

Pierce's Disease in NC

Risk, vectors, and management considerations

Hannah Burrack
Department of Entomology
North Carolina State University

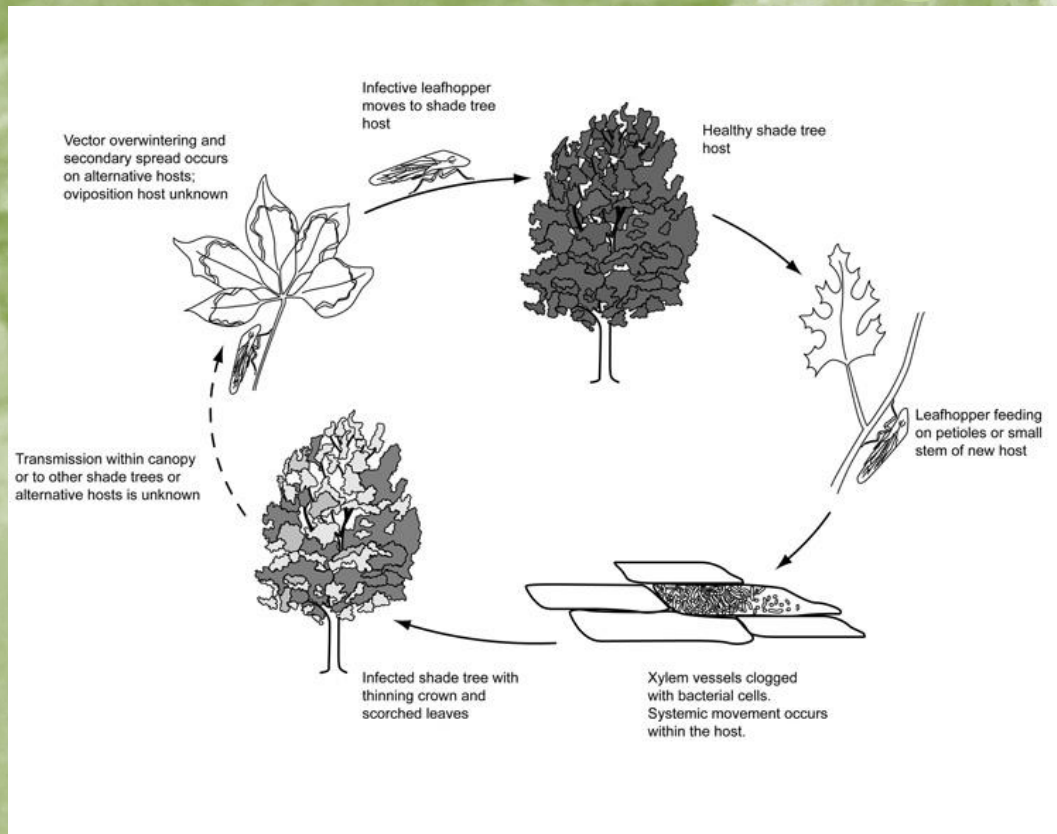
Pierce's Disease Vocabulary

Hosts – Host range is extremely broad with naturally occurring infections documented from 93 plant species in the United States, including woody perennials (where most of the economic damage occurs). Some strains of the pathogen infect a narrower host range (e.g. the strain causing oleander scorch does not appear to infect grapes).

Pathogen – *Xylella fastidiosa*, bacterium that infects the xylem of host plants.

Vector – The insect that moves the pathogen between hosts. In the case of PD, xylem feeding insects including leafhoppers and spittle bugs are potential vectors.

Pierce's disease cycle



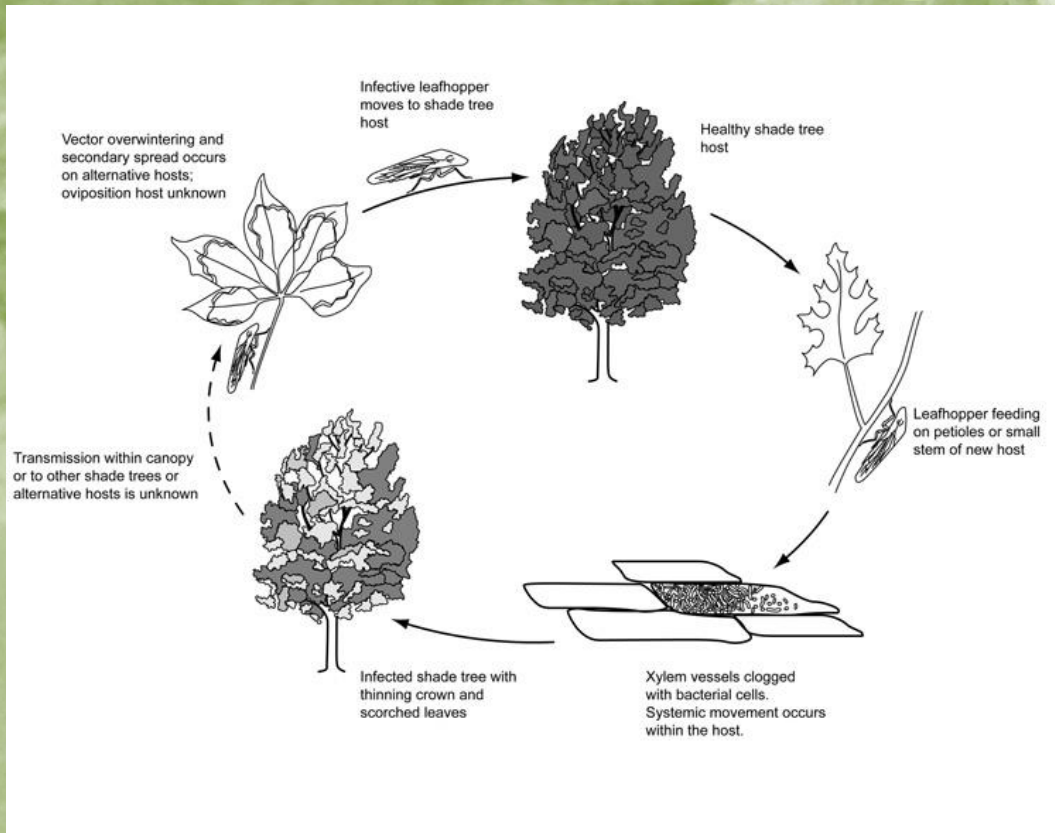
Xylem feeding leafhoppers, sharpshooters, and spittlebugs acquire the bacterium

