

# 1 **dfoliatR**: An R package for detection and analysis of 2 insect defoliation signals in tree rings

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## 11 **Abstract**

We present a new R package to provide dendroecologists with tools to infer, quantify, analyze, and visualize growth suppression events in tree rings. **dfoliatR** is based on the OUTBREAK program and builds on existing resources in the R computing environment and the well-used **dp1R** package. It is designed to aid research in the ecology of insect defoliation events and to reconstruct defoliator outbreak chronologies, but can be applied to other studies where host–non-host comparisons are useful. **dfoliatR** performs an indexing procedure to remove climatic signals in the host-tree series that are represented in the non-host chronology, or other annually-resolved climate series. It then infers defoliation events in individual trees based on user-specified thresholds. Site-level analyses identify outbreak events that synchronously affect user-defined numbers or proportions of involved host trees. Functions are provided for summary statistics and graphics of tree- and site-level series. We evaluated **dfoliatR** against OUTBREAK, using eight datasets including 222 host-trees, and found that **dfoliatR** improves on OUTBREAK with greater user control, identification of defoliation events, computing capacity, and both the statistical summary and graphical outputs. We provide two example data sets and script to enable users to gain familiarity with the package and its capabilities. The source code is available in the Comprehensive R Archive Network (CRAN) and on GitHub.

12 *Key words:* Dendroecology, dendroentomology, OUTBREAK, western spruce

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