New Jersey Department of Agriculture

Emerald Ash Borer Damage, Dispersal and Biological Control in NJ Spotted Lanternfly Identification

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Emerald Ash Borer

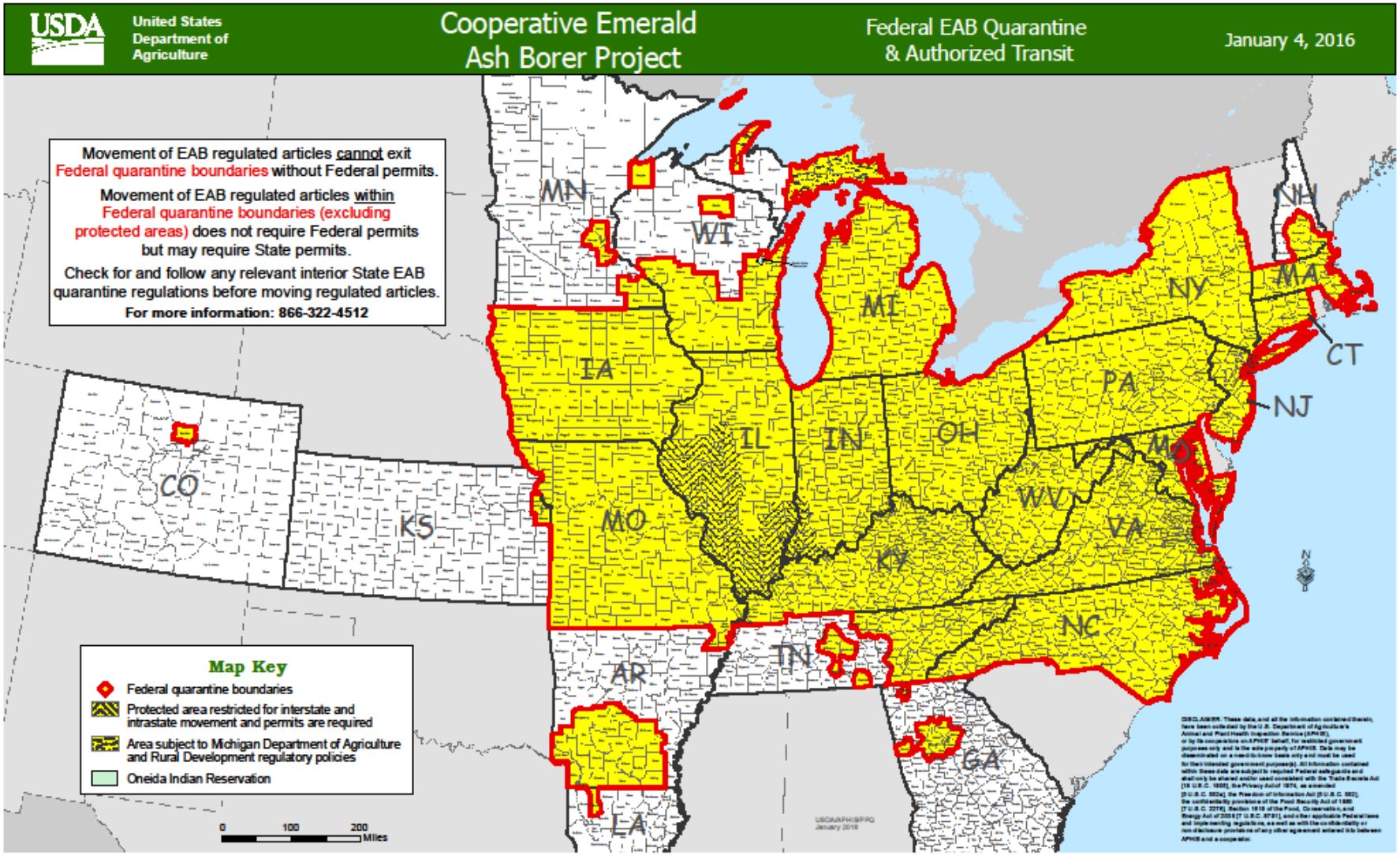
Agrilus planipennis

- **Original US discovery in 2002 in Detroit, MI.**
- **Native to Asia (China, Korea, Japan, Mongolia).**
- **Currently in Somerset, Burlington, Monmouth, Bergen, Mercer and Middlesex Counties as well as 25 states and two Canadian provinces.**