X. fastidiosa adheres to the foregut of the insect & multiplies



Photo via Doug Cook

Pierce's Disease management considerations



Insect is no longer infectious after molting (forgut is cuticular) = semi persistent transmission mechanism

No latent period for infection = insects can transmit immediately after acquiring the pathogen from an infected host

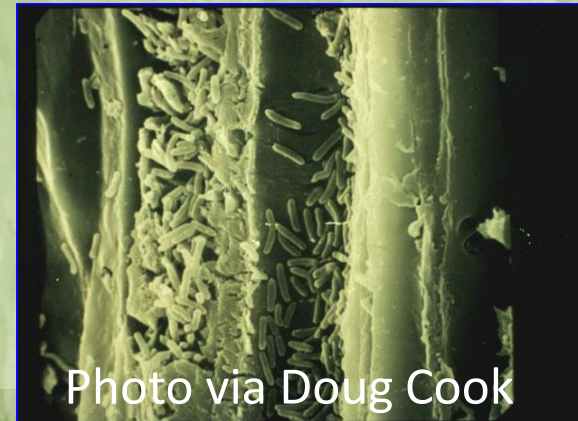


Photo via Doug Cook

Pierce's Disease management considerations

Symptoms



Pierce's Disease



Pierce's Disease



Pierce's Disease



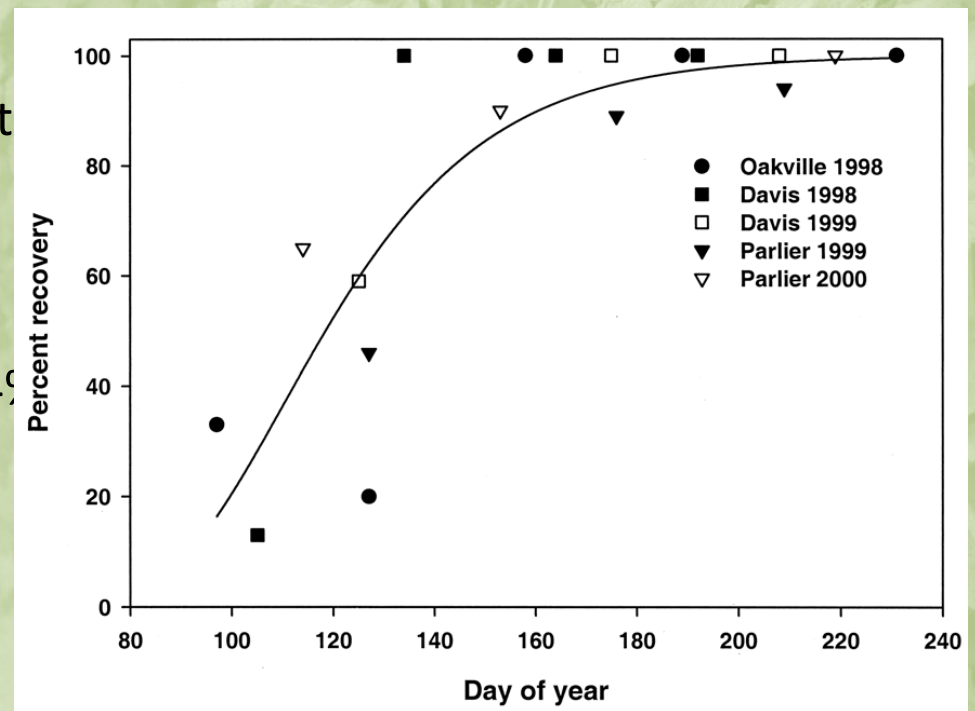
Pierce's Disease



Importance of infection timing

In high risk areas, early season infections are more likely to result in systemic disease.

“Vines inoculated on the earliest inoculation dates (April to May) developed more extensive and severe PD symptoms, and only 54% recovered after the following winter, compared with vines that had been inoculated during June through August, of which 88% recovered from PD the following winter.”

