

# Monitoring and Managing Ash (MaMA): How You Can Help Enable Lingering Ash Detection for Resistance Breeding

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*Made possible by Tree  
Species in Peril:*



# Monitoring and Managing Ash (MaMA)

Program of ERI that enables detection of *lingering ash* (LA) through:

- Large-scale data collection by natural resource professionals and community scientists
- Encouraging management that facilitates LA detection



Photos: R. Wildova, ERI

# What are lingering ash (LA) and how are they used for resistance breeding?

- ***Lingering ash*** = chemically untreated trees that were mature ( $\geq 4''$  DBH) during peak EAB invasion and stayed *healthy*  $\geq 2$  yrs. after EAB killed  $\geq 95\%$  of nearby ash
  - Found for all three widespread NE ash spp. (white, green, black)



*Lingering white ash. Photo: R. Wildova, ERI*

- USFS EAB Resistance Breeding Project has shown that **scion** (grafted twigs) from LA can be used in selective breeding to yield highly EAB-resistant trees (green, white).

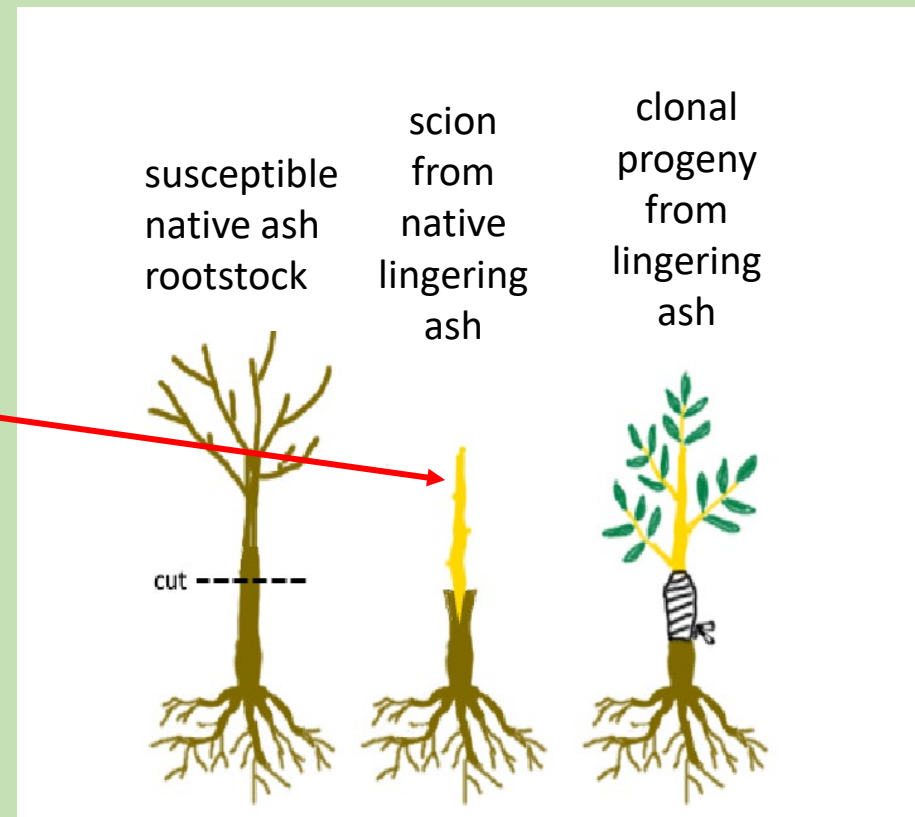
# USFS EAB Resistance Breeding Project

- LA scion from OH, MI grafted onto rootstock → rapid clonal propagation; then repeated crossing (w/in sp.) of progeny that show highest resistance.