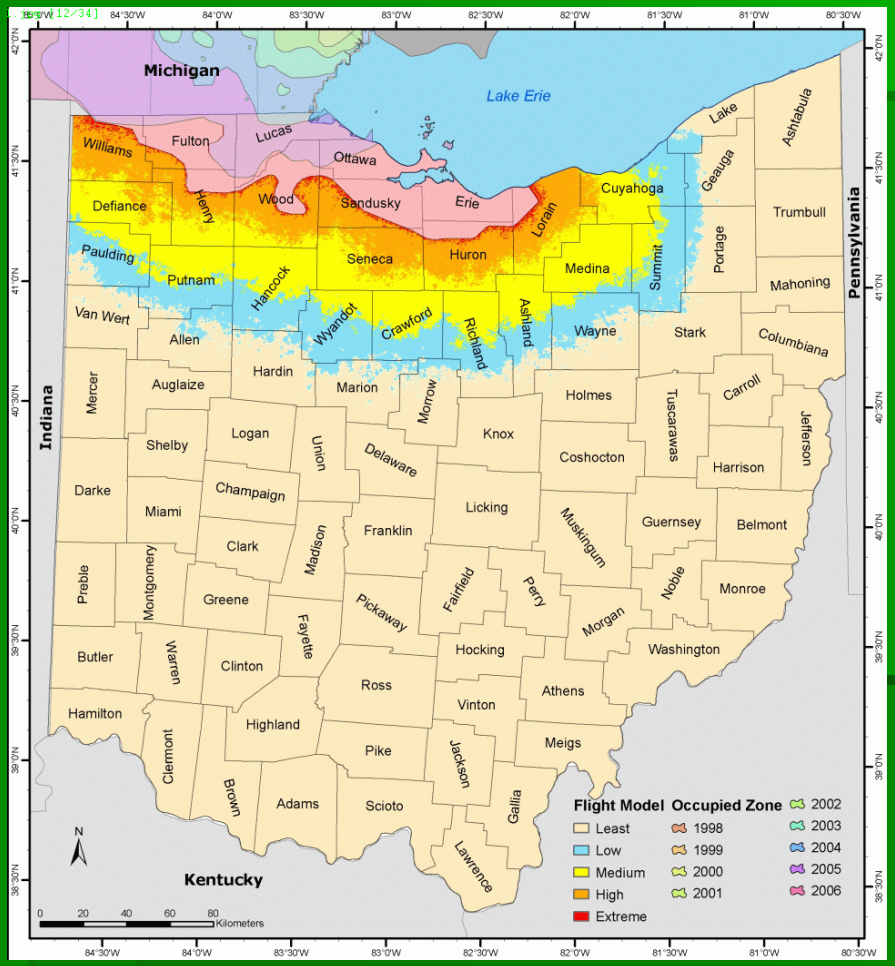
Emerald Ash Borer

- Larvae feed on the cambium layer of the tree.
- Larvae are up to 1½ inch long with 10 bell shaped segments.
- The Adult beetles feed on the foliage of the tree.
- Adults are 1/2 inch in length and 1/8 inch wide.
- One generation per year.
- Adults are active from May to August

