



# **New Jersey Forest Service Forest Health Program Update**

**15th Annual New Jersey  
Invasive Species Strike Team Conference  
October 5, 2022  
Duke Farms**

Rosa Yoo

Forest Health Specialist



# Forest Health Program

The goal of the Forest Health Program is to minimize widespread tree loss or decline by monitoring, surveying, and suppressing invasive pests and diseases, and to implement practices that perpetuate and support healthy forests into the future.

Implement an Integrated Pest Management approach

- Multi-faceted approach using chemical treatments, biological controls, tree genetics & resistance, restoration, species selection





# Forest Health

## Pests and Pathogens

Beech Leaf Disease



*Lymantria dispar dispar*



Emerald Ash Borer



Jumping Worms



Elm Zigzag Sawfly



Oak Wilt







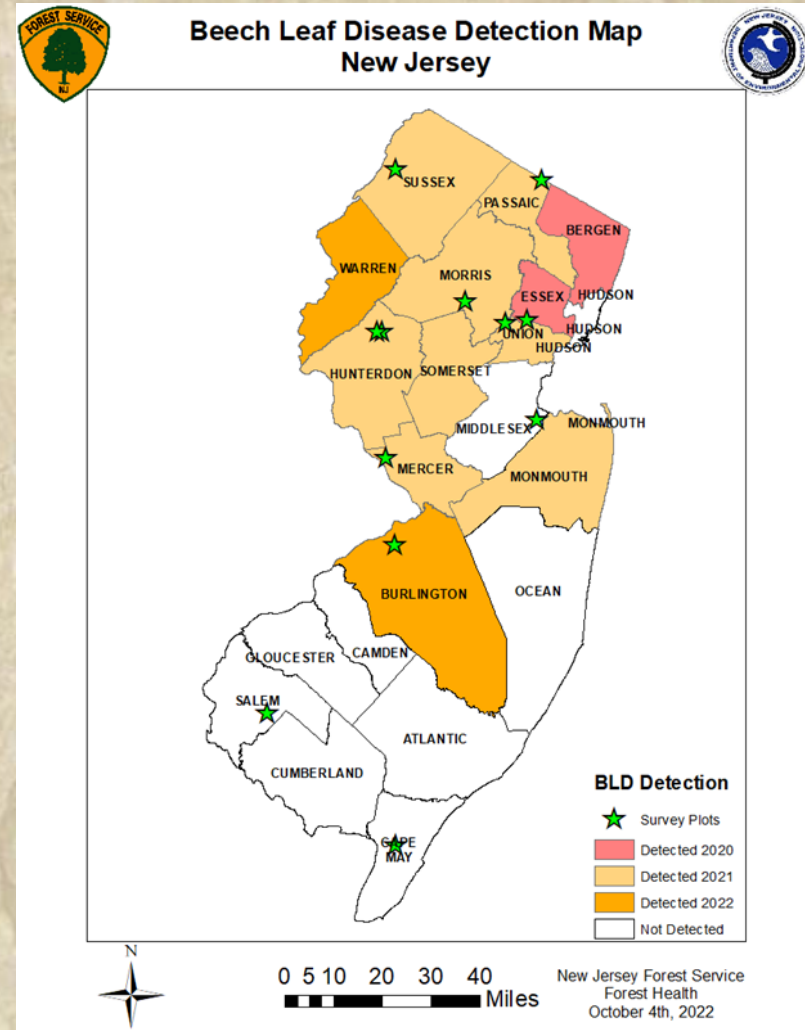
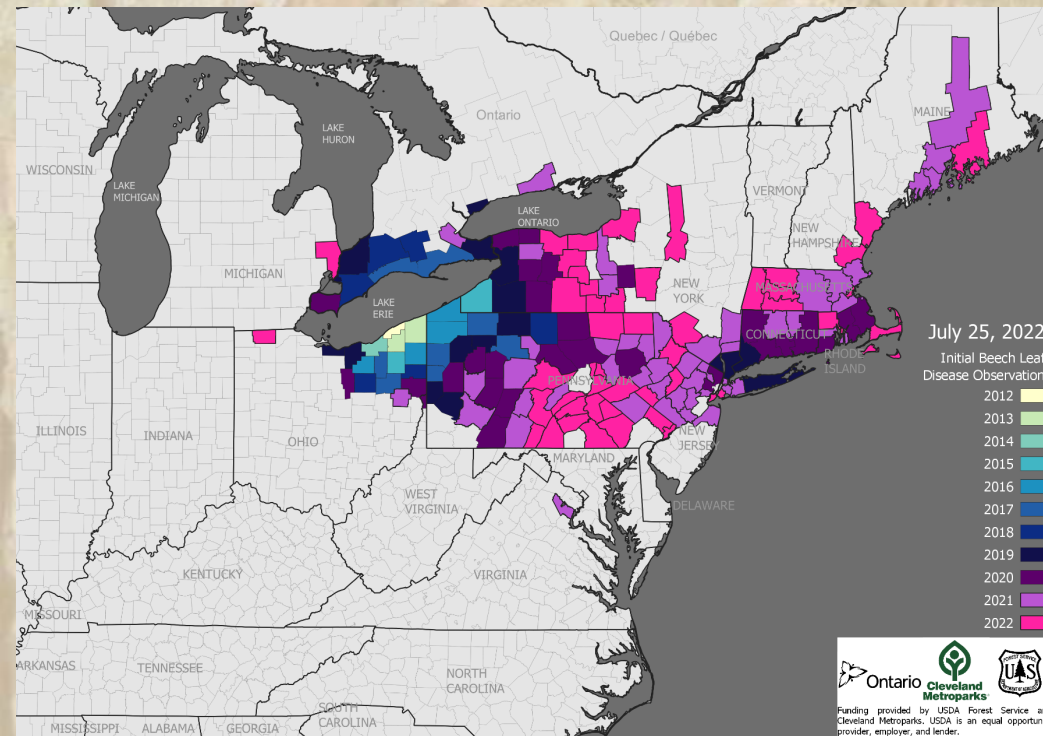
# Beech Leaf Disease

