Rob Dallmann & Lou Meyer

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Landscape Pests 2023

Crapemyrtle Bark Scale – Invasive Exotic

- First observed in Texas in 2004
- First Maryland observation in 2020 in Baltimore County
- Traveled by nursery stock
- Targets Crapemyrtle and Beautyberry

Gloomy Scale – Native Pest

- Main target is Red Maple
- Generally affect stressed trees
- Armored Scale – Difficult to reach

Damage to Trees

- Pierce the tree to drink the sugars (sap)
- Sugar depletion weakens the tree
- Honeydew, then Sooty Mold, covers leaves, decreasing photosynthesis

Control of Scale

- Physical – Scrape it off
- Cultural – Reduce stressors, reduce nitrogen
- Biological – Promote beneficial insects
- DIY Chemical – Oil during crawler stage
- Professional Chemical – Insect Growth Regulator or Systemic Product

What are these holes?

Yellow Bellied Sapsucker

- Feeds on sap and insects
- Round holes for deep drilling
- Rectangle holes for sap pooling

Sapsucker Control

- DO NOT KILL
- Wrap burlap on valued target trees
- Dangle shiny objects from limbs

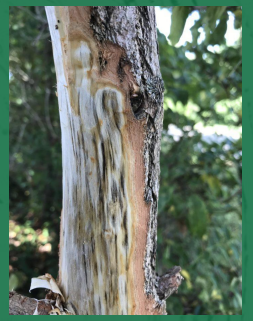
Take Homes

- Strive for balance
- Call a professional for guidance
- Read up before wading in
- Trees are the Answer

Emerging Pests and Diseases

WSA
ANNE ARUNDEL COUNTY
WATERSHED STEWARDS ACADEMY



Chris Riley, PhD

Research Scientist and Technical Support Specialist

Casey Trees®
WASHINGTON DC

Saturday, March 25th, 2023

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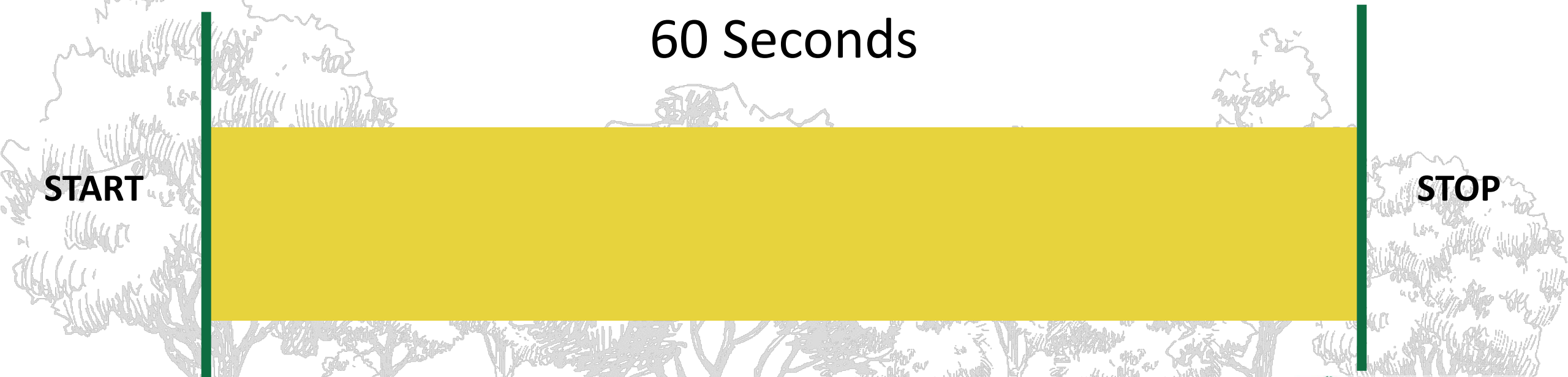
Turn to your neighbor/make a new friend

What are the major urban forest pests/diseases on your radar?

60 Seconds



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Emerging Urban Forest Challenges in Maryland

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Emerging Urban Forest Challenges in Maryland

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Spotted Lanternfly

Hemiptera: Fulgoridae

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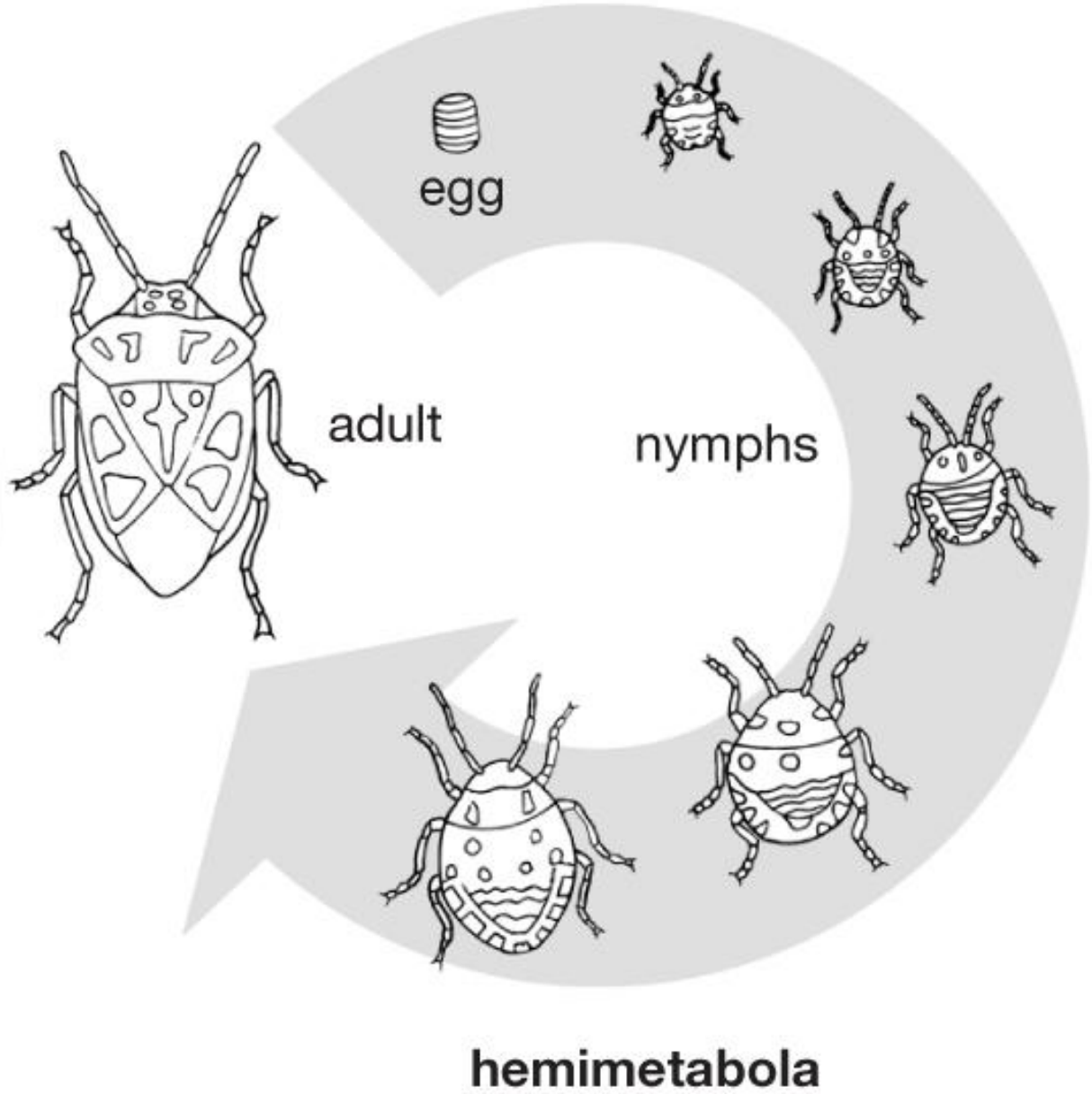
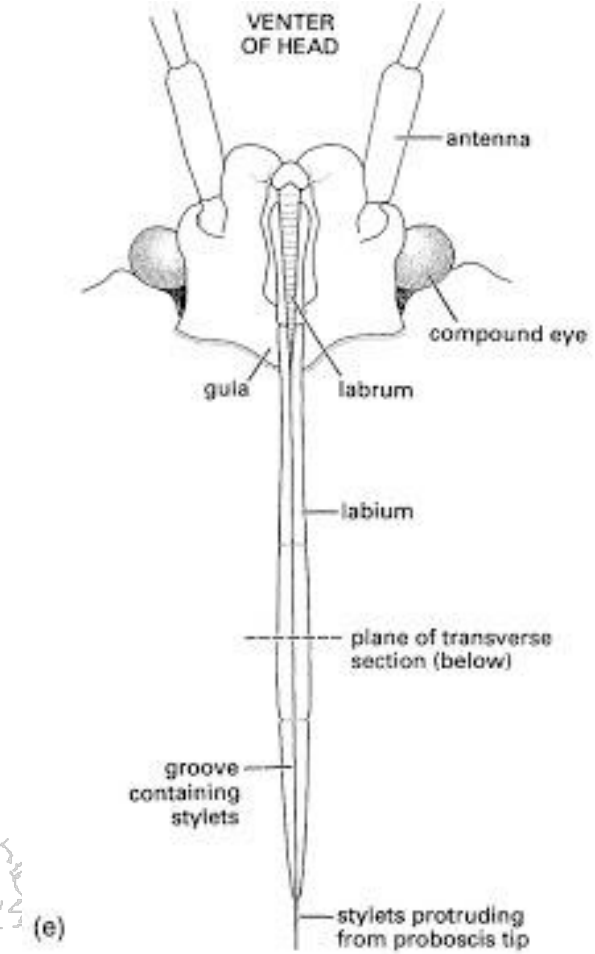


hemimetabola



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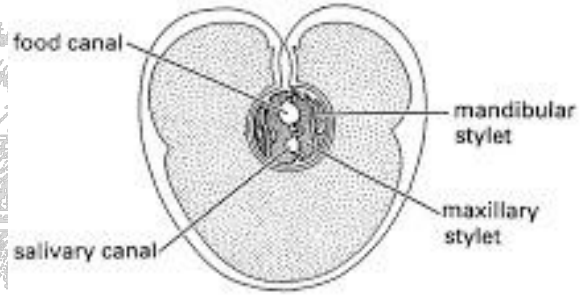


(f) TRANSVERSE SECTION OF LABIUM & STYLET BUNDLE

Hoppers

Order: Hempitera; Family: Several

Treehoppers

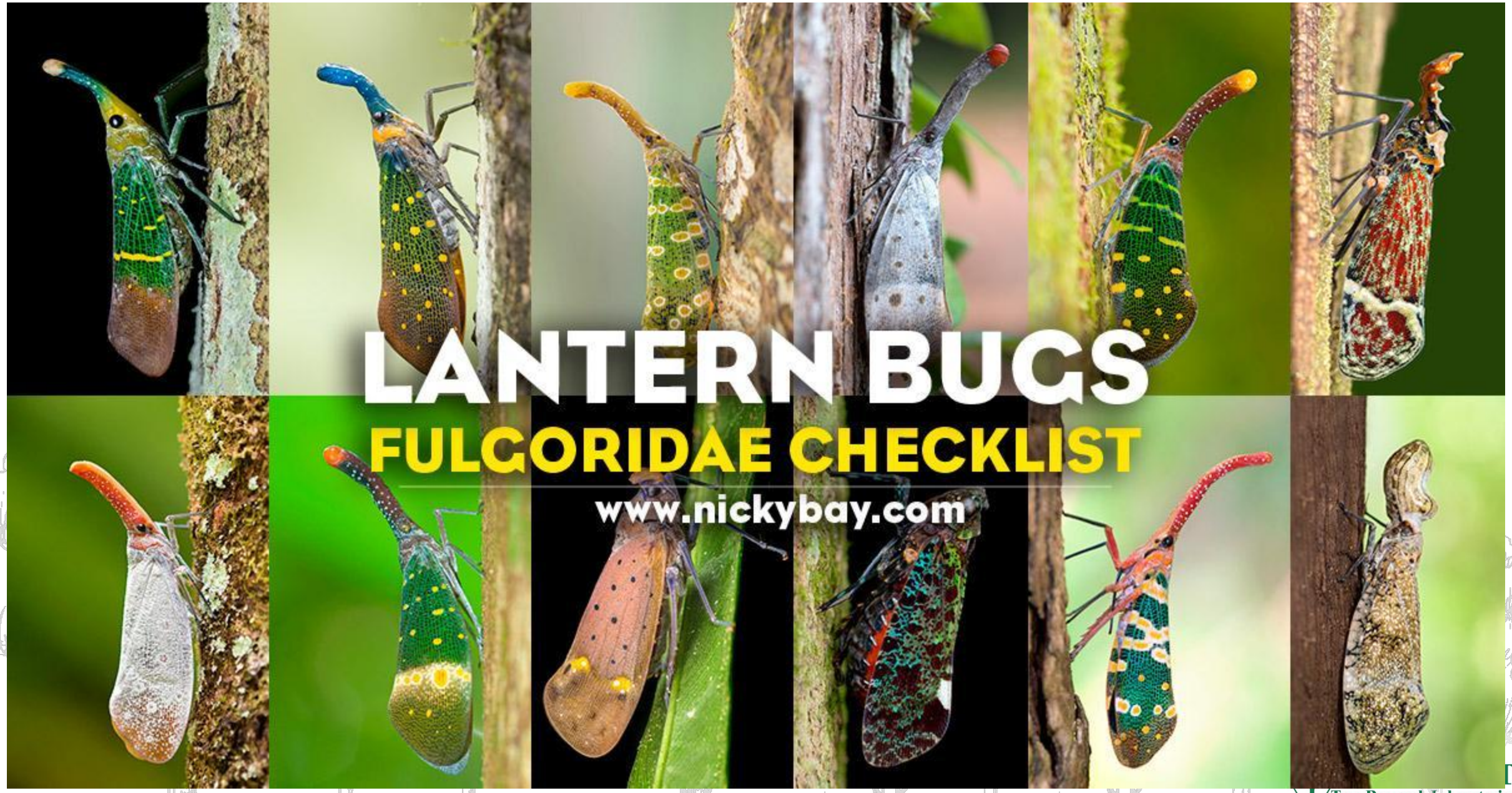
Planthoppers

Cicadas

Leafhoppers

Spittlebugs or froghoppers

Lanternflies



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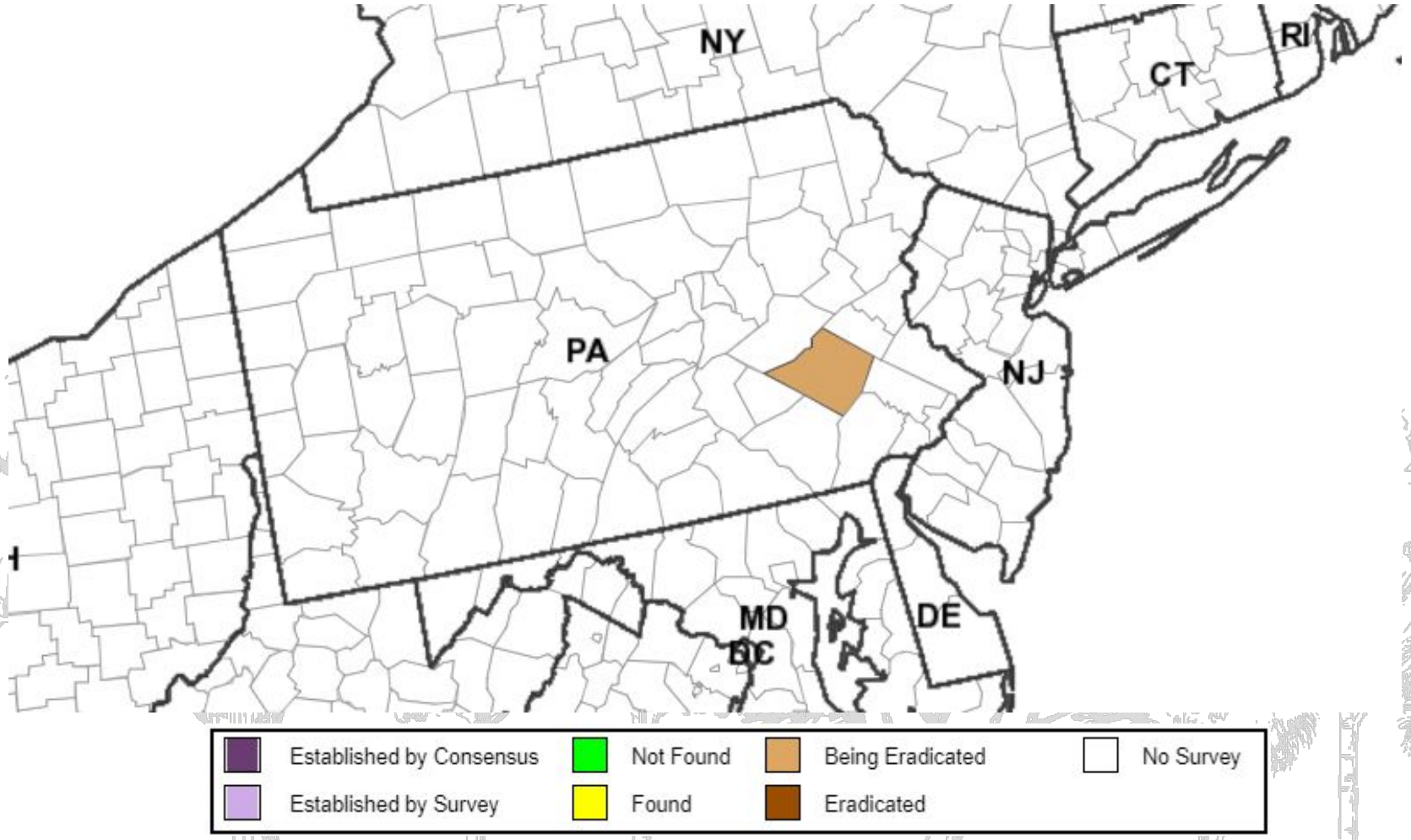
The story so far…

