





Photo
Mike
Belleme

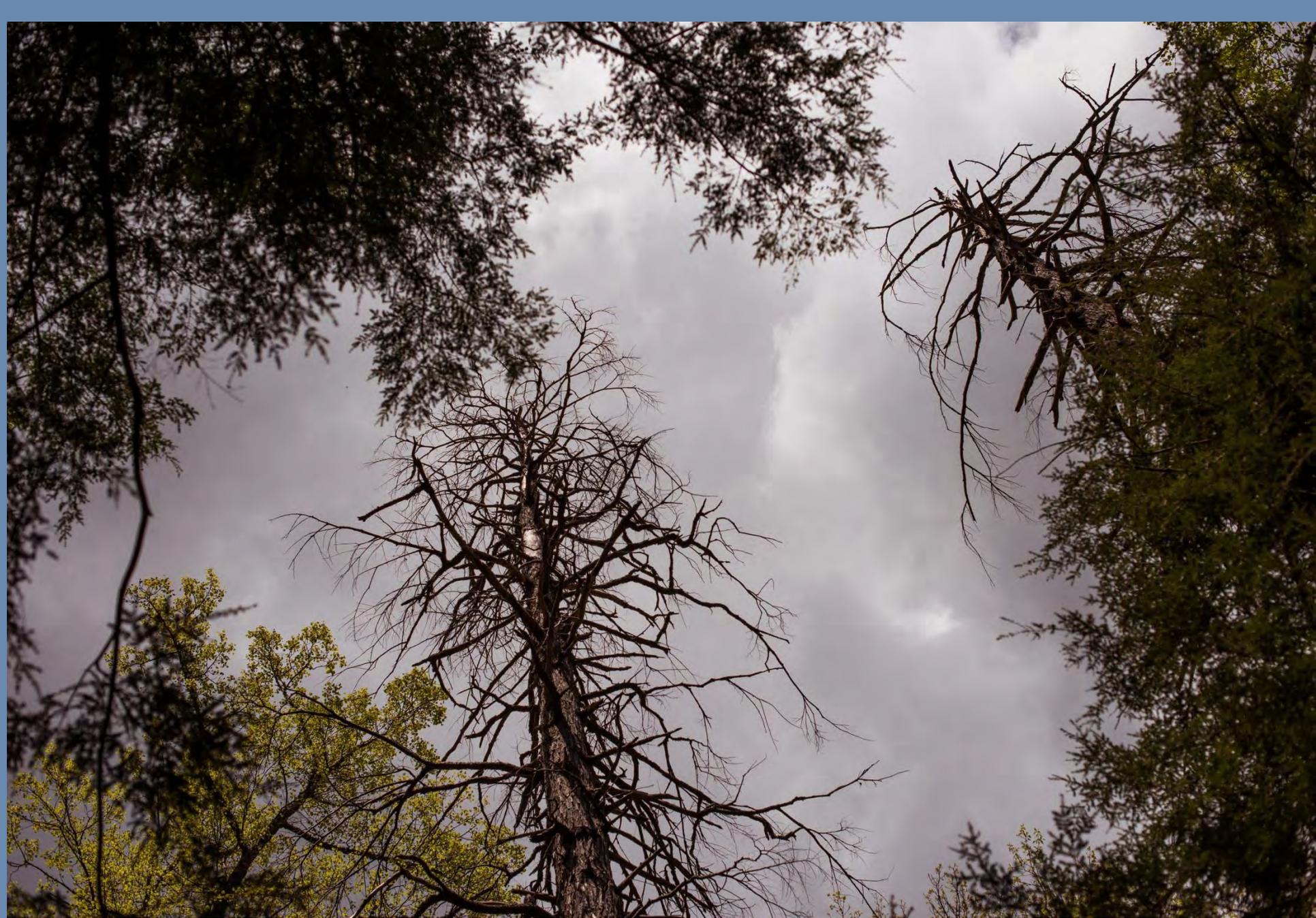


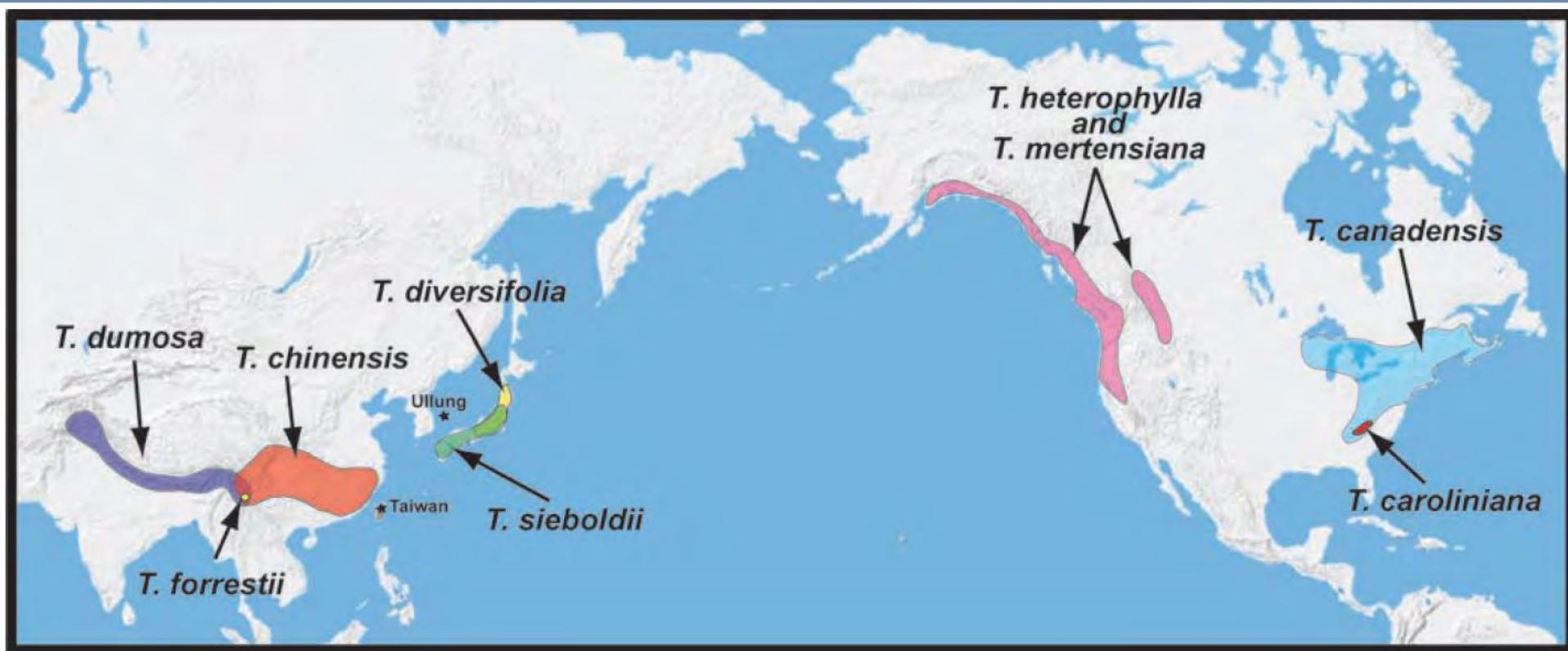
Photo Mike Belleme



Photo Mike Belleme



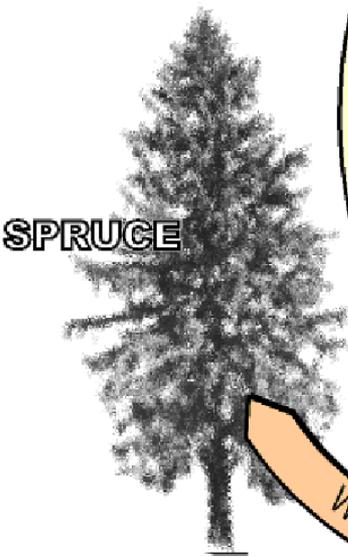
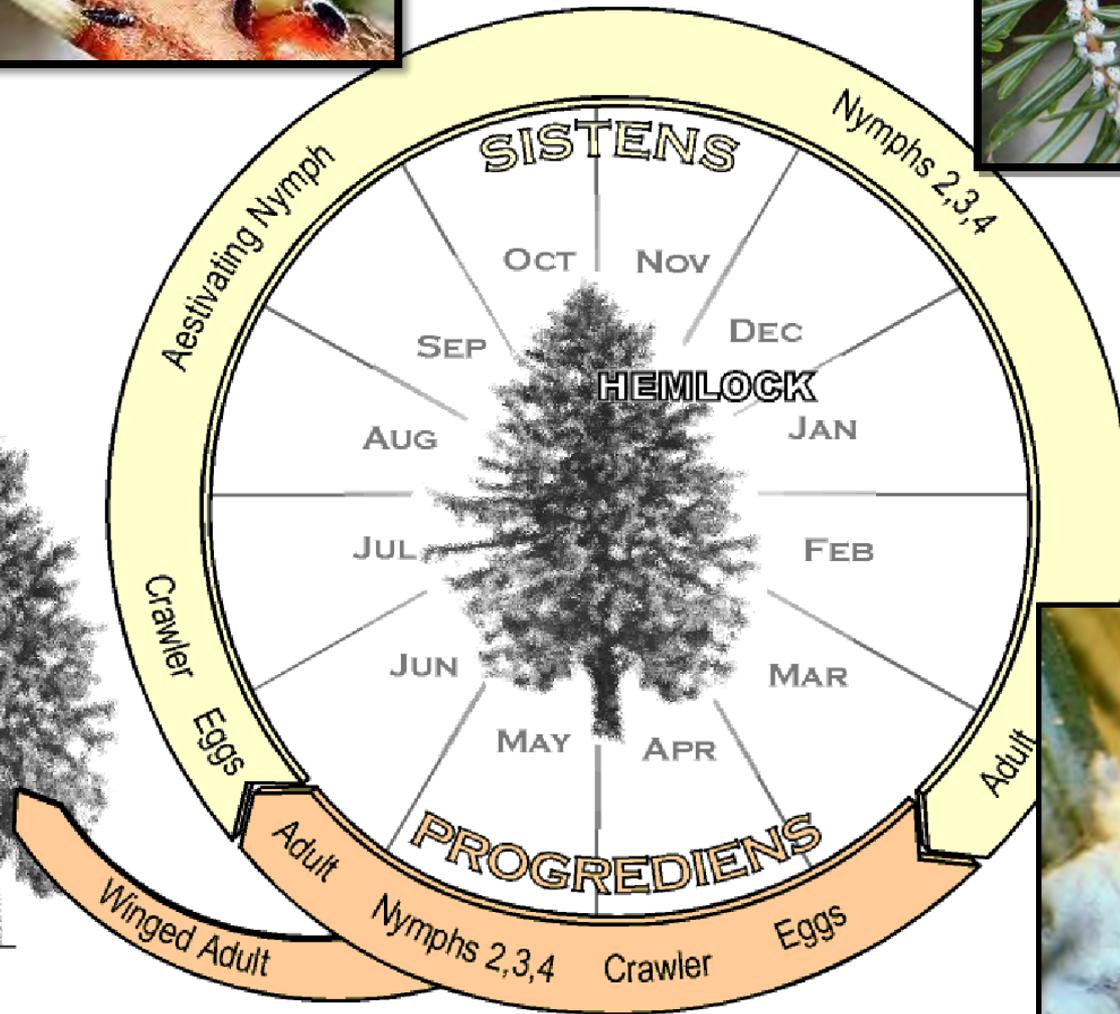
Hemlock Woolly Adelgid
Adelges tsugae



Worldwide distribution of HWA and *Tsuga* species.

