



# Invasive pests

## Past, Present, and Future

NACAA 365 Webinar, 8 September 2021



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**COOPERATIVE EXTENSION**  
*College of Agriculture, Forestry and Life Sciences*



*Department of*  
**FORESTRY AND ENVIRONMENTAL  
CONSERVATION**

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But first...a disclaimer...



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# Terms

Native = from here

Non-native = not from here

Exotic = not from here

Alien = not from here

## **Invasive**

Not from here

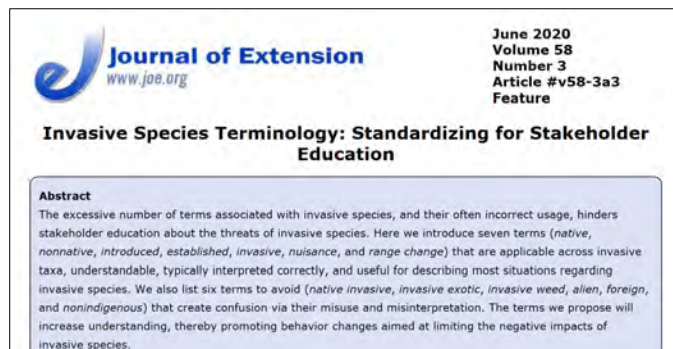
Causes damage

Displaces natives

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# Journal of Extension

<https://tigerprints.clemson.edu/joe/>

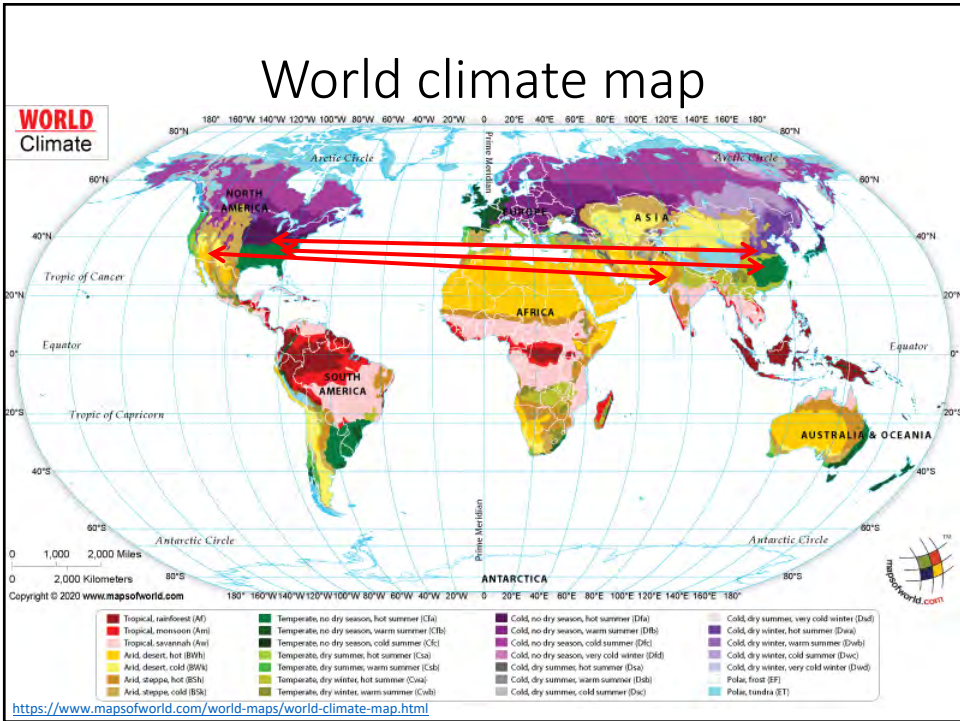


Iannone, B. V., Carnevale, S., Main, M. B., Hill, J. E., McConnell, J. B., Johnson, S. A., Enloe, S. F., Andreu, M., Bell, E. C., Cuda, J. P., & Baker, S. M. 2021. Invasive Species Terminology: Standardizing for Stakeholder Education. *The Journal of Extension*, 58(3), Article 27. <https://tigerprints.clemson.edu/joe/vol58/iss3/27>

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### How do invasive insects/fungi get here?

This block contains a collage of four images illustrating pathways for invasive species:

- Top left: A large container ship at sea, heavily loaded with multi-colored shipping containers.
- Top right: Stacks of wooden pallets, a common mode of transport for goods.
- Bottom left: An aerial view of a busy port terminal with numerous shipping containers and cranes.
- Bottom right: A pallet of potted plants, showing how biological organisms can be transported.

Below the images, several URLs are provided as sources for further information:

<http://www.cruisersforum.com/forums/f47/shipping-containers-in-sf-bay-and-at-sea-157886-3.html>, <http://www.lee-associates.com/logistics/2016/10/03/port-of-savannah-by-the-numbers/>, <http://irvinewoodrecovery.com/services/pallet-services/pallet-repair-cincinnati/>, <http://www.impactplants.co.uk/product/container-grown-portuguese-laurel-plant-pallet-deals/?v=7516d43adaa>

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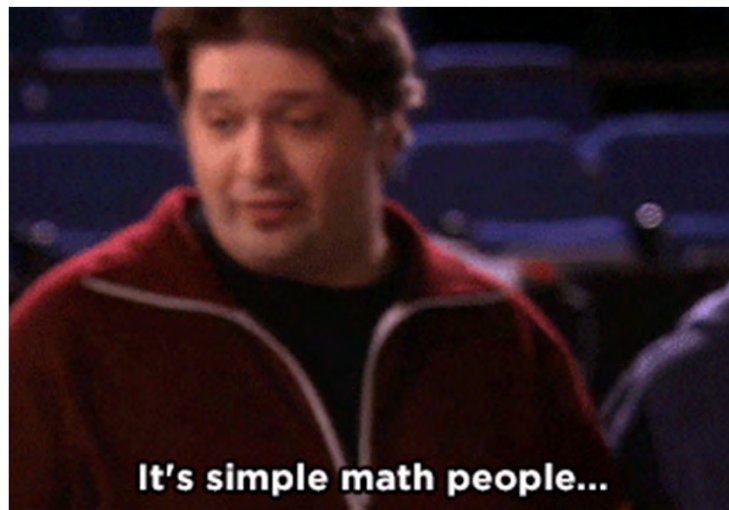
Once they're here, they move around



<http://rosecity-mi.us/tag/firewood/>; <https://www.forestryimages.org/browse/detail.cfm?imgnum=1197026>;  
[https://extension.entm.purdue.edu/GM/index.php?page=home\\_before](https://extension.entm.purdue.edu/GM/index.php?page=home_before)

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How do invasive plants get here?



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## When did they get here?

Tree-of-heaven	1784
Mimosa	1745
Paulownia	1844
Chinaberry	1830
Callery pear	1908
Russian olive	late 1800s
Autumn olive	1830
Chinese tallowtree	1776
Chinese privet	1825
Japanese privet	1845
Bush honeysuckle	1800s
Nandina	1804
Invasive roses-multiflora	1866
Cogongrass	1911

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## Invasive plants: Why did they get here?



