

The Children's Hour - Forests (58m version)

Kids Crew: What did the tree wear to the pool party?

Kids Crew: I don't know what.

Kids Crew: Swim trunks!

Kids Crew: Laughter

Kids Crew: It's time for The Children's Hour, Kids' Public Radio.

{Music: Green Chili Jam Band, Trees}

Katie Stone: That's the Green Chili Jam Band with Trees. You're listening to The Children's Hour. I'm Katie Stone. I'm here with a lot of great people at the Outpost Performance Space in Albuquerque, New Mexico. And on Zoom, hello everyone.

Kids Crew: Hi.

Katie Stone: And who do we have with us today?

Kids Crew: Hi, it's Illuminata.

Kids Crew: Hi, it's Nina.

Kids Crew: Hi, it's Thorfin.

Kids Crew: Hello, this is Cade.

Kids Crew: Hello, it's Haley.

Kids Crew: Hi, it's Amaya.

Kids Crew: Hey, it's Evan.

Kids Crew: It's Thaniel.

Kids Crew: Hi, it's Joe.

Katie Stone: Well, thanks for being here everyone on Zoom and at the Outpost. We're here today in a really exciting show. We're gonna be learning about trees and forests. I'm guessing that we've got some forest lovers here on The Children's Hour crew. Any of you really into forests?

Kids Crew: Forests are cool, yeah.

Kids Crew: I love rainforests, cause there's like so many creatures and animals and plants.

Kids Crew: Forests are partially the reason of our existence, so.

Katie Stone: Yeah. And you know what, Nina, we're gonna be learning exactly that, how we are dependent upon forests and trees as living beings on this planet. And the power that trees have to keep the planet alive is

amazing. We're gonna learn so much more about it from Wild Earth Guardian's Dr. Lisa Markovchick. This show also comes with a learn-a-long guide that meets and cites national education standards. You can find it at childrenshour.org. Look for this episode, Forests. Back in a moment.

{Music: Walkin' Jim Stoltz, If I Were a Tree}

Katie Stone: That's If I Were a Tree by Jim Stoltz off of A Kid for the Wild. You're listening to The Children's Hour. I'm Katie Stone. I'm very happy to be here with a lot of kids on Zoom and at the Outpost Performance Space in Albuquerque, New Mexico. With us today is Dr. Lisa Markovchick. She is a scientist at Northern Arizona University in Flagstaff, Arizona. And she's an ecologist for a nonprofit called Wild Earth. Guardians. Welcome to The Children's Hour.

Dr. Lisa Markovchick: Thank you. I'm very excited to be here. I recognize some of your voices from listening to other episodes and it's really nice to see you in person.

Katie Stone: Well we're happy that you're with us too. Your study includes how plants, fungi, and animals work together in cooperation, and I think that some people may be surprised to learn that. That plants and mushrooms, mycelia, can actually work together. Forests are really special places, aren't they?

Dr. Lisa Markovchick: So special.

Katie Stone: Why?

Dr. Lisa Markovchick: Well, some of our mature and old growth forest support species that can't live anywhere else, just for starters. As trees get older, they can also store a lot of carbon and continue to trap a lot of carbon from the air, which helps us with climate change. In the very near

term, some of our larger trees do that more efficiently and more reliably and faster. And on top of that, there's a whole bunch of unseen, unheard communication and partnerships and all sorts of different dynamics going on.

Kids Crew: How many different kinds of trees is needed to make up a forest?

Dr. Lisa Markovchick: It's not necessarily about how many different types of trees. It's usually more about the fact that there are trees. and how much canopy cover there is, how old in particular some of those trees are, and the kinds of environment they can create. So for instance, if we have a lot of shade and a lot of fallen logs, and a lot of what we call microclimates, which just means climates in little areas, so for instance under logs and rocks and protection from wind, then it houses a lot more plants and animals. And the older those forests get, there tend to be more and more different kinds of species that can live in them or need them for certain things like shelter.

Kids Crew: How old are the oldest forests?