Havill 2008.

Life Cycle

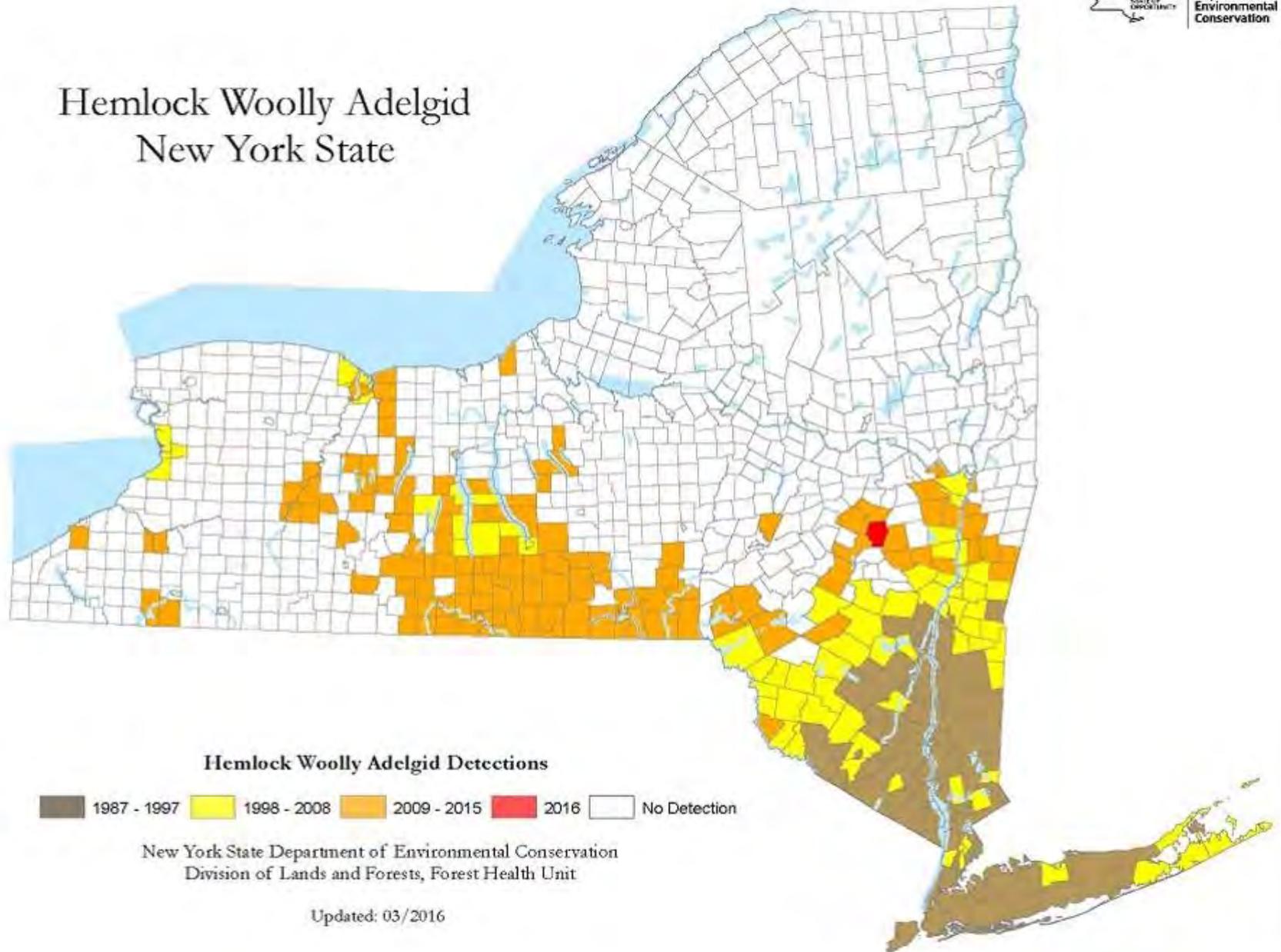


Impact on trees



- Inserts stylets at base of needles and feeds on xylem ray parenchyma cells
- Feeding kills buds first, then foliage
- Usually kills trees within 4 to 10 years, it takes longer on better sites, up to 20 years.