Reminder of home



Business opportunity

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## Invasive plants are often introduced as ornamentals or forages



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## Invasive plants are often introduced as ornamentals or forages

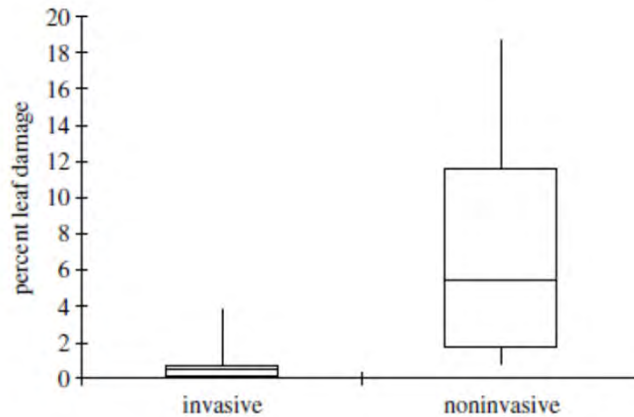
<u>The ideal forage plant<sup>a</sup></u>	<u>The common invasive plant<sup>b</sup></u>
Easy to establish	Germinates in many environments
Adequate seed production, seedling vigor	Extensive seed production with good seed longevity
Vegetative reproduction	Vigorous vegetative reproduction
Rapid growth rate and high yield	Rapid growth (vegetative phase to flowering)
Competes for resources	Competes interspecifically (structure, allelopathy)
Resistant to herbivory or removal	Armed or toxic to escape herbivory
Insect and disease resistant	Free from native predators

<sup>a</sup> Adapted from Barnes et al. 2007.

<sup>b</sup> Adapted from Baker 1974; Sutherland 2004.

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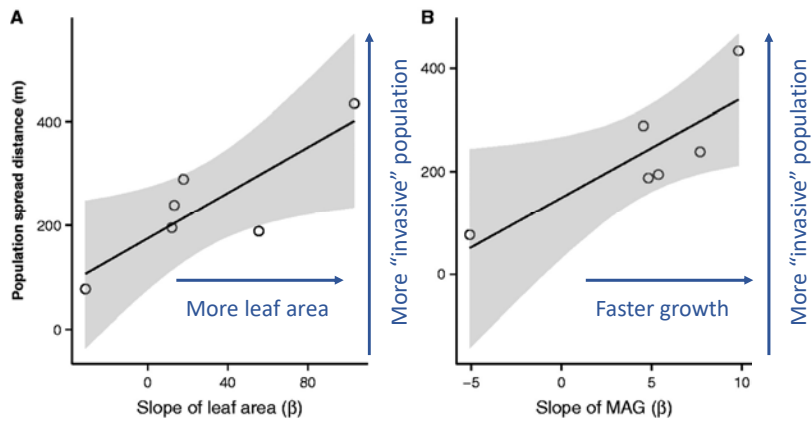
## Few things eat invasive plants



Cappuccino & Carpenter. 2005. *Biology Letters* 1:435-438.

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## Invasive plants have rapid early growth and can adapt to new environments



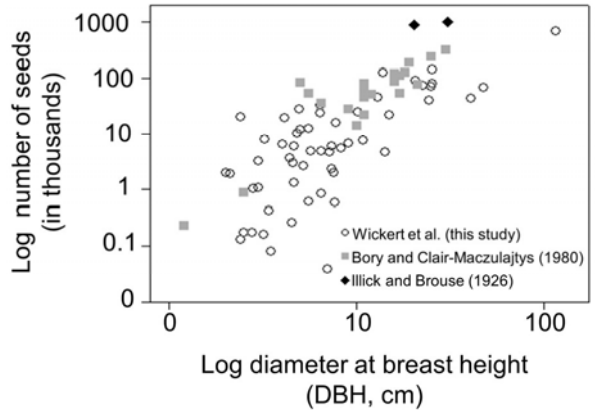
Zenni et al. 2016. *AoB Plants* 8:plw048.

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# Invasive plants can produce a LOT of seeds

*Ailanthus altissima*: 10 million seeds in a 40-yr lifetime



Seed viability >65%

Wickert et al. 2017. Forests 8(7),226.

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# Invasive plants often establish in disturbed areas

*Juncus bulbosus* in a disturbed area near Lake Ina, Australia



de Salas et al. 2014. Kanunnah 7:168-188.

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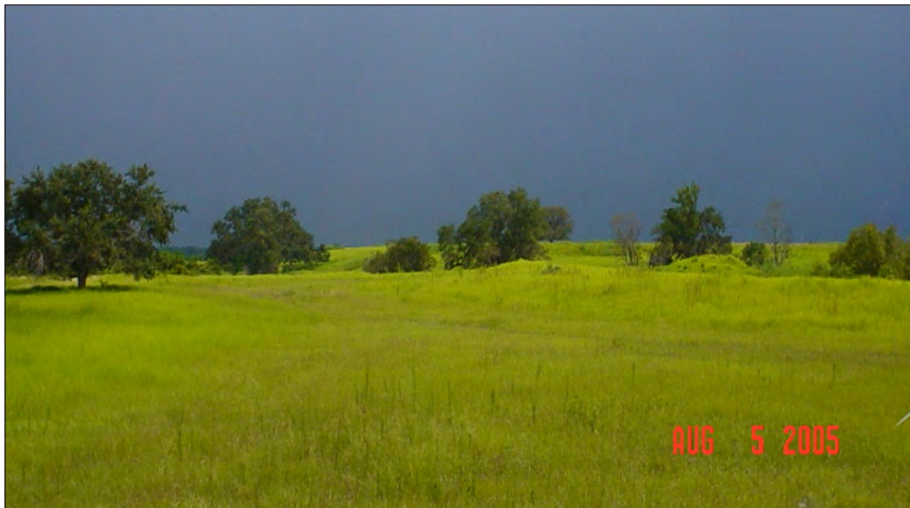
Invasive plants have very hearty roots or rhizomes



<http://www.bamboo.org>

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Invasive plants often form exclusive, dense infestations



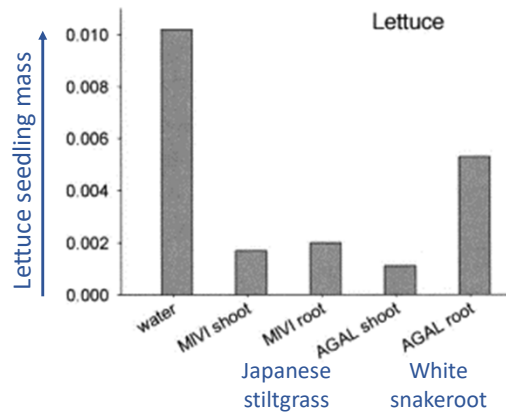
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Invasive plants have a wide tolerance to many environmental conditions



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Invasive plants often have allelopathic chemicals that can suppress competing plant growth



Corbett & Morrison. 2012. Northeastern Naturalist 19:297-312.