Dr. Lisa Markovchick: That is a great question. So I wanna know, have you ever been around a being that's older than 200 years old? Anybody?

Katie Stone: Maybe a tree.

Dr. Lisa Markovchick: I just visited a cottonwood that was about, oh, I don't know, seven miles from here on my way here. It was 160 years old that they know of, but there's even more impressive ones. Bristlecone pines can be 5,000 years old. And even you guys maybe are familiar with like creosote bushes, even though we don't necessarily consider them a forest, they're more of a desert, but they can also be really old. They can be 11,000 years old.

Katie Stone: Wow. Now, for listeners listening everywhere else than the desert, they don't look like much. They look like a little bush. Like, if you saw one, you'd be like, that's just an ugly bush. But they're really pretty amazing little, are they considered a tree?

Dr. Lisa Markovchick: They're trees, oh yeah.

Katie Stone: So if a bush is a bush and a tree is a tree, what actually makes a tree a tree and not just a plant?

Dr. Lisa Markovchick: So generally speaking, let's start with what's a plant. What's a plant?

Kids Crew: It's a living organism that photosynthesizes to get what it needs.

Dr. Lisa Markovchick: Yeah, exactly right. It captures energy from the sun. It traps carbon from carbon dioxide in the air and stores it inside of itself and its roots and its trunks and its leaves. It's also producing food. Basically everything we eat is either a plant or has been fed by a plant. So then what's a tree? We talked a little bit about that. It usually has more like one trunk. And they get really big and thick. If you think about a bush, they might have multiple stems coming out of the ground, and they're usually thinner, because there's a whole bunch of them. And they're kind of sprawly, and it's really cool actually, because as some trees grow older and grow old, they become trees, but they could start out looking like a bush. So for instance, our junipers that we have around here. they can start out looking very sprawly and they have lots of stems. And if they never get old, then they never actually become the tree that they could be. But as they get older, there's pictures of these same junipers with these huge trunks and they're really tall and they have a canopy way up in the air. And that is actually the same plant. It's just whether it's a youngster or whether it's an old tree.

Katie Stone: That's Dr. Lisa Barkovchik from Wild Earth Guardians. We have a Learn Along guide with this episode about forests. Find it at childrenshour.org. Look for this episode, forests.

{Music: Marais and Miranda, What Are the Parts of a Tree}

Katie Stone: That was What Are The Parts of a Tree by Marais and Miranda, off of Nature Songs.

Kids Crew: How are trees connected and how do they communicate?

Dr. Lisa Markovchick: So they don't have like a centralized brain like we do, like animals do. Anyone want to guess why?

Katie Stone: Gosh, that is such a good question. I never really thought about if trees had a brain.

Kids Crew: They don't really need it.

Katie Stone: But they are breathing and they breathe in air and they are expiring. They are breathing out oxygen. So we know that that's happening in their leaves. So in a way, their leaves are breathing in and out.

Kids Crew: I think it's because of like heat. And like they can feel the sun, they're connected in like tree roots. And so maybe they can like see it okay, there's like really close together, maybe.

Kids Crew: I feel like it's probably has something to do with evolution and how with tertiary levels, which is basically the food chain. how animals need something to eat. And so something needs to produce that first so

more energy can continue going up to smaller animals to larger animals, right?

Dr. Lisa Markovchick: Yeah, why would it be advantageous if you're liable to get eaten, or parts of you are, to not have a centralized brain or hard or...

Kids Crew: So it could regrow because if you're something that's easy to get destroyed, you don't wanna have a centralized brain because if that gets destroyed, then you can't grow up. But if it doesn't have a centralized brain, even if it's parts of it gets eaten, the rest of it can still grow.

