Landscape Ontario Podcast

Plant Hardiness Zone Map Update:

What it means for Canadian growers

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Guest: John Pedlar, Dan McKenney, Canadian Forest Service

SUMMARY:
Natural Resources Canada scientists John Pedlar and Dan McKenney discuss the latest plant hardiness zone map, how climate change is affecting growing conditions and the implications for Canadian landscapers, growers and gardeners.

INTRO:
Karina: For the first time since 2014, Canada's plant, hardiness zone map and website is getting an update, providing fresh insights into what to plant where across the country. This update reflects the latest climactic data and scientific analysis by Natural Resources Canada offering a clearer picture of how growing conditions across Canada have evolved.

And if you haven't guessed already, yes, things are getting warmer. Mostly aside from a few outliers, much of Southern Canada has experienced an increase in zone ratings with the largest increases occurring in Western Canada. Highest hardiness values are found in the coastal and interior regions of southern British Columbia, Southern Ontario and southern Maritimes region. Lowest hardiness values are found in the far north and mountainous regions such as the Canadian Rockies.

It's not just about heat. There are seven different climate factors considered when designating hardiness zones. The newly released map provides insights for home gardeners, commercial growers, foresters, farmers, landscapers, ecologists, and other professionals in Canada looking to optimize their planting and management strategies.

Natural Resources Canada scientists Dan McKenney and John Pedlar from the Canadian Forest Service have been the driving force behind these maps since they were first developed in the 1960s. They've joined me on the podcast to talk about what the changing climate might mean for the advancement of invasive species, how citizen science can help them create rich data sets, how they collaborate with

various U.S. agencies, and how Canadian hardiness zones are different from USDA zones that are often seen on plant tags.

Don't forget to subscribe to the Landscape Ontario Podcast to get updates every month as we explore the issues shaping landscaping and horticulture across Canada. Now I should mention that the audio in today's episode is a little sketchy due to some microphone issues, so thanks for your patience and for continuing to listen.

We have a video version with captions on the Landscape Ontario YouTube channel, and a downloadable transcription will be available on this episode's webpage, as usual.

Now let's meet today's guests and hear what they have to say about the updated plant hardiness zone maps.

Music transition

INTERVIEW:

Karina: We're excited to let Canadians know that we have an updated plant hardiness map, and I thought this would be a great chance to help landscapers and growers and independent garden centres and horticulturalists, those professionals working in the green trades, understand what the updated map could mean for them, what it means for the environment and the plants that they cultivate and care for.

And I'd love to get a sense of the science behind it that translates into something useful for people with their hands in the soil. To start off with, maybe we'll just talk about those key factors that you use to determine these updated maps, temperatures, precipitation, wind speeds, things like that.

Why are they so important and how is it we've had such a change that they need to be updated?

Dan: Well, um, John, do you wanna go first or me?

John: Yeah, I can, I can jump in. Um, I mean, I guess to, to clarify, there's seven different climate variables involved in the Canadian Plant Hardiness Index.

And as you mentioned, those include things, uh, really temperature related variables like minimum temperature of the coldest month and maximum temperature of the hottest month. And growing

seasonal length. They also include precipitation related variables like, um, amount of precipitation between June and November.

And then they also include some other variables that are maybe a little less obvious to include with plant hardiness. And that's maximum wind speed, maximum wind gust, I guess, average maximum wind gust, technically over a 30 year period. And average maximum snow depth, again over the 30 year period.

So all of those variables in different ways do affect plant survival at any given location. Some of them a little more obviously than others, but all certainly directly related to plant survival.

Karina: What's the prompt to revisit these maps and update them? Is it just a very timely planned out schedule or was there something that triggered, " Hey, we need to re-look at this?"

Dan: So maybe a little bit of history? We've done a few of these now. The original work was done in the 1960s by Agriculture Canada scientists, and we're the Canadian Forest Service part of Natural Resources Canada. What the heck are we doing this for? Well, there's a few reasons for that and one of which, uh, simply because we can. Back in the day when we first started doing this, we were developing maps of climate. Because in the forest setting, there's never a weather station near where you need it for your research plot. So, uh, I did my PhD in Australia and there was somebody there who, uh, developed these methods for mapping climate that were very, very good.

They've been adopted around the world. And I, and I didn't do that work in my PhD, but I knew 'em and had a good working relationship and we've adopted those methods here in Canada and applied them across North America. And one of the first applications, "Hey!" I was out in the backyard with my son looking up seed package. "Plant hardiness! We should do that." They were done in the mid 1960s, so that's quite a while ago. Climate has evolved since then and we have really better ways than done in the past. What the AGCanada scientists did was basically hand interpolate from about 640 weather stations. The formula that John mentioned, uh, the seven different variables were applied in a formula.