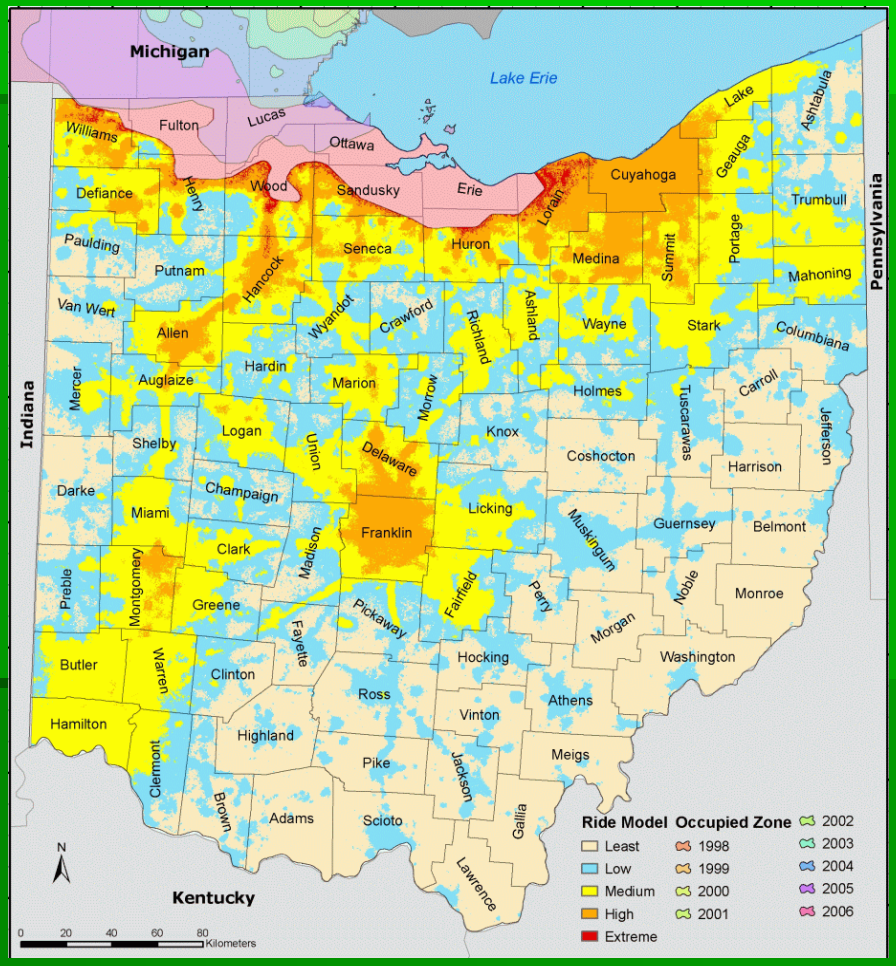
US EAB Infestations



Dispersal Differences

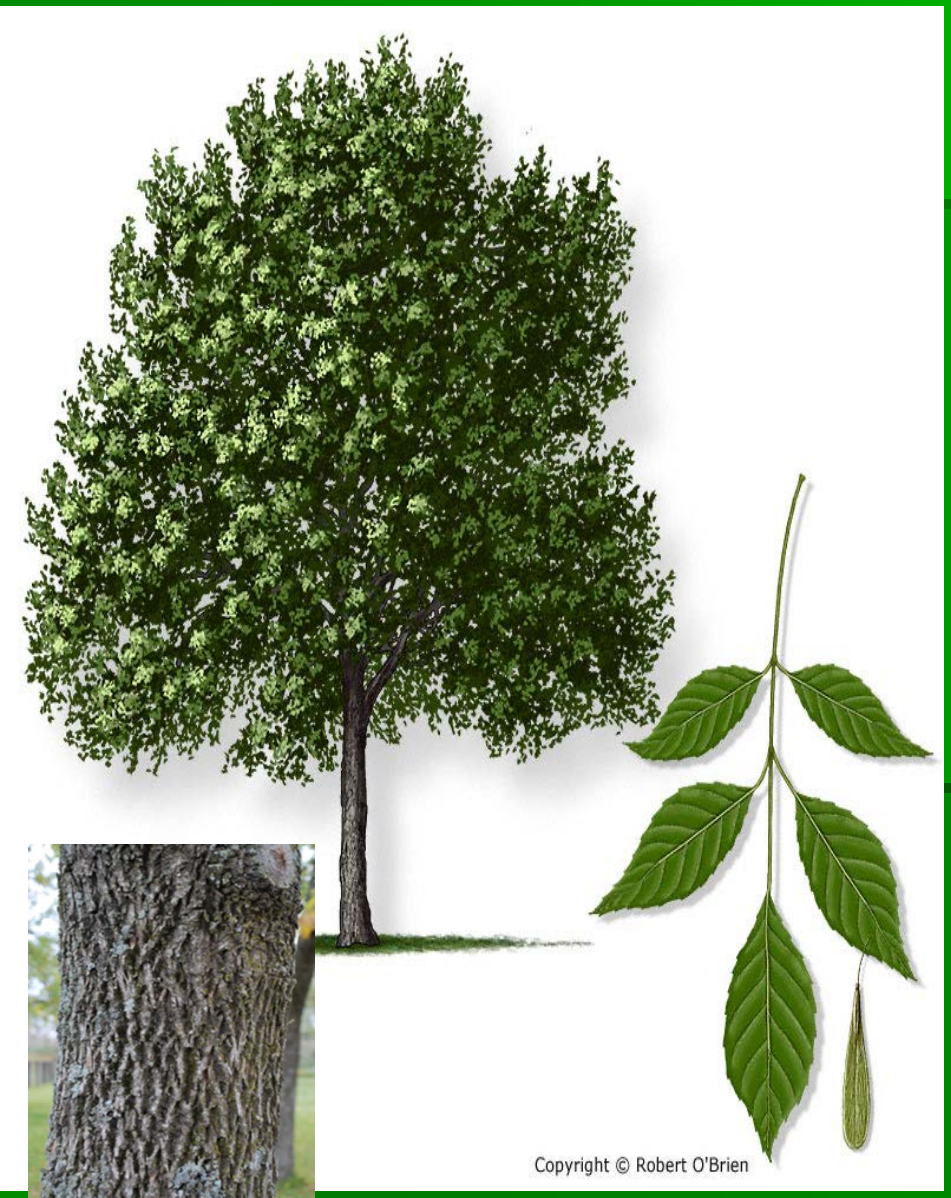


Flight Dispersal



Human-Assisted Dispersal
Firewood, nursery stock

EAB Hosts



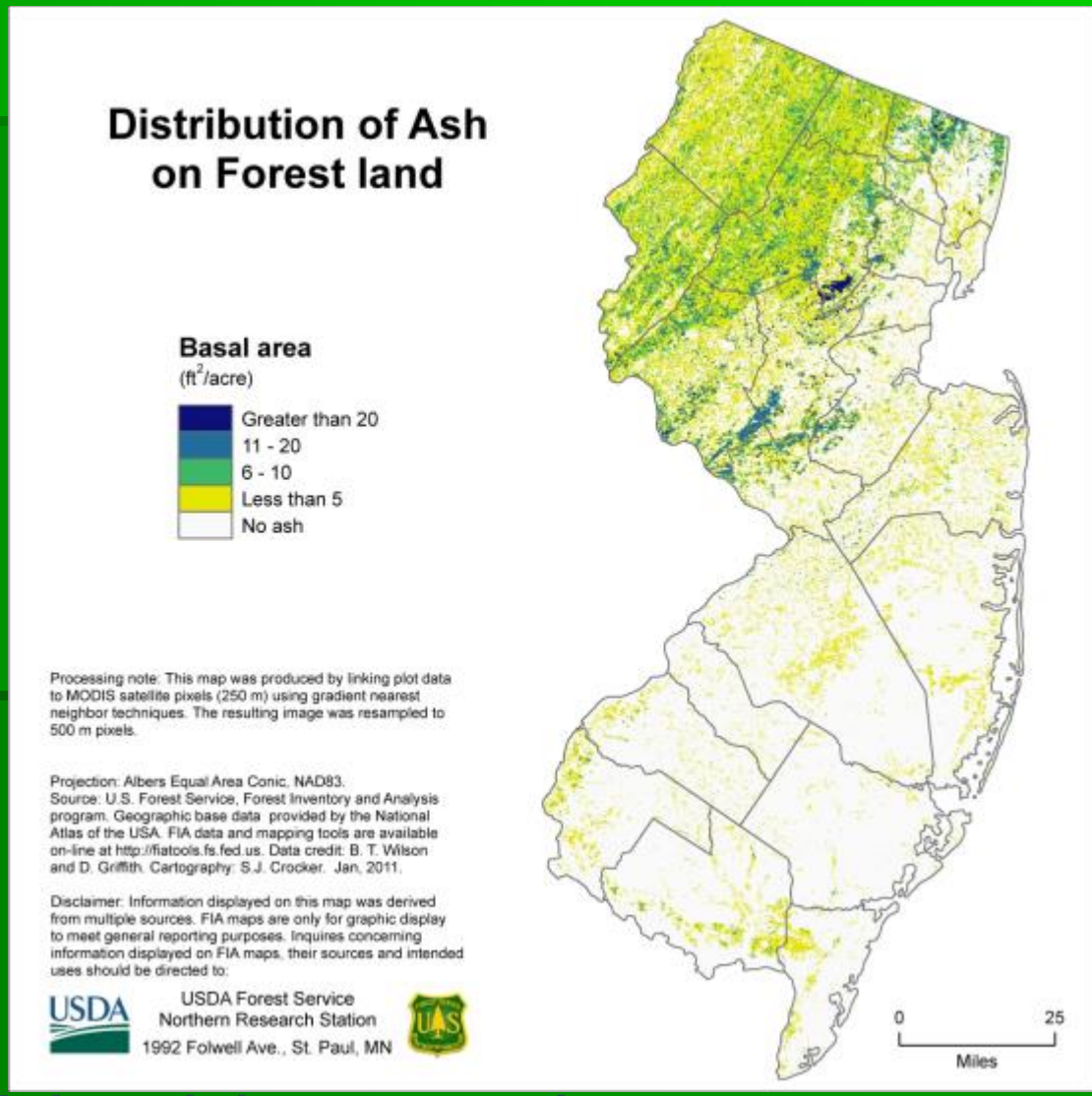
- ***Fraxinus spp*. in US : Green, White, Blue , Pumpkin and Black Ash**

- *** White Fringetree** Oleaceae,*Chionanthus virginicus*

NJ Ash Density

Ash distribution in NJ

- NJ has over 24 million ash trees.
- Green, White, Black ash found in NJ.
- Ash is a commonly planted landscape tree.



