Why Did That Tree Die? Was It Just Old Age?

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"CoD?" asks the detective of the coroner. That's "cause of death". In this situation, it's highly unlikely that the coroner would say: "Oh, the victim was just too old to keep on living". However, now and then a person lives into the second century of life and upon death, many might think that old age caught up to that person. There is a limit to the maximum age a human can reach - it seems it's some years over a hundred.

Trees are the same but different. Tree death in relation to age is certainly a viable concept - we know that some tree species are short-lived (like balsam fir - under a century) and some are long-lived (like eastern hemlock - several centuries). When an old tree dies, just like when an old human dies, careful examination of the circumstances can often reveal the likely cause, for example a disease.

Of the several ways in which trees are different from, say, animals, one is that trees have parts aboveground - the trunk, branches, and leaves - and parts belowground - the root system and associated fungi. The practices of tree coppicing and pollarding (not common in Canada but widespread in Europe, especially historically) take advantage of a tree's ability for the root system to service multiple generations of crowns. We usually age a tree by counting the rings on the main stem. That works if there is one original stem, but it doesn't work if the stem is the second, third, or higher number on the same root system. Should the tree not be aged by the age of the root ball? How would we ever do that, though?

People are fascinated by the concept of a tree's age, especially a big tree. In 2016, I visited - and hugged! (see photo) - the tallest known broadleaf tree in the world https://en.wikipedia.org/wiki/Centurion_(tree). It is a *Eucalyptus regnans* in Tasmania and measures a hundred metres tall. My fascination was with the tree's height and girth; my colleagues on the visit told me that the tree was estimated to be somewhere around five hundred years old. With current technology it impossible to tell the age of the tree with any accuracy. Big trees like Centurion are often hollow in the middle from rot and therefore can't be aged reliably from the growth rings (and some species, especially in the tropics, don't even have distinct growth rings).

When tree age is estimated and it is high, people marvel. We marvelled when our study of old-growth forests in western Nova Scotia revealed a hemlock approaching four hundred years of age. And you could never tell from looking at the tree, in a stand full of old and big hemlocks, that that tree might be the oldest - it was by no means the largest tree in the stand.

Using fairly simple Google searches, you can find out what are the oldest recorded trees in any jurisdiction. Notice that the age estimates of the oldest recorded trees for several species presented on this website - https://www.monumentaltrees.com/en/records/can/ - have ranges around them - this indicates that aging trees is often an uncertain process. And notice how the

oldest-tree ages range across more than an order of magnitude - the oldest eastern cottonwood is well under a hundred years, and the oldest coastal Douglas fir is well over a thousand years.

Another fascinating thing about tree age is that small trees of some species - for example, hemlock - can sit in the understorey of a mature hemlock canopy and just survive for decades until tree death in the overstorey makes room for them to grow and they proceed to develop just as if they had been ten years old rather than fifty. Trees don't age like animals.

To sum up, even if a well-trained tree pathologist can pinpoint the cause of death of an old tree (at least old for the species), I still think it is reasonable to say sometimes that a dying tree might be passing its best-before date and we shouldn't expect it to live longer because trees, species by species, have their age limits. The elm street-tree in front of my house, measuring about 80 cm diameter and over twenty metres tall, and probably around 80-90 years of age, recently got a pruning because it was showing a lot of deadwood among the branches. It does not seem to be under any unique stresses compared to the neighbouring elms on the street. It now looks quite sparse in the crown. Is the tree declining? Perhaps so. Might it bounce back? Perhaps so. I want the tree to live much longer, but if it is indeed just under a hundred years of age (like my house), it has delivered many decades of ecosystem services and for that I am intensely grateful. I am prepared for its demise, having two long-lived but as yet young trees - a yellow birch on my property, a European beech in the tree lawn - to take over the site when the old elm finally has to come down.

The tallest known broadleaf tree in the world - a *Eucalyptus regnans* in Tasmania. Photo Source: Peter N. Duinker

Eucalyptus regnans in Tasmania. Photo Source: Peter N. Duinker