2014



Initially found in PA in 2014;
Thought to have arrived in 2012

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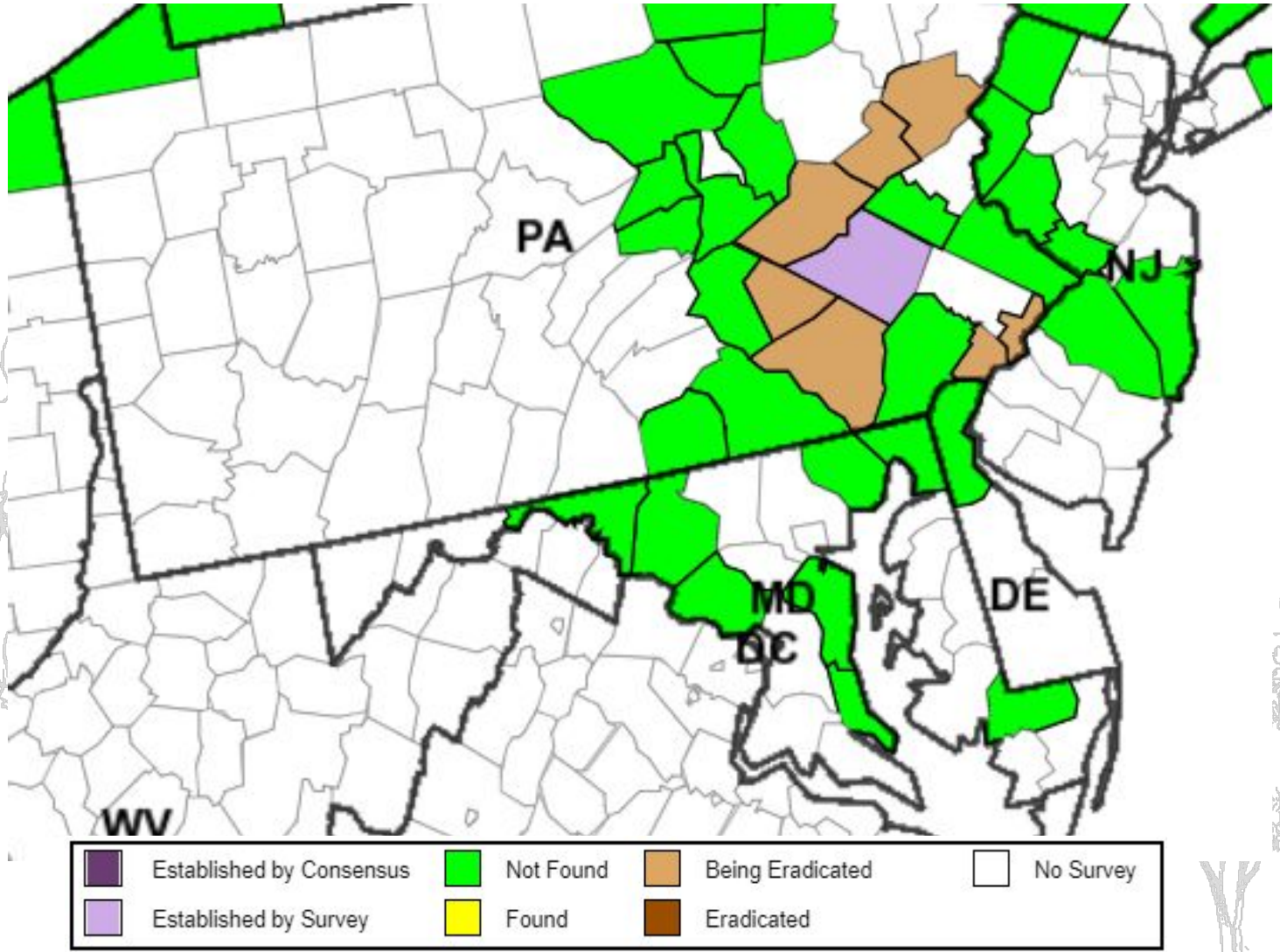
The story so far…

2017



Range expands;
First sighting in NY

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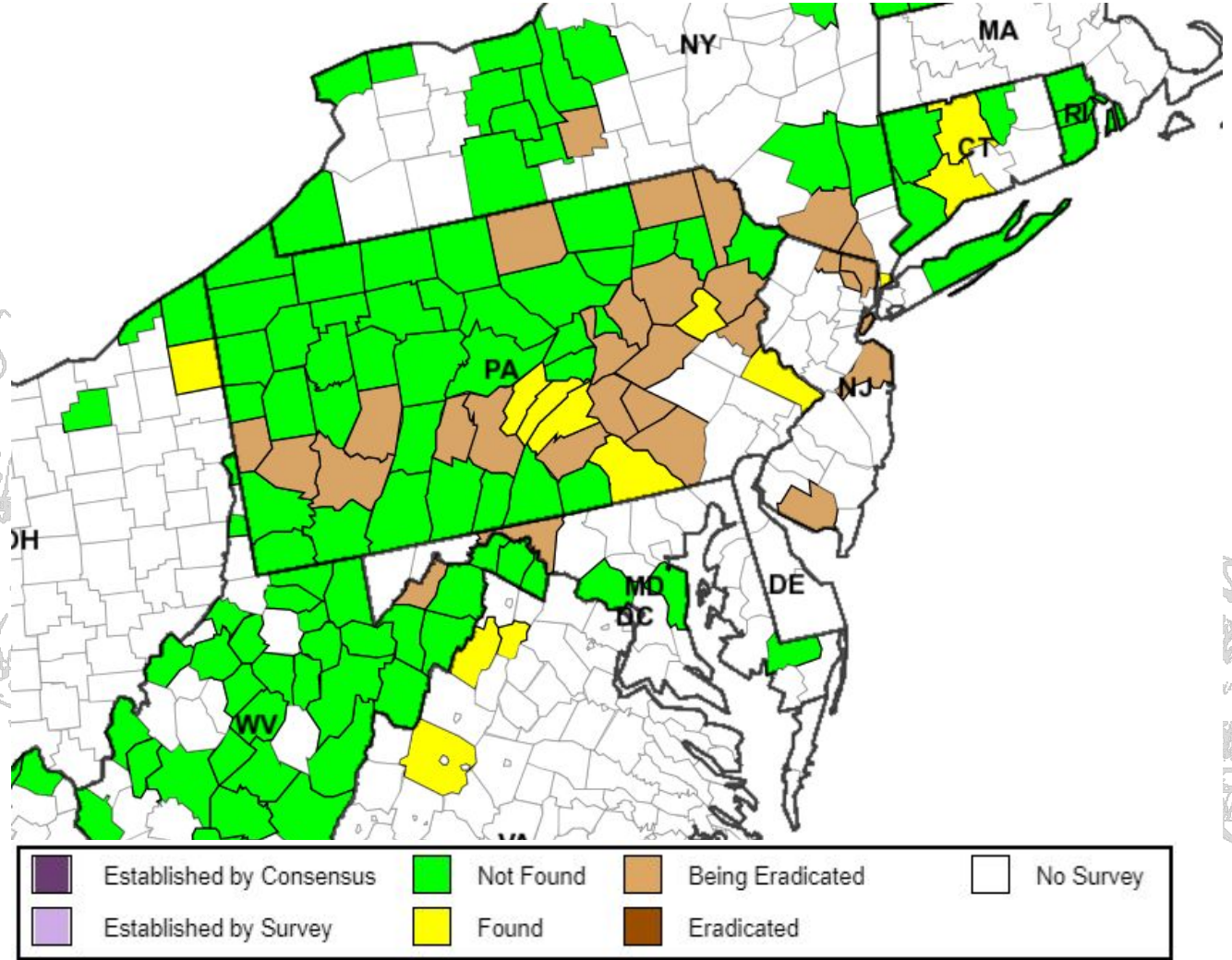
The story so far…

2020



Found in 7 states

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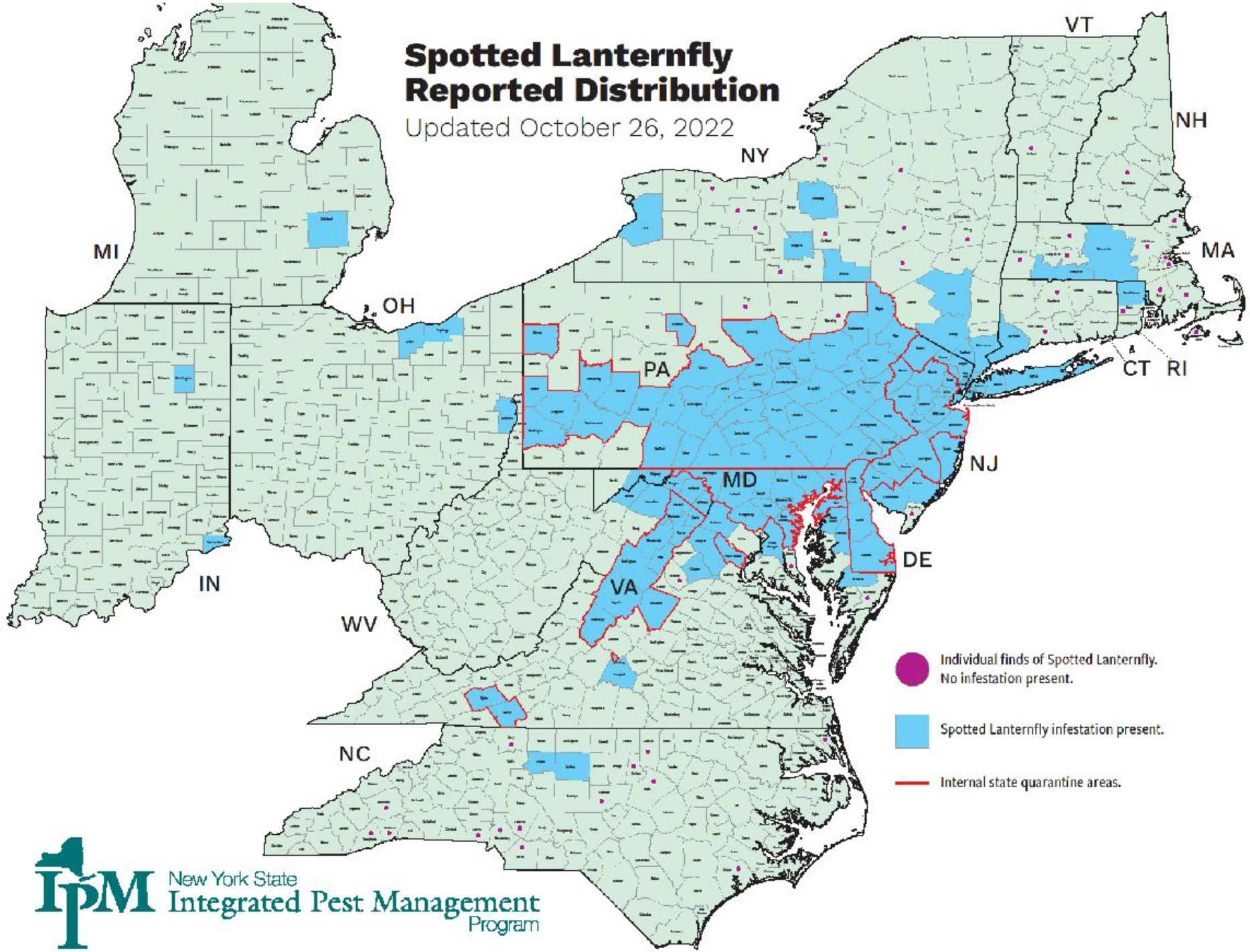

New York State Integrated Pest Management Program

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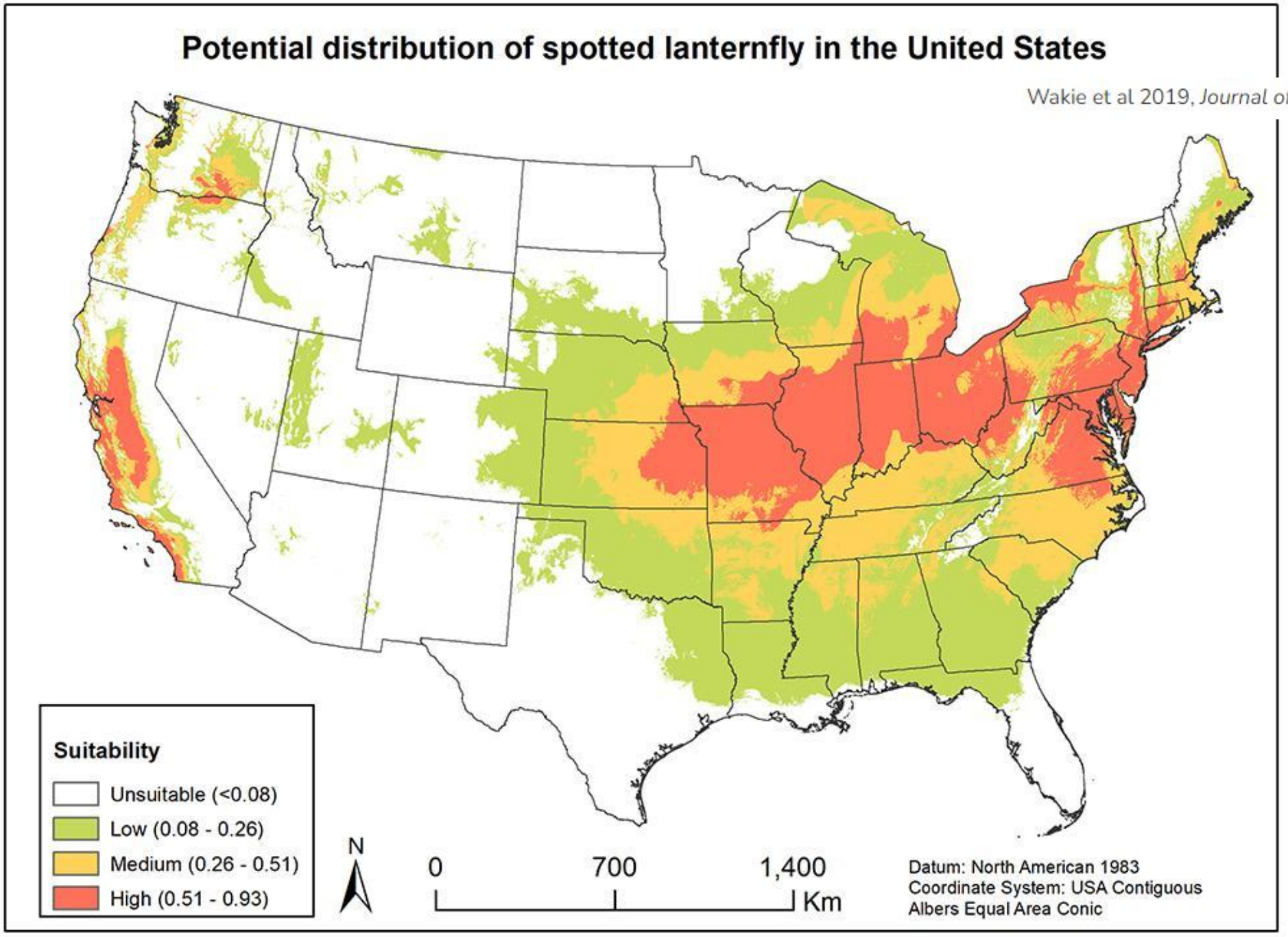
Potential distribution of spotted lanternfly in the United States

Wakie et al 2019, *Journal of Economic Entomology*



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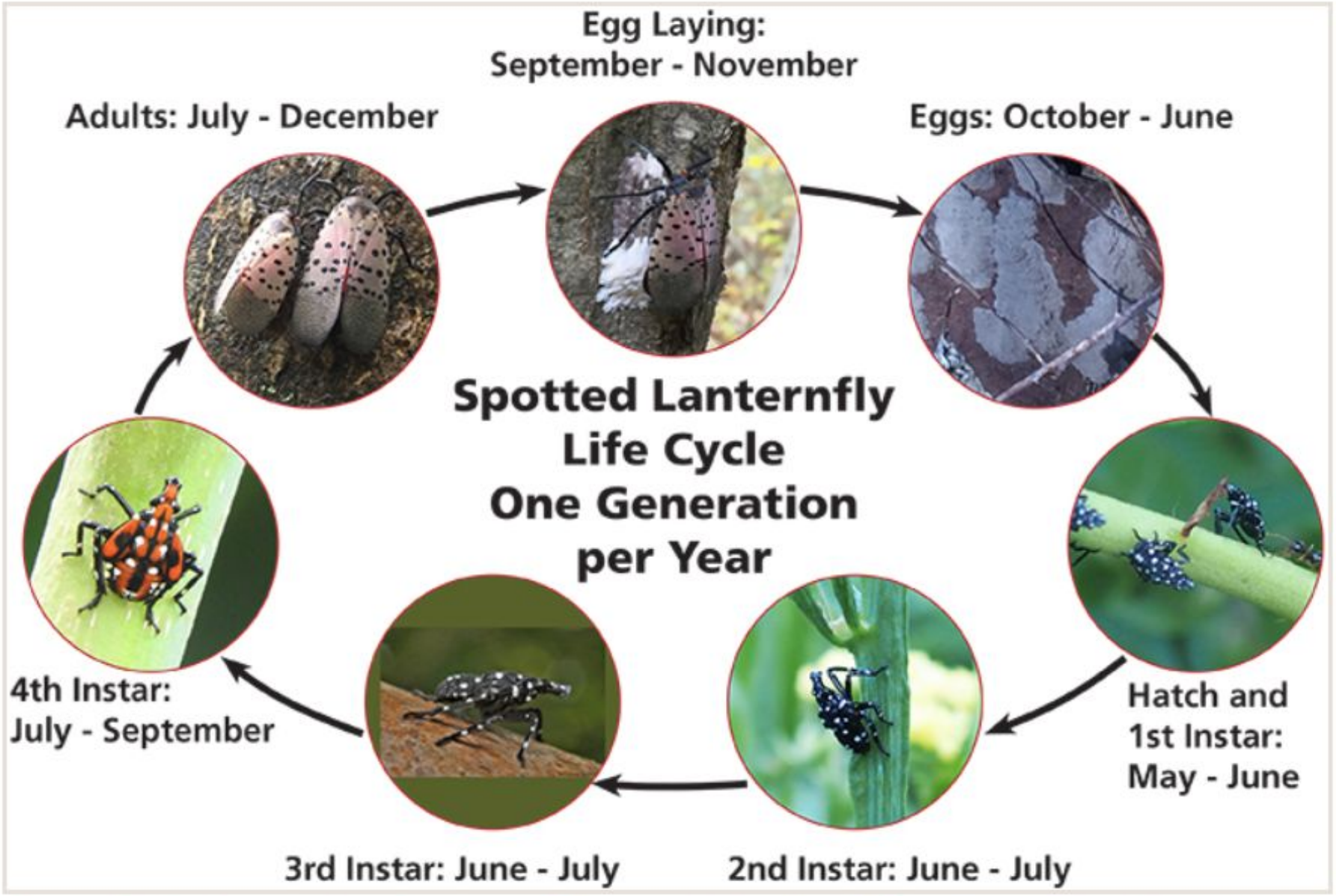

Photos: Egg Laying, Hatch and 1st Instar, 2nd Instar, Adults: Emelie Swackhamer, Penn State University, Bugwood.org; Eggs: Lawrence Barringer, PA Dept. of Agriculture, Bugwood.org; 3rd Instar: Dalton Ludwick, USDA-ARS/Virginia Tech; 4th Instar: Richard Gardner, Bugwood.org.

