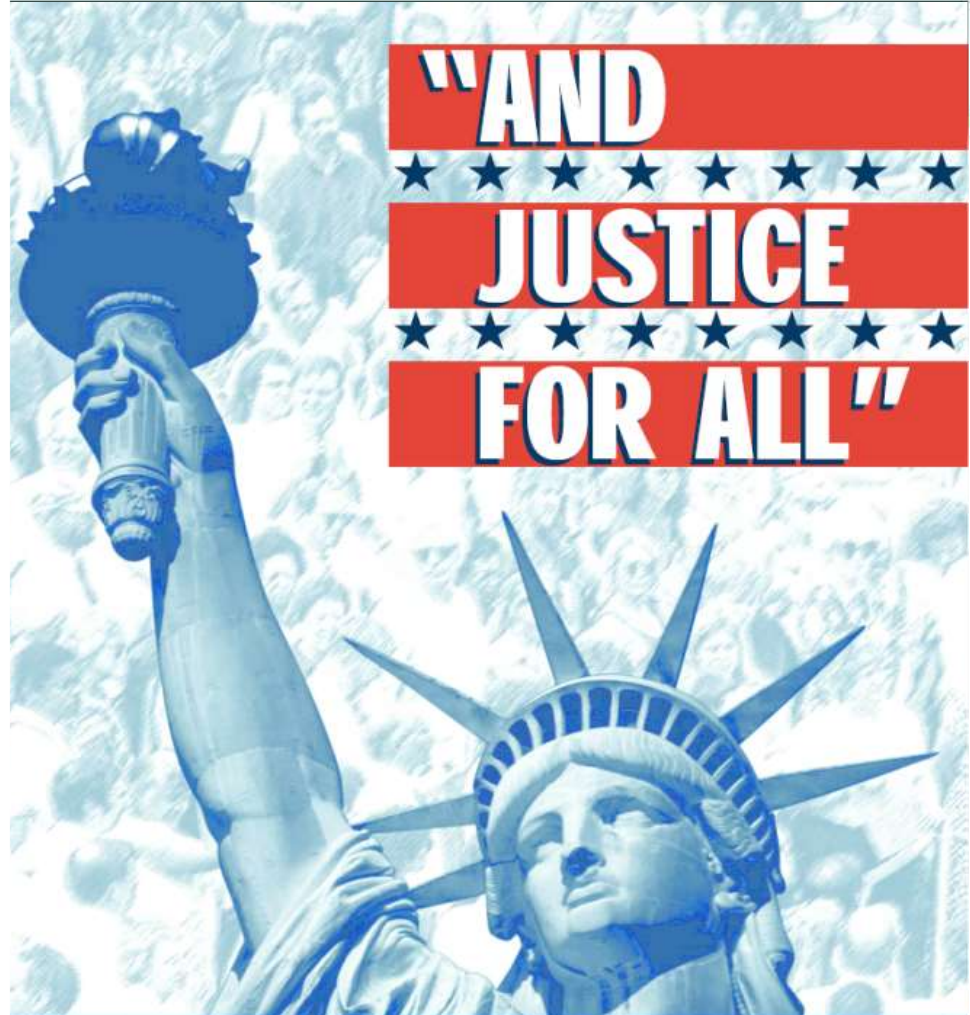


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**“AND  
JUSTICE  
FOR ALL”**