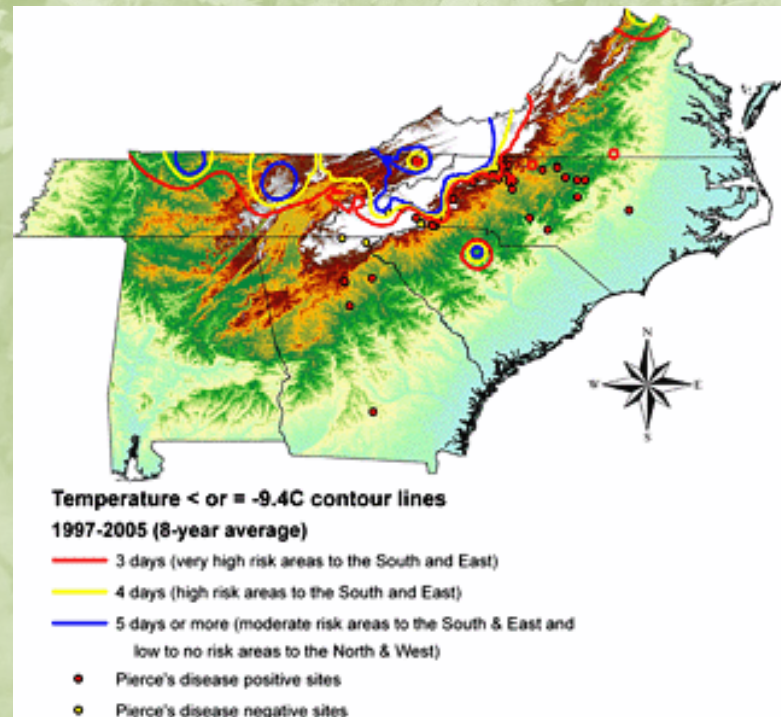
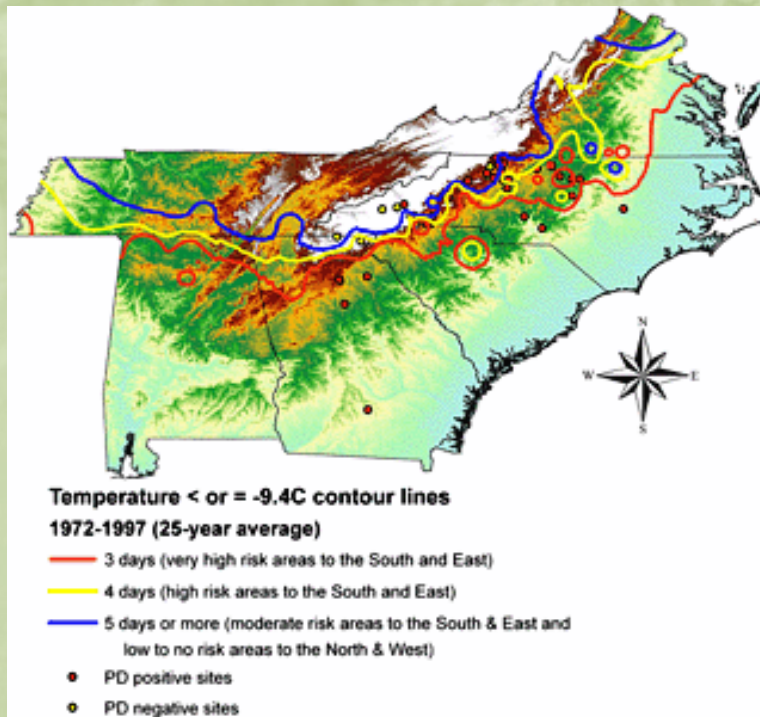


Feil, et al. 2003. Phytopathology.

Effects of winter temperatures in NC

Where are high risk areas?

Locations with 5 or more days with a low of 15F (-9.4C) are at lower risk of developing systemic PD



Pierce's Disease management considerations

Transmission efficiency:



Sharpshooters



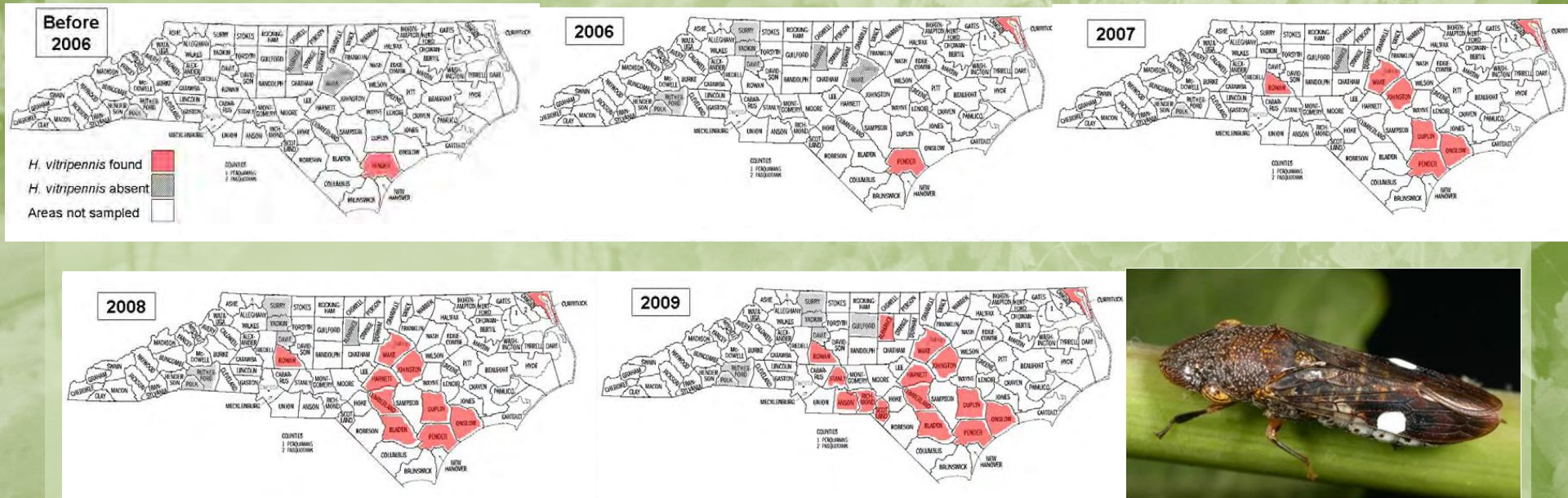
Leafhoppers



Spittlebugs

Insect vectors

Glassy-winged sharpshooter (Homalodisca vitripennis) is not the primary vector



GWSS has not been observed statewide, and even in areas where it is present, other vectors are more common and more abundant