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Damage

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SLF Hosts

Environmental Entomology, 49(5), 2020, 999–1011
doi: 10.1093/ee/nvaa093
Advance Access Publication Date: 14 August 2020
Forum

Forum

Worldwide Feeding Host Plants of Spotted Lanternfly, With Significant Additions From North America

Lawrence Barringer[1,3] and Claire M. Ciafré[2]

[1]Division of Entomology, Pennsylvania Department of Agriculture, 2301 N. Cameron Street, Harrisburg, PA 17110 [2]NatureCITE: Center for Integrative Taxonomy and Ecology, 1530 E. Farm Road 96, Springfield, MO 65803, and [3]Corresponding author, e-mail: lbarringer@pa.gov

Subject Editor: Melody Keena

Received 29 April 2020; Editorial decision 14 July 2020

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SLF Hosts

PennState Extension

Table 1. Common plant hosts for spotted lanternfly throughout the season.

Host	Nymphs			Adults		
	May	June	July	August	September	October
Rose (cultivated, multiflora, etc.)	■	■				
Perennials	■	■				
Grape (wild and cultivated)	■	■	■	■	■	■
Tree-of-heaven	■	■	■	■	■	■
Black walnut, butternut		■	■	■	■	
River birch			■	■	■	■
Willow			■	■	■	■
Sumac			■	■	■	■
Red/silver maple				■	■	■

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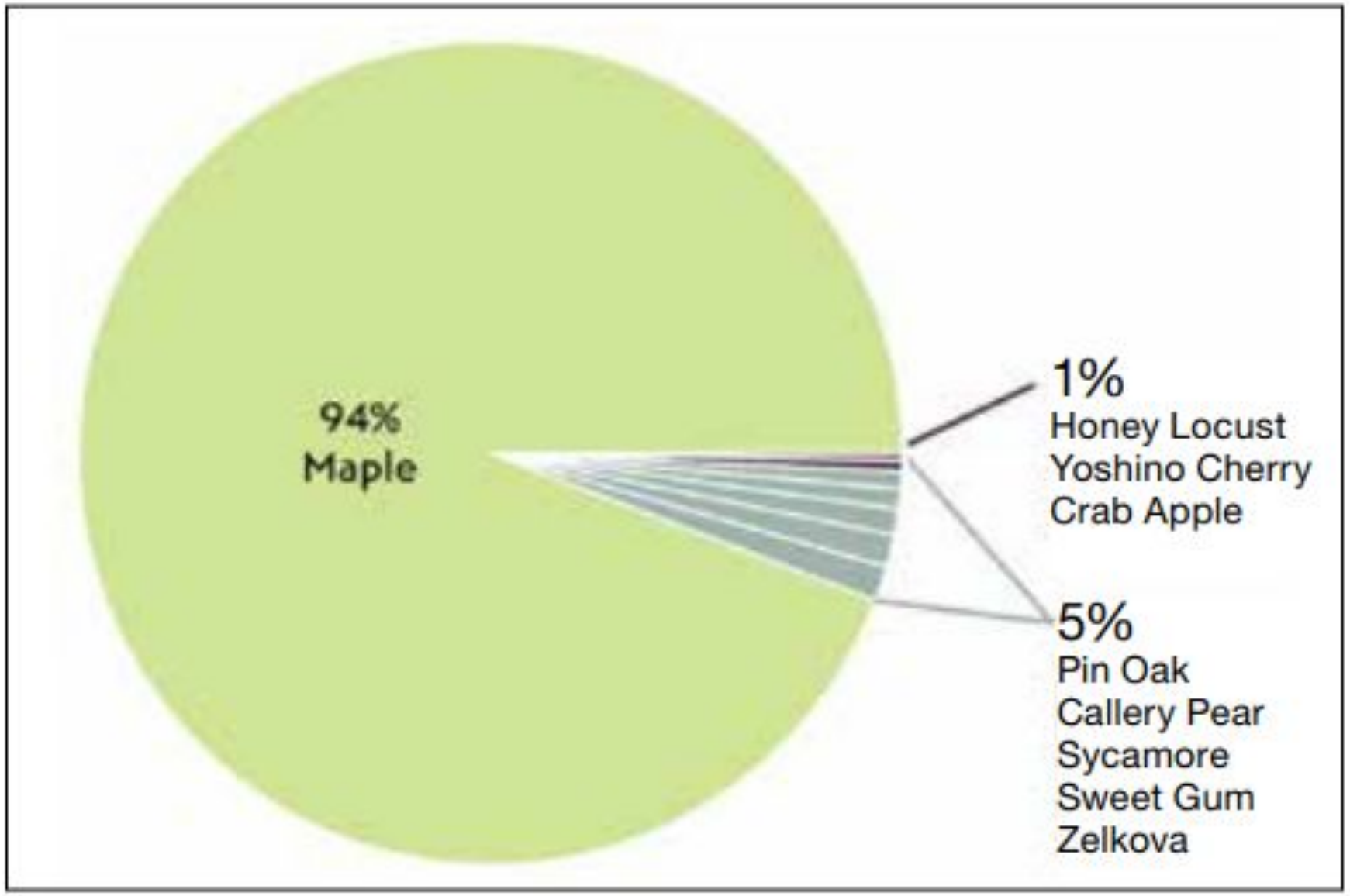

Figure 3. The proportion of adult SLF observed in a shopping center based on tree species. *Data provided by Brian Walsh*

- 200 trees counted
- 31% were red maples
- Held 94% of SLF

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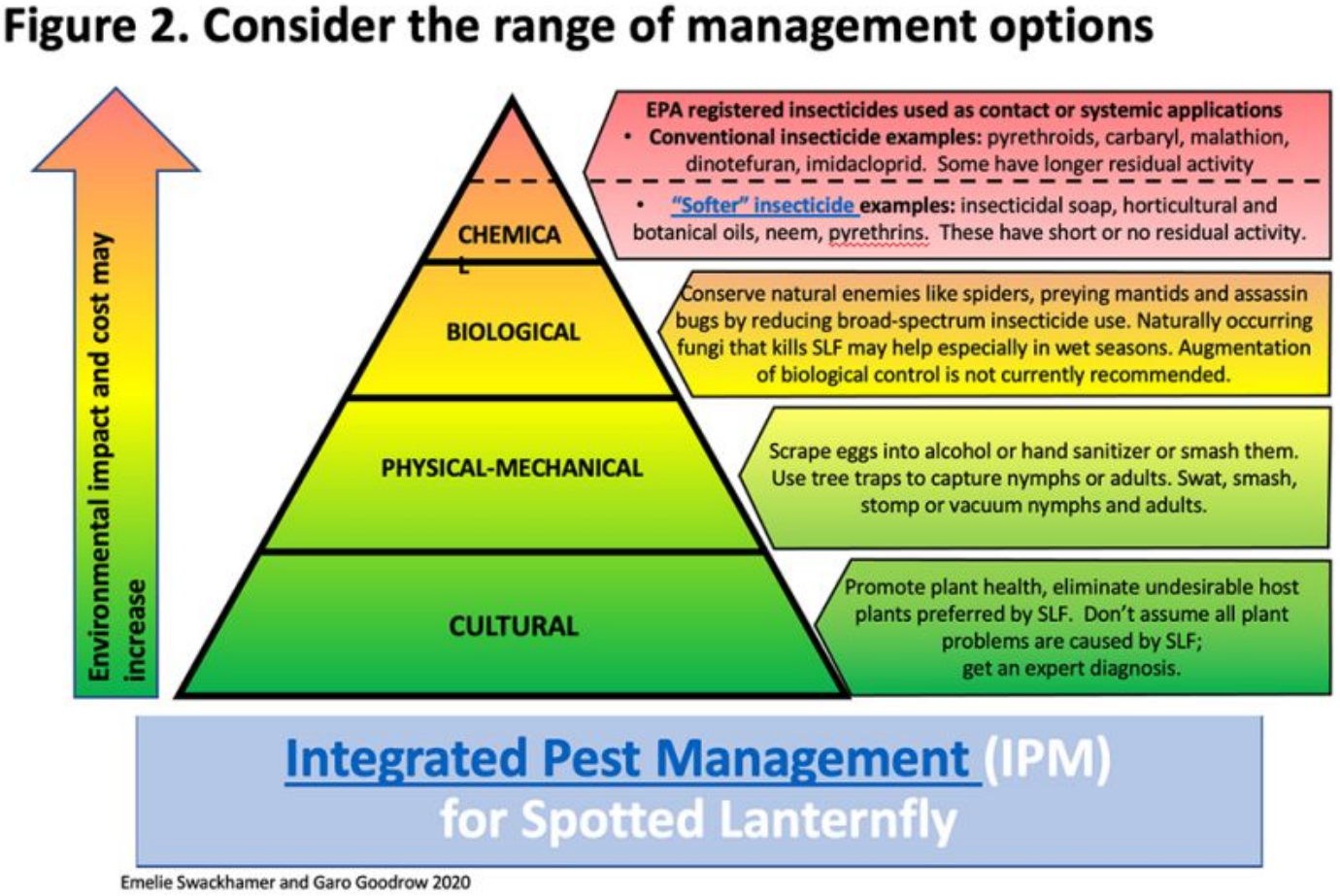
SLF Management

Figure 2. Consider the range of management options.



Graphic Links: 1) "Softer" insecticide, 2) Integrated Pest Management. Image: Emelie Swackhamer and Garo Goodrow, Penn State

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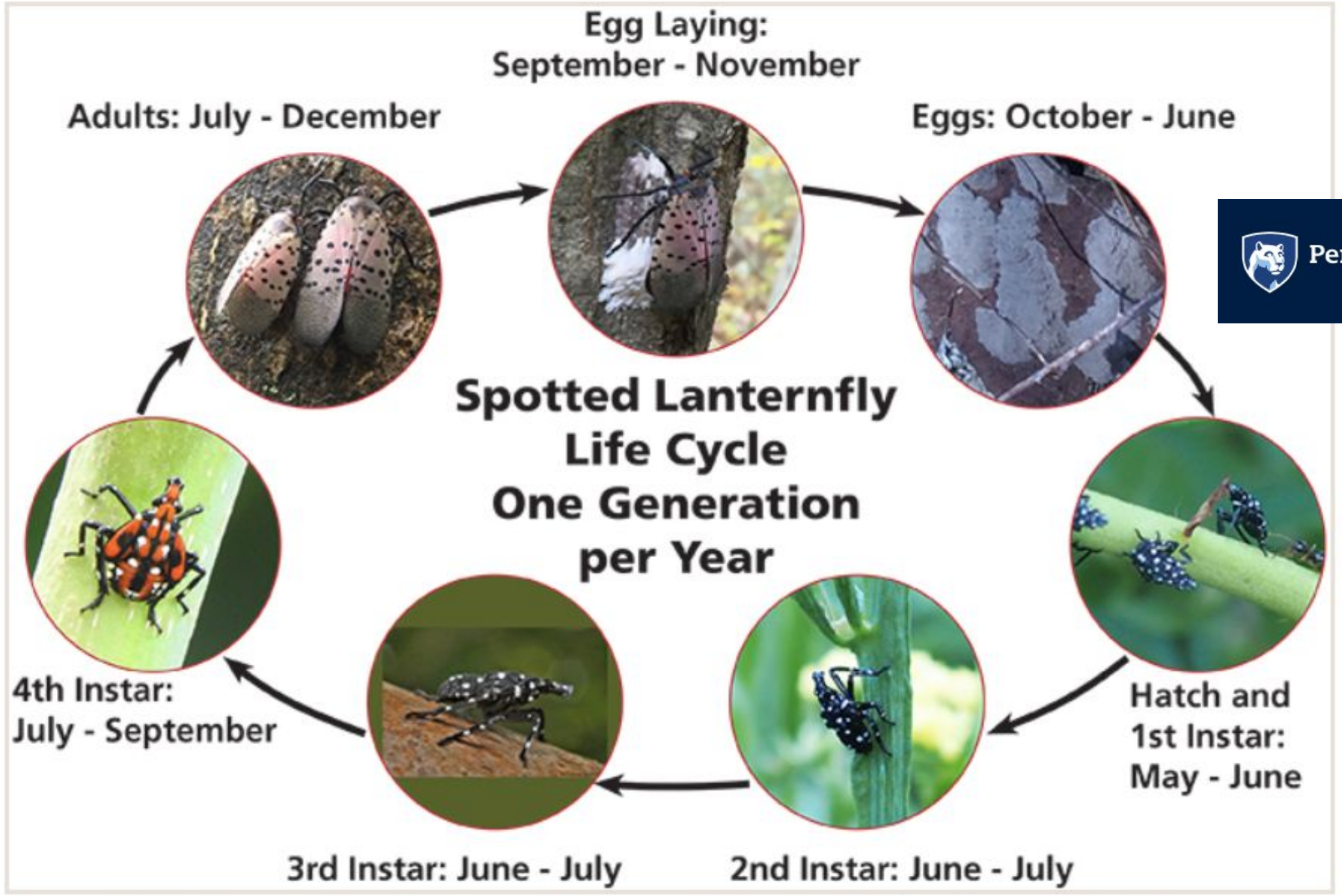

PennState Extension

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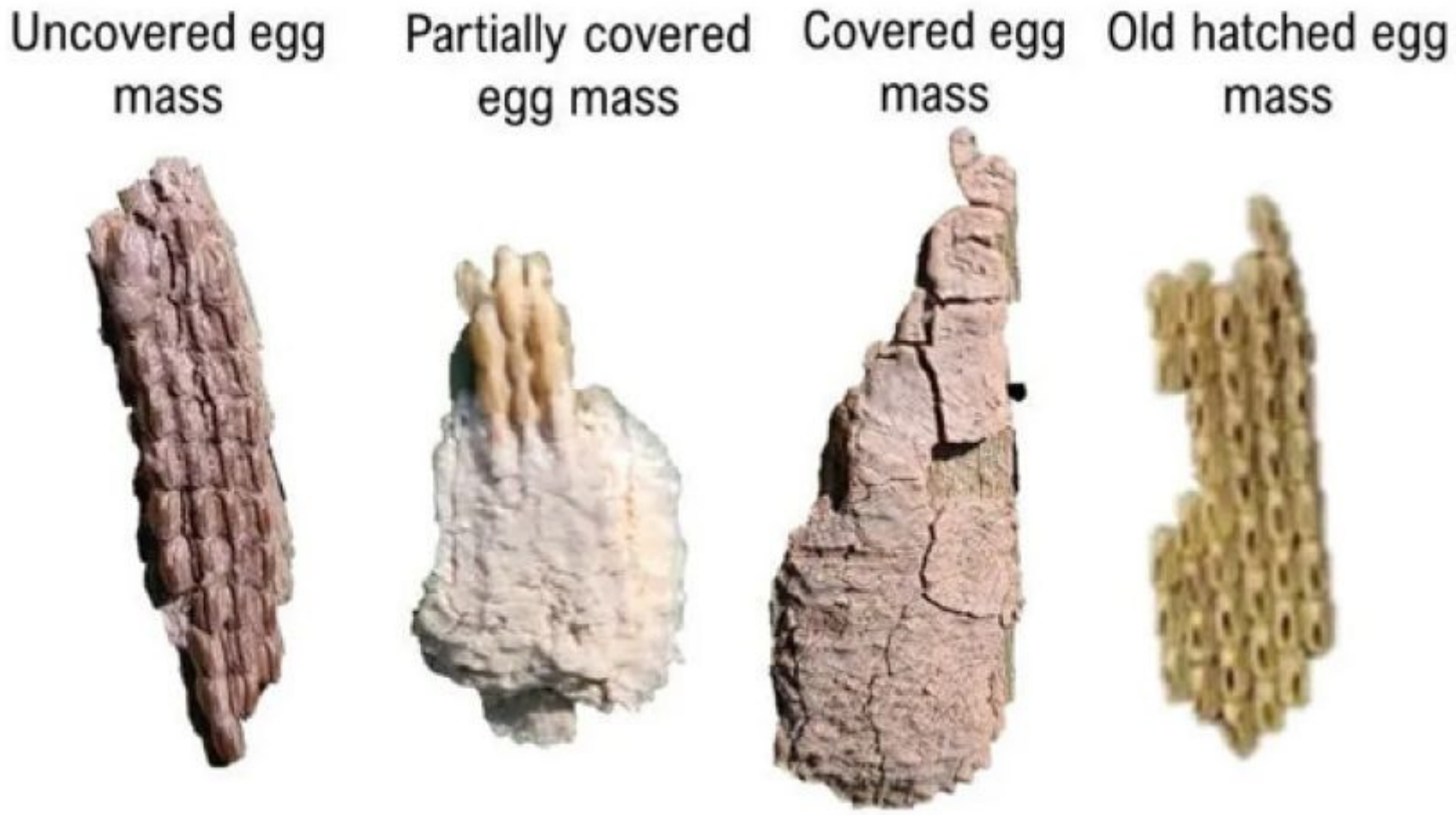

Variations in spotted lanternfly egg masses including color (yellow, gray, brown) and their covering.
Photo: Heather Leach, Penn State Extension

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VS

Spotted lanternfly egg masses on a red maple in a residential landscape in Washington County MD. These were the first SLF egg masses reported in MD this year on Sept. 23rd.
Photo: Josh Warner, Antietam Tree and Turf

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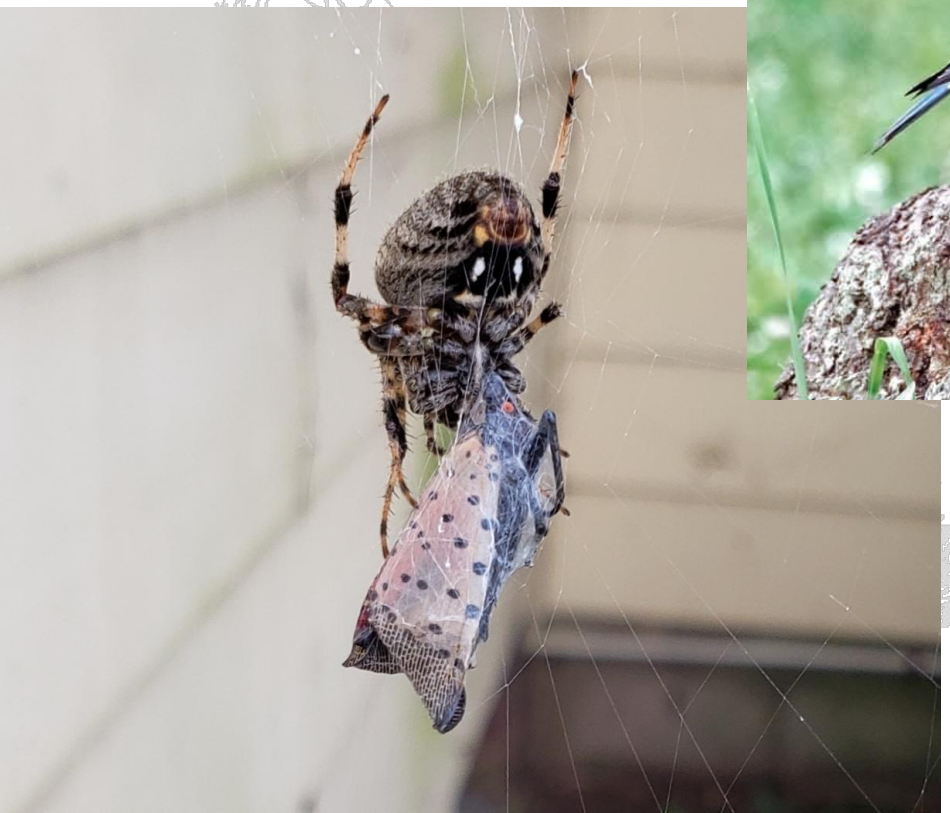
SLF Predation



Nymph/Adult Managemen

PennState Extension

Table 2. Management options for spotted lanternfly throughout the year.