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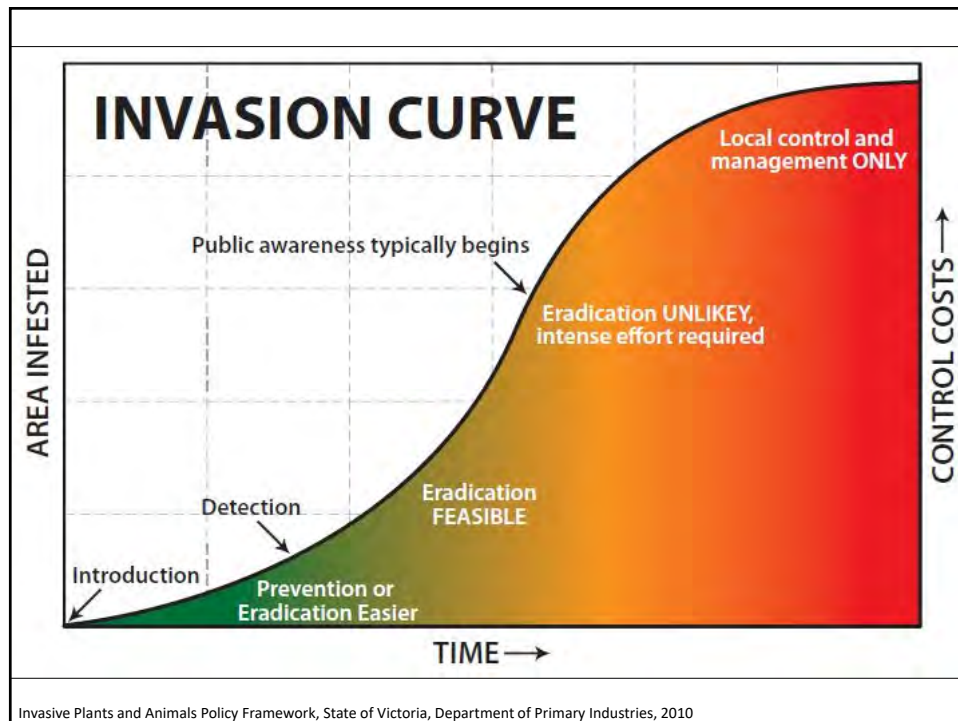
# Invasive plants may employ a “sit and wait” strategy



Oriental bittersweet  
Seedlings establish  
Wait for canopy gap  
Aggressively overtake trees

Greenberg et al. 2001. Biological invasions 3:363-372. Photo by Bugwood.

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## County Extension Agents are on the frontline for invasive species detection

More interaction with stakeholders than most  
specialists

More time in the field than most specialists

Better local, on-the-ground connections




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# First Detection

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Example:  
County Ag Agents first discovered the kudzu bug in Georgia

<https://www.kudzubug.org/>



**Discovery and Identification of *M. cribraria* in Georgia**

In mid- to late-October 2009, county agents from Barrow, Jackson, and Gwinnett Counties with the Georgia Cooperative Extension Service (University of Georgia's College of Agricultural and Environmental Sciences) and employees from several independent pest management firms in northeast Georgia filed numerous reports with the University of Georgia's Homeowner Insect and Weed Diagnostics Laboratory (Griffin Campus, Griffin, GA) regarding large numbers of insects that had aggregated on the outside walls of houses. On October 28, 2009 J. E. Eger


<https://academic.oup.com/iipm/article/1/1/F1/857477>

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# Range Expansion

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Example:  
Emerald ash borer



UCR5016065




2006 (Before EAB) 2009 (After EAB)


**Millions of trees. Billions of dollars.**

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### Emerald ash borer life cycle



As early as late March  
Peak in April/May  
End in late June




April-June



Eggs hatch in  
1-2 weeks

Has preceded leaf-out  
by 1-2 wks



Adults feed on foliage

BUT adults can survive  
1-2 wks without food

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## Emerald ash borer life cycle



Larval period = rest of spring/summer/fall/early winter



Winding galleries



Frass-packed galleries

Pupate in Jan-Feb

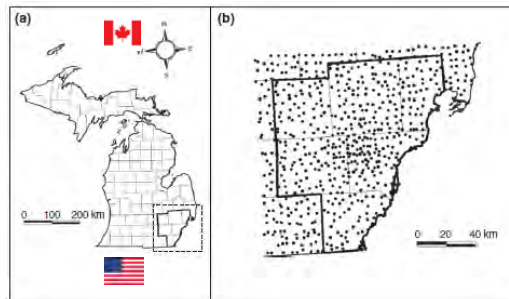
Pupal chambers

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## When did EAB get here?