Insect vectors

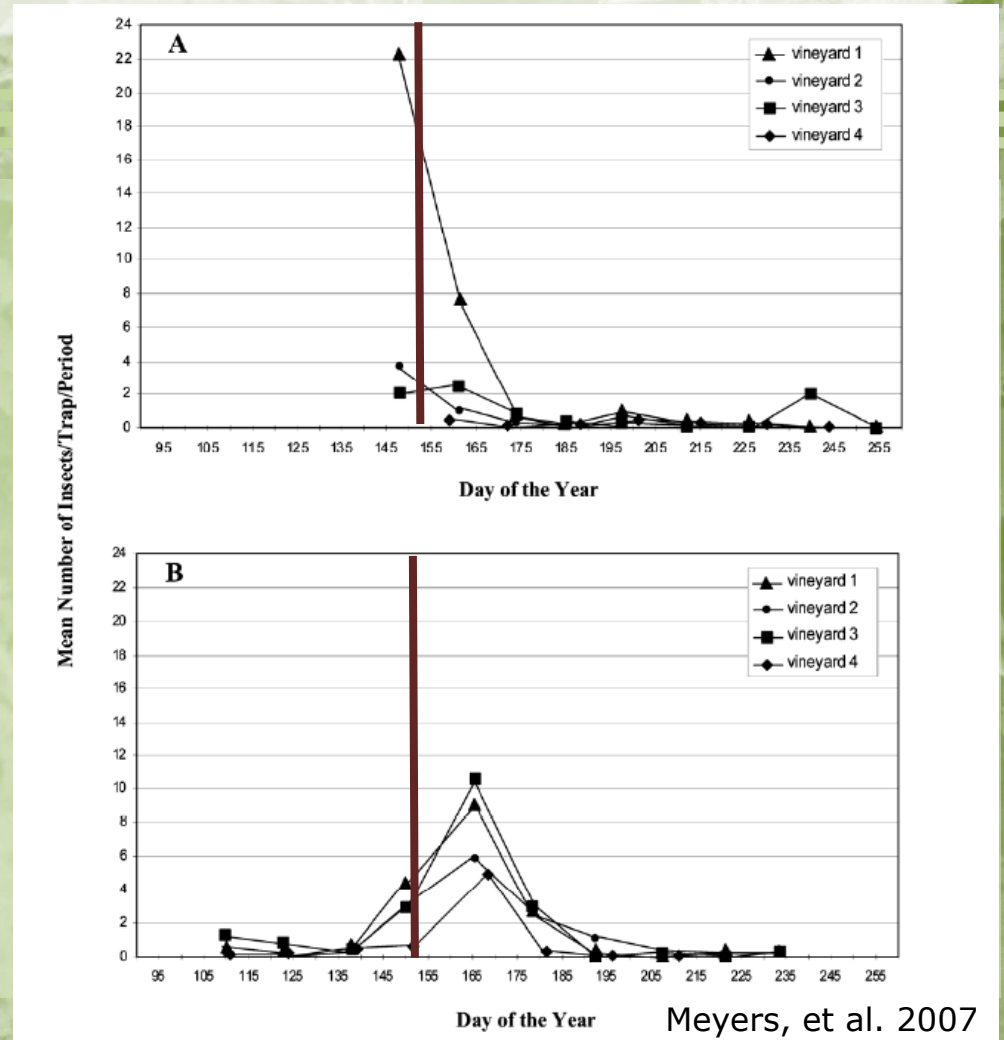
Glassy-winged sharpshooter is not the primary vector



Oncometopia orbona

27% of field collected samples positive for PD

69% of attempted greenhouse transmissions successful



Insect vectors

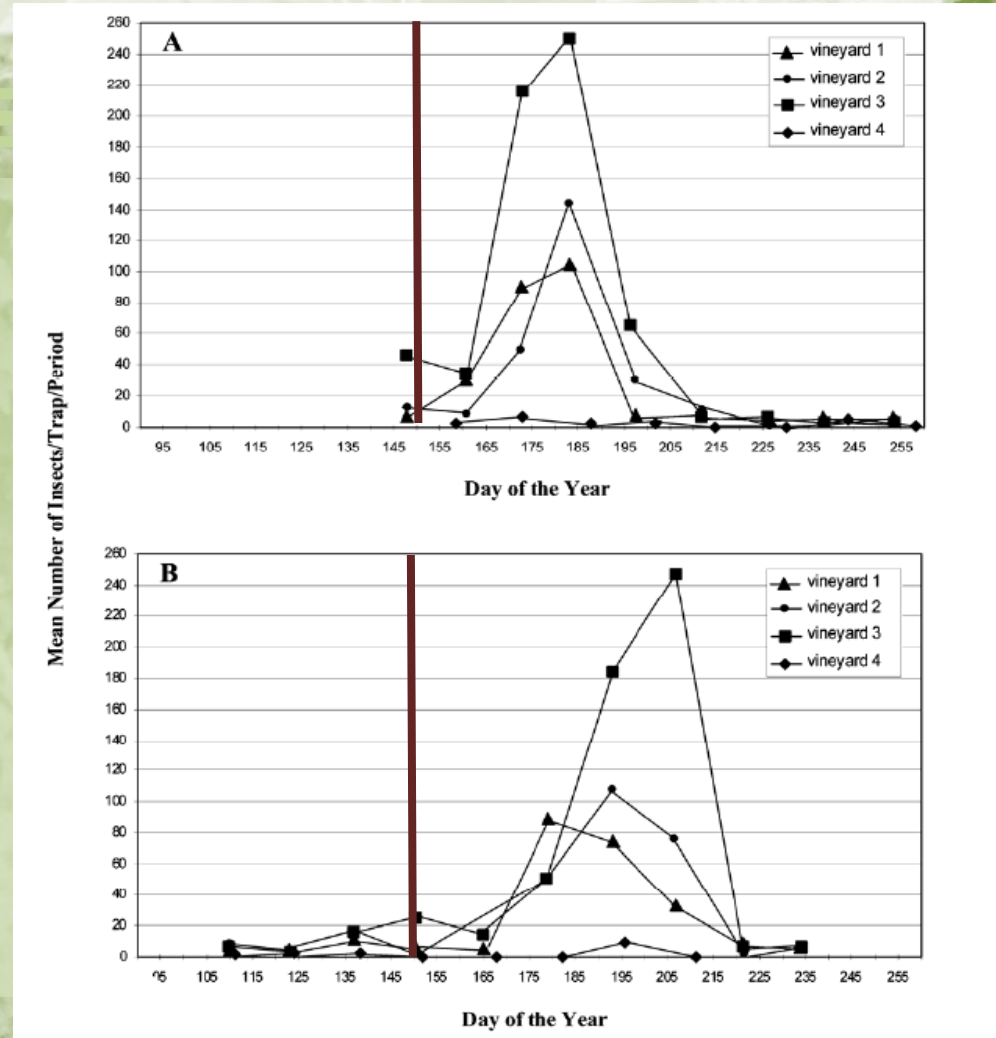
Glassy-winged sharpshooter is not the primary vector