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# Emerging Hop Insect Pests

Erin Lizotte, Michigan State University Extension





## Overview

- European corn borer
- Spotted lanternfly

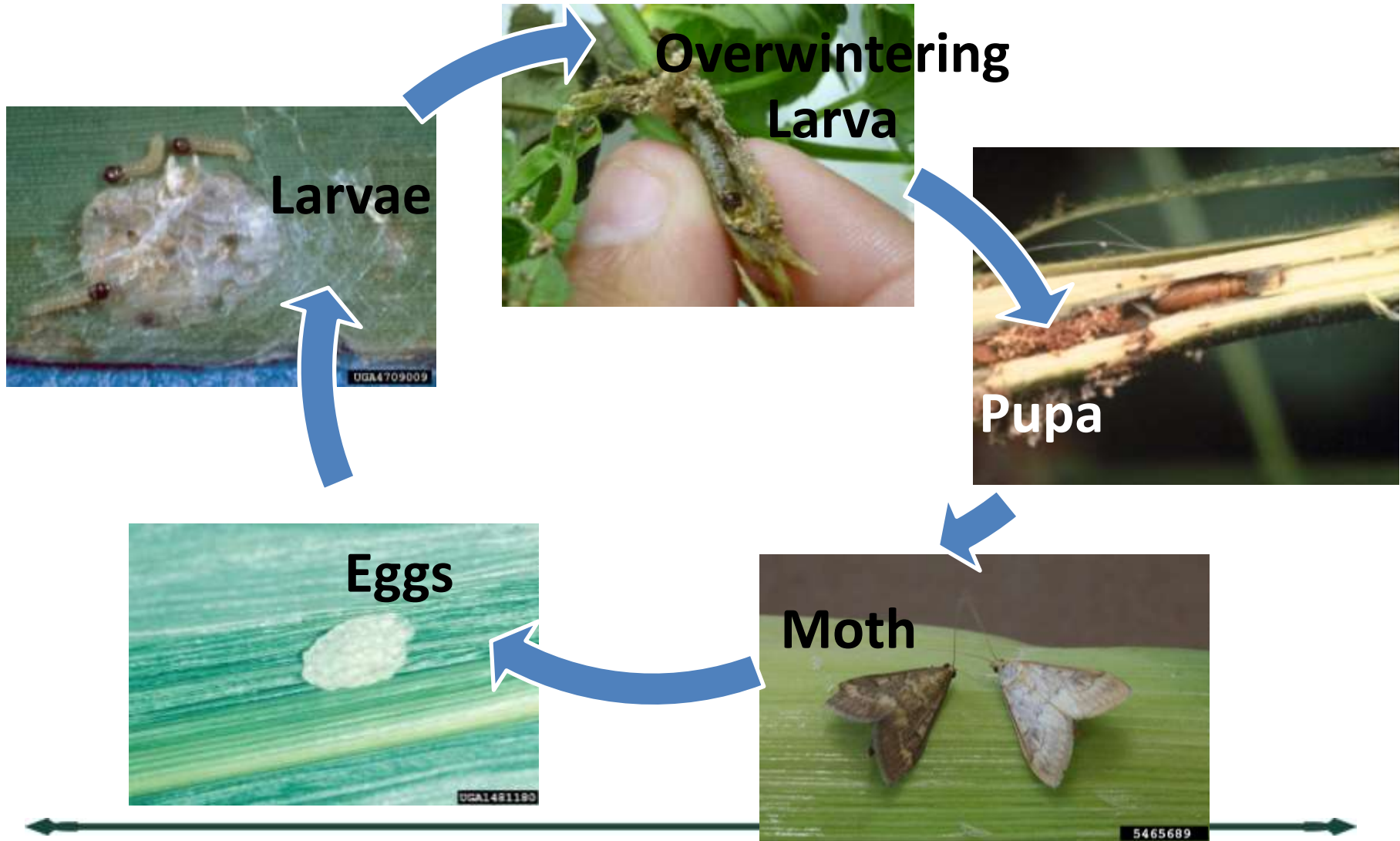


# European Corn Borer

- *Ostrinia nubilalis* is a moth species native to Europe
- Has a relatively diverse host range, including hop
- 2019 outbreak in some Michigan hopyards, likely caused by delayed planting in corn



# European Corn Borer Lifecycle



# European Corn Borer

- Completes 1-2 generations in MI
- 1<sup>st</sup> adult flight is expected from 450-950 DD50
- Adults emerge and mate
- Females lay eggs over 2-3 weeks
- Eggs hatch begins 16d after adult emergence
- Larvae feed externally 12d before boring into stems
- Second generation flight occurs from 1450-1950 DD50



Figure 1. Approximate distribution of annual generations of European corn borer in the United States and Canada.

