What does lightning actually do to a tree?

February 4 2022, by Gregory Moore

Credit: AI-generated image (disclaimer)

The huge storms many Australians have experienced recently have damaged or toppled old trees which had withstood the vagaries of our weather for the past century or more.

This is what we can expect as our climate changes, with storm events more frequent, wind speeds stronger and rainfall heavier. These all contribute to trees falling or dropping large branches.

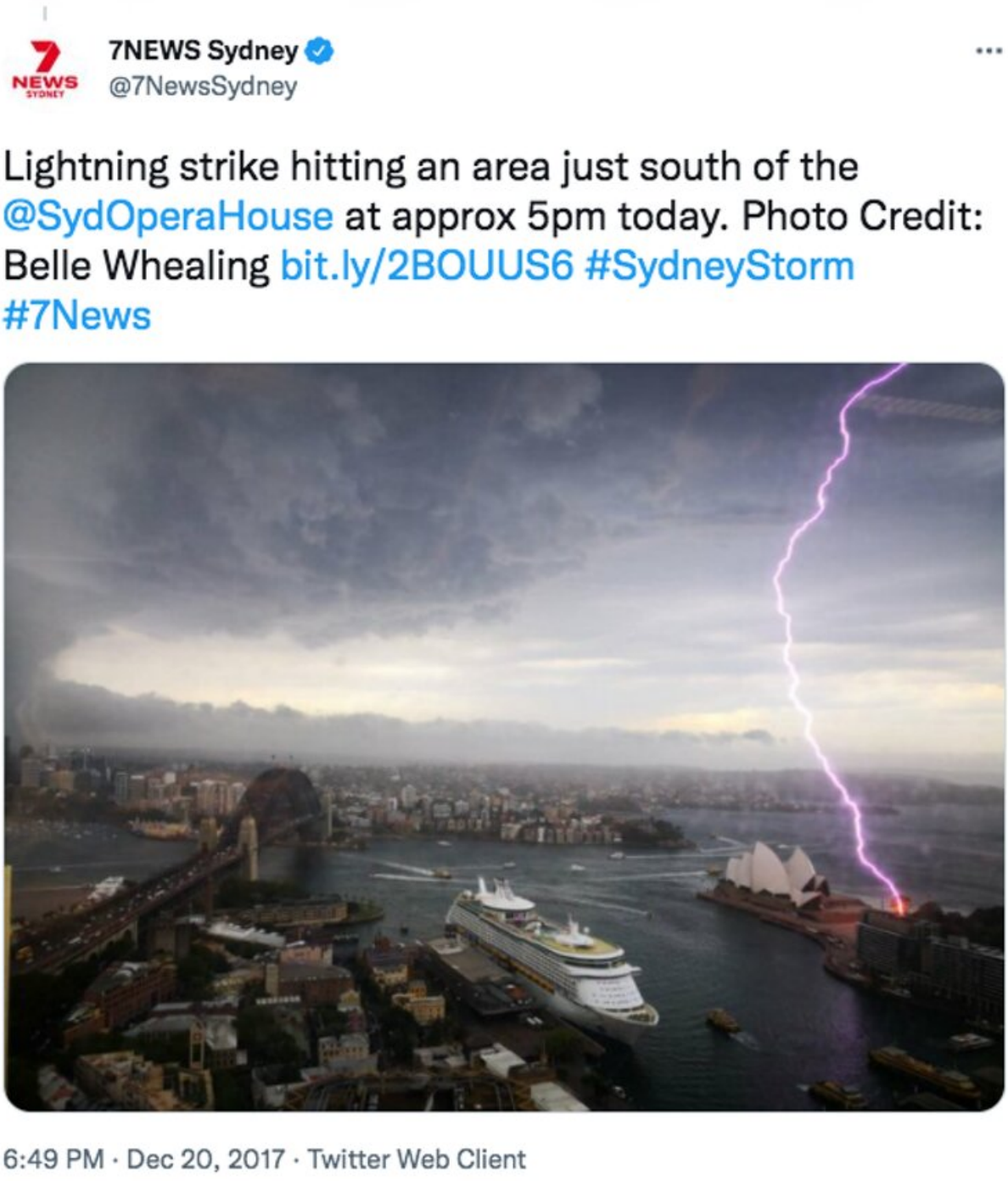
But there's something you might not think of as linked to climate change. As storms intensify in our new climate, we're likely to see more lightning strikes. And that means our tallest trees will be hit more often.