Sampled 1085 trees

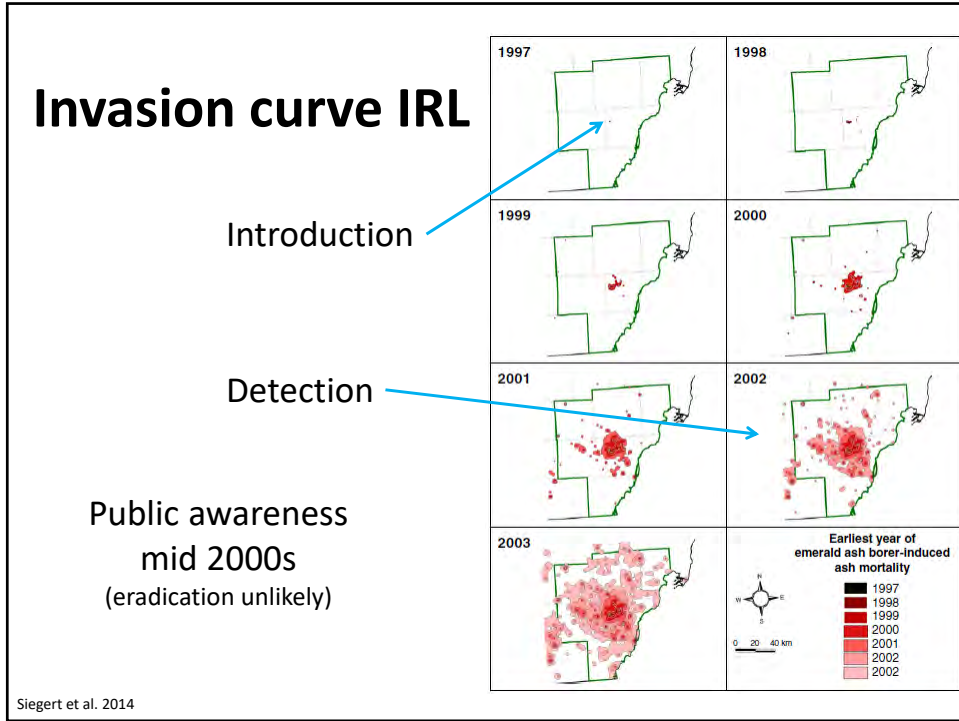
Original 6 county quarantine area



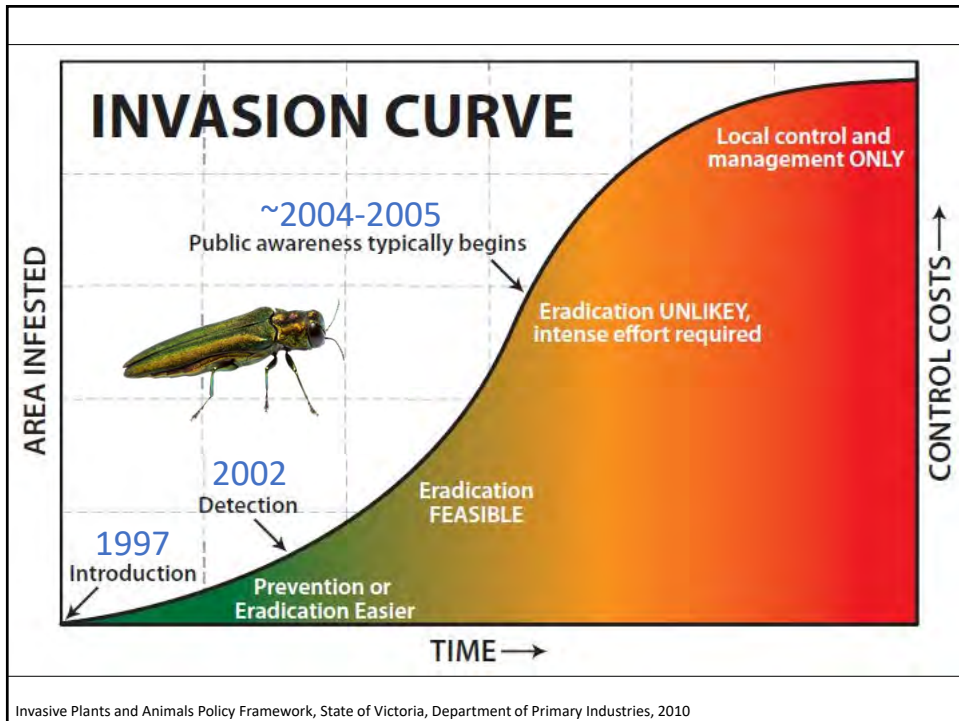
Siegert et al. 2014

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## EAB: What to look for

Declining/thinning crown



Epicormic sprouts



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## EAB: What to look for

Cracking/  
swollen bark



D-shaped holes



Winding galleries  
under bark



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## EAB: What to look for



Ash blanding



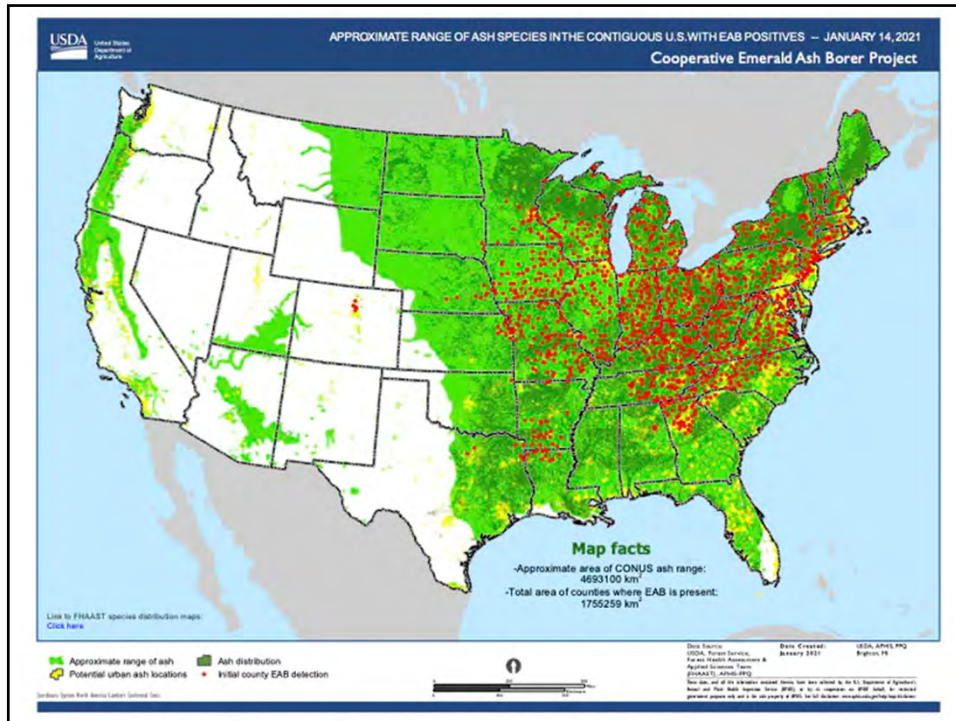
37

## EAB: What to look for

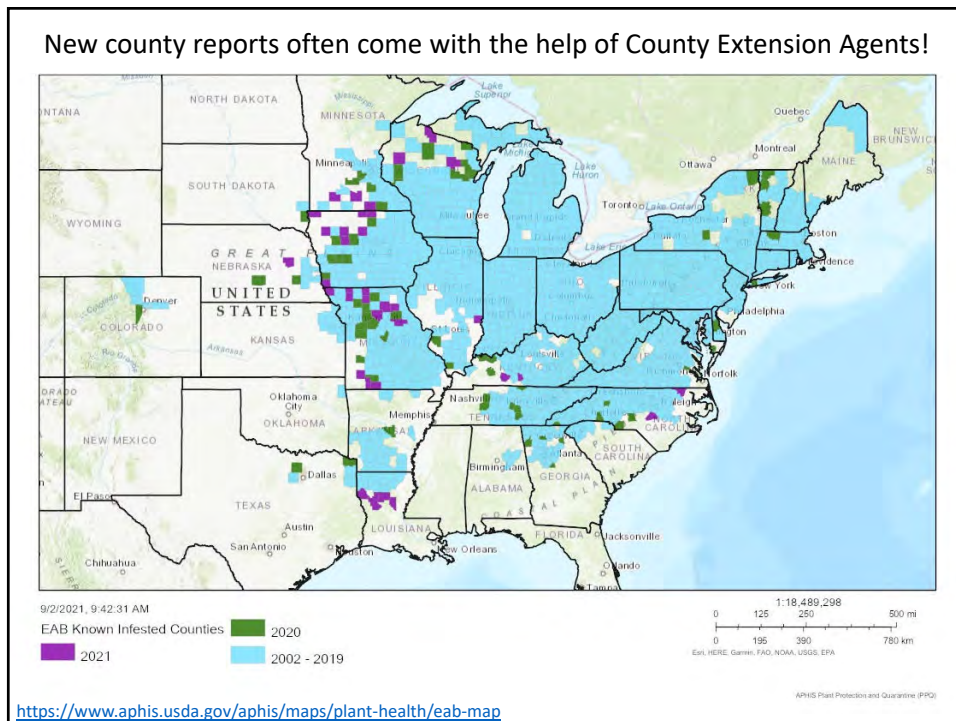
Woodpecker activity



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## Early intervention is critical for saving an ash tree

Good < 10%	Fair > 10% and ≤ 30%	Poor or worse > 30% thinning
10% thin	30% thin	50% thin





From C. Sadof webinar, 28 March 2018, available at <http://southernforesthealth.net/webinars>

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## EAB chemical control

Systemic  
Basal drench  
Trunk injections  
Trunk sprays

Imidacloprid  
Dinotefuran  
**Emamectin benzoate**  
Azadirachtin



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## EAB management in natural stands

Biocontrol

Stand manipulation



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While EAB has been sort of a “slow burn”, ALB was much different...



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ALB – found in SC in May 2020



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## Asian longhorned beetle (*Anoplophora glabripennis*)

Native to Asia

Extremely wide host range (>220 spp.)