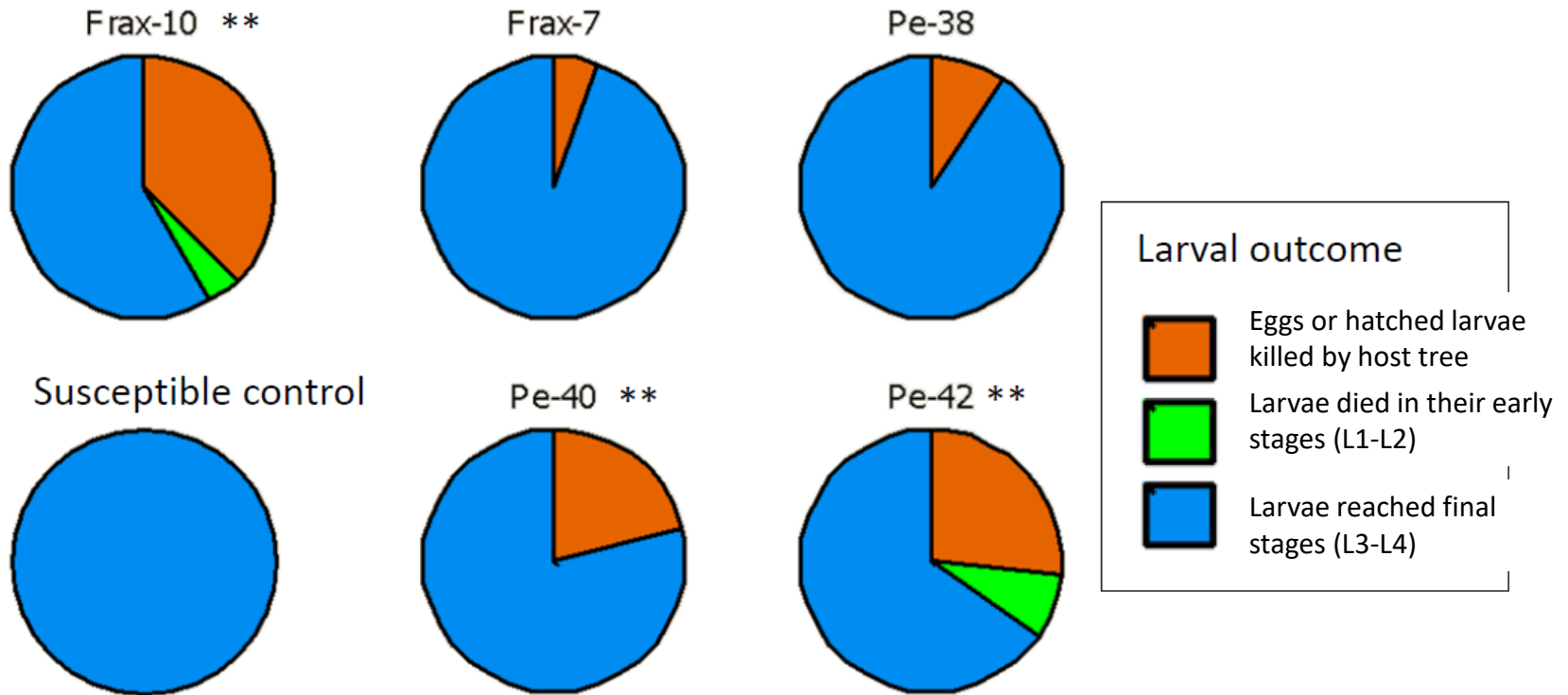
*Mason et al. 2026. Select genotypes of white and green ash show heritable, elevated resistance to emerald ash borer. New Forests.*