Graphocephala versuta

28% of field collected samples positive for PD

5% of attempted greenhouse transmissions successful



Insect vectors

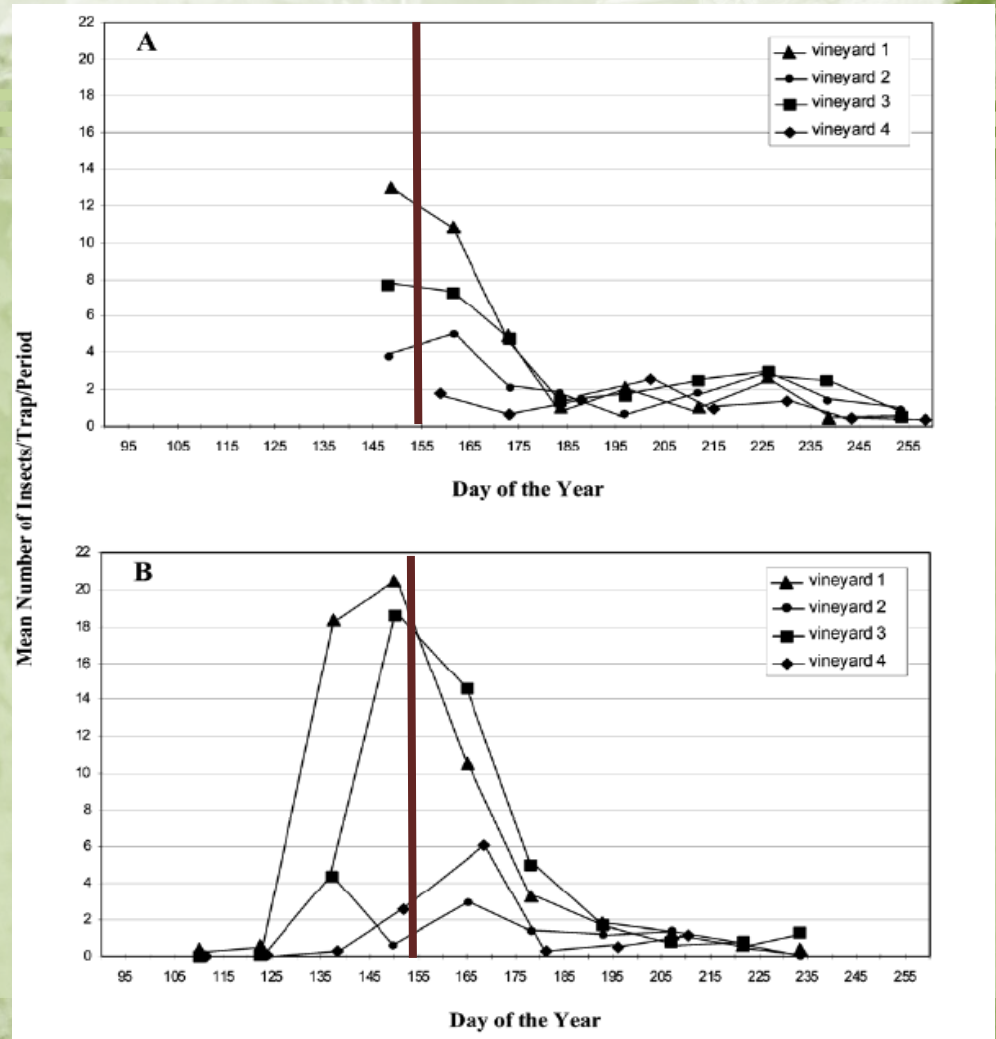
Glassy-winged sharpshooter is not the primary vector



Paraphlepsius irroratus

33% of field collected samples positive for PD

Likely transmission efficiency unknown



Vector monitoring methods

- Use AM-type unbaited yellow sticky traps (color is the attractant)
- Check weekly, and remove captured insects
- Traps can be reused as long as they remain sticky
- Record captures of main vector species (*Oncometopia*, *Graphocephala*, *Paraphlepsius*, *Homalodisca*) weekly; also record other leafhopper & spittlebug like species (NCSU Plant Disease & Insect Clinic can assist with ID of insects from photos)



Management recommendations

- In high risk areas, use systemic insecticides to prior to bud break to provide long term feeding suppression
- Follow with foliar application if needed (in very high risk areas) though mid summer
- Scout symptomatic vines in fall, flag, and revisit the following year in mid summer to determine if infections are systemic
- *Recommended materials in Bunch Grape IPM Guide at www.smallfruits.org*

Viticulture Extension and Outreach



Resources: Vineyard Management?

www.smallfruits.org

the Southern Region small fruit consortium

Home SRSFC Activities Crops Regional Expert **IPM/Production Guides** County Agent Training Weather

IPM/Production Guides

Last updated Friday 5 January 2018 8:9 GMT

Blueberries

[Southeast Regional Blueberry Integrated Management Guide](#)
[Southeast Regional Blueberry Horticulture and Growth Regulator Guide](#)
[Southeast Regional Organic Blueberry Pest Management Guide](#)

Bunch Grapes

[Southeast Regional Bunch Grape Integrated Management Guide](#)

Caneberries

[Southeast Regional Caneberries Integrated Management Guide](#)
[Southeast Regional Caneberry Production Guide \(PDF\)](#)
[Southeast Regional Caneberry Production Guide \(Online Version\)](#)

Muscadines

[Southeast Regional Muscadine Grape Integrated Management Guide](#)

Strawberries

[Southeast Regional Strawberry Integrated Pest Management Guide](#)
[Southeast Regional Strawberry Plasticulture Production Guide](#)
[Fungicide Selection for Botrytis and Anthracnose Fruit Rot Management 2017](#)

Resources: Vineyard Management?

www.smallfruits.org

2018 Southeast Regional Bunch Grape Integrated Management Guide

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Senior Editors

Phil Brannen (University of Georgia)

Bill Cline (North Carolina State University)

Contributions were also made by Frank Hale (University of Tennessee), Bill Cline (North Carolina State University), and Eric T. Stafne (Mississippi State University).

