:10

I had no idea that's what we were talking about.

Jamie 02:12

That's exactly it. So we are fortunate in this segment to be joined by Florida's own Assistant Bureau Chief Bureau of Plant and Apiary Inspection for the Florida Department of Agriculture Consumer Services Division of Plant Industry. I know, that individual is Miss Brandi Stanford. Brandi, thank you for joining us.

Amy 02:25

Say that five times in a row.

Guest 02:30

Yeah, thank you for having me. I'm excited to be here.

Jamie 02:32

Absolutely. So I want to emphasize to our listeners that Brandi is essentially the head of apiary specs for the state of Florida. She is the Chief Apiary Inspector.

Amy 02:41

She's the boss woman.

Jamie 02:42

That's right. Apiary inspection is something that's important for a lot of beekeepers around the US, and there are variations of this program in other countries. So in this segment, we're going to talk in detail about apiary inspection, what it is, and we're going to use Florida as an example to discuss this topic and concept with our listeners. So Brandi, let's just start from the top. Welcome. Starting from the top, how did you get into bees and apiary inspection in the first place?

Guest 03:09

Yeah, for sure. So I was not planning to work with honey bees at all. My plan was to go to vet school and live a totally different life.

Jamie 03:17

Lame.

Guest 03:18

I know.

Jamie 03:18

I'm just kidding.

Guest 03:20

My college roommate convinced me to take Principles of Entomology class with her during undergrad here. On one of those tours, we went out to the old Bee Biology Unit, and we got a tour from one of your PhD students, actually, Jamie, it was a Ashley Mortensen.

Jamie 03:35

Oh, really?

Guest 03:35

So Ashley gave me my very first --

Jamie 03:37

So I have her to blame for this.

Guest 03:38

Yes. I got my very first introduction to honey bees up close and personal with Ashley, and I was hooked. I was like, "This is so cool." So I applied for a summer job here in the lab, started out as a

toxicology technician during undergrad, and that was with Dan Schmale. We were working on a project putting bees in cups.

Jamie 03:59

Sure.

Guest 04:00

And then after graduation, I came back to the lab and worked as a technician and then became the lab manager. So I worked here at the lab for five years before it was the new fancy, beautiful facility. And then back in December of 2017, I started with the Florida Department of Agriculture, working for the then state apiarist, David Westervelt.

Jamie 04:23

Yep.

Guest 04:23

And he retired back in November. So I was promoted into this position in February of 2019.

Jamie 04:29

Now, you're living the dream.

Guest 04:30

Yep. One year later, I'm still here somehow.

Jamie 04:35

That's a good overview of your street cred, how you got here in the first place. But Amy and I, we really want to focus on what is apiary inspection? What is it? What does it do for beekeepers? We need to discuss a little bit about it being present in Florida, but not all states. So let's just kind of start with that beginning. What is apiary inspection? What does it offer to beekeepers, etc.?

Guest 04:58

So apiary inspection, for the most part, is usually a part of a regulatory entity. So with us, we're a part of the Florida Department of Agriculture here in Florida. In other states, other countries, they are mostly affiliated with government agencies, but they can also be affiliated with the extension services. So like, for example, in Texas, they're affiliated with Texas A&M University.

Jamie 05:20

South Carolina's with Clemson. I'm glad you brought that up. In Florida, apiary inspection is headquartered in our Department of Agriculture, but in other states, it can be headquartered in universities, etcetera, but it is the regulatory arm, even if it's in the University, like Clemson or Texas A&M, it's still regulatory.

Guest 05:35

Yes, exactly. So the primary purpose for the programs typically deal with detection and prevention and destruction of regulated pests or diseases. So, the most common one that we're all familiar with is

American foulbrood. So, inspectors across the country and across the world are looking for regulated bacterial paths, like American foulbrood, and other things that could be coming in. So here, a lot of the state's focus on preventing not only the presence of them, but the introduction of them.

Jamie 06:08

Sure. That's absolutely key. I know that, in Florida, for example, you guys are regularly inspecting for American foulbrood. But you were on the cutting edge when African bees were showing up here in the state. You guys and other apiary inspectors across the country are looking for tropilaelaps as an example.

Amy 06:27

Which is still not here, by the way.

Jamie 06:28

Yeah, yeah. So thank you. Thank you. Thank you. Thank you. Thank you. I do kind of want to look at it again on a broader level before we zoom in to Florida. On a broader level, it's not mandatory in every state, right?

Guest 06:42

That's correct. So the registration, I think, is what you're referring to.

Jamie 06:46

Sure.

Guest 06:46

It's not mandatory in all in all states. So here in Florida, we do have a mandatory registration process for beekeepers. But that is not the case everywhere. All the programs are structured a little bit differently. Here in Florida, we're fortunate that we have a pretty elaborate program. We have 10 inspectors, two field supervisors, whereas in many other states, they may not even have one full-time honey bee person.

Jamie 07:09

It's funny you say that. I was gonna ask you that very question. Do you happen to know what percentage of our states, or even a guesstimate, have any apiary inspection presence at all?

Guest 07:19

Yeah, so I would say over half definitely have a presence.

Jamie 07:23

Really? Okay. So there's someone somewhere in the state who does that kind of service. Okay.

Guest 07:28

So certain states have one dedicated person, some states have two or three, like one dedicated state apiarist and two or three inspectors. A lot of the northern states use seasonal inspectors because during the winter months, they're not able to do their inspections. So seasonal employees are used a

lot more up north, whereas, of course, we're inspecting year-round down here in the heat. So yeah, we have year-round employees here.

Amy 07:52

Yeah. I was kind of joking around earlier about everyone being scared of inspectors because, in fact, everyone will, especially kind of here in Florida, when they reach out to their inspector, they use them as a huge wealth of knowledge. So, I mean, can you talk to us a little bit about what services are kind of offered here? And maybe what other services are offered throughout the United States that inspectors might do for beekeepers?

Guest 08:14

Yeah, absolutely. So yeah, we often get the bad rap as the bee police.

Jamie 08:18

Or you're the regulators.

Guest 08:19

We're the regulatory government. It's kind of intimidating, right? But you're absolutely right. We're, in many cases, looked to as the first responders in the event of bee health issues or colony health issues.

Jamie 08:30

Good way to think about it.

Guest 08:30

We are there for regulatory purposes. But we're also there to try to help the industry, help the beekeepers mitigate any risks that we can, as far as pest introductions. If beekeepers are having problems with their colonies, they've been doing all the things right that they can think of, they're treating for their Varroa, they're monitoring and doing all those things, we can come in and try to be a second set of eyes and try to figure out what's going on. A lot of the programs will collect samples if there's something going on with those hives. They'll send them off to either the USDA to get them checked, or a lot of the programs actually have in-house diagnostics. There are a lot of different options that we can provide. Also, just information. So by nature, we're not here for extension, but by nature, by being in the field with these beekeepers, we're constantly talking and educating people, especially the newer beekeepers and these backyard beekeepers. Here in Florida, we're fortunate enough to have enough inspectors that we can get out to the backyard beekeepers as well. So we do a lot of teaching and educating them about pests. In some of the other states, like we talked about, they might only have one or two dedicated people, so some states only focus on commercial beekeepers. So they might only do mandatory inspections for commercial beekeepers and not for the others. So yes, while we are commonly looked at as the intimidating group, we really do provide a wealth of services for the beekeepers and try to support the industry as much as we can. We are very fortunate here in Florida because in many other states, even if they're not seasonal inspectors, they often are co-plant inspectors or something like that. In Florida, we're fortunate because our bee inspectors are bee inspectors. That's what they do. Yes. When you did my introduction, you gave that long hierarchy of the department. But in the Bureau of Plant Apiary Inspection, we are actually split, where there's an apiary inspection section and there's a plant inspection section. So there are dedicated personnel who are

focusing on inspecting those nurseries and stock dealers and there are dedicated personnel on my team focused solely on beekeepers. So that's very fortunate that we have people who can focus on bees 100%.

