Tracey: [00:00](https://www.rev.com/transcript-editor/Edit?token=JEZiFmess4fOJZyJWwatv2aGMephQXye8vFoyNqwxF7OnZCHpnU48m33gE8lc5KUAvw-of5wPU302oRxH_llpDOzDT0&loadFrom=DocumentDeeplink&ts=0.3) Hello and welcome to NC State's Audio Abstract. I'm your host Tracey Peake. As we stay at home, a lot of folks are doing their own bread baking and as commercial yeast can be hard to come by. A lot of them are experimenting with sourdough. We're speaking today with Erin McKinney, a lecturer in applied ecology and co-leader of the Wild Sourdough Citizen Science Project here at NC State about why and how sourdough does what it does and how you too can turn microbes into bread. Welcome Erin.

Erin: [00:33](https://www.rev.com/transcript-editor/Edit?token=m674P457Cwo_XJ-z7cjLUvWrQ-sku_wznYpxAfaS6nzrLH9e7hgea5AAjnnWsYhnq5yQSGb9CWBUYrmC5pD2HecFz3k&loadFrom=DocumentDeeplink&ts=33.22) Thanks for having me Tracey.

Tracey: [00:35](https://www.rev.com/transcript-editor/Edit?token=f6irRKIpt18Z2ICfTPU4edymnyjv6HEtd2yAag7I0Gbi82Dx2Tpq-FnoN91GjIIo8j4zRMhXCEmot5NfOAYKNa3y2zg&loadFrom=DocumentDeeplink&ts=35.98) First off, what is sourdough? How do a couple of tablespoons of water and flour turn into some kind of live concoction that you actually have to feed?

Erin: [00:45](https://www.rev.com/transcript-editor/Edit?token=M_m79X-kgpP25oKz7762X34m9tdoNSV_wfTwpFep8xoTkbcRBVqmyoil8K00is_yXpnSoiZv9YvErJXfQQNrkTh3cZY&loadFrom=DocumentDeeplink&ts=45.85) Yeah, so I think you've described your starting inputs for sourdough perfectly. It's really a glorified paper-mache paste, right? And you know you've got the consistency right if it's the same [gloppiness 00:00:59] as applesauce or toothpaste. So truly to start with it just is that thick paste, but over time transformations do take place as environmental bacteria and yeast start to colonize that flour and water mixture and you actually grow your own microbial garden in the jar.

Erin: [01:22](https://www.rev.com/transcript-editor/Edit?token=ezobU4GHd4e_ol39X7ic9dRF48Rku4a_UOkYA_0YZ6EoFEcS4HrqpBeylRg6Eca7oWp_Ok_Uustq-giCua2GVeeAdQI&loadFrom=DocumentDeeplink&ts=82) So the same way that if you left a bare patch of dirt out like a true garden and instead of planting plants, you just left it to nature. You'd start with little lichens and mosses, weedy things, and then you get grasses and dandelions, flowering things. Eventually you might have a small shrub or some sort of a tree grow up until you had a stable, what we call in ecology, a climax community. A stable community that doesn't shift too much from year to year. It performs very similar functions over time. So it's defined by stability and by a diversity of species that work together. And the same thing happens in your sourdough starter. What we're finding though in the microbial world is that bacteria and yeast follow different rules and that they come from different places over time.

Erin: [02:22](https://www.rev.com/transcript-editor/Edit?token=RhA1HjulwNB1HCtgJGRIXlxkSf76oV4gKy3sDYXlo14o57LvWQ7nG8z-TvhI-7Twq13SgqsTKqfQqoiwhkdW87klkWI&loadFrom=DocumentDeeplink&ts=142.11) So what you're saying is you're essentially exposing this to the air and then letting whatever bacteria and yeast happen to be in your immediate environment just kind of fall in there and do their thing?

Erin: [02:40](https://www.rev.com/transcript-editor/Edit?token=auuDyJwf_o6FNthSEB6QJ3GXTwHqMW5ipcei4rxgIndcX21_NY30mYt_HIDqKESvJRi0lVHHSwhtQUllCjA2S9XEP7Q&loadFrom=DocumentDeeplink&ts=160.06) Absolutely. Yep. We do normally recommend that you put either a loose lid or even just a piece of paper towel or a napkin over the top of it to keep any big chunks of something going in or any insects that might become very interested in your starter. You don't want the big stuff, but the microscopic things are really exciting and those could be inputs from the bacteria and yeast that are already in the flour that you use. It sometimes comes as a surprise to remember that the foods that we use are not sterile in and of themselves. They could be microbes from the air in your kitchen or your home. We know from other research out of the Dunn Lab, other citizen science projects, that our homes are kind of echo chambers of ourselves. So there are a lot of bodily microbes in the air and the dust in our homes and those microbes could literally come from your body as well, especially if you use your finger to wipe this extra starter off the spoon or the knife that you use to stir it.