A product of the Southern Region Small Fruit Consortium (www.smallfruits.org). Recommendations are based on information from the manufacturer's label and performance data from research and extension field tests. Because environmental conditions and grower application methods vary widely, suggested use does not imply that performance of the pesticide will always conform to the safety and pest control standards indicated by experimental data. This publication is intended for use only as a guide. Specific rates and applications methods are on the pesticide label, and these are subject to change at any time. Always refer to and read the pesticide label before making any application! The pesticide label supersedes any information contained in this guide, and it is the legal document referenced for application standards.

Management recommendations

Effective insecticides (as soil drench and foliar)

IRAC= 4A

- *Admire Pro (7-14 fl. Oz/year max) 12hr REI, 30 day PHI (soil)*
- *Belay, Clutch 50WDG, Venom, Scorpion*

Management recommendations

If soil drench, first foliar application should be different mode of action:

- *Applaud (IRAC=16)*
- *Baythroid (IRAC=3)*
- *Brigade, Mustang (IRAC=3A)*

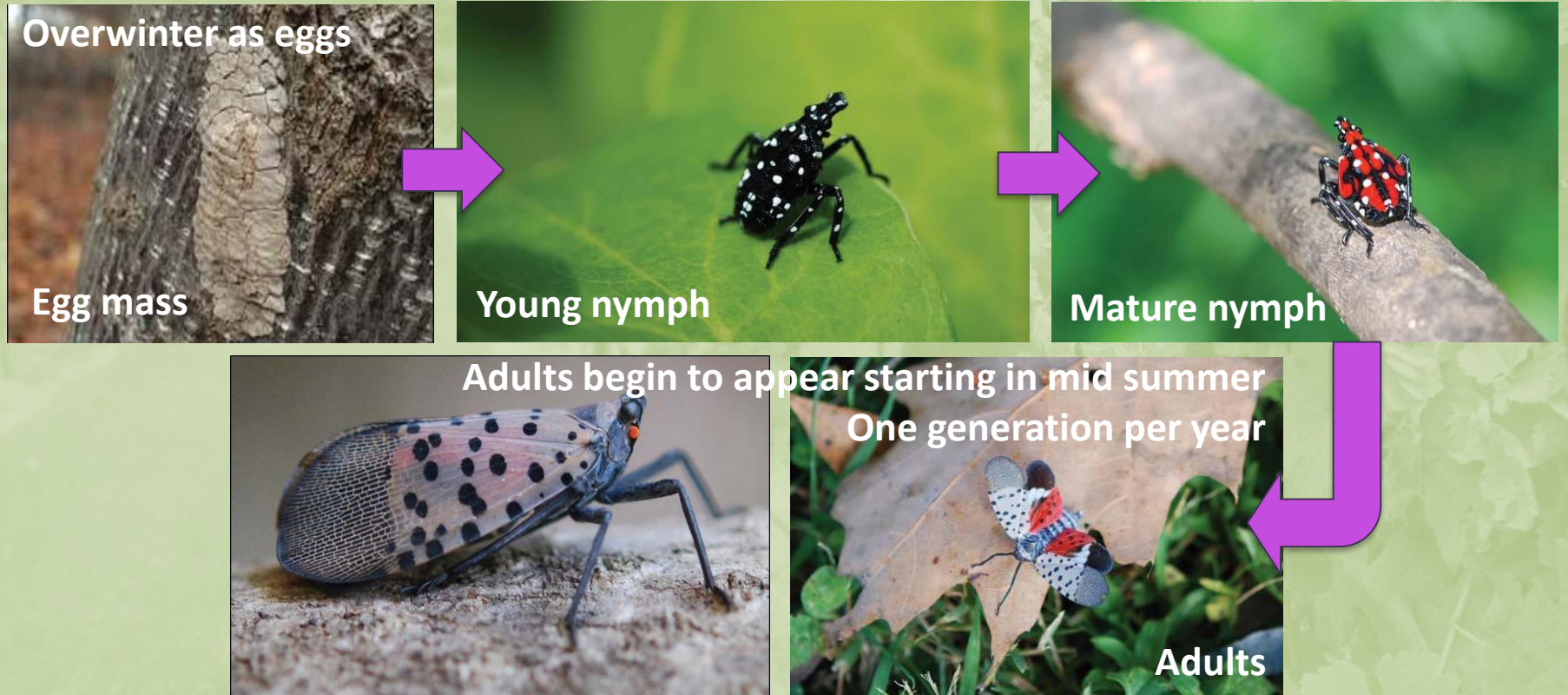
Invasive species of concern for grapes



Tree of Heaven (*Ailanthus altissima*) is a preferred host of glassy-wing sharp shooter and spotted lanternfly

