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How Could Climate Change Affect the Potential Spread of Pine Wilt Disease in Europe?

Gruffudd, Hannah; Evans, Hugh; Haran, Julien; Roux-Morabito, Géraldine; Roques, Alain; **Robinet, Christelle**

The pine wilt disease which can kill pines within a few months has been spreading in southwestern Europe despite severe control measures since its discovery in Portugal in 1999. It has thus become a serious threat to European forests. The pine wood nematode, *Bursaphelenchus xylophilus,* which is the causal agent of this disease, is transported by long-horned beetles of the genus Monochamus. The potential spread of the disease is therefore driven by several factors such as the presence of infested carrier beetles and the occurrence of conditions favorable to the expression of pine wilt. Climate conditions, and consequently climate change, are key parameters to consider when assessing the risk of potential spread of the disease. We investigate how climate conditions could explain: (1) the distribution of *Monochamus galloprovinciallis* (the current carrier beetle in Europe) and (2) the disease expression. The development of the disease is known to be closely related to high summer temperatures and drought conditions. We used the EvapoTransPiration (ETP) model to describe the effects of climate on the nematode growth and survival, photosynthesis and available energy. This model, validated on a disease gradient in Japan, helps us to explore the effects of climate change across Europe.

Will Northward Expansion of Eastern Spruce Budworm with Climate Change Affect Boreal Forest Resilience?

Pureswaran, Deepa; De Grandpré, Louis; Neau, Mathieu; Paré, David; Morin, Hubert; Kneeshaw, Dan

Climate change is altering forest insect disturbance regimes via temperature-mediated phenological changes in trophic interactions among host trees, herbivorous insects and natural enemies. Eastern spruce budworm outbreak centres have now appeared in the boreal black spruce zone that previously only suffered mild defoliation. In a multidisciplinary research team, we are evaluating a rising spruce budworm outbreak in ten permanent research plots on Quebec's North Shore over the course of the infestation. Estimates of defoliation since 2006 reveal that pure black spruce stands currently suffer up to 50% defoliation. Black spruce escapes severe herbivory due to a 2-week delay in budburst phenology relative to emergence from diapause of spruce budworm larvae. Observations suggest that budburst phenology of black spruce along a climatic gradient is sufficiently plastic to permit phenological changes as climate warms, that would be more conducive to herbivory. Mortality of black spruce could result in replacement on rich sites, by balsam fir forests. Poor sites may remain as low productive black spruce stands, or be replaced by even less productive ericaceous shrublands, decreasing the diversity of the plant community. The degree to which forest ecosystems are resilient to new disturbance regimes will have consequences on future forest management strategies.