Iowa State University NCR 0372





# MI Adult Flight Dates

**Approximate MI Adult ECB Flight Based on 2018 DD Average**

|                         | GEN 1 (450-950DD) | GEN 2 (1450-1950DD)         |
|-------------------------|-------------------|-----------------------------|
| Hawks (NE)              | June 11- July 10  | <del>Aug 7 - Sep 3</del>    |
| Traverse City (NW)      | June 3 - July 1   | <del>July 22 - Aug 14</del> |
| Linwood (E Central)     | May 31- July 1    | <del>July 24 - Aug 18</del> |
| Hart (W Central)        | June 3 - July 1   | <del>July 24 - Aug 18</del> |
| Berrien Springs (SW)    | May 27 - June 20  | July 11 - Aug 4             |
| Commerice Township (SE) | May 29 - June 27  | July 17 - Aug 10            |



- During ‘warmer’ years, flight will occur earlier and emergence will be more condensed (up to 25 DD50 per day would shorten emergence to less than 20 days)
- During ‘cooler’ years, flight will occur later and be longer (more than 30 days)



## 2019 European Corn Borer Damage in MI

- ECB larvae damaged vascular tissue
- Disrupted the flow of nutrients and water, impeding plant development
- Affected sidearm and cone development stages, greatly reducing yield and likely quality





# European Corn Borer

- Symptoms of damage from ECB appear as generalized stunting and in some cases wilt
- Plants fail to thrive and may lose their ability to climb the coir
- Check for stem wounds along bines, particularly where sidearms originate or bines contact each other or the coir
- The larval frass appears a little like saw dust and is trapped in webbing
- You may also see holes or wounding
- Cut open bines where borer is suspected, you will see discolored tissue, frass and likely the larvae/pupae itself













# Scouting for ECB

- Focus on adults and eggs
- Eggs are smaller than the head of a pin, but laid in scale-like groups
- Eggs are white when laid, but change to yellow and develop a black spot just before hatching
- Eggs are likely deposited on the underside of hop leaves in masses of 20-30 and covered with a waxy film



*Ronald Smith, Auburn University, Bugwood.org.*

## ECB Scouting

- Larvae are light gray to faint pink caterpillars with a dark head
- Larvae have dark spots along the sides on each segment and a pale stripe along the back
- Grow to about one inch but start out very small at hatch



## ECB Scouting

- Pupae are smooth, brown, cylindrical and found **inside** bines
- Moth is about 1" and light brown with wavy bands across the wings
- The tip of the body protrudes beyond the wings



Ronald Smith, Auburn University, Bugwood.org.

# Monitoring

- Monitoring for adult flight and egg laying is critical to assessing risk and properly timing the start of pesticide application to control ECB
- Unfortunately, simple wing or bucket traps used for other 'field crop moths' cannot be used to trap ECB
- Growers should begin scouting for adults/eggs before predicted flight begins at 450 DD50 and 1450DD50 respectively