Management Options	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Do not move any life stage of SLF	■	■	■	■	■	■	■	■	■	■	■	■
Scrape and destroy eggs	■	■	■	■	■				■	■	■	■
Spray eggs with dormant rate of horticultural spray oil*		■	■	■								
Traps (circle traps or protected sticky bands)					■	■	■	■	■	■		
Contact insecticide applications (after hatch and avoid bloom)					■	■	■	■	■	■		
Application of imidacloprid (systemic insecticide), after bloom					■	■	■	■				
Application of dinotefuran (systemic insecticide), after bloom							■	■	■			

*Some trees are sensitive to horticultural spray oil.

This is a guide for when to use management tactics to manage SLF. Read each label carefully and apply according to the label directions. These are our current best recommendations for management tactic timing, but not all combinations of active ingredient, timing, application methods, and tree species have been tested.

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Credit: Organic Plant Care: https://organicplantcarellc.com/facts-about-spotted-lanternfly-in-new-jersey-pennsylvania/
Image: Sap and honeydew running down trunk, which attracts yellowjackets and wasps who feed on the sugary excrement and leads to sooty mold, as well as weakens the plant.

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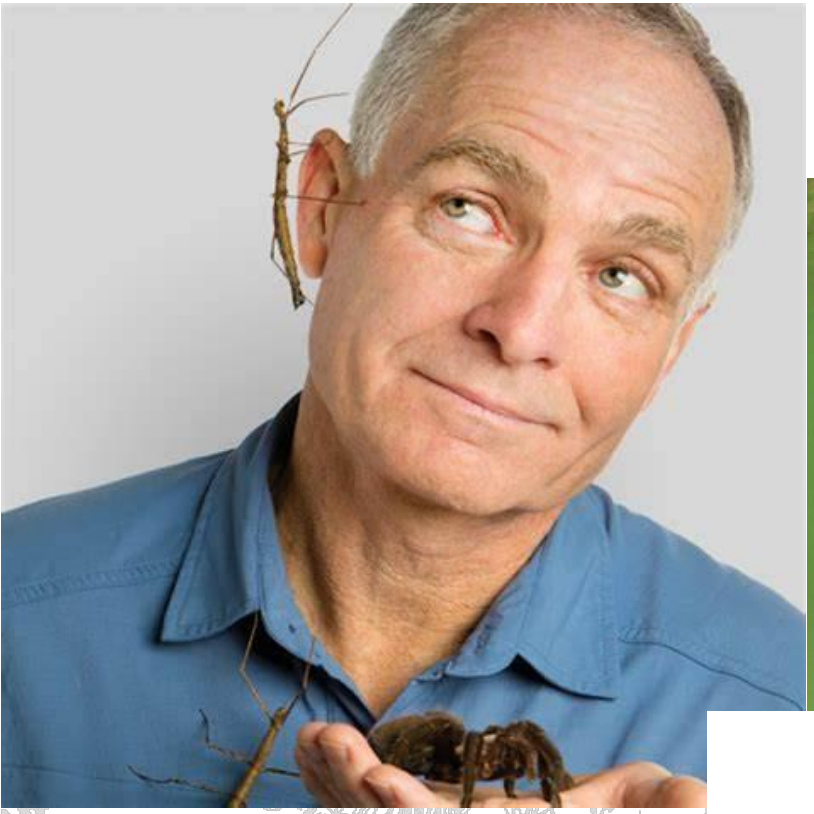

Dr. Mike Raupp
Emeritus Professor
Dept. of Entomology

Environmental Entomology, 49(4), 2020, 854–864
doi: 10.1093/ee/nvaa064
Advance Access Publication Date: 3 June 2020
Research

Pest Management

Applications of *Beauveria bassiana* (Hypocreales: Cordycipitaceae) to Control Populations of Spotted Lanternfly (Hemiptera: Fulgoridae), in Semi-Natural Landscapes and on Grapevines

Eric H. Clifton,[1,6,•] Ann E. Hajek,[1] Nina E. Jenkins,[2] Richard T. Roush,[3] John P. Rost,[4] and David J. Biddinger[2,5]

Dr. Paula Shrewsbury
Professor
Dept. of Entomology

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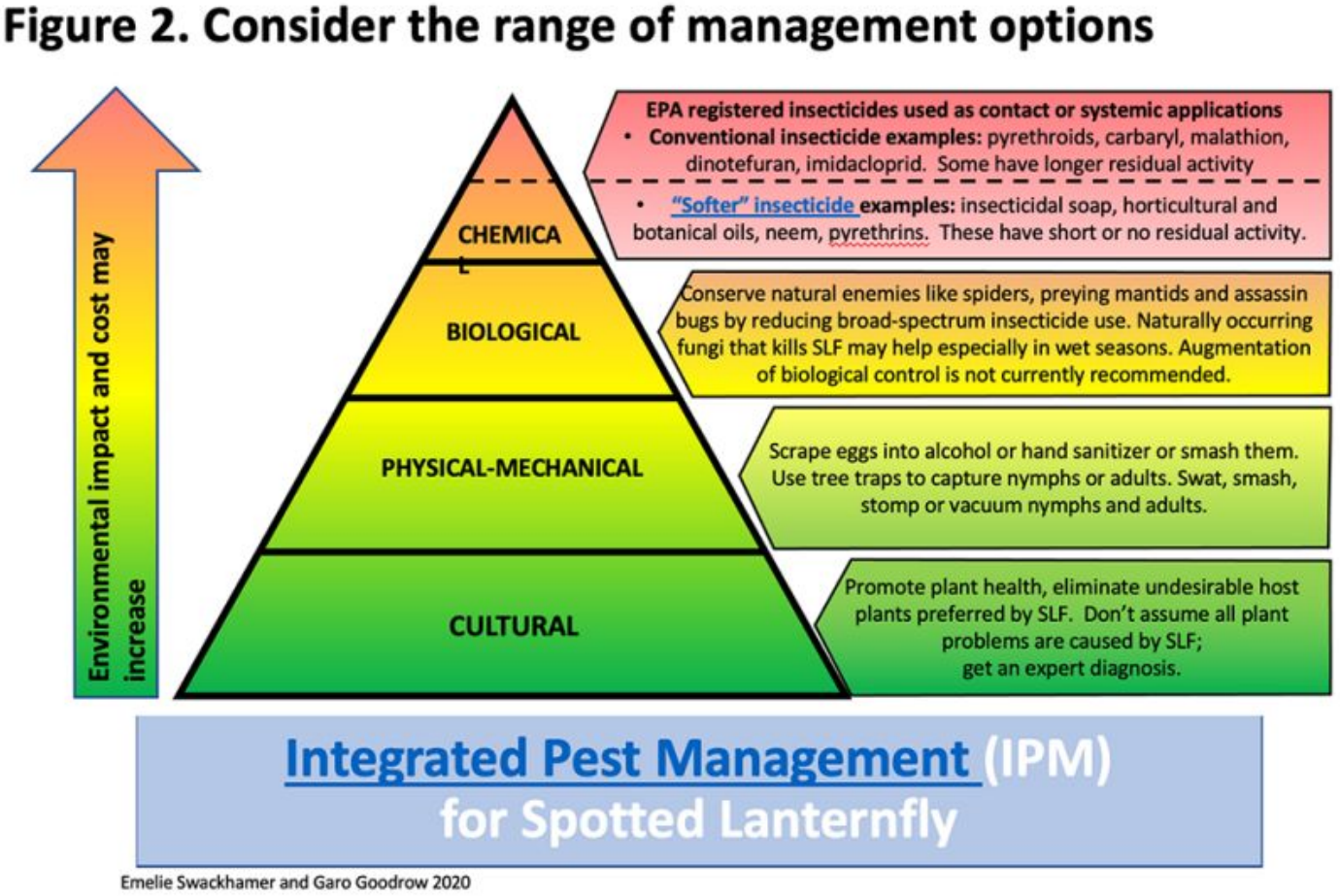
SLF Management

Figure 2. Consider the range of management options.



Graphic Links: 1) "Softer" insecticide, 2) Integrated Pest Management. Image: Emelie Swackhamer and Garo Goodrow, Penn State

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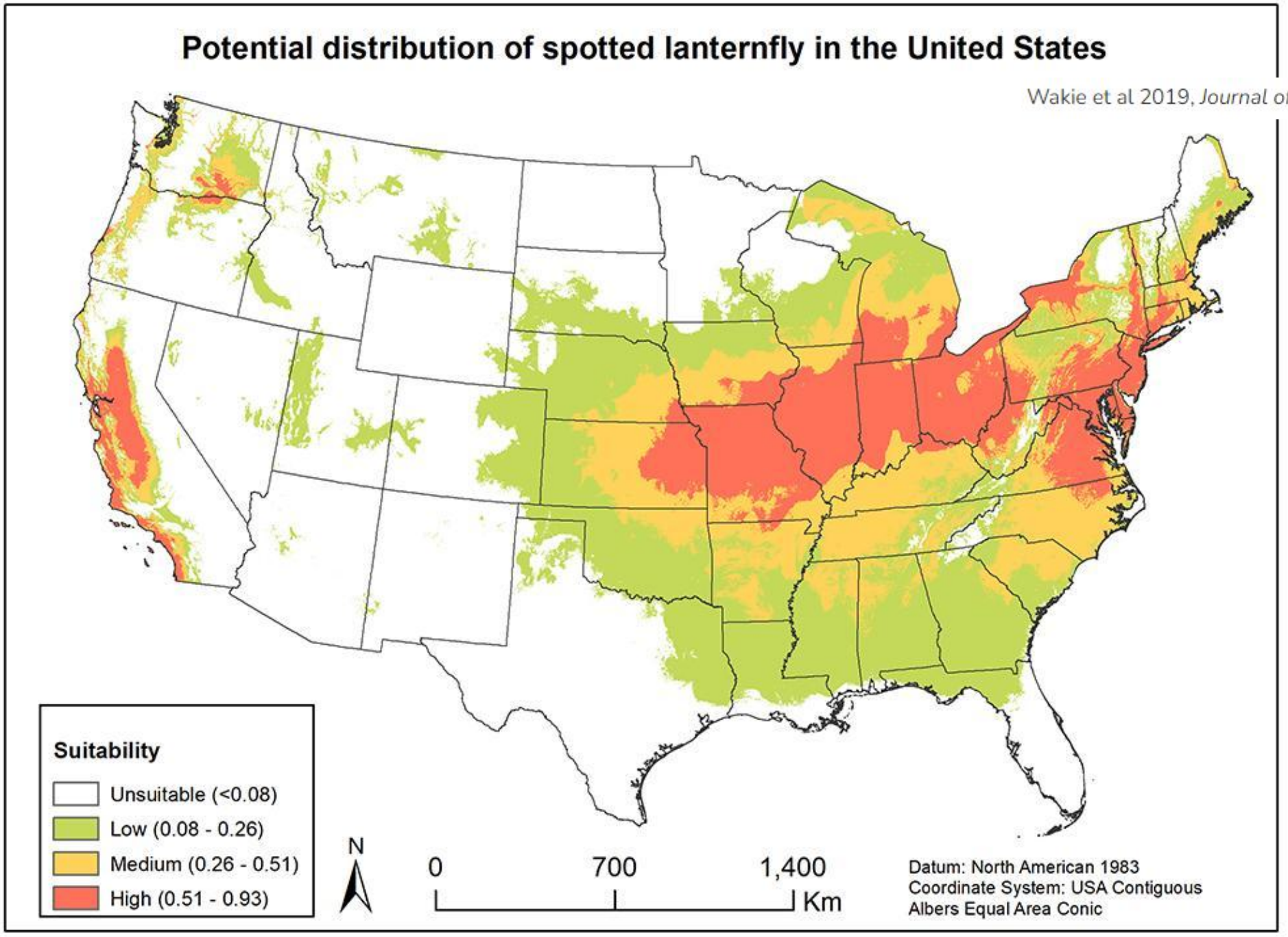
Potential distribution of spotted lanternfly in the United States

Wakie et al 2019, *Journal of Economic Entomology*



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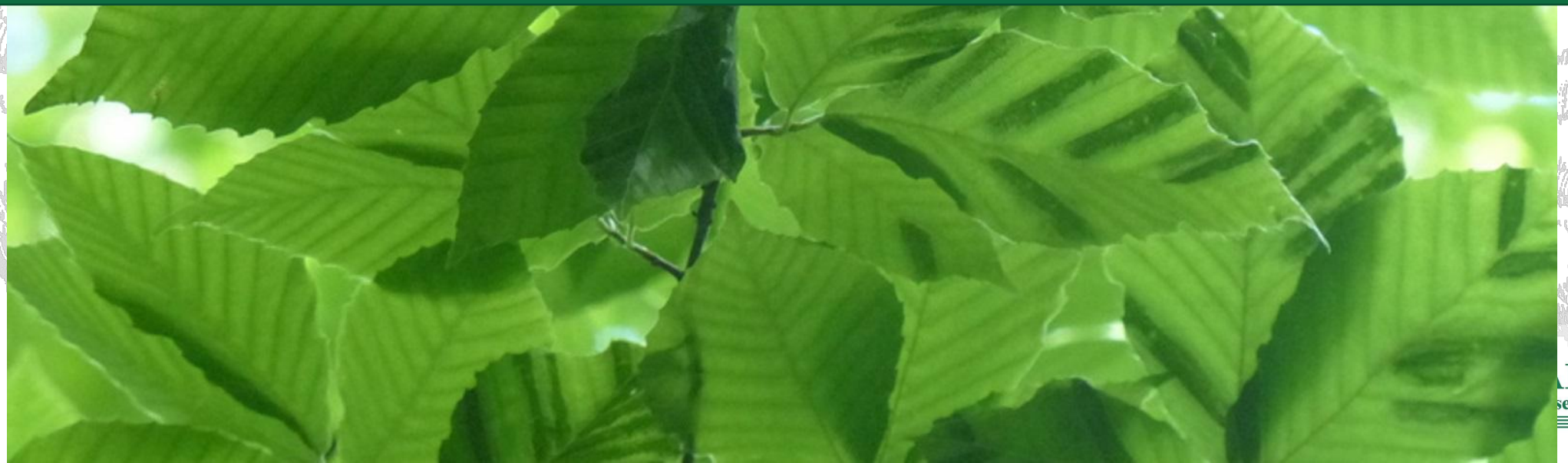
Beech Leaf Disease



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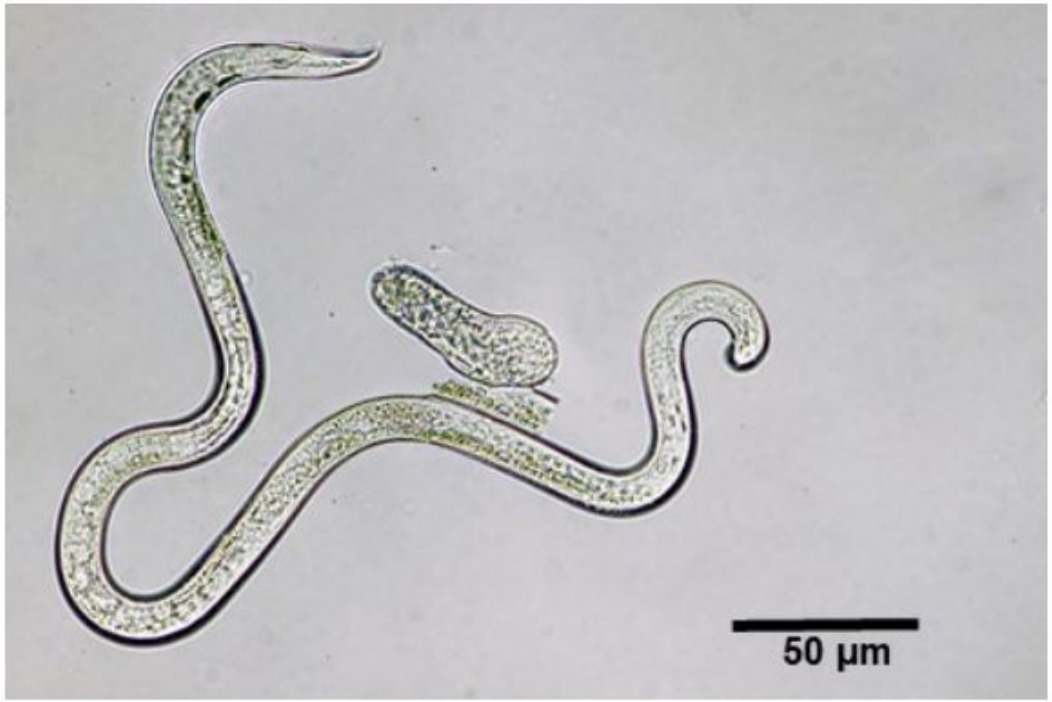
Beech Leaf Disease