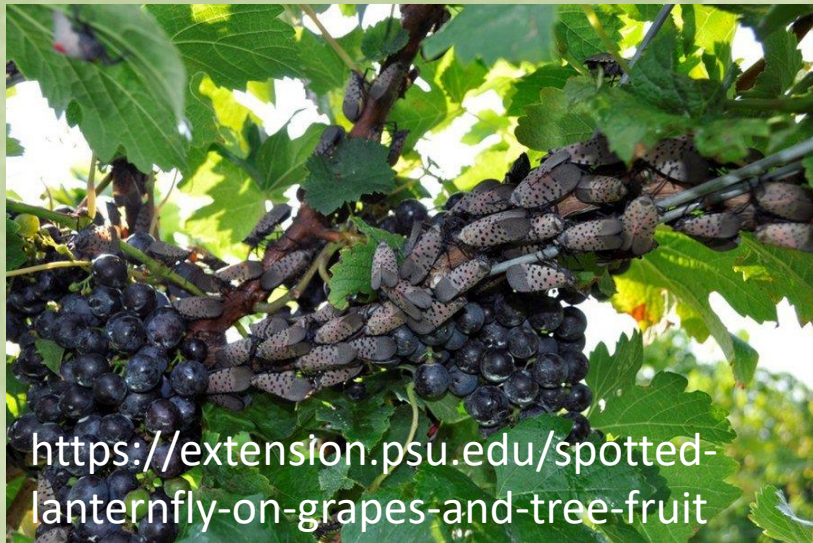
Invasive species of concern for grapes

Spotted lanternfly



Invasive species of concern for grapes

Spotted lanternfly



<https://extension.psu.edu/spotted-lanternfly-on-grapes-and-tree-fruit>

Late season feeding from adults appears to have the most potential for damage in grapes

1. Scout vines, focus on edges, especially near tree of heaven if present
2. Remove eggs off vines & trees, if present, by early spring
3. Consider banding trees to trap nymphs
4. Consider, removing tree of heaven if present
5. Apply insecticide if needed. SLF appears susceptible to organophosphates (1A), neonicotinoids (4A), pyrethroids (3), and carbamates (1B)

Emerging concerns

Grapevine Viruses!

Table 1. Initial grape virus survey in North Carolina. Eight symptomatic blocks in vineyards in the Appalachian Mountains and the Piedmont region were surveyed in October 2018 (10 random plants per block). Given is the percentage of plants positively tested for the presence of virus.

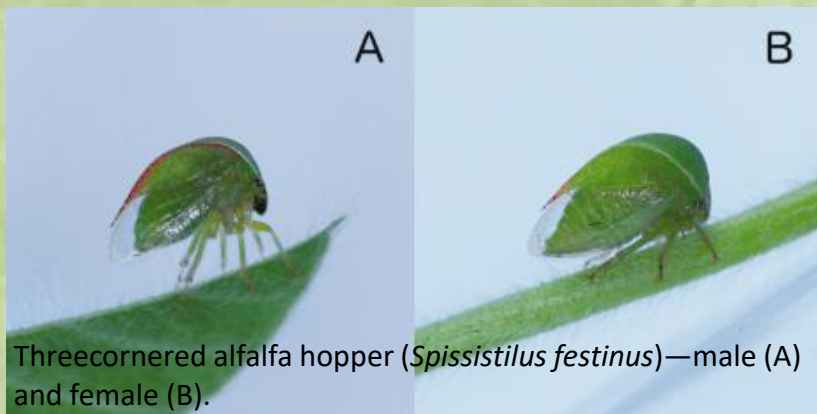
*: only one sample was positive.

GLRaV-2	GLRaV-3	GLRaV-4	GLRaV-7	GRBV	GVA	GVB	GRSPaV	TMSV	X.f.
1 %*	22 %	0 %	0 %	23 %	0 %	0 %	72 %	0 %	7 %

Emerging pest concerns

Three cornered alfalfa hopper

Grapevine Red Blotch Virus



Threecornered alfalfa hopper (*Spissistilus festinus*)—male (A) and female (B).

- **Confirmed vector of Grapevine Red Blotch Virus (GRBV)**
- Overwinter as adults and can have multiple, overlapping generations

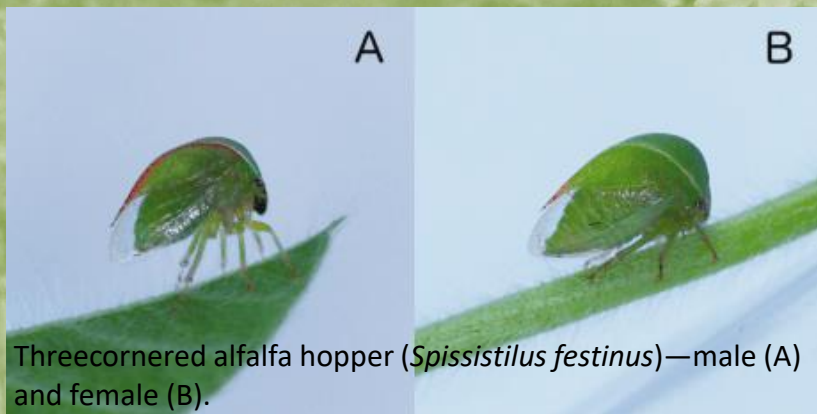
- Likely 3 to 4 generation in NC
- Seasonal biology in NC grapes unknown
- Understanding when grapes are most likely to be infected is important for defining management programs



Emerging pest concerns

Three cornered alfalfa hopper

Grape Red Blotch Virus (GRBV)



Threecornered alfalfa hopper (*Spissistilus festinus*)—male (A) and female (B).

- We don't know vector capacity for NC!!!!
- Other vectors are not known (Doesn't mean they exist)



Emerging pest concerns

Mealybugs – Grapevine Leafroll associated Viruses (GLRaV)



- Confirmed vectors of Grapevine Leafroll associated viruses (GLRaV)
- Several species with different vector capacity
- Vine Mealybug (Picture) and Grape Mealybug have highest vector capacity
- **VERY POTENT VIRUS VECTORS**

We don't know exactly what mealybugs are in NC!

What are we doing in grapes this summer?