Emerald Ash Borer Damage

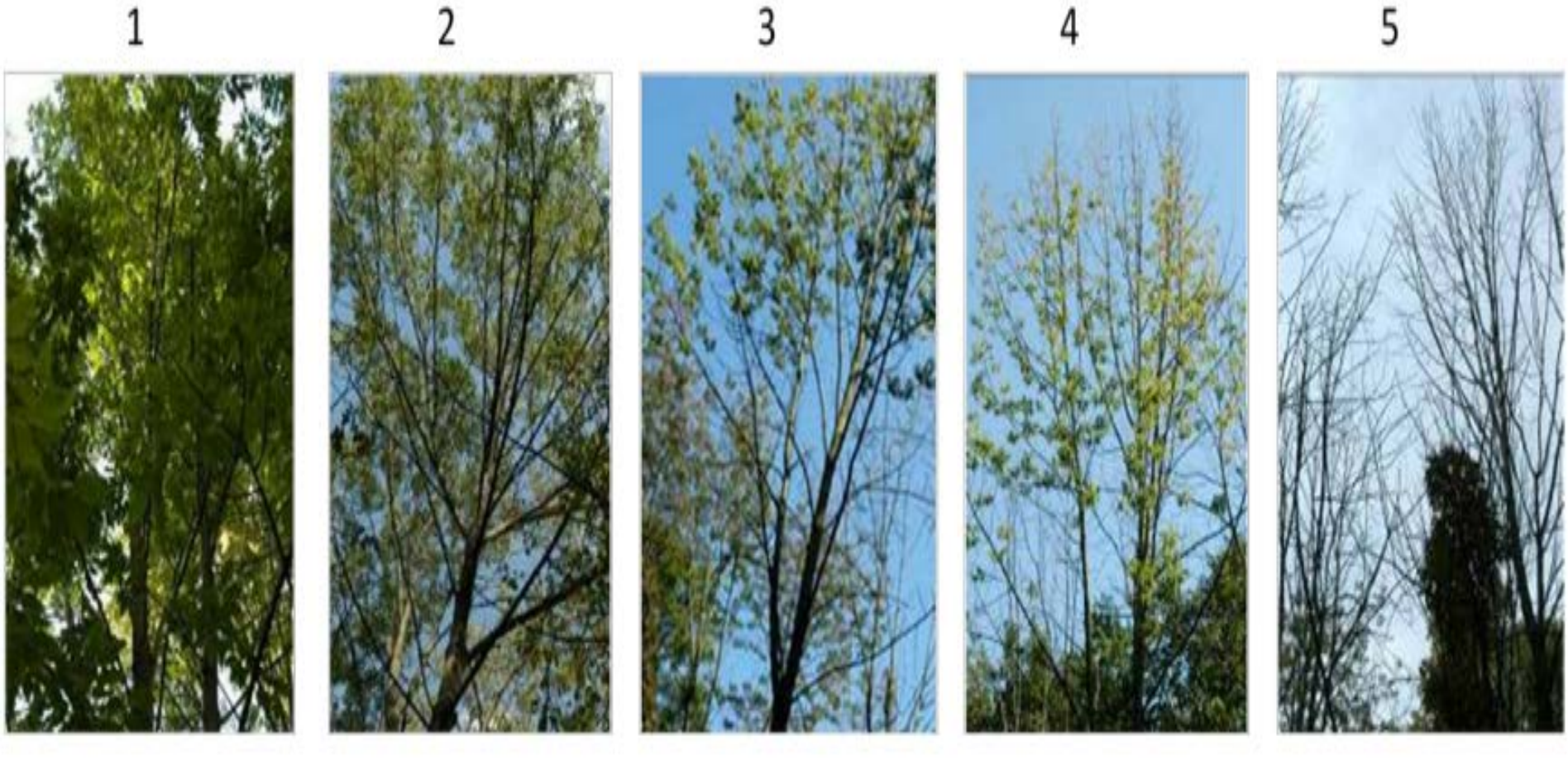
D-Shaped Exit Holes

Canopy Dieback

Larval galleries in the cambium layer

- Feeding and damage begins in the upper canopy
- Stops the nutrient and water flow
- Damage not detected until after the EAB has been present for a few years

Damage: Crown Death



Generally 5-6 years for 30% crown loss after initial infestation (1 & 2)
tree death by 10 years due to exponential growth of EAB population (3-5)

