Tree Age: Why the Fuss?

Peter Duinker, Halifax Tree Project, 2022-10-30

I have long wondered why many people are so keen to know how old a tree is. It seems deeply embedded in our collective psyches that we want to know the precise age, usually in years, of both organisms and inanimate things. Let's start with human age. We constantly ask how old a baby is – the youngest in weeks, those next in months, and finally the years for toddlers. We need to know ages of people so as to slot them into the correct level of school and to determine whether they are allowed to drive a car on public roads, vote in government elections, and purchase alcoholic beverages. In the news media, when someone dies or commits a crime, one of the first details we encounter about such a person is age.

We extend this to animals too. We like to know the age of a dog or cat so we have some sense of where they are on their life journey. Dairy farmers need to know the age of their milk cows so they can chart production efficiency and cull the low performers early in their potential careers. And the list goes on.

We even want to know the age of our things. Is that an antique, we might ask of an old piece of furniture? The older, the more valuable. How old is our fridge or kitchen range? That's important from a warranty and replacement perspective. When was that car new? Its age is a key trait for a whole host of reasons.

So it shouldn't surprise me when people ask me: "how old do you think that tree is?" My first thought, usually kept to myself, is why does that matter? Perhaps people want to know how long it takes to get a tree of that type, in that kind of location, to become as big as it is. For apparently old trees, perhaps people want to imagine what was going on at the time the tree was born, and what circumstances it has lived through to today. Perhaps people are in awe when they find out a tree's age and it's many times longer than the human lifespan. But never mind the motivation – the question comes up time and again when I am out with others and looking at trees, both in the city and the countryside.

There are several ways we can address the question of how old a tree is. The best is to know when it was planted, or started life on its own. I know the age of each tree I have planted on my city property because I have records of planting dates for each one. Actually, I hardly know the total age of each tree because I don't know how long it took to grow some of them in the nursery from which I acquired them. So, really, I have a minimum age. For small seedlings, this hardly makes a difference to age estimates, but for planted saplings, time in the nursery could be 5-10 years, even longer.

Let's identify and then not discuss the expensive and rarely used approach of radiocarbon-dating. If it really matters to know the age of a tree, then carbon-dating the wood can be used to develop a good estimate. But we need to remember that the wood in the centre of an old tree may have become wood many centuries earlier than the wood right under the bark, which is the youngest wood. All these complications!

The most commonly used approach when we don't know the year when a tree was born is to count the rings of stemwood. In our climate (and most mid-latitude and northern climates), the wood of a tree trunk grows in discernable rings. Each ring represents one year of growth, so if we can count the rings – from the centre to the bark – that will give us the number of years that part of the tree has lived. The rings are a consequence of changes in the rate of wood increment through the growing season. The light-coloured wood is early wood (spring/early summer, growing faster), and the dark coloured wood is the late wood (late/summer into autumn, growing slower). This woody material is called xylem and is

created by the cambium which is just under a tree's bark. (The cambium also creates phloem which, each year, gets sloughed off and becomes bark).

So, how do we get access to the interior of a tree so we can count the rings? Two ways. One is to cut clear through the trunk. If this would mean killing a tree we don't want to kill, we can't use this methods. I used it to get a sense a few weeks ago while in Charlottetown – see photo left. The largest elm tree in the city was toppled by Hurricane Fiona and the massive trunk was still lying in the streetscape. I took a moment to count the rings on the largest of the several stems all connected to the mainstem. I got just over 140 rings. The best I could say, then, is that this tree was at least 140 years old, and perhaps even a couple of decades more to account for the height up the stem of my count plus the tree's time in a nursery.

We usually don't have a chance to cut through a tree trunk to count the rings. In this case, we can resort to a tool called an increment borer (see photo right). This tool is hand-drilled into the trunk and a thin core is extracted. We can count the rings right there and then beside the tree or glue the core onto a small board and take it back to the lab for processing (sanding, maybe staining, possibly using a magnifying device to see the rings clearly if they are really narrow, and measuring for ring width).