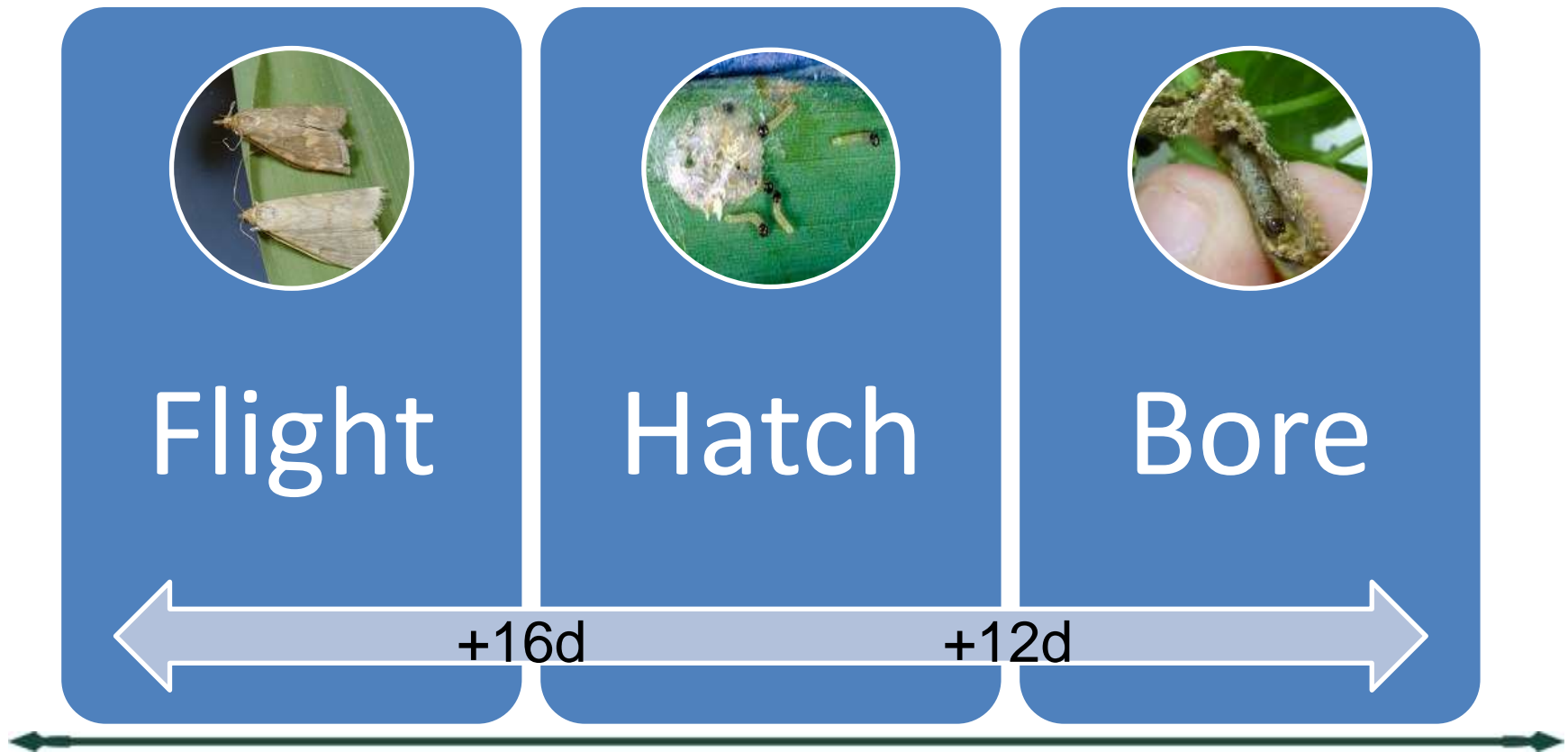
## Monitoring for ECB

- May use a sweep net at dusk/dawn to catch adults in grassy areas adjacent to fields
- Consider establishing a trapping and monitoring system with neighboring hop or corn growers to limit the workload on any one individual farm
- Growers can also work with neighboring corn growers (non Bt corn) to monitor their crop for egg masses as an indication of risk



# ECB Management

- Insecticides should be applied to **control larvae before they enter the protection of the bine**



# ECB Management

## Larvacides

- Registered spinosad for hop growers include Entrust\*, Entrust SC\*, and SpinTor 2SC\*
- Coragen (chlorantraniliprole)
- *Bacillus thuringiensis* (Biobit HP, Crymax Bioinsecticide, Deliver, Dipel DF\*, Dipel ES, Javelin WG, Xentari\*)

## Larvacidal and moth activity

- Product containing pyrethroids (too many to list) will also likely be effective though more disruptive to natural enemies



# Biological Control

- *Trichogramma ostriniae*
- Attack eggs and has shown efficacy in pepper in New England
- Released weekly during adult flight
- Release rate in peppers 90-120,000/acre weekly
- Requires modified insecticide use on the farm