Epicormic Shoots from EAB Damage

Epicormic Shoots in Winter and Summer

Bio-Monitoring

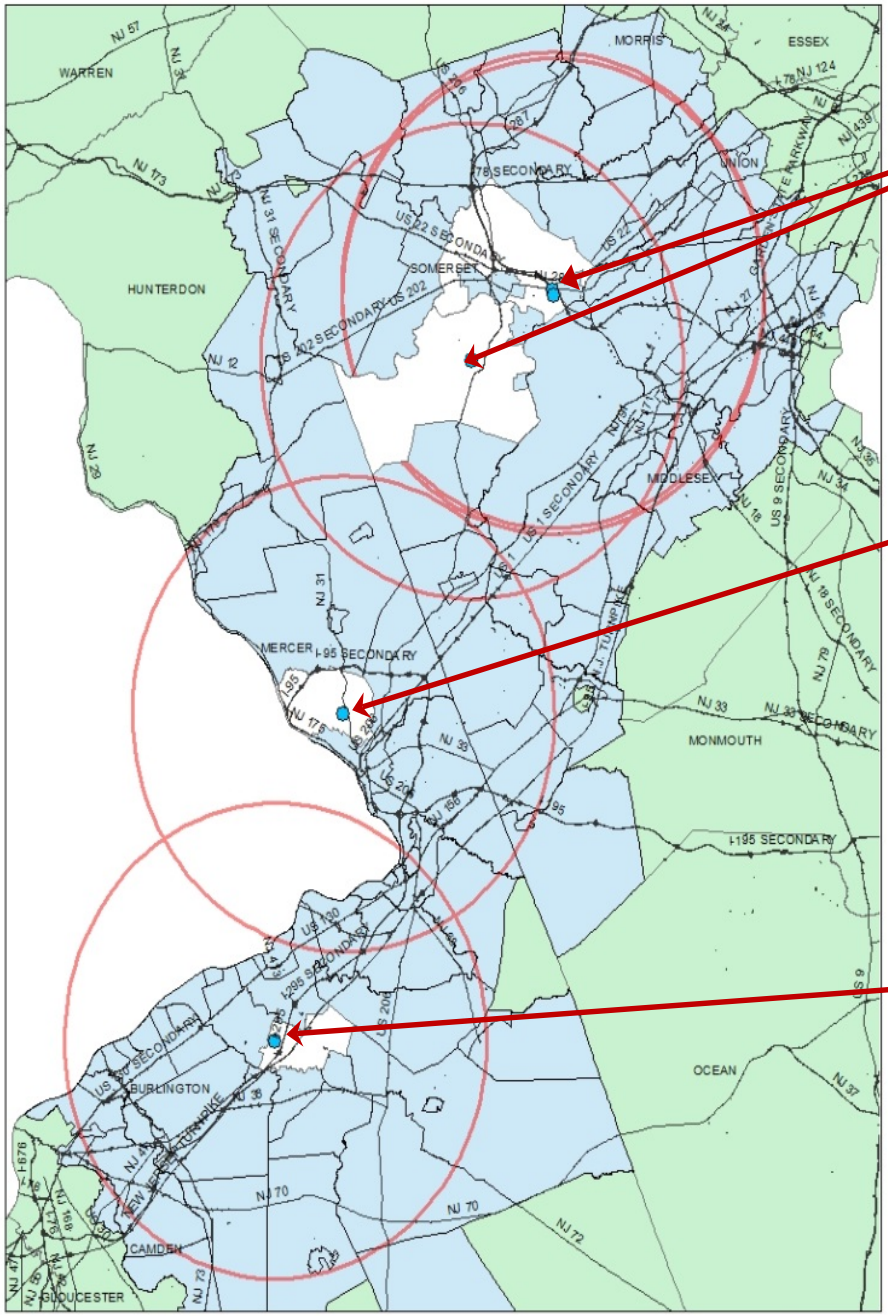
Woodpecker “blonding”

Ecological Impact

- The Genus *Fraxinus* has 53 species worldwide.
- Loss of ash will cause new associations primarily affecting native trees and shrubs possibly creating new ecosystem.
- 150 US plant community types could be severely compromised,16 of which are imperiled. (2015 Wagner and Todd)
- 98 species of insects including 21-29 monophagous moths are dependent on ash, thus causing loss of diversity and possible extinction.

Economics

- EAB Established in 25 states and 2 Canadian provinces.
- Michigan has 40-50 million trees alone.
- Nationally est. 250 million dead ash trees.
- Threatens 7.5 billion trees in NA.
- In a 10yr estimate, EAB will cause the loss of $20 billion in landscape trees.
- Research shows that **80%** of the cost of non-native forest insects are borne by municipal governments and homeowners (Aukema et. al. 2011)