Tracey: [03:44](https://www.rev.com/transcript-editor/Edit?token=Nv0nKiiqwooQMD1WpTPq4t_Y4-PU_oZo-OOpDbtJXe92qP4fZ-sO3Exqw9XrTXrWKgEdyC-HLhsCYb4c85nzBhl_LFY&loadFrom=DocumentDeeplink&ts=224.26) When we're working with the starter itself, there's a process where you have to feed it. Can you walk me through that? Why are we feeding this starter? Why are we taking some out and putting some in for a certain number of days and then we can use it?

Erin: [04:00](https://www.rev.com/transcript-editor/Edit?token=_7crunoyYNHKNqofK4-EwzfLRmMzFTAYHYgjx0BUERCmciVMK6s0aHP8uf8zwifV6jDZxwrHUQp8GKgTiQuz0pgy6uE&loadFrom=DocumentDeeplink&ts=240.49) Absolutely. So when... Think of the inputs, your flour and your water, the water just makes it so that everything can kind of swim around and all the nutrients in the flour are dissolved so that the microbes can actually get to the nutrients and digest them. Water helps all of those biological processes work, but the flour is full of nutrients, especially sugars and starches. Everything on the planet can digest sugar and starch. So that means it's a powerful little energy source for our microbes. When we feed it, you are offering an influx, it's like fertilizing your microbial garden.

Erin: [05:01](https://www.rev.com/transcript-editor/Edit?token=DpIPecidAIbuVfHayFquTUrA7hUDLww5kibytMkFtaiCEMvWQ1pvJNeHhb87fNk7LsT9jX9mJ-HWtFI9viHs8LxJnOk&loadFrom=DocumentDeeplink&ts=301.12) You're offering an influx of nutrients, but those nutrients are not infinite. And what we find in the early days of a baby starter, in the first days of its life, the sourdough microbes will run out of food after about 24 hours. After a few days, you'll start to notice a liquid layer form on the top of your starter. That's what we call hooch.

Erin: [05:54](https://www.rev.com/transcript-editor/Edit?token=ct9Ekby0F2MjrL-L53aTJv969xqZS_MDjZdyhkodQafwVVqoWJk0XOdtcUXikI6MpwSkvYXriX8ifs5-gWOu8_Ov4Kc&loadFrom=DocumentDeeplink&ts=354.27) It's largely alcohol, so as one might expect of hooch, but don't drink this because the alcohol is a product made by yeasts that are stressed. So in the sourdough starter that hasn't been fed for 24 hours or even for 12 hours, if your starter is really hungry, then the yeast gets stressed. They start to push off alcohol as a product and that seals off the starter from the outside world. So when you come back to it every 24 hours in those early days and you remove half of it, you discard half of your starter that's making room so that you can feed back equal parts of flour and water to the starter.

Erin: [06:41](https://www.rev.com/transcript-editor/Edit?token=Ruh1lGi-VYHVORoTJwuF4y0K8ofmHPH0WQCx7j2WTXfsf1eMTOabgcyrouk4nU_EoiRa3brcJ0oCNMmCtRf_Xa5pRas&loadFrom=DocumentDeeplink&ts=401.9) We always want to feed equal parts, a one part starter, to one part flour, to one part water. So if you didn't cut your colony in half or cut your community in half, you would feed exponentially more and more flour and water and your starter could fill your home in a matter of weeks. [crosstalk 00:00:07:03]. Not to mention it would exacerbate the flour shortage. So to avoid that by removing and discarding half of your sourdough starter, you can then just keep it to a tablespoon per feeding.

Tracey: [07:31](https://www.rev.com/transcript-editor/Edit?token=wCGwOHIQ6BG4rNSGW51vF2zkE764BMagO3MdfLlDt2AhNPxgToP8m7tRnJB1-KElP8RwOeRVm8IiZKWdmF3uu9s_Hh8&loadFrom=DocumentDeeplink&ts=451.68) So we know how the starters work and what they're doing. How does baking with a sourdough starter differ from just making bread with commercial yeast?