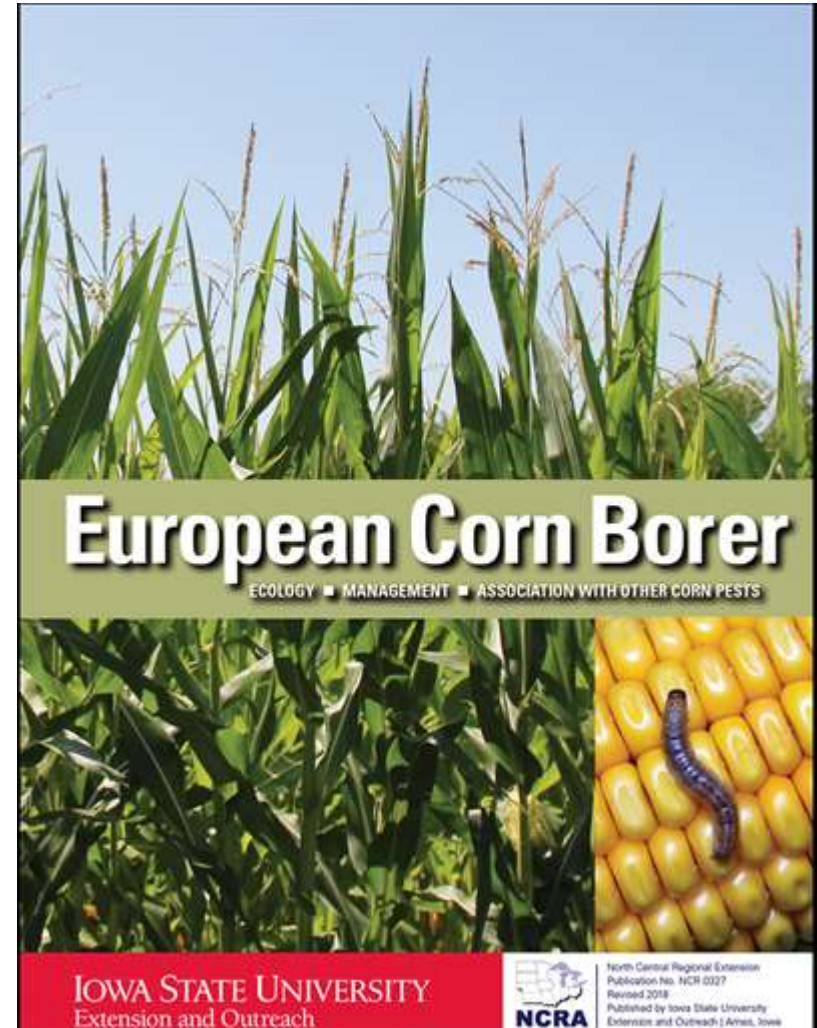


Peggy Greb, USDA Agricultural Research Service, Bugwood.org



# ECB Management

- Fields with substantial infestations should carefully dispose of crop waste
- Management should be based on continued monitoring
- For more information on the European corn borer, refer to the Iowa State University publication, European Corn Borer – Ecology and Management and Association with other Corn Pests



# Preparing for spotted lanternfly



**Prepared by Rufus Isaacs**

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**Original slides developed by**

Heather Leach, David Biddinger, Michela Centinari, Greg Krawczyk, Erica Smyers, and Julie Urban