- Emerging disease of *Fagus* spp. – all species/varieties seem to be susceptible
- Causal agent appears to be a foliar-feeding nematode, initially described in Japan
- Nematodes only infest/damage leaves

Figure 4: *Litylenchus crenatae* adult male and egg



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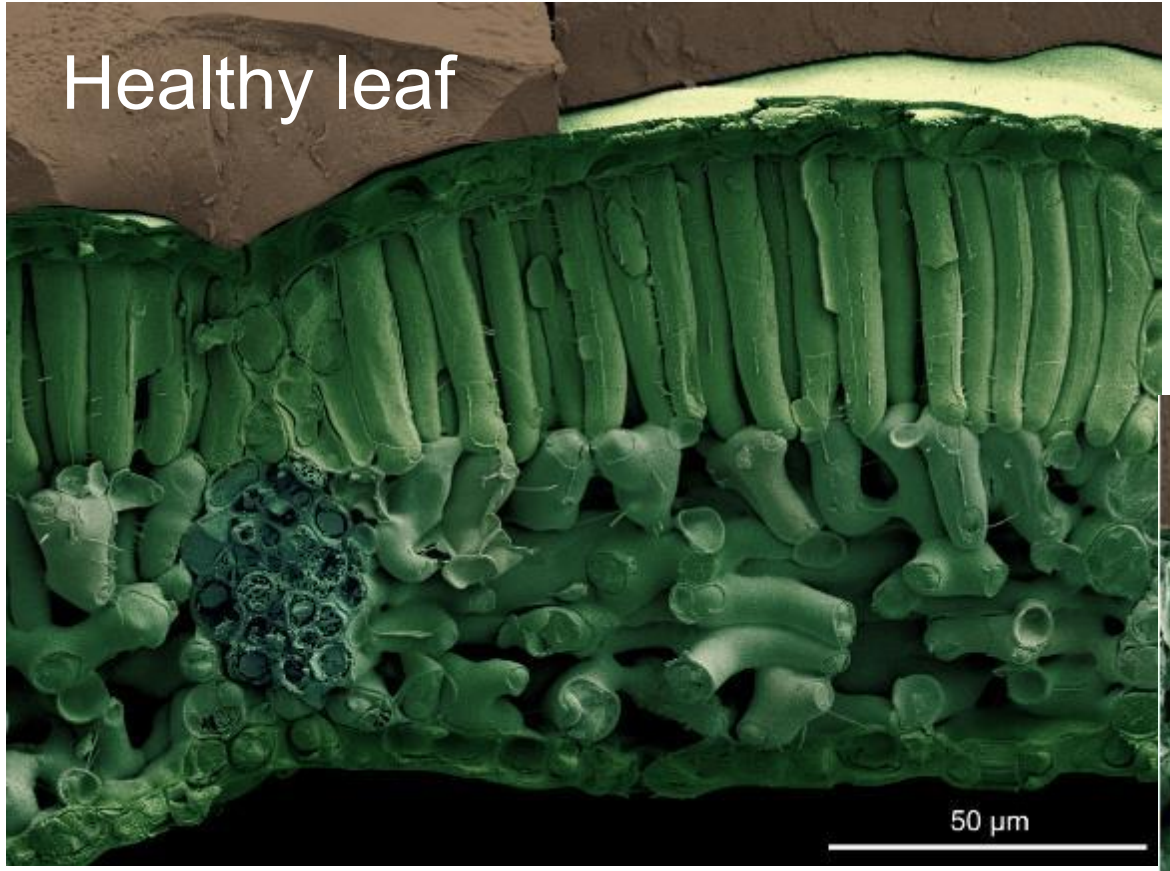
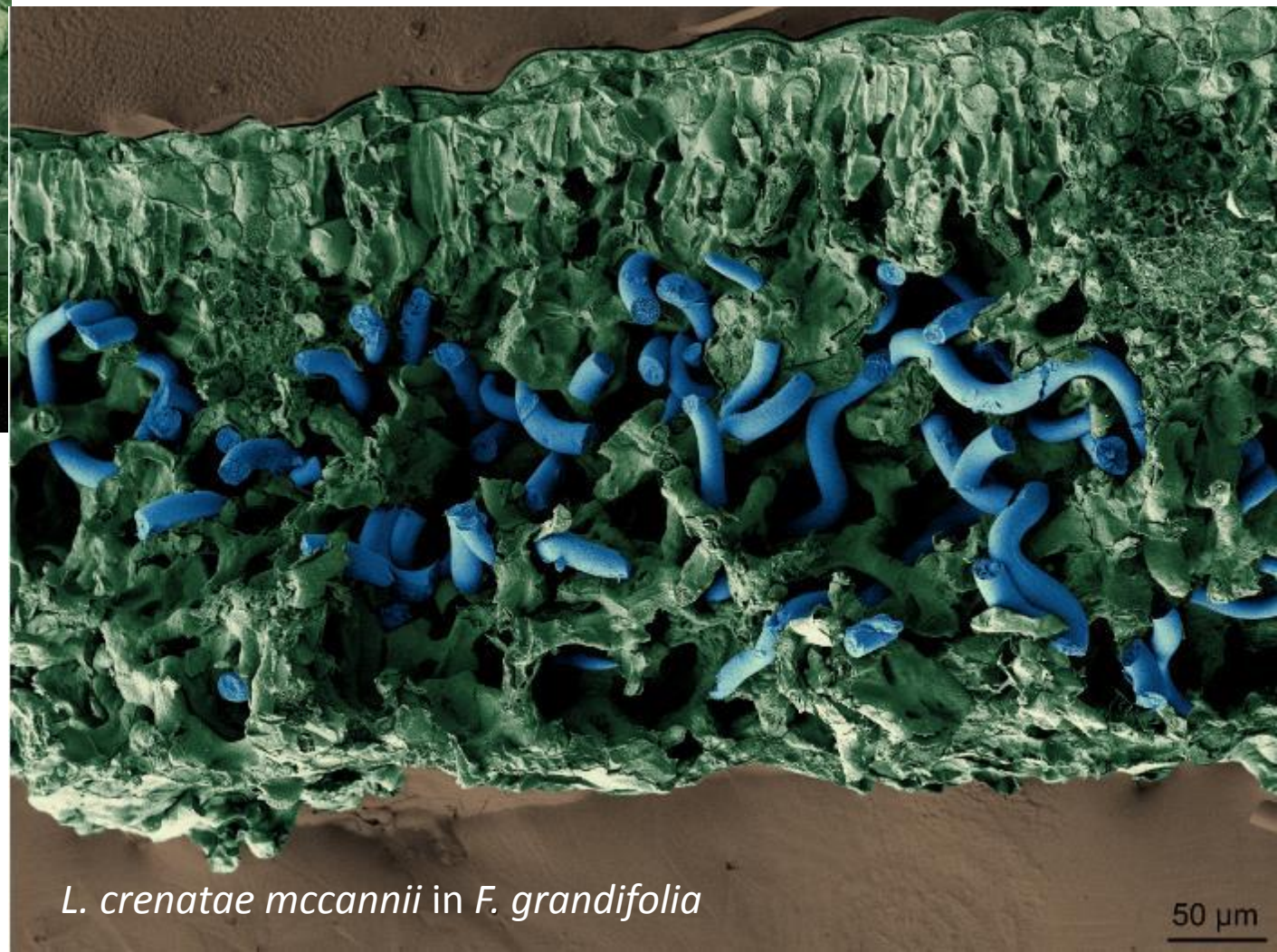


Upper layer palisade parenchyma
Lower layer spongy mesophyll
Fagus grandifolia leaves revealed by freeze-fracture LT-SEM

Freeze fracture by Gary Bauchan, Colorization by Joe Mowery, ECMU, USDA-ARS Beltsville, MD

BLD Leaf with *Litylenchus crenatae mccannii*

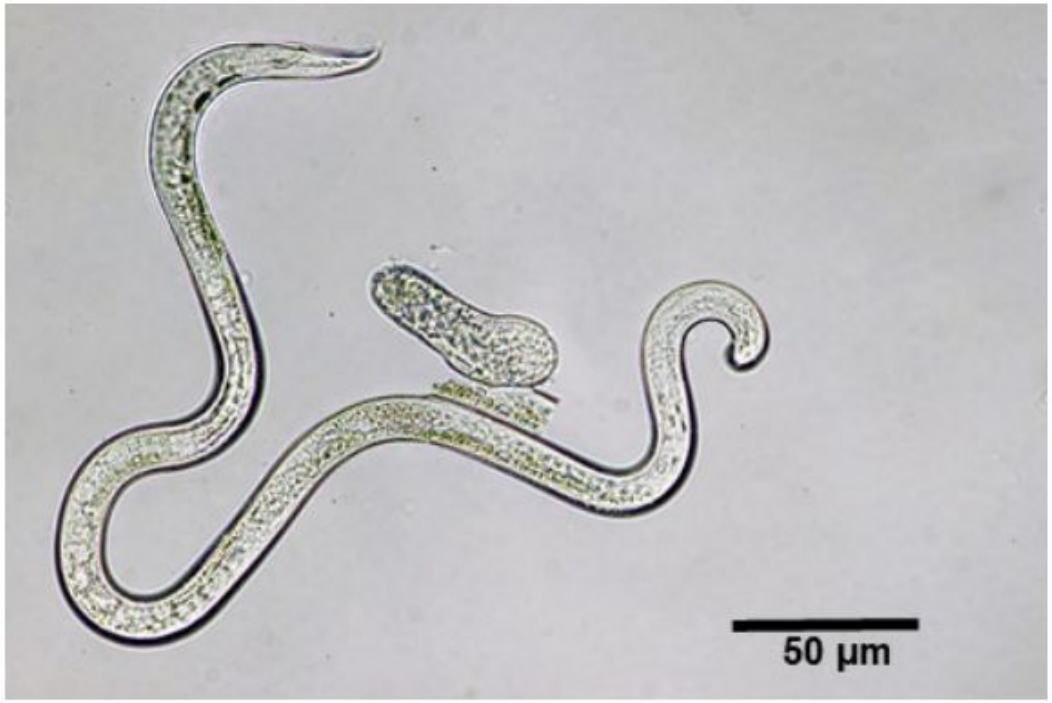
Lower leaf peel, Longitudinal section,
Freeze-Fracture, LT-SEM



Beech Leaf Disease

- Nematodes present in buds at start of growing season
- In late summer/early fall, move from leaves to new buds and are immediately present in the spring
- Can move locally in water films/perhaps other vectors

Figure 4: *Litylenchus crenatae* adult male and egg



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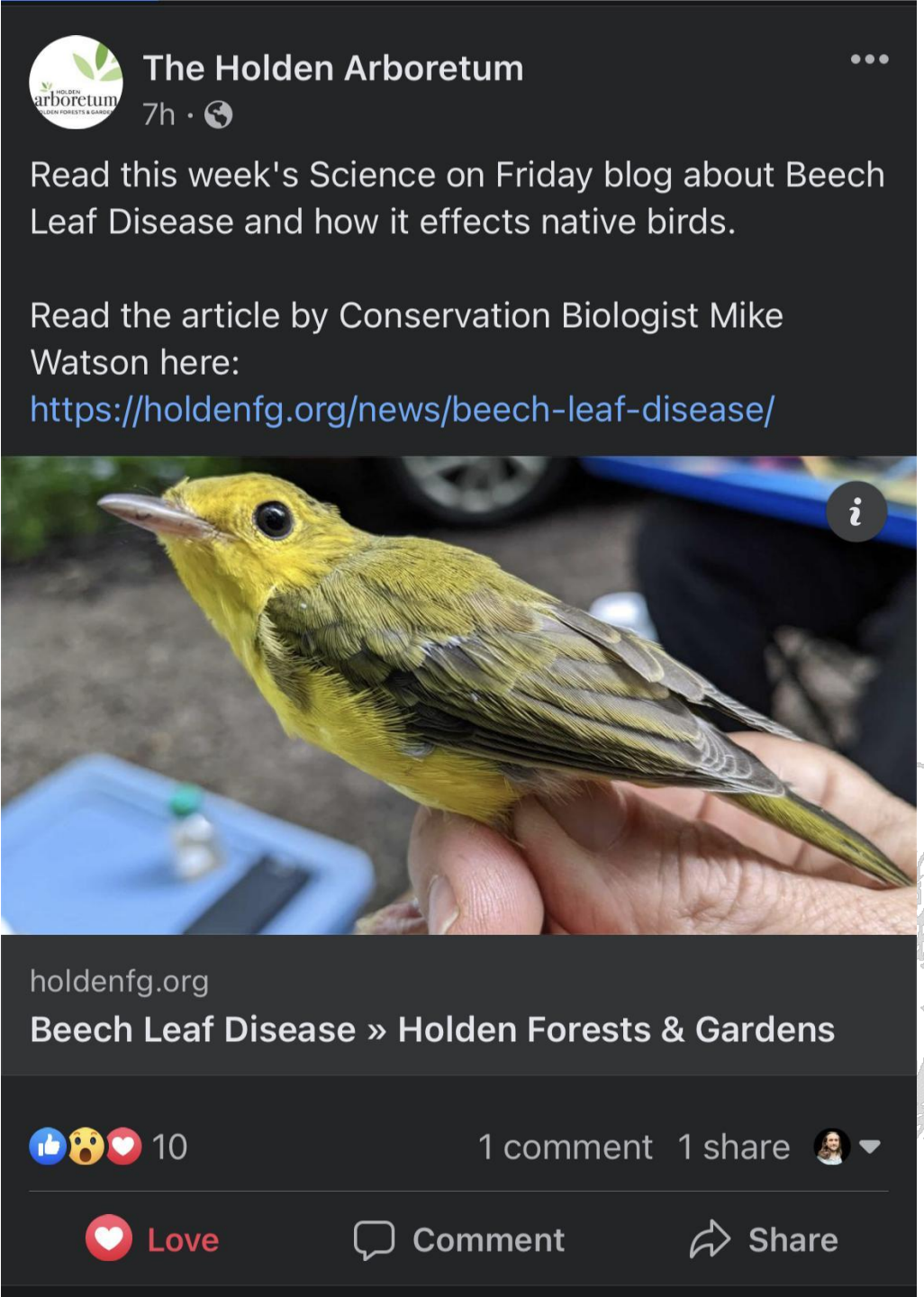
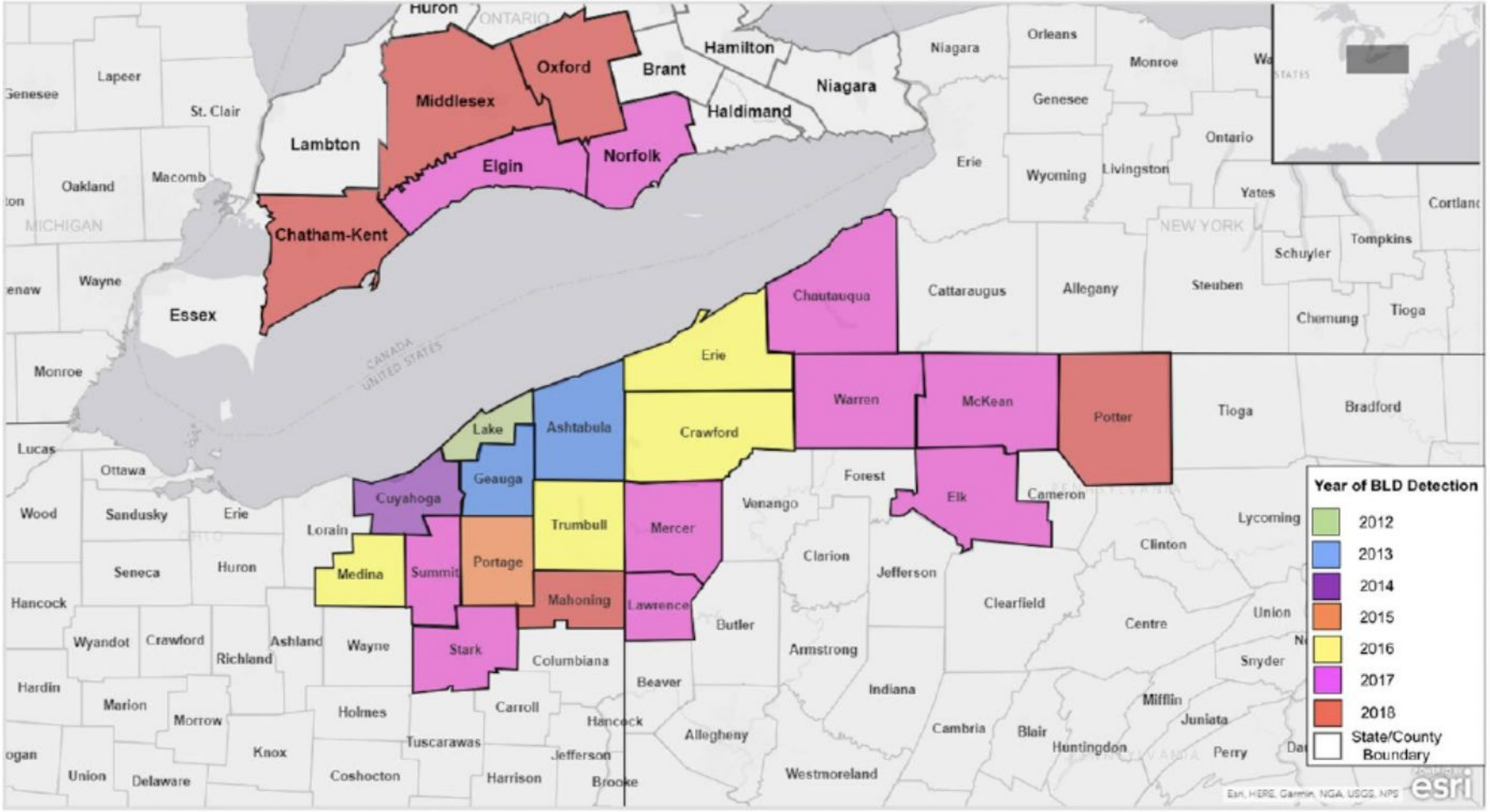
Possible Vectors?



vector. Dani Martin (Forest Pathologist; US Forest Service) recently began investigating whether and how birds might serve as vectors for *L. crenatae* by capturing birds in BLD-affected areas and collecting fecal and other samples. These are then tested for *L. crenatae* DNA.