Erin: [07:43](https://www.rev.com/transcript-editor/Edit?token=2LsOE0D_W0q9ZwrV0DHqxXP0LJxjuDm2wqibfKRm8K09xCRK2EmWDPlYBLEDxpgZGLkKX2NSJ4z_bi3y4to4hM2AYug&loadFrom=DocumentDeeplink&ts=463.32) It differs in a couple of different ways. I think the most noticeable difference for a lot of bakers is the amount of time that it takes. So whereas, if we use a rapid rise commercial yeast, usually those sorts of recipes using a commercial yeast or a dry yeast, it's what a four to six hour rise and then you punch it down, you let it double again, and then you pop it in the oven. So it's four to six hours from mixing the bread dough to coming out with a loaf fresh out of the oven.

Erin: [08:17](https://www.rev.com/transcript-editor/Edit?token=-K-XocBXDA0u9OdJpqYIHPRmK49KAgDreNRSjkeDzPC4EwzecrYOriGA1ctBzN9UD2_fQx8wMLbc_FWIr1F9ljm697Q&loadFrom=DocumentDeeplink&ts=497.33) With a sourdough loaf, with my go to recipe these days that we've actually put into the materials available with the Wild Sourdough Project, I will mix up my flour, my water, some salt, and the starter, and then I like to keep that starter on the counter for at least four to six hours if it's a warm day and then I'll pop it in the fridge overnight. Or more and more what I'm doing is just mixing the bread dough at night and then leaving it on the counter overnight. So for 12 sometimes 18 hours, depending how warm my house is, and then I may or may not toss it into the fridge for another couple hours before I bake. Just depending on if I'm ready to bake. Putting stuff in the fridge presses pause and buys you a little bit of time. Things slow down at cooler temperatures, so one major thing is the time factor. It takes a little bit more planning for your schedule, which makes this actually I think a lot more accessible and maybe even exciting for folks who are looking for stuff to do at home.

Erin: [09:29](https://www.rev.com/transcript-editor/Edit?token=uUqG1FExZL4jzQghq6xC9Zu7K8R8POX9T1dkyY9VDVOm41GHJL3qCJhCR43gipNX9Z3N7p4x3fmUeX3KV6QEKOP-TvA&loadFrom=DocumentDeeplink&ts=569.16) But there's a whole microbial story of how this is different from a commercial yeast bread as well. So if you think about all the commercial yeast it's one species on Saccharomyces cerevisiae, one species of yeast. And depending on where you're getting it from and who you're working with, you might have one of maybe three different strains of one yeast. So that's like thinking about three different dog breeds out of all the breeds of dog within the species of dog. They're three very closely related strains. So that'd be like saying bakers working with rapid rise commercial yeast are usually working with yellow labs, chocolate labs and black labs. In sourdough starters, what we've found with the Global Sourdough Project is that there are about 70 types of yeast, 70 different species. So not breeds of dog, but like dogs, and wolves, and foxes, and jackals, and coyotes, and just different types of dog.

Tracey: [10:35](https://www.rev.com/transcript-editor/Edit?token=ATunzfGUfw2VzUxrj3cLmO5eJ5GVCj5oBpNVJezdDffKu7ngB-nMn25BpJdbbG03pt8yBfvAyA_mS1Cy6m-AdbiYqYM&loadFrom=DocumentDeeplink&ts=635.8) That's amazing. So everybody's sourdough starter is going to produce a slightly different type of bread.

Erin: [10:44](https://www.rev.com/transcript-editor/Edit?token=RIM4hsx2Z63X8bh_EEbJJAvE1ahBZlJg-ykD8Xa2-DeZhW_ST0sSaE-HGiyCBAu_9wIsC2pzurIKddLNoWC6NOhwl2w&loadFrom=DocumentDeeplink&ts=644.76) Yeah, exactly. And it's not just yeast, it's also bacteria. So as many types of yeast as you have across all known sourdough starters, you also have more than that many different types of bacteria that are producing different types of acid. They might be producing lactic acid, which is more of a dairy flavor, you think of a mild, like a yogurt tartness or it might be acetic acid, which is more vinegary.