We were able to um, basically make the variables, map them and combine them in a way that replicated the original work, which was from climate of 1930 to 1960. And so we did that time period as well just to see, "Hey, hang on, we're doing a different method. Is it gonna come up close to what they did?"

And in fact, it did, except in some places like the mountains where there's big elevation changes and certain areas where you can see it's, it's a little more challenging. So we did it for that period for 1961 to 90, 1971 to 2001, 1981 to 2010. You can see there's a pattern. So there's a 30 year average that the weather folks have, which tries to describe average conditions, and that's what the work did. And that's

a very important point about all this, is that, um, these are really average conditions and not and as every gardener knows, an individual winter can make a big difference. So basically, our update now is the 1991 to 2020 period. Uh, there's a little bit of a delay here because it takes time for the weather station folks, Environment Canada and parts of the US to do this, as well, to basically clean up the data, make sure it's all consistent. There aren't too many errors.

Then we get it, the weather station data, we make these models, and in that process we check for more errors. Sometimes we find an issue, like something as simple as, "Oh, the Peterborough, uh, weather station was recorded in feet instead of metres for its elevation.

Or, oh, there was a decimal place there in, uh, in this thing." So sometimes their quality control checks don't pick up everything. Pretty darn good now. Earlier on when we did this, there was more of that. But it takes time and this isn't our main job. We do this stuff. And another aspect of it, which is I think where this kind of world is going, which is we develop these things for our sort of forest world and ecological world of called species models.

And that's where every individual plant gets a map. Okay. The plant hardiness map is just a generalized map for all perennial plants. Um, and all we've done is repeated this formula with each new set of climate- normal periods. You know, it's also getting past the original work, so we also think that, you know, we're finding issues. These, these are models, they're not perfect. There are issues with them and certainly there are some that have been pointed out to us and we're quite okay with that. We know that there are there, 'cause, you know, plant survival and growth is affected by many things, some of which aren't, like John said, represented.

You know, we can go into a few details about that. But that's a very long-winded story, sorry, Karina, about some of the history there and, you know, the sort of a little bit of a path forward. Our plant hardiness website has both the index itself, the map, the zones.

Also literally thousands of individual species models. We also include the USDA approach, so a Canadian version of the USDA plant hardiness zone, which is based only on one variable, extreme minimum temperature. And even that sounds easy, but it's not. It's actually, it took a little while for us to kind of figure out what that really meant.

And basically they took the coldest single day, in each winter period, so it could be December of the previous year, and um, and then worked out an average of those coldest days for some period. And when we first did this, I think it was 12 years now we're doing a 30 year average, extreme minimum temperatures.

So, so those are all models that are available and people can use. We think about things like heat stress, but we haven't developed a model. We have some models like that, but not carefully refined just yet. Anyway, those are, uh, I don't know. That's a, a few bit of history there, Karina, some of which may be useful, may not be.

Karina: I have so many questions now. First of all, I thought that was quite interesting that you're in the backyard with your son and you look at the back of a seed packet. And this is an early trigger for you to think about doing these maps. Yeah.

Dan: Yeah. It literally was. Yes, indeed. I, I think I can, I don't think I have a false memory there.

Karina: I love that.

Dan: And he's a gardener now.

Karina: Your son's a gardener?

Dan: Yeah. He loves gardening.

Karina: Yes. Yeah. Well, you planted that seed quite literally. Oh. So I, I love when there's that story and that will resonate with anybody who has stood in their own garden going, "Is this gonna work here? Do I try it anyway?" So I love that.

You mentioned that some of the data comes from the U.S. so not just the USDA maps, but I'm guessing, uh, what, like weather stations close to the U.S. border?

Dan: Yeah because our models, like those species models that I mentioned, they cover all of North America. Okay. And we get plant observation data from, take sugar maple. Grows from down in Tennessee up to past, like Timmons, to around Timmons. So those models are developed by getting locations of where things grow and have grown for a while. We sort of take a five year minimum as a standard and uh, with these models we can get an estimate of climate at that specific location.

So that gives us a climate profile of, well, the minimum place, the minimum sort of profile of temperature and precipitation, wherever something grows to the maximum all across the continent. And then we map the climate habitat, that's what those species models are. And I, I just think those are a more sort of robust way of doing potential climate habitat mapping.