Hemlock Woolly Adelgid New York State



Hemlock Woolly Adelgid Detections

1987 - 1997 1998 - 2008 2009 - 2015 2016 No Detection

New York State Department of Environmental Conservation
Division of Lands and Forests, Forest Health Unit

Updated: 03/2016

Ecological Impact



Ecological Impacts

- Hemlock is a *Foundation* species in our forests
 - They occupy the base of the food web
 - They are critical species in the habitat they help create
 - **Generally so common that we take them for granted**
 - We depend on the ecosystems they build and maintain for a wide range of tangible and intangible services



Direct cooling effects of shade on waterways



Thick canopy
retards snow melt
keeping
groundwater cooler
for longer

New York State Hemlock Initiative



To guide the statewide HWA management efforts and other threats to hemlock in New York State

- NYSHI based at Cornell
 - Biological control program
- PRISM's working with DEC and State Parks

NYS Hemlock Initiative Tasks

- Identify and engage stakeholders, train volunteers
- Identify priority hemlock stands
- Survey and map
- Develop and implement best management practices
 - assess management efficacy.
- **Establish hemlock gene conservation strategies.**
- Develop and implement biocontrol program to grow and redistribute natural enemies
 - Locate hemlock hedges across the state

nyshemlockinitiative.info

Laricobius nigrinus



- Native to Pacific Northwest
- Good life cycle synchrony with HWA
- Released in 16 states on east coast since 2003.
- Establishment at many locations in the East.
 - Banner Elk, NC
 - Spread over 30 miles since first introductions in 2003
 - Over 12,000 collected in two weeks for release in 2013
 - Delaware Water Gap, Northern NJ and PA populations are growing since releases began in 2006

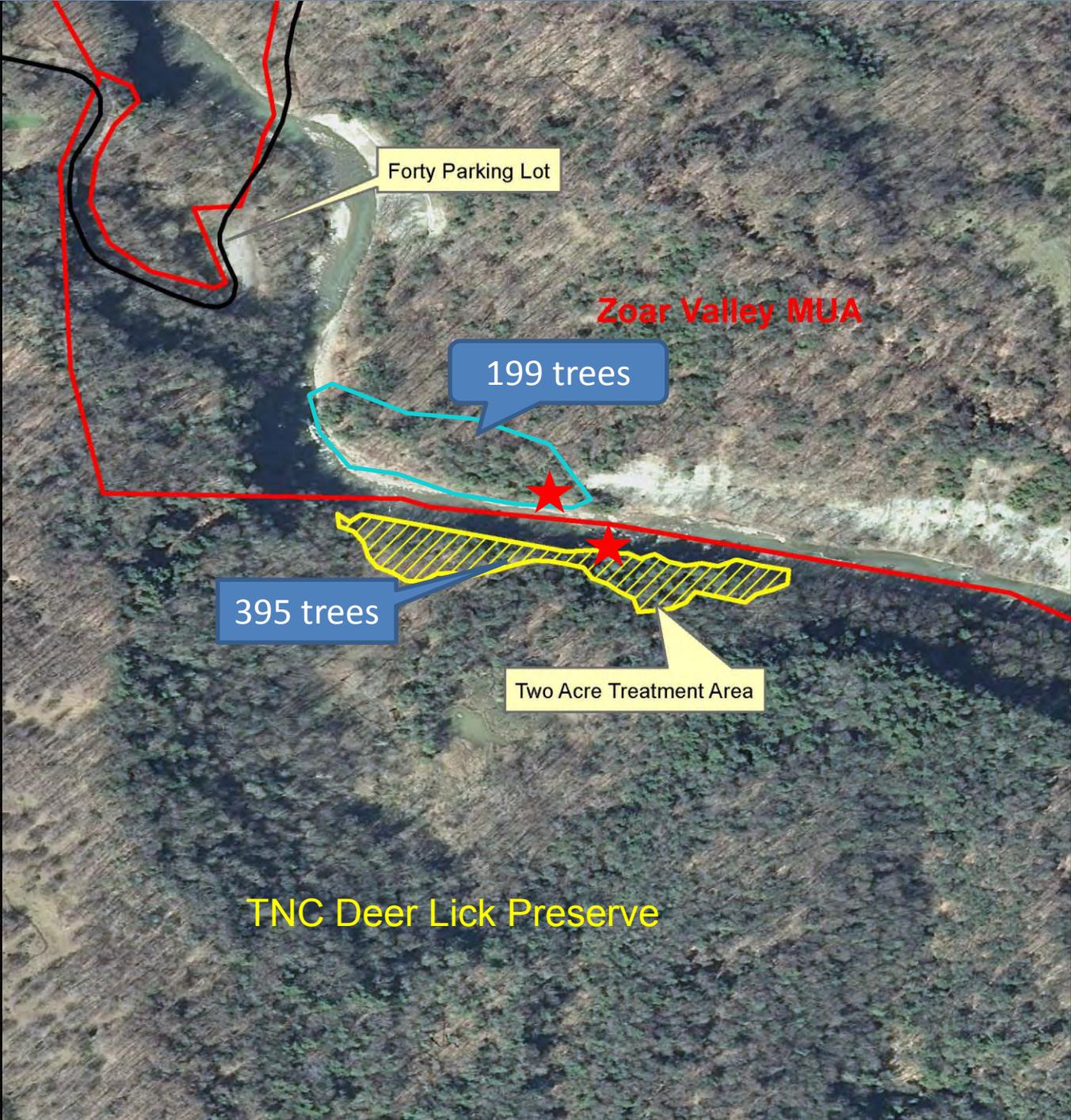
Leucopis argenticollis & L. piniperda

- Silverflies
- Diptera: Chamaemyiidae
- Second most abundant predator of HWA in the Pacific NW
- Native to New York
- Larvae feed on both Progrediens and Sistens eggs.
- Released at 3 NY sites in 2015 and 5 sites in 2017



Systemic Insecticides

- Imidacloprid
 - Various formulations and application techniques
 - Injections – NO
 - Basal Bark Spray (2ee) - restricted
 - Time release tablets - restricted use
 - Soil drench available to homeowners
 - Effective for 7 years or more
 - Slow to move through tree
- Dinotefuran (Safari)
 - Basal bark spray only in NY
 - Effective for only 1 or maybe 2 years
 - Fast movement in tree



