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How droughts affect forests

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High on the list of the threats forests face due to climate change is tree mortality following droughts, which are becoming longer and more severe.

This could trigger extensive ecosystem changes according to an international team of nearly 40 scientists, writing in the journal PNAS.

It's known that sudden tree death following droughts has wide-ranging impacts, including changes in carbon cycling and storage, water cycles, plant growth and overall resilience.

Now, Enric Batllori, from Spain's Centre de Recerca Ecològica i Aplicacions Forestals, and colleagues have added a big-picture analysis of forest regrowth patterns from 131 forest and woodland sites around the world.

The sites had broad variation in climates and vegetation, ranging from dry tropical to temperate but excluding rich tropical forest ecosystems. The researchers followed up, on average, five years after drought-induced tree death.

Overall, they found limited regrowth of key forest and woodland species. Just 21% of pre-drought trees grew back and 10% of forests and woodlands shifted to non-woody growth such as grasslands.

In more than two thirds of sites, dead trees were replaced mostly by shrubs, "pointing to important post-drought alterations of ecosystem structure and function".

In 10% of sites there was no replacement by woody vegetation, which the authors say suggests "at least a transient loss of forest and woodland cover promoted by drought-related mortality".

In the short term, these patterns prevailed regardless of pre-drought climate. But wetter conditions following drought-triggered death produced fewer ecological changes.

Tree species that resprout, such as cottonwoods (*Populus* spp), eucalypts (*Eucalyptus* spp) and oaks (*Quercus* spp), more successfully replaced themselves than trees that rely on seeds to propagate, such as pine trees (*Pinus* spp) and fir trees (*Abies* spp).

Other factors that influenced recovery included light requirements, shade tolerance, community composition and management (such as prescribed burning, thinning and grazing). Pathogens increased the impact of drought on shrub dominance after tree mortality.

While the overall trend was similar, interesting patterns were seen at a community level. Ecosystems dominated by trees that favour moist conditions, for instance, showed shifts towards more drought tolerant plants.

Such transformations include *Juniperus osteosperma*, *J. monoesperma* and *Purshia tridentata* replacing *Pinus edulis* in North America, *Quercus pubescens* or *Q. ilex* replacing *P. sylvestris* in Europe and *Corymbia calophylla* superseding *Eucalyptus marginata* in Australia.

The authors note that their observations highlight short-term effects of drought on tree species and ecosystems, saying more insights are needed in the longer term, factoring in other stressors such as wildfire, pests and invasive species.

“The ultimate temporal persistence of such changes remains unknown,” they write, “but, given the key role of biological legacies in long-term ecological succession, this emerging picture of post-drought ecological trajectories highlights the potential for major ecosystem reorganisation in the coming decades.”

Source: <https://cosmosmagazine.com/uncategorized/how-droughts-affect-forests/>