And I'll tell you another little story about that, like doing this for sugar maple. When I give a seminar or something on this, I show a map of how we do this and there are little gray dots on the map of here's all the locations where we know sugar maple grows, or we think we do because there's a little gray dot out in Dawson Creek, British Columbia.

What the heck? Sugar maple's not supposed to go there. It's over in the eastern side, but story is that, uh, a retired Environment Canada meteorologist found out about some of this work that we were doing and he contacted us and found out what we were doing and he said, "Hey, we got an arboretum here. I'm gonna put in all the plants that grow in our arboretum." So I actually believe that that data point, which looks like it's way outside, is probably a true identification. And that's important for helping to understand the climatic limits of where things can grow.

Karina: That's really interesting because, uh, somebody else that I've interviewed in the last six months or so, he has a nursery in I think Langley, B.C., and he's a seed collector...

Dan: Ohhh.

Karina: He travels around and when he identifies plants that are growing robustly in places that he doesn't normally expect to see them, he collects their seed and he tracks it. Like he's got his own wealth of data. And he takes it back, and they grow it.

And then they know that this particular plant, when he reproduces it at scale, that these plants are going to be successful in a broader range than they may normally have been if they were from a place where they were typically found. And so he'll travel around Canada looking for these specifically, and, and then he had an example of going to Edmonton. And noticing a beautiful specimen of an oak tree on some woman's front yard. And he goes, he talks to her, can I collect your acorns? And so he picks these acorns, takes them back and grows them. And now he's got this range of oak trees that grow beautifully in a zone where it would be kind of unusual for them.

Dan: Not thought to be possible. Yeah. Absolutely.

Karina: So it's fascinating that there are these parallels of data collection that I don't know if they're necessarily all entwined, but the combined data points of that would just be so massive to collect and wrestle with.

Dan: Yep.

Karina: You mentioned that you were doing a lot of this extrapolating by hand. Are we using AI models at this point?

Dan: Well, we use these computer models, which it's not AI per se, but it's based on some very good mathematics to make the maps. It's something called thin plate smoothing splines. Yeah, it's not AI, but it's definitely based like the species models are.

We have millions of locations for literally thousands of plant species. And at the website you can click on a location and it'll tell you a list of these climate habitats that may overlap your location or you might wanna know about a specific species. We've had some discussions with Agriculture Canada.

They're interested in trying to do that for apples, apple varieties. Um, so, you know, there's some newer science to that stuff. There are people that do these kinds of modeling. I feel like we've been doing it for maybe the longest in Canada. But there are different ways to do it, but that's a, you know, you diving deep into the science, uh, stuff there.

But it's useful stuff. Um, I think it's probably the more robust way of figuring out what could grow where. You know, for that oak tree or whatever. An interesting quick side note too, last week John and I were at a conference in Ottawa that included seed issues.

And there were some people from B.C., so that is truly a big issue and something we think about lots about the movement of seed, how far it can go, how is it genetically adapted, that kind of thing. Not so much for agriculture, but certainly for trees.

Karina: Mm-hmm. The success rate of something growing there because the public wants to plant certain things in their properties. Right? They might want that birch tree. "I really want a birch tree because it has this look and the aesthetic of it." But if it's not well suited to a site, then you're just wasting inputs and time and money to try to get this tree that's not suited to grow there.

But there's also the factor of, as these climates shift and there's a lot warming up, we're starting to be able to get invasive species that maybe were held at bay, that now have room to move into a spot that they weren't before because the climate supports it. Is that a trend that you think is going to continue or is this just sort of an anecdotal thing that's not really happening yet?

John: I can jump in on that one. I, I think, um, certainly in the forestry world, we see a lot of the invasive species expansion that seems to be related to warming temperatures. A couple that come to mind, um, the mountain pine beetle in Western Canada is a pretty famous example of, uh, it was actually a native

species that was limited to the southern portion of British Columbia. But as temperatures have increased, it's been able to expand northward and start moving eastward and there's a lot of debate and research looking at whether it's actually going to be able to continue moving eastward and cause a threat to pine forests of Eastern Canada as well.

Another species we're hearing a fair bit about these days is the Spotted Lanternfly, and that's one that can certainly have an impact on agricultural crops as well as some tree species as well. And, um, correct me if I'm wrong, Dan, but I don't think it's been located in Canada yet. It's certainly a concern and headed in this direction.

Dan: A little, um, another more plant example, uh, garlic mustard, you might have heard of that. Mm-hmm. And again, when we first did that, we collaborated with somebody who worked for, uh, the US Forest Service and got some plant data from them.