Forty Parking Lot

Zoar Valley MUA

199 trees

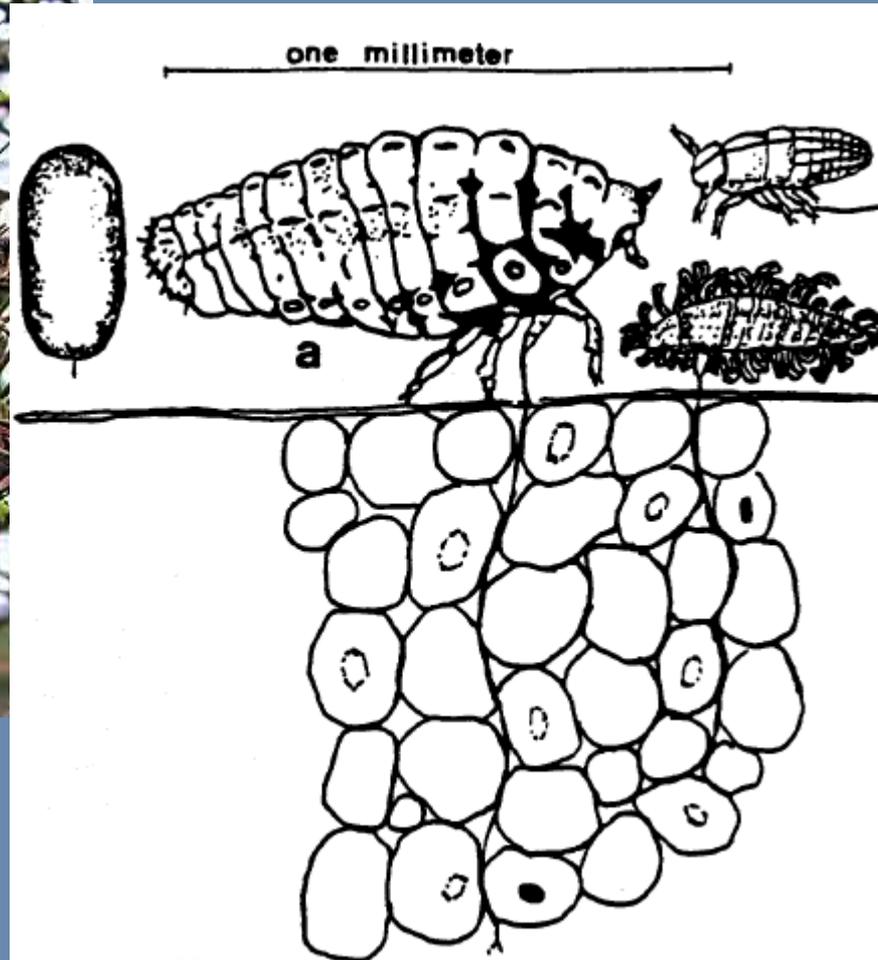
395 trees

Two Acre Treatment Area

TNC Deer Lick Preserve

Balsam Woolly Adelgid

Adelges piceae



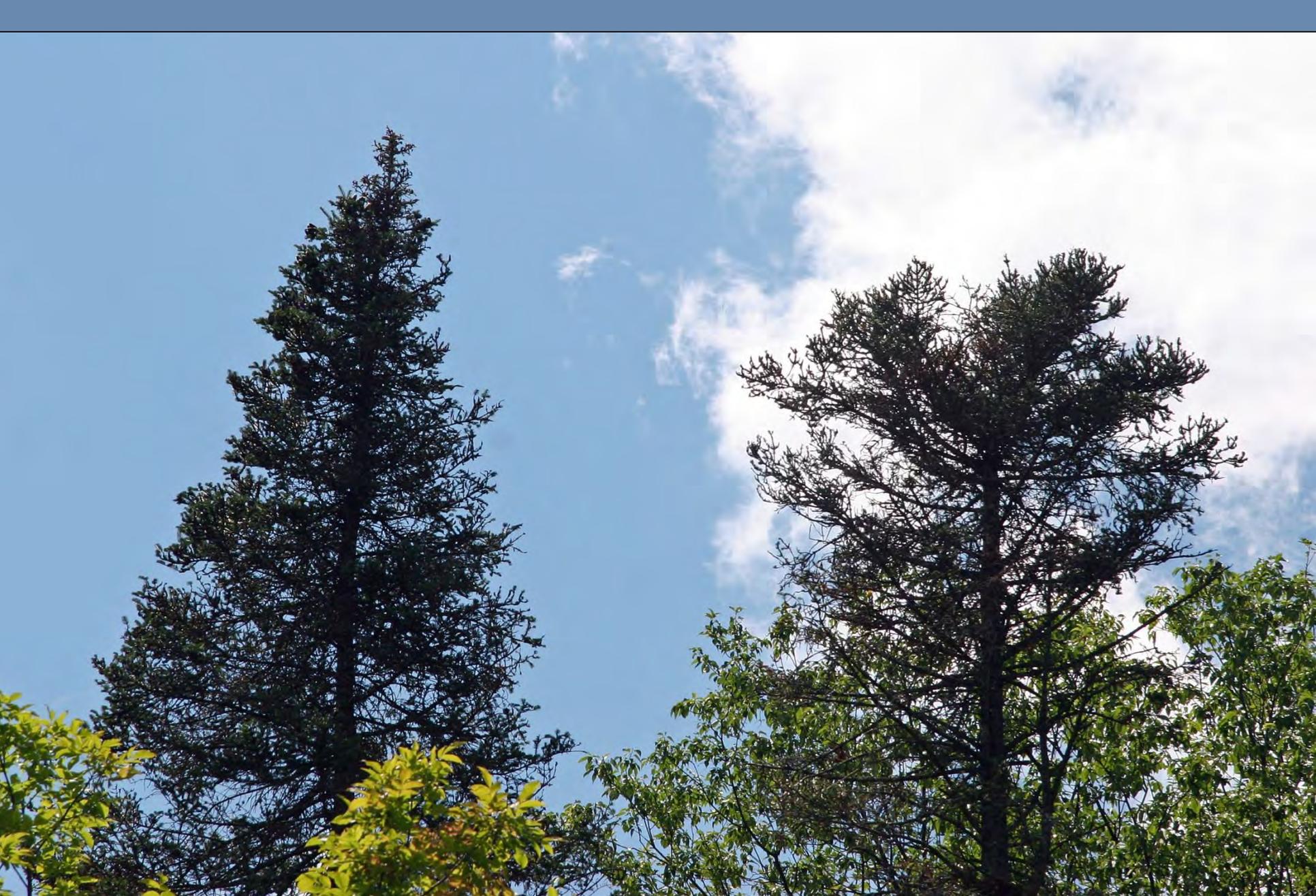


- Two basic infestations:
 - Twigs – Gouting
 - Stems or main trunk of the tree
- Stem infestations can rapidly kill a tree
 - 3 to 10 years depending on tree vigor
- Twig infestations can linger for years
 - Apparent on trees in the understory
 - Can linger and disfigure crowns for many years – 30 years or more in some *Abies* species.

