

Hemlock Woolly Adelgid and the NYS Hemlock Initiative

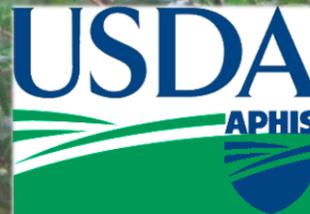
HWA ID, Biology, and Management

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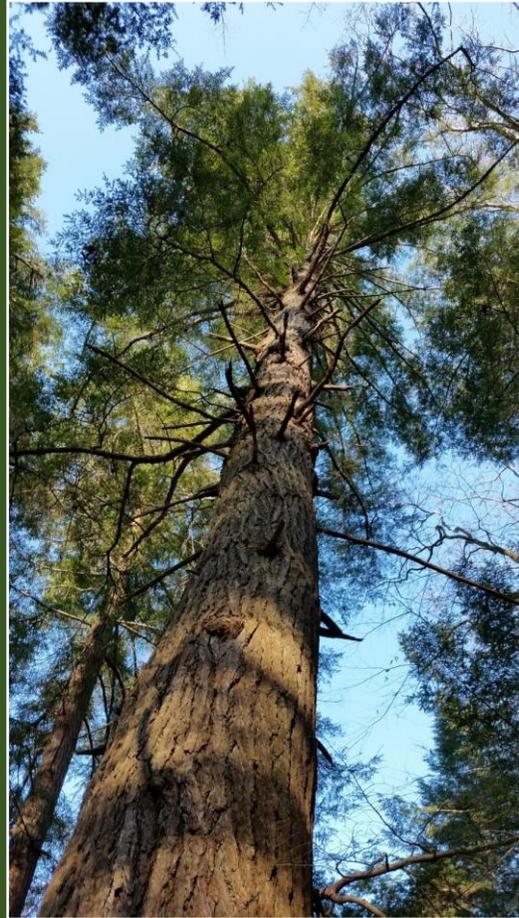
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Cornell CALS
College of Agriculture and Life Sciences

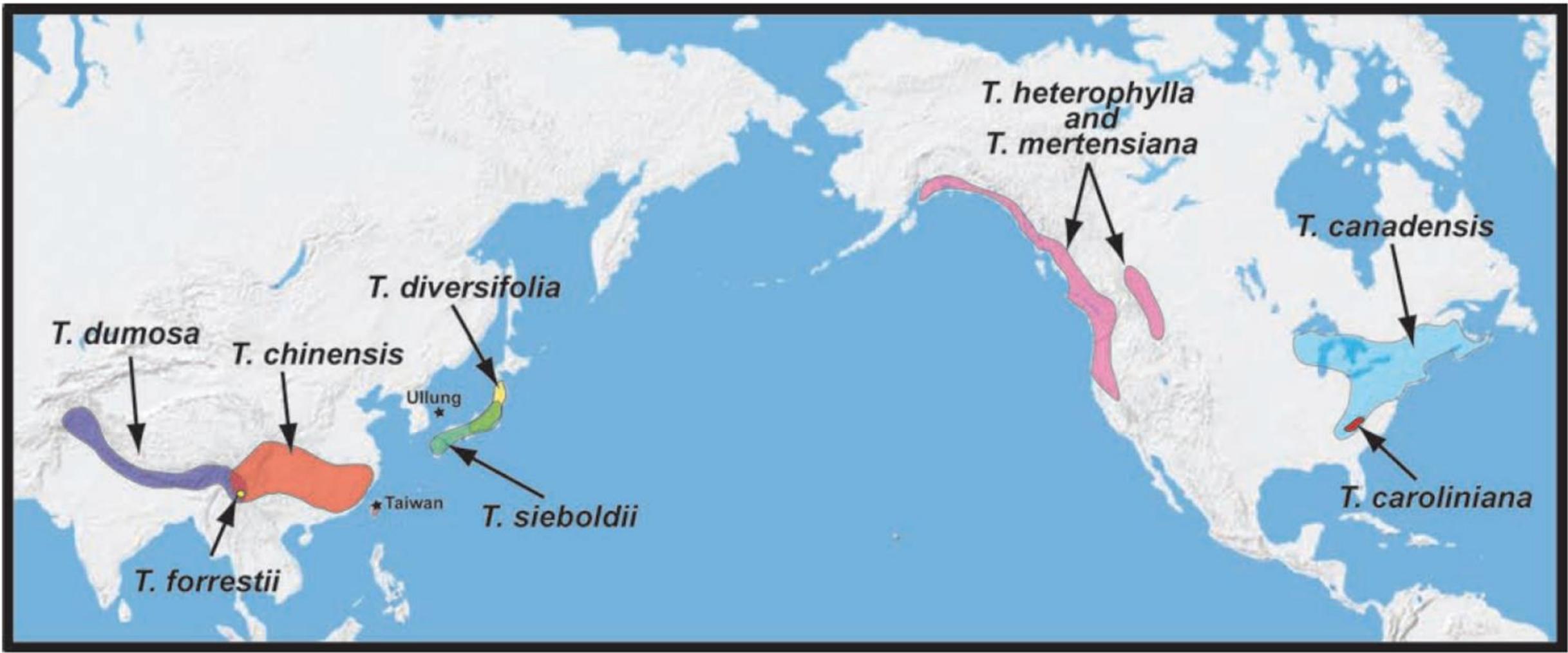


Eastern Hemlock

Tsuga canadensis



Worldwide Hemlock Species Distribution



Hemlock and HWA genetics research
Havill, 2008

NY Forests: A Hemlock's Home (and Ours)