Jamie 10:40

Especially given the number of inspectors you have as well.

Guest 10:42

Yes, so many people are split between those responsibilities.

Jamie 10:45

Well, oftentimes, people look at inspection as regulatory and they think maybe, if there is a group that's receiving benefit, it's the beekeepers. But I would say the scientific community and government agencies also benefit from inspectors. It was inspecting groups, the inspectors, that really got, very early on, on this colony collapse disorder, or bee loss issue. They're the ones who brought it to attention. I think, if I'm not mistaken, Dennis vanEngelsdorp, when he was working heavily, who's now a faculty member at University of Maryland. He was an inspector at the time that all of this stuff was happening. Inspectors are the ones who help us monitor for diseases and pests spread around the country. And furthermore, they visit with commercial beekeepers, they survey commercial beekeepers, essentially, way more than we can. So they have a lot of that commercial knowledge, that I feel like we need to tap into way more than we even do.

Guest 11:40

Yeah, there are so many opportunities for the researchers and the extension agents to collaborate with the inspection programs. And we are, I think, just on the verge of tapping into that. Amy, you and I have talked in the past a little bit about how we can, hopefully, find ways to collaborate and use the expertise and the actual eyes and hands in the field that we have in the inspection program to kind of help with some of the extension and the research goals of the your lab. I think a lot of the other states probably also work closely with their extension research agents too.

Jamie 12:11

I travel quite a bit and speak, really, kind of all around the country. And almost all the time, when I go to a state bee meeting, there'll be that state's inspector or inspectors in attendance, and they will always come up and introduce themselves to me. They will talk about all the stuff that they're doing in the state on behalf of their beekeepers. And it's just really heartwarming. I know our inspection service so well, but I feel like the inspectors in general are such a great service. So, bee movement, right? Let's let's talk bee movement. That's a big issue. In Florida, in 2006, we had about 100ish thousand colonies. We now have 650ish thousand colonies and other states are seeing similar trends. Why are inspectors so important for the movement of bees between states?

Guest 12:54

Yeah, so every state has its own requirements for entry into their state, not just for bees, but for plants, for ag, for livestock, things like that. Every state is going to have their own regulations. So it's one of our goals, or one of our responsibilities as the apiary inspectors to facilitate the movement of honey bee colonies into other states, whether it be for honey production, for pollination, for just selling bees in

general. So we play a very important role in getting those certifications issued, mostly for commercial beekeepers, but also backyard beekeepers. Let's say they're moving to another state and they want to take their hives with them, they need to get the proper certifications to get out of state, right? So here in Florida, we have out-of-state permits that serve as an export permit, so that beekeepers can be certified to leave. Again, with the different requirements, certain states may have a requirement that the bees have been inspected in the last 30 days to allow them in. Other states have 90-day requirements, some have 180, 360, et cetera, et cetera. So it's our job to kind of work with those other state apiary programs to make sure that we're meeting the rules and that the beekeepers are meeting the rules for bringing their colonies into the state, and vice versa. The whole reason that these transportation requirements exist is we want to make sure that the bees coming into our state are not going to negatively impact beekeepers in the state. We want to make sure those colonies are clean, that they have a proper health certificate or export certification, and other states want the same thing. So that's the main purpose of them.

Jamie 14:29

So like in Florida, many other states' inspectors have been intimately involved in drafting best management practices for their respective states' beekeepers. I know a lot of inspectors are on national groups, like the Honey Bee Health Coalition includes a number of inspectors who are instrumental in drafting these BMPs as well as helping shape the industry. So given that our state's not the only one that has inspection programs, is there a national group of inspectors where they can meet and discuss? What is it? What do they do? How often do they meet? What are the some of their goals, etc.?

Guest 15:02

So we have a nonprofit organization called the Apiary Inspectors of America that also encompasses the Canadian provincial apiary programs, as well as we often incorporate Mexico and some of the members of the Caribbean. So it's not just specifically the United States of America. We meet at least once a year. We usually try to meet in conjunction with either the American Beekeeping Federation annual meeting or the American Honey Producers Association. We meet at that same time of year. Basically, we're a group of state inspectors. Sometimes, they're also extension folks or researchers who are a part, but mostly primarily, it's the state apiary inspectors who meet together, we talk about rules, we talk about regulations. Basically, our common goal is to promote bee health throughout the country, throughout the world, to prevent pest introductions that could be dangerous or a threat to our state or our country. But this group of people, they're so awesome.

Jamie 16:04

I think I know the answer, but what is a pest or a disease that you guys are worried about coming into the US? Something that you guys are monitoring for? One of the services you provide is monitoring, right? You want to keep bad critters out. So what are some of those bad critters you hope we don't get?

Guest 16:19

One of them that we really, really hope we don't get is tropilaelaps mite. That's predicted to be much worse than Varroa. So we're hoping that never gets here, so we are monitoring for that. Most of the state apiary programs, if not all, participate in the National Honey Bee Survey, which is funded by USDA Apis and collaborated with Bee Informed Partnership. So we're issued kits, the inspectors are issued kits, and we go around to commercial Beekeepers or migratory operations, collect samples,

send them up to be processed to get a national, comprehensive look at colony health across the nation. And one of the things that we're looking for throughout that survey is that tropilaelaps mite.

Jamie 17:00

Sure. Make sense.

Guest 17:01

Some other things we're concerned about are, potentially, the Asian giant Hornet.

Jamie 17:04

Yep, that one's been a recent buzz here.

Guest 17:07

Yes, exactly. So unfortunately, that was introduced to Canada late last year.

Jamie 17:13

British Columbia?

Guest 17:14

British Columbia. And then a colony was found in Washington State. I haven't heard any updates in the last couple of months. But that actually was found in North America for the first time last year, which is very concerning. So, we're constantly monitoring for things like that.

Jamie 17:31

I know, personally, given the research I've done on behalf of FDACS. I know you guys are also concerned about unwanted subspecies and species of honey bees, right? So there are nine species. We keep *Apis mellifera* so that means there's eight others. Those inspectors are hoping to keep the other eight out because of unwanted disease and pests that might accompany them. But even within *Apis mellifera*, the bee we keep, there are some unwanted races or subspecies. As an example, African honey bees, right?

Guest 17:57

Yes, *Apis mellifera scutellata*. Yeah, by nature, not everyone loves honey bees, right? We all do, of course, that's why we're talking about them. But not everybody is always so excited when they see them show up at their swimming pool or other things. So one of the other things that our inspectors respond to are stinging incidents or complaint calls from homeowners or neighbors who may not be thrilled that the neighbors have bees. So if we get a report of a stinging incident, we always want to check up on that. So our inspectors will go out and pull samples from those colonies. And what we're looking for whenever we run those samples in the lab is the presence of African honey bees because we do not allow -- it's illegal to keep African bees here in Florida, because that is an unwanted race of honey bees.

Jamie 17:58

That's right. So oftentimes, though, not always, but oftentimes, the African bee diagnostic centers had been run out of apiary inspection programs. That was the case here in Florida, and I think some

Alabama inspectors were trained to do it as well. So I know that there are those kinds of things, those services you're providing too. Probably in other states as well.

