UNIVERSITY OF CALIFORNIA
Agriculture and Natural Resources

Entomology & Biologicals

Biology and Management of the Spotted Lanternfly: a Potential Threat to California Grapes

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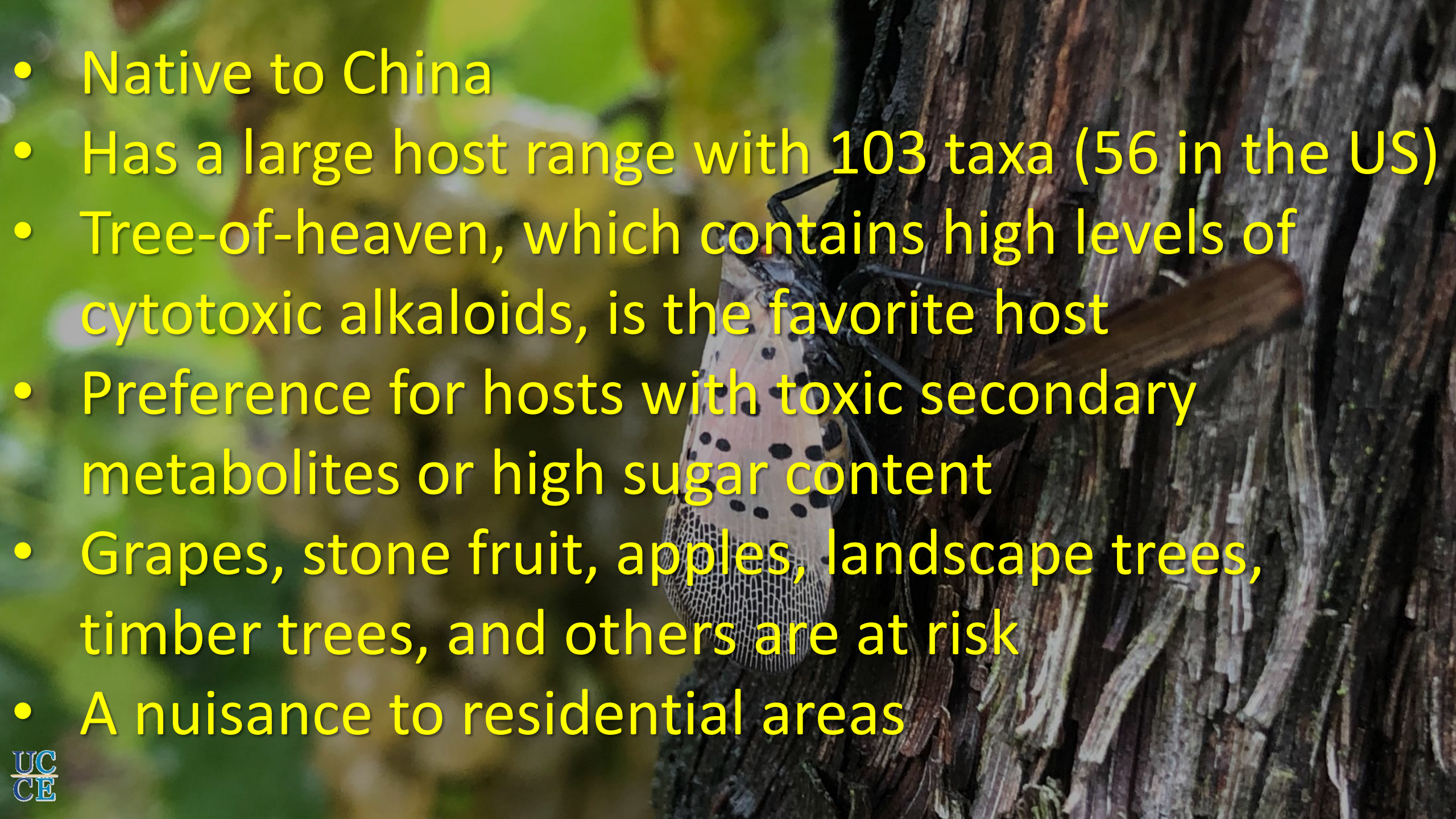
4th Ag Innovations Conference, 15 September 2020

Spotted lanternfly
Lycorma delicatula
(Hemiptera: Fulgoridae)



- Native to China
- Has a large host range with 103 taxa (56 in the US)
- Tree-of-heaven, which contains high levels of cytotoxic alkaloids, is the favorite host
- Preference for hosts with toxic secondary metabolites or high sugar content
- Grapes, stone fruit, apples, landscape trees, timber trees, and others are at risk
- A nuisance to residential areas

Host plants of SLF in the United States

Aceraceae: Japanese maple, red maple, silver maple, and sugar maple
Araliaceae: Japanese angelica
Asclepiadaceae: Rough potato
Betulaceae: Asian white birch and grey alder
Compositae: Greater burdock
Fabaceae: Black locust
Fagaceae: American beech and chestnut oak
Juglandaceae: Black walnut and Chinese wingnut
Magnoliaceae: Kobus magnolia and Tuliptree
Meoraceae: White mulberry
Oleaceae: Common lilac
Platanaceae: American sycamore
Rosaceae: Apple, black cherry, false spiraea, Japanese flowering cherry, hybrid cherry, peach, and rose
Rutaceae: Amur corktree and bee-bee tree
Salicaceae: Cottonwoods/poplars and willows
Simaroubaceae: Tree-of-heaven
Sterculiaceae: Chinese parasoltree and Japanese snowball
Ulmaceae: Japanese zelkova
Vitaceae: Virginia creeper, table/wine grape, and wild grape

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• Feeds on plant sap, weakens the host, leads to sooty mold development, reduces yields, and can kill the host
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Biology

SLF LIFE CYCLE

Egg hatch and 1st instar
Apr-Jun

Egg laying and egg period
Sep-Dec to Sep-Jun

2nd instar
Jun-Jul

3rd instar
Jun-Jul

4th instar
Jul-Sep

Adults
Jul-Dec

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Freshly deposited
Suzanne Wainwright-Evans, Buglady Consulting