Dr. Lisa Markovchick: Exactly. So there's a whole bunch of people out there studying how plants can do all these different things that we might not normally think of. So they don't have eyes, but can they see? They're actually using the sun, right? So they have photoreceptors in their leaves. So they don't have eyes, but they can indeed sense light. because they're actually looking for the light to use it to make energy. And so they can do things like that. They can also, they don't have ears, but there's folks out there studying how they use vibrations. So in a way, kind of like some of the insects and spiders and things that don't have ears as well, they sense vibrations. And they use the vibrations kind of as a surrogate for sound because sound is just a wave. It is a vibration. And so there's folks out there looking at how they actually produce certain frequencies. And if you play those frequencies back to them, they'll actually grow towards the sound. Or let's say you have water in a pipe. So the plant can't sense the moisture from the water, but it'll still grow towards the sound, even if it's just the sound of water. So they can do a whole bunch of things that we often don't think about, or maybe we have words for that we only use for animals. But they do these things. They move, they can grow faster to get back into the sunlight if they're in the shade. They can make room for their neighbor. And they actually use chemicals. So rather than talking, for instance, they can communicate with these things we call volatile organic chemicals. They will release different ones to communicate different things so they can actually tell their neighbors when they're sick or when they're getting attacked. and call in the predators of the animal that's eating them. So if they're say an aphid eating them, they can send out chemical signals that

actually call for the other type of insect that likes to eat that one to come on in and chow down.

Katie Stone: That's incredible. So what you're saying is that the trees we see anywhere in the forest, on the street corner, they have a whole complex system of communication that not only with their immediate surroundings, so vibrationally through the ground, but also chemically through like pheromones and smells? Is that how they're doing it?

Dr. Lisa Markovchick: Yeah, volatile organic compounds or chemicals that they release into the air. There's also, you know, I study mycorrhizal fungi and they're in the roots. If you're going to come into somebody's house... What's the first thing that has to happen?

Kids Crew: Knock.

Dr. Lisa Markovchick: Knock! And then they're gonna wanna know who's there, right? Before they let you in, they're not gonna let just anybody in. Well, plants and fungi, if they're gonna work together and kind of invade each other's space, right? To form some kind of exchange organ, then they have to knock on the door and say, who's there? So there's a whole chemical signaling that has to happen in order for the plant to say, well, who are you and what do you want?

Kids Crew: So other than calling for help, what do trees speak about through the chemicals?

Dr. Lisa Markovchick: We're still trying to figure it out. So there are many different compounds they can release. It looks like they can release them through the air as well as their roots and potentially through their mycorrhizal fungi. But we don't know what all the different compounds mean. So it could be like words, right? Or letters even, where they have different combinations that mean different things. So there are some where people have identified that, oh, that one means that something's eating

them and they're calling for help or they're not feeling good. But there are other ones that we still don't know what they mean.

Katie Stone: That's the voice of Dr. Lisa Markovchick. She is teaching us about forests. You can learn a lot more in our Learn Along Guide. Find it at childrenshour.org. Look for forests.

Kids Crew: You're listening to The Children's Hour Kids Public Radio. We'll be right back.

Katie Stone: The Children's Hour is produced by The Children's Hour Incorporated, an educational non-profit based in Albuquerque, New Mexico. We're listener supported at childrenshour.org. Electric Playhouse supports The Children's Hour, now open in Las Vegas, Nevada, inside the forum shops at Caesars Palace. Learn more at electricplayhouse.com. The New Mexico Department of Cultural Affairs supports The Children's Hour. Experience the magic of New Mexico's many cultural traditions at museums and historic sites statewide. More at nmculture.org slash traditions.

Kids Crew: I like all of the podcasts because they help me learn a lot. I'm Brooklyn Elder from Albuquerque.

Katie Stone: Find hundreds of educational podcasts at childrenshour.org or anywhere you listen to podcasts. Look for The Children's Hour.

[20:00]

{Music: Katherine Dines, The Mighty Tree of Life}

Katie Stone: That was Mighty Tree of Life by Katherine Dines off of Hunk-Ta-Bunk-Ta-2. Remember, this episode comes with a learn-a-long guide that meets and cites national education standards. You can find it at childrenshour.org. Look for forests. We've talked a little bit about what

makes a tree. And early on when we first started talking to you, Cade asked, you know, what makes a forest? Is it a number of trees? But let's get more into that. What actually makes something a forest and not just like a bunch of trees in one spot?

