

# Researchers find trees worldwide more sensitive to drought than previously thought

22 November 2012, by Bob Yirka



Image: Wikipedia.

(Phys.org)—A multinational team of researchers has found that trees worldwide are more sensitive to drought than scientists realized. By analyzing data on trees around the world, the teams has, as they write in their paper published in the journal *Nature*, found that even small changes in precipitation can lead to large numbers of tree deaths. In a perspective piece in the same journal, German researcher Bettina Engelbrecht says the teams' results indicate that trees of all regions could be in trouble as global temperatures rise, not just those in drier climates.

To find out how sensitive trees in general are to changes in precipitation amounts, the research team studied data from 226 trees located in 81 sites around the world. Specifically, they looked at the point at which trees begin suffering from what is known as hydraulic failure. Trees pull [water](#) from the soil by means of [evaporation](#) in their leaves. As water moves out of the leaves, a vacuum is created in the channels (xylem) that bring water up from the roots into the plant, which serves to pull

water up into the tree from the soil. If less water is available than the plant needs, [air bubbles](#) begin to accumulate in the xylem, plugging them. If enough channels become plugged, the tree suffers hydraulic failure and dies.

In analyzing the available data, the researchers discovered that approximately 70 percent of the trees they studied lived near the point of failure. This they say is because trees adapt to their surroundings by developing in such a way as to suck up just the right amount of water they need to survive, while at the same time, competing with other plants in the area for other resources such as sunlight. This means, Engelbrecht, writes, that even [trees](#) in wet regions are at risk of dying off if rainfall amounts change even a little bit.

The researchers suggest that rainfall amounts worldwide are likely to change as the world heats up due to global warming. Some areas are expected to get more water, others less. This new research suggests that those places that get less, even just a little, are likely to see widespread tree die-offs.

**More information:** Global convergence in the vulnerability of forests to drought, *Nature* (2012) [doi:10.1038/nature11688](https://doi.org/10.1038/nature11688)

## Abstract

Shifts in rainfall patterns and increasing temperatures associated with climate change are likely to cause widespread forest decline in regions where droughts are predicted to increase in duration and severity<sup>1</sup>. One primary cause of productivity loss and plant mortality during drought is hydraulic failure<sup>2, 3, 4</sup>. Drought stress creates trapped gas emboli in the water transport system, which reduces the ability of plants to supply water to leaves for photosynthetic gas exchange and can ultimately result in desiccation and mortality. At present we lack a clear picture of how thresholds to hydraulic failure vary across a broad range of

species and environments, despite many individual experiments. Here we draw together published and unpublished data on the vulnerability of the transport system to drought-induced embolism for a large number of woody species, with a view to examining the likely consequences of climate change for forest biomes. We show that 70% of 226 forest species from 81 sites worldwide operate with narrow (

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