

Local water availability is permanently reduced after planting forests

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A shallow river bed in Buderim Forest Park, Queensland, Australia. Credit: Laura Bentley

River flow is reduced in areas where forests have been planted and does not recover over time, a new study has shown. Rivers in some regions

can completely disappear within a decade. This highlights the need to consider the impact on regional water availability, as well as the wider climate benefit, of tree-planting plans.

"Reforestation is an important part of tackling [climate change](#), but we need to carefully consider the best places for it. In some places, changes to water availability will completely change the local cost-benefits of tree-planting programmes," said Laura Bentley, a plant scientist in the University of Cambridge Conservation Research Institute, and first author of the report.

Planting large areas of [trees](#) has been suggested as one of the best ways of reducing atmospheric carbon dioxide levels, since trees absorb and store this greenhouse gas as they grow. While it has long been known that planting trees reduces the amount of water flowing into nearby rivers, there has previously been no understanding of how this effect changes as forests age.

The study looked at 43 sites across the world where forests have been established, and used [river flow](#) as a measure of water availability in the region. It found that within five years of planting trees, river flow had reduced by an average of 25%. By 25 years, rivers had gone down by an average of 40% and in a few cases had dried up entirely. The biggest percentage reductions in water availability were in regions in Australia and South Africa.

"River flow does not recover after planting trees, even after many years, once disturbances in the catchment and the effects of climate are accounted for," said Professor David Coomes, Director of the University of Cambridge Conservation Research Institute, who led the study.

Published in the journal *Global Change Biology*, the research showed that the type of land where trees are planted determines the degree of

impact they have on local water availability. Trees planted on natural grassland where the soil is healthy decrease river flow significantly. On land previously degraded by agriculture, establishing forest helps to repair the soil so it can hold more water and decreases nearby river flow by a lesser amount.

Counterintuitively, the effect of trees on river flow is smaller in drier years than wetter ones. When trees are drought-stressed they close the pores on their leaves to conserve water, and as a result draw up less water from the soil. In [wet weather](#) the trees use more water from the soil, and also catch the rainwater in their leaves.

"Climate change will affect [water](#) availability around the world," said Bentley. "By studying how forestation affects [water availability](#), we can work to minimise any local consequences for people and the environment."

More information: Laura Bentley et al, Partial river flow recovery with forest age is rare in the decades following establishment, *Global Change Biology* (2020). [DOI: 10.1111/gcb.14954](https://doi.org/10.1111/gcb.14954)

Provided by University of Cambridge

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