Guest 18:57

Yeah, absolutely. So, African bees are generally more defensive, they have more defensive characteristics, like they will send more bees out to defend their colony. They might chase you a little bit further. So those aren't things that we want had.

Amy 19:12

And they're not fun to manage.

Guest 19:13

No, they're -- exactly.

Jamie 19:15

Especially for people who don't know much about their management.

Guest 19:18

Yeah, they can be dangerous in urban and suburban areas. So we do pull samples and run those samples in our diagnostic lab here in Florida at the Department of Ag.

Jamie 19:28

Yeah, I mean, I think you guys are incredibly valuable. Like I said, I see apiary inspectors popping up all over the place, anytime there's opportunities to draft BMPs, anytime there's big discussions happening at the national level regarding bee losses or bee health, apiary inspectors are there and having their voice heard. I want to kind of circle the wagons back to one of the early reasons that apiary inspection exists in the first place, American foulbrood. So you guys and other apiary inspectors -- I grew up in Georgia when I would have the apiary inspector come out looking at my hives, he was looking for AFB. And so historically, what have inspectors done when they find AFB, American foulbrood? This is what people think about when they think about apiary inspection.

Guest 20:05

Fire, right? We have bonfires. No. Luckily, one good thing about the inspection programs is over the years, we've started to see less and less frequently foulbrood. So last week, I was down with one of our apiary inspectors, Freddy Howard, who's been around, he's actually been an inspector for 35 years. So he has a lot of the history.

Jamie 20:26

Institutional knowledge.

Guest 20:27

Exactly. And he was telling me some of the stories about back in the day when they would get shipments, like truckloads of honey bee colonies from other states that may not have had big inspection programs, and they would get them offloaded, an inspector here would start looking through them, and

the whole load would be infested with AFB. So they would actually have to spend weeks burning all of those hives, which was devastating, not only a lot of work, but it's a huge loss to the beekeeper.

Jamie 20:54

Sure, absolutely.

Guest 20:55

But it's necessary, because if that disease spreads to other beekeepers in the area, it's going to be even more detrimental. So over the years, throughout all the inspection programs, we've started to see less and less incidences of American foulbrood, which is great. But whenever we do find it, and it still does pop up unfortunately, we quarantine that apiary. So no movement of bees in or out of that location can happen. The colony is destroyed by fire. The other option is to use irradiation to kind of treat that hive. But it's not a very economical option in many ways because there aren't a lot of irradiation facilities in our state that can deal with honey bee colonies. So most of the time, nine times out of 10, we're going to go ahead and destroy that colony by burning it. And that quarantine stays in effect for 30 days. So the inspector then has to go back out, inspect all of those hives to make sure there are no symptoms showing up, then we can release it.

Jamie 21:51

Brandi, to me, American foulbrood is a great example of a success story with apiary inspection. I think we have lower incidences of that because of apiary inspection. In fact, I don't go to meetings and see talks on American foulbrood. I don't hear people talking about it. And people don't appreciate that the reason for that often owes to the services of apiary inspectors. And so I think that's a great example.

Amy 22:15

Yeah, so Brandi, you're talking about how there's less and less American foulbrood, right? So things are constantly changing. I guess my question for you is, how do you see apiary inspection services evolve to meet some of the needs of the industry? I mean, things are constantly changing. So what do you kind of envision and how will the inspection services potentially change?

Jamie 22:35

I mean, you mentioned one, like the tropilaelaps example. 10 years ago, I would suppose, maybe, there wasn't a National Honey Bee Survey, right? Now there is and it uses inspectors. So how do you guys evolve with the industry to make sure you're meeting the needs?

Guest 22:51

Yeah, so one of the main things the industry is facing right now, everybody talks about it, it's like in the room, is Varroa. So we're hoping to, moving forward, do a little bit more for Varroa, establish a more intensive Varroa monitoring protocol for our inspectors, so kind of make that a more intense part of our inspections. A lot of times we see that beekeepers just don't know. And it's crazy for those of us who are so intimately involved in the industry because we're so exposed to Varroa all the time, but a lot of new beekeepers, they just don't know about Varroa. So we're going to try to, in the upcoming year, focus more on Varroa monitoring, talking about the importance of that.

Amy 23:36

Yeah, I was giving a talk this past weekend, and I felt like I could have just stood there for an hour saying, "You need to monitor for Varroa." And I could just say that over and over and over. I don't know how much I could have stressed that. I mean, everyone was probably annoyed about it. But I still think that it didn't fully come across.

Guest 23:55

I mean, you guys have done surveys for commercial beekeepers and other beekeepers around the country. A lot of them are saying these problems are started by Varroa, and not just Varroa themselves, but the pathogen or the viruses that they spread. Also, hoping for, in the future, maybe we can work together on some research projects, our inspectors can be available for collecting samples whenever Humberto, for example, needs to do a project with commercial beekeepers. We can be that hands-on connection because that's something the industry is just drowning by right now.

Jamie 24:25

Yeah, one of the ways that I see you guys evolving is that you are just present at the state, national, and international meetings. You're hearing the concerns of the individuals out there. And then you all go home to your respective states and you tweak your programs to make sure that you're addressing the things that beekeepers are talking about at these meetings and the concerns that they have. Often, a lot of surveys about bee health are run through inspection programs, right? So I just think that the model of apiary inspection, just in my short time in academia, has changed significantly from just looking at American foulbrood to now monitoring for the threat of diseases and other pests and unwanted subspecies and species of bees, and all of this is in result of the continuing education that the apiary inspectors have had through Apiary Inspection of America, just through all of these groups and efforts and organizations, you guys are constantly involved in growing your knowledge and responding appropriately to beekeepers. So I think that's great.

Amy 25:22

Yeah. I think it's also important because you guys are very good at communicating this information and communicating with each other. And I think that is probably why there's so much success within the apiary programs throughout the country and beyond. Because, I mean, I remember at the American Beekeeping Federation, the conference, one of the inspectors had come up, and that was probably one of the best, most practical, just most applied presentation.

Jamie 25:50

Hands-on talk, yeah.

Amy 25:51

And it was so entertaining. And it was just such an amazing talk, and it really got everyone inspired. And I'm not trying to say anything about the other talks that happened during that conference. But that was one that really just stood out to all of us, and you could definitely tell that the communication was there. And it was fantastic.

Guest 26:08

I went to my first Apiary Inspectors of America meeting two years ago, and I was like, "Oh, my gosh, I had no idea that there were all of these people so on fire for helping the bee industry."

Jamie 26:18

On fire, Brandi, they're on fire. They really are. There's just a lot.

Guest 26:20

They really are. They're so passionate. We work for the state, right? So, we're not doing this because of salary. We're doing this because we --

Jamie 26:29

What?!

Guest 26:29

No, I mean, these people really are out there doing this because they love bees, because they love beekeepers, and they want to make a difference in the ag industry. So in our communication, we all talk to each other all the time. If we have something that comes up, we'll send a picture. "Hey, have you guys seen this?" If somebody hasn't seen that before, because a lot of us in this are new in our roles, which was also eye-opening to me, a lot of the other inspectors are fresher eyes, younger, and don't have as much of that institutional knowledge as some of the previous inspectors. So we really lean on some of those other states to kind of help us learn and we talk a lot. We talk about regulations and ways to improve things for our beekeepers.

Amy 27:12

Sounds fun.

Guest 27:13

I know, right?