Pennsylvania State University

hll50@psu.edu

# Spotted lanternfly



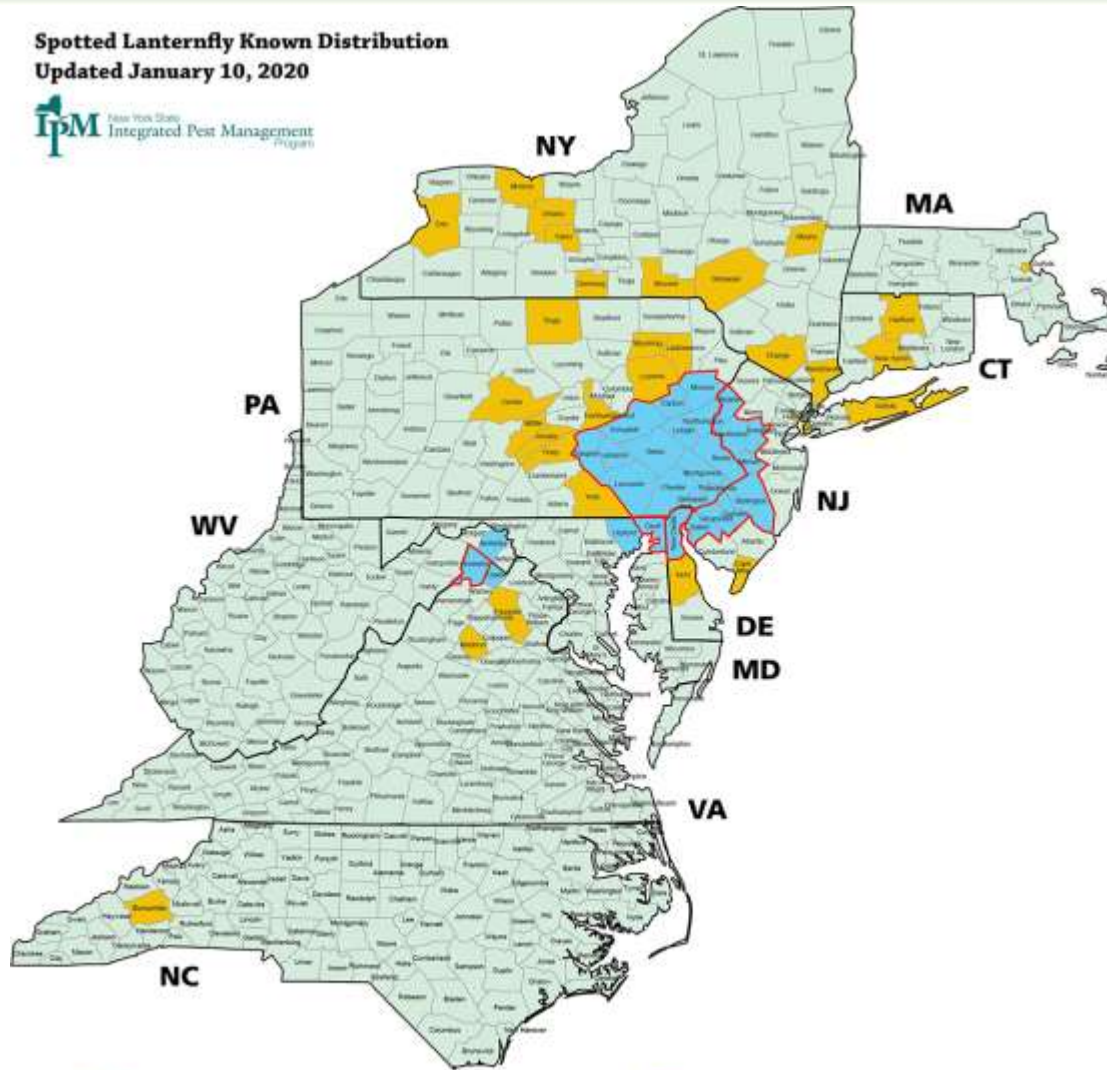
## NEW INVASIVE PEST




Native to Asia,  
found in  
southeastern PA  
in 2014

Now **spread to**  
NY, MA, CT, DE,  
VA, NC



