

Pest predictor identifies ingredients for ecological recipe for destruction

July 10 2024, by Shelby Hartin



Credit: University of Maine

If you've felt the familiar itch of browntail moth rash, seen the grayish-green needles of an infested hemlock or watched as woodpeckers bore into ash trees for a meal hidden beneath the surface, you've experienced the devastating effects of non-native pests.

Browntail moth, hemlock woolly adelgid and emerald ash borer are only

three of the many pests that have wreaked havoc on Maine's public health, economy and ecological landscape.

Angela Mech, assistant professor of entomology at the University of Maine, is an expert on forest insects, specifically the invasive ones.

"When talking about non-native insects that invade North America, the first time something is detected, those of us who work in the field hold our breath, because we have no idea if it's going to be the next [emerald ash borer](#), the next browntail moth, the next really bad thing," Mech said.

Mech has been grappling with how to predict which of these invaders may cause the next ecological disaster since 2016, when she was a postdoctoral researcher at the University of Washington. "Why do some species do all these bad things? But the majority of them don't?" Mech said, posing the same question that brought the group together initially.

That question inspired Mech and her collaborators to develop a tool to predict the risk a non-native insect may pose if introduced to a certain area. Its name is, fittingly, [pest](#) predictor.

The [i-Tree Pest Predictor tool](#) is the result of seven years of work by Mech and colleagues representing institutions across the United States.

It launched in fall 2023 and uses input data determined by hypotheses to predict the probability of a non-native insect becoming a high-impact pest. It is hosted by i-Tree, a peer-reviewed software suite from the Forest Service that provides urban and rural forestry analysis and benefits assessment tools.

To create the tool, researchers compiled factors that may affect non-native insects' ability to reshape a forest. Traits of the insect, traits of the North American host trees, insect evolutionary history and tree

evolutionary history were each evaluated and then combined into a single model that predicts the risk a given insect poses for each North American tree species.

"We had to collect all this data to test those hypotheses," Mech said.

"Our conclusion was that, like every recipe, there are multiple ingredients, and so there was no single answer. It was actually multiple things. Sometimes it does have to do with the host and then it also has to do with evolutionary history. It's about having these things lined up in the right way. It's the recipe for destruction."

Nathan Havill, a research entomologist with the Forest Service's Northern Research Station was one of many of the pest predictor's key developers. Havill works in the agency's invasive species unit, concentrating on pests that impact trees and forest ecosystems. He focuses mainly on genetics and evolutionary biology, examining new pests to find out more about where they come from and their natural enemies that may have the potential to stem their spread.

At present, Havill is gathering information about approximately 70 species of non-native insects. His intent is to input this information into the model, which can help determine if any have the potential to become high-impact pests.

"Oftentimes, when a non-native insect gets introduced and it rears its ugly head as a pest, it's a scramble to figure out what it is and where it came from. During the time when we're trying to figure out that basic information, the pest is killing trees," Havill said.

"If we can focus our efforts on particular groups of insects and study those before they get here, then we can reduce some of our time trying to figure out those basic elements. That's really the benefit that I see for this tool: being able to focus the research and make it more efficient to

study those insects that have a higher probability of becoming mega invaders."

Havill also noted that the use of a tool of this kind creates a more efficient and cost-effective workflow for eradicating pests once they arrive.

"Oftentimes we're caught by surprise, and by the time we realize that an invasive insect is a serious pest, it's spread so much that eradication is really difficult. If we can recognize and understand what the pests are earlier, and be able to identify them and find them earlier, then we can potentially eradicate them before they spread and become pervasive pests," Havill said.

Mech and Havill both see this tool as a proactive solution to the reactive work they both do daily. With the tool's ability to help predict the next ecological disaster, their next step is to spread the word and connect with researchers worldwide to determine how it can make an impact in their own countries.

Provided by University of Maine

Citation: Pest predictor identifies ingredients for ecological recipe for destruction (2024, July 10) retrieved 10 July 2024 from <https://phys.org/news/2024-07-pest-predictor-ingredients-ecological-recipe.html>

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.