Jamie 27:14

I think this will be the last question I have for you. I think it's an important question. But I've been in Florida for about 13 and a half years, so worked pretty intimately in Florida. Every day, I know that more and more. To me, I could be absolutely wrong here, but I'm looking at it from the outside. To me, the greatest threat to apiary inspection is funding. When I watch a lot of other states, and even here, battles here in Florida about whether or not to fund apiary inspection programs, Florida, since I've been here, the number of bee colonies has gone up fourfold. The number of beekeepers has gone up fourfold. But the number of apiary inspectors hasn't changed. A lot of other states are marginalizing, maybe, their apiary inspection programs, Could you tell me about how the threat of funding issues, funding apiary inspection programs causes concern to you or other apiary inspectors across the country?

Guest 27:22

Gettin' old, Jamie. Yeah, so apiary inspection programs don't fund themselves very well.

Jamie 28:21

They're not revenue-generating.

Guest 28:22

They're not revenue-generating. So we talked about mandatory registration and stuff, some of those states that have a mandatory registration process or program, they may not even charge for that registration. Here in Florida, we do have a fee associated with it.

Jamie 28:37

But it's so marginal.

Guest 28:37

It's so minimal, it's \$10 a year if you have one to five colonies. That's certainly not enough to pay salaries. So I think at all times, all programs are a little bit at risk of being cut because that is something that is not revenue-generating, it's not self-funded, it's not paying for itself. But that doesn't mean that the apiary industry isn't super important.

Jamie 29:03

I agree.

Guest 29:04

So beekeepers and their colonies are increasing production in other areas, right? So blueberry growers, if it weren't for the honey bees, they would not be producing it.

Jamie 29:19

Sure, sure.

Guest 29:20

So while the programs themselves may not fund their existence, the importance of the bees and the importance of the industry certainly is worthwhile. We're lucky here in Florida to have a lot of support, but at any time, that can be cut and be detrimental for the industry.

Jamie 29:39

That can change. Political winds. To me, Brandi, I think that some sums it up exactly. Apiary inspectors are, to me, more vital than they have ever been in a time of increasing global trade where there's a lot of potential for importing diseases and pests or other bees. They're important because bee health is so critical right now. And that's why it's kind of always hurt me to see the funding issues a lot of states have had. So I agree, I think they're incredibly important to fund and they're worth funding. I think beekeepers know this deep down inside, and I think a lot of beekeepers have lobbied to have these programs still in existence. But I do worry. I worry about the future. And I think that that will be really bad for the industry if we were to lose apiary inspections.

Guest 30:24

Yeah, I mean, industry support is critical with getting support for these programs' funding and other resources. We saw right here in Florida, what the industry can do to build a bee lab. And so, same with these programs across the country. I mean, the industry support is absolutely vital to their existence.

Jamie 30:43

Sure. Well, Brandi, thank you so much for joining us on Two Bees in a Podcast.

Guest 30:47

Thank you for having me.

Jamie 30:53

So, ladies and gentlemen, you've been listening to Brandi Stanford, Assistant Bureau Chief for the Bureau of Plant and Apiary Inspection, Florida Department of Agriculture and Consumer Services, Division of Plant Industry. Thank you for telling us about the importance of apiary inspection. We're fortunate to have you and other apiary inspectors in Florida and are grateful for the services that apiary inspectors across the world provide to their beekeepers.

Guest 31:10

Absolutely. Thank you guys so much. Happy to be here.

Honey Bee 31:20

For more information about this podcast, check out our website at www.ufhoneybee.com.

Jamie 31:31

Welcome back to Two Bees in a Podcast. So all of you listeners out there know that a lot of managed honey bee colonies are used out there in the United States for the purpose of providing crop pollination. And we think, in Florida, specifically, those are crops like blueberries and watermelon, cucumbers, etc. But there are a lot of crops scattered around the US, and the world for that matter, that honey bees are often moved to. But honey bees, the bees that we use, specifically, are only one of about 20,000 species of bees on planet Earth. And a lot of these other bee species, the majority of them, in fact, also make contributions to pollinating some sort of plant, either a wild plant that's important for natural ecosystems, or agricultural plants that we benefit from, even though, oftentimes, the credit may be given to honey bees. So in this particular segment, we are very fortunate to be able to welcome and be joined by Dr. Rachel Mallinger. She's an Assistant Professor of Entomology here at the University of Florida Department of Entomology and Nematology. She is a world expert, Amy, in pollination ecology.

Amy 32:32

World expert! She is so awesome. I usually just tell people to go talk to her and I'm like, "I'm here to talk about bees, but just honey bees. All the other bees, you can talk to Rachel about." I'm sure it was.

Jamie 32:41

It's funny you say that. It's like, "Jamie, your expertise is in one bee?" I'm like, "That's right." The other 19,999, Dr. Rachel Mallinger knows about. Well, honestly, Amy, she joined our faculty in November of 2017, and for me in many ways, that was like liberation day. Because up until that point, I was fielding a lot of calls and doing some research --

Amy 33:04

Just making up answers.

Jamie 33:06

No, I was not. But we did do a lot of work with pollination ecology. It's just, it was not my wheelhouse. And so I was grateful that the demand in Florida was high, that the University of Florida here decided that they needed to hire someone who focused on pollination ecology. Rachel's just been great in that capacity. Rachel, welcome to Two Bees in a Podcast.

Guest 2 33:27

Thanks for having me.

Jamie 33:28

Yeah, it's really great to have you on. It's funny, Amy was joking, but it's absolutely truthful. I mean, having you onboard really has made my job easier. But I also think it's been beneficial to Florida. And I think in the long term, it's gonna be beneficial to crop pollination and wild pollination in general, because your expertise is something that's so important. So let's just start from the beginning. I want to introduce you to our listeners. So let me just start, what got you interested in the topic of pollination ecology?

Guest 2 33:55

Well, I admittedly was not a bug kid. I was not the kind of kid that loved insects. I actually wasn't even really a very outdoorsy kid. So I sort of grew into it. And my first interest was really in agriculture. So in college, I took ecology courses and really got interested in ecology, and I studied abroad in Thailand and did some agro-ecology courses while I was there. Then, I followed that up with a senior thesis on integrated pest management and some sort of novel tactics of managing pests in apple orchards. So I was really interested in how biology and ecology can inform agricultural management. And I did my Master's in entomology, but not really on pollinators, more on interactions between plants and herbivores, and on integrated pest management and how cropping systems affect natural enemies and pests. And around that time, there was increasing interest in bee conservation and in pollination ecology in Wisconsin, and really, throughout the country. I started reading more about it, getting more interested in it. After my master's, I did an internship with a lab at the University of Wisconsin, Madison working on apple pollination. And that's really where the interest in pollination, in bee-mediated pollination, but really just in pollination, more broadly, started.

Jamie 35:19

So, Rachel, I mean, I want to think about this for just a second because prior to honey bee colony losses in, say, 2006, when colony collapse disorder, as it were, started, and all these bee losses started being reported, there were a lot of people who were focused on native pollinators or unmanaged pollinators at other universities, but it was nowhere, in my opinion, near the level that it is today. So I think one of the things that would benefit listeners is what is pollination ecology? I understand pollination, I understand ecology, but what is the field of pollination ecology, and why is it growing? Why do a lot of universities seem to be getting into this?