Is lightning always lethal to trees?

Most of us are used to the rules we were told about lightning and trees from childhood. Don't shelter under a tree during a thunder storm. Lightning never strikes in the same place twice.

How do these rules apply from the perspective of a tree? Old trees are often the tallest thing around. When lightning strikes, they are more likely to be struck. You'd think a lightning strike would be game over for most trees. In fact, the effects can vary enormously.

The damage done depends on the tree species, whether it was sheet or forked lightning, how wet it was and where the lightning hits the earth and dissipates.



The lightning strike pictured hit a tree in Sydney's Royal Botanic Gardens. Credit: Channel 7

Strikes can be up to a million volts, generating temperatures up to 20,000°C. For a tree unlucky enough to be hit by one of these events, it's all over. The sap inside the tree instantly turns to steam, which can cause it to literally explode, or lose great strips of wood and bark. It would be an excellent idea not to be under a tree when this happens.

Trees are not very good conductors of electricity. If the trunk of the tree is very wet from rain, the lightning will course through the water and dust on the trunk down to the earth, causing little damage to the tree itself. You can sometimes see the sooty residue left on parts of the tree after a strike like this. You may well notice the tree will appear to be undamaged and continue to grow well.

Sometimes, lightning will strike one side of a tree. Such a strike often kills the tree's living tissues in a strip running along a large branch, vertically down the trunk to the ground, or even ending a meter or two above the ground. You'll notice the lightning scar on trees like these, as it's very visible. The wood behind the scar often decays over time, leaving a hollow behind. Trees can often recover from strikes like this, if the scar and decay are not too great.

There is a splendid variegated elm growing at Melbourne University's Burnley Campus which was struck by lightning almost 30 years ago. Many of us thought it would die, but it defied the odds. Over the following years, I observed the long, narrow lightning scar deepening as the wood decayed. As more years passed, its trunk broadened and the scar eventually grew over. If you go past today, you will see no evidence of wounds or scars. But you and I know a secret—its trunk is hollow but strong.

Lightning can cause unexpected tree deaths well after the strike

For some trees when there is a small or no lightning scar, the tree appears to be fine only to die suddenly between two and 12 months later. This may be due to the strike causing a serious disruption to the tree's metabolism or because it's been unable to fend off fungal disease or insect pests after being weakened by the strike.

If the lightning goes to the earth through the roots, there may well be no symptoms of a strike visible above ground. Underground, it can be a different story, with potentially catastrophic damage to the root system. If the whole root system is damaged, the tree can die quickly, or fail over time as the roots decay. If only some roots have been killed, the tree may decline slowly for no obvious reason.

Credit: Johannes Plenio from Pexels

Some trees do seem more susceptible to lightning than others. I've seen a number of pines and other conifers die after a strike, for instance, while many eucalypts and oaks recover and remain healthy. It is possible to install a lightning protection system on a tree, but they're costly and rarely installed in Australia.

If you know a tree has been struck by lightning, you would be wise to keep an eye on it. Often, the serious damage is not immediately obvious and will only be revealed in the weeks and months ahead. For some trees, the full impact only becomes clear in the following spring when they fail to recover or resume normal growth. An inspection by a qualified arborist would be a good investment.

You may well need an arborist to help with a related climate change driven threat to trees. That's wind. In places like Victoria, trees cope with the prevailing winds from the west or north west by developing stronger root and branching systems. But now we're seeing strong winds and severe storms coming from different directions.

If the wind comes from an unusual direction, a tree can be damaged or fall despite its age and past experience. The storm which pillaged Victoria's Dandenong Ranges last year toppled many old, strong trees and led to long-lasting power outages because the winds came from a different direction. An arborist can check if your trees have been weakened by these new threats.

Lightning really does strike twice

When you think about the rules we were taught about lightning as children, you can see why the main one exists. You do not want to be near a tree during a thunderstorm.

Some rules aren't quite accurate. The tallest and oldest tree in an area would be very likely to have been hit by lightning, and not just once but often. So yes, lightning can strike twice in the same place.

In fact, lightning is likely to strike in exactly the same place—the top of the tallest tree—every few years until the tree is no longer the tallest around, as other trees grow up and around it. Even for old trees, there is safety in numbers.

Provided by The Conversation