Host: Beech trees (*Fagus spp.*)

Found: 12 NJ Counties

Origin: Unknown

First noticed in Ohio in 2012







# Beech Leaf Disease



- American, European, Oriental, and Chinese beech are susceptible to BLD
- Visual symptoms – dark banding between leaf veins
- The nematode (*Litylenchus crenatae mccannii*) is associated
- Mode of dispersal is not well understood – birds, insects, rain?
- Full mechanism of infection is not well understood – complex with bacterial or fungi?



Figure 1.—Banding appearance associated with BLD. (Courtesy photo by Tom Macy, Ohio DNR)



Figure 2.—Banding appearance and shrunken leaves associated with BLD. (Courtesy photo by Cleveland Metroparks)



Figure 3.—Advanced symptoms of BLD with chlorotic striping. (Courtesy photo by Cameron McIntire)





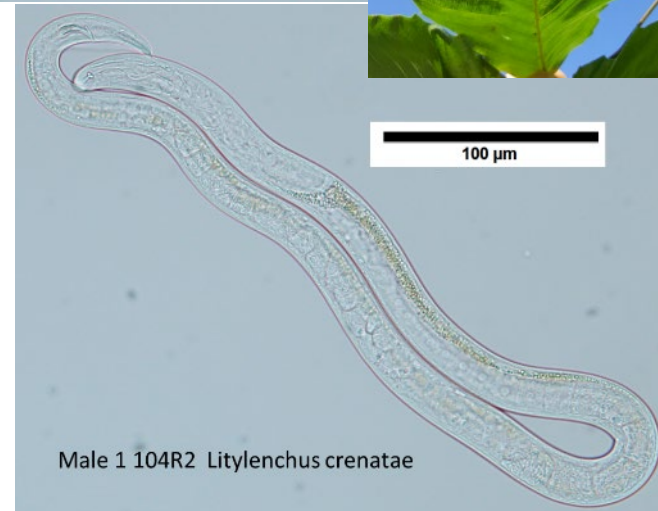
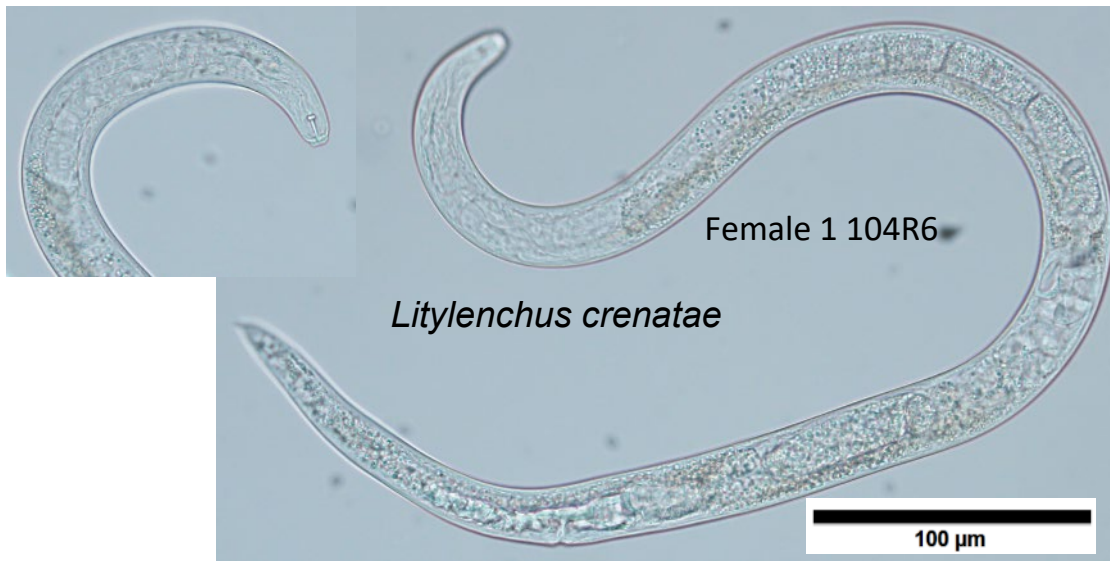
# Beech Leaf Disease

- Progressive – initial infection can be difficult to detect
- Early infection - Normal size leaves with sparse banding
- Later progression – shrunk/curled leaves, early defoliation
- Smaller beech succumb approximately 2-5 years
- Larger beech trees appear more resilient