And, we had just some locations, pretty limited like parts of Illinois and maybe a little bit more, but the species maps for that showed its encroachment into Southern Canada. So in fact, in Australia where they're using some of these methods, they've used these tools to help them search for and find certain things.

The famous story being something called long-footed potoroo which was a a marsupial, little animal. But, um, the species models are good. They really are good. They do a lot of things. Um, we're not necessarily trying to map always actual locations, but that is part of the application and the interest in doing that kind of work.

Uh, but definitely invasive species is part of it, and we have models for both sorts of plants and insects, diseases. Um, at least some not everyone, but that's something we do work on.

Karina: Uh, interesting. The Spotted Lantern Fly is the most recent podcast episode that we did there.

Dan: We didn't even know.

We did not know on that one.

Karina: Yeah. It's, uh, it's been found, but only, it's coming on like packaging. Or been found on transport. It hasn't been found necessarily alive, but it's come in on something that's been driven across a border.

Dan: Mm-hmm.

Karina: And I live in BC surrounded by orchards and vineyards and lots of tree of heaven.

Ah, and so Spotted Lanternfly, I'm kind of like, well, if it comes here and it gets rid of the tree of heaven, I wouldn't be too sad about that, but all the other things that it feeds on, that would be pretty devastating for the economy. I think that's a huge driving factor for jobs and tourism.

Having these things that move and I guess by identifying on a map where there's potential for invasive species to go could create a certain level of awareness. Keeping your eyes open for something you weren't looking for before.

Dan: Yep. Yeah, absolutely.

John: Yeah, absolutely.

Dan: it's funny because we are, I'm not sure if you've seen the latest update of this scientific paper that we're collaborating on, but it's answering that exact question a little more focus in the forestry world but what are the main invasive threats that are staring up at Canada and going, "Umm, that looks tasty," and what's expected to happen with those in the next few decades.

Karina: I'll be keeping my eyes on that because the grower sector is very keen to make sure that our plants stay clean. And with trying to trade plants interprovincially and moving soil around, it's not an easy thing to make sure that boxwoods from here get over there without introducing a moth that's gonna wipe everyone out or something like that.

So if we were to look forward to the future, assuming we're all healthy and hale and we're ready to do this again in years, what do you think that's gonna look like? Are we accelerating towards some major changes or are we okay? Are we just like coasting right now?

John: And it would probably be 10 years if we're following our typical pattern.

We'd wait for a new 30 year period, which would be sort of 20 years of overlap with what we've just released plus 10 new years. Which Dan and I might be around for and might not. But anyway, retirement aside, um, yeah. You know, a lot of the climate models are projecting an acceleration, I guess, of climate change moving into the mid part of the century. At this point we're not seeing a lot of reduction in those emissions. They're still following a fairly high trajectory. Hopefully that'll change in the next decade or so, but at this point I think we're sort of locked into some amount of change.

So I think with the next update, we'd certainly expect to see more of the same, which is, for the most part across, you know, 80% of the land base of Canada we saw increases this time around. So I wouldn't expect that to change in the next update.

Karina: So that could mean we're looking at getting closer to something tropical, right?

We're looking at Vancouver and Victoria having quite a dramatic change there. They're now like in the 9, 9a, 9b, something like that.

Dan: Yeah, that's right. It's not like a smooth progression. There's noise and one of the things that's probably changed since the earlier time, I don't a hundred percent, but the polar vortex is something that's talked about and it's more unstable. And so you get periods of quite intense cold to go along with an average warmer temperature. So sometimes it's those extremes that do make a difference for particular species anyway. So again, it's not meaning that all of a sudden it's, everybody's gonna be growing peaches and roses.

Karina: Or they might try.

Dan: Or maybe, yeah, yeah, that's right. That's what, yeah. People wanna do it. And that's, uh, you know, and that's one of the reasons why we've continued to do this stuff is because it does connect with people and people's interests and it is important economically. Culturally, socially, all of those things are ---gardening is such an important thing for Canadians. And this is a nice way to connect because we can use citizen science to do this stuff. You know, master gardeners get points, they've made contributions to models, and they're on the ground and they help assess and provide feedback. So, you know, it's a good thing. It's been, um, you know, a fun journey.

John: You're right that 9a is currently the top zone in Canada and that could easily be moved up to a 9b in the next update, yeah.

Dan: Climate maps are limited also by the number of stations that are available. And we really don't have enough, I don't think, personally in, uh, in Canada to, to really map things in a high degree of detail.