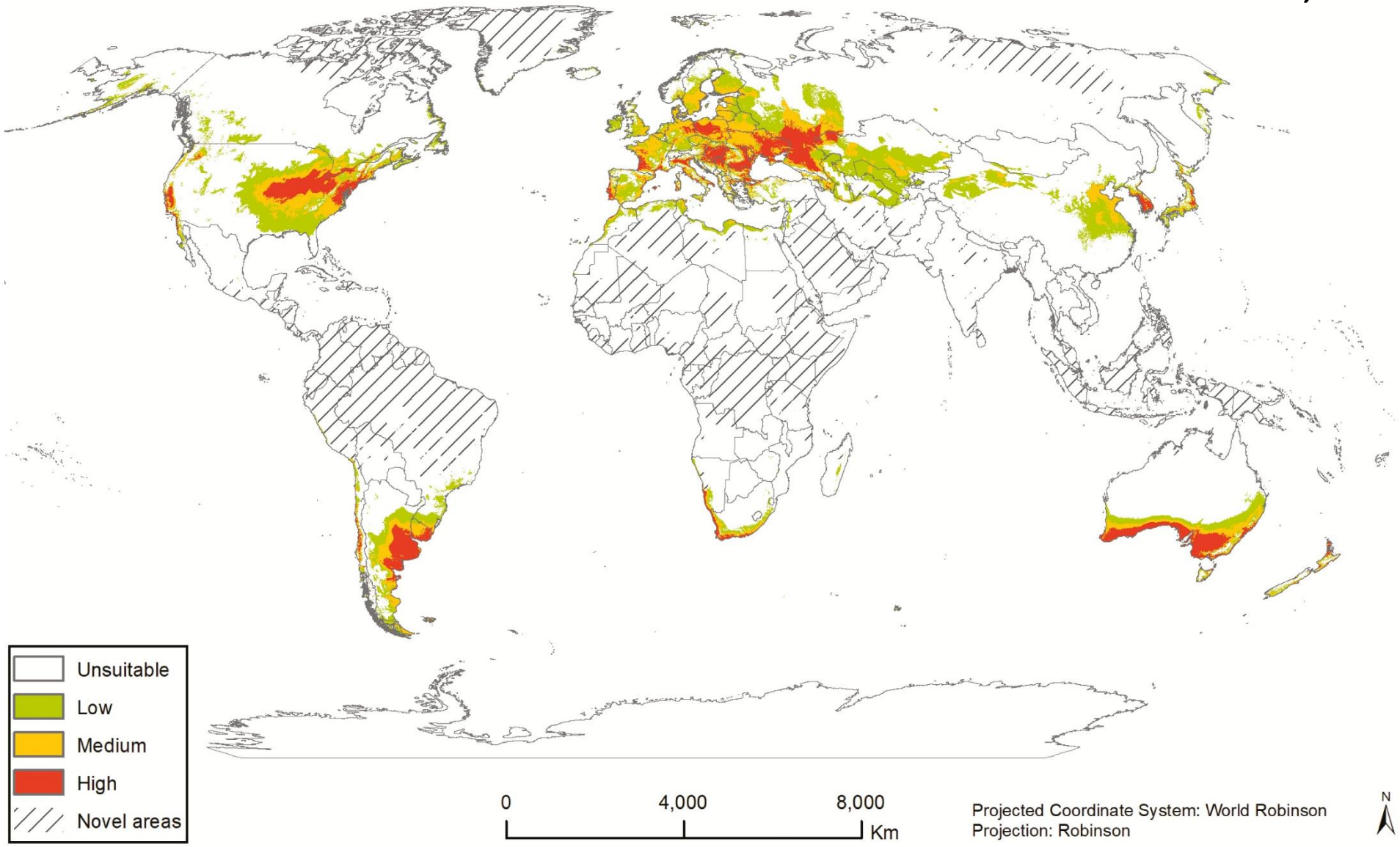

Older
Anna Dougherty, USDA-ARS


Emerged
Surendra Dara, UCCE

Global distribution model

Global potential distribution of spotted lanternfly based on MAXENT model

Wakie et al., 2019



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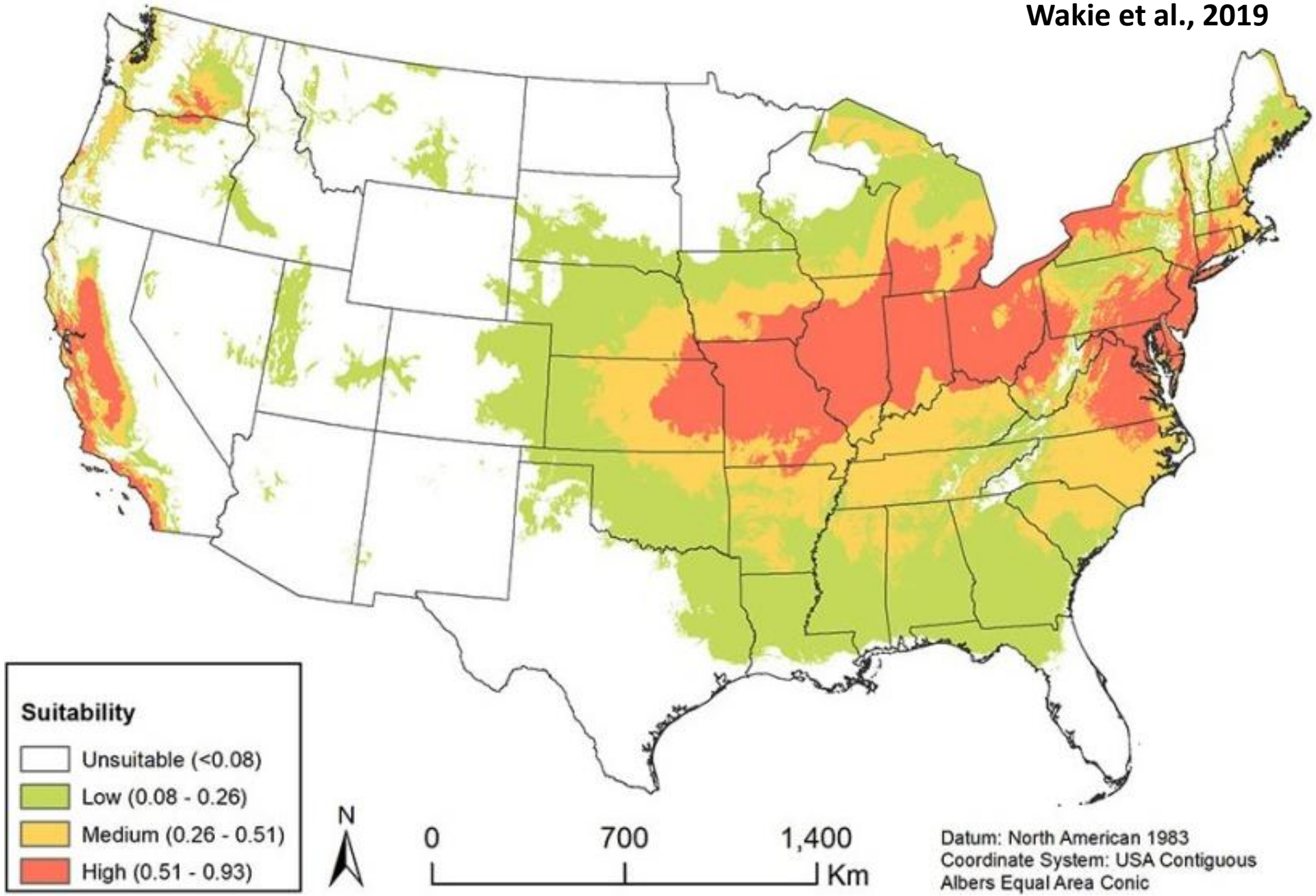
US distribution model