Photo: K. Knight, USFS

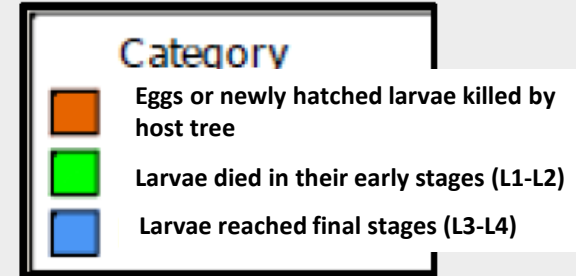
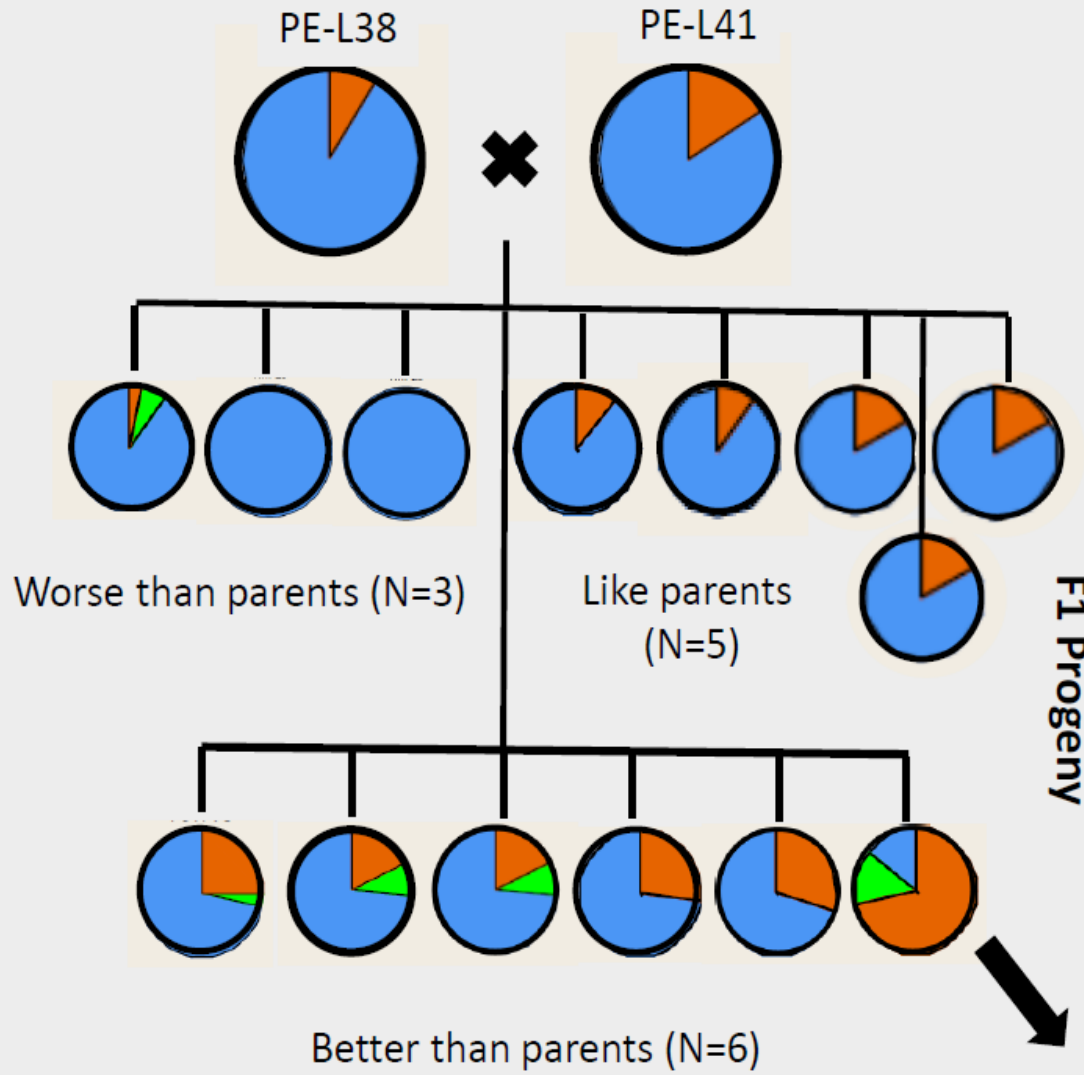


# A Sample of the 2012 Results: Green Ash



- Similar 'lingering ash' canopy phenotypes
- Different larval outcomes (high host-killed, low larval weight)

# Cross Between Two Lingering Ash Parents:



*EAB larva killed by lingering ash; photo by J. Koch.*

Select for 2<sup>nd</sup> Generation Seed Orchard = Restoration Quality Seed!!!

# Resistance likely needed even if biocontrol agents established

- EAB devastated green ash planted in China despite parasitoids native there, presumably because of lack of resistance;
- Promising *long-term* approach in North America can be resistance breeding + biocontrol.



+



# Using scion for resistance breeding has advantages over using seed

- Scion from LA are genetically identical to it.
  - *Seed from LA have only 50% of their genetic material from mother tree*
- Grafting of scion from mature LA rapidly produces mature trees ready for breeding.



Photo by T.  
Hildebrant

# To find lingering ash, need to look at right places at right times

- Looking in area before mortality threshold reached yields spurious LA (not yet attacked enough by EAB)
- Waiting too long means:
  - *Lost opportunities*  
Trees likely to die from EAB (resistance only partial) or other causes
  - *Ingrowth confused with LA*

# MaMA *action maps* help identify where and when to search for LA

- Initially created based on EAB detection history, w/ standard mortality trajectories, spread rates used to model where/when 95% mortality will be reached.
- Refined and updated using MaMA's ongoing data collected on ash health, mortality.
- Show areas that *should be* ready to search for LA.
- Show areas needing more data and which MaMA projects to use to collect needed data.
- Differences in species decline trajectories to be taken into account in interpreting these maps.