But, um, shorter time periods are something that people live in. Mm-hmm. And yet they can have an impact. We're taking long-term averages. That's what this is, that's what this work represents.

Karina: So how could we improve that data? Like is there a way for people working in the landscape trades, maybe the growers, the builders, the horticulturalists, is there a way for them to contribute localized data that would help strengthen the maps?

Dan: And it has happened. You know, we've had some horticulture clubs give us observations of what grows in their communities. It's not as smooth because we started before this, but you know, like iNaturalist will tell ya the plant and it gets kind of connected to a location. We can use those locations to help develop these profiles. So it's a great way to do citizen science. What we've done in the past, we give people spreadsheets. A tricky thing is you gotta make sure you know your plant ID, and we need the scientific name, not the common name, because a common name in one place is a different species in another place.

So there's a certain level of, you know, you need kind of a specialist and there are lots of good specialists who know these things, and you wanna make sure that it's survived for you know, a reasonable number of years. But I don't know. John, what do you think?

John: Yeah, no, I, I think you nailed it. I mean, I think it's been unfortunate, but we used to have a better system for allowing citizen science for people to contribute observations. That was kind of something that you could do online at our website. And we've had some security issues with the IT side of things. So we had to shut that down, unfortunately.

But we are actually just in the process of trying to incorporate the iNaturalist records into our database as well, which would open up sort of a whole new realm to our models.

Dan: Yeah, not necessarily the hardiness zone map. That's a different thing, and that, that would require I think, another more concerted effort similar to what the AgCanada scientists do, where you might have a network of nursery growers all trying to have a common garden of a number of different species and set up this network and let 'em grow for a while and do some scientific assessments and, look at the variables that are driving the results.

Karina: But to be useful, you would want some sort of a standard intake form, right? Because you don't wanna be managing somebody messaging you on Instagram, right? Right. And then sending you an email and then, you know, all these things. So it's too bad that that website didn't work out because yeah, that would be an ideal intake, right?

John: Yeah. Yeah, it would. Yeah. I'm intrigued with the insights you have of this, Karina, because this has always been a bit of an unknown to me exactly how plants, you know, this is that whole other half. We make the map, but then the plants get rated as well and we have nothing to do with that.

So that's, uh, I'd love to hear some more about that side of things, 'cause it sounds like you've got some insights there.

Karina: Uh, well, I, I would defer to a trial manager that I know who is a fabulous person. But what I have learned is that when we're looking at plants, it'll say plant hardiness to zone five.

Ideally, that is the coolest that it should still thrive in. But then there's this whole mix of any plants that come up from the U.S. They're using the USDA numbers. Mm-hmm. But the plant, the tags, using their info, but we are interpreting it as our info, or at least the consumer is, right?

So you're at a garden centre, you go, "Oh, this is hardy to *this*." But that may not be the same.

John: No, no, that's a very good point.

Dan: We actually did a paper which I'll send you now, where we compared the USDA zones to the Canadian zones, and it's like you just said, it's not a simple, "Oh, a 5a is a 4a."

In fact, what we show in this paper is that a Canadian 4a might have five different USDA extreme minimums across the country. So, what zone do you use? Right? And a lot of times, like I say, people don't know. They don't know which zonation is on the back of the seed packet.

So that is problematic for sure. Mm-hmm.

Karina: Because that's the assumption, right? Like you wanna make it easy. When you're standing with your feet in a puddle and you're looking at a range of plants, you're not gonna go, "I'm gonna look up that research study about comparing... they're not gonna do that. They just wanna look at label and go, "Oh, this will work." And then they spend the money and take it home and get disappointed. So there's this unity that needs to happen between the trade, between Canada and other international growers.

Dan: Mm-hmm.

Karina: Everyone wants those tropical plants. They wanna put the palms in around their pool, and then wonder why they don't last until spring the next year. Like, there's all these kinds of things that landscapers, horticulturalists, they have to choose what they're going to put into a landscape.

And then it's not just a matter of money, but the cost to keep something like that alive. So these are big decisions being made that affect all kinds of different aspects you don't necessarily think of individually, but then when you're looking at this big picture of hardiness zones, should this be offered to the market here in the first place? Should it be, and we just invest in the inputs to keep it alive? It starts getting complicated.

John: Yeah, it is, it is a big topic, that whole USDA zone versus Canadian zone. And it's a bit of a mess, I think, around the rating of plants. Along with this update, we provide an update for the USDA hardiness map as well for Canada.

So as long as people know what zone they're looking at or what the type of zonation they're looking at on the plant, then hopefully they can look at one of the maps if they need to just see which zone they fall into. And it can be tough to know what zone you're looking at on the plant tag.

