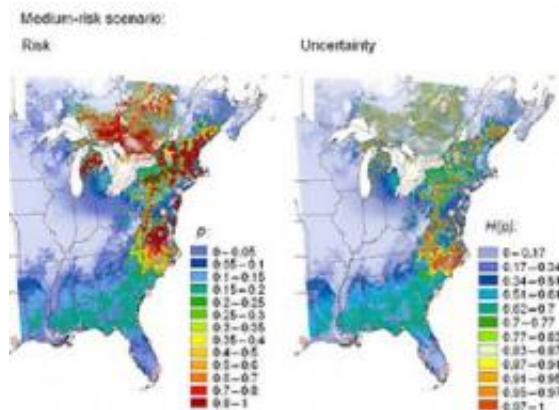


# Bugging out: Researchers help track wayward pests through mapping

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This map charts results of a stochastic simulation model for *Sirex noctilio*, a Eurasian woodwasp, in eastern North America. Credit: Frank Koch

Tracking invasive pests around the world sounds like it would make for an interesting show on the Discovery Channel. However, the work that goes into tracking these species is less "Deadliest Catch" and more "Dirty Jobs." Researchers at North Carolina State University partnered with scientists and analysts from around the globe to determine recommendations to improve pest-risk mapping to better inform decision makers on where and how to best combat pests.

"We use pest-risk maps to estimate where [invasive species](#) might arrive, establish, spread or cause harmful impacts," says Dr. Roger Magarey,

senior researcher at NC State. "This provides decision makers the insight to determine whether management - prevention, eradication, containment or suppression - is needed, and which option is most appropriate."

Species that have the potential to cause harmful ecological, economic or social impacts in an area of concern are considered "pests." Maps are created as visual representations of pest risk. However, the various methods used to create these maps can potentially yield very different depictions of risk for the same species. Pest-risk mapping is part of a greater [risk assessment](#) - which informs pest management. Pest-risk assessments help determine the degree of risk a pest might represent, and influence where land management agencies, regulatory agencies and agricultural groups should allocate the most resources - and what specific actions to take - in order to protect our forests, agriculture and other natural resources.

Researchers developed a set of guidelines to improve risk mapping - including things such as increasing international collaboration, incorporating [climate change](#) and providing training in pest-risk modeling. Their recommendations were published in the May issue of *BioScience*. Dr. Frank Koch, a research assistant professor at NC State, focused his work on a recommendation around improving the representation of uncertainty.

"Uncertainty is inherent in pest-risk models - you can't pre-determine things like climate change - and you certainly cannot always account for things like incomplete data or natural variability in the system. And because uncertainty often goes unrepresented in pest-risk mapping, the maps may suggest more certainty than actually exists," Koch explains. "So one of our recommendations is for pest-risk analysts to address uncertainty through processes like sensitivity analyses - where verification and validation provide estimates of model error - or

ensemble modeling - where a structured combination of predictions can yield a lower mean error than any individual prediction."

Magarey's research looked into creating software systems to account for climate change - which poses its own set of challenges for the development and interpretation of pest-risk maps. His climate-based prediction system, in which you input biological values for a particular pest - like the optimum temperatures for growth - gives you an output that shows what parts of the country are most at risk for a particular pest.

"This study was important because we had different groups of people - entomologists, biologists, plant pathologists and more - coming together to prioritize the most important areas of improvement in the way we do pest-risk mapping," Magarey says. "Right now, we have people using a variety of techniques to [map](#) pest risk. Creating best practices out of these recommendations will result in higher quality - and higher consistency - of pest-risk maps."

"Our next step as a group is to develop a best practices guide - not a cookbook of how to do pest-risk mapping - but to lay out what you need to have in place to ensure validity and rigor of your mapping, and making sure that information is getting to the right decision makers," Koch added. "We've learned in this study that there is a big disconnect between the scientists who create the maps and those who must use the maps to marshal their resources. We need to do a better job of making these maps more communicative for those who need to implement their findings."

**More information:** "Pest Risk Maps for Invasive Alien Species: A Roadmap for Improvement" Authors: Roger D. Magarey and Frank Koch, North Carolina State University, Robert C. Venette, U.S. Forest Service, Darren Kriticos, Commonwealth Scientific and Industrial Research Organisation, et al. Published: Online, May 3, 2010, in

*BioScience.*

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