RESEARCH OUTCOMES

Effectiveness of dogs and humans at detecting invasive spotted lanternfly in vineyards and forests

Grapes, apples, hops, and maple syrup are some of the most valuable agricultural commodities in the United States, with New York, Michigan, and Pennsylvania among the top producing states. For example, New York State's grape and wine industry generates roughly $14.93 billion in total economic activity, supporting 92,731 jobs and $5.64 billion in wages annually[1]. The spread of a highly invasive pest, the spotted lanternfly (*Lycorma delicatula*), also referred to as SLF, presents an imminent threat to these industries and the livelihoods supported. Originally detected in the Northeast United States in 2014, populations of this planthopper have since increased exponentially, and are causing severe impacts to agricultural operations in Pennsylvania and neighboring states, including nurseries, tree farms, and fruit growers — especially vineyards[2]. Spotted lanternfly infestations in vineyards can cause 80-100% vine mortality in a single growing season, raising concern for its spread into New York State and other regions[3]. Further spread could have significant economic and environmental impacts across the U.S., particularly for leading fruit producers like California and Washington.

A recent collaborative research effort has brought our canine companions into the spotlight, sniffing out and alerting us to their camouflaged SLF egg masses, a novel application comparing dog and human detection efficacy. So where has this work led us? Can dogs really help to safeguard our cherished crops and wine-bearing fruits? And are they able to do this better than their human counterparts?

Detector dog Dia searches a vineyard.
PC: Abby Bezrutczyk

Close up of SLF egg mass.
PC: Audrey Bowe

Our interdisciplinary research team and collaborators coordinated by the New York Invasive Species Research Institute (NYISRI), conducted surveys in 20 vineyards and adjacent natural areas in the neighboring states of New Jersey and Pennsylvania. Data collected from November 2020 through April 2021 were used to build occupancy models to help estimate the probability that 1) a location is occupied by SLF, and 2) a human or canine can detect it.

We found SLF are more likely to lay eggs on vines closer to forests, particularly within 75 meters distance, consistent with other findings[4]. We also found SLF prefers to lay eggs on poles over vines. Probability of encountering egg masses declined farther from the forest, which can help inform future search efforts. In terms of who won the detection competition, we found humans were better at detecting egg masses in vineyards where visual searching was easy, however dogs performed over three times better than humans at detecting egg masses in forests, where sniffing proved easier than seeing. It is important to note that all sites had moderate to high SLF infestations, which was necessary to be able to build the occupancy models. In a real-life early detection scenario where infestation levels are low or unknown, we suspect dogs may be better at first detection regardless of habitat type or setting. After comparing the efficacy of humans and detection dogs, identifying environmental factors that influence dogs' detection abilities, and the probability of SLF egg occurrence, the team has come up with optimal search strategy recommendations.

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1 John Dunham & Associates. 2022 National Economic Impact Study of the American Wine Industry. WineAmerica, The National Association of American Wineries.

2 Urban, J.M. 2020. "Perspective: shedding light on spotted lanternfly impacts in the USA." Pest Management Science 76:10-17.

3 Pfeiffer, D. G., E.R. Day, T. Dellinger, A. Dechaine, and M. Stutphin. 2019. Spotted Lanternfly in Virginia Vineyards. Virginia Polytechnic Institute and State University.

4 Leach, A. and Leach, H., 2020. Characterizing the spatial distributions of spotted lanternfly (Hemiptera: Fulgoridae) in Pennsylvania vineyards. Scientific Reports, 10(1), p.20588.