Karina: Now if, if I'm not mistaken, there are a couple of spots in the maps that didn't get warmer. They've gotten cooler. If there's sort of like this global sense of warming, how are some places getting cooler?

John: Well, global warming's not a hundred per cent consistent across the globe, and so there's areas that are warm more than others, and there's some areas that warm slower and in some cases maybe aren't warming at all. And at least in this, you know, relatively short period that we're working with. One area in particular that showed a decline was in Newfoundland, uh, sort of on the eastern portion of the island. Probably the largest area of decline in Canada.

Our working theory on that right now is that, you know, one of the offshoots of climate change is that there's more iceberg spawning in the far North Atlantic. Those are moving down and actually cooling some of the mainland of Newfoundland as a result.

And we have looked into this a bit and there were about twice as many icebergs moving down iceberg alley, uh, in the 30 year period of this update compared to the first update we did, which was a different 30 year period. So there might be something there.

Dan: And also remember that the formula is not all about temperature.

Mm-hmm. Mm-hmm.

It's about precipitation and uh, rain in January, which is a weird one. It is actually rain. It's not precipitation, 'cause precipitation can be snow. Mm-hmm. But roots don't like to be frozen. So if there's not much snow and it rains and freezes, that's problematic.

So again, it's not, it's not like the USDA approach which was a single climate variable. It's based on seven things.

Karina: So can people use this information to make some long-term decisions and planning for the future? Like you said, some things happen in short bursts. How can we plan ahead for the next 5, 10, 15 years to make sure that we have this healthy canopy, we have healthy agriculture. That we are being sustainable, maintaining biodiversity.

Is there any way that we can get a grasp on that or are we just sort of still at the mercy of, "Well, this is what happens"?

Dan: I'll jump in first maybe, John. This is another argument for these things being 30 years. For each application or use, there's a certain nuance to people's decisions about these things.

For commercial growers, clearly you probably wanna be fairly conservative, in the sense that you don't wanna do anything that could, if it gets a slightly colder year, then you gotta have a problem. People will need to be careful and sometimes there's, you know, once in a hundred year things that happen that's not part of the equation.

So it depends on how cautious somebody wants to be. Gardeners often, you know, private, private individuals, they might be quite happy to try because they wanna have a butterfly bush for a couple of years, and that's fun. But, there's nuances to decisions that each individual knows their own needs.

So the thing to remember is that these are 30 year averages at this stage, but even then things can happen that are beyond the 30 year average.

Mm-hmm.

John: I agree with Dan there. I think, um, I think the big thing here is caution when making any of those large scale changes. One thing we've looked into a bit over the years is how much change is actually going on in various industries related to the changing hardiness zones. And, and it's, it's not, um, a whole lot so far from what we can tell as far as fruit trees in a certain region switching over to different varieties or different species.

Um, large growers are being pretty cautious about transitioning and for good reason. Um, certainly some experimentations can happen and you could try experimenting in fairly small quantities to start, but wholesale changes, I think people are holding off on generally.

Dan: Yeah. You don't have grape growers for wine in the middle of the prairies. And we do know that, as John mentioned earlier, there are some places where, you know, there probably are issues we've heard about some where people have some concerns, um, like Newfoundland, maybe parts of the prairies where maybe changes in snow cover combined with very, very cold temperatures is actually making things worse. So the formula doesn't maybe apply quite so well as it once did. And even places in like Alberta with Chinook winds. Those are always like, that's a tough area to grow plants anyway, right? So, um, it's all about the timing of individual weather events. That is something that, again, the growers are the ones that, they have a probably a better sense of that and their particular plant needs.

The website, you can look at specific locations and get information so you know, that side of it, people can dive deeper if they like. I mean, I think like to say that, hey, always talk to your local nurseries. And, you know, there are people that, and, and, and the gardeners, the master gardeners, the horticulture clubs. Those are folks that often have people that have tried to experiment with plants. We don't recommend people using, you know, invasives, that's, yeah, that's not good. Uh, even though this might open the door to try something new. Um, you know, I think there needs to be caution. But, no, we think being outside and working on gardens is a great thing for the public and for the private sector like growers and stuff.

I think again, they need to realize these, there's 30 year averages, there's still risks involved. They're in tune with the local micro climates associated with their planting areas and, um, they're making important decisions that affect their livelihood. So, you know, probably there's some caution involved.

I don't think it's changed a ton in a lot of places, but it's, it's been going up since the original work. There's no doubt about that. I think everybody can see that.