Dr. Lisa Markovchick: Usually a forest we consider has a certain size, so maybe bigger than five acres, for instance. It might also have a certain amount of canopy cover. So like we were talking about trees, especially like in my area, we have ponderosa pines and they often don't grow together. So they don't have interlocking canopies. And then there's also all of these relationships that we're talking about. So if we have left that area alone for a long time, those relationships have more time to build up. The microclimates that we were talking about have more time to get into place. And all these different layers of like, like if you go into, well. I was gonna say the redwood forest, but even in like in Texas, and there's these old growth junipers that we were talking about earlier where we have them, but they often look like bushes. If you let them mature, there are all these different layers. So like in the space between the trunk and the branch, some leaf litter and dirt can collect there, and all of a sudden you have a whole new ecosystem just right there with some plants and bacteria and fungi. So, We're looking for this species diversity as well as some of that structure and function with the big canopy. But we're also looking for these really amazing intricate relationships that build up between those different species as time goes on.

Katie Stone: So over time, little critters like squirrels or even mice or birds love those sections where there's a bunch of debris in the arm of a tree.

Dr. Lisa Markovchick: There are owls who need to nest in cavities in trees, so they actually need standing dead trees or cavities in trees. There's caribou, or what we know as reindeer. They will only eat particularly over the winter. They rely a lot on lichens, but lichens tend to only grow in sort of more undisturbed areas. because they're very sensitive to, for instance, like air pollution and drying and things like that.

Kids Crew: What happened if we didn't have any forest?

Dr. Lisa Markovchick: I don't know if we know what would happen if we didn't have any forests. I mean, there are grasses, they do photosynthesize, but trees have a very, very different effect. They have all this shade and canopy, they provide all this structure that grasslands don't necessarily provide, even though grasslands are amazing too. So, I don't think we wanna find out because if we take down all that canopy, we're gonna eliminate a whole bunch of species along the way, probably ones we don't even know about because fungi for instance, such a huge percent, it's like somewhere around 98% still remain to be discovered. They're sort of what people have equated at the lungs of the earth. For instance, in the Amazon, where they are cutting down a lot of trees to make way for ranches, there are a lot of dynamics in the air with warming and lack of water that result from that.

Katie Stone: So it turns out forests actually seem to attract clouds and rain, is that true?

Dr. Lisa Markovchick: They do, they do.

Katie Stone: How?

Dr. Lisa Markovchick: Well, remember they're affecting the temperature because they're providing shade. They're also soaking up a bunch of water. And then as they photosynthesize, they're releasing that water back into the air. So it creates this ongoing cycle of attracting water, using water, putting it back into the system.

Kids Crew: How do trees reproduce?

Dr. Lisa Markovchick: How do plants reproduce? very similarly to some other kinds of plants. They're not that different, but there are different ways. They could have flowers. They could have sort of wind pollinated systems.

So, things like pinecones that we might think of, similar to animals where you want that female and that male portion that come together to make a baby. They're gonna have something similar, but they have it in their flowers or in their cones. And some trees will have Say they can have a female and a male cone on the same tree or on different trees, for example. So, they have different ways of doing it, but all kind of towards the same goal.

Katie Stone: That's Dr. Lisa Markovchick, and we're learning about forests today on The Children's Hour. Find our Learn Along Guide at childrenshour.org. Look for this episode, forests. Sing Along to Tim right here on The Children's Hour.

{Music: Sing Along Tim & The Pacifiers, Mother Tree}

Katie Stone: We're learning about forests today on The Children's Hour with Dr. Lisa Markovchick from Wild Earth Guardians.

Kids Crew: What do the relationships between trees and fungi and other elements of the forest do?