Eradication efforts

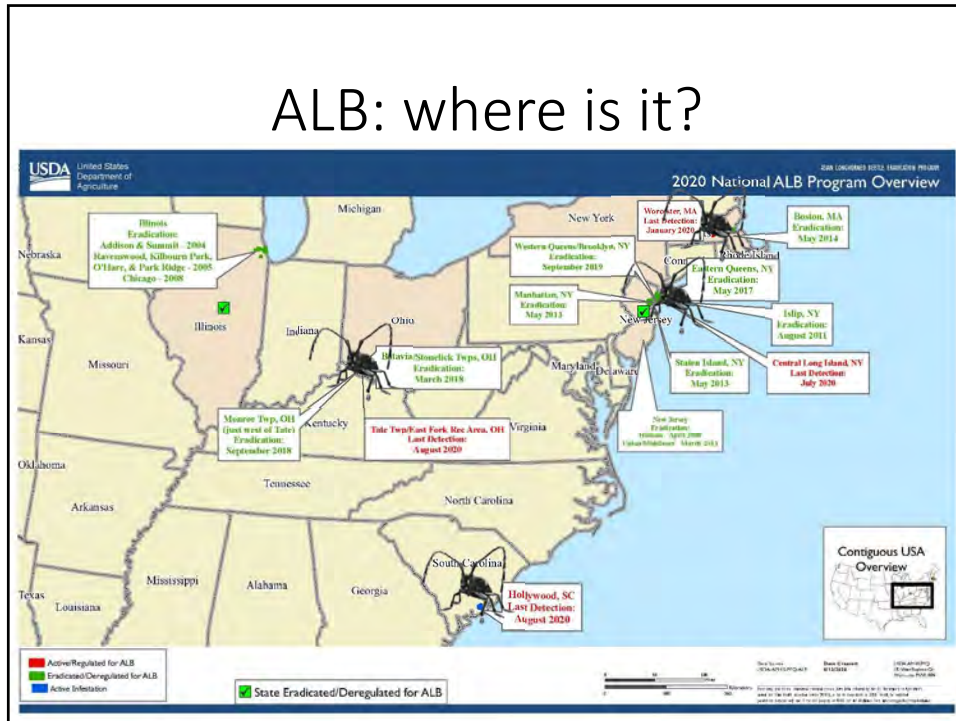
Large, bluish feet

White bands on antennae

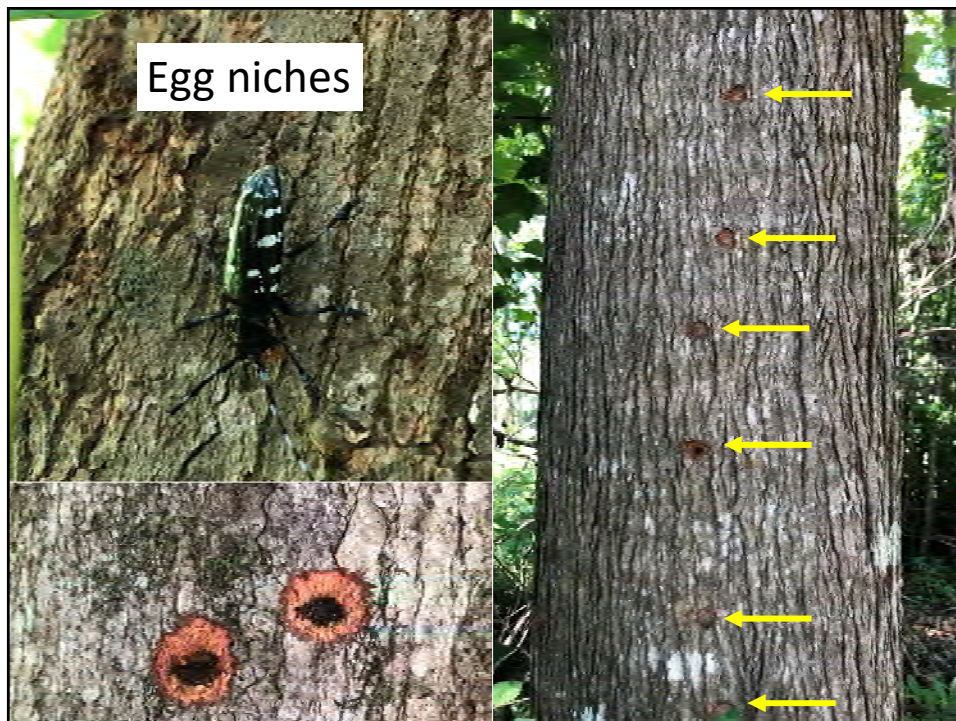


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# ALB: where is it?



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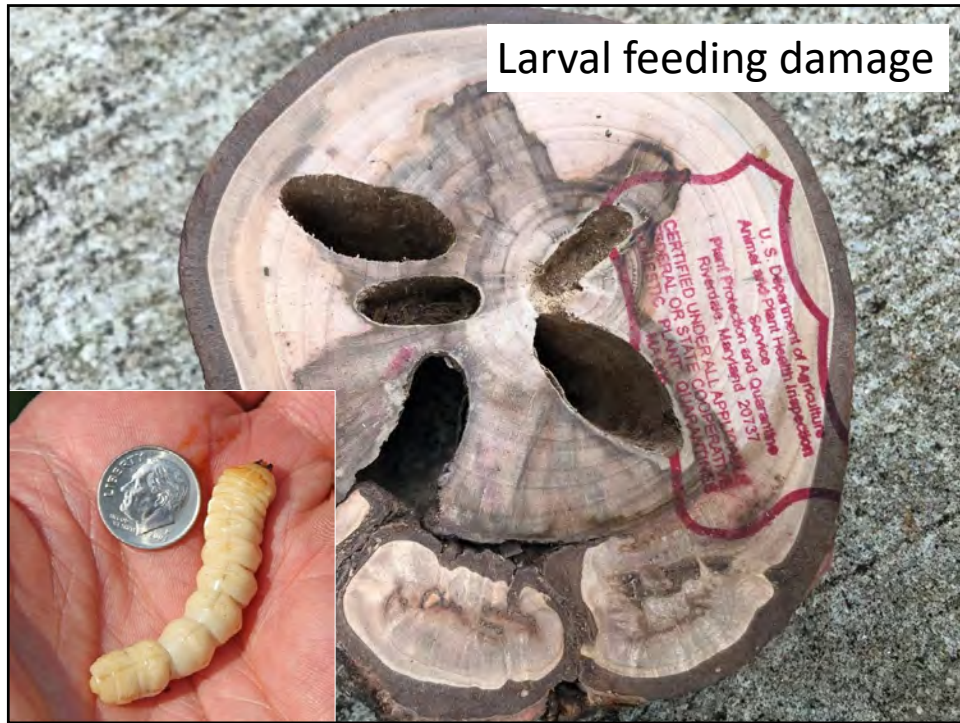