Karina: Creating a heat zone map came up as something potential to work on. And you mentioned earlier that the current climate zone map isn't just heat based. Would there be a purpose for having one like the USDA's model?

John: I think we're envisioning something pretty similar to the USDA heat zone map. They actually have one of those already, and it's just kind of the polar opposite of the plant hardiness map, which is based on mean minimum temperature. The heat zone map is based on hottest temperatures over the course of the year.

So I mean, the thinking there is that hot temperatures are just gonna increasingly be an issue in Canada moving forward with a foreseeable future anyway. And although realistically it's probably only gonna be a serious concern for the southern portion of the country, at the same time, that's where the majority of the population is. So there, there could be some value to that.

Karina: You said this is not your full-time job. You're doing something else. What is it that makes you want to work on this? Is it like a passion project for you as individual scientists?

Or like, "Yeah, I really wanna dive into this and, and keep doing it."

John: Yeah, I mean, I, I have a general interest in climate and plants and, and sort of the interaction between climate and plants. And that's where a lot of the research I get involved with is headed. So I mean, the plant hardiness zones fit really well into that interest area.

And there is always some excitement around these updates and seeing exactly how things are gonna change and where they're gonna change. And you know, hearing people's reaction to that too, it's interesting. You know, with this project we feel like we're connecting with really a big segment of the Canadian population and that's not the case for a lot of science projects in general.

For sure.

Dan: Everybody loves trees, but not as much as they love their gardens. So yeah, I mean, I'm, I'm like, John. I think, uh, this was a very interesting and useful application, and there are aspects of it that tie very much to our sort of core business with Natural Resources Canada with respect to understanding plants, how they grow, how they might be affected by a changing climate. I always like to say that even, uh, and, and my background's actually in environmental economics, um, in both ecology and economics, everything's really about it, if you boil it down, questions to do with distribution, abundance and productivity of plants and animals, including even mines, right? I mean, minerals. Where are they? How much, how do they grow? Why do they grow, those sorts of things. So, that's the kind of connection to the core science that we do. And it's a great way to connect to people. And we learn, we learn, you know, we're learning from you today. Like John says, it's, uh, makes it quite interesting and useful for us too to do this kind of stuff, I think.

Karina: So what do you find most delightful about working on this project?

John: Delightful is a strong word for science!

Karina: Giving you the benefit of the doubt!

Dan: Yeah. I don't know. Me. Hey, Karina, meeting people like you. How's that?

Karina: Oh go on.

Dan: It does open doors. It's both interesting and fun and, um, well, I think as you probably know, we both have an interest in the outdoors and gardening and, um, yeah, it's good.

It's a good, useful thing to do. We're lucky. We're lucky we can make the connection with our core business. Um, and that's part, that's definitely it is. This, like, the hardiness zones per se, not, you know, but it's what's all involved in it and the capacity that it provides for us and what it can say for people who do make decisions.

That's what our science is meant to do. Help people with decisions.

Karina: Hmm. Looking at that holistic big picture of we need all these individual parts to come together, help inform people, draw those threads from unexpected places for those insights. So I'm glad that there's somebody on the case.

We've been watching, I know there was about six months, nine months ago we were starting to hear rumblings on, “It's coming. It's coming. It's about to be released” so we have been sitting on the edge of our seats going, "I wanna post about this."

Dan: We were too, we were sitting on the edge of our seats too. I can say it wasn't our fault why the delay happened.

Karina: So how do you know you're done? Like when you get to that point, when do you say, "Enough, let's just release this thing"?

John: Well, kind of the last thing we do is try to publish a paper that summarizes the work in the scientific journal. Once we get that successfully published, which is presently a long process really, it's four to six months anyway, but that's kind of what defines the end of the process of completing the new update. I mean, there's a lot that happens before that as far as you know, when do we decide good is good enough?

Well, we certainly went through a number of rounds of quality control and, uh, didn't always conclude it was good enough. But, um, we felt like we got enough clean rounds, I guess, where we all like, "Okay, this looks good compared to the last update. So let's roll with it."

Karina: And the whole process takes how long?

John: Well, in this case it was, you know, like what, four years of or so, which...

Dan: feels longer COVID happened too and that sort of thing.

John: Balancing it with 10 other projects or whatever, but you know, it was four years on and off and we had what, two retirements in that time, which did not help any at all.

Dan: That's right, that's right.

John: It was a bit of a struggle this go around in many ways, but...

Dan: Yes, usually, yeah, it's not quite as long as this, but yeah, that's a good point, John. Two important people retired and so, you know, we had to figure out how to do some things that some other people were doing, and, uh, the publication process.