Persistent chronic crown decline

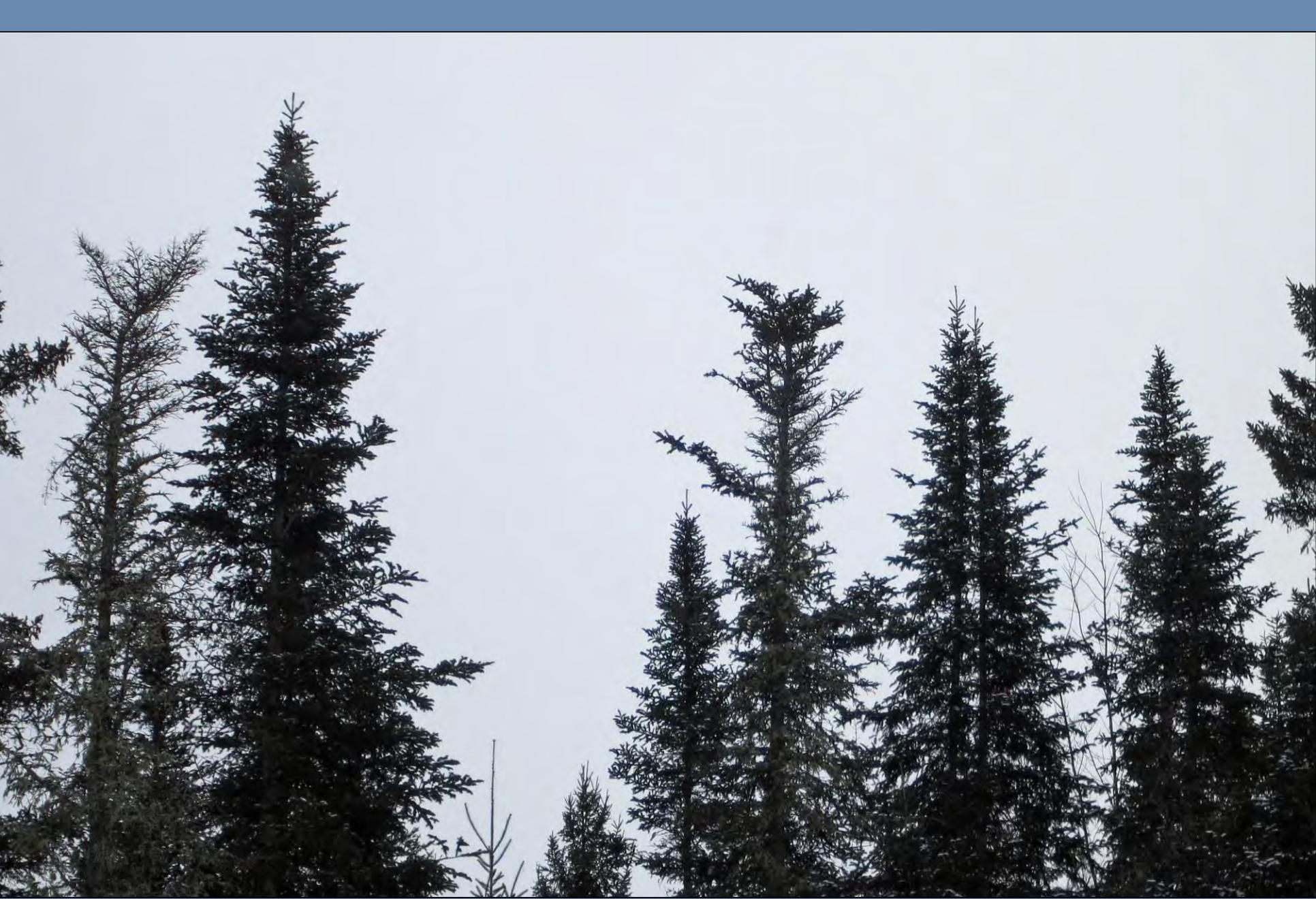


Balsam fir, *Abies balsamea*, in the Adirondack Mountains, NY



Low level crown decline

Persistent crown decline

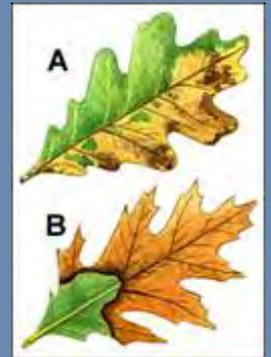


Balsam fir near Indian Lake, NY

Oak Wilt

Ceratocystis fagacearum

- First detected in Wisconsin in 1944 and has since spread throughout the Midwest down to Texas
- Affects all oaks but Red oaks succumb more rapidly
- First found in NY near Schenectady in 2008
- In 2016 found at 4 places on Long Island and in Canandaigua
- Spread by firewood movement and nitidulid beetles feeding on fungal mat
- Avoid pruning or wounding oak trees in the spring and summer, when spore mats are present
- Treatment by trenching to remove root grafts then destroying trees



- 4th of July Disease
- Red to brown
- From edge inward



Illustration: Robert O'Brien
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- Fungal mat develops under bark
- Bark eventually cracks allowing access to insects attracted to sweetness produced by the fungus



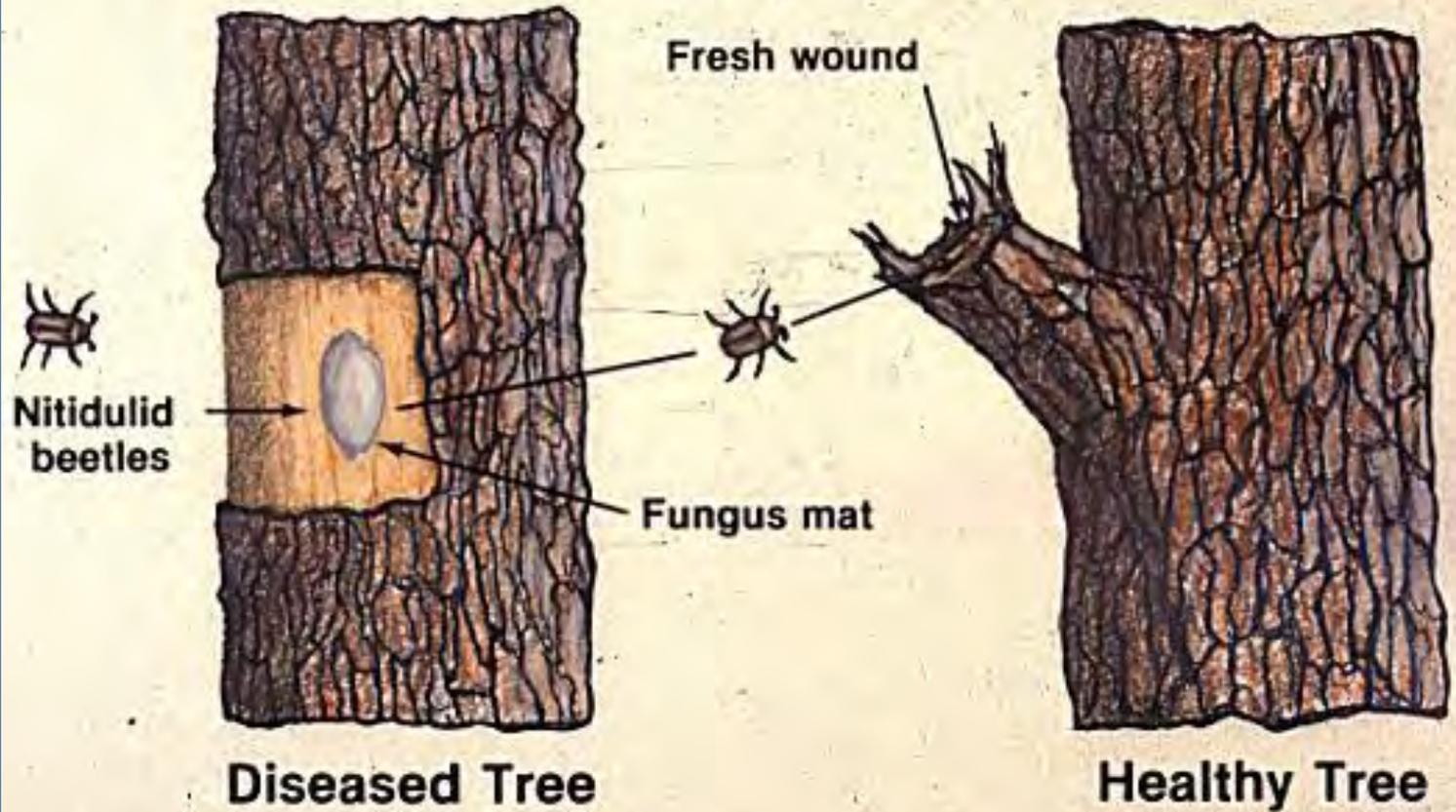
1 mm

1 mm



Illustration: Robert O'Brien
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Insect Spread of the Oak Wilt Fungus



