

Insects love windthrows

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Using flight interception and pitfall traps, the researchers followed the development of insect fauna in areas hit by storm Lothar. Credit: Beat Wermelinger/WSL

A study conducted by the Swiss Federal Institute for Forest, Snow and Landscape Research (WSL) shows that storm-ravaged woodland is approximately twice as rich in insect species as undamaged forest. This

is because many endangered forest insects benefit from the open forest areas left behind by storms.

Storms, like Vivian, Lothar or Kyrill, are the most frequent natural disruptive factors in European forests and a driving force of forest dynamics. Windthrows alter habitats by opening up previously shaded sites, thereby changing the local climate and vegetation. Furthermore, storms produce large quantities of dead wood, on which about a quarter of all forest-dwelling organisms depend.

The WSL researchers investigated insect biodiversity in three forest areas destroyed by the storm Lothar in 1999: a beech forest in Sarmenstorf (in the canton of Aargau), a spruce forest in Messen (Solothurn) and a mixed forest in Habsburg (Aargau). Over two summers there, they used flight interception and pitfall traps to collect insects and then identified the caught [species](#) back in their laboratory. Control areas were surveyed in undamaged neighbouring woodland.

Usually, forest owners salvage stem wood after storms, to sell it. However, this affects natural forest development, for example because it removes the dead wood vital for insects. So the researchers determined insect diversity within the three aforementioned windthrow sites, both in areas cleared of uprooted trees and in unsalvaged forest.

Exclusive windthrow species

Windthrows are inhabited by both [forest insects](#) and open-land species. The researchers found that this not only increases the absolute insect total, but also the number of species. On average windthrows were found to be home to twice as many species as intact forests and to nearly four times as many bee, wasp and bug species.

"In addition, windthrows attract many endangered beetle species,

especially those that depend on dead wood," explains Beat Wermelinger, a forest entomologist at the WSL and lead author of the study. "By contrast, intact forests tend to be home to fewer exclusive insects," he says. For example, ground and bark beetles are often found there, with 72% of bark beetles belonging to a non-native species: the black timber bark beetle.

Mosaic clearing boosts biodiversity

There was hardly any difference between salvaged and unsalvaged windthrows in terms of species diversity: only the number of spider species – which are not insects - was higher in salvaged areas. However, there was a clear difference regarding species composition, with less than two-thirds of the species found occurring simultaneously on both types of site. The reason for this is that although salvaging timber removes habitats for wood-dwelling insects, it creates new microhabitats, for bees or wasps, for example.

"Mosaic forest management lays excellent foundations for high species diversity," concludes Wermelinger based on the research findings now published in the science journal *Forest Ecology and Management*. Mosaic management entails leaving both salvaged and unsalvaged areas after major storms, deliberately with a view to maintaining and promoting forest biodiversity.

The impact can only be assessed in the long term

It may seem surprising that biodiversity in unsalvaged windthrows is not appreciably higher. "The probable reason for this is that plenty of dead wood remains in place even after stem wood has been removed" the insect expert explains. "Unlike in Scandinavia, for example, where only about 10 m³ of wood per hectare remains after windthrown timber has

been salvaged, in Swiss forests some 50 m³ still remain". On average, one hectare of Swiss [forest](#) contains in excess of 24 m³ of dead wood.

That said, forests and salvaged windthrows are virtually devoid of thick dead tree trunks. Yet many dead-wood beetle species are dependent on such large-sized wood, because the rotten trunks provide them with stable and sufficiently humid long-term habitats. "So we will probably only be able to assess the actual impacts of salvaging windthrown timber a few decades from now," says Wermelinger.

More information: Beat Wermelinger et al. Impact of windthrow and salvage-logging on taxonomic and functional diversity of forest arthropods, *Forest Ecology and Management* (2017). [DOI: 10.1016/j.foreco.2017.01.033](#)

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