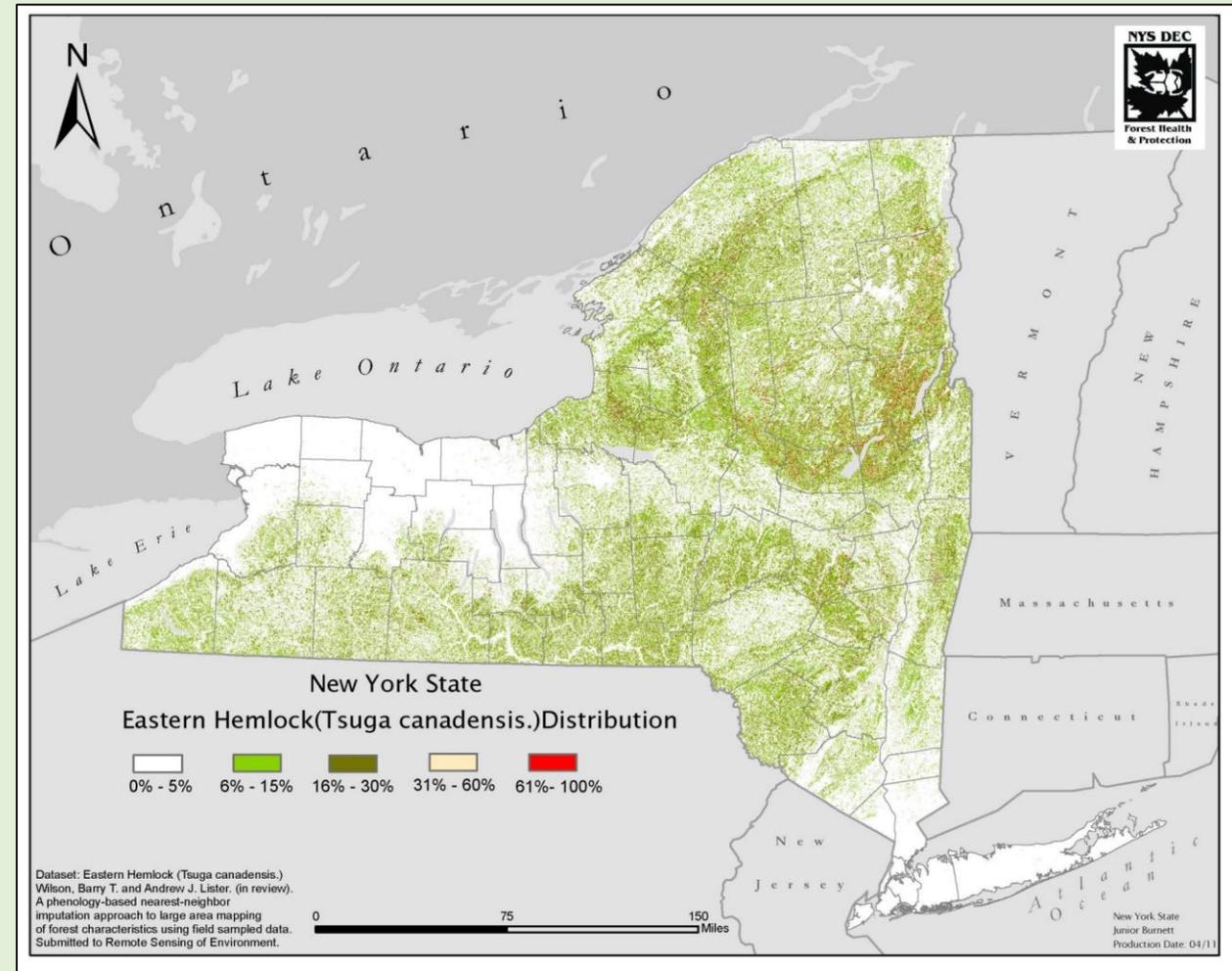


- 18.95 million acres of forest
- 76% (14.4 million acres) of NY's forests privately owned
- \$14 billion in forest products/services; \$1.9 billion in forest-related tourism in NY State

(Stats from dec.ny.gov)

Hemlock: A Foundation Species

- Creates unique habitat
 - Shelter for many forest species in summer and winter
 - Freshwater stream conditions
- Base of food web
- Irreplaceable in ecosystem
- Third most common tree in NY forests! (and NY has more Eastern hemlock than any other U.S. state)



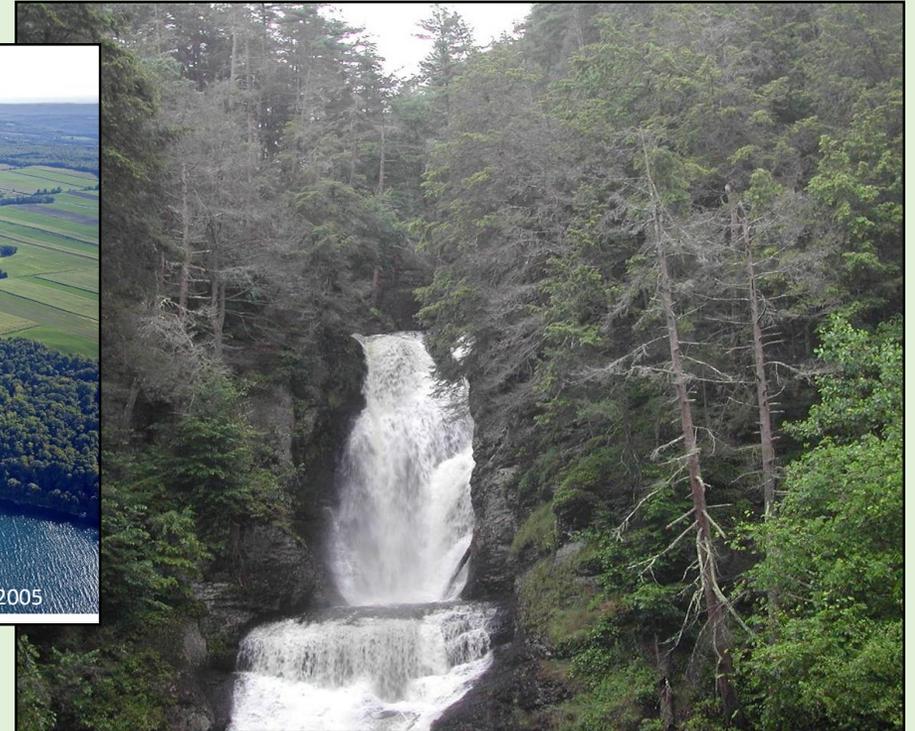
Ecological Significance

- Critical habitat
- Protect freshwater resources from runoff
- Stabilize soils, steep banks, and gorges



Bill Hecht, 2005

SKANAWATLES LAKE Mouth of Bear Swamp Creek and Finger Lakes Land Trust's Babar Preserve September 28, 2005 Photo by and copyright to Bill Hecht



Hemlock Loss Impacts:

- Water quality
- Wildlife and habitat
- Aesthetics of NY's forests
- Economic impacts

Potentially...

- Allows invasive species to invade new areas



Steve Norman, Pisgah National Forest, NC

Hemlock Woolly Adelgid

Adelges tsugae

- Invasive forest pest
- Feeds on hemlocks' stored nutrients
- Kills trees in 4-10 years in Southern Appalachians, 6-20 years where winters are cooler
- Characterized by white, waxy masses on hemlock twigs at base of needles



