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New Trees Are No Substitute for Old Trees

The fires in Canada underscore the need to let our current mature forest grow old.

Warmer and drier conditions will weaken this resistance and make even these mature forests more prone to wildfire. This is very likely an important factor with the fires currently burning in Canada. | Megan Albu/AFP/Getty Images

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Nearly everyone living in the eastern U.S. has been served a powerful reminder of the complex effects of climate change this week. Just looking out of windows in Washington, D.C. or North Carolina, we

could see that wildfires raging across Canada could produce hazardous air quality and apocalyptically orange skies thousands of miles away. The impacts of the smoke on human health are clear, but the smoky skies also call attention to something more — the importance of forests in maintaining our planet's health.

Most people understand that trees and forests play an important role in reducing climate change — that's one reason there are so many popular efforts aimed at planting trees. But what many people don't understand is that not all forests are alike, and that using our forests to mitigate climate change is a lot more complicated than just planting more trees.

It turns out the age and composition of forests makes a big difference in what role they play in preventing wildfires and storing carbon. Old growth forest is the best at both, but there is very little old growth left in either the western or eastern United States.

But a large amount of the forests on public lands is what foresters call "mature" forest, which is nearly as good as old growth and in fact is on the brink of becoming old growth. It is these older forests that will help us prevent future forest fires and will do the most to reduce climate change, and its these forests that we need to protect at all costs.

Here's why.

Forested landscapes are important reservoirs of stored organic carbon, but scientists are concerned that we are entering a vicious cycle of wildfires and climate change that could lead to a permanent decrease in the amount of carbon stored in forests overall. When a forest burns, carbon storage is diminished and carbon dioxide is released adding to the concentration of greenhouse gases that are warming Earth's atmosphere. When forests regrow, they can again absorb carbon from the atmosphere, but it takes a long time — many decades. In the meantime, such a cycle would almost certainly produce more wildfires and could be exacerbated by increased deforestation and inappropriate forest management.

Forest ecosystems are constantly changing, affecting carbon absorption and storage, and the risk of wildfires. The way we perceive and manage this change has significant global implications. While the change process varies across different forest types and locations, there is a general pattern that applies to

After major forest disturbances like a timber harvest or catastrophic wildfire, tree seeds germinate and seedlings become established. The speed of this regeneration depends on the amount of seed dispersed and the suitability of the post-disturbance environment. Therefore, it's no surprise that the earliest tree species in an area (called "pioneer trees") disperse their seeds via wind and can grow rapidly in an open environment.

Within a few years, tree seedlings grow quickly, and their canopies expand to form a continuous green "solar panel." The time it takes for this growth depends on the site's fertility and the number of pioneer trees in the environment. The result is an immature forest composed of trees of small stature and similar age. These immature forests pose a high risk of wildfire due to the abundance of fine fuel, small branches and leaves, near the ground.

The next phase involves a process of growth and death, where smaller trees are shaded out and killed by larger, faster-growing trees — a process known as thinning. However, the leafy canopy remains intact and gradually rises above the forest floor as the trees grow. These forests efficiently absorb carbon dioxide and store it in the tree trunks and roots. By separating the fine, leafy fuels from the forest floor, the likelihood of wildfire diminishes. Immature forests often include a unique assemblage of herbs, shrubs and animals. Still, the diversity of that assemblage is small in comparison with what is to come.

The forest continues to thin as it approaches maturity. The surviving trees will get bigger, accumulating additional carbon and storing some of it within the debris of the forest floor. In a mature stage, the shady understory of the forest keeps things moist, and much of the debris consists of larger logs that are not easily ignited, so the "dead stuff" is less likely to serve as fuel for a fire. This

mature forest has many fewer but much larger trees and its ecosystem becomes more complex — translating into an increasing number of plant and animal species.

In addition to the age and maturity of a forest, geographic location matters. In drier western regions like the Four Corners and eastern Cascades, for example, ongoing thinning can create open, savanna-like forests. In these landscapes, small surface fires (which occur every four to eight years) are a natural part of a healthy ecosystem — without them, woody shrubs and trees invade, increasing the risk of more severe wildfires.

But in moister regions, canopy openings allow shade-tolerant trees to flourish, creating a complex system with large amounts of carbon stored in standing dead trees and fallen logs, contributing to a high amount of biological diversity. The oldest and largest trees in these forests can be several hundred to several thousand years old, and they play a vital role in carbon absorption and storage. These old and diverse forests are resistant to wildfires due to the size and moisture content of the dead wood. However, warmer and drier conditions — like those caused by rising global temperatures — will weaken this resistance and make even these mature forests more prone to wildfire. This is very likely an important factor with the fires currently burning in Canada.

Unlike humans, who show their signs of aging with wrinkles or worsening eyesight, forests may get old, but they don't get weaker. However, like humans, different forest types age differently. Some forests, like those in our western savannas, age in ways that increase the likelihood of severe wildfires. In these ecosystems, light surface fires can mitigate that risk. Other forests, like those in the moist Pacific Northwest and eastern Appalachian range age in ways that diminish the risk of catastrophic fire.

In all cases, nature knows what it is doing, and human intervention tends to make matters worse, not better. If we can let our forests be, we will reap many benefits including increased biological diversity, water conservation and recreation. And fewer wildfires.

There is ample forest on private land to meet our needs for timber and wood fiber. It is our public lands in both the U.S. and Canada that represent our best opportunity to manage forests to both mitigate and adapt to climate change.

While most remaining old-growth forests in national forests are protected, they represent less than 13 percent of the overall forest landscape. However, nearly 50 percent of public lands now support mature forests that are on their way to becoming old growth.

So we need to both protect as much of our remaining forests as we can, but — importantly — we also must let them get old. New trees are no substitute for old trees and the ecosystems they nurture. Letting our current mature forests age further is our best opportunity to diminish carbon emissions and mitigate catastrophic wildfires that threaten the health of humans and of our planet.

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