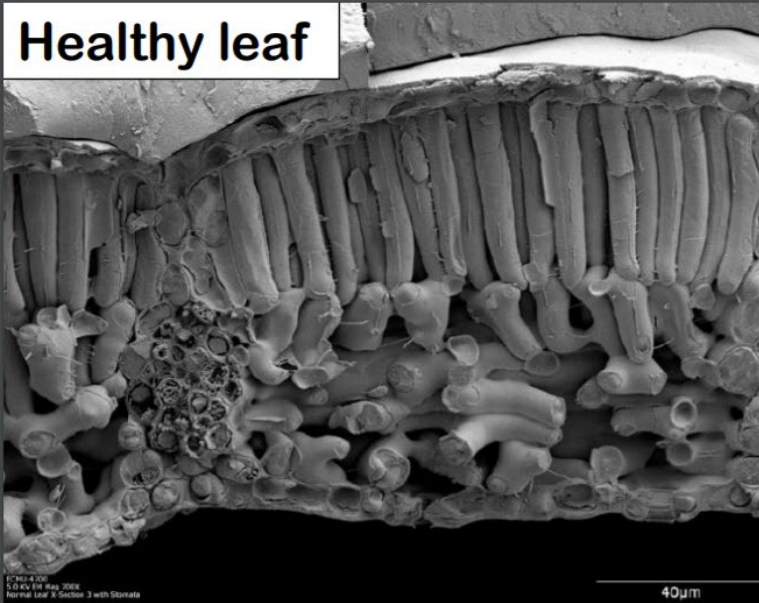
# USDA ARS Nematode Report





# Beech Leaf Disease

Healthy leaf

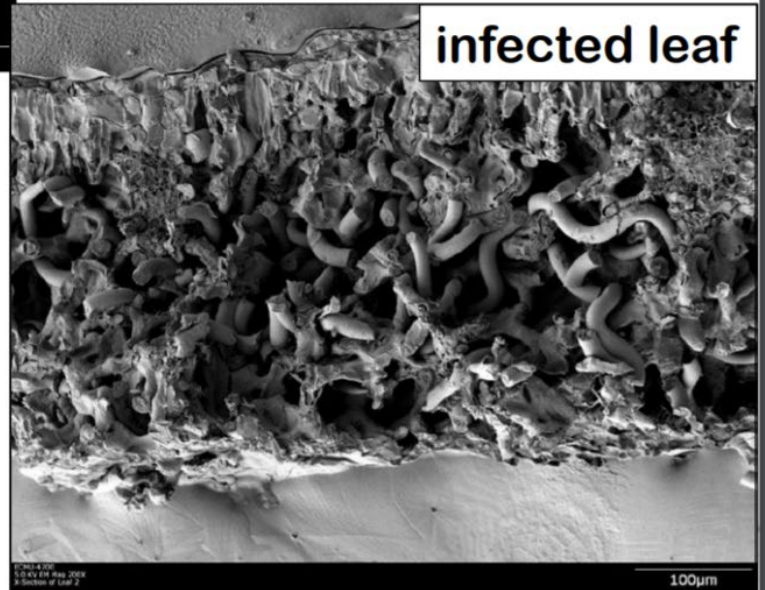


**CAES**

The Connecticut Agricultural Experiment Station  
Putting Science to Work for Society since 1875

Beech leaves,  
in cross-  
section, late  
season





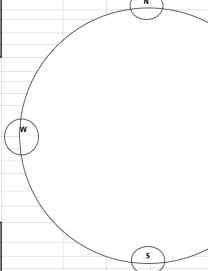
infected leaf



Electron micrograph images:  
Gary Baughan, USDA-ARS





- |    | B  | C | D | E | F | G | H | I | J | K | L   | M | N | O | P |  |  |  |  |  |
|----|--|---|---|---|---|---|---|---|---|---|---|---|---|---|---|--|--|--|--|--|
| 1  | Beech Leaf Disease Monitoring Project - Background Data Sheet  |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |  |  |  |  |
| 2  | <b>GENERAL INFORMATION</b>   |   |   |   |   |   |   |   |   |   | <b>LOCATION</b>   |   |   |   |   |   |  |  |  |  |
| 3  | Plot ID: _____   |   |   |   |   |   |   |   |   |   | State: _____ County: _____  |   |   |   |   |  |  |  |  |  |
| 4  | Project Name: _____  |   |   |   |   |   |   |   |   |   | Local Place Name: _____   |   |   |   |   |  |  |  |  |  |
| 5  | Beech Leaf Disease Monitoring  |   |   |   |   |   |   |   |   |   | Landowner: _____  |   |   |   |   |  |  |  |  |  |
| 6  | Date (mm dd/yyyy): _____   |   |   |   |   |   |   |   |   |   | Ecoregion: _____  |   |   |   |   |  |  |  |  |  |
| 7  | Surveyor Name: _____   |   |   |   |   |   |   |   |   |   | Photo Nos.: _____   |   |   |   |   | Plot Diagram: mini image<br>4.1 acre plot: 37.2' radius<br>(Times > 5' dbh)<br><br>4.61 acre plot: 11.8' radius<br>(Saplings < 5' dbh)<br><br>subplot: 1m (39") radius at each cardinal point<br>(Seedlings) - see diagram below<br> |  |  |  |  |
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| 15 | Datum:  NAD83 WGS84 = NAD27   |   |   |   |   |   |   |   |   |   | <b>SITE ATTRIBUTES:</b>   |   |   |   |   | Plot diagram: large image<br><br>  |  |  |  |  |
| 16 | GPS location taken from plot center  |   |   |   |   |   |   |   |   |   | measured from plot center   |   |   |   |   |  |  |  |  |  |
| 17 | Latitude: _____  |   |   |   |   |   |   |   |   |   | Beech leaves: _____   |   |   |   |   |  |  |  |  |  |
| 18 | Longitude: _____   |   |   |   |   |   |   |   |   |   | Shape No: _____   |   |   |   |   |  |  |  |  |  |
| 19 | Aspect: _____  |   |   |   |   |   |   |   |   |   | Shape Shape: _____  |   |   |   |   |  |  |  |  |  |
| 20 | Local Accessible: <input type="checkbox"/> m <input type="checkbox"/> ft   |   |   |   |   |   |   |   |   |   | Shape Position: _____   |   |   |   |   |  |  |  |  |  |
| 21 | GPS File Name: _____   |   |   |   |   |   |   |   |   |   | Approximate distance (ft) to nearby bodies of water (lakes, streams, creeks): _____ |   |   |   |   |  |  |  |  |  |
| 22 | shape details), Location (directions & landscape context), Distance to bodies of water (lakes, streams, creeks, even those that run intermittently), Veg Characterization (community description, dominants, strata, BROPTYPE) |   |   |   |   |   |   |   |   |   | Optional Moisture sensor readings: _____  |   |   |   |   |  |  |  |  |  |
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New Jersey Forest Service  
Forest Health  
October 4th, 2022