Dr. Lisa Markovchick: We talked a little bit about mycorrhizal fungi and the fact that they knock on the door and enter the root and then they form a special structure with the plant where they can exchange different things. So they might go ahead and find some water. give it to the plant or they might find some nutrients that the plant needs. And then in return, the plant will give them some photosynthate or what they make in photosynthesis. There's also folks who are studying what we know as common mycorrhizal networks. And right now there's a little debate going on as to whether the scientific results mean what we think they mean. But, it looks like there might be these networks of mycorrhizae out there, and we're trying to figure out if that's true, and if so, how far they go. And if they do share resources between plants, because that's what some of the studies suggest, there's also what we call endophytes, which are basically fungi that live in different ways inside the plant. So often, for instance, in the pores or the stomata of

the plant leaves, and in some case we don't know what they do, but in other cases they seem to also help deter insects and things like that. My advisor, Dr. Geering, at Northern Arizona University, she has these amazing studies in Pinion Juniper woodlands. There's two different strains of trees. One's really short, one's really tall. The short ones have a different microresol community than the tall ones. And if you look at them, you might think that short ones are kind of not doing so well because they have moths eating them. That's why they're short. But in fact, the short ones are actually more drought resistant because of the mycorrhizal community that they have. So, she did these amazing studies where she showed that even if you try to give the opposite mycorrhizal community to those two different strains of trees, they want the mycorrhizal community that they normally have. And not only that, but if you expose them to drought, the one that's more drought tolerant that has that drought tolerant mycorrhizal community, the other one tries to sort of acquire that same mycorrhizal community. So, we have sort of some evidence showing that they're also helping plants regulate how efficiently they use water and how well they can survive things like drought, for example.

Katie Stone: What's the benefit for the mycorrhizal fungi to live on a tree leaf? Do they just, it gives them a place to live?

Dr. Lisa Markovchick: So, the mycorrhizal fungi are going to be in the roots. The endophytes often will live in the roots or other tissues, but largely above ground and things like the leaves. In some cases, we don't know why they're there. We can't tell what they're doing. There's sort of hypotheses out there that maybe they're actually just kind of hanging out. And in other cases, they seem to help with things like... deterring insects that would otherwise eat the plant. And so there's a whole bunch of really exciting possibilities with things like agriculture, for instance, where we could actually reduce the amount of fertilizers that we use or the amount of pesticides that we use by really advancing our knowledge in these areas and making sure that we're preserving some of these amazing forests where different species might be hanging out that aren't necessarily hanging out in sort of more disturbed areas because we might not know yet what they're doing for us. So, we don't wanna lose them.

Katie Stone: That's Dr. Lisa Markovchick. She's an ecologist. We're talking with her today about forests. We've got a few more questions for her coming up. So stick with us.

{Music: Pierce Freelon & Nnenna Freelon, Little Mushroom}

Kids Crew: You're listening to The Children's Hour, Kids Public Radio. We'll be right back.

Katie Stone: Many thanks to the Outpost Performance Space for hosting The Children's Hour. The Children's Hour is supported by United Way of North Central New Mexico. Support for The Children's Hour provided by New Mexico Arts, a division of the New Mexico Department of Cultural Affairs and by the National Endowment for the Arts. Support for The Children's Hour provided by the City of Albuquerque Cultural Services Department and the Urban Enhancement Trust Fund. Support for The Children's Hour provided by the New Mexico Children's Foundation. You can keep up with The Children's Hour by signing up for our monthly newsletter at childrenshour.org.

[40:00]

{Music: Jenn Cleary, Take a Walk in the Woods}

Katie Stone: This is the Children's Hour. You just heard Jenn Cleary with Take a Walk in the Woods. Before the break, Little Mushroom is Pierce Freelon and Nina Freelon from their AnceStars release. We're learning about forests today on The Children's Hour. The kids have a few more questions for our guest, Dr. Lisa Markovchick.

Kids Crew: Do different species of plants share similar DNA?

Dr. Lisa Markovchick: Yeah, so it's kind of like animals. If we think about... things like monkeys and chimpanzees, our DNA is really not that different from theirs. And it's similar in other kingdoms too, things that are related share a lot of their DNA, but small differences can result in sort of the big differences that we see on the outside.

Katie Stone: It's really sad to look at maps of old growth forests. There's hardly any left, especially in the continental United States. Why should we care about our old, old growth forests?