- Monitoring grape berry moth, spotted lanternfly, three cornered alfalfa hopper, and PD vectors at 8 NC vineyards; 4 *vinifera* & 4 muscadine
- Producing weekly scouting reports (starting May 1) available at entomology.ces.ncsu.edu and distributed through the NC Winegrower's Association



Follow us @NCSmallFruitIPM
Like us @ www.facebook.com/NCSmallFruitIPM
Read us at entomology.ces.ncsu.edu



Resources: Information?

NCSU GRAPE PORTAL:
<https://grapes.ces.ncsu.edu/>

The screenshot displays the NCSU Grape Portal website. At the top left, it says "NC STATE EXTENSION". On the right, there are links for "COUNTY CENTERS", "TOPICS", and "GIVE NOW". A search bar is located in the top right corner. The main header features a large image of green grapes with a red overlay containing the text "Muscadine and Vinifera Grapes". A vertical navigation menu on the left lists various categories: "Meet Our Staff", "Events", "NEW: Grape Grower Forum", "Resources", "Production", "Pest Management", "Marketing", "Freeze Damage", "Cultivars", "Q & A", "Activities for Kids", "Departmental Extension Sites", and "Publications & Factsheets". The "ask an EXPERT" logo is at the bottom left. The main content area includes an "Events" section with a listing for a "Viticulture Workshop" at Surry Community College on April 17. Below this is a "News and Updates" section with three articles: "Please Use the New Grape Growers Online Forum", "Viticulture Workshop at Surry Community College, April 17", and "SkyBit Service Not Available Anymore".

Resources: Information?



Muscadine and Vinifera Grapes

- Meet Our Staff
- Events
- NEW: Grape Grower Forum
- Resources
- Production
- Pest Management
- Marketing
- Freeze Damage
- Cultivars
Cultivar Characteristics, Sources of Vines
- Q & A
- Activities for Kids
- Departmental Extension Sites
Horticulture, Plant Pathology, Crop Science ...
- Publications & Factsheets



Events

APR 17
WED
Viticulture Workshop
Surry Community College
Wed 4/17 10 AM - 3 PM
20 hours away

News and Updates

Please Use the New Grape Growers Online Forum

Dear grape growing and winemaking community: Please take a look at the new online Grape and Muscadine Forum. The Forum is built ...

FEATURED

Viticulture Workshop at Surry Community College, April 17

Pesticide Credits Available Wednesday, April 17, 2019 10 a.m.–3:30 p.m. Surry Community College, SBVE Building 630 South Main Street, Dobson, NC Pre-Registration Required ...

— 19 hours ago

SkyBit Service Not Available Anymore

Dear Farming Community, Please see the attached email conversation. Dear Sir or Madam, my name is Mark Hoffmann, I am Assistant Professor ...

— 3 weeks ago, [Strawberry Growers Information](#) ✕



Grape and Muscadine Forum

[Services](#) › [Forums](#) › [Small Fruits Forum](#) › Grape and Muscadine Forum

This forum contains 20 topics and 2 replies, and was last updated by [uteigubolehi](#) 4 hours, 33 minutes ago.

Viewing 7 topics - 1 through 7 (of 7 total)

Topic	Voices	Posts	Freshness
For Sale/Wanted Started by: smallfruitscals	2	2	2 weeks ago Whit Winslow
Training and Trellis Started by: smallfruitscals	2	2	3 weeks, 3 days ago Justin Taylor
R&D Started by: smallfruitscals	1	1	3 weeks, 4 days ago smallfruitscals
Varietals Started by: smallfruitscals	1	1	3 weeks, 4 days ago smallfruitscals
Events Started by: smallfruitscals	1	1	3 weeks, 4 days ago smallfruitscals
Pest and Disease Management Started by: smallfruitscals	1	1	3 weeks, 4 days ago smallfruitscals
Soils Started by: smallfruitscals	1	1	3 weeks, 4 days ago smallfruitscals

Viewing 7 topics - 1 through 7 (of 7 total)

Search for:

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- [Grape and Muscadine Forum](#)
- [Small Fruits Forum](#)
- [Strawberry Forum](#)

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- [Forum SPAM](#)
- [Grape Events in 2018](#)
- [Pruning Workshop in Georgia Feb 8](#)

NC STATE Small Fruits

Services Research Grower Resources Team and Positions News Contact

Vinifera and Hybrids

This page provides a list of links to supporting extension and outreach programs for bunch grapes and hybrids in the U.S.

Complete Management Guides:

[North Carolina Wine Grape Production Guide](#)

Contains a detailed guide that provides grape growers with practical information about choosing an appropriate site for a vineyard, establishment, and operation of commercial vineyards in North Carolina. It includes a new chapter on spring frost control and examines the pros and cons of active frost protection systems.

[University of California Agriculture and Natural Resources Pest Management for Grapes](#)

Provides information on what one should be doing during the year in an overall IPM program. Also contains the University of California's official guidelines for pest monitoring techniques, pesticides, and non-pesticide alternatives for managing pests in agriculture, floriculture, and commercial turf.

[Pacific Northwest Plant Disease and Pest Management Handbook \(web resource\)](#)

Search engine for finding information on Insect Management, Plant Disease Management, and Weed Management.

[Possible reasons for stunted growth in vineyards \(Oregon State\) \(pdf\)](#)

This publication will help you identify probable causes of distorted shoot and vine growth in vineyards and direct you to other resources that can lead to solutions. (Includes details on spring frost, herbicide drift,

[.ncsu.edu/crop-production-guides-and-ipm-information/](https://www.ncsu.edu/crop-production-guides-and-ipm-information/)

and insect and mite pests)

Search for:

FORUMS

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[Small Fruits Forum](#)
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RECENT POSTS

[Forum: GRAPES](#)

Thank you!

Q+A

Thank you for your attention

NCSU
Department of Horticultural Science
2721 Founders Drive (Kilgore Hall), Room 258
Raleigh, 27695 NC

cell (919) 352 8006
Email: mark.hoffmann@ncsu.edu
<https://smallfruits.cals.ncsu.edu>
<https://grapes.ces.ncsu.edu>