Tracey: [11:42](https://www.rev.com/transcript-editor/Edit?token=lXMQ6Pt31uvRGj0veesZGKAhHxBuyhEvwfQ0pNm7YzWqc7k3ZHMn1IODy4uo8mV3X_GdJcxZxpzoiY0LBaJ07Gf_BhQ&loadFrom=DocumentDeeplink&ts=702.1) So talking about these sourdough starters and each one being kind of unique, you hear about families that have had these starters for generations and they've traveled with them and they go sometimes thousands of miles from where they first started. What do you make of this? It's almost like an emotional attachment to a little pet

Erin: [12:09](https://www.rev.com/transcript-editor/Edit?token=Pk9ce_NnWPiRN05fOjJ25phyK-bnLoHVJxcmfRsYM9gZ9l6EPHQmFJ0SA_kWuas5LfhNvFXAvjHM-eMgyQdfPGOpYSQ&loadFrom=DocumentDeeplink&ts=729.04) They're like heirloom pets that outlive you. This is like your great, great, great grandmother's pet that now you get to take care of. And I think there's a heartfelt connectivity there and an investment, one, because in those cases these starters have been passed down for generations. So it's a physical, tangible link. Your great, great, great grandmother might've been doing the exact same motions that you're doing today. So there's kind of a ritualism across time, but there's also...

Erin: [12:43](https://www.rev.com/transcript-editor/Edit?token=rZpNRlmdDVJdb9tUj4JPaD0tQIzsGOx5PAUAxVJisOKj45b4lJ8Zhv_bAoZisFCRfh205Gj0wDCVUN2-s7emR2kURcI&loadFrom=DocumentDeeplink&ts=763.81) Starters are also called mothers, and I think that speaks to the investment, the caring, the nurturing that... You mentioned earlier in our conversation that it seems a little bit intimidating of a starter, whereas pets or children might feel a little bit more like, "Oh I can handle that, but a starter?" It is a daily investment, or a twice, or thrice daily investment depending on how hungry your starter is. So there is a caring and a constant tending that I think is unique to starters among fermented foods that every day you discard some, you grow it up, you feed it, you mix it, and even in the handling of the bread, it's all very tactile and there is a deliberacy in the preparation of the food and the starter itself.

Tracey: [13:39](https://www.rev.com/transcript-editor/Edit?token=qqlv6bzYaBILVfwryyvwwjYrisEkG3fdbg-2Cq4OzJwmK5SeodgtT6-Xatzk-5zFggEO7ysXnBrRHn1M-OmlDR2yOnQ&loadFrom=DocumentDeeplink&ts=819.91) I really liked that. It's really... It's a neat idea. In fact, all of this is really a neat idea. And that kind of brings me to sort of the overarching involvement that you have with sourdough right now. As the co-lead of the Wild Sourdough Project, which is a citizen science project run out of Rob Dunn's lab here at State, can you tell me a little bit about what prompted this project and what you guys are looking at? And then give a plug for folks who might be interested in taking part and to how they could maybe find some more information?

Erin: [14:12](https://www.rev.com/transcript-editor/Edit?token=UHCRf4tMW1TLoW3UncT3k2dTypMQisNlQbQF8R4gwJhLolmLhjEG8IuS6cUat8cUxBRDPmnvtM99_hHk7QoovX8-Hf8&loadFrom=DocumentDeeplink&ts=852.69) Absolutely. So this project, it feels like the natural next step to our original Global Sourdough Project. Now for a very small digression overview of the global project, we sent surveys out to anyone in the world who wanted to answer our questionnaire about how you keep your starter. How old is it? Where has it traveled? Who originally made it? What is your history with it? Do you have pets or not? What sort of a dwelling do you live in? What sort of flour do you feed it? What kind of water do you use? All of the, what we would call the metadata, right? The all the information that might help to explain what bacteria and yeast diversity we would uncover in those different starters. Over 500 people from 17 countries around the world sent us samples of their starter, and this was casting a very broad net.

Erin: [15:04](https://www.rev.com/transcript-editor/Edit?token=0fEAtdlH148clm5PiOqYZfWZ5qvSIeNIRJjfN96oNmQ9T9Z0OmIdQDHMiqRR6wkp6zlaJOIWgeLbe6jOKs_igNkB3Zo&loadFrom=DocumentDeeplink&ts=904.67) There was no control. It was not a true experiment. It was observational data, what exists in the world and that's how we uncovered all this tremendous diversity, but it made it very difficult because we had no control over any of it. It made it very difficult to pinpoint how does geography affect the diversity and the behavior of your starter? How does the age of a starter affect it's diversity? How does flour type affect it? Right? So with this, the Wild Sourdough Project, we're able to hopefully address some of those 15,000 questions that sprung up as we tried to answer questions in the first project. So by asking every participant to start a sourdough starter from scratch and sending us the data from the first 14 days, the 15 feedings of that sourdough's life, we are able to compare apples to apples. All the starters will be the same age.