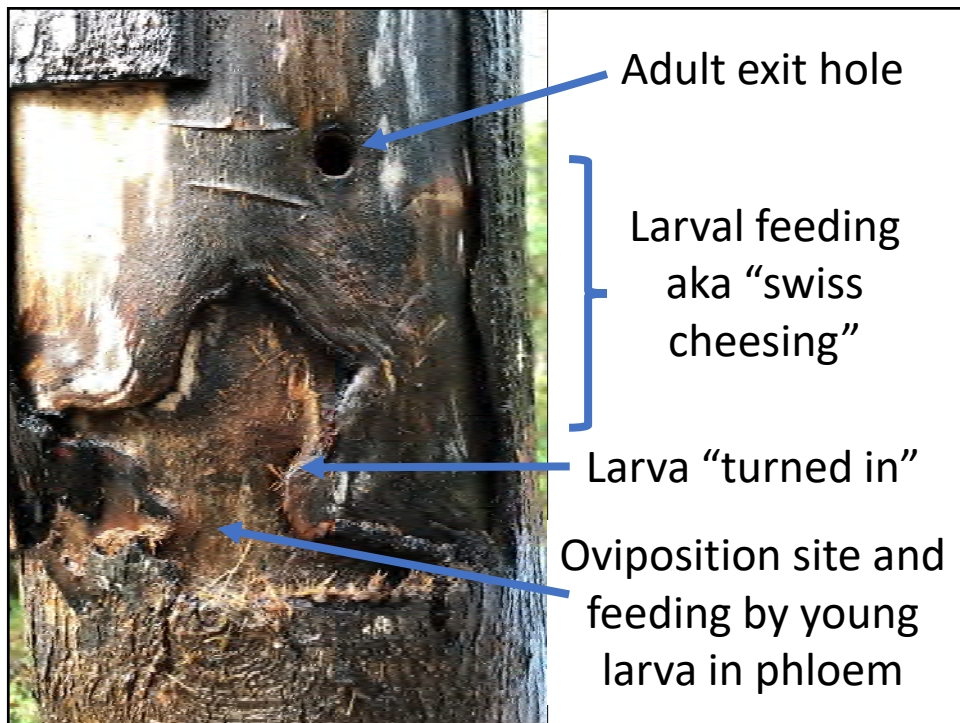
49



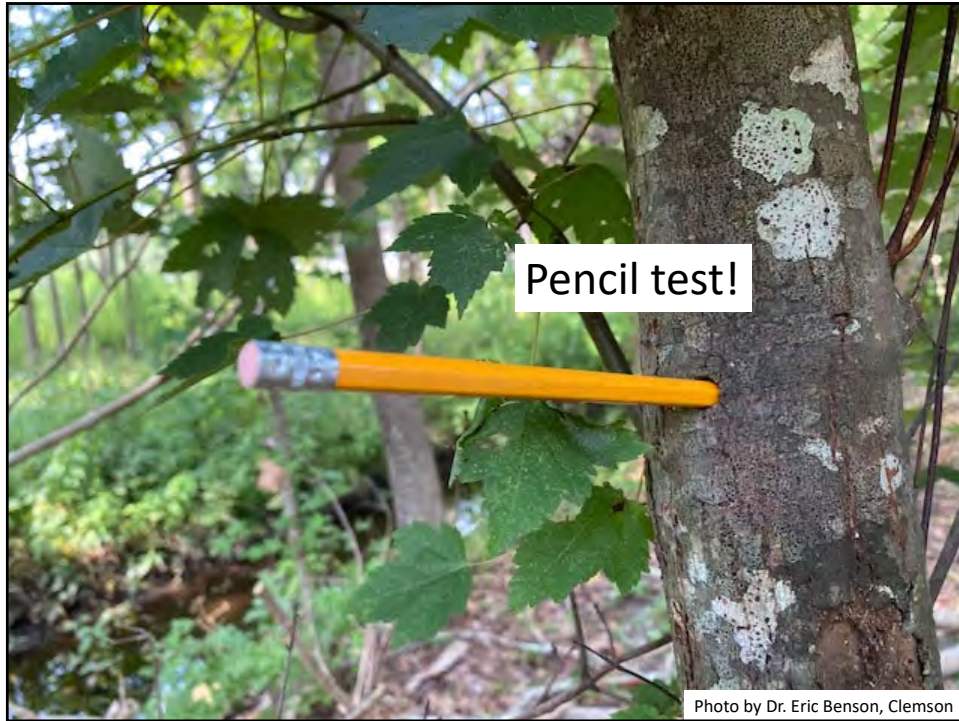
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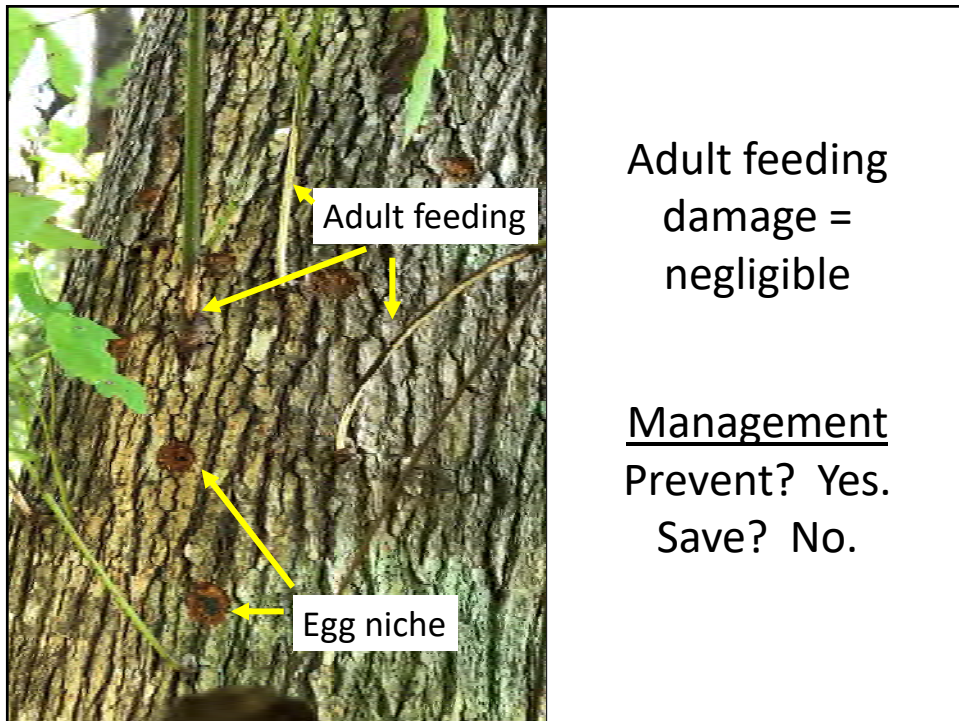
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About 45,500 trees surveyed

~41,000 uninfested

~4,500 infested

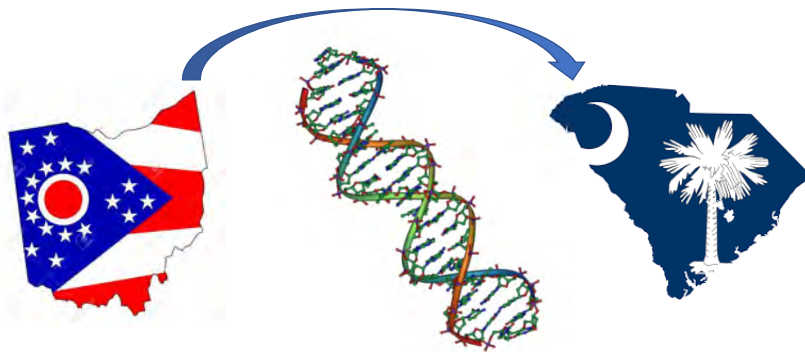
~98% maple

The screenshot shows the journal article page for "First Recorded Asian Longhorned Beetle (Coleoptera: Cerambycidae) Infestation in the Southern United States". The authors listed are David R Coyle, R Talbot Trotter, Meredith S Bean, and Scott E Pfister. The article is from Volume 12, Issue 1, 2021, published on 10 March 2021. The page also features a navigation bar with "Issues", "Special Collections", "Submit", "Alerts", and "About" options, and a search bar. A "PDF" icon is visible on the right side of the article preview.

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ALB: how did it get here?