Guest 2 35:57

Sure, that's, I think, a really interesting, good question. So pollination ecology is the study of pollination, which is the process by which plants are pollinated. That is the transfer of pollen from the male reproductive parts to the female reproductive parts. And if that transfer of pollen is successful, if it's the right quantity of pollen and the right quality of pollen, then fertilization happens, and you get a seed and

a fruit. And that is important for wild plants, for plant reproduction in wild natural ecosystems, and also, of course, for the production of seeds and fruits and cropping systems. And I think historically, pollination ecology is really a plant-focused field. So pollination ecologists would probably be more likely to be housed in botany departments, in biology departments. Even though my training is in entomology, I'm increasingly reading horticultural journals, I'm working with horticulturalists, agronomists, botanists. And so I think you would probably find a bit of pollination ecology if you went to, say, a botany conference, although I imagine a lot of it would be focused on non-crop plants. And so I think that this interest in pollination ecology within cropping systems started for maybe a few reasons. One, increasing concern that honey bees may not meet the demand for bees, both because of colony losses in some parts of the world, and also because of increased demand for these specialty crops. So as countries have gotten wealthier, there has been increased demand for things like almonds and berries. Our diets have changed. And so I think that increased demand has really coupled or combined with concerns about managed honey bee colony losses, has really driven this need for pollination ecology within cropping systems.

Amy 37:44

Yes. So when you're talking about doing your research with the apple orchards, were you working with honey bees, or what insects were you working with? What pollinators were you working with?

Guest 2 37:56

So I was working in apples in Wisconsin, and Wisconsin is a fairly large producer of apples, but it's nowhere like Washington or New York State. And their growers do bring in managed honey bees, but they also receive a lot of pollination services from the wild bee community. And the majority of those wild bees are native, although there are some non-native feral bees as well. So these wild native bees are contributing to pollination. And I found that they were contributing more than the managed honey bees. And in fact, growers actually didn't need to bring in managed honey bees. They actually didn't get better fruit set when they did. And they could save money by not bringing in managed honey bees, although it's an insurance. So there may be some years where, because of weather or wild bee emergence patterns, you don't get the pollination from those wild bees that you typically do. And then the managed honey bees are an insurance. But in general, growers didn't see a yield boost from bringing in managed honey bees.

Jamie 38:51

So this is your PhD work?

Guest 2 38:52

Right.

Jamie 38:52

So in response to your PhD work, did you see growers changing the number of honey bee colonies they moved in per acre?

Guest 2 38:59

To some extent, yes. There were some growers that started reducing honey bees. Anecdotally, growers typically know what's going on in their field. And I think anecdotally, a lot of these growers had

observed, "I'm not really sure I'm getting much from these managed honey bees." Maybe there was a year where they contacted the beekeeper later, just had fewer bees brought in and they realized, "Hey, my yields are about the same." So, growers did, I think in response to this, as well as their own observations, start to reduce the honey bees that they brought in. But I would want to make the point that, again, these systems are a little bit different than fruit orchards in other regions where the crop is grown in such large fields in a monoculture. In Wisconsin, the orchards are small to medium, they're typically in a pretty diverse landscape. And so I think that, in large part, explains why the wild bee community is so robust, so abundant and diverse.

Jamie 39:52

You keep using words like community and maybe interactions between plants. I want to get back to this pollination ecology. You've given us a good definition of pollination but where does the ecology part come in? For our listeners, what does ecology mean? And help them understand kind of pollination ecology in the greater sense. I really think what you've said so far is really leading in that direction.

Guest 2 40:14

Right. So yeah, pollination is this process by which pollen is transferred to result in fertilization, and so on, and so forth. And ecology really speaks to interactions, both between or among individuals, as well as between and among species, and interactions with the abiotic environment. And so, yeah, ecologists are really interested in interactions. And again, as Jamie mentioned, there are hundreds or thousands of bee species in an area, depending on whether you're talking about a state or country, there are hundreds and thousands of species that are interacting with each other, and they're interacting with the plants that they pollinate, they're interacting with the abiotic environment. And so, as ecologists, we're really interested in all of those interactions.

Jamie 41:00

Sure. As someone who's a honey bee person, it's been really fun for me to sit and watch the growing pollination ecology emphasis across the US. I would say I'm pretty familiar with Europe as well, and I see it in Europe. So there's a lot of Rachel Mallingers popping up in a lot of universities. And to me, it's a very exciting way to think about pollination because we don't have many honey bee ecologists. We have a lot of honey bee this and that and the other, but not ecologists. So this idea that you're not just planting a plant and hoping bees visit, the plants growing in certain soil conditions under certain treatment regimens, under certain fertilization, certain nematodes are in the soil, other critters are visiting the plants, and then you've got these bees coming in. So it's holistically looking at the community and setting the stage for improving pollination in crops. Let's talk about these unmanaged pollinators. We often refer to honey bees as non-native and everything else as native, but it's better to call them unmanaged. So these unmanaged pollinators, so give us some examples. You mentioned the one with your apples, but what are some other examples that maybe honey bees aren't so needed that the native -- there I did it -- the unmanaged pollinators are contributing significantly to other cropping systems across the US?

Guest 2 42:16

Right. So I did a postdoc in sunflowers in the Great Plains.

Jamie 42:20

Sure.

Guest 2 42:21

And there we find that honey bees will visit sunflowers for nectar, they don't typically collect pollen, I think both because of the time of year that sunflowers are blooming, and also perhaps their preference against sunflower pollen. And because sunflowers produce so much pollen, they don't like getting that pollen on their bodies when they're just collecting nectar. So they'll visit sunflowers for nectar, but they don't seem to really like them because again, they get covered in pollen, they're not trying to collect that pollen, they're always brushing the pollen off. It's a hassle. So we saw a number of wild, and in this case, they were native, although there are wild non-native insects. So that distinction, I think, it's better to say wild or unmanaged. We did see a number of wild native species, many in the longhorned bee group. So that's the tribe Eucerini, *Melissodes* species in particular, that visited sunflowers and they visited with greater frequency. And we did an efficacy test and found that we had greater seeds set from these wild native bees as compared to honey bees as well. And so in sunflowers, that's another great example of a system where you have a lot of native wild bees that visit frequently. They're effective. I think sunflower is interesting because it's a crop that's native to North America. And so you might expect that these native wild bees are going to be really good pollinators. Apple, alternatively is not native. There are a lot of native bees that do like it. But I think we would probably expect these native crops like sunflowers might even see greater pollination services from the native bees because they've evolved together. Blueberry is another example. We're working on blueberry here. And because of the timing of blueberry bloom in Florida, there aren't a lot of wild bees present, but there are some. We see a lot of bumble bee queens, and we also see the southeast blueberry bee. And especially, now --

Jamie 44:14

I love that bee.

Guest 2 44:14

It's amazing. Such a great bee, especially towards the end of the cultivated blueberry bloom. Although, we're actually seeing, at some sites, even early on in the bloom, depending on the site, we see a lot of the southeast blueberry bee and it's a native bee that is thought to be a specialist of blueberries and related plants. And it's super cute.

Jamie 44:35

It's funny, Rachel, I have blueberries in my backyard. My wife's PhD is in pollination ecology in blueberries and we have honey bees in my backyard and we grow blueberries. My blueberry production is absolutely built on the back of *Habropoda*. It is not my honey bees visiting my own blueberries, it's that southeastern blueberry bee that's out there working from before I get up in the morning until when I go to bed. It's so fun to watch. It's amazing to see these things happen.

Guest 2 45:01

It's so fast. Incredibly fast and really an effective pollinator. So yeah, blueberries is another crop. Canola is another one that a lot of people have studied, found large contributions from the wild pollinator community. The list really goes on and on. Cucurbits, pumpkins...

Jamie 45:17

Alfalfa. Did you mention alfalfa?

Guest 2 45:19

Right. So alfalfa is really interesting, too. We haven't really talked about managed non honey bees. So we've talked about managed honey bees, and we've talked about wild bees and wild pollinators. But there are also other managed bees, the alfalfa leaf-cutter bee being one of them. And that's a great pollinator for alfalfa.