# MaMA data collection projects

- **MaMA Ash/EAB Surveys** – quick reporting of EAB evidence. Important where EAB not yet reported.
- **MaMA Monitoring Plots Network** – Monitoring *40 untreated mature trees* annually until dead. Data determines timing of lingering ash search of nearby area, also reveals variation in mortality trajectories. Flexibility in plot shape and size.
- **MaMA Rapid Ash Mortality Assessments (MaMA RAMAs)** – Less precise alternative to monitoring plot, only for sites already w/ some mortality, has no tagging or multi-year commitment. *Use CalTopo to record track.*
- **MaMA Lingering Ash Search** – reporting LA from high-mortality (typically  $\geq 95\%$ ) areas. *Use CalTopo to record track.*

Data reported on

**anecdata** 



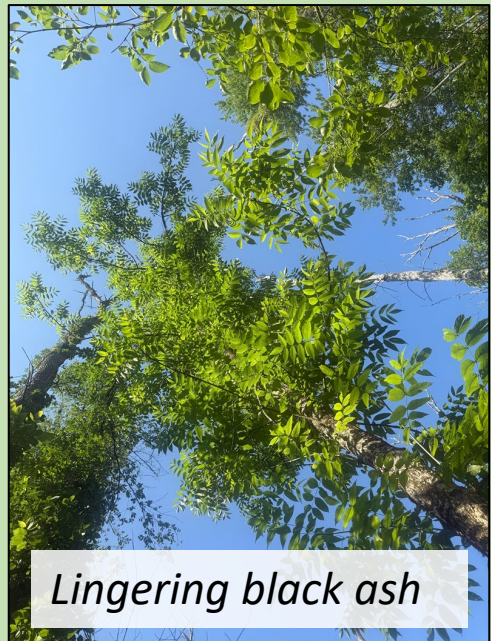
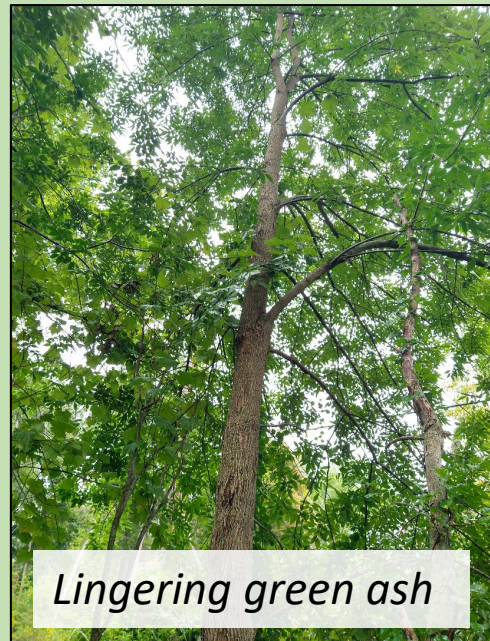
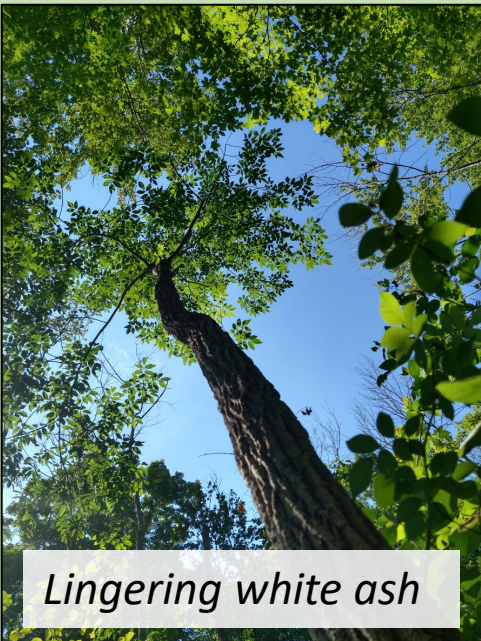
**TreeSnap**

Can also email data  
to ERI.



# Confirmed lingering ash found via MaMA in NY/CT

Ash species	Total validated	Total from which scion collected
White	202	70
Green	41	18
White/green	16	0
Black	23	18
<b>Total</b>	<b>266</b>	<b>106</b>