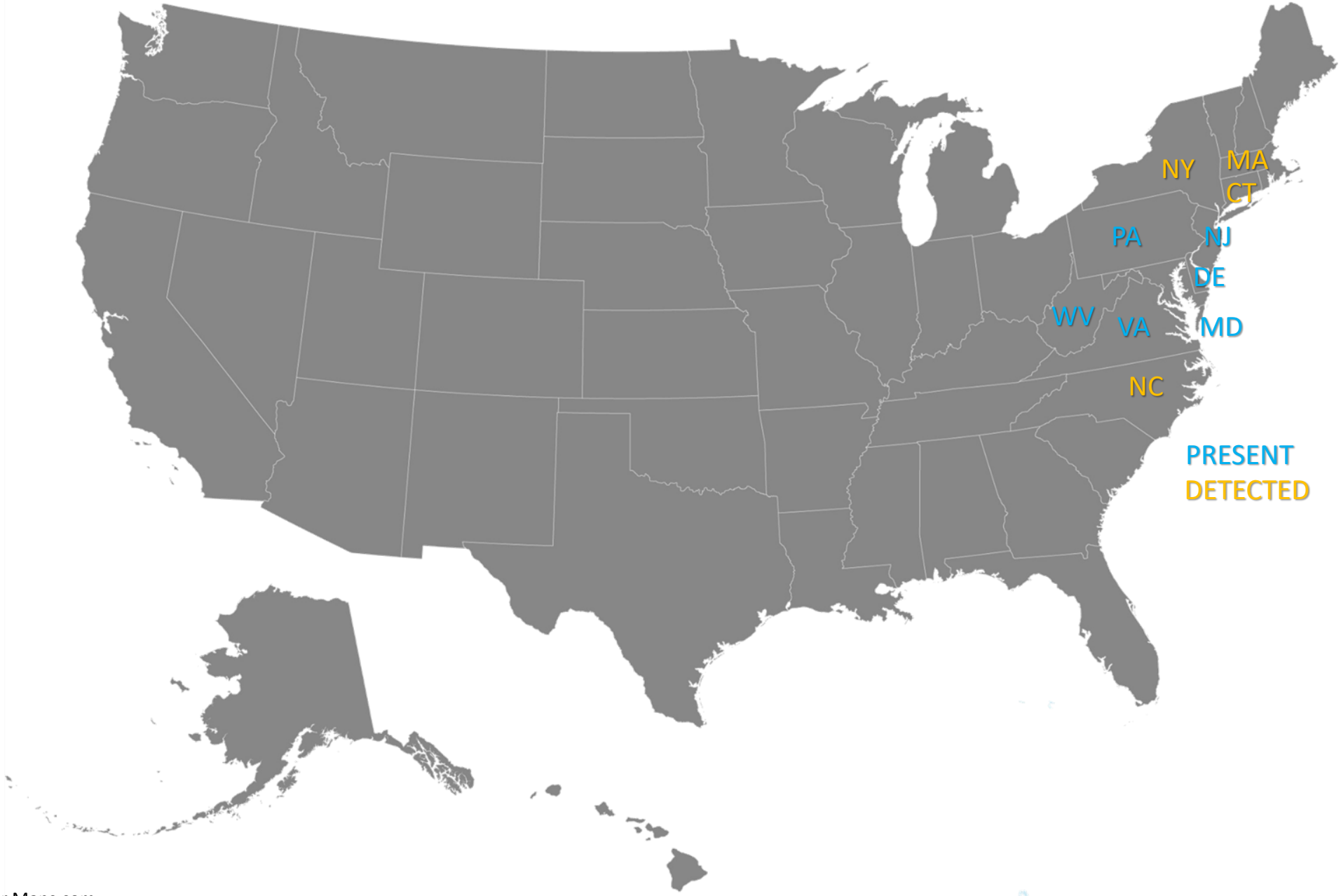
Potential distribution of spotted lanternfly in the United States