Erin: [16:05](https://www.rev.com/transcript-editor/Edit?token=dNocmk7NeIevik20b04KO1thZ5QvmZ8_V1ojIJMGjv5IUNBwISTbXeO9EuecR6aNorlRcdB8eCpR7BgaEpRisxNqLcg&loadFrom=DocumentDeeplink&ts=965.52) And we're also asking everyone to make sure that you only use one type of flour to feed a single starter. From there, you can create multiple starters that are fed different flour types or you can use the same type of flour and have one starter inside or one starter outside, the sky's the limit from there. But it is very controlled in having a single flour type. So by controlling age and flour type, then we know that the variables that will differ, we'll be able to explain more of the data. So where you live. Does that make sense?

Tracey: [16:38](https://www.rev.com/transcript-editor/Edit?token=cCCFC-I3RvoBwqmuDJ_Zj-PIPzr4-VCvFSzI6D4nvyRI5mA3yU1FbPPbnmpla4noC9t6-fIzUcD-Qkg7dM5_Y2fjiG4&loadFrom=DocumentDeeplink&ts=998.2) Yeah, it does. So your overall goal here is to paint a microbial picture of sourdough from around the world, and you're interested in getting folks from all over to help out with that,

Erin: [16:52](https://www.rev.com/transcript-editor/Edit?token=jcltljhbFHOqL6JRw1TnHt8E_mTqW3OAiFpFfKTqSDbeOvz7xfjsmoxH4NcgCC-aNTSU8F5eVCorpP8752yMfD5pulk&loadFrom=DocumentDeeplink&ts=1012.4) And we hope that in engaging the public... Well there... I think sourdough is an incredible model for learning about science and microbes in particular, but also for learning more about food. So I am now locked out of a lab, so I'm on a level playing field with everyone else at home. I no longer have access to fancy equipment or DNA sequencing. We really tried to make this protocol something that anyone can do anywhere, even though we are all housebound and in a pandemic. And so having a protocol that requires a cup and a half of flour, that's pretty feasible. And it takes 15 data points and at the end of those 15 data points, or maybe even before, you can use your starter to then bake something to sustain yourself, intellectually and nutritionally.

Erin: [17:52](https://www.rev.com/transcript-editor/Edit?token=M_wViZJXFY80x1NIjQS-lR2EwSj5jDrh0gdgfjxlFoXeLRqlBcIre20jv4sMLfzCLRCh6OzgVs9klp5E0ENaNfGZRWI&loadFrom=DocumentDeeplink&ts=1072.04) We're actually trying to focus also on the behaviors of the bacteria and the yeast. So thinking about how high does your starter rise, gives us some insight to the yeast's activity in producing carbon dioxide and other aromatic leavening agents. Through our fermentology mini webinars series, we'll have Michael [Calanti 00:18:17] as a guest speaker in a few weeks. Teaching participants or anyone who wants to learn how to really assess the flavors and the aromatic profile of your bread. So thinking then about how those bacteria and yeast are really contributing to your bread flavors and your aesthetic experience of this garden that you've created and then destroyed in an oven.

Tracey: [18:43](https://www.rev.com/transcript-editor/Edit?token=-CcuewsDoT2_WLg5SsNcJRnvlzllqo-Danraue0Q9pEYHZHnFrCK8nEuK2zdD_1JRG7S8VevF1y5IF6CuFqm8X5oByA&loadFrom=DocumentDeeplink&ts=1123.54) That's great. So if anyone listening wants to maybe do their own starter for science or just for bread, where can they find more information about the Wild Sourdough Project?

Erin: [18:57](https://www.rev.com/transcript-editor/Edit?token=QOoVfdg-sHCQobFQTuOsxV4n-lM8uIfFUUEkNUeheFKr1AOFl_jNfLnx89xPlxp49XXQHBKYUgj8AyPsIxfAIalNCqQ&loadFrom=DocumentDeeplink&ts=1137.09) Yeah, so you can either Google Dunn Lab Wild Sourdough or you can go to RobDunnLab.com/projects/wildsourdough.