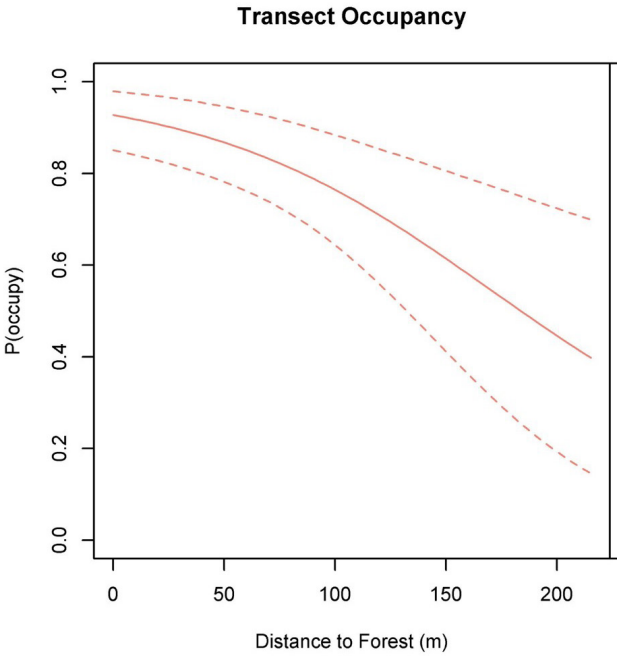

Fig 1. Occupancy of spotted lanternfly egg masses in relation to distance of vineyards from forests. Vineyard transects closer to forests had a higher probability of encountering spotted lanternfly egg masses.

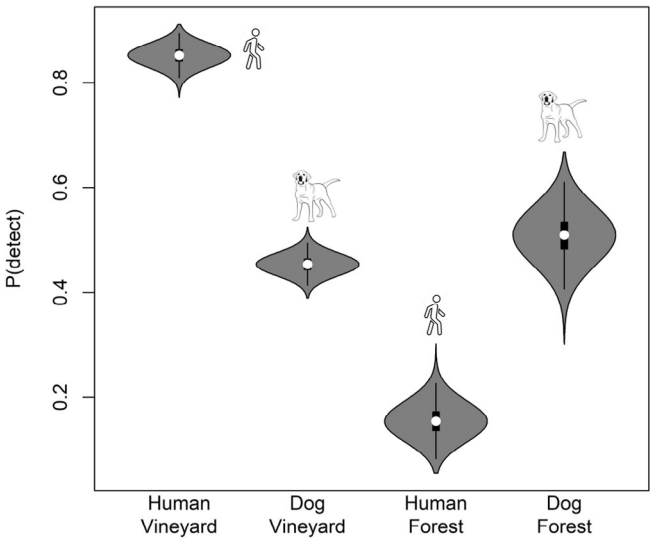

Fig 2. Probability of detecting spotted lanternfly egg masses by dogs and humans in forests and vineyards. In vineyards, humans had better detection than dogs, while dogs had better detection in forests.

SEARCH STRATEGY RECOMMENDATIONS

- Search in vineyards close to forests
- Search larger trees near vineyard edges
- Search poles in vineyards (e.g. wood, metal)
- Use dogs to search vineyards only in early detection
- Use dogs in forest sites where visual detection is challenging for humans
- Keep a close eye out for egg laying from September to November, and hatching from May to June

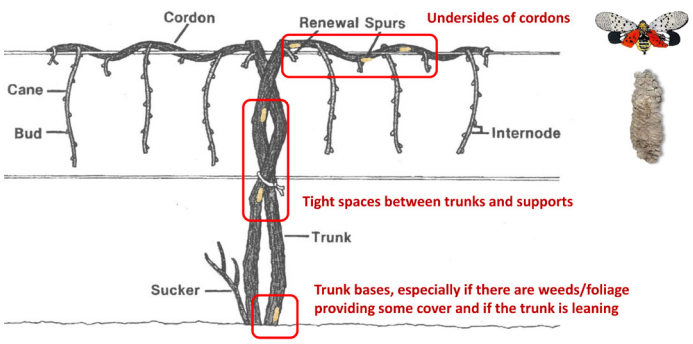

Fig 3. "Prime real estate" (recommended search areas) for SLF eggs on grapevines, based on casual field observations, not data from our research.

RESEARCH TEAM

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To learn more, or visit:
nyisri.org/research/slf-dogs/

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