Wakie et al., 2019



US distribution

Current distribution in the US: 14 August 2020



Free Vector Maps.com

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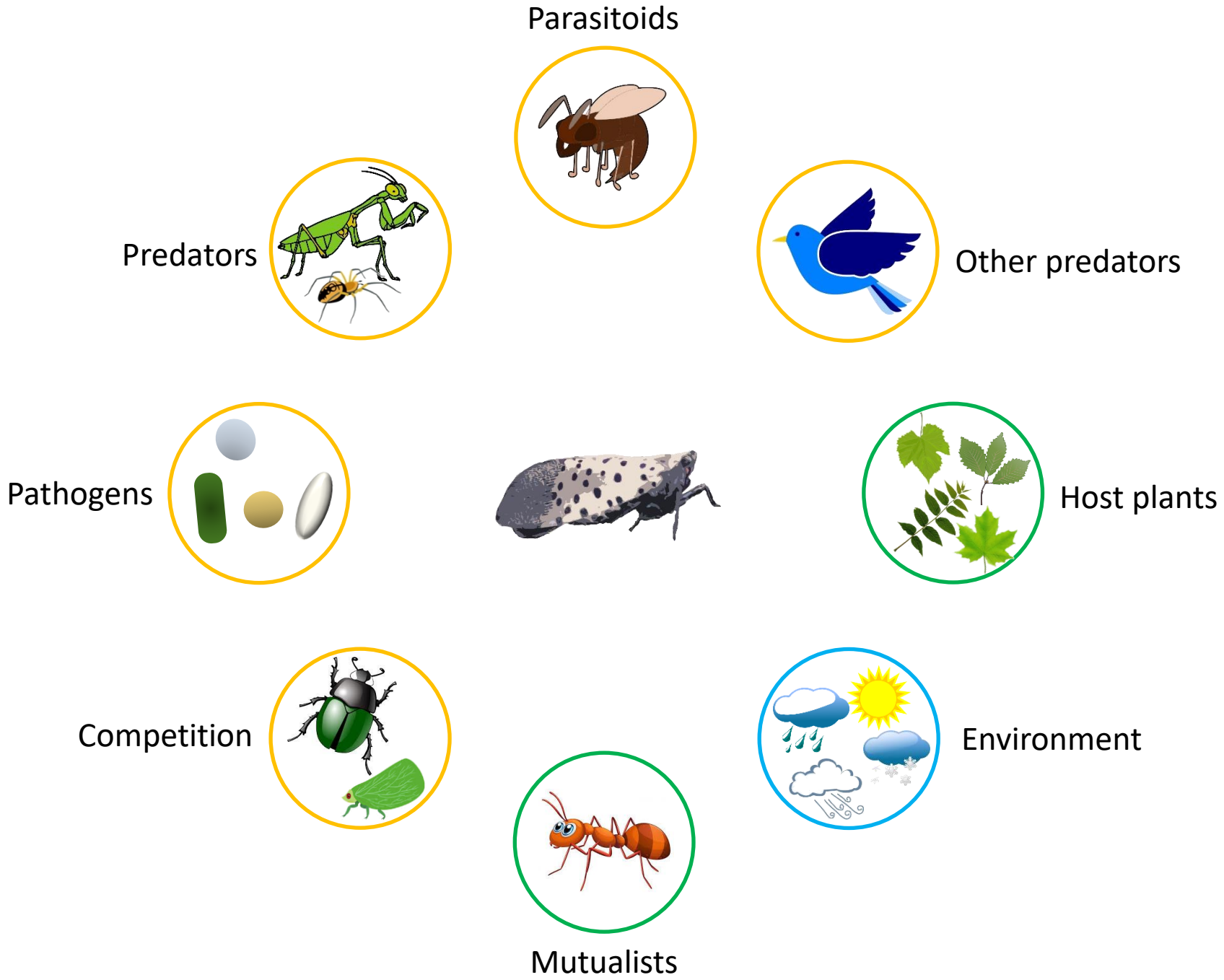
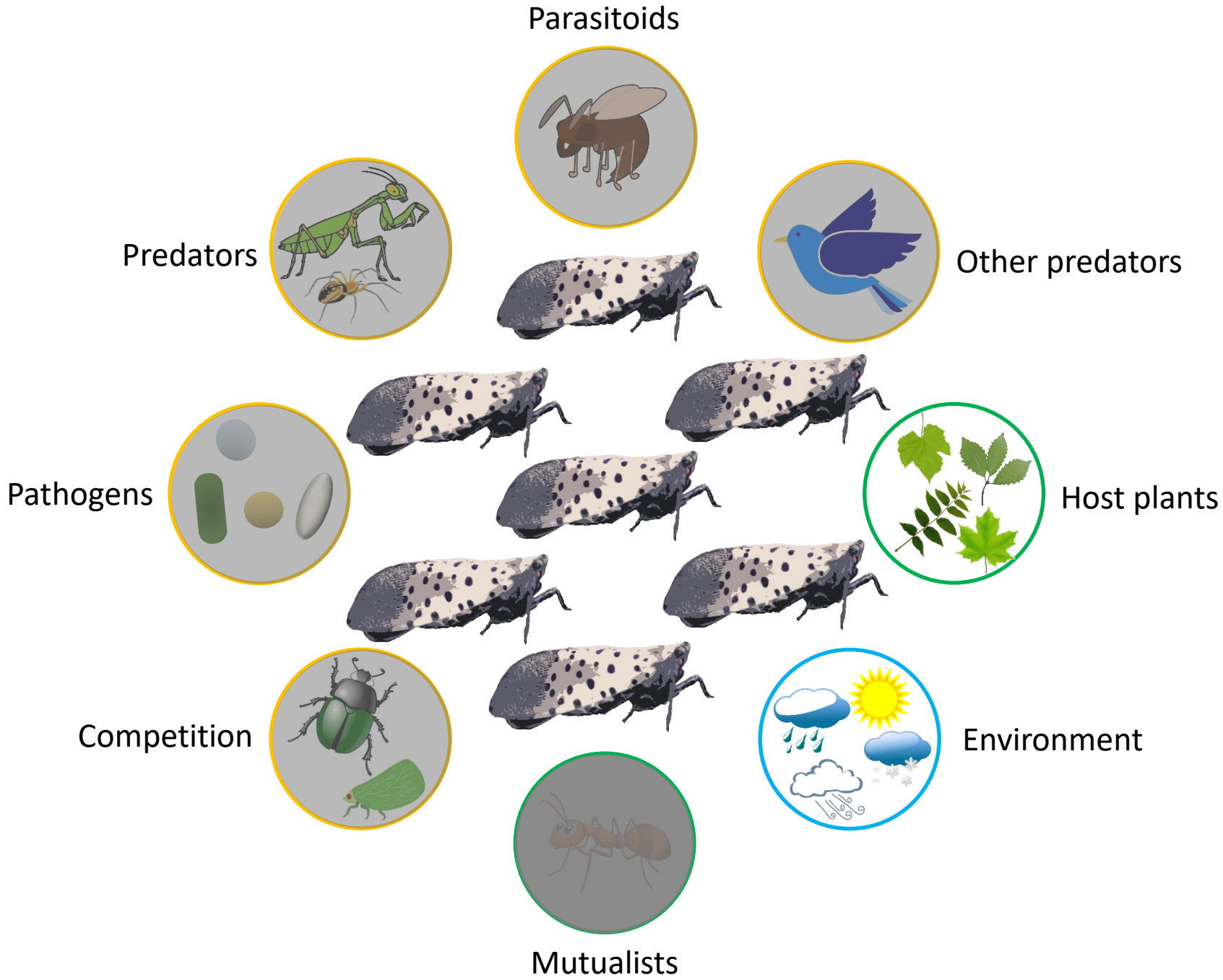
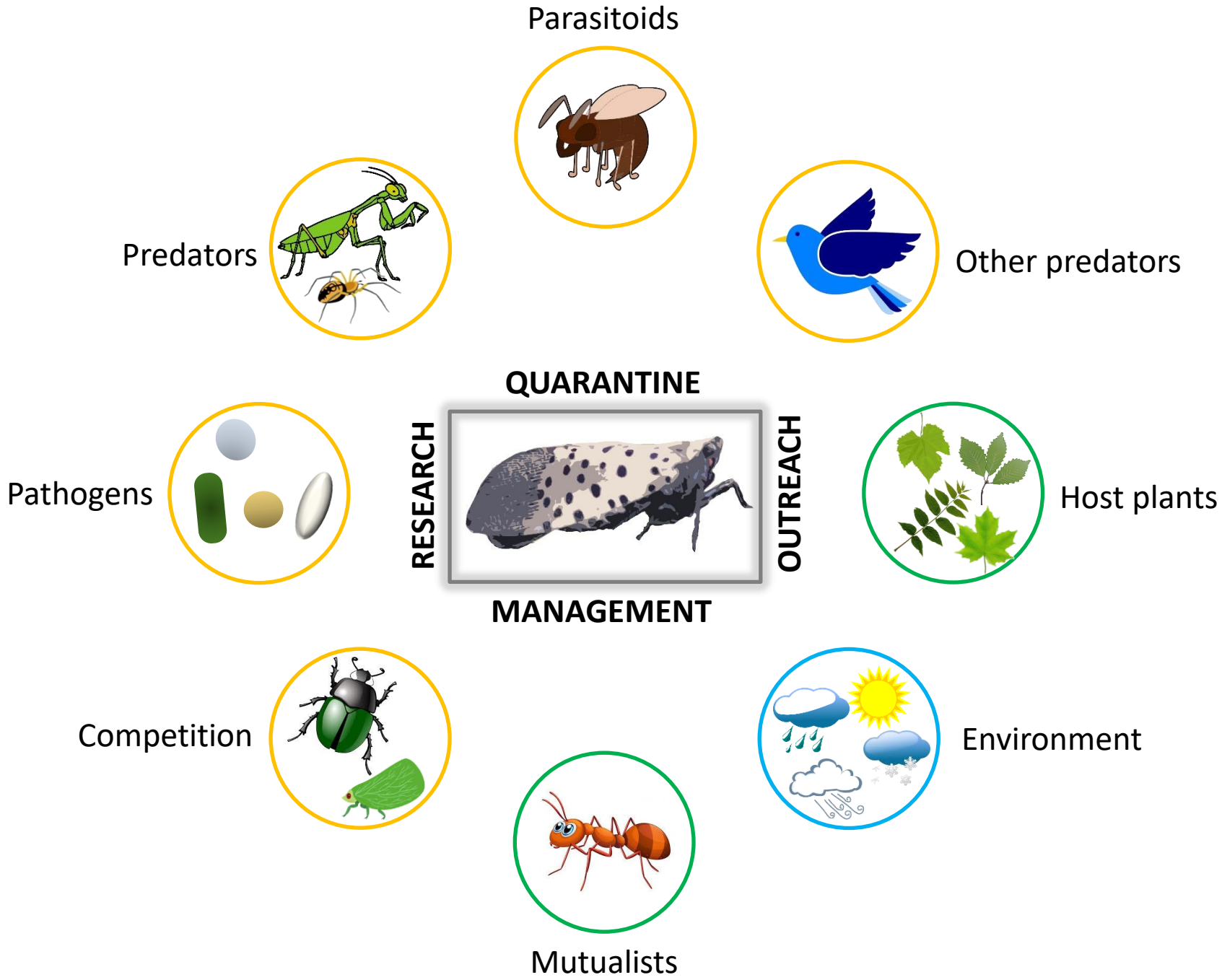
Invasive pests in native environment