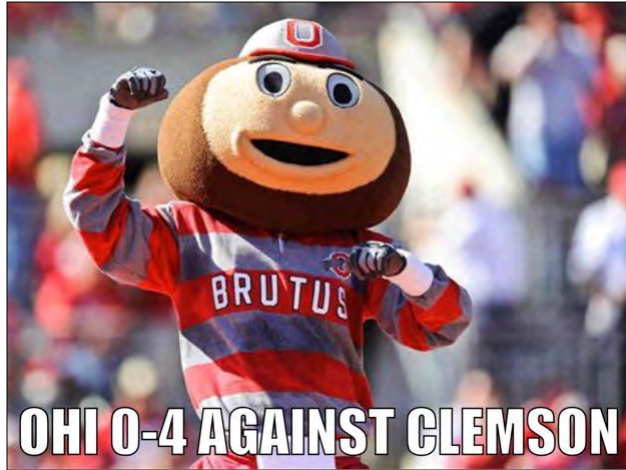
Genetics of first beetle matches Ohio population



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# ALB: how did it get here?

Genetics of first beetle matches Ohio population



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# ALB: how did it get here?



Genetics of first beetle matches Ohio population

(presented without comment)



College Football Playoff National Championship  
NCAA football

NCAA football - Mon, 1/11 Final

 24 - 52 

3 Ohio State Buckeyes (7-1) 1 Alabama Crimson Tide (13-0)

Final  
Limited in-person attendance

Team	1	2	3	4	T
Ohio State Buckeyes	7	10	7	0	24
Alabama Crimson Tide	7	28	10	7	52

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# ALB: how did it get here?



Could be from ALB's native range



China and the Koreas

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# ALB: how did it get here?



Could be from Europe



Javal et al. 2019. J. Pest Sci. 92:173-187.

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## ALB: how did it get here?

Port of Charleston ~20 miles  
Port of Savannah ~90 miles



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## ALB: how did it get here?

RV park



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# ALB: how did it get here?

Railroad



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# ALB: how did it get here?

Tourism

Charleston, Hilton Head, Savannah...



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Long story short:  
we don't know the origin.

Is all hope lost?

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## Asian longhorned beetle



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# Stakeholder Education

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# County Extension Agents will be critical to containing and eradicating ALB!

The screenshot shows a webpage from the NC Cooperative Extension. The main header includes the NC Cooperative Extension logo, N.C. A&T, and NC EXT. Navigation links for 'COUNTY CENTERS', 'TOPICS', 'CONTACT US', and 'GIVE NOW' are visible. A search bar is located in the top right. The article title is 'Asian Long-Horned Beetle Alert', written by Joanna Radford and last updated by Nicole Vernon. The author's bio identifies her as an Extension Agent for Agriculture and Natural Resources at the Surry County Center. A sidebar on the left lists various resources like COVID-19 Resources, Events, and Meet Our Staff. Social media sharing options for Twitter, Facebook, Email, and Print are provided on the right.

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## Spotted lanternfly (*Lycorma delicatula*)

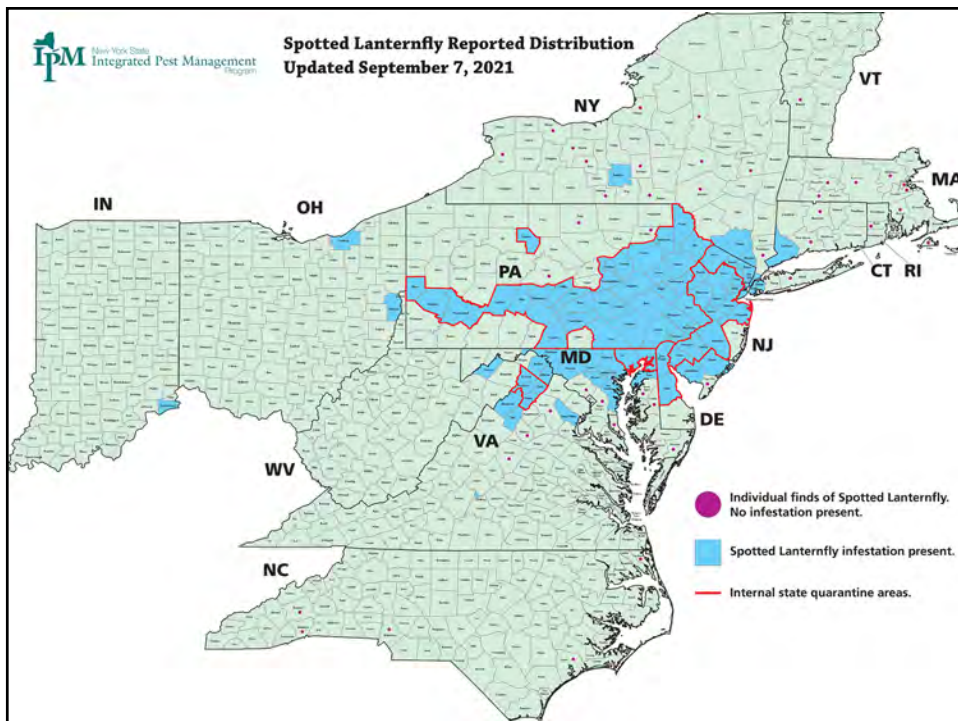
Major pest of fruit trees & vines  
Native to China, Bangladesh, Vietnam  
Pennsylvania, 2014



