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QUANTIFYING THE IMPACT OF INTERACTING GLOBAL CHANGE DRIVERS ON TEMPERATE FORESTS; EXTREME CLIMATE AND ATMOSPHERIC POLLUTANT DEPOSISTIONS IN ENGLAND

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ABSTRACT

A key challenge in a human-dominated world is to understand how chronic changes in ecosystem resource availability brought about by land-use and atmospheric pollution, interact with disturbance events such as climate extremes. How do these interactions affect the resilience of ecosystems? Do they lead to the expansion of non-native species and do they result in a more homogenous biosphere where common generalists become more widespread at the expense of ecosystem specialists?

We addressed these questions by analysing the impact of the October 1987 storm on woodlands in SE England. The storm was an extreme weather event typified by wind speeds then only thought likely every 200 years. We report an analysis of ecological changes between 1971 and 2002 in 293 plots distributed randomly across 10 storm-impacted and 16 ecologically equivalent control sites. We tested the hypothesis that the storm had deflected sites from the wider national trajectory of an increase in woody basal area and reduced understorey species-richness associated with ageing canopies and declining woodland management. We also expected storm disturbance to amplify the impact of increasing soil pH, a UK-wide response to reduced atmospheric sulphur deposition.

By 2002, storm exposure was estimated to have increased mean species richness per 200 m2 by 32%.Woody basal area changes were highly variable and did not significantly differ with storm exposure. Increasing soil pH was associated with a 7% increase in richness but there was no evidence that soil pH increased more as a function of storm exposure.

Despite all sites exceeding the empirical critical load for nitrogen deposition, there was no evidence that in the 15 years since the storm, disturbance had triggered a eutrophication effect associated with dominance of gaps by nitrophilous or non-native species. Thus the storm had not homogenised woodland understoreys by stimulating the expansion of widespread generalists.

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