Three rounds of netting at Holden (January, April, and August 2022) resulted in nearly 80 birds from more than 10 species. Birds were captured in mist-nets at one of two locations at Holden, held briefly to allow time for defecation, then measured and dusted for mites before being released at capture location.

Many samples have tested positive for *L. crenatae*, indicating that the nematode that causes BLD are present on birds. Next steps include looking for viable (live) nematodes in samples collected from birds, and more direct testing of nematode presence and viability in fecal samples (i.e. demonstration that nematodes can survive passage through a bird's digestive system).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Macomb
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Monroe
Lucas
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Wood
Sandusky
Erie
Seneca
Huron
Hancock
Wyandot
Crawford
Richland
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Morrow
Knox
Union
Delaware
Holmes
Coshocton
Tuscarawas
Carroll
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Beaver
Allegheny
Westmoreland
Stark
Mahoning
Lawrence
Butler
Armstrong
Indiana
Cambria
Blair
Huntingdon
Mifflin
Juniata
Perry
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Centre
Clinton
Lycoming
Clearfield
Jefferson
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Bradford
Warren
Crawford
Erie
Chautauqua
Lake
Ashtabula
Geauga
Cuyahoga
Trumbull
Mercer
Medina
Summit
Portage
Cattaraugus
Allegany
Steuben
Chemung
Schuyler
Tompkins
Yates
Ontario
Livingston
Wyoming
Genesee
Orleans
Monroe
Niagara
Erie
NEW YORK
MICHIGAN
CANADA
UNITED STATES
Year of BLD Detection
2012
2013
2014
2015
2016
2017
2018
State/County Boundary
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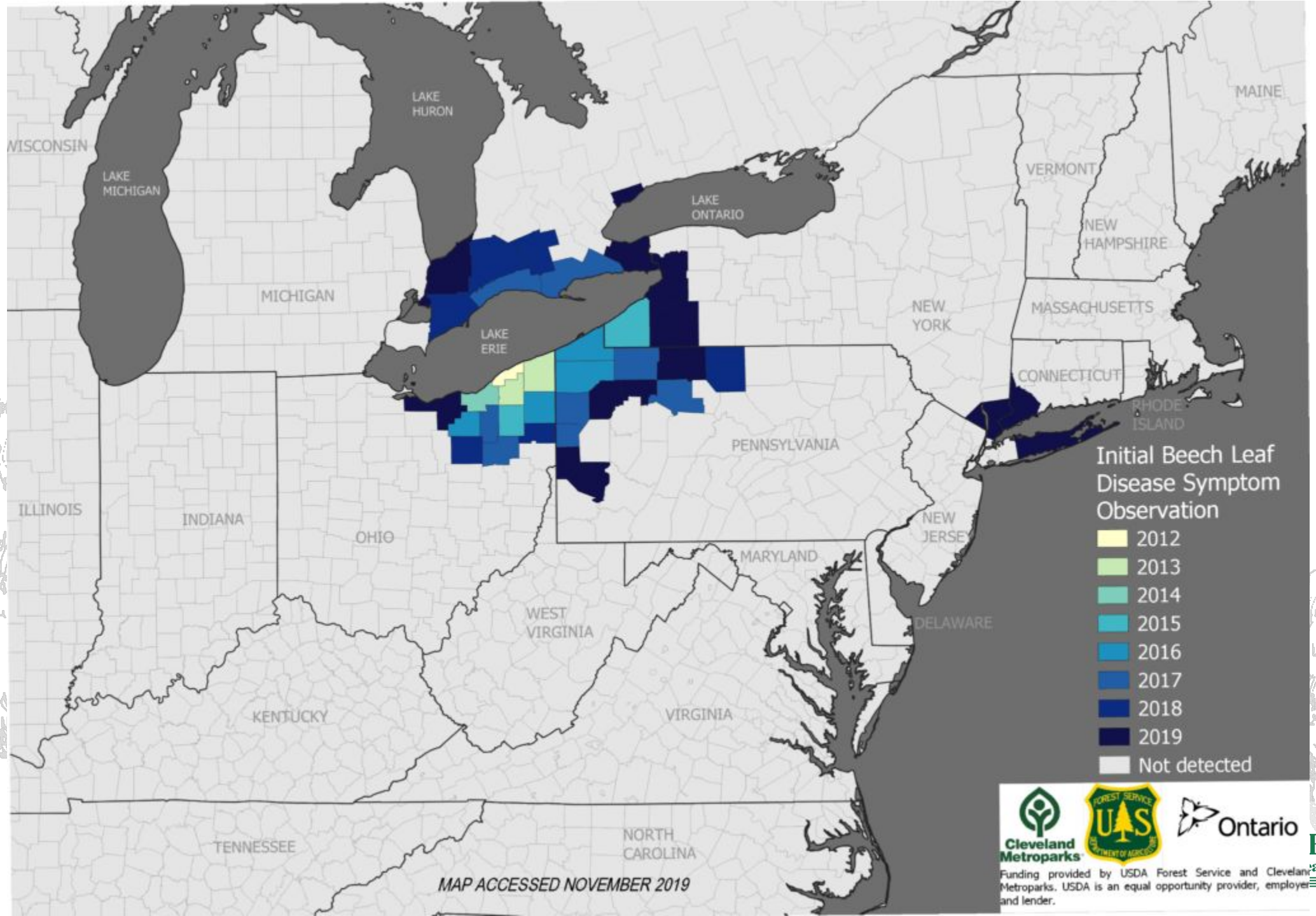

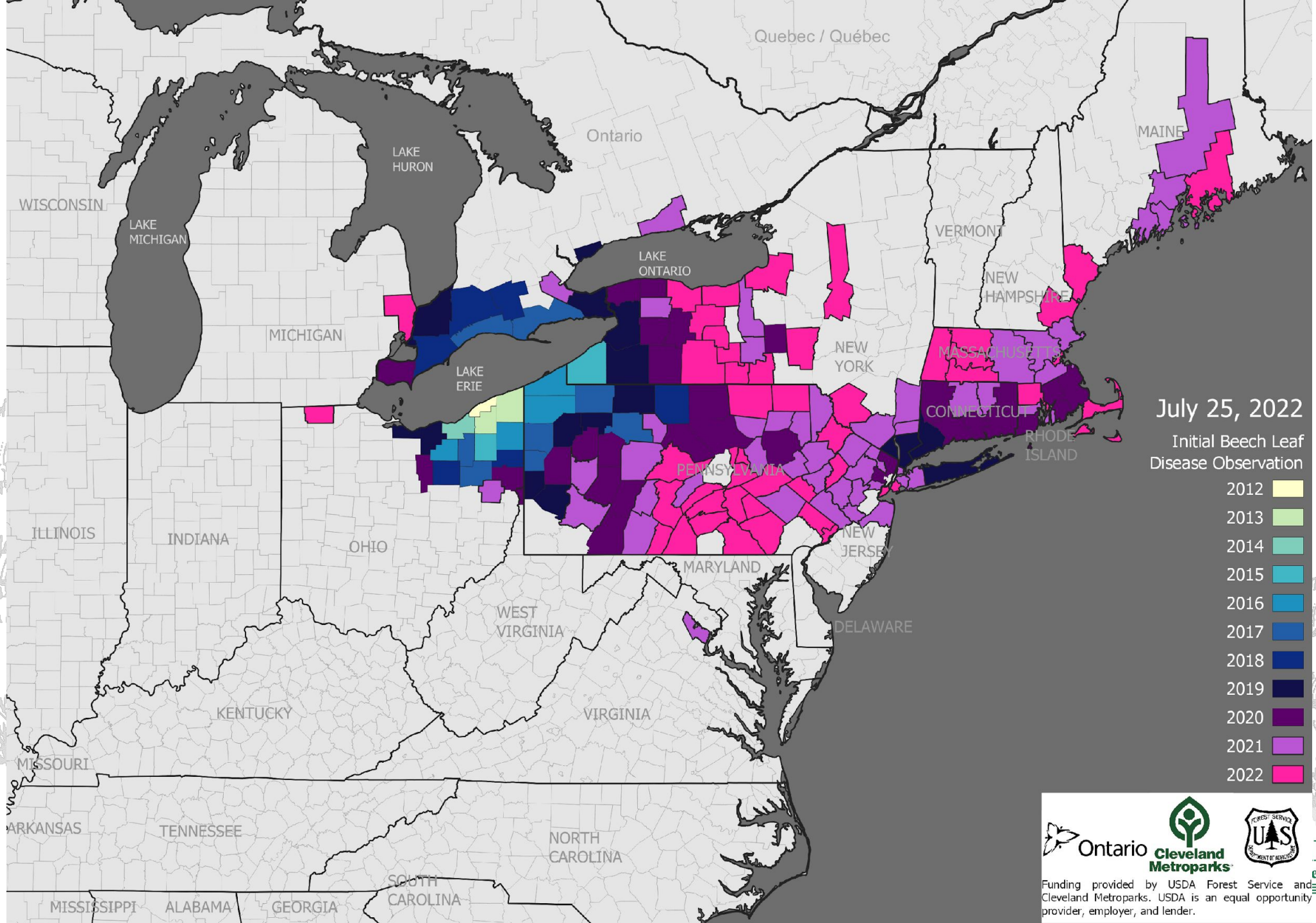

Ontario Cleveland Metroparks
Funding provided by USDA Forest Service and Cleveland Metroparks. USDA is an equal opportunity provider, employer, and lender.
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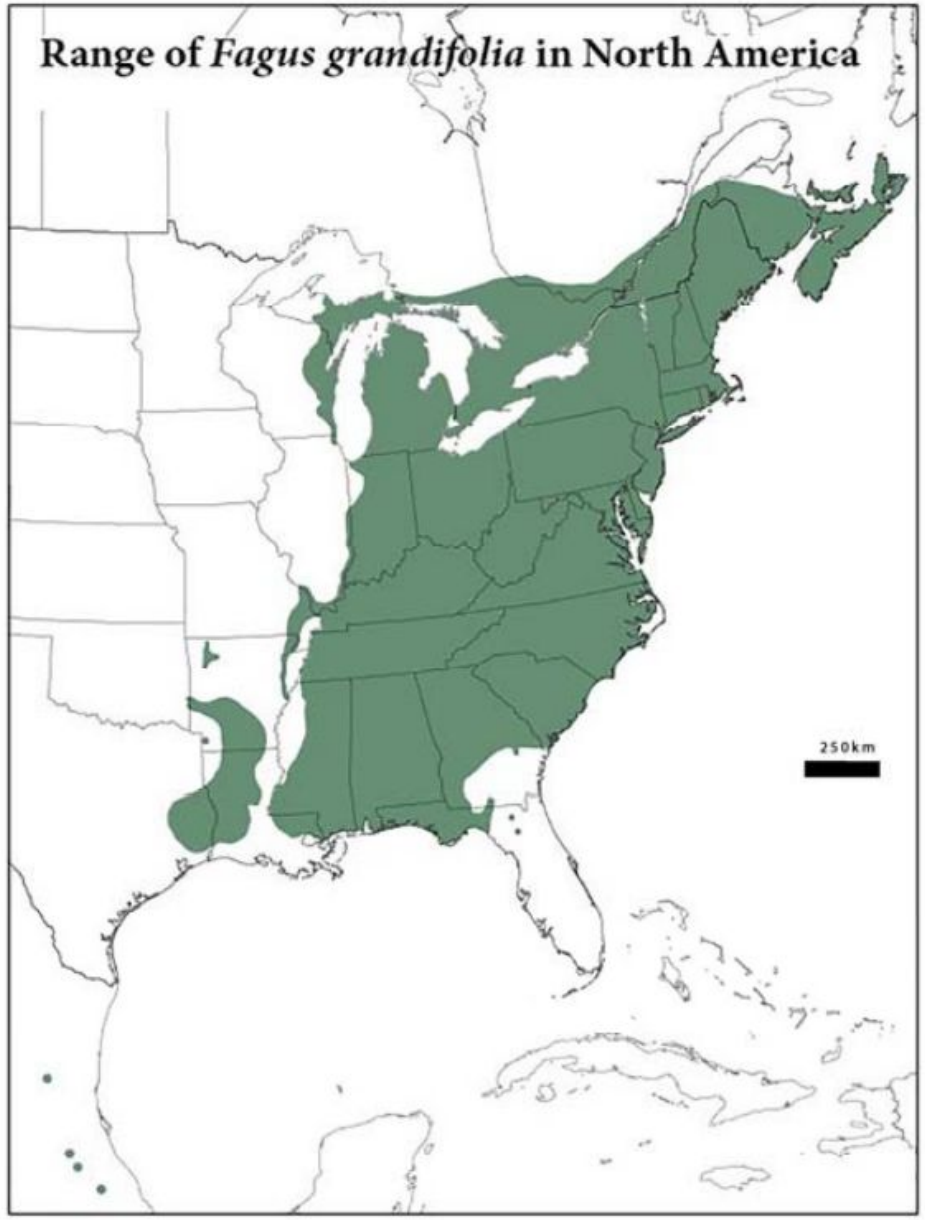

Figure 1. Present geographic distribution of the American Beech. This map was created using ArcGIS and the documented range of American Beech is depicted in green. The data were downloaded from the United States Geological Survey's Geosciences and Environmental Changed center website [5].

Review

Impacts of Beech Bark Disease and Climate Change on American Beech

Christopher Alexander Stephanson and Natalie Ribarik Coe *

Department of Biology, Green Mountain College, Poultney, VT 05764, USA; stephansonc@greenmtn.edu
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BLD Early-Stage Symptoms

Dark banding as damaged bud tissue grows out

Best seen from below

Mild symptom increase most in years 2-4

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BLD Later-Stage Symptoms

Distortion, leaf crinkling, dying buds

Thick, hardened leaves after 2/3 banded

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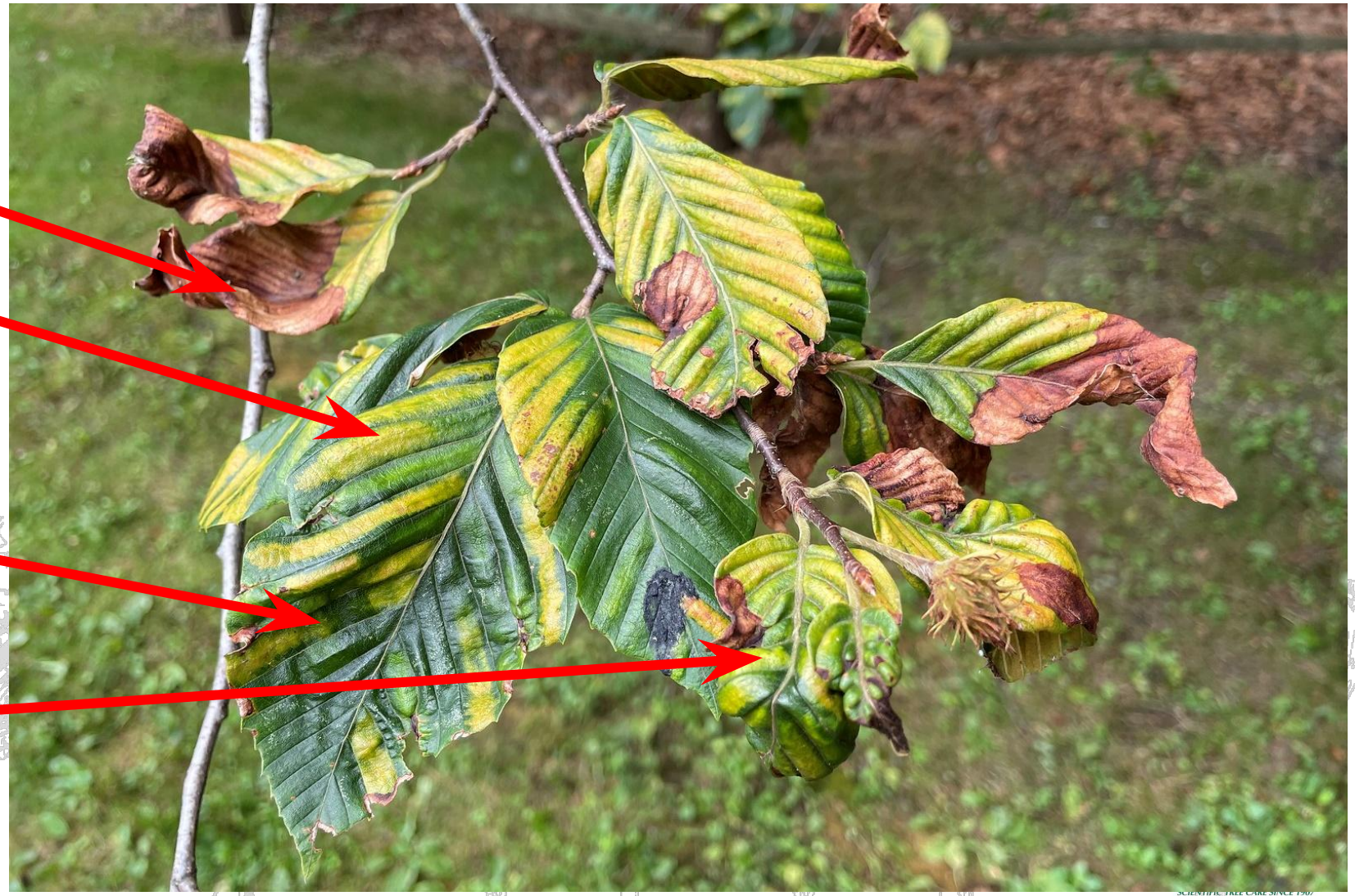
BLD Later-Stage Damage

Necrosis

Chlorotic banding

Dark banding

Stunting



Lookalikes?