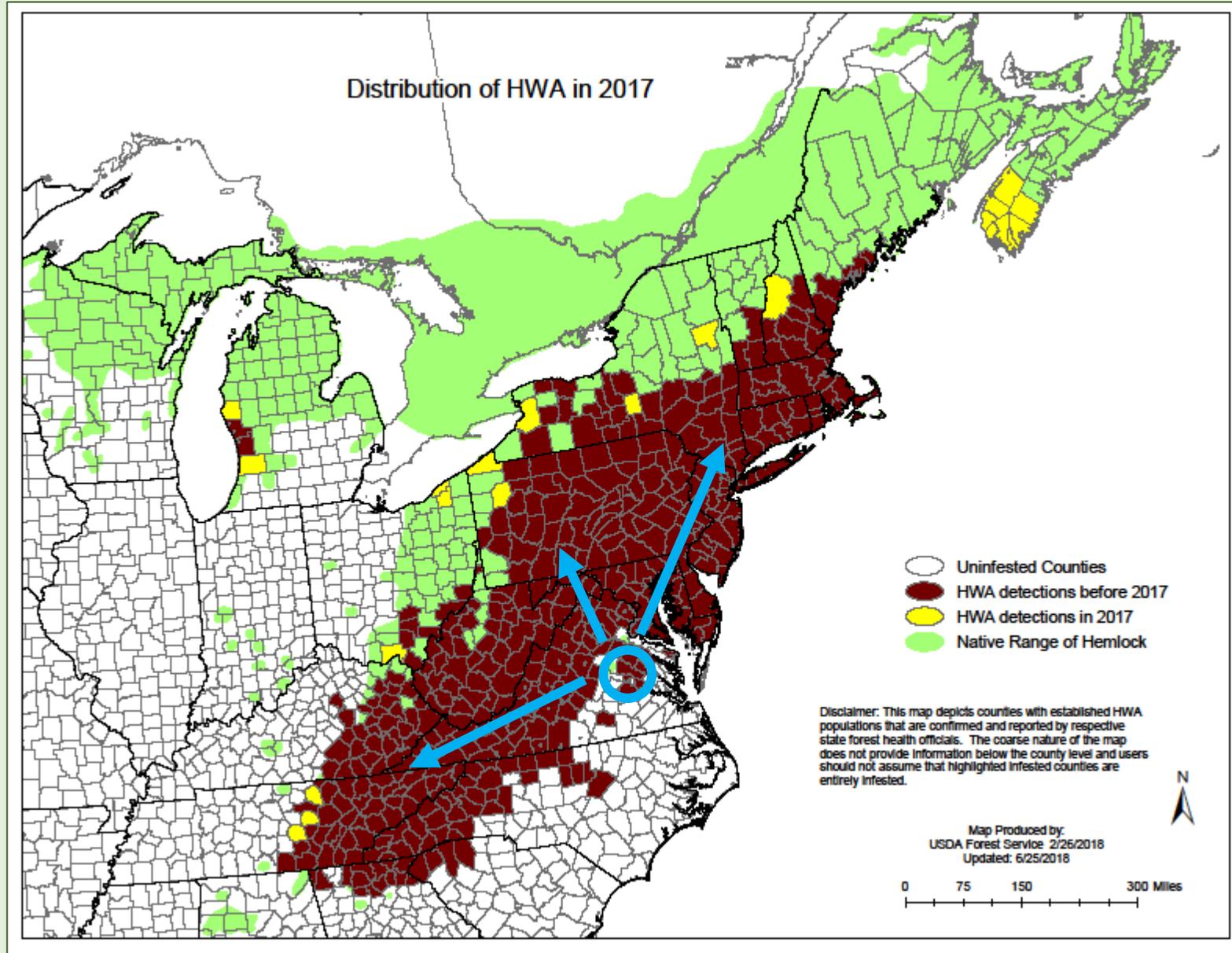


HWA Biology

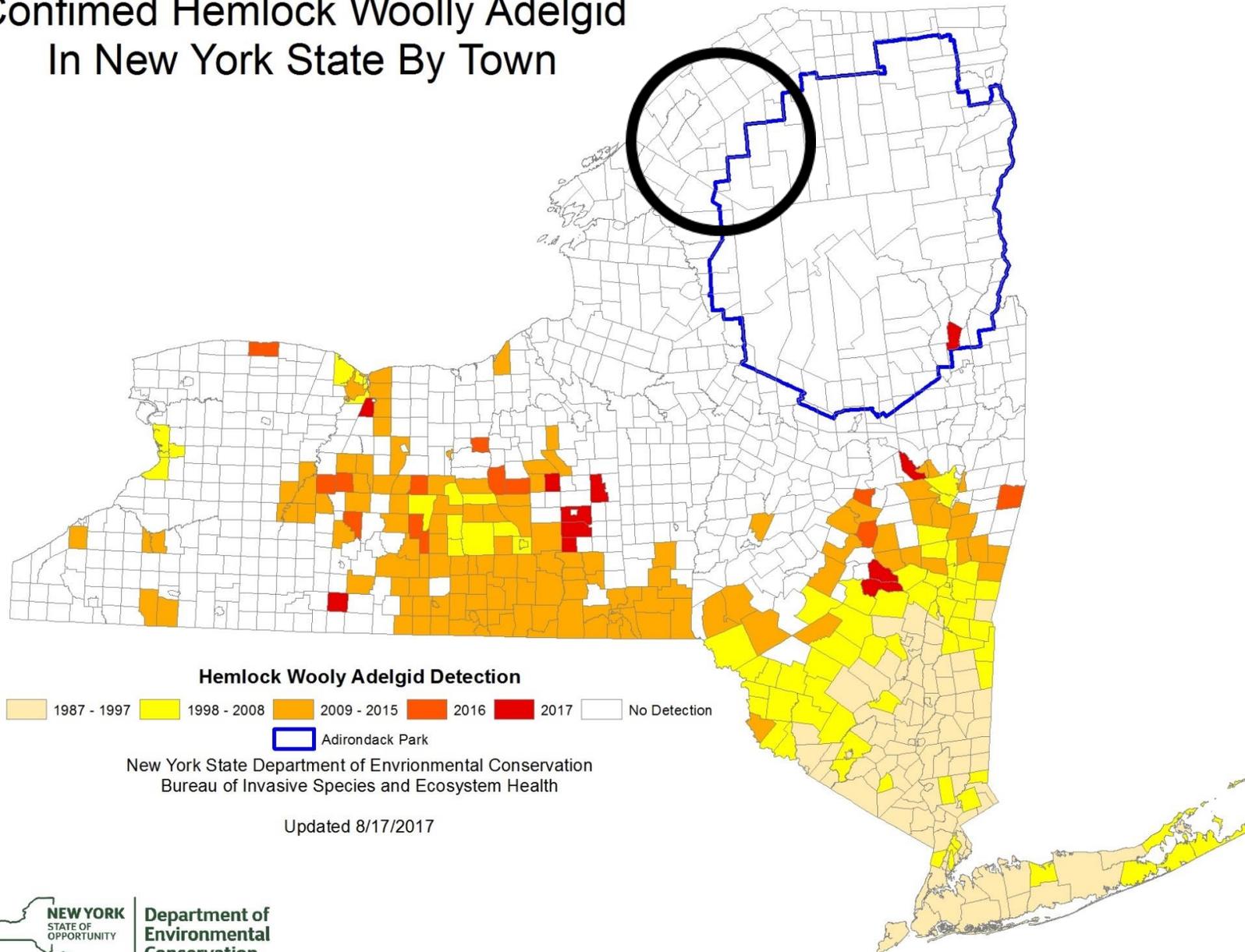


- Aphid-like insect, piercing-sucking straw-like mouthpart
- Native to southern Japan
- Spreading vectors include birds and other animals, humans, wind, etc.
- Faster spread with warmer temperatures
- No natural HWA resistance in eastern hemlock

