Ecological study discovers impact of the great drought on forests

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(Phys.org) —The impact extreme weather can play on British forests and the lessons to be learned to make them more resilient to future climate change is the subject of an ecological study published today.

Ecologists from the University of Stirling and the Joint Nature Conservation Committee studied the great drought of 1976 which saw plagues of ladybirds, a Drought Bill, and cries to 'save water: bath with a friend'.

Their findings, published in the British Ecological Society's journal *Functional Ecology*, found that it caused permanent changes to our forests. Extreme events like droughts and floods are becoming more frequent and more intense due to climate change, causing major damage to plants and animals, but are difficult to study due to their rarity.

This study looked at Lady Park Wood in the Wye Valley, a 45-hectare National Nature Reserve on the border of England and Wales. Drawing on regular forest surveys going back almost 70 years, Stirling Professor Alistair Jump and his team looked at how relative abundance of beech and sessile oak changed between 1945 and 2010. They also examined tree ring data to discover how growth rates of the two species altered over the same period.

Professor Jump said: "We wanted to identify whether events that we consider extreme from a human point of view are extreme for the trees that also experienced them. To help us to predict the impacts of future extreme events, we wanted to see how long it took for beech trees to recover from extreme drought and to compare drought effects on beech with another, more drought tolerant species, namely sessile oak."

They found the great drought caused changes in the forest that are still evident today. Before 1976, beech was the dominant species in Lady Park Wood. The long, hot summer of '76 selectively killed the more drought-sensitive beech and permanently suppressed the growth of the surviving trees. This tipped the balance in favour of the more drought-tolerant oak. There are now more oak relative to beech than in 1976, and oak is more competitive and growing better.

"The drought of 1976 – the most intense since records began – has led to long-term changes in forest structure to this day, more than 30 years after the event," added Professor Jump. "Our study shows that the beech trees could tolerate drought with little long-term impact until a threshold of drought severity was reached. At this point, the trees suffered a sudden and previously unpredictable reduction in growth, with a very slow recovery. For beech, even the healthiest trees have never fully recovered from this most severe historical drought: even decades later, their growth is still suppressed.

"In managed forests, this has particular implications for resource stability in the future given that trees are a long-term crop and extreme events are set to increase in frequency and intensity as our climate changes. Where appropriate, forest managers could promote resilience to future extreme events through manipulating species mixes in planted forests.

"Given the long lifespan of the trees which form forests, actions taken now have consequences far into the future. We urgently need to know now how they might respond to the kinds of challenges that are predicted for the rest of the 21st century and beyond, so that we can plan effectively."

More information: onlinelibrary.wiley.com/doi/10.… -2435.12126/abstract