Because of the way trees grow, it is often difficult to estimate age with acceptable confidence. If a tree grows really, really big, it is beyond the scope of an increment borer to measure. Moreover, some tree species in some parts of the world don't actually show distinct annual rings. I was exceedingly fortunate a few years ago to have visited the tallest known broadleaf tree in the world – its name is Centurion because it is – or was when I visited it in 2016 – about 100 m tall (https://www.wondermondo.com/centurion/). The tree, no more than a hundred kilometres from Hobart in Tasmania – is more than four metres in diameter – see photo below. Even if there were annual rings, it is impossible to age the tree using an increment borer. The best estimate of Centurion's age is roughly four centuries, but it could easily be a century above or below that. For me, though, I say who cares? It's just a very special, most massive tree!!

Another issue is that a perfectly healthy tree on the outside may be totally rotten in the core of the trunk. This doesn't necessarily mean that the tree is weak or unhealthy – trees grow only on their exterior so what really matters is whether the outer parts/layers of a tree are healthy. But when the core is rotten, counting rings, regardless of the means of getting access to them, becomes a real challenge, if not downright impossible.

It was brought to my attention last week that a huge hemlock tree in Hemlock Ravine had been knocked down by Hurricane Fiona. Once I learned where the tree was, I immediately went to inspect. Turns out it is a tree I have stopped at many times in the past couple of decades – it is directly beside a busy path and when I take groups of people to Hemlock Ravine Park, we pause and marvel at this most beautiful huge hemlock. I ask my students each to make a visual estimate of the tree's diameter, and then we put a diameter tape on it and get a reading. It is important for students of nature to get a visual sense of the dimensions of things so they can make confident estimates when they don't have measurement instruments.

The tree trunk, measuring 110 cm diameter at breast height, broke clean off at about four metres from the ground. Consistent with most of the downed trees on the west side of the eye of Hurricane Fiona, the tree fell southward on account of the hurricane's north winds. I took photos – two included below – and tried to figure out how to get an estimate of its age (my informant was keen to know). I brought a

40-cm increment borer in case I could use it; not only was it too short but, as it turns out, the centre of the tree was quite rotten. The rotting wood still displayed growth rings, but was too weak to stand up to the pressures of driving the borer into the wood. So, that wouldn't work.

I inspected the exposed wood of the trunk lying on the forest floor and determined, as you might imagine from the photos, that a full count of rings from tree centre to the bark would be impossible. So here is my procedure to come up with my best quick-and-dirty estimate of this tree's age. I took home a chunk of the rotten trunk where rings were quite visible – see photo. Interestingly, to give you perspective, it is about the size of two pounds of butter but the whole piece weighs about half a pound. Fresh wood, even when dry, should weigh much more than that, but this piece is rotten and dry.

Using a magnifying glass for visual assistance, I counted 80 rings across about 8.5 cm of trunk width. I estimated that the measured diameter of 110 cm should have 10 cm taken off to account for the thick bark. The radius is then 50 cm. Making a bold assumption that the tree grew during the rest of its life at the same rate as the piece I took home – a piece I can't place positionally in the trunk so I don't know whether this piece was from the tree's early life or later life – that would make the age estimate to be 50 cm / 8.5 cm x 80 yr = 470 yr.

My “bold assumption” cannot be tested except with extremely intense laboratory examination of the tree trunk, given that the wood is quite rotten except for the outer 15 cm of radius. How far wrong could I be? We know that hemlocks can live to be over five hundred years of age – folks working for NS Department of Natural Resources and Renewables found one last year that they measured at 532 years (https://www.bing.com/search?FORM=AFSCWO&PC=AFSC&q=oldest+hemlock+tree+in+Nova+Scotia). And what if the growth during the eight decades represented in my little block of the trunk was significantly slower than in other centuries of the tree’s life? If that were the case, how young could this tree have been before falling two months ago? Let’s say, for the sake of argument, in its three hundreds of years. Still a pretty awesome old tree!

I cannot help myself – like so many others, I am constantly looking at trees and wondering how old they are. But every time I find myself thinking that way, I shake my head and try to focus on other characteristics that make the tree interesting – its species, size, shape, location, context, health – these are all characteristics I have a much better chance of being sure about than the number of years since the tree was born. Is knowing tree age worth the fuss?