HWA on the East Coast

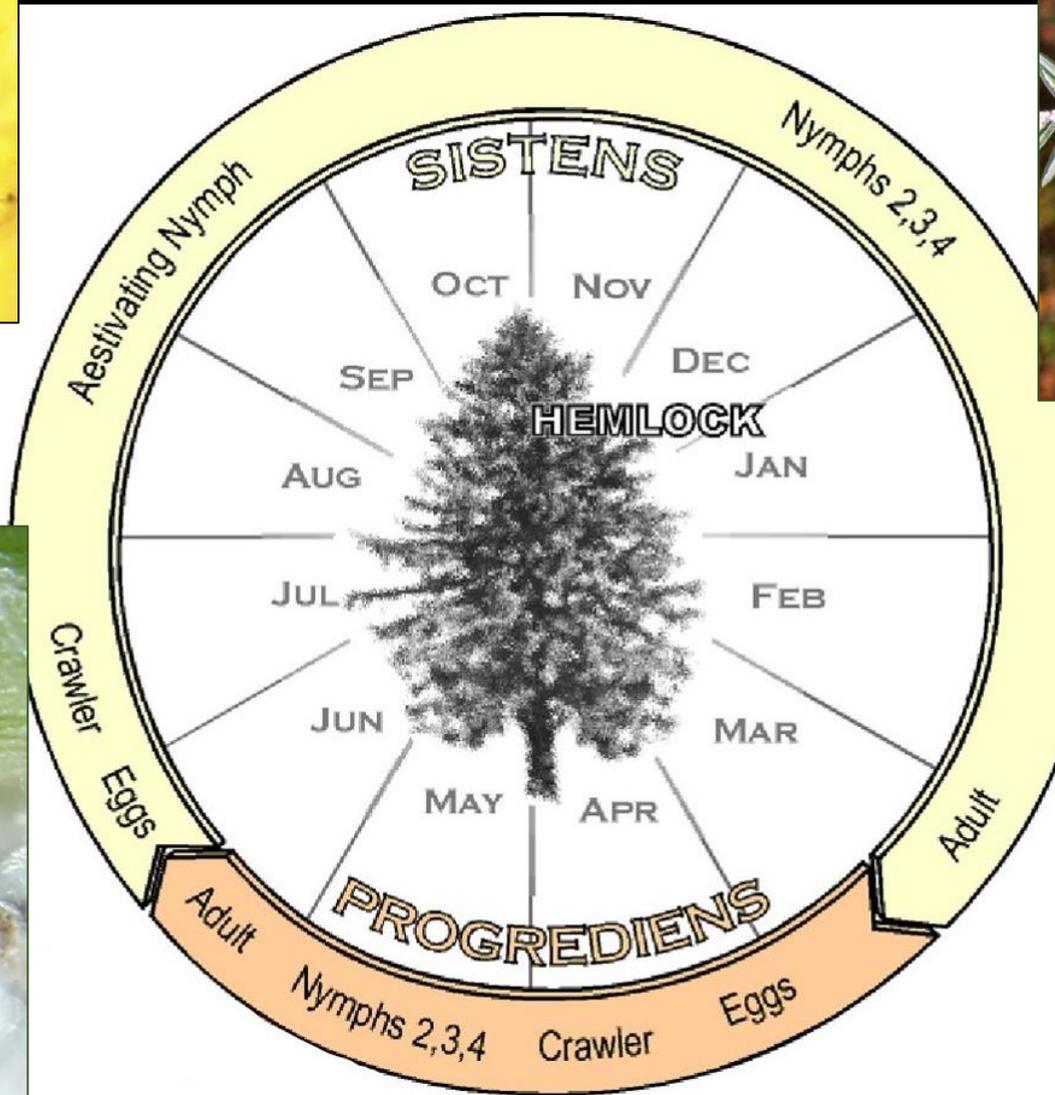


Confirmed Hemlock Woolly Adelgid In New York State By Town

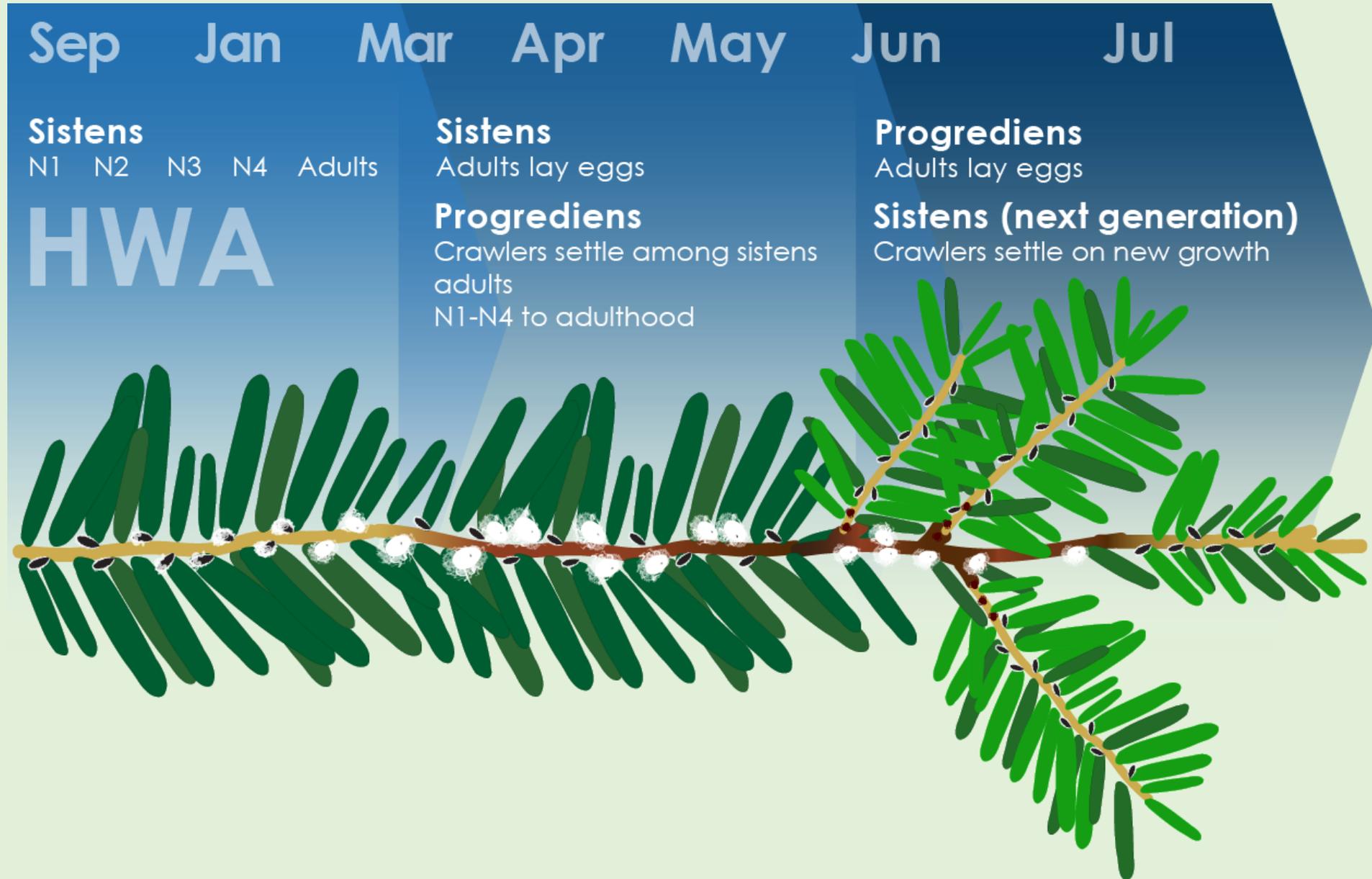


Department of
Environmental
Conservation

Life Cycle of HWA



HWA Mechanism of Infestation



HWA: Here comes trouble!

- 2 generations per year
 - Asexual reproduction
 - No natural predators
 - Milder winters
- =OUTBREAKS!



HWA Identification: Using HWA Phenology

November-April

- HWA growing and developing throughout winter
- Accumulates its woolly body covering for protection, develops ovisacs for laying eggs
- Woolly masses present on twigs at the base of needles



May-October

- HWA in period of dormancy
- Appears as small black nymphs surrounded by white halo
- Finding may require use of magnifying glass or hand lens (7x or 10x magnification)



Tips for HWA Hunting!

- Best detection time: **Late fall-early spring**
- **Look for hemlocks** near gorges, streams, and on steep, north-facing slopes
- Look at underside of twigs and branches

Look for...

- Foliage clues:
 - Weakened or declining crown
 - Greyish cast rather than healthy dark green
- HWA infestations on fallen branches
- Wool on bark, washed down from rain event



HWA Management

- Important to continue to survey for HWA populations and monitor tree health
- Currently treating with pesticides is the best option for saving trees in the short term!
- Biocontrols still a long way from widespread effectiveness, but the colony is growing strong and we are optimistic!
- Releases throughout NY since 2009, more this year!



HWA Management: Pesticide Treatment

- Imidacloprid
 - Slow-acting
 - Long-lasting—Protects trees for up to seven years
- Dinotefuran (Brand names Safari, TransTect)
 - Fast-acting
 - Short lifetime in tree



Treating with Imidacloprid (and Dinotefuran)

For Landowners

- Imidacloprid available as soil drench—Bayer Advance Tree and Shrub
- Applied in mineral soil at base of tree
- Always read label, apply a safe distance from water source

For Certified Pesticide Applicators

- Can apply Imidacloprid and Dinotefuran as tank mix
 - Best option is basal bark application
- Spray in spring or fall when trees are actively transpiring
- Prices based on DBH of trees