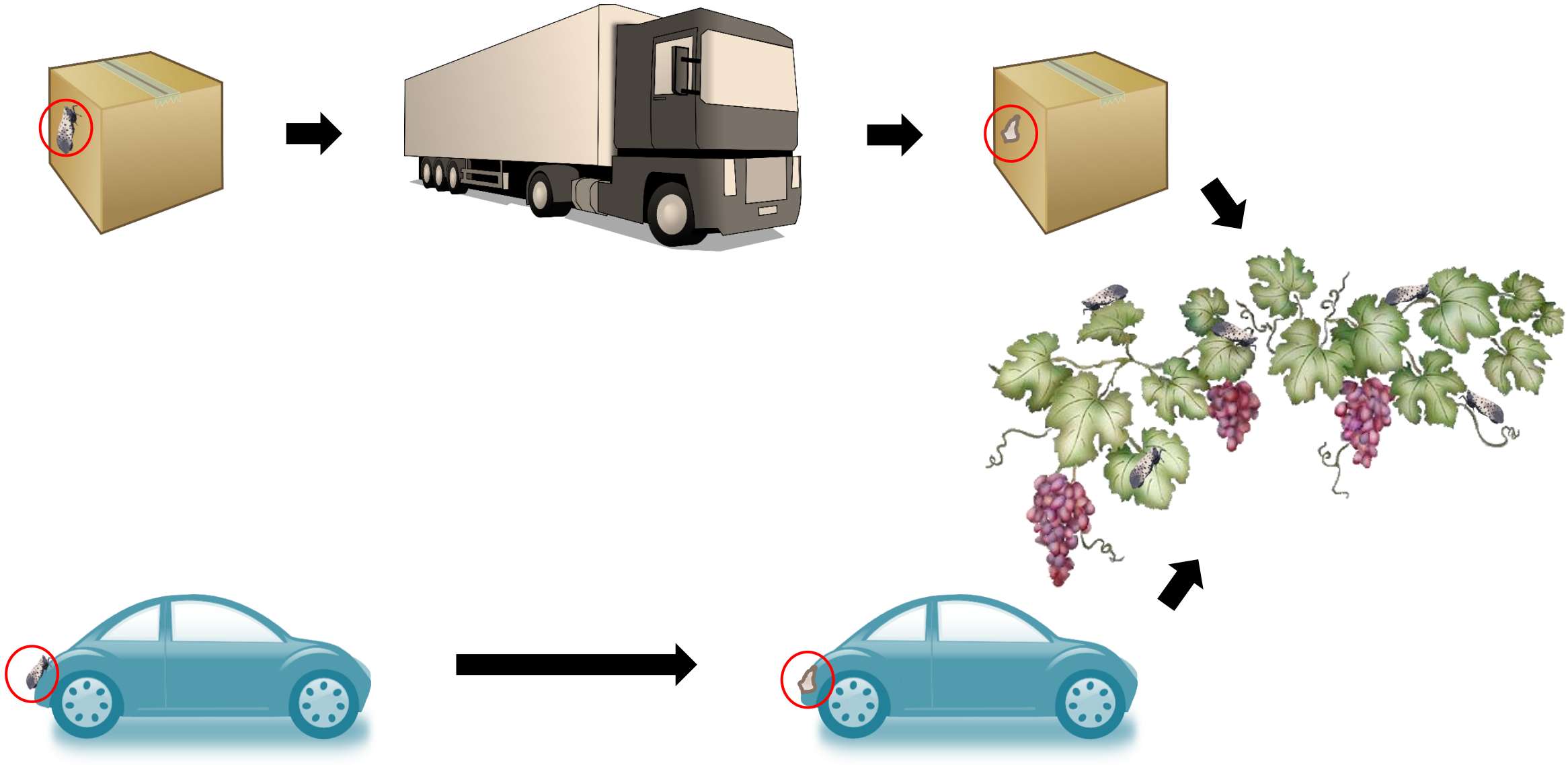
Invasive pests in new environment



Invasive pests in new environment



Potential routes of SLF dispersal



Integrated Management of Spotted Lanternfly

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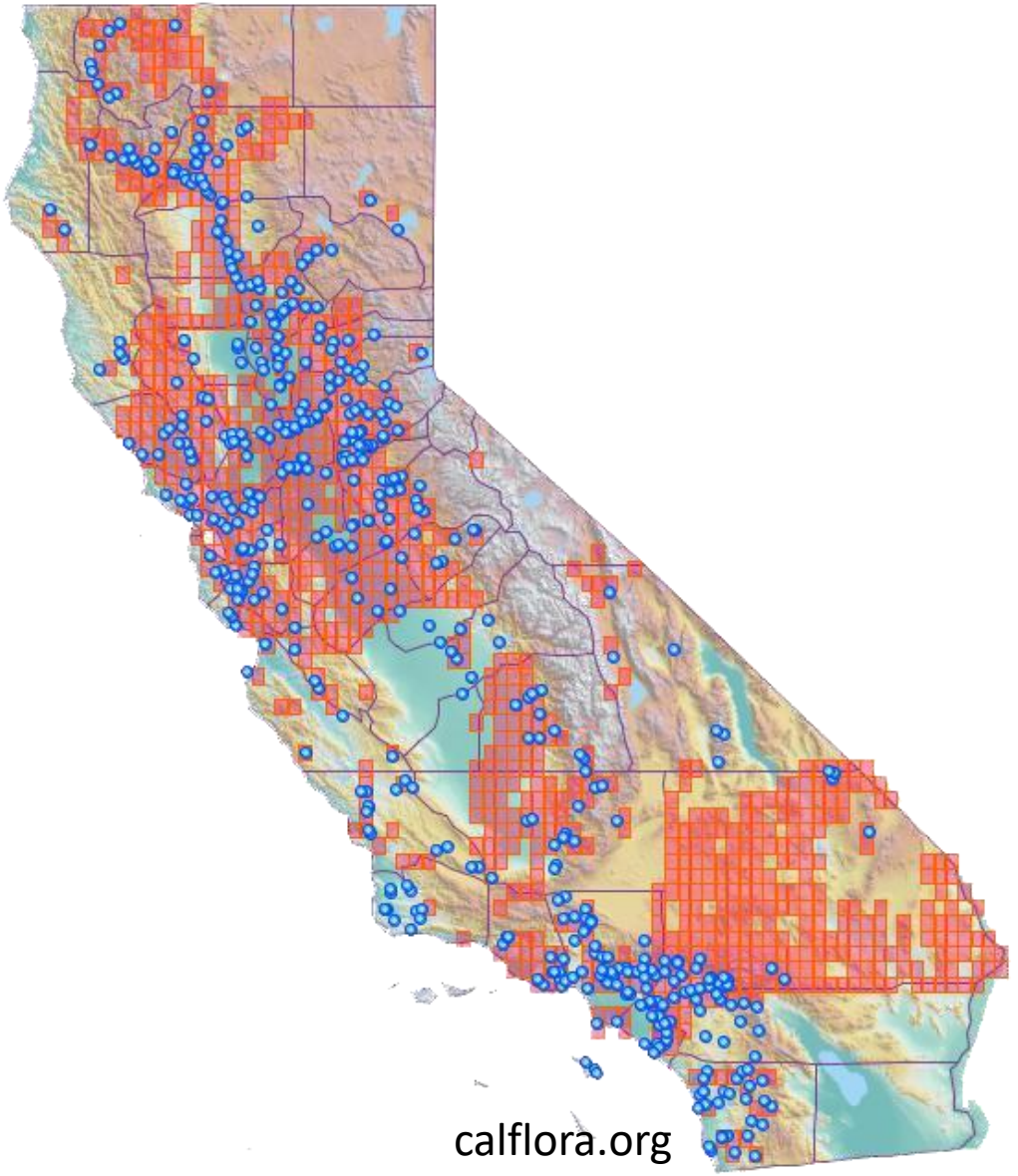
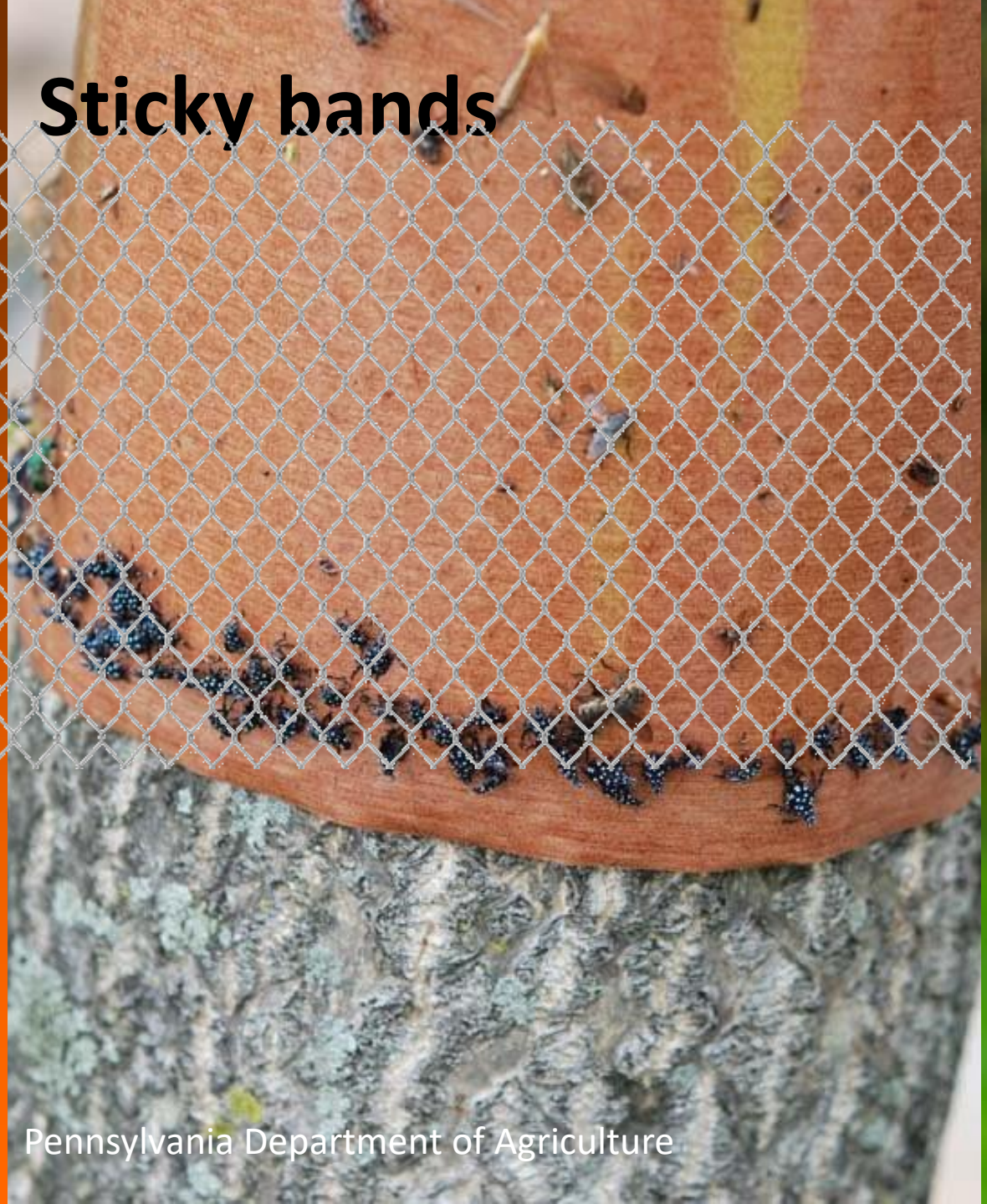
Tree-of-heaven (*Ailanthus altissima*)

Cultural control



Mechanical control

Sticky bands



Pennsylvania Department of Agriculture

Penn State

Behavioral control

Lures

- Methyl salicylate — All nymphs and adults
- (*Z*)-3-hexenol — Older nymphs and adults