# Beech Leaf Disease

**2021**







# Beech Leaf Disease

**2021**



**2022**



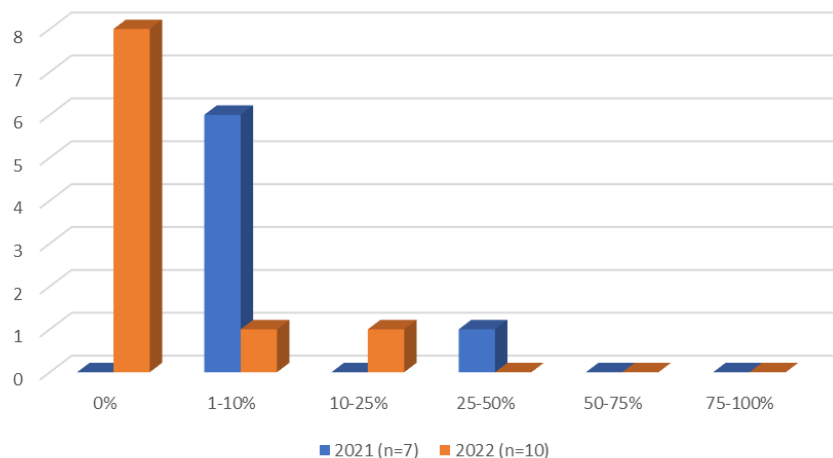




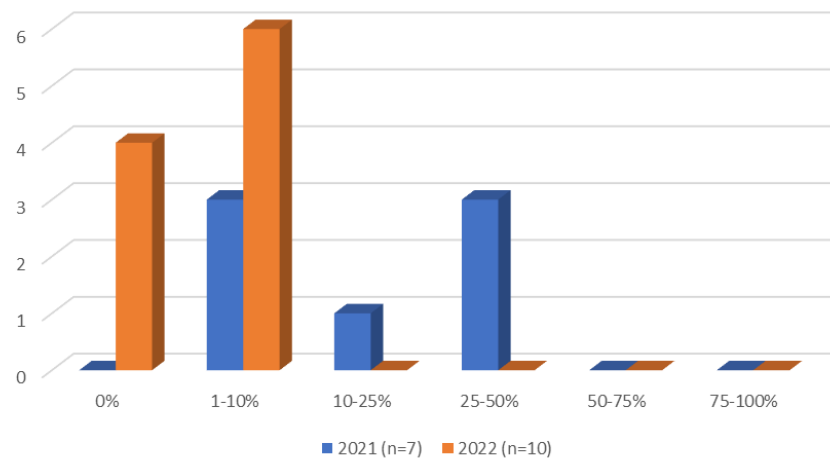
# BLD Long-term Monitoring Plot Data

# Beech Leaf Disease

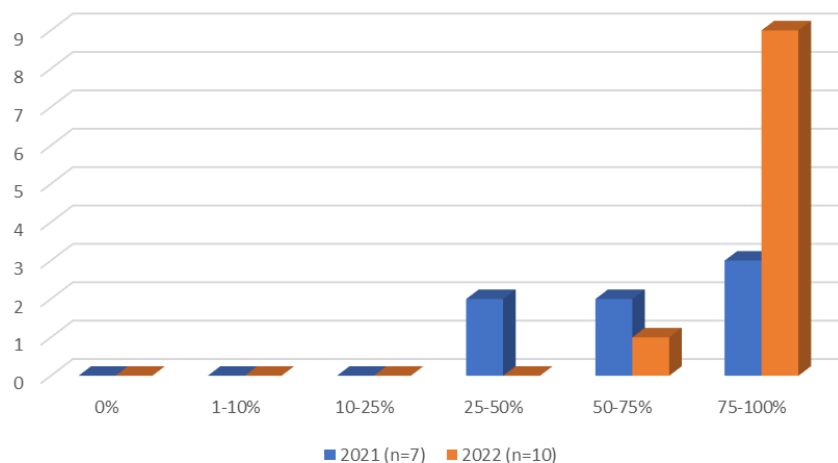
Normal Size Leaves, No BLD Symptoms



Normal Sized Leaves with Striped Pattern



Shrunkened or Curled Leaves Striped or Solid







# Beech Leaf Disease

- No known treatment or management at this time
  - Research and studies are ongoing to test products and efficacy
- Don't move infected trees, leaves, branches, wood, soil
- Optimize beech tree health
- Help monitor and track detections in new Counties
  - TreeHealth App
  - Report to NJFS:  
[foresthealth@dep.nj.gov](mailto:foresthealth@dep.nj.gov)







# *Lymantria dispar dispar*

(formerly Gypsy Moth)

Host: 100's of species – Prefer Oaks

Found: Statewide

Origin: Europe

- Detected in NJ in 1920
- Biological controls released to control populations
- In 1981, the worst LDD defoliation event resulted in over 800,000 acres impacted
- ~3+ consecutive years of heavy defoliation can cause widespread tree mortality



LDD caterpillar has 6 pairs of red dots and 5 pairs of blue dots. Caterpillar feeding causes the defoliation



The female moth (white) is flightless. The male moth (brown) can fly and has feathery antennae.