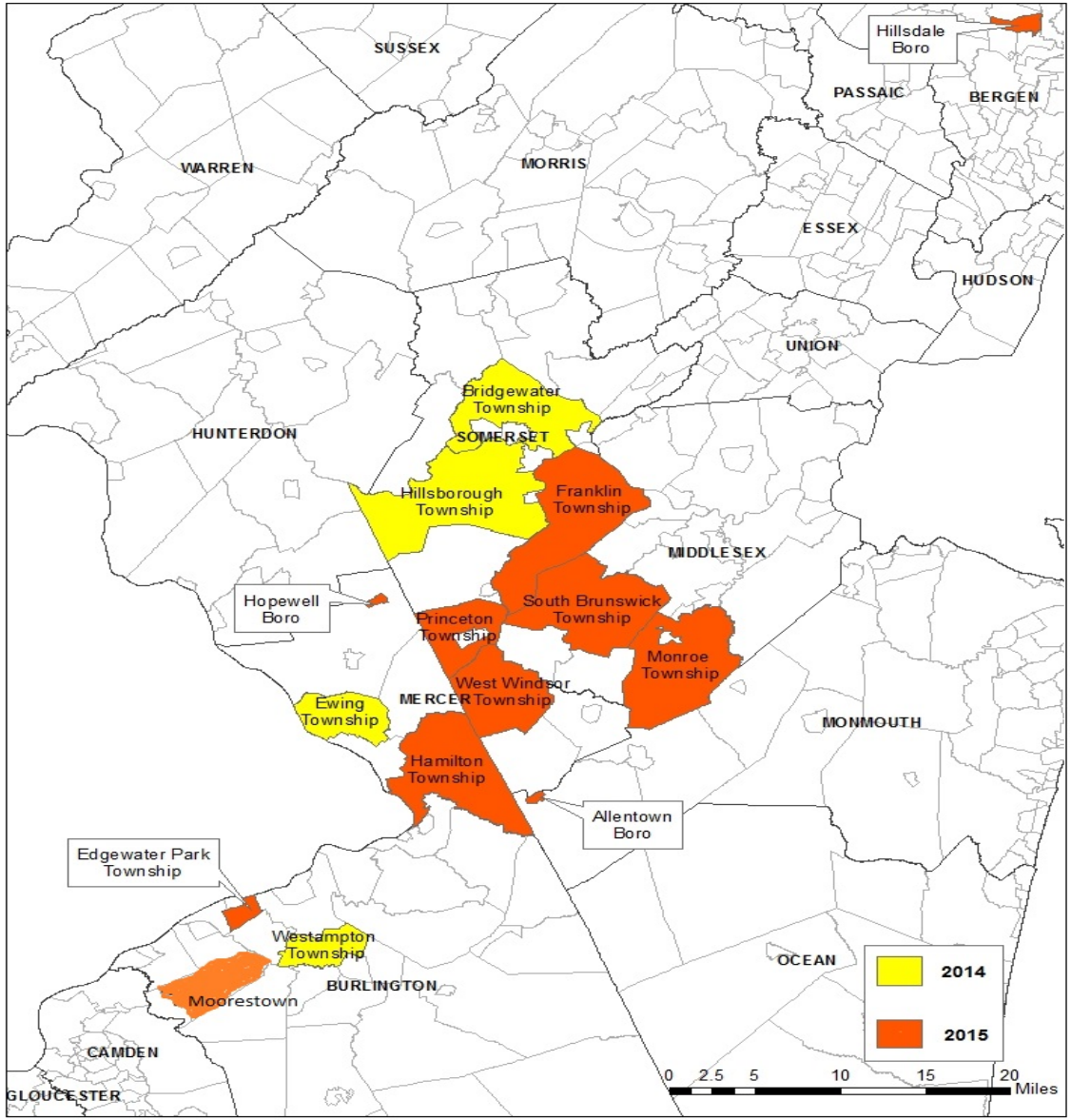
Somerset County
Bridgewater and Hillsboro

Mercer County
Ewing

2015 survey based on
2014 detections

Burlington County
Westampton

2014/2015 Survey Results



Monitoring: EAB Traps

Do you have a site in areas adjacent to positive municipalities where we could put up a trap?

Lindgren trap

Use of pheromone attractants, purple color is wavelength of damaged in UV

Chemical Control

- Trunk Injections
- Soil Injections
- Systemic Bark and Foliar Sprays
- Soil Drench
- Granular