NEW YORK STATE

Department of Environmental Conservation

Powdery mildew

Symptoms: Leaves and stems appear to be covered in a white, powdery substance that resembles powdered sugar.

Photo by University of Georgia Plant Pathology, Bugwood.org

Anthracnose

Symptoms: Small brown or black spots on leaves that eventually cause dead areas. New leaves may curl.

Photo by Nancy Gregory, University of Delaware, Bugwood.org

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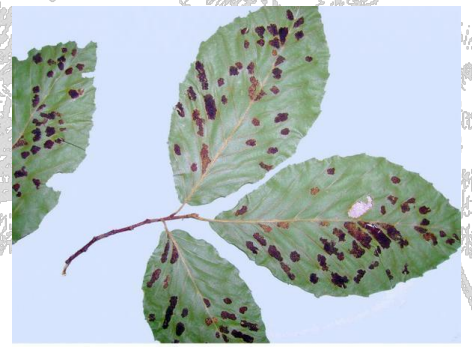
Lookalikes?

NEW YORK STATE

Ser

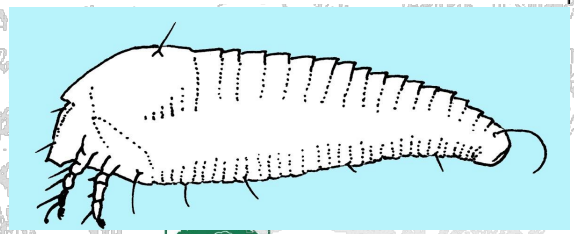
Department of Environmental Conservation

Beech leaf rolling aphid	**Signs:** Leaves may curl and appear yellow/faded between the veins. 
Erineum patch	**Symptoms:** Yellowish patches appear on the upper side of the leaf. The patches are light green in spring, then fade to orange and eventually brown.  Photo by Eric R. Day, Virginia Polytechnic and State University, Bugwood.org



Erineums caused by *Aceria ferruginea* on beech.

Photo by Charles Smith (Strick Tree Services)



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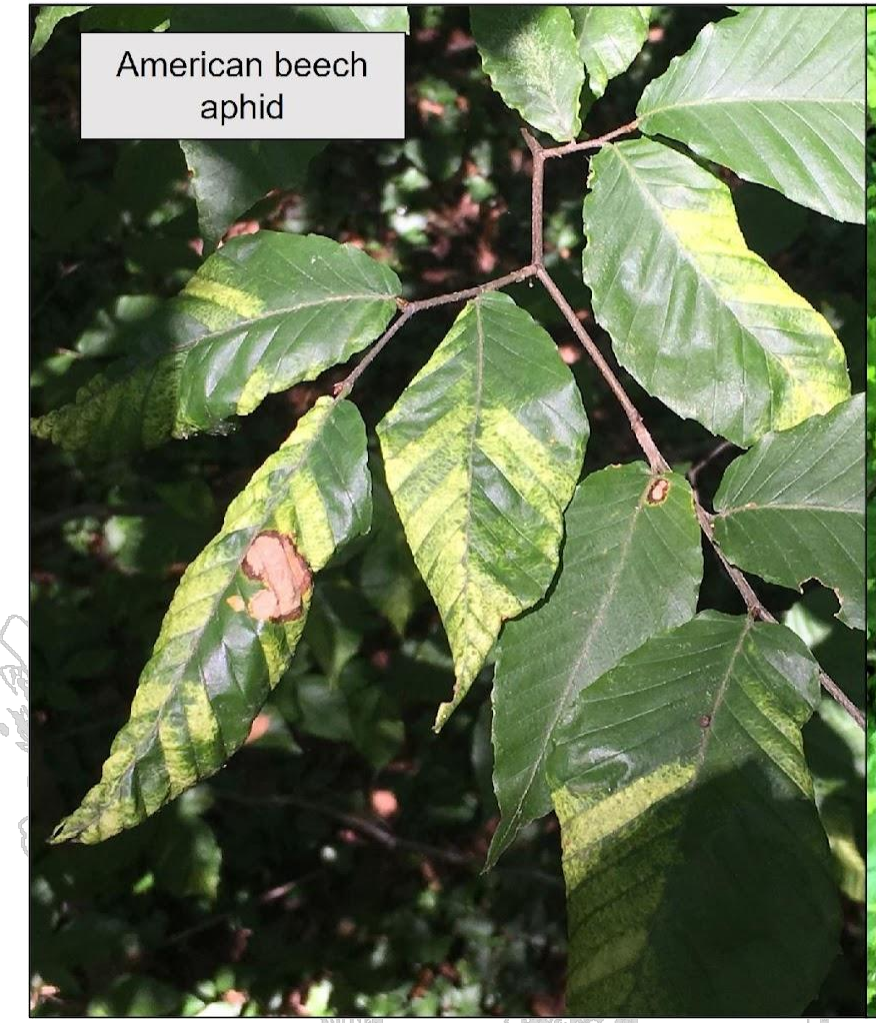
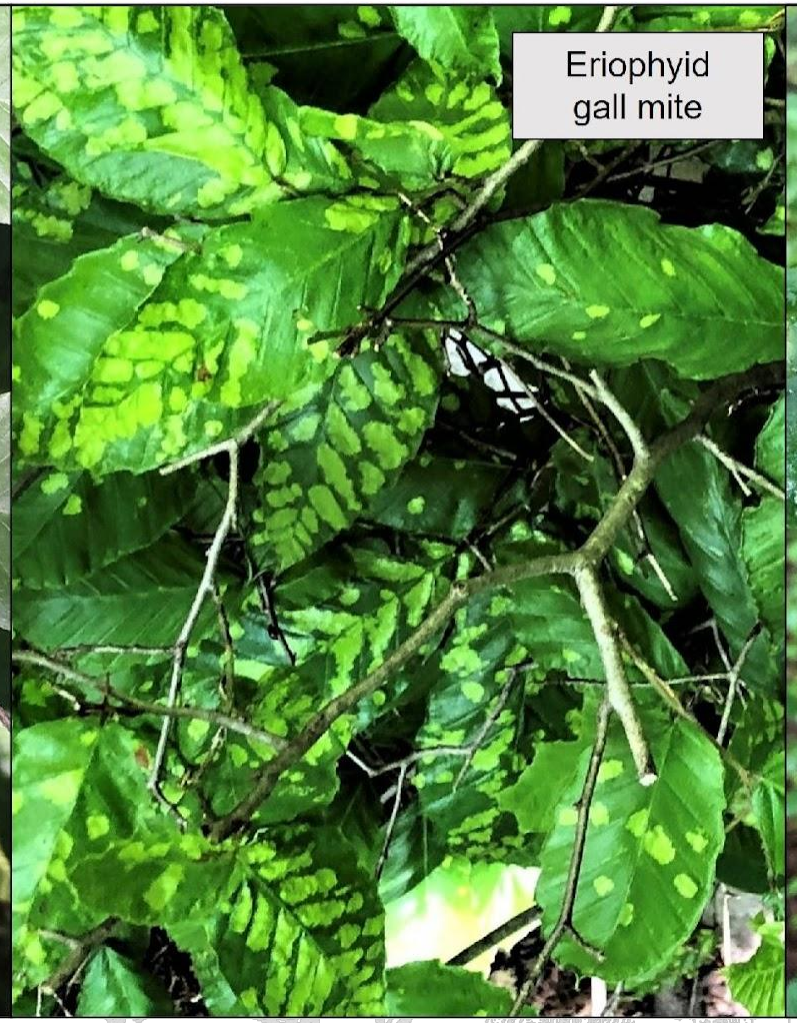
Beech leaf symptoms
three different causal organisms





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Lookalikes?

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Long Term Effects

Individual trees suffer foliage loss and canopy dieback

Forest stands dramatically changed as canopy thins

Long Term Effects

Tree death likely due to energy depletion

Roughly 5-7 years

Trees seem to be dying faster in some parts of the Northeast

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BLD Management Efforts

- Substantial time/effort/resources invested in finding solutions – numerous trials, numerous products, numerous sites
- Collaborations with numerous partners (Cleveland Metro Parks, Davey)

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Research Scientists

Dr. Tom Smiley

Dr. Drew Zwart

Dr. Andrew Loyd

Dr. Chad Rigsby

Dr. Beth Brantley

Dr. Chris Riley

Drs. Kelby Fite, Kevin Chase, and Matt Borden (CLT)

Drs. Glynn Percival, Jon Banks, and Luke Hailey (UK)

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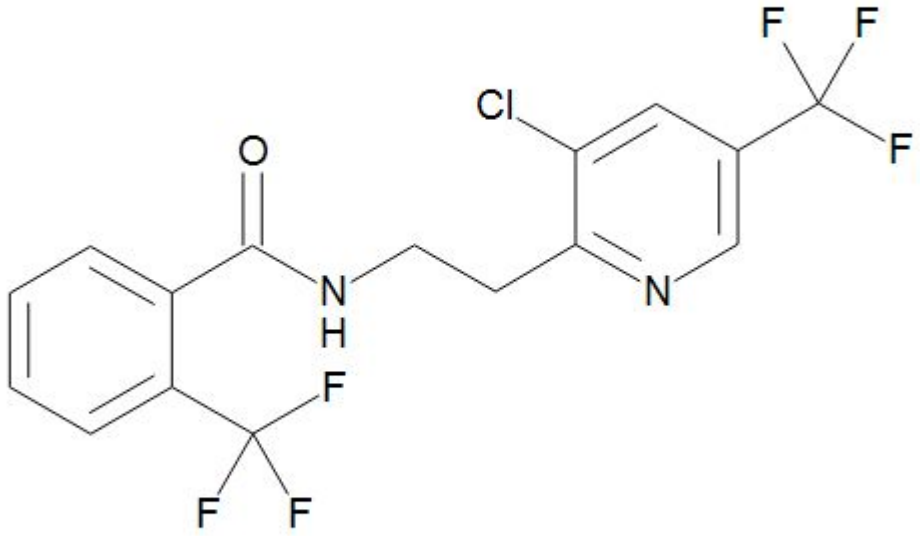
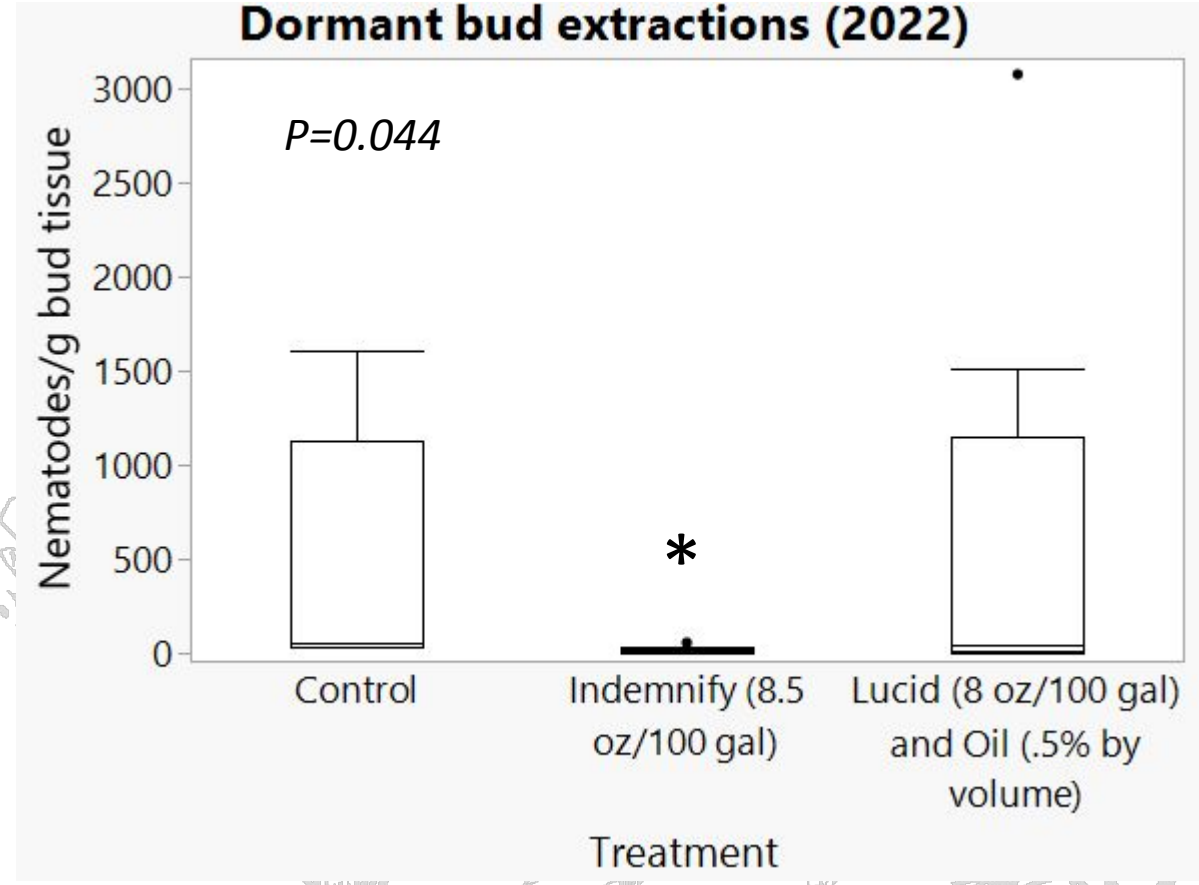
BLD Management Efforts

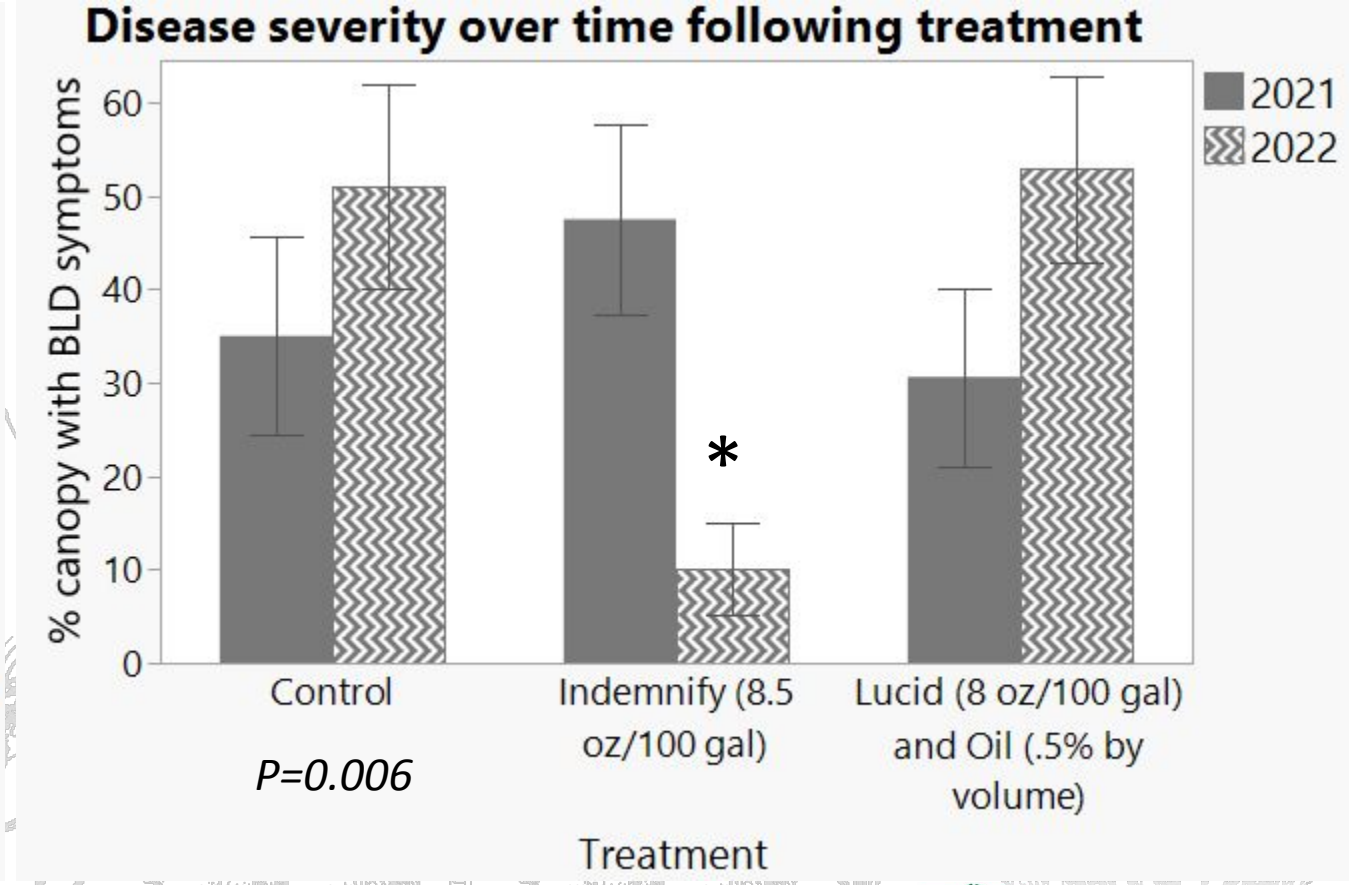
Fluopyram

Fluopyram, the active ingredient in Indemnify, blocks nematodes' cellular respiration and limits their ability to produce energy. The energy-drained nematodes straighten out and become paralyzed. They stop feeding on roots and eventually die.