Pupa cases (dark brown) are often found in bark crevices. Egg masses (buff tan) are usually located in shady or protected areas





# *Lymantria dispar dispar*

LDD defoliation increasing

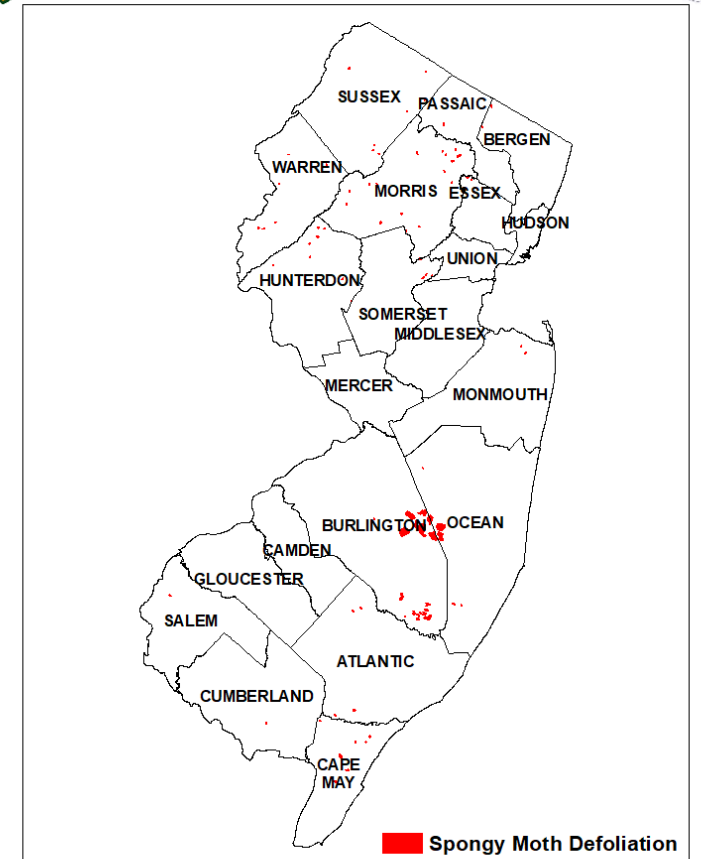
- 2022 – 15,000 acres
- 2021- 10,199 acres
- 2020 – 1,003 acres



Summer 2021 – Burlington County



## Spongy Moth (LDD) Defoliation 2022



0 5 10 20 30 40 Miles

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# *Lymantria dispar dispar*

- Suppression – utilized when LDD populations are not sufficiently controlled by biological controls
- Aerial applications of Btk (*Bacillus thuringiensis var. kurstak*) – a biocide containing a soil bacterium that effects the gut of young LDD caterpillars
- Biological controls are most effective with wet springs (*Entomophaga maimaiga*) or when populations are high (NPV)
- NJ Department of Agriculture administers a voluntary cooperative LDD Survey and Suppression Program for municipalities and counties (<https://www.nj.gov/agriculture/divisions/pi/prog/gypsymoth.html>)



*Entomophaga maimaiga*



The egg **parasitoid**  
*Ooencyrtus kuvanae*



*Nucleopolyhedrosis virus (NPV)*





# *Lymantria dispar dispar*



UNH

## Native Look-A-Likes

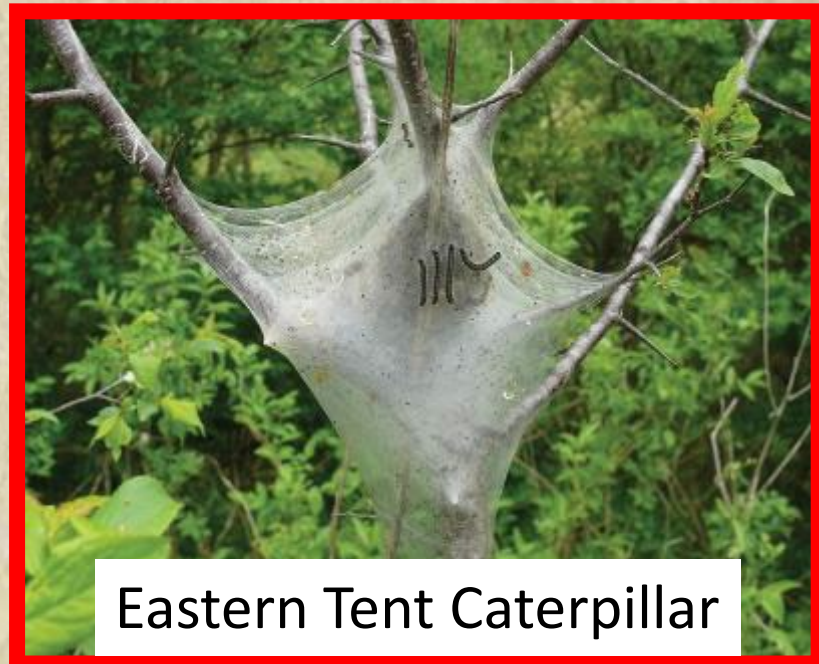


UNH



Fall Webworm

\* LDD do not  
build tents or  
webs \*



Eastern Tent Caterpillar





# Emerald Ash Borer

*Agrilus planipennis*

Host: NA ash (*Fraxinus spp.*),  
white fringetree (*Chionanthus virginicus*)