- (*E,E*)-α-farnesene — Older nymphs and adults

Cooperband et al. 2019 J. Econ. Entomol. 112: 671-682

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Biological control

Key Biocontrol Agents in China

Anastatus orientalis
(Hym: Eupelmidae)
Egg parasitoid

Dryinus stantoni
(Hym: Dryinidae)
Nymphal parasitoid

Hannah Broadley[1,2], Juli Gould[1], and Kim Hoelmer[3]
[1]USDA APHIS PPQ, [2]U Massachusetts, [3]USDA ARS

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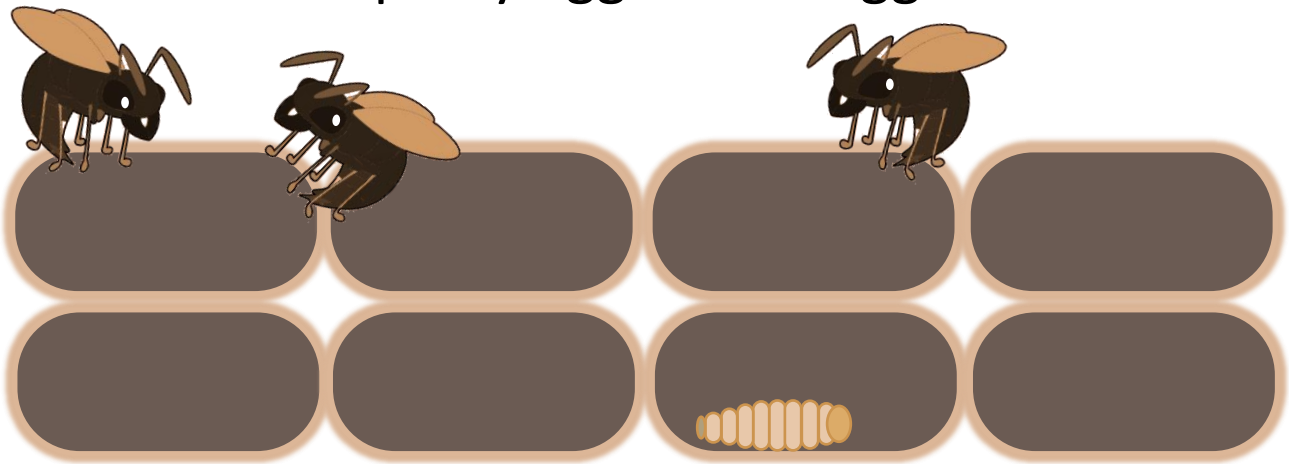
Parasitoids attacking SLF eggs