Dr. Lisa Markovchick: So, part of the answer is that we want to preserve these reservoirs of species that might not be anywhere else. And for instance, older forests, while they might have more mycorrhizal fungi, it might also just be different mycorrhizal fungi. And so we want to make sure just along those lines of that example, that we're preserving these reservoirs of diversity of our species so that we're not losing them. And then along other lines, they're really important because in the next 10 to 30 years, we really need to trap and store a lot of carbon. And these old growth forests are full of trees that are already full grown, have big canopies of leaves. Remember those leaves are the little factories that are taking carbon dioxide out of the air and storing it inside the plant roots and plant trunks. and I might add inside mycorrhizal fungal tissues that are underground. And so we don't wanna lose them because in the next 10 to 30 years when we need it the most, they're gonna be those powerhouses that are really storing carbon for us. And I think some people are cutting older trees and mature and old growth forest down just because they need to support their family and that's the only way they can bring in money. And then there's also, you know, a lot of folks doing it. because they're trying to make sure that places are more resilient to fire. And so trying to figure out how to preserve our old growth forests and also balance all those other needs is really important. And that's sort of what we're trying to figure out at Wild Earth Guardians where I work as an ecologist is what does that look like? How do we make sure that people can earn a living and do the right thing? and also make sure that we're doing the right thing to protect these ecosystems in the long run, but thinking about all these different relationships and interactions that we might not otherwise be thinking about.

Katie Stone: So, I just want to point out to our listeners in the audience and the kids here that people live to be about 80 years old. And so, if we were all planting trees in our lifetime, eventually, and not too long after we die, If we plant a forest, that will be considered old growth.

Dr. Lisa Markovchick: Well, that would be considered mature. But imagine if you're planting trees even now. It's going to take that long for them just to get mature, right?

Katie Stone: Well, so it sounds like the best time to plant a tree was 20 years ago. So, the next best time to plant a tree is today.

Dr. Lisa Markovchick: Well, yes, except there's less than 20% of old growth forests left in the world. And for instance, in the US, it appears that about a third of those are, for instance, on forest service lands and they have relatively few protections. So it's not like, you know, the national parks or somewhere where they have guaranteed protections.

Katie Stone: I think that's surprising for people. I think if we think of something as a forest or a national forest, you would imagine that that's protected. There's a lot to learn. And if you are interested in forests, We need you to study them just like our guest, Dr. Lisa Markovchick. She has been our guest today on The Children's Hour. Thank you so much for being with us on The Children's Hour. We've learned a lot from you.

Dr. Lisa Markovchick: Thank you guys so much for having me. It was so great to be here with you and for all the amazing questions. If you'd like to learn more, we've got links and a learning guide at childrenshour.org. Look for this episode, Forests. Here's a little Ella Jenkins. many pretty trees around the world. There are many pretty trees all around the world. Here's a pretty tree now. It's an oak tree. It's an oak. There are many pretty trees all around the world.

{Music: Ella Jenkins, Many Pretty Trees All Around the World}

{Music: Kid Kaleidoscope, Old Oak Tree}

Katie Stone: From the adventures of Kid Kaleidoscope, that's Old Oak Tree. And before that, Ella Jenkins from Songs Children Love to Sing. You're listening to The Children's Hour. We've learned a lot about forests, but there's still a lot more to know. You can find our Learn Along Guide that meets and cites national education standards. Look for it at childrenshour.org under this episode, forests. We'll go out with one more from Okie Dokie Brothers. We'll catch you next time for another edition of The Children's Hour.

{Music: The Okee Dokee Brothers, Child of Nature}

Kids Crew: The Children's Hour is produced by The Children's Hour Incorporated, a New Mexico non-profit.

Kids Crew: You can find photos, links, learn-along guides, and more about us at ChildrensHour.org.

Katie Stone: Today's show had production help from our senior producer, Christina Stella, as well as Thaniel, our intern. Our learn-along guides are written by Jonathan Dunski with support from Lorraine Archibald.

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Kids Crew: Our theme music was written by C.K. Barlow.

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