**Spotted Lanternfly Known Distribution**  
Updated January 10, 2020

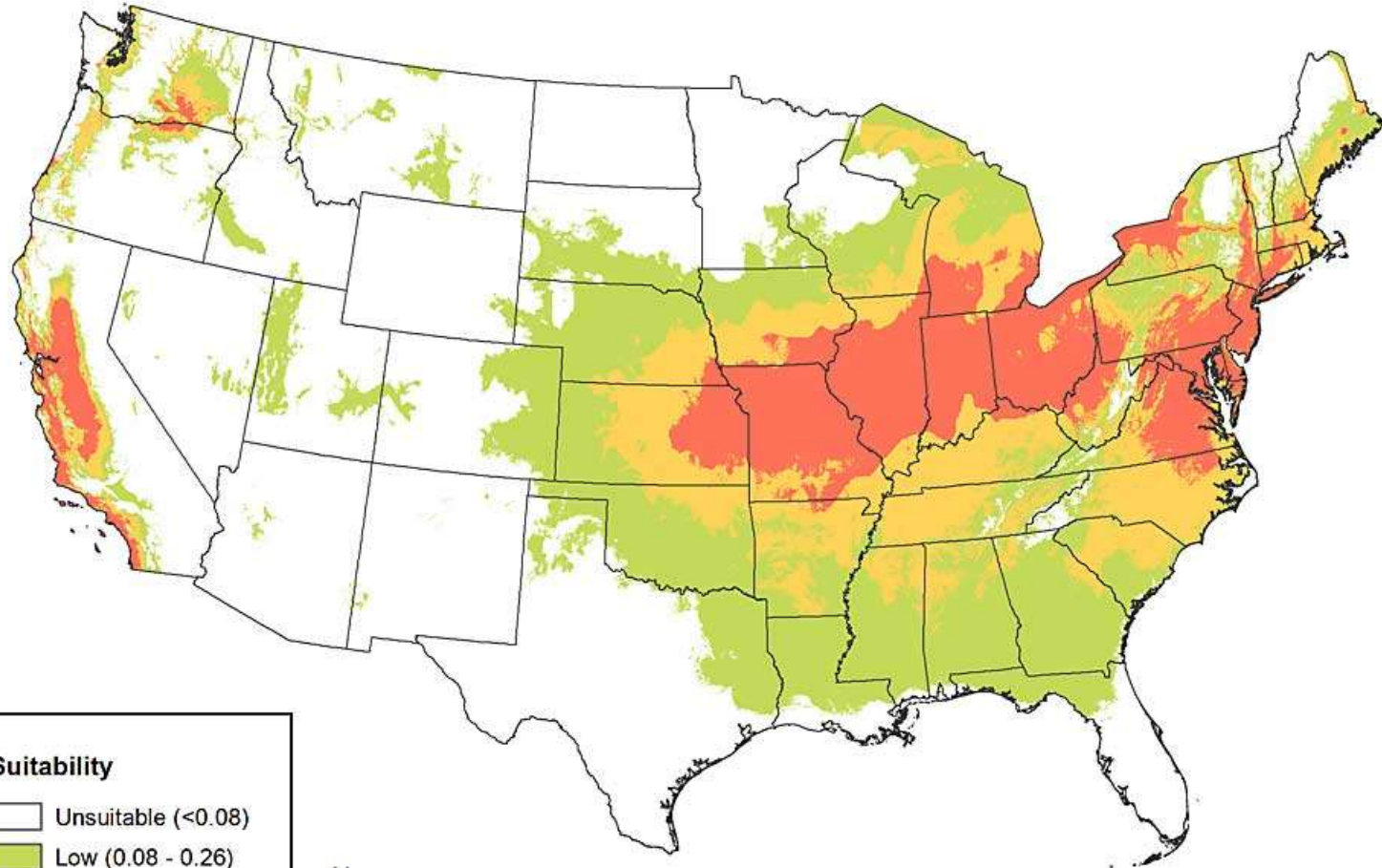


 NY external quarantine areas. Spotted lanternfly infestation found.  Spotted lanternfly found, no infestation.  
 Internal state quarantine areas.