Biological control

Wasps lay eggs in SLF eggs



Wasp larva

Empty SLF egg after wasps emerge

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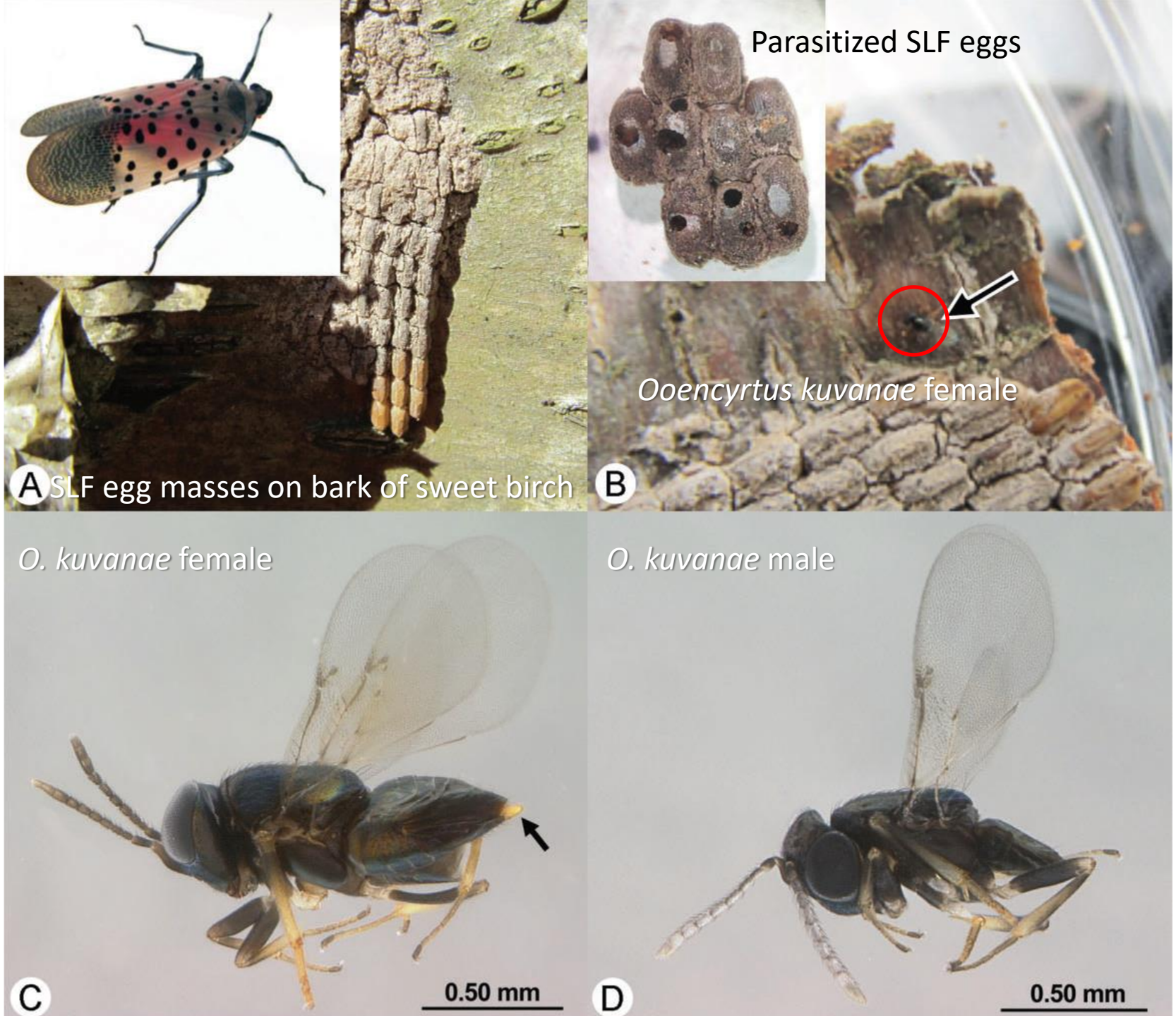
Biological control



Liu & Mottern, 2017 J. Insect Science 17(1): 18; 1–6

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Microbial control

Batkoa major infection

Photos: Eric Clifton, Cornell

Microbial control

Beauveria bassiana infection

Photos: Eric Clifton, Cornell

Chemical control

- Neonicotinoids
- Organophosphates
- Azadirachtin
- Insecticidal soaps
- Entomopathogenic fungal formulations

Evolutionary adaptations

- Wide host range
- Hosts with toxic secondary metabolites
- Size and bright coloration (aposematism)
- Host searching behavior
- Overwintering in egg stage
- Protective covering on egg masses
- Appearance of egg masses
- Egg-laying on inanimate objects

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IPM for SLF

- Outreach
- Prevent invasion

- Destroy egg masses
- Prevent moving egg masses
- Biological control
- Ovicidal treatments

- Biological control
- Microbial control
- Insecticidal treatments
- Sticky bands

- Biological control
- Microbial control
- Insecticidal treatments
- Sticky bands and lures

- Removing tree-of-heaven
- Treating tree-of-heaven

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Quiz

- Which of the following is correct about the spotted lanternfly?

A. Egg masses are covered with a protective coating
B. First three nymphal instars are black with white markings
C. Fourth instar nymph is red with black and white markings
D. Adults have distinctive colors and markings on their body and wings
E. All of the above

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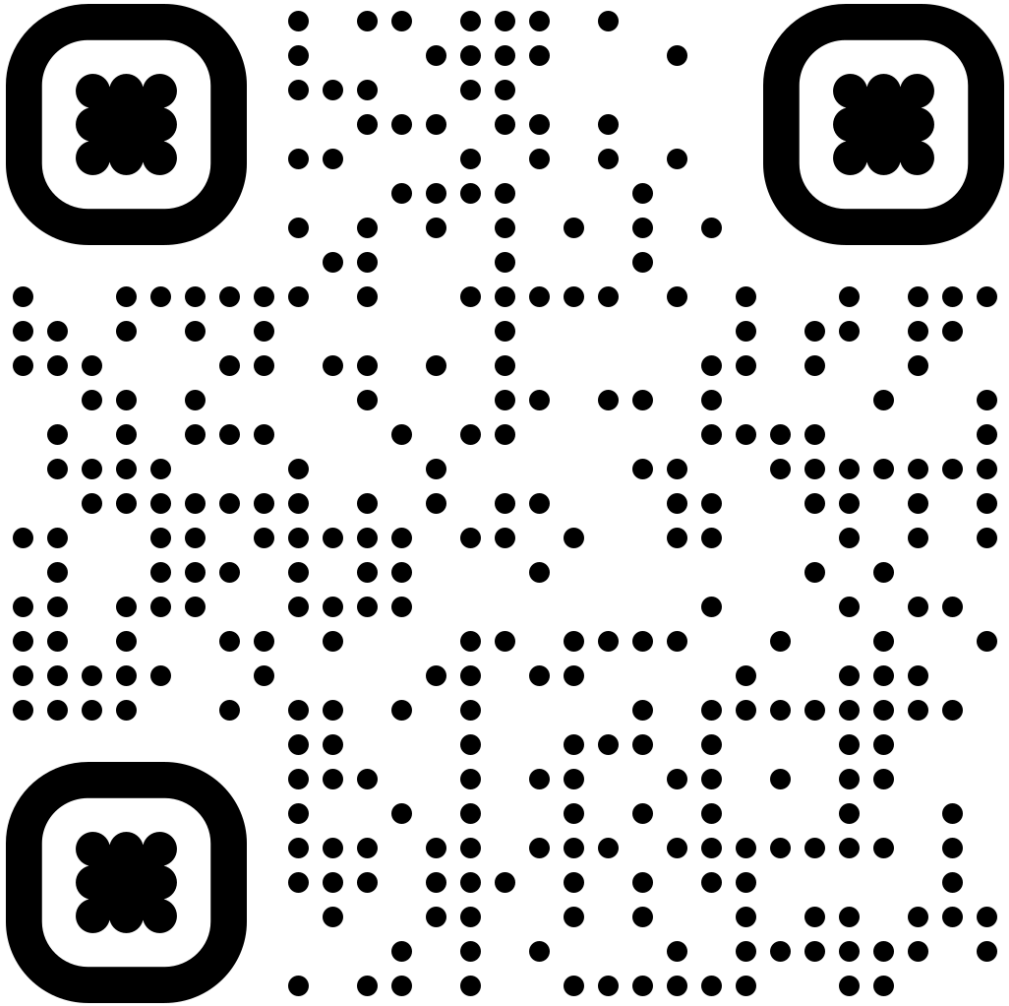
Quiz