Jamie 45:37

Let me ask a question. So one of the things that you commonly hear when you're comparing honey bees to unmanaged bees, so you often hear that unmanaged bees are more efficient pollinators. Tell us what that means. You were hinting at it, and I know what the answer is because you're talking about blueberries as an example, southeastern blueberries. How is a bee a more efficient pollinator than another bee? I think it's a fascinating story. So I think our listeners are gonna want to hear it.

Guest 2 46:04

You'll hear terms like efficiency, efficacy, value, importance, and the relationship between all of those terms is a little bit muddy. But in general, I think of a pollinator's value or importance as based on two things. Its visitation frequency to the plant, and then its efficacy on a per-visit basis. To look at visitation frequency, we will go out and see, for a given plant in a given field, how many of the visits are by honey bees or by a different bee, like the southeast blueberry bee. And then we can say, on a per-visit basis, how effective is that bee? And that can be measured by how much pollen it's transferring on a per-visit basis or it could be measured by how much fruit or seed is set on a per-visit basis. And so for blueberries, you could take a single visit by honey bee and a single visit by southeast blueberry bee, and say, "What is the size of the fruit that results from that single visit?" And then you can multiply that by how many visits you're getting from those bees. In some cases, honey bees are not very efficient, but their visitation rate is so high that they're overall more important. Sure, you might have a really effective bee like a bumble bee queen, but if there's only two in your field, and they're visiting 20 flowers compared to thousands of honey bees that are visiting thousands of flowers, the importance of the honey bee is going to be greater.

Amy 47:23

So was your research just kind of sitting there and counting the different bees on the different flowers? I mean, you're talking about this and I'm like, "This sounds like a pretty cool research project." Yeah, you read about the research that goes on with it.

Guest 2 47:31

it's a lot of time outdoors. It's a lot of counting, and then the per-visit efficacy is particularly tedious. Often, that's done by waiting for a single visit from a particular pollinator and comparing that to a single visit from a different pollinator.

Jamie 47:49

Yeah, my wife, she did some work with watermelons when she was a PhD student and we were out there at six in the morning because the watermelon flower only opens for one day and closes about two

in the afternoon. So we were out there before it would open. She had a tag before it would open, it would open, and then we come back and allow one bee to visit and then bag it so that no other bees could visit it. I'm so glad that Rachel's at UF.

Guest 2 48:16

It's really tedious. This is, I guess, less tedious, but equally time-intensive. I'll give you another example of how, I think, time-intensive a lot of these ecology studies are. Ecology really has to happen in the field. You're looking at interactions. So this year, we're particularly interested in this is sort of applied question. We're particularly interested in stocking densities of bees and do growers get better pollination services when they bring in more managed bees? And we're also looking at contributions from wild bees. But we're really trying to narrow in on this question of stocking density. So we have 20 different farms that vary from one to eight hives per acre, and we're looking at the pollination that each farm receives based on their stocking density. We're measuring this across multiple cultivars per farm to try to get a really whole farm.

Jamie 48:16

What's a cultivar?

Guest 2 48:46

So a cultivar is like a plant genotype. Cultivars are individual genotypes, and they're cultivated, meaning they're bred for particular characteristics. So let's take the example of apples, Red Delicious is a cultivar, Jonagold is a cultivar. Within that cultivar, the plants are nearly identical or identical, but they're different from other cultivars. Yes, exactly. Yeah. So some crops you need cross-pollination between cultivars. Apples and blueberries are good examples of that. Farms will typically have lots of cultivars, both for pollination, but also because consumer preferences vary. You might like Jonagold, you might like Red Delicious, and so on and so forth. So at these blueberry fields, we're looking at pollination across multiple cultivars. We have 20 farms that vary from a half hour north of here to two and a half hours south of here and vary in their stocking density. So it's really, incredibly time-consuming. We're looking at every week we visit these farms and take a whole slew of measurements, a whole bunch of data.

Jamie 49:26

Oftentimes, there may be cross-pollination. So, in blueberries, you have rabbiteye, but you have cultivars Climax, Premier, things like that. So that might be beneficial to have multiple cultivars. Yeah. So I think native bees, obviously, play a very important role in the pollination. You were talking about efficiency or efficacy or whatever, you know, another thing that a lot of them do is they just handle a flower differently than a honey bee does. For example, I'm aware of sonication. So could you give an example, what is sonication, how is it that a single visit by one bee might more likely result in fruit set than a single visit by another bee species?

Guest 2 50:40

Yes, exactly. So when we do these per-visit efficacy studies, we kind of say, how does fruit or seeds that differ between these bees on a single visit basis, but there's a whole slew of behaviors that are responsible for those differences. If you see a difference, why is that? One of those could be, does the bee vibrate or buzz pollinate? So some plants, including ericaceous plants, like blueberries and

cranberries, as well as solanaceous plants like tomatoes, they have these anthers, they're poricidal anthers, and instead of releasing the pollen freely along the side of the anther, they have a little hole at the top and you need a particular buzz of a particular frequency for that anther to release its pollen in a sort of poof. Only some bees apply this vibration or this buzz.

Amy 51:27

I knew that, but I didn't know the intensity.

Jamie 51:30

It's crazy because you can get like two -- it's certain keys. Right? Correct me if I'm wrong, but you can get a tuning fork that is that key, hit the tuning fork, touch the flower, and the flower will release its pollen.

Guest 2 51:42

Yeah, it needs a particular frequency. Particular frequencies vary in their efficacy. There's frequencies that are most effective and only some bees do this. Bees within the apidae family, that includes bumble bees, the southeast blueberry bee, also some sweat bees, honey bees do not.

Amy 52:00

Boring! I'm done with honey bees. I'm over it.

Jamie 52:04

Listen, Amy, you're getting paid to do honey bee extension.

Guest 2 52:07

Right. One reason why honey bees are not as effective. But don't worry, not all crops need buzz pollination. Things like sunflowers, canola, honey bees can be just as effective, but for blueberries, cranberries, tomatoes, things that need buzz pollination, bumble bees, southeast blueberry bees, other bees that buzz pollinate are more effective and you can hear them. You hear bumble bees, when they fly, they make a particular sound. It's different from the sound they make when they buzz pollinate. They'll land on a flower, usually there's this kind of quiet period, and then you'll hear like this "beeeeeeeep." Oh. Blueberry farmers across Florida just released their pollen. If you play this podcast while driving down the road, keep your windows up so that you won't accidentally release the pollen. I've perfected that noise.

Amy 52:56

Thank you for that.

Guest 2 52:58

It's super cute. You can find YouTube videos of it. Yeah, that's one reason why they can be more effective. But there are other behaviors too. So some bees, like honey bees again, will nectar rob so they'll just go after the nectar and they'll avoid making contact with the reproductive parts. But other bees will do that too, carpenter bees are notorious.

Jamie 53:16

I was gonna say that's only because carpenter bees started in the first place.

Guest 2 53:20

Notorious nectar robbers.

Jamie 53:23

Let me ask -- I love the fact that you're mentioning southeastern blueberry bees, carpenter bees, bumble bees also. So if you had to say a top five non honey bee, bee pollinator in the US, and then we'll maybe broaden if you want to include some species around the world, but what are the top five, in no particular order, bees that you think are incredibly important for agriculture, for crop pollination that doesn't start or end with honey bee.