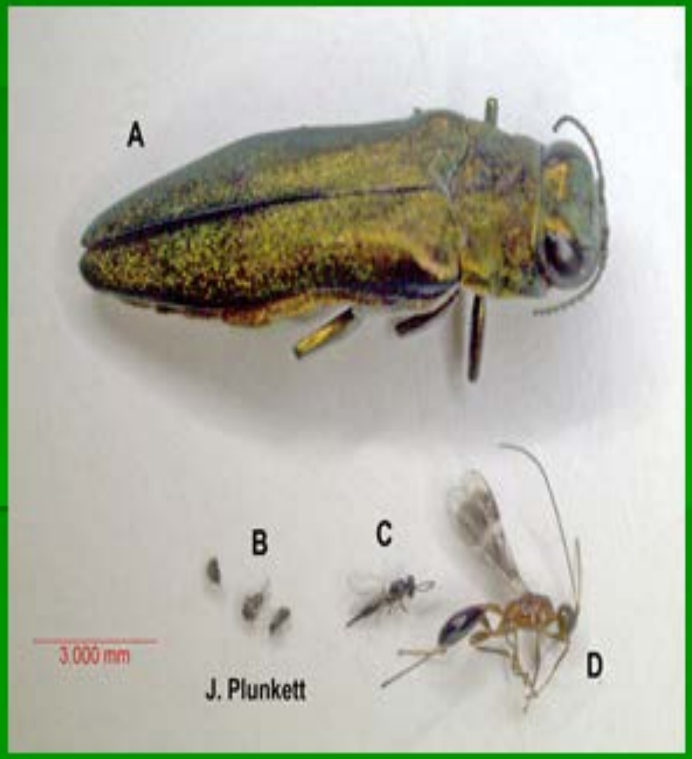
EAB Bio-Control

Natural Enemies

- The USDA APHIS PPQ Biological Control Production Facility in Brighton, MI
- Designed to produce EAB parasitoids
- Four non-native wasp species

Parasitoid wasps

- A= EAB
- B=*Oobius agrili*
- C=*T.plannipennis*
- D=*Spathius agrili*



O. agrili will parasitize 60% of the eggs laid in summer; *T. plannipennis* will parasitize 50% of the larvae (4 generations/year) *S. agrili* will parasitize up to 90% of the larvae

NJ EAB Bio-Control

- 4 locations
  - Hillsborough (Duke Island Park)
  - Bridgewater (CP)
  - Ewing (Buglab)
  - Hillsboro/Franklin (DNR Canal)
- *Oobius agrili*
  - 1,600 released
- *Tetrastichus plannipennis*
  - 14,336 released
- Total of 15,937 parasitoids released in 2015
- 3 releases/ 2weeks beginning in Sept.

- ***S. agrili was*** **not released as it has not been approved for release by APHIS north of 40° latitude as it has not been shown to establish. Another species, *S. galinae* is being evaluated.** NJDA-PABIL meeting with Brighton staff in April 2016 about rearing the EAB beneficials

NJDA takes Bio-control seriously!

Spotted Lanternfly

Lycorma delicatula

Spotted Lanternfly

Lycorma delicatula

- The Spotted Lanternfly is a planthopper from Asia, specifically found in China, Korea, India, Vietnam, and parts of eastern Asia. It belongs to the family Fulgoridae in the order Hemiptera (true bugs).
- Found in Berks County in Pennsylvania Fall 2014, prompting the immediate quarantine of Pike and District townships. Recently, SLF has spread to the edges of Bucks County
- SLF was introduced in Korea in 2006 and since has attacked over 25 plant species which are known to grow in Pennsylvania.
- **Not present in NJ as yet. PDA is conducting an eradication program.**

Lifecycle: Adults

Approx. 1 inch in length

Adults

- While a poor flyer, the Spotted Lanternfly is a strong jumper.
- Adults can be seen as early as July.
- In the fall, adults switch hosts to feed on Tree of Heaven (*Ailanthus altissima*).
- Egg laying begins in late September and continues up to the 1st killing frost.
- Life cycle is typically univoltine (one generation per year) and spotted lanternfly overwinters as eggs.

Egg Masses

- Freshly laid egg masses containing 30-50 eggs have a grey waxy mud-like coating that adhere to flat surfaces including tree bark, rocks, lawn furniture, RV's and pallets.
- Waxy deposit disappears on old egg masses which look like brown seeds.
- Choosing plants with cytotoxic metabolites in the Fall for egg laying is thought to be a mechanism of defense for protection from natural predation over the winter.

Nymphs

- Beginning in late April to early May nymphs will hatch from egg masses laid on bark, stone, and other vertical surfaces.
- There are four nymphal instars; they're fast!
- The first 3 instars are black with white spots and wingless.
- The fourth instar has red wing pads and upper body.
- Nymphs spread from the initial site by crawling and feeding on woody and non-woody plants.

Hosts

- Spotted lanternfly feeds on a variety of host plants including fruit trees, ornamental trees, woody trees, and vines. Apple, birch, cherry, dogwood, **grapes**, Korean Evodia, lilac, maple, poplar, stone fruit, pine and tree-of-heaven are among more than 70-100 species of hosts attacked by this pest.

Hosts

- South Korean observations indicate that spotted lanternfly has a wider host range early in life as young nymphs and a narrow range as they grow older, especially before egg laying.
- Preference for hosts containing high sucrose and fructose content.
- Tree-of-heaven, which contains high concentrations of cytotoxic alkaloids, is one of the favorite hosts. Korean Evodia contain toxic secondary metabolites as well.

Human-Mediated Transportation

- International Trade and Commerce

- Movement
  - Firewood
  - Cargo
    - Pallets
    - Containers
  - Nursery Stock
  - Raw materials
  - Stone products
  - Cast Iron Products

QUESTIONS?

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http://www.nj.gov/agriculture/divisions/pi/prog/emeraldashborer.html

If you see these call us at 609-406-6942