Q&A: Landscape ecologist says California wildfires aren't a random situation

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For the past several weeks, dozens of wildfires have scorched a destructive path across western forests and plains, threatening homes and habitat—as of this week, more than 5 million acres in California, Oregon and Washington have been destroyed by some of the largest wildfires in the region's history. Monica Turner, a landscape ecologist in the Department of Integrative Biology, spent several decades studying the ecosystems of Yellowstone National Park after wildfires ravaged the park in 1988. For more than a decade, Turner, who just received the 2020 Eminent Ecologist Award from the Ecological Society of America, has warned that situations like the one that damaged Yellowstone could become more common. She took a few moments to put the current catastrophic wildfires into context for us.

What are the conditions that created these fires?

Massive fires, like those burning this summer in California, Oregon and Washington, happen with extreme drought and high winds. Hot temperatures dry out the fuels (all the live and dead vegetation, including trees, shrubs, grasses and logs) and set the stage for fire. Once ignited by lightning or a spark from human activities, strong winds can make a fire grow quickly and race across a drought-stricken landscape.

Climate is the big driver of "megafires" (individual fires that grow to more than 100,000 acres), but fuels also come into play. In some of the dry forest types (such as ponderosa pine forests in the southwestern United States and parts of California), fires used to burn frequently and stay along the ground. The mature trees have thick bark that allows them to survive frequent surface fires. The big trees are spaced apart, and the forests are easy to walk through. Some of the dry forests have become very dense due to decades of fire suppression. The unusual build-up of fuels allows fires to get into the canopy more easily and travel from tree to tree.

In other forest types (like lodgepole pine and spruce-fir forests), large crown fires that travel from tree to tree have been "business as usual" for thousands of years. The trees are not adapted to survive the fire, but rather to seed in rapidly afterwards. Large crown fires occur during drought years. Historically, the forest has time to recover during the century or more before fire returns and the cycle begins again. Fires have burned even the old-growth forests of Oregon in the past, but there may be a few hundred years between fires. Climate conditions are usually too cool and wet.

Is the current slate of wildfires a sort of perfect storm situation?

Summer 2020 was indeed a perfect storm. The western United States has gotten steadily hotter and drier during the past 40 years. Hotter temperatures mean drier fuels. But the lightning storm that started fires throughout the region at the same time was unusual, then strong winds blew for days. The combination of these conditions is primarily responsible for the big fires this summer.

Fuels also matter, but they make little difference under such extreme conditions. With weather like 2020, fires will burn through forests of all ages, structures and densities. Fires will not stop at a "thinned" forest. Burning embers and branches also travel on the wind for miles ahead of the main fire, allowing the fires to cross roads, rivers and lakes, and accelerating the spread of the fire. Fire breaks that work under milder conditions will no longer do the job.

Added to the mix is the increased density of homes and infrastructure in forests throughout the West. Homes are also fuel, as seen in stark images from many communities devastated by the fires. Lives were tragically lost, and thousands of people face terrible losses.

Should we have seen this coming?

We have seen this coming. For more than 30 years, scientific assessments have predicted the increase in fire throughout the West because of climate change. Fifteen years ago, the connections between big fires and the hotter springs and summers, earlier snowmelt and longer fire seasons were clear. Recent studies have shown that human-caused climate warming led the area burned each year in the West to double between 1979 and 2015.

The weather conditions that produce big fires are now happening more often. As fuels become drier and drier, fire size increases exponentially. This means that just a little more drought can lead to much bigger fires. Hot temperatures drive this trend; just like our gardens dry out during a week or two of heat, so do our forests. Temperatures this summer broke records all across the West coast.

While these and other recent fires were not unexpected, the future has arrived faster than expected. Most studies anticipated such large increases by mid-century, yet this is only 2020. And it is not just affecting the U.S. Extreme heat and drought have led to megafires in the Arctic, Siberia, Australia, Brazil and Argentina during the past year.

What can we expect in future years?

Unfortunately, until we can restore our atmosphere by reducing greenhouse gas emissions and stopping climate change, we can expect more of the same—and maybe worse. More warming will bring more fire. There will still be variation from year to year, and we'll still have cold, wet summers. But the warming trend will continue, and each year the chance of another "perfect storm" will rise. The human, economic and ecological costs will continue to grow.

There are things we can do, however. This includes providing funding and incentives for "hardening" homes and infrastructure to withstand fire, and reducing vegetation around communities. We must also think about where and when to rebuild or re-locate, just as we do in areas prone to flooding or hurricanes.

Eventually, the wildfires will burn out and be controlled. What will the short and long-term impact be on the forests there?

Valiant efforts by thousands of firefighters have saved people and property, but the fires will ultimately be put out by rain and snow. However, in the short term, too much rain could mean trouble because recently burned forests are vulnerable to landslides.

Miles and miles of fire-killed trees will be the biggest short-term impact. However, even big fires skip some areas as they burn across the landscape, and there will be islands of un-burned trees within the fire perimeter.

The long-term effects are difficult to predict, because so much is changing so fast. Will there be seeds available for new tree seedlings to establish next summer? Will seeds from live trees be able to disperse into the burn, or will the distances be too great? If the seeds arrive in the burn, will the climate still be suitable for them to germinate? If next summer brings more drought, can the tree seedlings survive? Will non-native, invasive species gain a foothold?

My expectation is that some areas of the forest will recover, much as they have done historically. Other areas, however, may reach another "perfect storm" of conditions that could cause a forest to become a shrubland or grassland. We are facing novel conditions, and the past may no longer predict the future.

Several years ago, you said "Change is going to happen, but we'll still have forests. We'll still have a wide variety of native species. It will still be

Yellowstone." What did you mean by that?

I have studied forests and fires in Yellowstone for over 30 years. As the largest wilderness landscape in the lower 48 states, the Greater Yellowstone Ecosystem is a living laboratory for studying environmental change and how nature responds. The 1988 Yellowstone Fires were enormous fires that heralded the new era of increased fire in the West. At the time, many people thought Yellowstone had been destroyed. However, the fires were not an ecological catastrophe. Rather, native plants and animals recovered rapidly and on their own.

However, the climate is changing fast, and my current research focuses on how Yellowstone's forests may change in a warmer world with more fire. For the past 10,000 years, Yellowstone has experienced large fires at 100- to 300-year intervals. We now expect fires to burn much more frequently. Recent fires in 2016 re-burned the same forests in less than 30 years. Forests are not recovering as well after these fires.

We also use computer simulation models to explore future climate and fire scenarios. Our results suggest that forests will decline in Yellowstone during mid-century. Remaining forests will be younger and sparser than today. Some tree species will decline as others increase. However, the forests will not disappear completely, and native species will still be present. Yellowstone will continue to change, but it will still be Yellowstone.

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