Do not prune oaks in spring and summer



Disease spreads by root grafts from an initial infection point

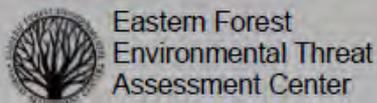
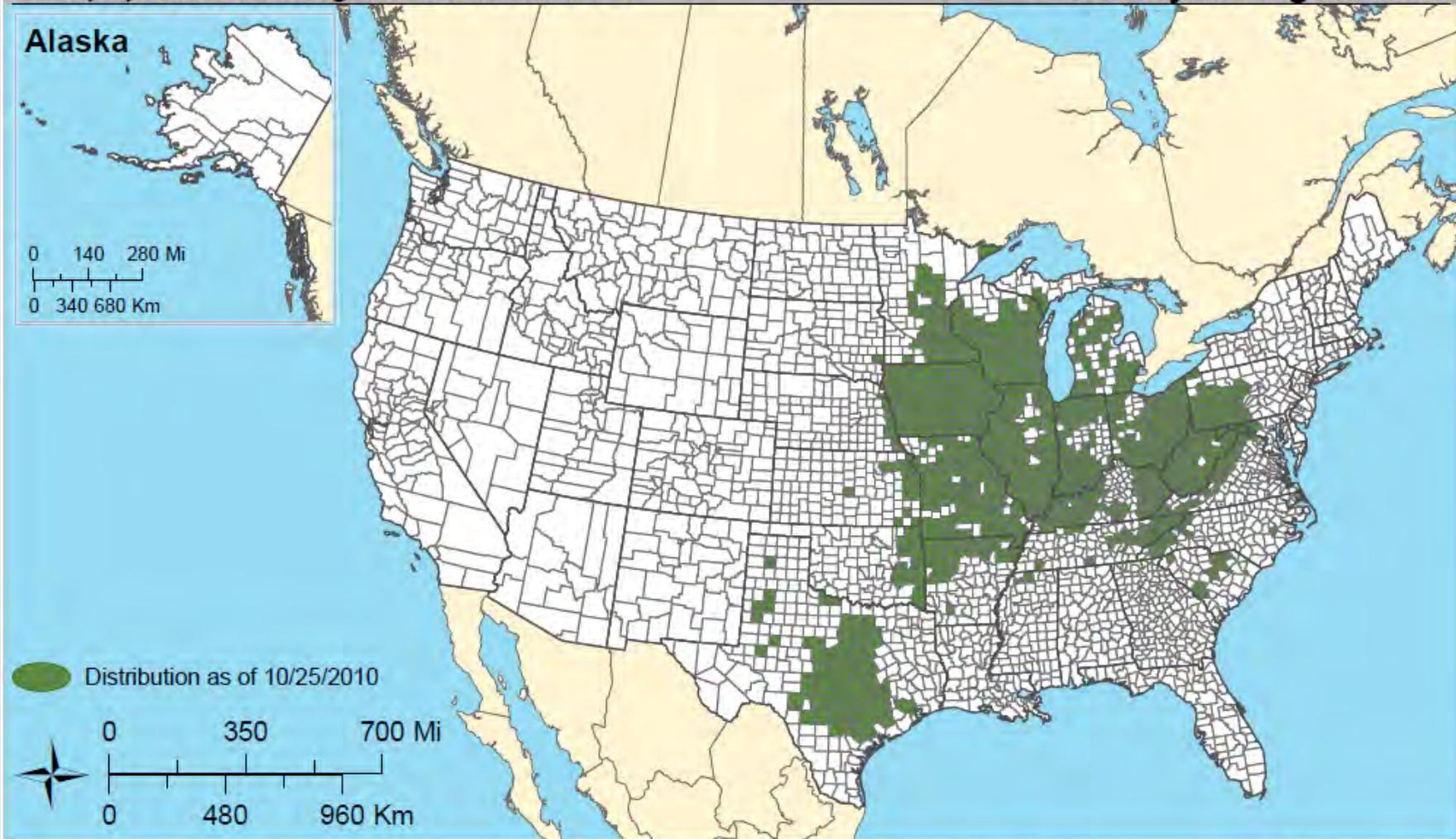


