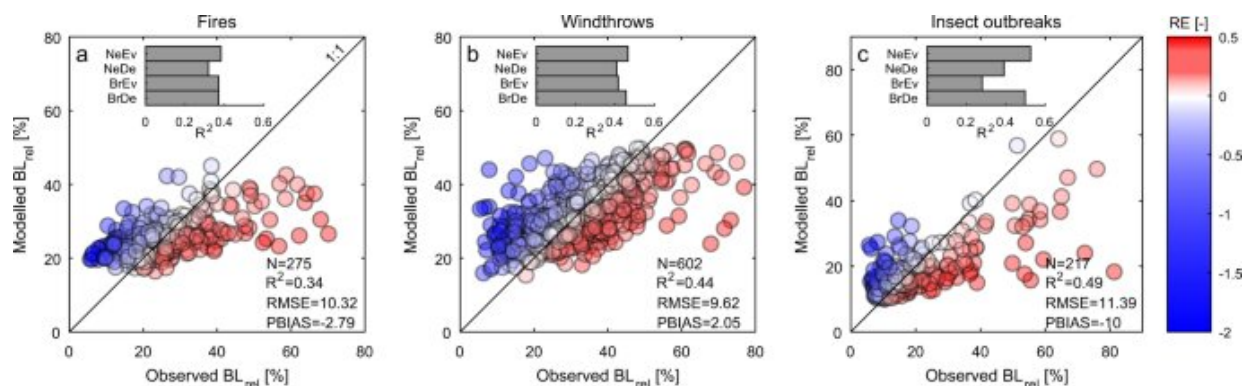


More than half of Europe's forests vulnerable to climate-related hazards

February 24 2021



Observed versus modelled relative biomass losses (BL_{rel}) due to a fires, b windthrows, and c insect outbreaks. Model estimates account for the mixture of different plant functional types (PFTs). Number of binned records (N), coefficient of determination (R²), root mean squared error (RMSE) and percent bias (PBIAS) are shown in labels, while relative error (RE) in colour. R² values in the inset box refer to PFT-specific model performance: broadleaved deciduous (BrDe), broadleaved evergreen (BrEv), needle leaf deciduous (NeDe) and needle leaf evergreen (NeEv). Credit: *Nature Communications* (2021). DOI: 10.1038/s41467-021-21399-7

Climate change has made Europe's forests more vulnerable to hazards like fires, insect outbreaks, windthrows, or a combination of these three, according to a new JRC study.

More than 60% of the biomass in these forests is exposed to these risks—over 33 billion tons in total—putting the future role of forests for wood provision or carbon sequestration under growing uncertainty.

The scientists applied machine-learning models to disturbance records and [satellite data](#) from 1979-2018, to measure and map the vulnerability of Europe's forests to these hazards.

For the purpose of this study, 'vulnerability' was defined as the fraction of biomass that is potentially lost when a [forest](#) ecosystem is affected by a natural disturbance.

The study, Emergent vulnerability to climate-driven disturbances in European forests, shows that forest structural, physiological and mechanical properties largely control forest vulnerability to fires, insect outbreaks and windthrows.

They also found that vulnerability to insect outbreaks in particular has grown over this period, especially in the rapidly warming northern forests found in parts of Scandinavia and northern European Russia. These regions have seen increases in insect vulnerability of around 2% per decade.

Quantifying the effects of natural disturbances to forests' resilience and productivity at large scales is a major challenge. The results of this study contribute to better understanding potential climate-driven natural disturbances on European forests, helping to guide [forest management](#) and define adaptation policies to address these vulnerabilities

Filling the knowledge gap

Quantifying forest vulnerability to natural disturbances and understanding the underlying mechanisms is crucial to developing

effective mitigation and adaptation strategies. However, until now there has been a lack of observational evidence on forest vulnerability at regional and continental scales.

Published in *Nature Communications*, the study seeks to bridge that gap by providing the first observation-based, comprehensive assessment of the [vulnerability](#) to natural disturbances in Europe's forests.

The study's methodology is based on a machine learning approach, using data from Earth observations, climate data, and databases of forest disturbances. Because it is purely data-driven, it can be reproducible and applicable at large scales.

Background

Forests and other wooded land cover more than 40 % of Europe, making it one of the most forest-rich regions in the world. In addition to providing timber and wood products, our forests are home to many ecosystems and are a major part of Europe's biodiversity.

The impacts of [climate change](#), which has led to more fires, pests and extreme weather, including droughts and storms, are putting forests under increased pressure.

As part of the European Green Deal, the European Commission has launched an online public consultation on the development of a new EU Forest Strategy.

The strategy, which the Commission will adopt later this year, will build on the EU Biodiversity Strategy to 2030, cover the whole forest cycle and promote the many services that forests provide.

More information: Giovanni Forzieri et al. Emergent vulnerability to

climate-driven disturbances in European forests, *Nature Communications* (2021). [DOI: 10.1038/s41467-021-21399-7](https://doi.org/10.1038/s41467-021-21399-7)

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