

Even trees 'hold their breath' to avoid harmful wildfire smoke, research finds By Mj Riches published July 31, 2024 Trees don't like to breathe wildfire smoke, either. Mixing volatile organic compounds, nitrogen oxides and sunlight will make ground-level ozone, which can cause breathing problems in humans. Unlike humans, however, leaves breathe in and out at the same time, constantly taking in and releasing atmospheric gases. Clues from over a century of research In the early 1900s, scientists studying trees in heavily polluted areas discovered that those chronically exposed to pollution from coal-burning had black granules clogging the leaf pores through which plants breathe. While scientists usually think about urban regions as being large sources of ozone that affect crops downwind, wildfire smoke is an emerging concern. For example, a study of multiple crop and wetland sites in California showed that smoke scatters light in a way that made plants more efficient at photosynthesis and growth. These pores are much like our mouths, except that while we inhale oxygen and exhale carbon dioxide, plants inhale carbon dioxide and exhale oxygen. When wildfire smoke is in the air, doctors urge people to stay indoors to avoid breathing in harmful particles and gases. They suspected that the substance in these granules was partly created by the trees, but due to the lack of available instruments at the time, the chemistry of those granules was never explored, nor were the effects on the plants' photosynthesis. It can also damage plants by degrading the leaf surface, oxidizing plant tissue and slowing photosynthesis. Other compounds, including nitrogen oxides, can also harm plants and reduce photosynthesis. We also measured the leaves' emissions of their usual volatile organic compounds and found very low readings. As atmospheric and chemical scientists, we study the air quality and ecological effects of wildfire smoke and other pollutants. Both humans and plants inhale other chemicals in the air around them and exhale chemicals produced inside them. However, a lab study in which plants were exposed to artificial smoke found that plant productivity dropped during and after smoke exposure -- though those plants did recover after a few hours. In a study that started quite by accident when smoke overwhelmed our research site in Colorado, we were able to watch in real time how the leaves of living pine trees responded. Plants have pores on the surface of their leaves called stomata. Most modern research into wildfire smoke's effects has focused on crops, and the results have been conflicting. On the first morning of heavy smoke, we did our usual test to measure leaf-level photosynthesis of Ponderosa pines. We were surprised to discover that the tree's pores were completely closed and photosynthesis was nearly zero. But what happens to trees and other plants that can't escape from the smoke? They may respond a bit like us, it turns out: Some trees essentially shut their windows and doors and hold their breath. How plants breathe?