Guest 2 53:49

Right, right. I think you'd have to say, probably *Bombus impatiens*, leisure bumble bees, the bumble bee species, and it's the bumble bee species that's been commercialized. So it exists in the wild, but you can also buy colonies of it. I don't know exactly where this would rank but probably the alfalfa leafcutter bee again. It's thought to be, and most likely is, the world's most intensively managed solitary bee. A solitary bee that's been commercialized, domesticated. The US produces some alfalfa, I think Canada is also a huge producer of it. So in North America, it's very important. So let's see, beyond those two, *Osmia*, *Osmia lignaria*, the blue orchard bee. Again, these are all wild in some parts of the world but also managed. You can also buy all three of these bees, and they just come in a box. Yeah, so the *Bombus impatiens* comes in a box and then the leafcutter bee and the mason bees you would buy as little cocoons, essentially.

Jamie 54:48

And they come refrigerated, right? They don't want them emerging. So that's three, there's a *Bombus*, there's an *Osmia*, and the leafcutter.

Guest 2 54:55

And the leafcutter, which is *Megachile*.

Jamie 54:57

Probably two more bumble bees, you think? Are there any other managed bumble bees?

Guest 2 55:01

There are other managed bumble bees worldwide, but in the US, *Bombus impatiens* is the only one that's commercially available. But yeah, I think wild bumble bees would probably also be up there. So different species of *Bombus*. Bumble bees are very fast, they make a lot of visits per time, they can buzz pollinate, so I think they are really important. Beyond that, there's some sweat bees that are really, really common.

Jamie 55:31

We see that here.

Guest 2 55:32

Yeah, here in Florida, *Halictus poeyi* is really, really common, *Agapostemons*, it's a metallic green bee. So I think some of these sweat bees that are really, really abundant, those two in particular for Florida, might rank also in the top five.

Jamie 55:49

Which bee group do you think doesn't get enough credit? Would it be sweat bees? I mean, bumble bees get a lot of credit, but let's not talk about the main honey bees, bumble bees. So you think it's the sweat bees?

Guest 2 55:57

I think for crop pollination, it would be the sweat bees.

Jamie 56:00

Are underappreciated?

Guest 2 56:00

Yeah, underappreciated. I think across crops, sweat bees are probably the group that should get more credit for some of the early spring blooming. So for apples, for example, *Andrena*, I think, are also underappreciated. So this is a genus of bees known as the mining bees, they nest underground and these long tunnels, they're solitary, and they're really important, particularly for spring blooming. But sweat bees are more ubiquitously found across the season. So for crops that bloom at different times, I think sweat bees would probably be up there as an underappreciated group.

Amy 56:08

So how many bees are you talking? Like when you order sweat bees to release or whatever, I'm saying whatever, but I don't really mean whatever, it's just that my mind is just blown right now. So I'm kind of speechless, but, like, how many?

Jamie 56:51

Doesn't sound like it.

Amy 56:52

How many bees are we talking?

Guest 2 56:53

Yeah, so sweat bees, at this point, you can't purchase, but it'd be great if you did, because again, I think they're really, really good pollinators. But some species are very common in the wild. The ones that you can purchase, leafcutter bees and mason bees, so leafcutter bees you can purchase in the gallon, and I think it's around like 30,000 cocoons per sort of gallon. You can buy tens of thousands, hundreds of thousands, depending on how big of an operation you have. Mason bees, typically, you would buy in smaller quantities. They're not produced at the scale that the alfalfa leafcutter bee is. But you can produce anywhere from a dozen to a few dozen to a few hundred. If you're a commercial grower, you'd probably purchase somewhere in the hundreds or maybe even low thousands of mason bees. And again, each individual cocoon will produce a bee, and you keep them cool until you want

them to emerge, and then they would emerge. The bumble bees, you get this little box, right? And it probably has around 250 workers.

Jamie 57:57

Sure. And they usually come in quads, so you'll get these four colonies in a quad. So it's like a bigger box that holds those four independent boxes.

Guest 2 58:06

So you might have about a thousand workers in that quad, 200-250 workers per. So again, when you're thinking about quantity, depending on how many of these you're purchasing, you're talking about hundreds to thousands of these other bees, but when you think about a honey bee colony, you've got tens of thousands of foragers, probably. So, in terms of number, honey bees are probably the easiest to flood a field with at this point. But the efficacy of these other bees may outweigh their lower abundance.

Amy 58:38

I have a really random story, but someone was talking about how they had purchased bumble bees, and on the outside of the box, it says, "Do not open." But they wanted to see if they actually got 250 of them so they open it up, and of course, they all just flew away. They weren't able to count them anyway. Follow the directions on the box.

Guest 2 58:54

Not a great idea. You could kind of count them without opening the lid because you can see in there, but it's hard to count because they're moving around.

Jamie 59:01

We did research years ago with a grad student in our lab where we froze them and counted, so I know exactly. That's another question for another day. So Rachel, I have this kind of final, all-encompassing questions for you. And I think this is important given this as a growing field. There are a lot of faculty members across the world getting involved in this. What do you think are the three biggest research needs in the field of pollination ecology? To me, it's a growing science. It's not like it's not a long-lived science. It's been around for a while, but to me, I feel like I've seen an explosion. So to move this field forward, what do you think the three biggest research needs are now in your field?

Guest 2 59:44

That is a good question. So I think, and again, I'm biased a little bit because of what I'm currently studying, but I think one really interesting area of research is how floral traits and the breeding of these crop plants, and typically, they're not bred for floral traits or for anything really related to pollination, they're bred for other things. They're bred for how the fruit or the seeds taste.

Jamie 1:00:10

More big and better tasting food.

Guest 2 1:00:12

Yeah, or now, we're breeding for machine harvesting and all that. But I'm particularly interested in how these breeding efforts have affected floral traits and how that, in turn, changes the attractiveness of the flower to pollinators.

Jamie 1:00:23

So that's one. That's good.

Guest 2 1:00:25

So that's one. I think, again, more on the plant side of things, and this may be unpopular in the bee crowd.

Jamie 1:00:31

Just let it go.

Guest 2 1:00:33

But research to reduce our dependence on insect pollinators increased for fruit, especially parthenocarpy, which is a fancy science word, but it's basically the plant's ability to set fruit without fertilization.

Jamie 1:00:45

It's funny, you mentioned that is like a beekeeper's biggest nightmare. It truly is. You're talking to beekeepers, mainly, here. In the almond world though, rumors, the research on that, and almonds are so important for honey bees. This is a field of research. So, number three. What's number three?

Guest 2 1:01:02

And then, I think number three would be research, there's a lot of research on wildlife conservation. So I have to put that in there somehow. And I think that conserving wild bees could have benefits for crop pollination. But there is a little bit of this open question of, if you build it, will they come? So if we do these efforts to improve wild pollinator populations in these different landscapes, is there enough of a sort of residual population and community there to enhance? What are the best ways that we can enhance wild pollinator populations and communities? And related to that, interactions between pest management and pollination, so how can we design pest management programs that are optimal for conserving wild pollinators? So while pollinator conservation efforts, I would say, tend to be focused on either habitat for wild pollinators, so increasing habitat around fields, and then also minimizing exposure to pesticides, so thinking about how we can design pest management programs for pollination, and thinking about other ways to conserve wild pollinators like habitat enhancements. But those habitat enhancements don't always work. So there needs to be a community there that can be enhanced by those habitats. At what scale do we need to implement these habitats? Does it need to be acres? Can it be small flower strips? So that's a little bit of a big research area, but I think just general research into either enhancing or conserving wild pollinators.

Jamie 1:02:33

So Rachel, thank you so much for spending your time with us.