Found: 17 NJ Counties

Origin: Asia



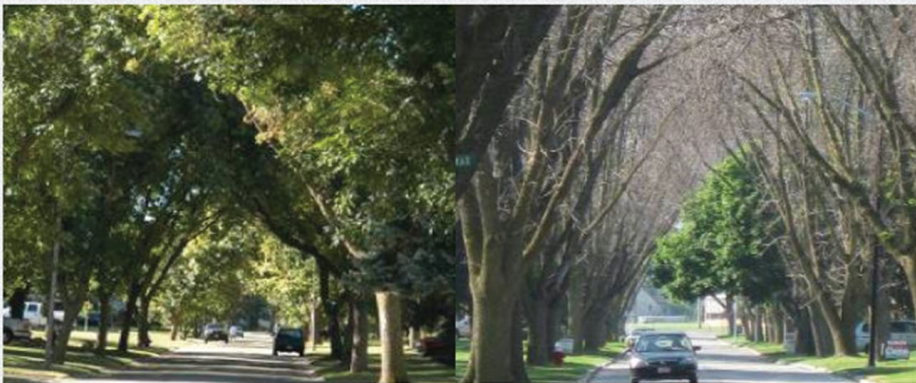




# Emerald Ash Borer

## *Agrilus planipennis*

- EAB first detected in NJ in 2014
- All North American ash species are susceptible to EAB
- Expect nearly 100% mortality without intervention
- Estimated over 24 million ash trees in NJ forests, countless more in landscapes



**TOLEDO STREET BEFORE AND AFTER EMERALD ASH BORER**

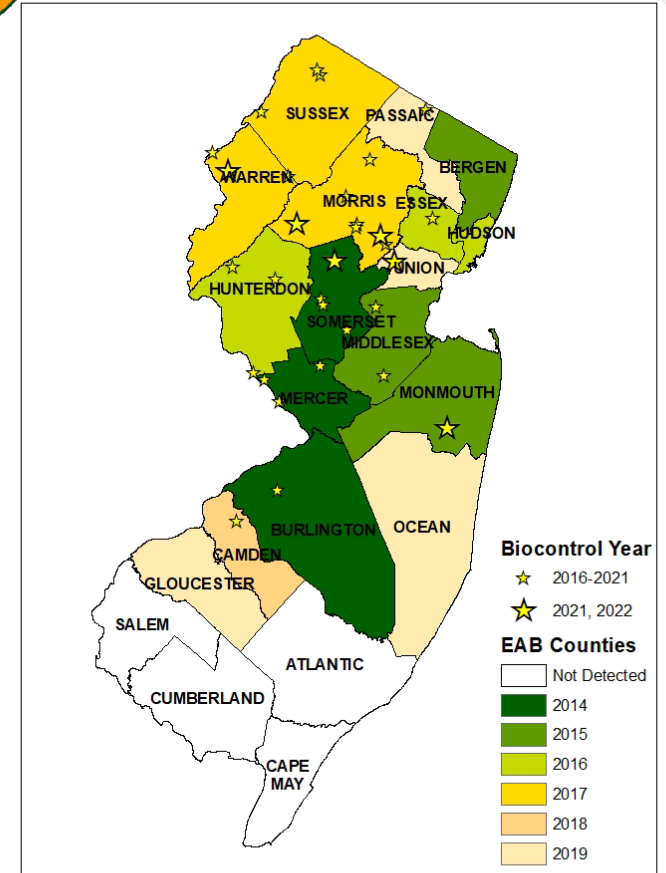
BEFORE: JUNE 2006

PHOTO COURTESY OF DAN HERMS, OSU

AFTER: AUGUST 2009



### Emerald Ash Borer Detection New Jersey



0 5 10 20 30 40  
Miles

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October 4th, 2022





# Emerald Ash Borer

*Agrilus planipennis*

- Ash Management
  - Treat healthy ash trees
  - Remove infested trees or ash trees in high use areas not slated for treatment
- Biological Control released since 2016
- Monitor ash
- Replant with non-host species