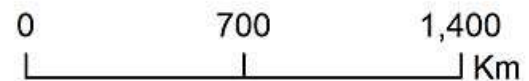


### Potential distribution of spotted lanternfly in the United States



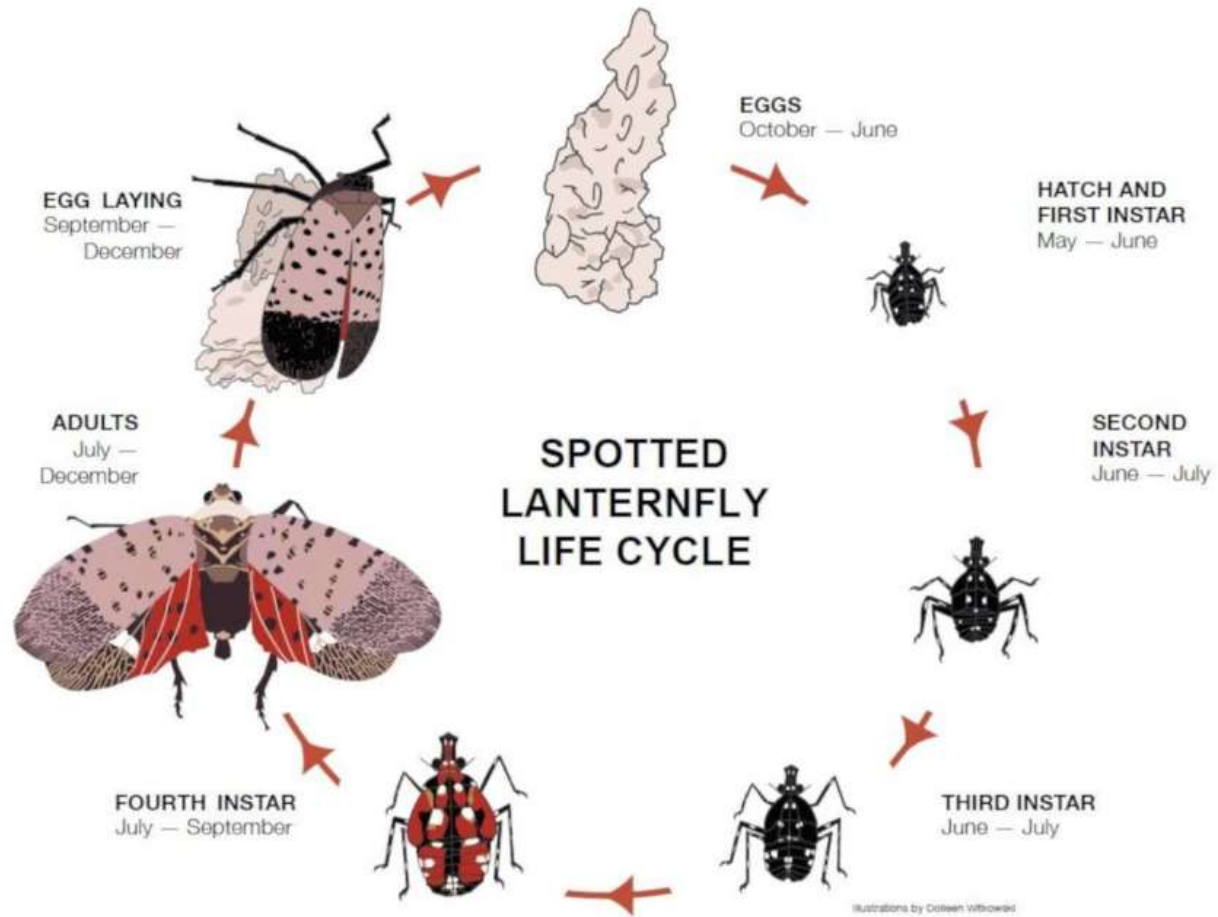
**Suitability**

- Unsuitable ( $<0.08$ )
- Low (0.08 - 0.26)
- Medium (0.26 - 0.51)
- High (0.51 - 0.93)



Datum: North American 1983  
Coordinate System: USA Contiguous  
Albers Equal Area Conic





# SLF life stages



E. Swackhamer



PA Department of Agriculture



PA Department of Agriculture



PA Department of Agriculture



PA Department of Agriculture

- A. Egg masses
- B. Early nymph
- C. Late nymph
- D. Adult, wings closed
- E. Adult, wings open



# Insects that resemble SLF



Gerald J. Lenhard, Louisiana State University, Bugwood.org



Herb Pilcher, USDA Agricultural Research Service, Bugwood.org

Tiger moth



Elizabeth Benton, University of Georgia, Bugwood.org

Green stink bug nymphs



Herb Pilcher, USDA Agricultural Research Service, Bugwood.org

Great leopard moth



Rebekah D. Wallace, University of Georgia, Bugwood.org



# SLF has a broad host range



## HOSTS

**tree-of-heaven**

grape

apple

black walnut

silver/red maple

river birch

willow

& others

Substantial feeding  
not recorded on  
conifers

# Tree-of-heaven identification

## TREE of HEAVEN

Male and female trees

Reproduces by seed (samaras) or by “clones”

Bark has appearance of **cantaloupe** skin.

Leaf scars have a heart shape.

Few other animals are recorded on tree-of-heaven



Dave Jackson

Steve Baskauf



Dave Jackson



Dave Jackson





# Preparations

- SLF on the state watch list for invasive pests
- State and local organizations increasing awareness
- APHIS Task Force established
- Close connections with PSU research & extension
- Monitoring detections in other states
- MSU fact sheet available
- Report first any suspected sightings or samples to your state department of ag and MSU



# Resources

- [IPM.msu.edu](http://IPM.msu.edu) > invasive pests
- [Hops.msu.edu](http://Hops.msu.edu)
  - Michigan Hop Management Guide
  - Hop IPM Field Guide
  - Scouting flip guide
- Bine and Dine Webinar Series
- Great Lakes Hop Working Group Online Course
- Facebook: Michigan State University Hop News
- Sign up to receive scouting reports







United States Department of Agriculture  
National Institute of Food and Agriculture

This work is supported by the Crop Protection and Pest Management Program 2017-70006-27175 from the USDA National Institute of Food and Agriculture. Any opinions, findings, conclusions or recommendations expressed in this publication are those of the author(s) and do not necessarily reflect the view of the U.S. Department of Agriculture.