Bartlett Tree Experts
Foliar Nematicide Trial (Perry, OH)





In Progress: Round two with Broadform

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BLD Management Efforts

- Current research suggests foliar treatments with AI Fluopyram can reduce nematode populations, symptoms
- **Coupled with phosphonate treatments = best management approach at present**

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RESEARCH LABORATORY TECHNICAL REPORT

BARTLETT TREE EXPERTS

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Beech Leaf Disease

Andrew L. Loyd, PhD
Plant Pathologist

Beech leaf disease (BLD) is an emerging disease caused by a nematode, or microscopic worm. All cultivars of American and European beech are susceptible. Beech are ecologically important trees in the eastern United States and are common feature trees in landscapes. Beech leaf disease was first observed in Lake County, Ohio (Cleveland area) in 2012. Since its initial detection, the disease has been observed in other counties in Ohio, Pennsylvania, New York, Connecticut, and Ontario. BLD is caused by a foliar-feeding nematode, *Litylenchus crenatae,* which was described initially on Japanese beech in Japan where it causes a mild disease. In the United States, however, healthy beech trees have been observed dying in a period of six years from the onset of symptoms. As BLD progressively worsens, the tree's overall health weakens exposing it to secondary insect pests and diseases.

Questions?

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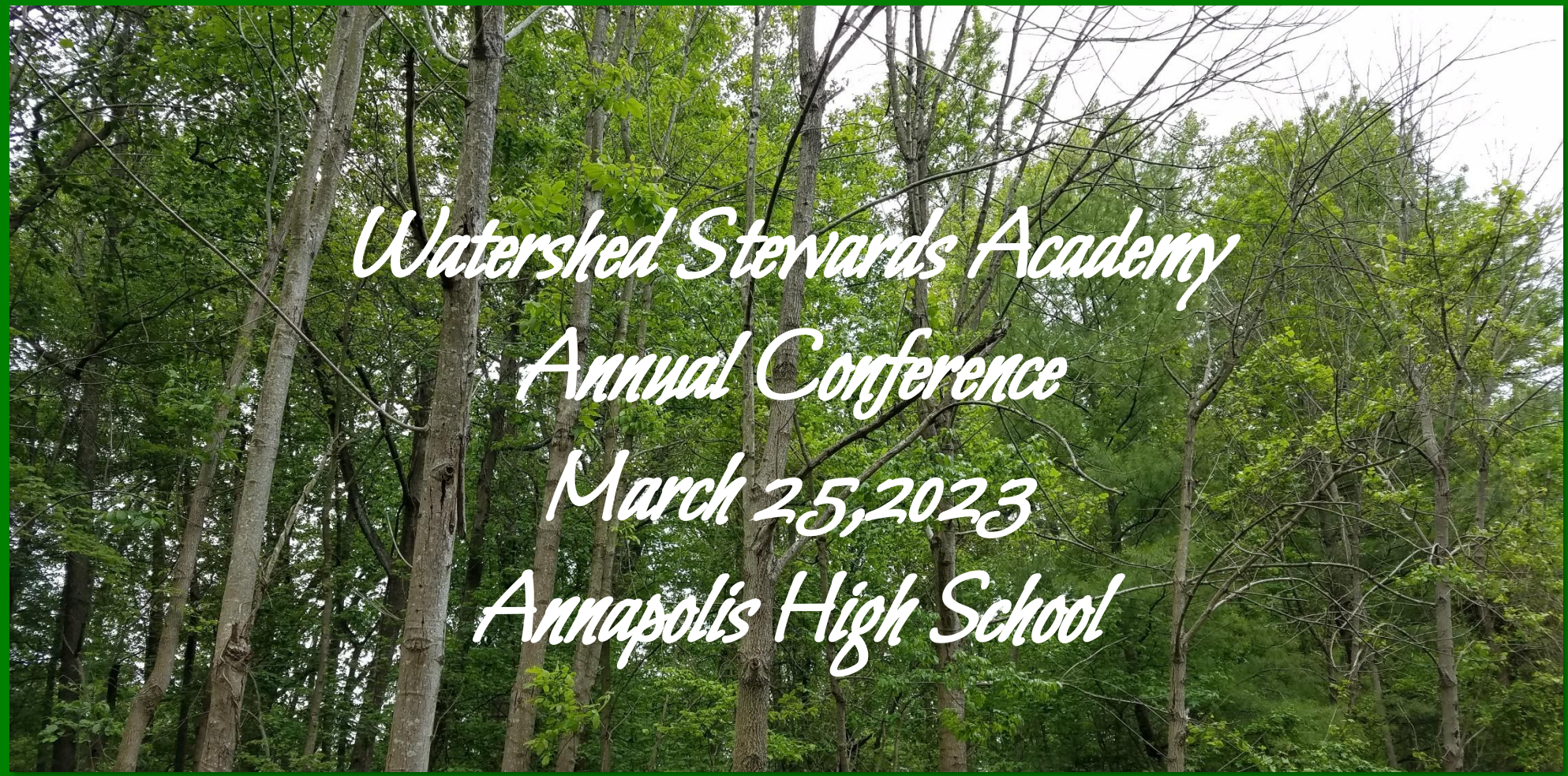
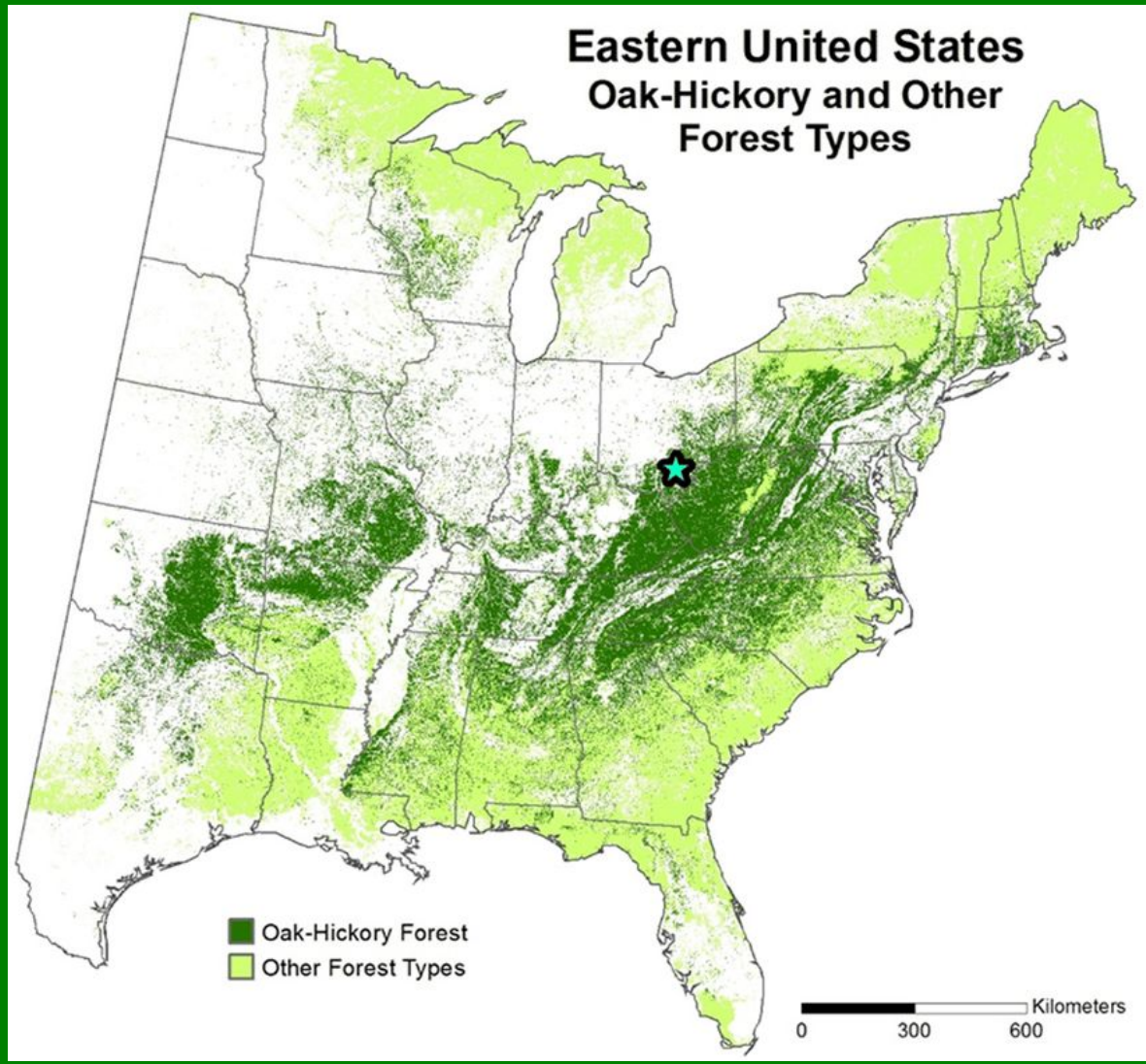
Oak Decline in AA County



Oak Decline

- Oak decline is a phenomenon that has been observed over all the mid Atlantic and Southern States.
- Anne Arundel County is typically Oak-Hickory



Oak Decline

- Oak decline is a phenomenon that has been observed over all of the mid Atlantic States;
- Oak deline is a disease complex.
- Decline of a tree is a progressive state of worsening health that is caused by stress. There are several factors identified as stressors that weaken the tree, making it vulnerable to insect pests and diseases.

Oak Decline

- Oak decline is a phenomenon that has been observed over all of the mid Atlantic States;
- Decline of a tree is a progressive state of worsening health that is caused by stress. There are several factors identified as stressors that weaken the tree, making it vulnerable to insect pests and diseases;
- Oak Decline generally *cannot be stopped* once the process starts!

Oak Decline

Noted Stressors

- Periods of Drought – excess precipitation
- Urban Stress – pollution, soil issues
- Diseases
- Insect pests
- Overcrowding – Mature trees require more room to grow

Oak Decline

Bacterial leaf scorch, *Xylella fastidiosa* on red oak
note the yellow halo at the edge of the infection

Oak Decline

Hypoxylon canker of oak, *Biscogniauxia atropunctata atropunctata*

David J. Moorhead, University of Georgia, Bugwood.org

Oak Decline

Why is this important?

- Oaks compose approximately 30% of the trees in Anne Arundel County. [1]
- In certain forest types, they may make up 90%;
- Oak provide higher wildlife benefits than other species. [2,3]

1. Lister, Tonya W. 2018. Forests of Maryland, 2017. Resource Update FS-166. Newtown Square, PA: U.S. Department of Agriculture, Forest Service, Northern Research Station. 4 p.
2. Tallamy, D (2009), Bringing Nature Home. (2nd edition) Portland, OR/USA: Timber Press
3. Ober, H. K. & Minogue, P. J. (2014). Managing oaks to produce food for wildlife. WEC249 Gainesville: University of Florida Institute of Food and Agricultural Sciences.

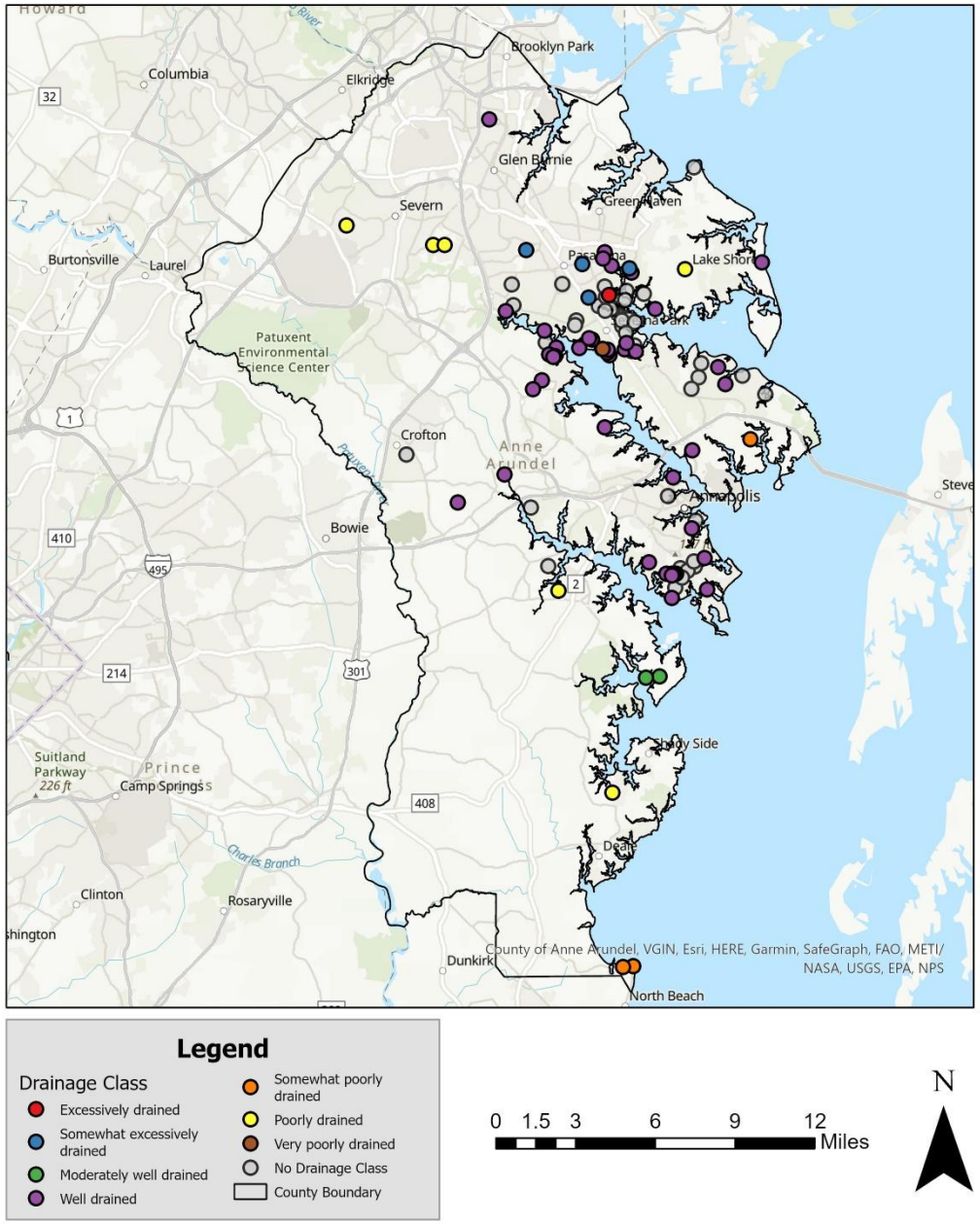
Oak Decline - Study

- Homeowners were asked to report dead oaks on an online form.
- Data complied and entered in GIS and spread sheets
- Some sites were field checked and further examined
- Sites were matched up with soil types

Oak Decline Study

Data points with soil overlays

Oak Decline Reports 2020-2022



Oak Decline

- Canopy loss is estimated by formulae developed by the US Forest Service [2]
- Estimate of acreage is then derived
- Plans made to restore sites. Planting or natural regeneration

2. Lamson, Neil 1. 1987. D.b.h./crown diameter relationships in mixed Appalachian hardwood stands. Res. Pap. NE-610. Broomall, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 3 p.

Oak Decline – Study Results

- Canopy loss estimated for three years was 23.4 acres[2]
- Most significant factor was cycles of weather extremes coupled with droughty soil types
- Density of forest as measured by basal area was likely significant in some stands.

2. Oak Decline Report, Summary, E. Reaves, 2023.

Oak Decline Study Results

Precipitation data from BWI indicates *7 years of drought* conditions and *4 years of excess precipitation* over 12 years

Chart A

Monthly Total Precipitation for Baltimore Area, MD (ThreadEx)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
2010	2.24	4.15	5.53	2.20	3.49	1.55	4.36	4.74	8.26	2.95	2.04	1.96	43.47
2011	2.66	2.69	4.99	3.52	2.42	3.51	2.77	10.38	13.32	3.31	2.45	4.50	56.52
2012	2.54	2.42	1.76	1.99	1.99	2.68	3.27	5.82	2.21	8.92	0.71	3.11	37.42
2013	3.64	1.95	2.64	2.20	3.43	7.81	2.77	1.13	1.65	7.62	2.82	5.27	42.93
2014	2.71	4.58	4.38	8.60	3.35	3.95	2.80	7.90	3.21	4.16	3.36	3.58	52.58
2015	3.89	2.24	4.67	4.30	2.10	13.09	3.49	2.46	3.25	3.40	2.42	5.85	51.16
2016	3.50	5.70	2.10	1.31	5.24	3.20	6.09	3.96	4.36	0.78	1.51	2.77	40.52
2017	2.69	1.46	3.82	3.52	5.64	1.40	7.11	4.60	1.95	2.99	2.15	0.95	38.28
2018	1.00	5.30	2.25	3.20	8.17	4.77	16.73	3.84	9.19	2.69	8.14	6.54	71.82
2019	3.15	3.64	4.14	1.46	5.51	2.95	3.85	2.39	0.16	6.21	1.10	3.57	38.13
2020	3.11	2.98	3.05	5.52	1.76	5.95	3.43	11.81	4.48	4.36	6.35	4.58	57.38
2021	2.15	4.85	3.90	2.07	3.63	2.75	3.65	4.36	6.04	5.24	1.33	0.82	40.79
2022	4.27	2.31	3.13	3.92	M	M	M	M	M	M	M	M	M
Mean	2.89	3.41	3.57	3.37	3.89	4.47	5.03	5.28	4.84	4.39	2.87	3.63	47.58
Max	4.27 2022	5.70 2016	5.53 2010	8.60 2014	8.17 2018	13.09 2015	16.73 2018	11.81 2020	13.32 2011	8.92 2012	8.14 2018	6.54 2018	71.82 2018
Min	1.00 2018	1.46 2017	1.76 2012	1.31 2016	1.76 2020	1.40 2017	2.77 2011	1.13 2013	0.16 2019	0.78 2016	0.71 2012	0.82 2021	37.42 2012

Highlighted numbers indicate months\years where precipitation was 10% or more, Below Normal

Highlighted numbers indicate months\years where precipitation was 10% or more, Above Normal

Source: https://www.weather.gov/wrh/Climate?wfo=lwx NOAA Climate Data - Baltimore, MD

Oak Decline – Study Results

- Oak Decline will continue given the weather extremes resulting from Climate Change.

- Measures to alleviate stress in prominent oak trees such as watering during droughty periods may help [2]
- Density of forest as measured by basal area can manipulated by removing select trees to reduce density of forested area. This can be applied to urban\residential areas as well as forested tracts. [2]

2. Oak Decline Report, Summary, E. Reaves, 2023.

Oak Decline

Questions?.....Answers?

Prepared by Earl D. Reaves, Jr. CF
Inspections and Permits

Photo Erin Higgins, QWP