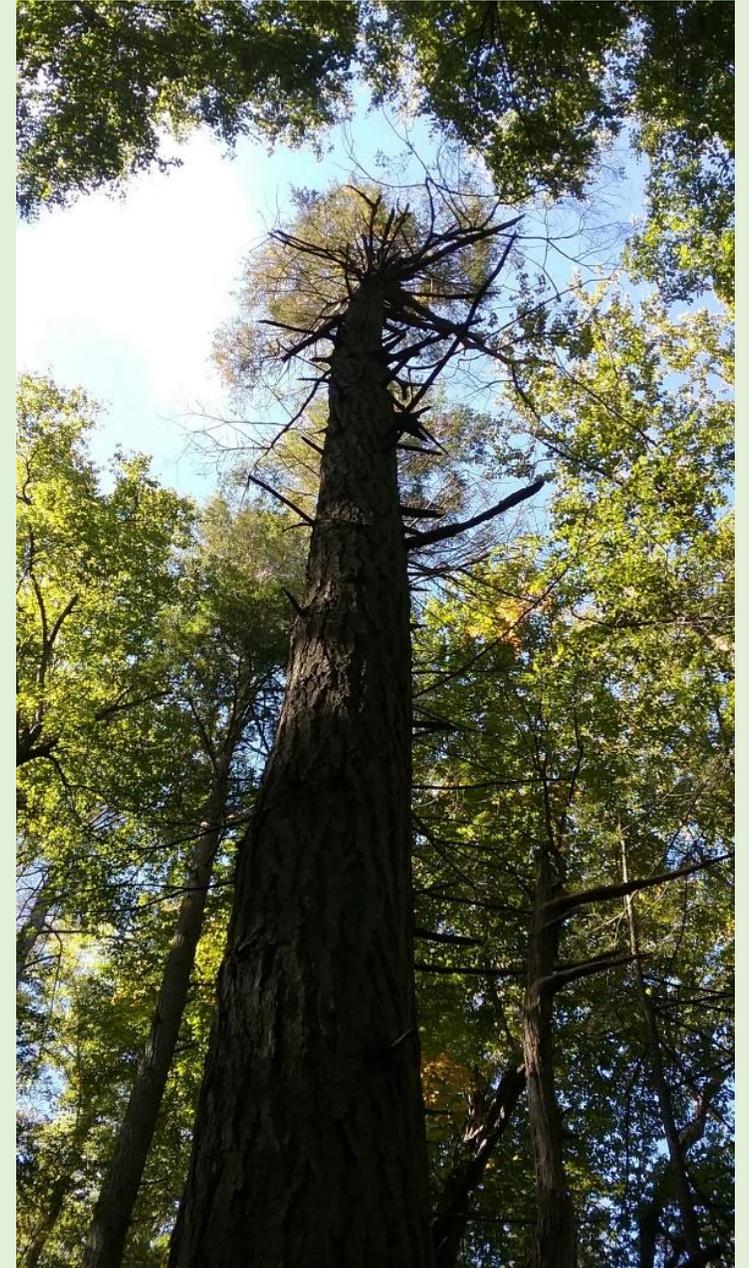
Imidacloprid in the Environment



- There are always risk when applying pesticides in an ecosystem
- Ongoing studies in Great Smoky Mountains NP for studying effects on stream macroinvertebrates, soil and canopy communities
- Findings: Limited effects on non-target organisms while preventing cascading ecological effects from hemlock loss

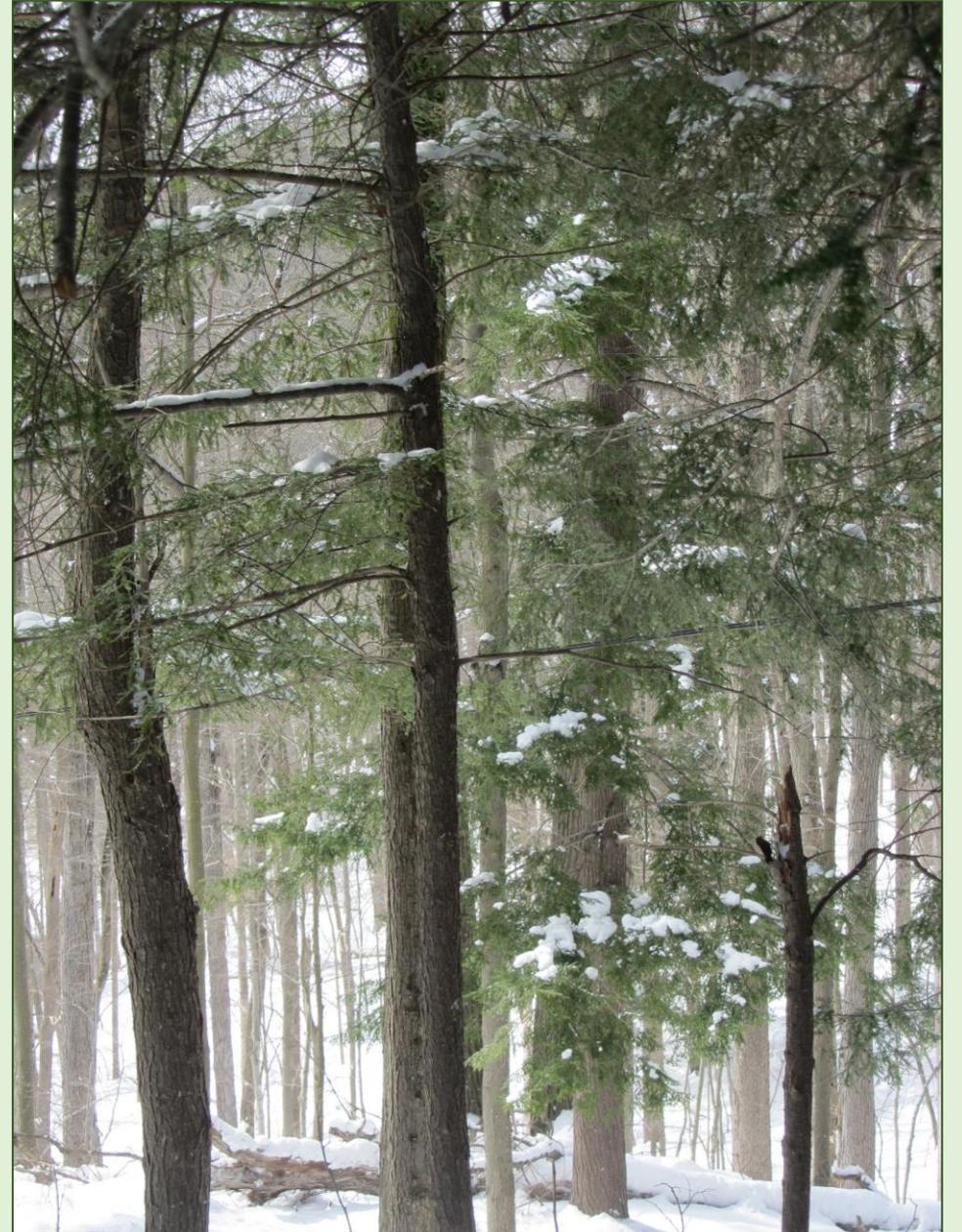
Imidacloprid as an HWA Treatment: Context is Key!

- Originally developed to be less harmful to vertebrates and limit bioaccumulation
- Applied in low dose to kill a small target
- Long-lasting effects reduces need for reapplication



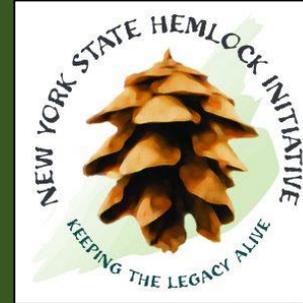
Management Prioritization

- Know where hemlocks are and keep tabs on tree health
- Make a plan for when infestations appear
- Consider:
 - Stand traits, ecosystem services, cultural value

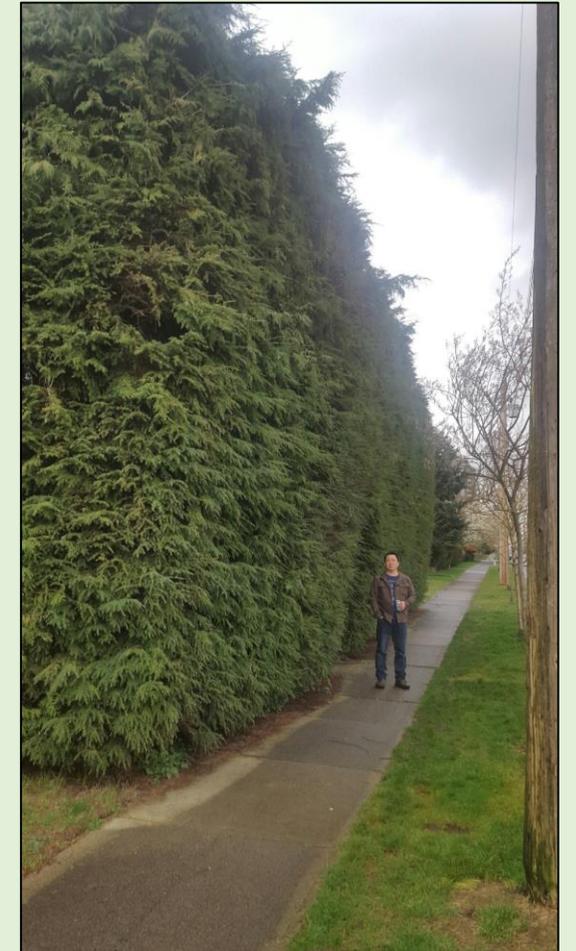


The New York State Hemlock Initiative

- Part of Cornell University's College of Agriculture and Life Sciences (CALC); led by forest entomologist Mark Whitmore
- Biocontrol research facility
- Community science volunteer initiatives help improve our research efforts