- Spotted lanternfly can be a major threat to grapes and other crops if it invades California

A. Yes
B. No

Can you recognize SLF?

https://ucanr.edu/SLFsurvey



***Lycorma delicatula* (Hemiptera: Fulgoridae): A New Invasive Pest in the United States**

Surendra K. Dara, Lawrence Barringer, Steven P. Arthurs

Journal of Integrated Pest Management, Volume 6, Issue 1, March 2015, 20,
https://doi.org/10.1093/jipm/pmv021

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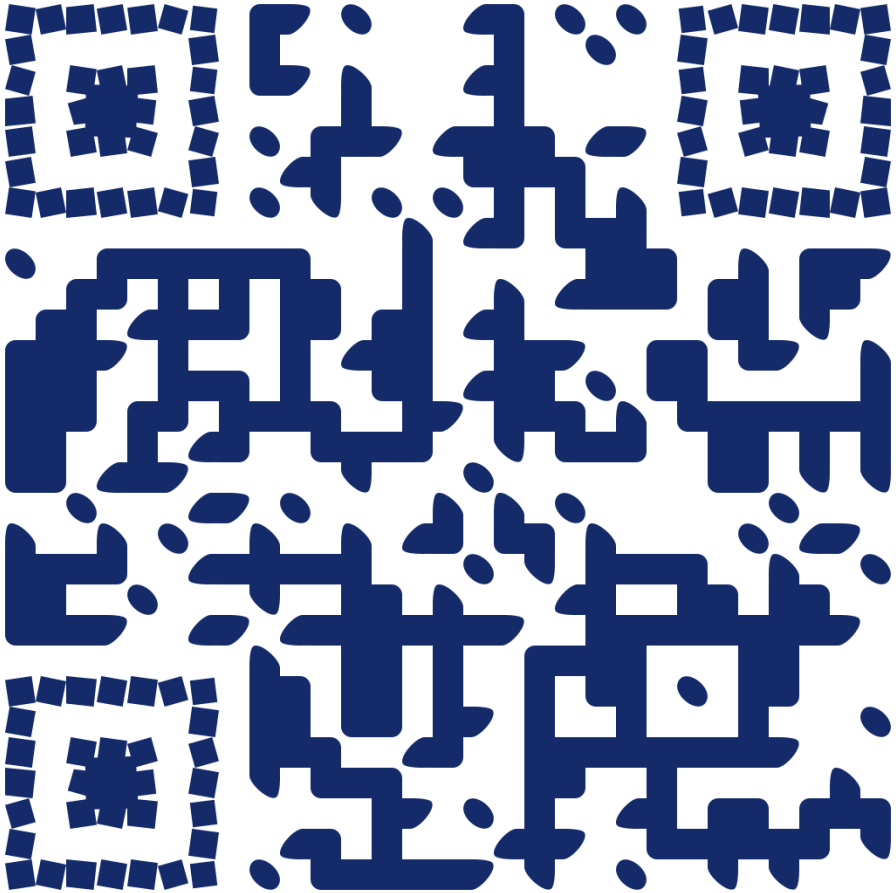
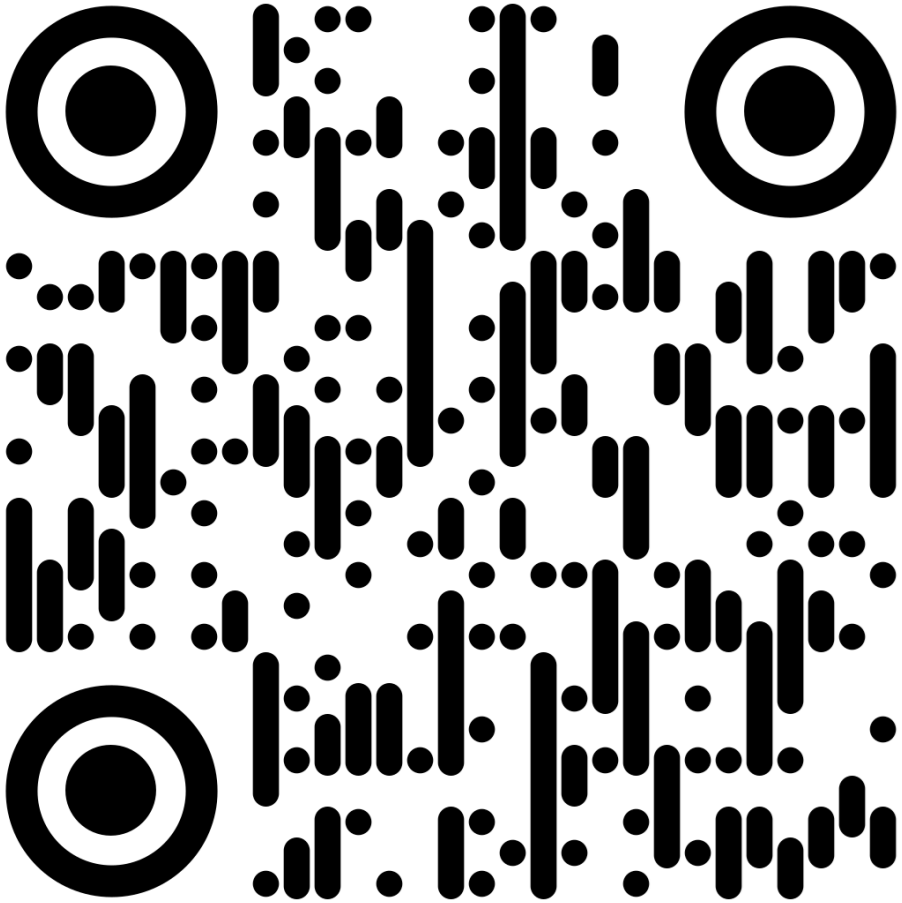
Spotted lanternfly short video https://youtu.be/45103-PFI4M



Video of a version of this presentation https://youtu.be/5Cy8quU--yY



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Thank you!

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