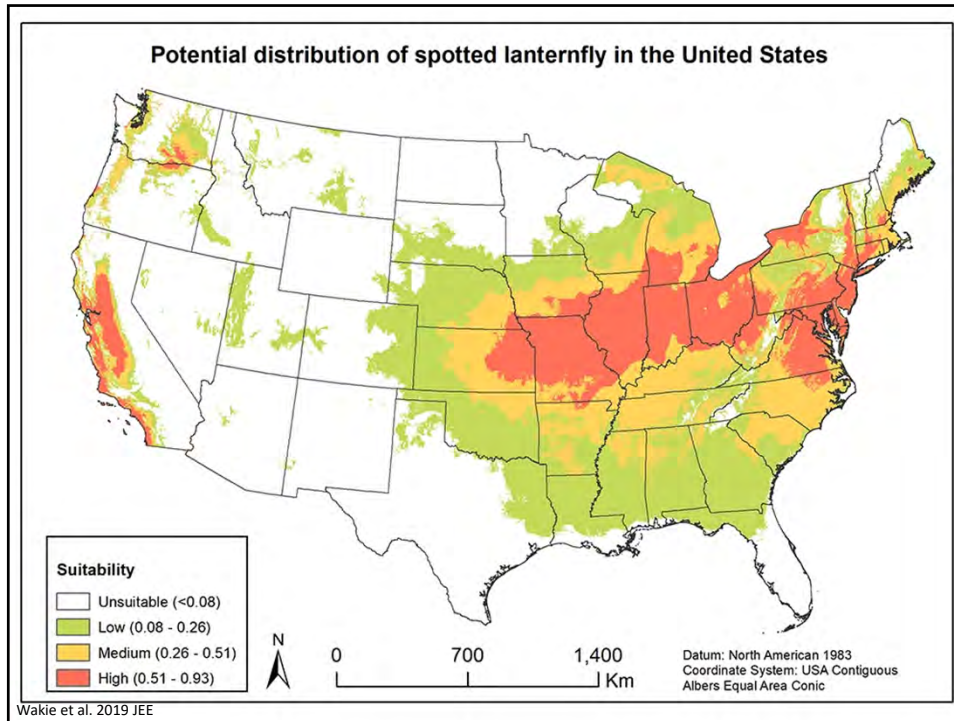
74



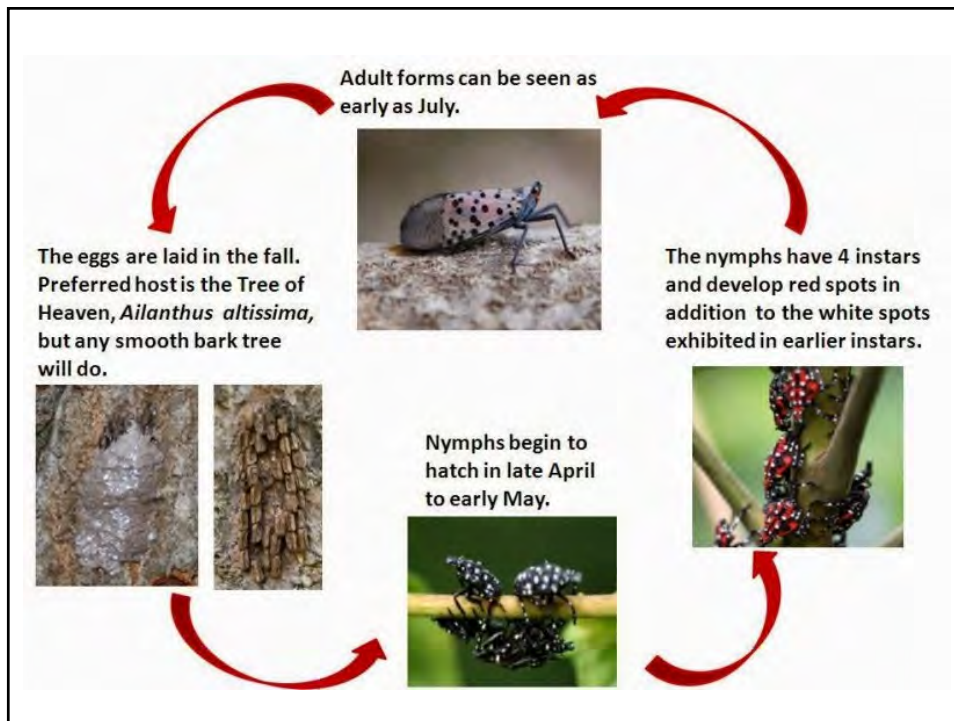
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## Strong preference for tree-of-heaven



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County Extension Agents are critical to  
containing and eradicating SLF!

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# County Extension Agents are critical to containing and eradicating SLF!

## Report Sightings of Invasives

**iMapInvasives** is an online tool for invasive species reporting and data management. This application can be downloaded to phones and used by the public to catalogue Spotted Lanternfly or Tree of Heaven.



### Report Online Here:

Report a Spotted Lanternfly in Virginia (Please include address of location and photo of insect or egg mass)

### Website Resources:

Virginia Cooperative Extension Resources for Spotted Lanternfly in Virginia

Virginia Department of Agriculture and Consumer Services (VDACS) Spotted Lanternfly Resources

### Spotted Lanternfly in Albemarle County:

The Albemarle County Extension office has been training volunteers and monitoring for Spotted Lanternfly at various sites across the county since April of 2020.

This invasive pest poses a significant threat to area vineyards, orchards and hops yards. In

**VIRGINIA TECH** **SLF**

460 Stagecoach Road  
Charlottesville, VA 22902

Hours: 8:00 a.m. to 5:00 p.m.  
Monday - Friday

Main Office: 434-872-4580  
Fax: 434-872-4578  
Contact Us / Directions

## Be our eyes in the streets!

You can help prevent the spread of the Spotted Lantern Fly which causes devastation to our agriculture, natural resources and home landscapes.

If you think you have seen a Spotted Lanternfly, please call CCE Rockland at 845-429-7085, ext. 3 or send a photo with locational information, such as an address or GPS coordinates, to NYS Department of Environmental Conservation:

**PennState Extension** MENU SEARCH ACCOUNT CART

LEARN HOW TO SLOW THE SPREAD OF THE INVASIVE SPOTTED LANTERNFLY

CORONAVIRUS INFORMATION AND RESOURCES FOR THE EXTENSION COMMUNITY

### Spotted Lanternfly Management and Pesticide Safety

Lycorma delicatula, commonly known as the spotted lanternfly (SLF), is an invasive insect pest present in Pennsylvania and some other eastern states. SLF threatens grape production, tree health and it is a nuisance in landscapes.

**EMILIE SWACKHAMER**  
Extension Educator, Fruit Industry

- Extension
- Management of Fruit Production
- Lygiformis delticatula (Spotted Lanternfly)
- Pesticides and Managing Pest Landscapes
- Stone Fruit Production

PHOTO BY EMILIE SWACKHAMER

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# Ongoing Management

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Example:  
County Ag Agent started Wild Pig  
Abatement Program

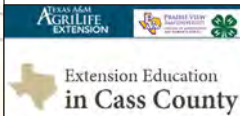
<https://cass.agrilife.org/wild-pig-abatement-program/>

Program run by residents

Hosts hunts and other reduction activities



Jessica Rymel



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# Multi-Agency Collaboration

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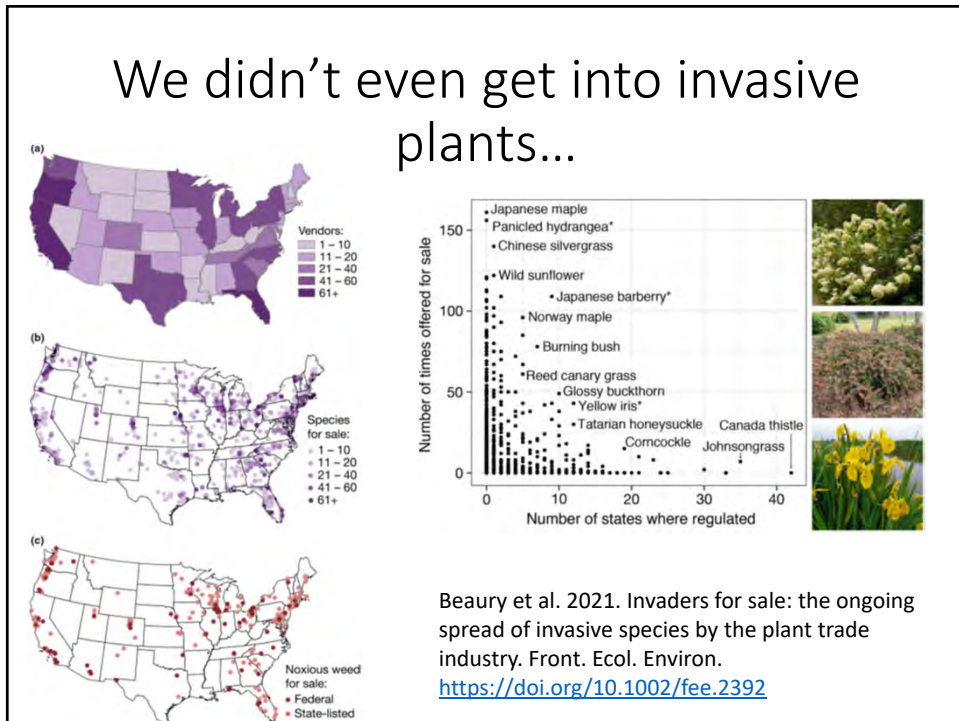
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Y'all are critical!  
Don't forget it.

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Questions?

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drdavecoyle

@drdavecoyle



*Department of*  
**FORESTRY AND ENVIRONMENTAL  
CONSERVATION**



**COOPERATIVE EXTENSION**  
*College of Agriculture, Forestry and Life Sciences*

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