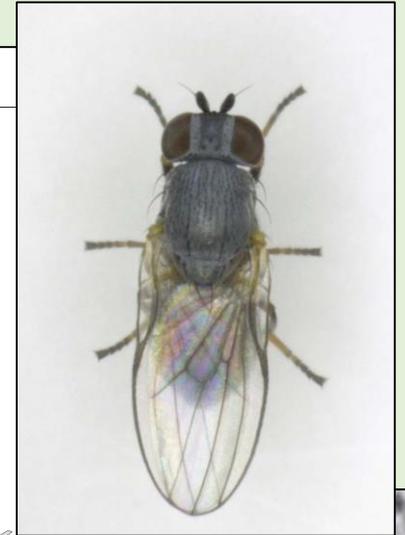
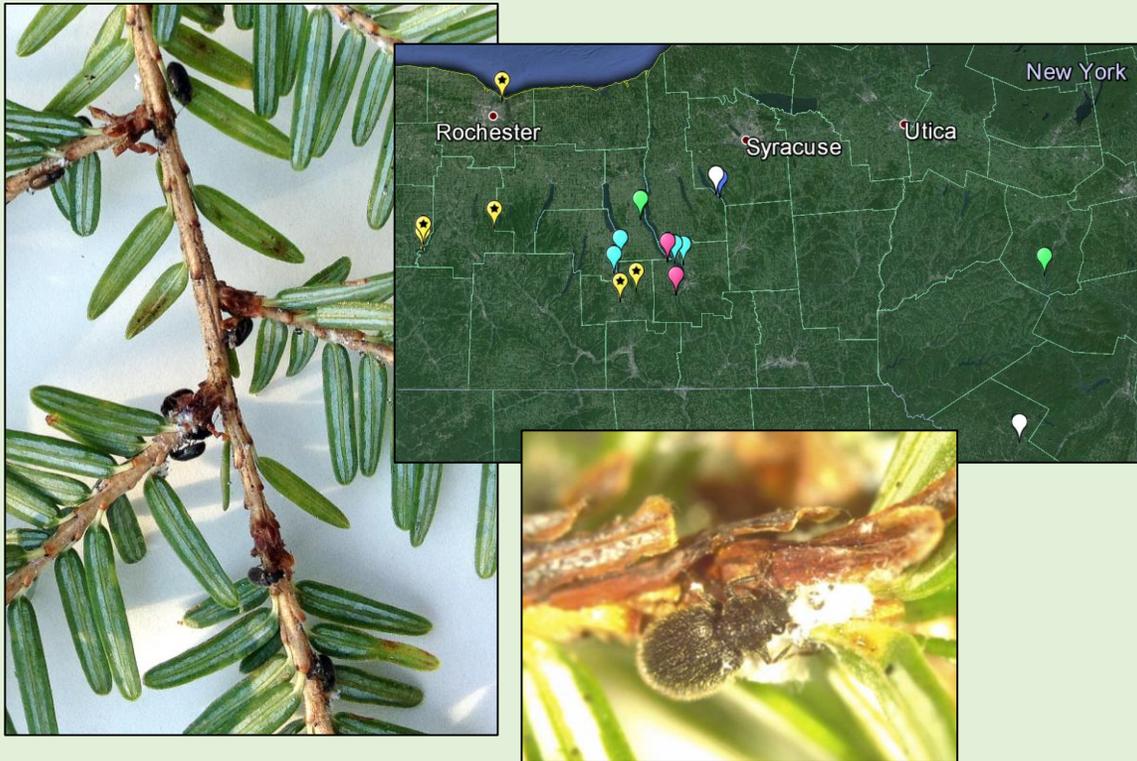
NYS Hemlock Initiative Biocontrol Program



Biological Control of HWA

Laricobius nigrinus & *La. osakensis*

- Beetles from Pacific Northwest/Japan
- Prey-specific
- Life cycle synchronizes with HWA
- Releases in NY since 2009—21 locations

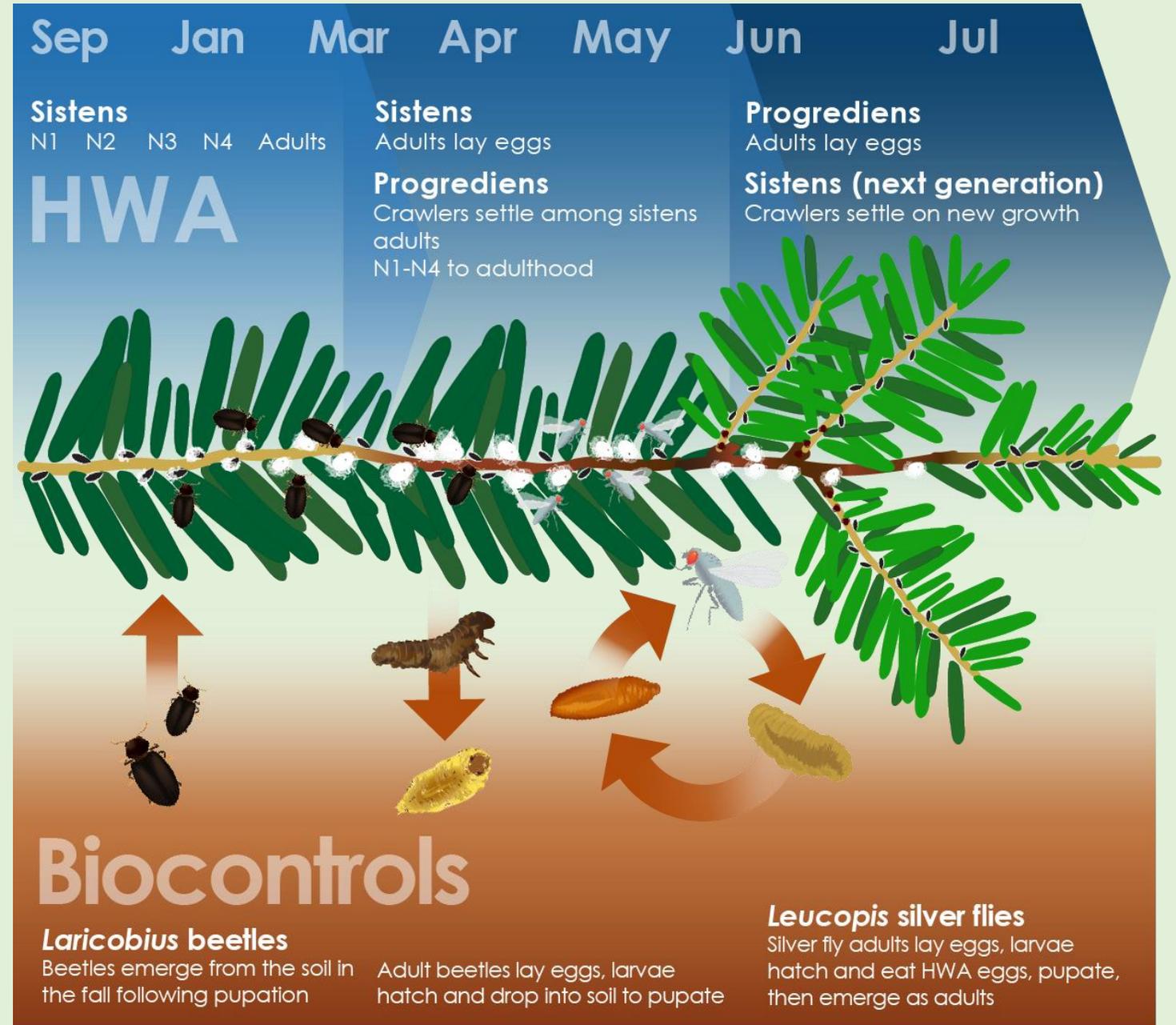


Leucopis spp.