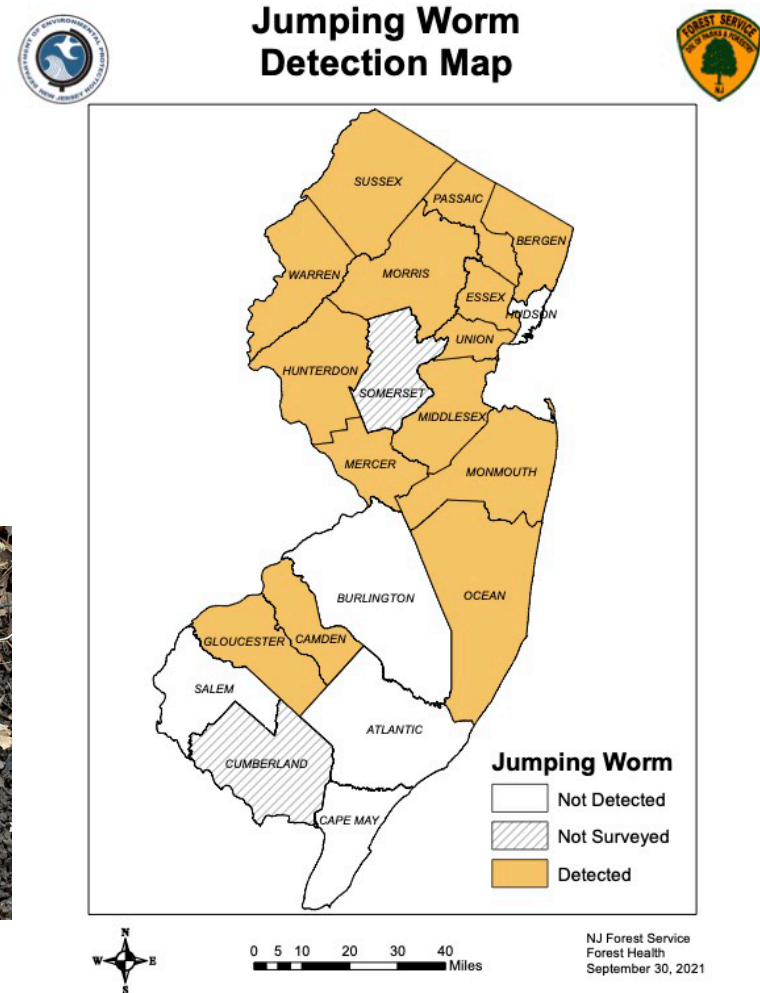
# Jumping Worms

(*Amyntas* sp. & *Metaphire hilgendorfi*)

- Native to Asia
- Surface feeders that limit organic matter and leaf litter layer
- Reduce seedling recruitment and regeneration of native plant species
- Cause erosion
- Identification:
  - iridescent sheen
  - snake-like movements
  - granular castings



Granular castings







# Jumping Worms

(*Amyntas* sp. & *Metaphire hilgendorfi*)



A forest without jumping worms (left) has a rich understory of plants and a thick leaf-litter layer; one experiencing a heavy jumping worm invasion (right) has few remaining plants and no intact litter layer. *Scott Loss*





# Jumping Worms

(*Amyntas* sp. & *Metaphire hilgendorfi*)



Biodiversity



Soil productivity





# Jumping Worms

(*Amyntas* sp. & *Metaphire hilgendorfi*)

- Unfortunately no known effective controls at this time
  - Prescribed burning?
  - Tea Leaves
  - Coconut fiber
- Prevention is the most effective control measure
  - Worms and eggs can be hidden in soil, mulch and unintentionally moved to new areas
- Preliminary survey results suggest worms least commonly found in forests in the Outer Coastal Plain area
  - Sandier sites
  - Pine & Oak overstory

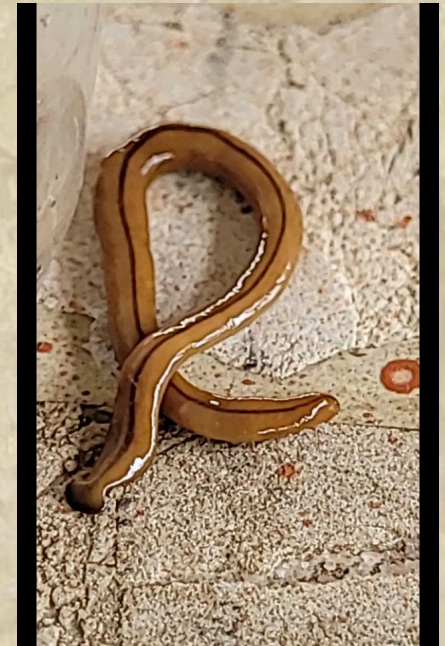






# More “Worms”

- “Hammerhead worms”
- Planarians
- Carnivorous – feed on worms, snails, slugs
- Non-native and Invasive
- Report in Passaic County in 2021







# Elm Zigzag Sawfly

(*Aproceros leucopoda*)

- Native to Asia
- First North American detection was in 2020 in Quebec, Canada
- Detected in Virginia in 2021
- Defoliates leaves of all Elm (*Ulmus*) species
- Reproduces parthenogenetically (without a male) and can have 4 -6 generations per year
- New growth after defoliation can be attacked by the next generation
- Not Detected in NJ



Female elm zigzag sawfly laying an egg on leaf serration



Elm zigzag sawfly leaf feeding



Elm zigzag sawfly net-like cocoons





# Oak Wilt

(*Bretziella fagacearum*)

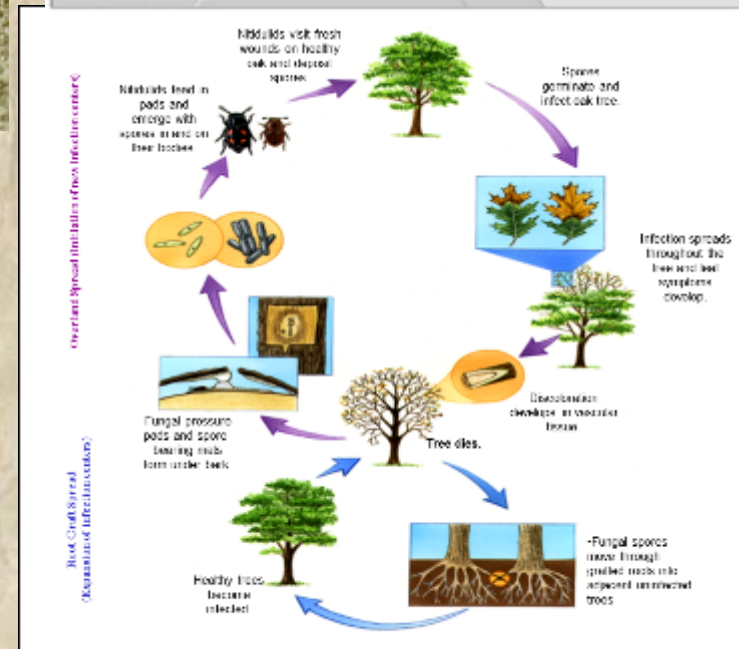
Host: Oaks

Closest Find: Long Island, Brooklyn, NY

Origin: Unknown

Monitor/Visual surveys

- Scorching appears in July
- Trees can die within weeks of infection
- Cooperating with Rutgers Plant Diagnostic Lab to test for oak wilt
- Not detected in NJ