Tracey: [19:12](https://www.rev.com/transcript-editor/Edit?token=aNzDNSXhXeBEHXHsX7IrLovCdbnU_0-AOwSrV-p0V-kEKlG7tQ-CAZ_XykC4XxqbMM94GW-BsyKUSEOq1FtwhA2uo3Y&loadFrom=DocumentDeeplink&ts=1152.3) Okay, well that seems easy enough. What is the coolest thing or the weirdest thing that you have discovered while doing this project? What's the coolest thing you know about sourdough, or yeast, or fermentation, or the weirdest fact you've uncovered.

Erin: [19:43](https://www.rev.com/transcript-editor/Edit?token=YqAM_190z4DgzOAKbDXQk2E-KtzdLy16YoP9K5NaioozMOLdcKRk6P4Xw48scog4BQWE506nRRXjVPIM4ez8NLk00nc&loadFrom=DocumentDeeplink&ts=1183.08) Let's see. So I have a personal anecdote. I have a friend who went to a research station in Antarctica, McMurdo Station, for a couple months and he brought me back a sourdough starter that someone had started. So granted it was very hungry by the time it came to me because it had had to come through a transit and customs. I have no idea how he made this magic happen, but he brought it back to me so that I could sequence the DNA in it. And when I opened it up to smell it, it just smelled meaty, like beefy. I've never smelled such rich umami notes from a starter. It was wild. So I don't know. I don't know. Maybe it was buckwheat flour. I don't actually know. So that's probably the most wild sensory experience I've ever had with a sourdough.

Erin: [20:44](https://www.rev.com/transcript-editor/Edit?token=Fgnn2aQ0fl3T3qxGf6PMt-6v-PClkqr2JeuMzdOSNGV2Rq5Wt4wkP9R307nmpRF4DDaLIQTEodif2itLAEyl3-UK6dA&loadFrom=DocumentDeeplink&ts=1244.64) But I think one of the most exciting things that I've learned through follow up experimentation with an undergrad researcher and with four teachers from here in Raleigh who I worked with last summer, they grew 40 different sourdough starters. So four replicates each from 10 different types of flour. And we used five types of flour that had gluten in them and five gluten free flours. And it was really incredible to me to see how high the gluten free grain fed starters could rise even though they don't have gluten in them. So the microbes are doing... It's a humbling reminder. I've been studying microbes for over a decade and still sourdough is humbling and surprising at every turn, even as it is like a basis for building human communities.

Erin: [21:46](https://www.rev.com/transcript-editor/Edit?token=j3fpkeG1G4iwuAX29K-N-d2jLsfTgSBi7mWVBLAZzBDmOrHhh7t9siCtnxwvvyRp-SPeppPIVVDCsl7aIm4WF9rl5QQ&loadFrom=DocumentDeeplink&ts=1306.42) And just this idea that we think of gluten free as an anti baking tool or something to be worked around and to be accommodated, the ultimate challenge for commercial bakers, Or for anyone with gluten intolerance, but really these gluten free grains, they feed communities of microbes that are wildly successful at producing leavening agents. So I think there's some untapped potential there that hopefully we can use to figure out how to bake delicious breads for anyone who wants to eat bread.

Tracey: [22:27](https://www.rev.com/transcript-editor/Edit?token=8TqKPz7XfxfUiQ5BEFqIyyevVCRKLkJFXfINWoytabMF0tzLxu23_goKNi814xvicWPxRrTkUwrMxZe2-d_X55fO2ZI&loadFrom=DocumentDeeplink&ts=1347.47) Well this has been really enlightening and fun. Thank you so much for being here today, Erin.

Erin: [22:41](https://www.rev.com/transcript-editor/Edit?token=zT2_NKzVAKkRL45PJpU30usn_dru6W0U1T7oH1IY8IJI8Qh-p59xrrKK08fors-2Wn7CHR--q4AbcM9x5B0cphRIq3U&loadFrom=DocumentDeeplink&ts=1361.08) Absolutely. Thanks for having me.

Tracey: [22:43](https://www.rev.com/transcript-editor/Edit?token=DEeh_-p_4c1j8QBYa8gY6v8MfdNEA7MAPIryptTLyXyl-uVAQs_r-jyieRDlNgZBWBrf1oAyp9t-Uk4Of7IQLE6826g&loadFrom=DocumentDeeplink&ts=1363.51) We have been speaking today with Erin McKinney, a lecturer in applied ecology and co-leader of the Wild Sourdough Project here at NC State. This has been Audio Abstract. I'm your host, Tracy Peake. Thank you so much for listening.