- Two species of silver flies
- Abundant predators of HWA in PNW
- Larvae feed on HWA eggs
- Released in NY since 2015—10 sites in 2017

Timing Is Important!

- Adult beetles eat live developing HWA and are active in the fall
- Silver fly larvae eat HWA eggs and are active in the spring during the HWA sistens and progrediens egg-laying periods



2018 Biocontrol Highlights

- Spring 2018:
 - Successfully reared *Leucopis* silver flies in lab to F2 generation
 - Released 743 silver flies at 6 field sites
- Fall 2018:
 - Released 2,000 *Laricobius* beetles
 - Found beetles at a total of 5 sites since first releases; 3 sites were new this year



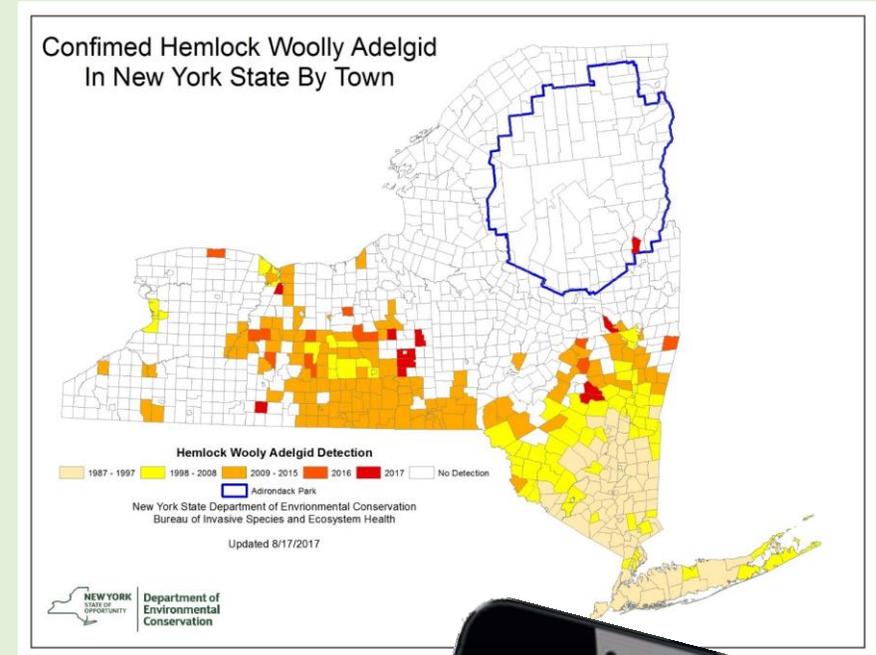


Getting Involved in Hemlock Conservation

- Landowners/Land Managers:
 - Treating trees
 - Hemlock hedges
- Community Scientists
 - Surveying and reporting HWA findings
 - Tracking HWA phenology
 - Assessing tree health
 - Monitoring biocontrol release sites for establishment

Reporting HWA Sightings:

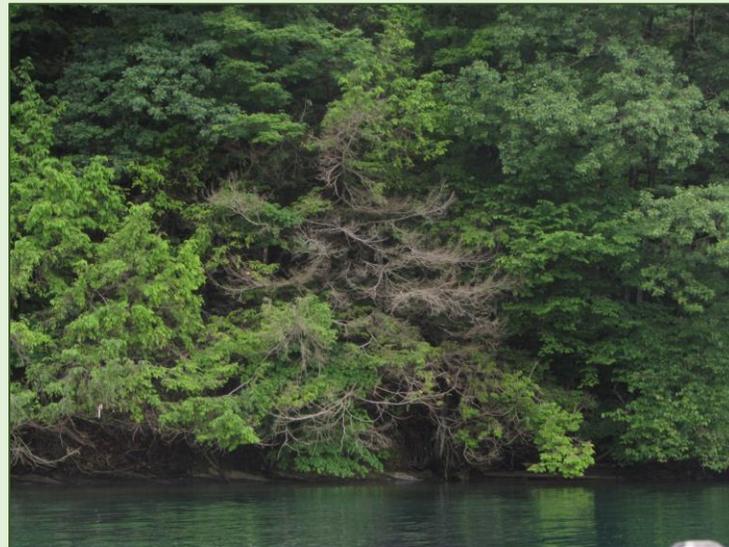
- **NY iMapInvasives**—available as smartphone app and on desktop computer; download at **NYiMapInvasives.com/mobile**
 - Can be used to report HWA infestations (HWA) and hemlocks that are not infested (x-HWA)—**BOTH CONDITIONS IMPORTANT TO KNOW!!!**
- or....
- **Call DEC's forest pest information line at 1-866-640-0652** or....
- **Use the NYSHI HWA reporting feature on our website at www.nyshemlockinitiative.info/report-hwa-finding**



HWA Boat Surveys

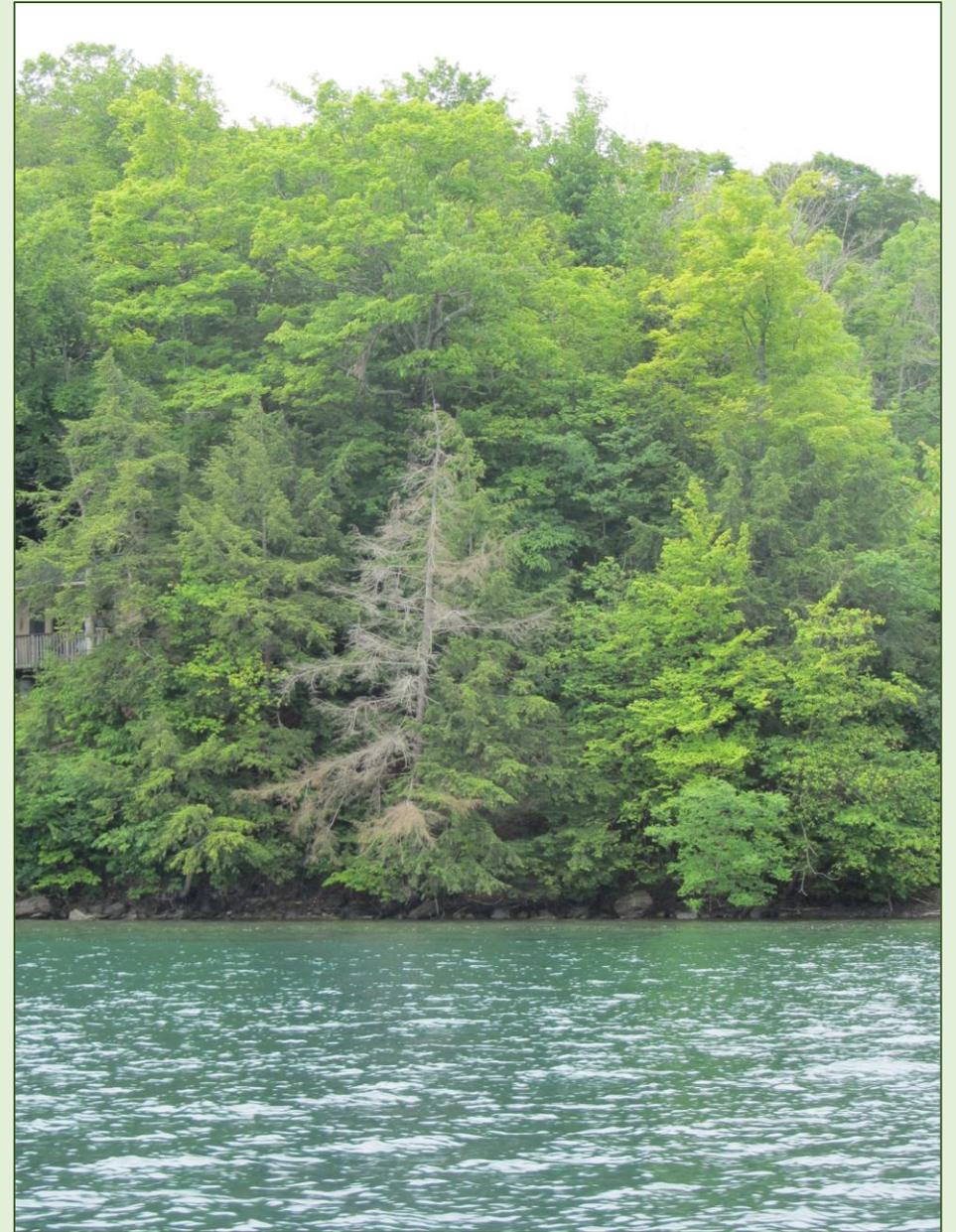
Look for...