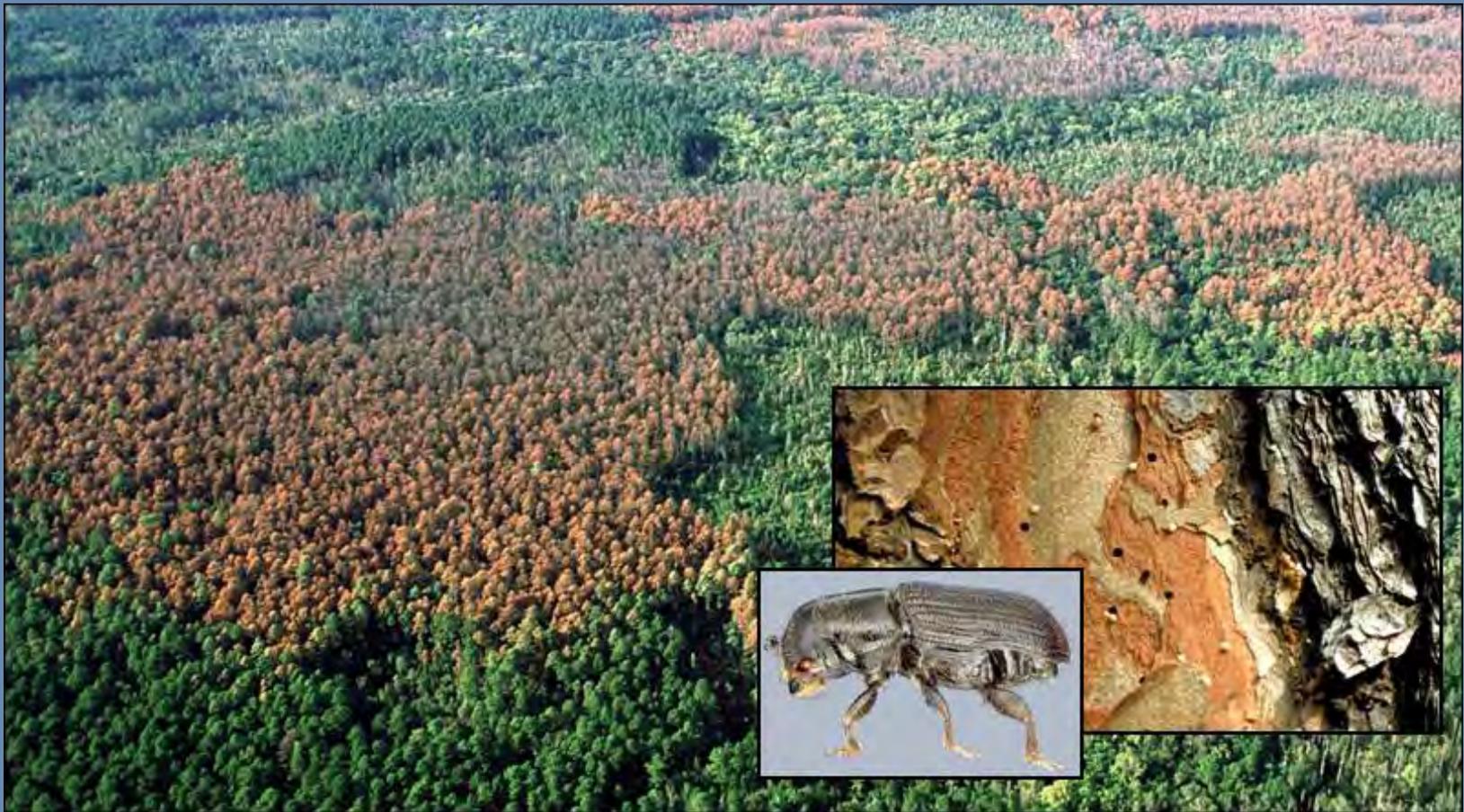
Alien Forest Pest Explorer

www.fs.fed.us/ne/morgantown/4557/AFPE/

Pest Distribution Map

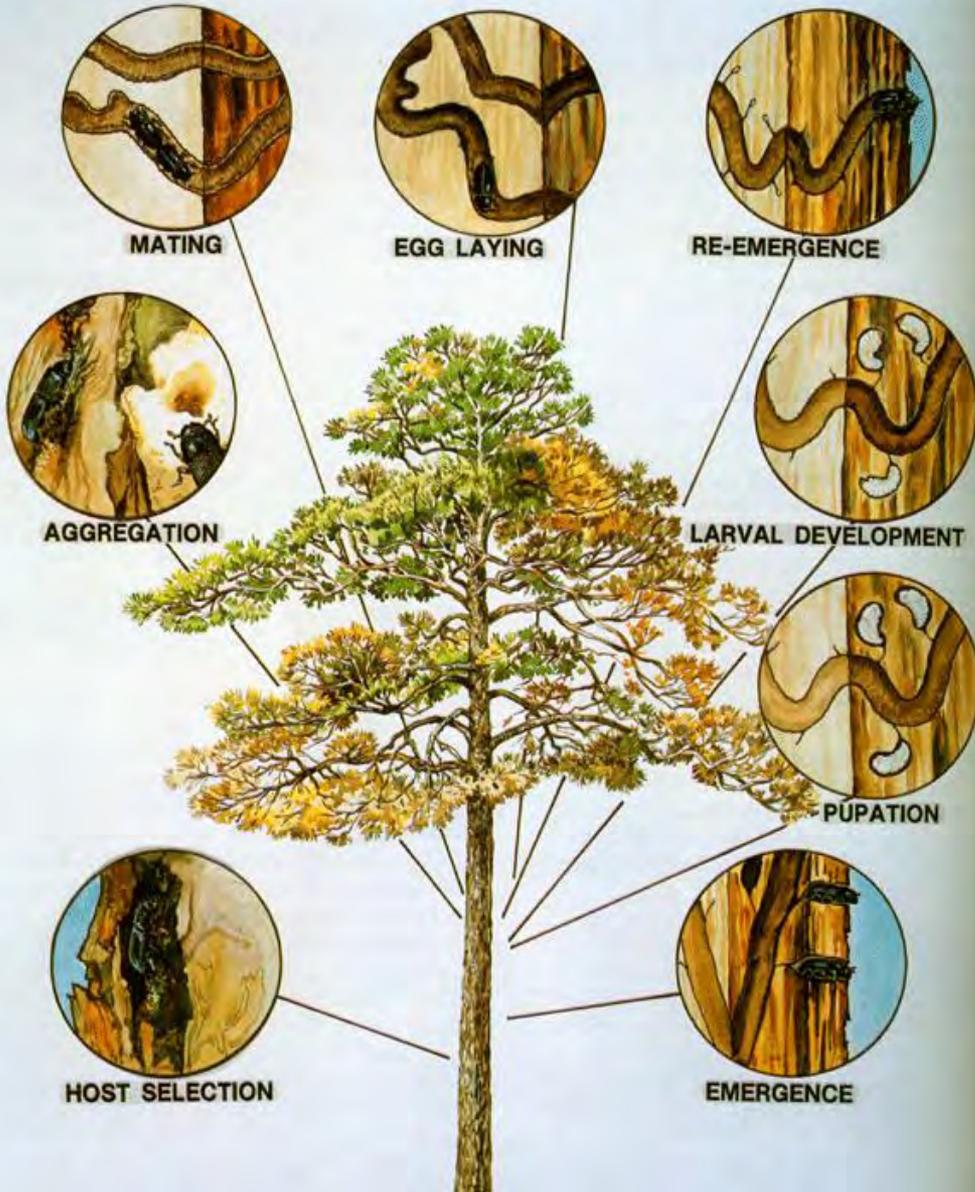
Oak Wilt *Ceratocystis fagacearum*





Southern Pine Beetle In New York

SPB Life Cycle



- Life cycle normally 35 to 60 days in the south
- May be up to 6 generations per year in the south
- Outbreaks are cyclic, often coinciding with draught



SPB Factoids

- Many species of pines are attacked
 - Pitch pine is the favored host on Long Island
- Normal tree resistance is to mobilize resin ducts and basically spit the attacking beetle out. Pitch tubes are formed.



SPB Galleries



- The classic bark beetle story:
 - Initial attackers, females, release aggregation pheromones and cause pitch tube formation letting lose a plume of host tree volatiles.
 - Aggregation to pheromones initiates mass attack and eventually the successful colonization and death of the tree.
 - This was the first documentation of chemical communication between insects.
 - With aggregation, tree defenses are overwhelmed and egg gallery construction proceeds.

- This is an insect native to North America but NOT to New York - first report Sep 2015
 - Normally attacks cut or weakened trees, a predator.
 - Trees can be weakened by age or disease or kids with hatchets
 - Populations can build up if there are many weakened trees in an area and then overwhelm the defenses of normally healthy trees nearby.
 - With wind-driven population expansion natural enemies are often left behind, essentially duplicating the invasive non-native scenario.
 - No coevolution for resistance and no natural enemies.



Spotted lanternfly

Lycorma delicatula

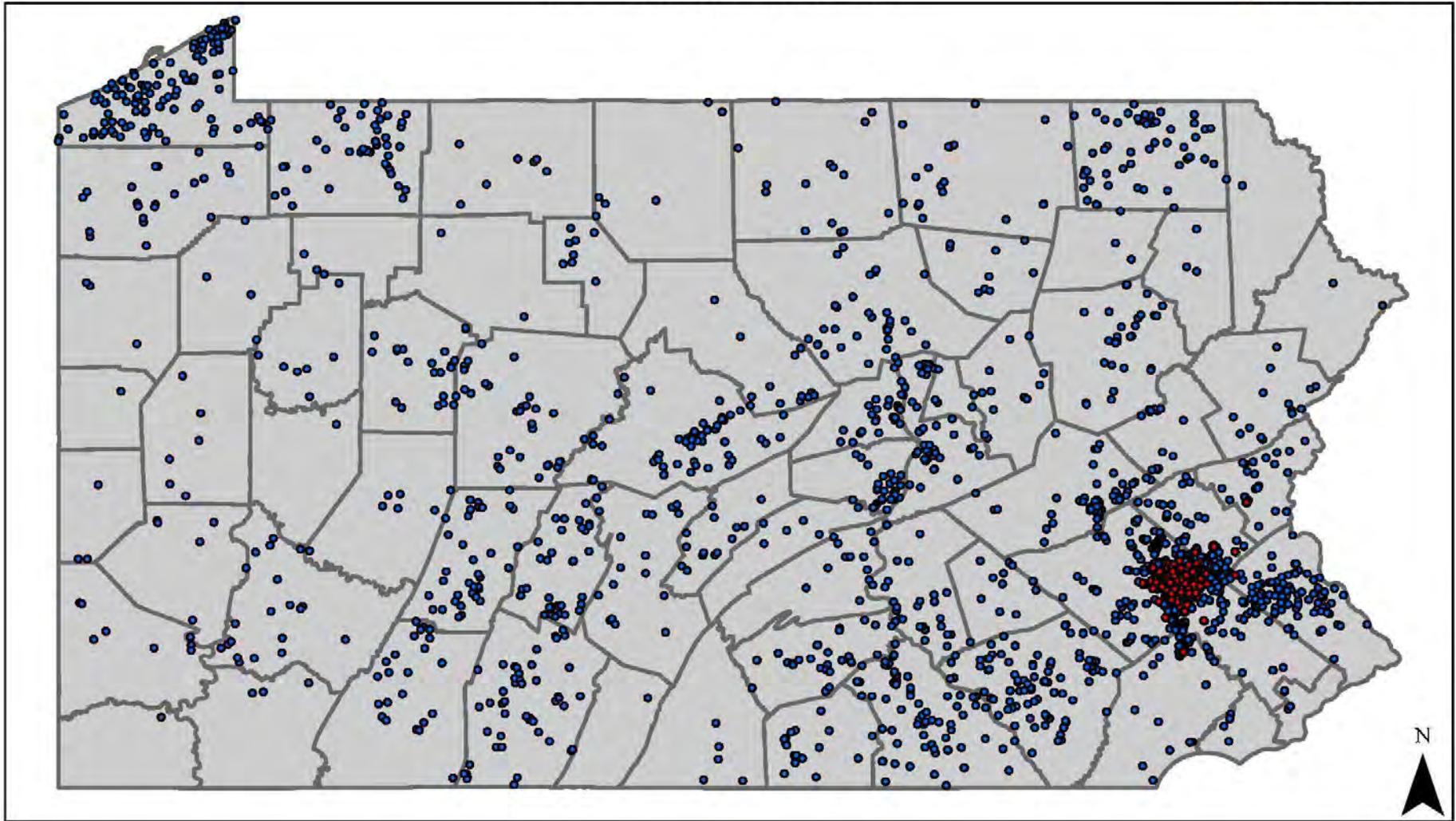
Hemiptera:Fulgoridae

Spotted Lanternfly

- Native to China, India, Viet Nam, and Japan.
- Invasive in Korea where it spread rapidly after introduction in 2006
- First detected September 2014 – Berks County
- Eggs laid on smooth bark or other nearby surfaces
- Nymphs are polyphagous
 - Fruit trees in rose family, pine, oak, walnut, poplar, Liriodendron, maples,
- Adults prefer Ailanthus and Vitis