# Oak Wilt

(*Bretziella fagacearum*)



## Oak Wilt

- Leaf scorching can appear as early as July
- Red oak family trees will succumb that same season
- White oak family trees will succumb 1-2 years after infection
- Affects the entire tree



## Bacterial Leaf Scorch

- Leaf scorching appears mid-August
- Can take 10+ year for a tree to succumb to BLS
- Red oak family trees are most susceptible
- Affects branches, or sections of the tree, at a time





# Biological Control Program

Emerald Ash Borer



Black Swallow-Wort



Spotted Wing Drosophila



Knotweeds



Mile-A-Minute







# Biological Control Program

NJ Department of Agriculture

Phillip Alampi Beneficial Insect Laboratory

<https://www.nj.gov/agriculture/divisions/pi/prog/buglab/about/>







# Emerald Ash Borer

*Agrilus planipennis*



- Biological control releases started in 2016
- 2 larval parasitoids - *Tetrastichus planipennisi* and *Spathius* spp.
- 1 egg parasitoid - *Oobius agrili*
- Released in 13 Counties
- Reared by USDA APHIS in Brighton, MI
- All 3 parasitoids recovered



<https://nsrforest.org/>



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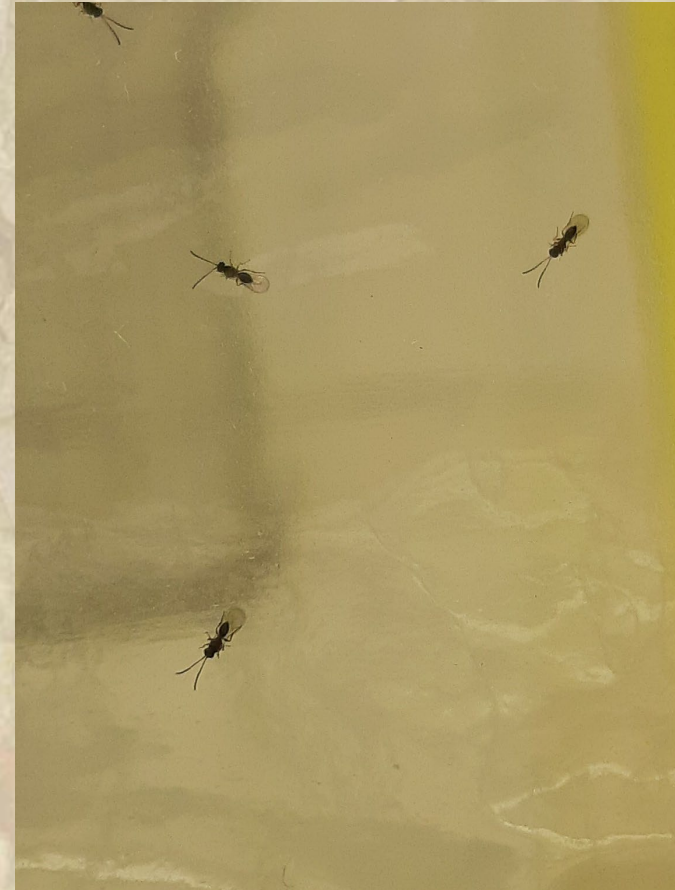


# Spotted Wing Drosophila

## *Drosophila suzukii*



- Native to East Asia
- Serrated ovipositor allow SWD infest ripening/ripe fruit
- Significant impacts for fruit production and marketability
- Parasitoid wasp - *Ganaspis brasiliensis*
- Field releases started in 2022
- 5,000 wasps released







# Mile-A-Minute

*Persicaria perfoliata*



- Native to India and East Asia
- Annual vine, germinates from seeds
- Mile-A-Minute weevil - *Rhinoncomimus latipes* – larvae feed on stems, adults feed on leaves
- ALMOST 1 million *Rhinoncomimus latipes* weevils were reared for control of Mile-a-minute (955,000). 775,000 have been released since 2005.





# Black Swallow- Wort

*Cynanchum louiseae*



- Native to Europe, in the milkweed family
- Introduced as an ornamental vine
- Monarch butterfly caterpillars cannot survive on black swallow-wort
- *Hypena opulenta*, a moth native to Europe
- Larvae feed on leaves
- Well established in Canada







# Knotweeds

*Polygonum spp.*



- Native to Asia
- The Japanese Knotweed Psyllid - *Aphalara itadori* – larvae and adult feed on plant sap
- Lerp – sugary waste product, also affects plant growth and health
- Reared over 37,000 adults since March 2020
- Environmental Assessment in progress







# Forest Health



Is it all doom and gloom?

Maybe,

But it could also be an opportunity

- Collaboration
- Plan Ahead – think long-term
- Observe and report strange things!

NJ ISST - <https://www.fohvos.info/invasive-species-strike-team/>

NJ Beneficial Insect Lab - <https://www.nj.gov/agriculture/divisions/pi/prog/buglab/>

NJ Forest Health Program - [foresthealth@dep.nj.gov](mailto:foresthealth@dep.nj.gov)

Rutgers Diagnostic Lab - <https://njaes.rutgers.edu/plant-diagnostic-lab/>

NJ Licensed Tree Experts - <https://njtreeexperts.org/>





***THANK  
YOU!!***

Rosa Yoo  
Forest Health Specialist

ph: 609-306-2433

[rosa.yoo@dep.nj.gov](mailto:rosa.yoo@dep.nj.gov)  
[foresthealth@dep.nj.gov](mailto:foresthealth@dep.nj.gov)