- Hemlocks with dull, greyish foliage, pale appearance
- Dead branches



If surveying in late spring-early summer:

- Lack of new, bright green buds





VS



If you see any signs of infestation...

- Get closer to shore to investigate
- Report any infestations!
- Plan to visit the area on foot for further (terrestrial) surveying



Hemlock Hedges!

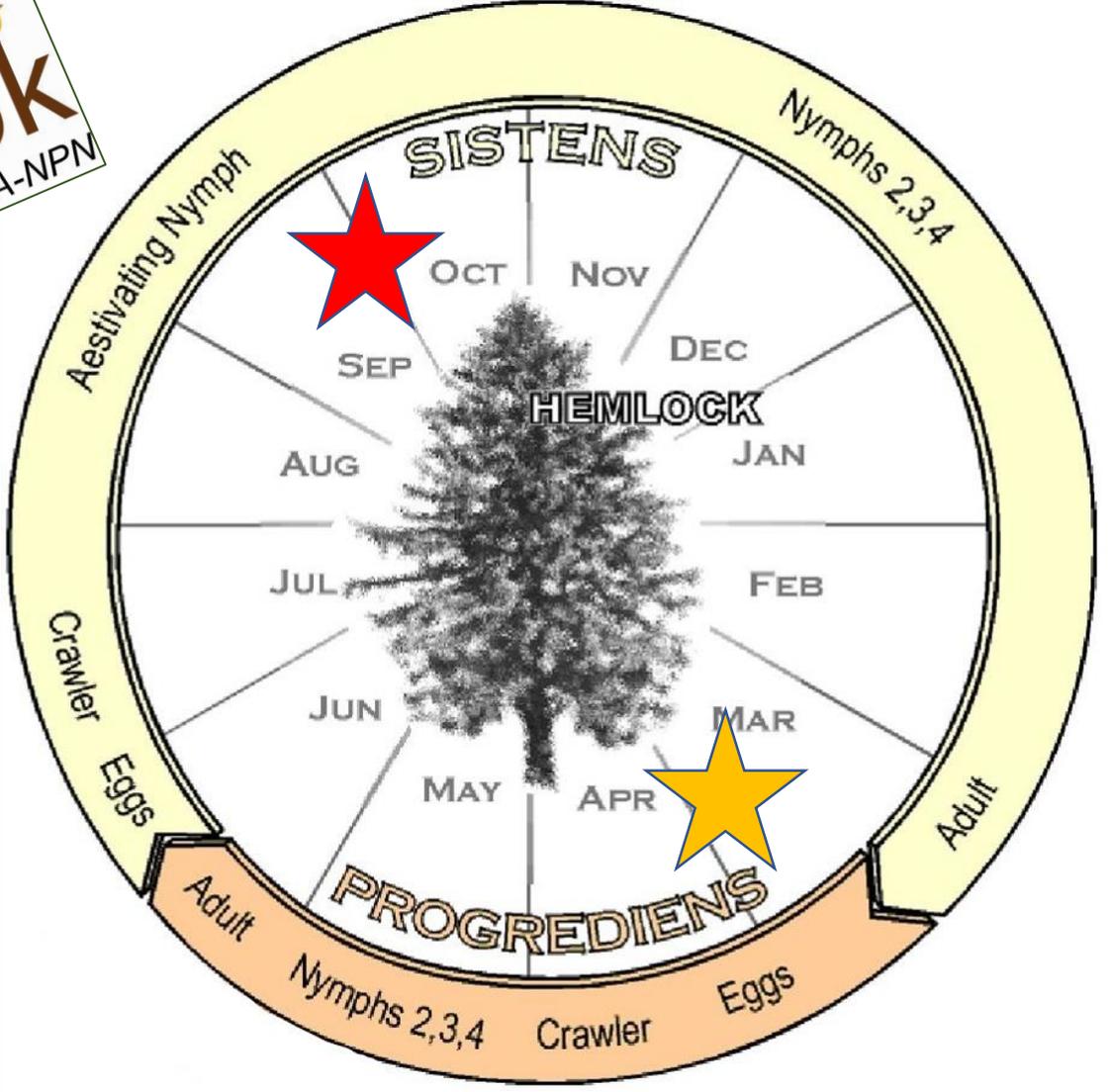
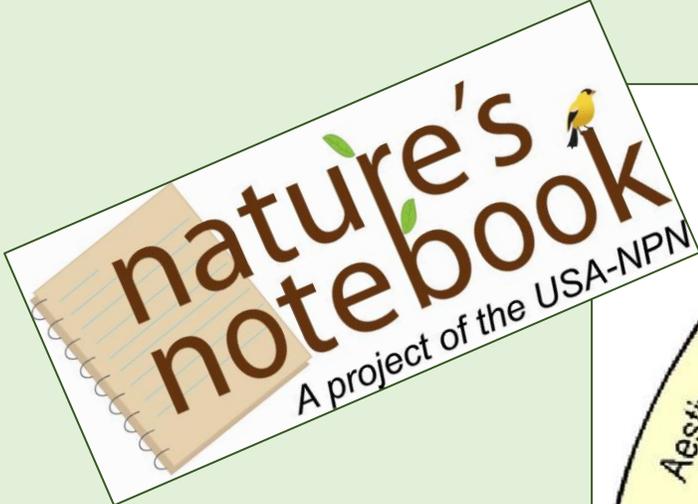
- Hedge insectaries contribute to our biocontrol efforts
 - Easy collection site
 - Locally acclimated predator population

Hedges should be healthy, dense, and HWA-infested with limited disturbance

Email:
nyshemlockinitiative@cornell.edu



Tracking Phenology: Aligning Predator/Prey Life Cycles



A Final Note: HWA, Climate, and Our Role

- We cannot rely on cold winter temperatures for complete HWA mortality
- Treating trees is the best option for saving hemlock genetic diversity in the short term
- HWA is here to stay, so we must adapt and move forward—Biocontrol research continues for long-term management!

For more information...

NYS Hemlock Initiative:

- Website—www.nyshemlockinitiative.info
- Facebook & Instagram—[@NYSHemlockInitiative](https://www.facebook.com/NYSHemlockInitiative)
- Email—nyshemlockinitiative@cornell.edu

More resources:

- NYS DEC—www.dec.ny.gov,
www.facebook.com/NYSDEC
- Adirondack Park Invasive Plant Program (APIPP PRISM)—www.adkinvasives.org



Thank You! ...Questions??