But we do that because we wanna make sure it's as good as we can. And I'm sure there's gonna be, you know, somebody's gonna notice something that they question and say, "Well, fair enough."

But I'm pretty, we're pretty confident that the models are good. We know that our climate maps are very good. We were probably the first people that did these things. Our daily models, not the 30 year, but our daily models are used to help calibrate the downscaling of the climate change scenarios that are used in the country by some groups.

That climate stuff is something we're very proud of and it's, it takes up a fair bit of time and we don't do that all by ourselves. We do that, you know, with people in Environment Canada and U.S., NOAA. So, you know, it's not just us doing different aspects of this work, the plant hardiness stuff, yes, we've pretty well been the ones doing that side of it but we have partners, collaborators, and, uh, we wanna try to make sure we do the best we can and everybody's busy, I'm sure, as you know.

Karina: In terms of USDA and NOAA, these are agencies that are maybe not as robust and well supported as they were when you started this project. Has that impacted your interactions, your data

gathering, the collaboration and the quality of work that could be done between all these different agencies?

Dan: Well, I think, uh, so far it's been okay. I mean, uh, we get weather station data from them. They do a lot of curating and cleaning and that helps us with our continental models for sure. And, and they even, um, they help with, uh, even making sure Canadian data is as, as good as it can be for us, like in a consistent format.

Believe it or not, it's a lot of work to make sure you clean up the station data, make sure it's good. And we don't wanna, we don't wanna mess with it too much because we're not the climate data people. We will have questions, we'll go back to them.

They'll do updates sometimes. So, you know, that's what happened through this time period too. You know, hopefully things are okay on that front. We don't work with the USDA on, we've just taken their formula and applied it to the Canadian side of the border. Mm-hmm. We don't publish the same thing for them because they've got their own, we're not pretending we're doing theirs.

Um, but they don't have an equivalent Canadian type model, it's their extreme minimum temperature model, so for this stuff we concentrate on Canada.

John: And then we have downloaded and obtained some climate data from NOAA.

Dan: Absolutely.

John: Last, in the last year.

Dan: Yeah. Well actually Kaitlin just did some a couple weeks ago because we had to update some, uh, 2024 models. Okay. So that side of it is still operating.

John: So the cuts there haven't affected that particular functionality that we needed.

Dan: Not yet.

Karina: That is such a curious situation for scientists in that particular field of study because devoting your life's work to understanding climate and then, you know, maybe being told that “There's no problem there. There's nothing to worry about. Look away!”

Dan: Yeah, there have been definite cuts there that we've heard about. It's not insignificant, including in like the US Forest Service and organizations like that, that it often takes a bit of time before you really notice the big impacts because the people are gone and there's no replacement of that kind of capacity, which, that's what's likely happening.

Karina: When you're in the middle of something, there's a lot of knowledge stored here (gestures to brain), and if you were just to get up and walk away, then that goes with you.

Dan: Yeah. Mm-hmm.

Karina: And so that's a scary spot. So I'm glad Canada continues to have invested in support for what you're doing. And I'm sure all of our growers are as well.

So, Dan, John. Thank you so much for coming on the podcast because I think we had a great conversation today and I hope our listeners can take away this understanding of all the work that goes into creating these maps to support people who grow and nurture green spaces across Canada, and providing some of the insights and the science and their reason for being. So thank you for bringing all your knowledge with you today.

Dan: Thank you so much for the opportunity. It was great speaking with you.

Music transition

EXTRO:

Karina: I'd like to thank Dan and John for making time to join the Landscape Ontario Podcast. With the release of their new maps and peer reviewed paper. they've been super busy with media appearances and interviews, so I hope you learned something new during our discussion today and take away an appreciation for the science that goes into defining Canadian hardiness zones, as well as John and Dan's dedication to wrangling huge volumes of data to help Canadians enjoy a better experience with plants in their local landscapes. Relevant links in a transcription of today's conversation can be found on this episode's page at landscapeontario.com/ podcast. You can also watch the video version with captions on YouTube, which might make it a little easier to pick up everything our guests say.

And of course, I want to hear from you. If your local plant hardiness zone has increased, are there any new plants that you are eager to try? Let me know at podcast@landscapeontario.com. Thanks again for tuning in, and until next time, keep growing.

Resources relevant to this episode

Canada's Plant Hardiness Site
Report: Updated plant hardiness zones for Canada and assessment of change over time
Report: Change and evolution in the plant hardiness zones of Canada