

# **GLOBE North America Phenology Campaign:**

## **Dr. Alix Contosta Q&A Transcript**

**Dr. Alix Contosta:** My name is Alix Contosta. I work at the University of New Hampshire and I am really interested in winters especially, but also seasons and how they're changing, and how changing winters and changing seasons affect forests.

**U.S. GLOBE: What kind of research do you do?**

**Alix C.:** A lot of my work happens during the winter and is really trying to understand how snowpack that we get in the winter, how it insulates soil. So the snowpack is like a blanket that covers the soil and how it helps to keep the soil warm and how it helps to support nutrient cycling in the soil. So a lot of my research focuses on that and tries to understand how, as our winters change, what the effects are on soil nutrient cycling and the ability of soils to hold water.

But I'm also really interested in seasonal transitions in and out of winter. So when do leaves change color and drop in the fall? And when does green up happen in the spring, because that also affects the ecosystem into the summer.

**U.S. GLOBE: When did you know you wanted to be a scientist?**

**Alix C.:** I didn't know I wanted to be a scientist until I was about 26 or 27, so I didn't grow up thinking I wanted to be a scientist. I think part of that was that no one in my family was a scientist, and I didn't know any scientists. And so it wasn't something I imagined for myself.

I grew up in a city, and my family wasn't very outdoorsy. It wasn't until I was in college that I ever really had significant time outside of a city, out in nature, hiking, exploring rivers. And it was through being outdoors that I got interested in ecology and then through that interest in ecology that, you know, made me realize that maybe I wanted to pursue science as a career.

**U.S. GLOBE: What is a research question you've tried to answer?**

**Alix C.:** I've been really fascinated by the timing of green up in the spring. A big part of my research is really oriented towards this time of year we call the vernal window, vernal meaning spring and window because there's a lot of light.

And so if you are in a place that has snow in the winter, that snow is covering the ground. You probably have ice on lakes, probably have ice covering streams and then that snow melts and the ice melts. And then there's this period before the leaves come out where there's a lot of light that can reach the ground, that can reach the stream. And that's this vernal window period. And that is a period that we think it's changing as our climate changes.

There's this delay between when the snow melts and when the leaves come out, that this lag period, this vernal window that's getting longer because leaves emerge on trees, not just based on how warm it is, but based on how much light there is.

And you know, you can have a really warm late winter and early spring, but a lot of trees may not respond to that because there just isn't enough light for them to decide, OK, now it's time for our buds to burst and for our leaves to come out. And they have these adaptations because what you don't want as a tree is for your little baby leaves to come out and for there to be this really hard freeze, for them to all die.

And so we see that the snow is melting earlier and earlier. And even though the leaves are also emerging earlier, it's not happening at as fast a pace. And so you have this period between snow melt and leaf out that's getting a lot longer or at least that's what we're trying to understand with our research.

### **U.S. GLOBE: What equipment or technology do you use in your research?**

**Alix C.:** So one of the things I really love about the work that I do, especially around the Vernal window, is that there are a lot of different kinds of tools available that go from like really sophisticated and complicated to really simple.

So to measure snow depth, all you need is a ruler. You just stick a ruler in the snowpack and you can see how deep it is. That's the simplest tool.

You can also measure the snow depth with fancier equipment. There are these little sensors we have, they're called Sonic range finders. They stick out above the snowpack and they send a little pulse of sound, and the time it takes for that sound wave to return is related to the distance.

We can also try to infer snow presence or absence from satellites.

So you can go all the way from a ruler to a little sensor that emits a sound pulse to a satellite, and the same is true for looking at phenology. You're thinking about the spring, looking at twigs and seeing. Are the buds dormant? Are they starting to swell? Have they broken and you start to see buds emerging? Do you see little leaves, are the leaves getting bigger?

That's a, you know, a simple way to look at different key stages of spring green up that a lot of people use, including the National Phenology Network. And there have been a lot of papers that have been published using that technique.

What I tend to use is something that gives me a little bit more continuous measurements. So I use cameras either in the Pheno Cam network or my own little cameras that take pictures every half hour. So if you go out and you're looking at a twig, you maybe can only do that once a day or once every few days. If you're taking pictures every half hour, you get the more continuous record. With pictures, you can look at how much green is in the picture, if you're looking at spring green up. And if you're looking at fall coloration, you can look at how much red is in the picture.

But just like snow, you can also see those changes from space. With satellites, you can go from, you know, being out in your backyard or in the woods making, you know, manual observations, to some kind of sensor like a little camera to a satellite. And I use all three of those.

### **U.S. GLOBE: Why is studying phenology important?**

**Alix C.:** So in general, I think studying phenology is important because seasons define really key events. You know, now that it's fall, we're thinking in my house about Halloween and moving into Thanksgiving, and then as we get into winter, thinking about the winter holidays and the first snowfall and skiing.

So I think seasons really sort of dictate what we do in terms of like you know, our life activities and also help to find how we mark time. So there's something about that that rhythm, that sense of return, that cycle that I think is really important to us as people.

But I also think it's really important to understand in my work as a scientist because our seasons are changing, those changes in leaves changing color of flowers emerging don't align with the days on the calendar when we're used to certain things happening. And so it's that sort of misalignment between ecosystems and society that is one of the hallmarks of climate change.

I also think it's really important to understand phenology and understand the timing of key life events for organisms because they're really important for, you know, driving the way that water moves through our ecosystems. If leaves are on trees, if plants are green, they're using that water for photosynthesis, and if the leaves are off, they're not.

Same thing for nutrients that are in soils. How much carbon dioxide is coming out of the atmosphere and getting taken up by plants really matters, and that changes depending on whether leaves are on and green or whether they're turning color in red and falling off.

### **U.S. GLOBE: What is your favorite fall activity?**

**Alix C.:** I really like hiking in the fall. I like going up to the mountains and hiking and seeing the leaves that are changing color. My favorite hike that I ever did in the fall was on Mount Moosilauke in New Hampshire, where in the valleys the leaves were at peak color and all orange and red. And at the summit there was snow, and it was just really incredible. Standing at the summit in the snow and seeing other snow covered summits and then looking down into the valleys and seeing them all bright red and orange.

But I also love apple picking and all the things that go along with apple eating. So ideally there would be a hike followed by maybe some apple cider.