Guest 2 1:02:36

Yeah, you're welcome.

Jamie 1:02:37

Hey, guys, you've been listening to Dr. Rachel Mallinger, Assistant Professor of Entomology, who's a Pollination Ecology Specialist. She is a faculty member here at the University of Florida Department of Entomology and Nematology. Thank you so much.

Guest 2 1:02:50

You're welcome.

Jamie 1:02:50

Good luck with your work.

Guest 2 1:02:51

Thank you.

Jamie 1:02:53

Amy, I think I really enjoyed that segment from Dr. Rachel Mallinger. But you remember, she was mentioning sweat bees. Right? You remember her talking about that? So she had mentioned that sweat bees aren't really available, that you have to use native sweat bee populations for pollination purposes, you can't purchase them. Do you know why we have no managed sweat bees?

Amy 1:03:10

Why not?

Jamie 1:03:11

Because antiperspirant manufacturers haven't been able to manufacture enough antiperspirant to keep up with what would be a growing demand of sweat bees.

Amy 1:03:20

What?

Jamie 1:03:21

Yeah, they sweat. And if we had them under management, we sure would need a lot of antiperspirant.

Amy 1:03:28

Are we jumping into our question and answer time now?

Jamie 1:03:31

No. Maybe we can. Let's just use this to go into question and answer time. All right?

Amy 1:03:34

That's fine. That sounds good.

Jamie 1:03:36

Have we got a treat for you listeners. I like it already, Amy. It's everybody's favorite game show, Stump The Chump. Our producer, writer and director, the sound technician, extraordinaire, James, put that together for us. We've been calling our segment Stump The Chump, and finally, he formalized some music. So we want your feedback. Two Bees in a Podcast listeners, let us know what you think about that intro. I happen to think, Amy, that it is awesome sauce.

Amy 1:04:19

Just when you think that this podcast can't get better, we do something like that.

Jamie 1:04:23

Oh my goodness, we can get better. That is something I think we have demonstrated week in and week out that there's lots of room for improvement, Amy.

Amy 1:04:32

That's fair. Okay, so I have a couple of questions for you. The first one is from the Bee Wrangler on Twitter, which is Logan. He's such a jokester. He actually wants to know how many retweets you need to do before you let him do a bee beard here at Bee College.

Jamie 1:04:48

He's going to have to retweet it probably quite a bit. I've always been anxious about doing bee beards. I went on sabbatical into Germany back in 2015ish, I think. The days go by fast. The Bee College I was gone, they allowed bee beards.

Amy 1:05:03

What! Did anyone get stung?

Jamie 1:05:05

I don't know, they haven't told me that. So I'm generally averse to bee beards. But, they're pretty cool.

Amy 1:05:10

Alright.

Jamie 1:05:11

I'm just jealous I can't grow a beard and bees are not. So I think I'm just stopping it for everybody.

Amy 1:05:15

Well, now my question is how many retweets does he need to do for you to do a bee beard?

Jamie 1:05:19

That's just not possible. He can retweet until his tweet has been read quite a bit.

Amy 1:05:25

Tweet tweet. You should do your little bird tweet tweet. Okay, so a couple of other questions that we have. We've been receiving, again, questions on our voicemail, on our email, I think we might have to end up getting some separate email account just for questions because I just keep pulling them from all

of our different social media accounts. But Anthony from Virginia left me a voicemail and he was wondering about dead-out so he's wondering how long can mites survive after a colony dies? Do we worry about robbing and, again, how long do they survive? Is it a couple of days? Is it a couple of weeks? What's that time range?

Jamie 1:06:00

Yeah, so the simple truth is we don't know with certainty how long mites can live off of their hosts in the wild. What I believe just kind of in my heart, and I reserve the right to be wrong, is that within 24 hours of a colony being dead, the mites that are left behind are also dead, unless the colony died with brood available, and there are mites being in that capped brood. The trick there is, though, if those mites emerge with the bees that emerge from that brood that was left behind in an otherwise dead colony, they're essentially doomed. Now, there are, of course, possibilities for bees to rob that colony, the honey resources left behind, and they can pick up those mites and carry them back with them to their hives. And there's also this idea of Varroa bombs. When a colony dies due to Varroa, it's almost like a Varroa explosion through drift and through robbing the Varroa that are left behind in that old hive body are now just gone. So I think within 24 hours the damage is done and they're just dispersed.

Amy 1:07:01

Okay, so I mean, yeah, so the second question that he had was for brood breaks. So if you do have a brood break, how many mites would you typically take out with that?

Jamie 1:07:10

Yeah, so what I have seen the research say is that about 70% or so, remember this is biology we're talking about so any number is possible, but around 70% of the mites are in capped brood sales at any given time. So when you are treating with a flash treatment like oxalic acid or formic or something like that, you're only able to kill up to about 30% of the mites. So if you break the brood cycle, say, for 14 to 28 days, so there's no possibility of brood for mites to actually go and invade, then all the mites are on adult bees at that time. So that's why people use brood breaks. They try to make it where all the mites are on adult bees, and then some sort of flash treatment will do away with a lot of the mites.

Amy 1:07:54

Awesome. Alright, so our last question for this segment. So, Mark on Facebook wrote to us and said he's been listening to our podcast, and then we were talking about invasive species and we didn't mention that honey bees are non-native. Do some people consider honey bees an invasive species?

Jamie 1:08:10

Mark from Facebook, that's a great question. And there's a long answer and a short answer, and I'll just kind of keep the answer short. So you are right. Honey bees are a non-native species. They were introduced to the United States with the earliest European settlers. The earliest records I believe we have is an introduction into Jamestown in the 1620s, about the time settlers were hitting Jamestown and making a go of it.

Amy 1:08:34

Is that your town?

Jamie 1:08:35

No. You mean my town or the other James' Jamestown?

Amy 1:08:39

Oh, I guess I'm sitting here with two James.

Jamie 1:08:40

Exactly. So yes, they are introduced. However, rather than invasive, we consider them naturalized. So yes, they're here. Yes, they are in a lot of places all over North America. Yes, they have established populations outside of our managed colonies, but it's more appropriate to call them naturalized. Usually, invasive has a negative connotation, and there's an inference they're doing lots of damage. And I would say all the damage that honey bees are doing is not collectively bad, right? So there's a lot of good that honey bees do. And they're naturalized. It's funny, there are plenty of people who consider them invasive and think, in fact, that we should do away with them altogether. And I know that there are states as an example that have closed state parks to beekeepers under that guise, "We only want native species here." But I think, in general, that debate has essentially been settled, right? We can't do away with them. They're here and so they're naturalized. And I think at this point, we really don't know what the environment was prior to the introduction of honey bees. So it's really difficult to know how much change they've introduced in the US.

Amy 1:09:49

Cool.

Jamie 1:09:50

That's a great question. And certainly there's plenty of philosophical discussions to be had about it beyond just the comments that I added.

Amy 1:09:57

Alright. Well, thank you. Listeners, please keep asking away. We're gonna try to acknowledge all of them but there are so many.

Jamie 1:10:05

It's great. We have a really cool problem right now in that we're getting way more questions than we can handle. And I think that's just good. It's good because that means we've got a lot of listeners. For those of you asking questions, that doesn't necessarily mean your question will be answered, but we will do our best to get to as many as possible.

Amy 1:10:20

Absolutely. We'd like to give an extra special thank you to the following: to our editors, Shelby Hal and Bailey Carol, and to our audio engineer James Weaver. Without their hard work, Two Bees in a Podcast would not be possible. So thank you.

Jamie 1:10:42

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!