Lycorma Detection Survey

Results through 08 Feb 2016



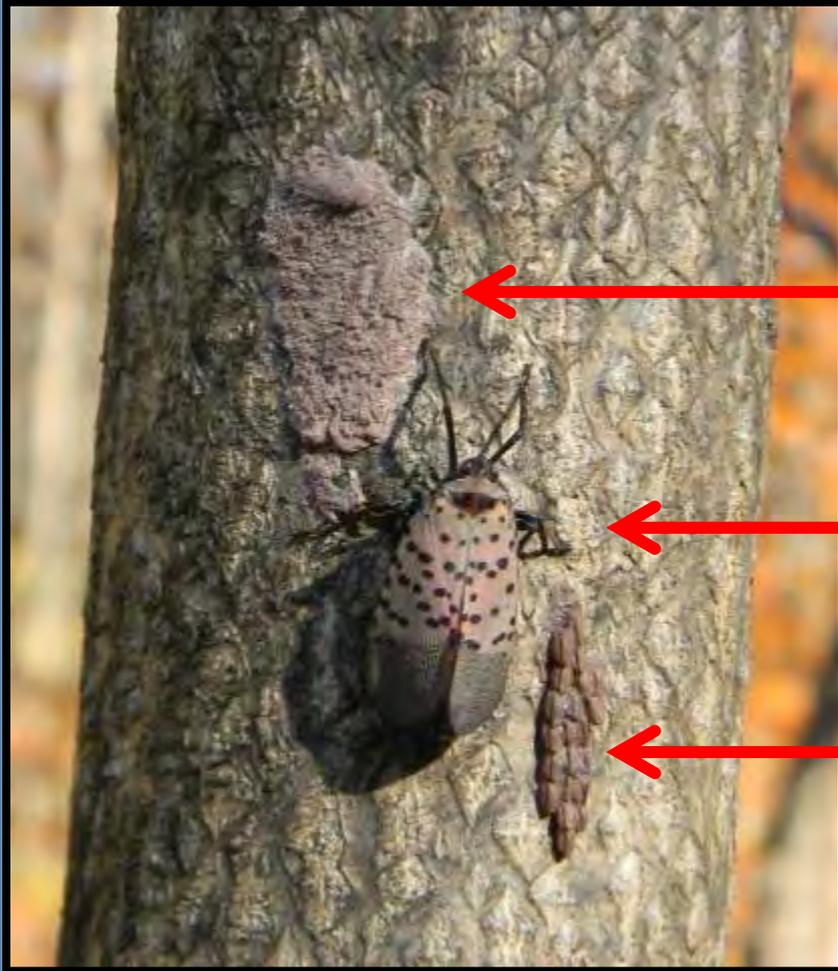
Spotted Lanternfly Presence

Lycorma Survey Points

- Present
- Not Found

EGG MASS IDENTIFICATION FOR SPOTTED LANTERNFLY

HEMIPTERA: FULGORIDAE: *Lycorma delicatula* (WHITE)



In the photo to the left
you can see:

Covered Egg Mass

Adult Spotted Lanternfly

Uncovered Egg Mass

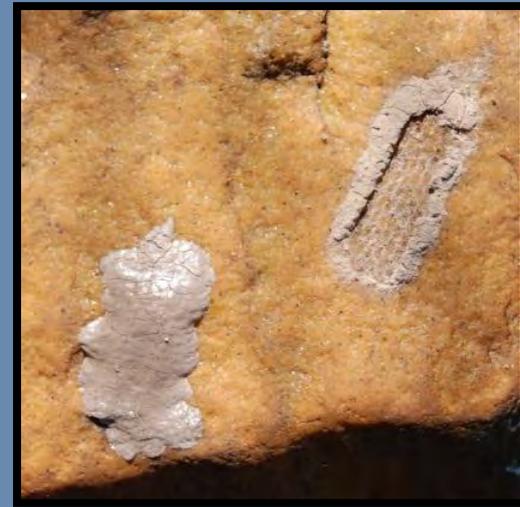
EGG MASS IDENTIFICATION FOR SPOTTED LANTERNFLY

HEMIPTERA: FULGORIDAE: *Lycorma delicatula* (WHITE)

The eggs mass putty can also dry out or become distorted before eggs hatch. The covering then takes on a dried, cracked earth appearance as seen below.



A tire track pattern can also be seen when eggs are scraped from the surface. Both of the egg masses on the stone pictured are from this year and only 2-3 weeks old.



EGG MASS IDENTIFICATION FOR SPOTTED LANTERNFLY

HEMIPTERA: FULGORIDAE: *Lycorma delicatula* (WHITE)



Daniela Lupastean, University of Suceava, Bugwood.org

Gypsy Moth's egg masses have a similar appearance to Spotted Lanternfly.

Many of the same surfaces are used by both species.

The covering for Gypsy Moth is more fibrous and generally lighter in color.

Gypsy moth eggs are more spherical than Spotted Lanternfly eggs.



Greg Hoover, Penn State Extension

Spotted lanternfly nymphs

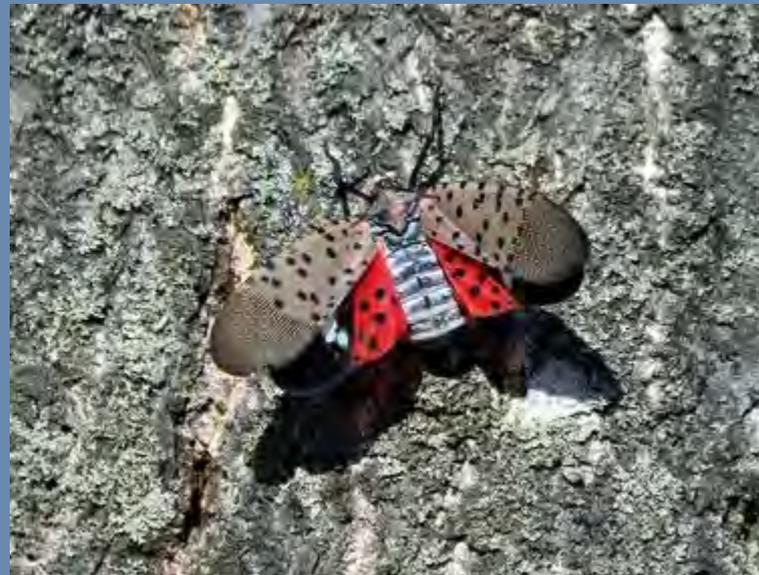


Active insects. They climb up and down trees, sometimes dropping from the top and ballooning for dispersal

Spotted lanternfly adult



Feeding can cause
sap to ooze onto
the bark surface



Joe Heller ©2001
GREEN BAY PRESS-GAZ.