Photos: R. Wildova, ERI

# Collecting scion



Photos: R. Wildova &  
J. Rosenthal, ERI

# Scion grafted!

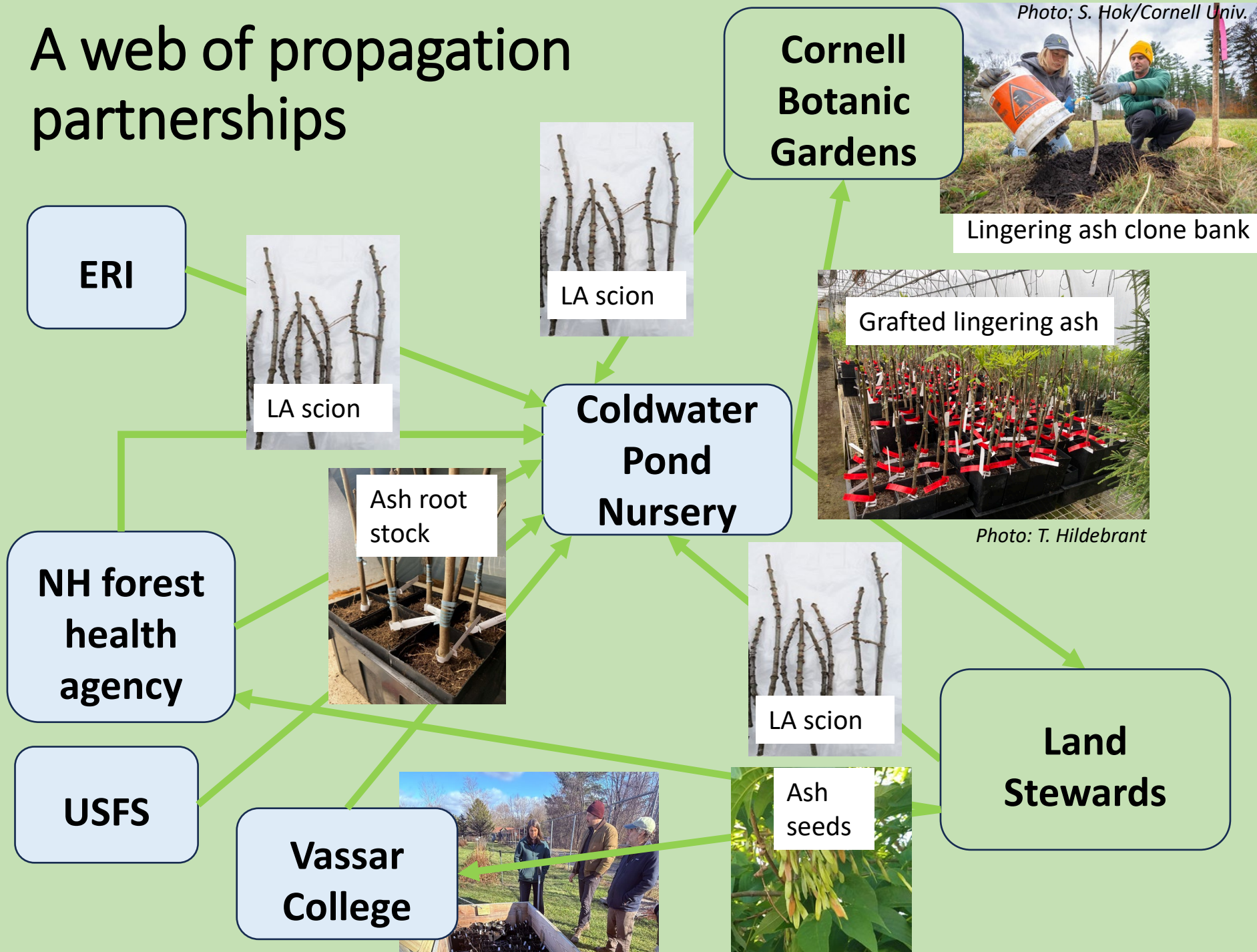
*Grafted trees; photo: Todd Bittner, Cornell Botanic Gardens*



*Scion grafted at the Coldwater Pond Nursery by Ted Hildebrant*

*Planting out lingering ash clonal bank; photo: S. Hok/Cornell Univ.*

# A web of propagation partnerships





# Our partners in CT

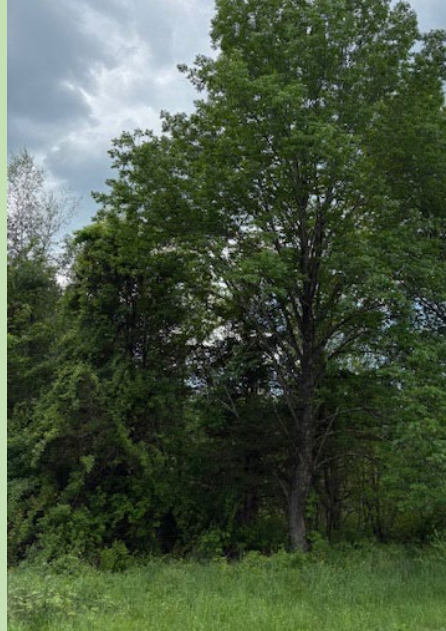
- Connecticut Land Conservation Council
- CT Department of Environmental Science and Forestry
- Manes Consulting LLC
- Great Mountain Forest
- Aton Forest
- The Kent Land Trust
- Southbury Land Trust
- Shelton Land Conservation Trust
- Four Springs Landscape and Garden



Photos: R. Wildova



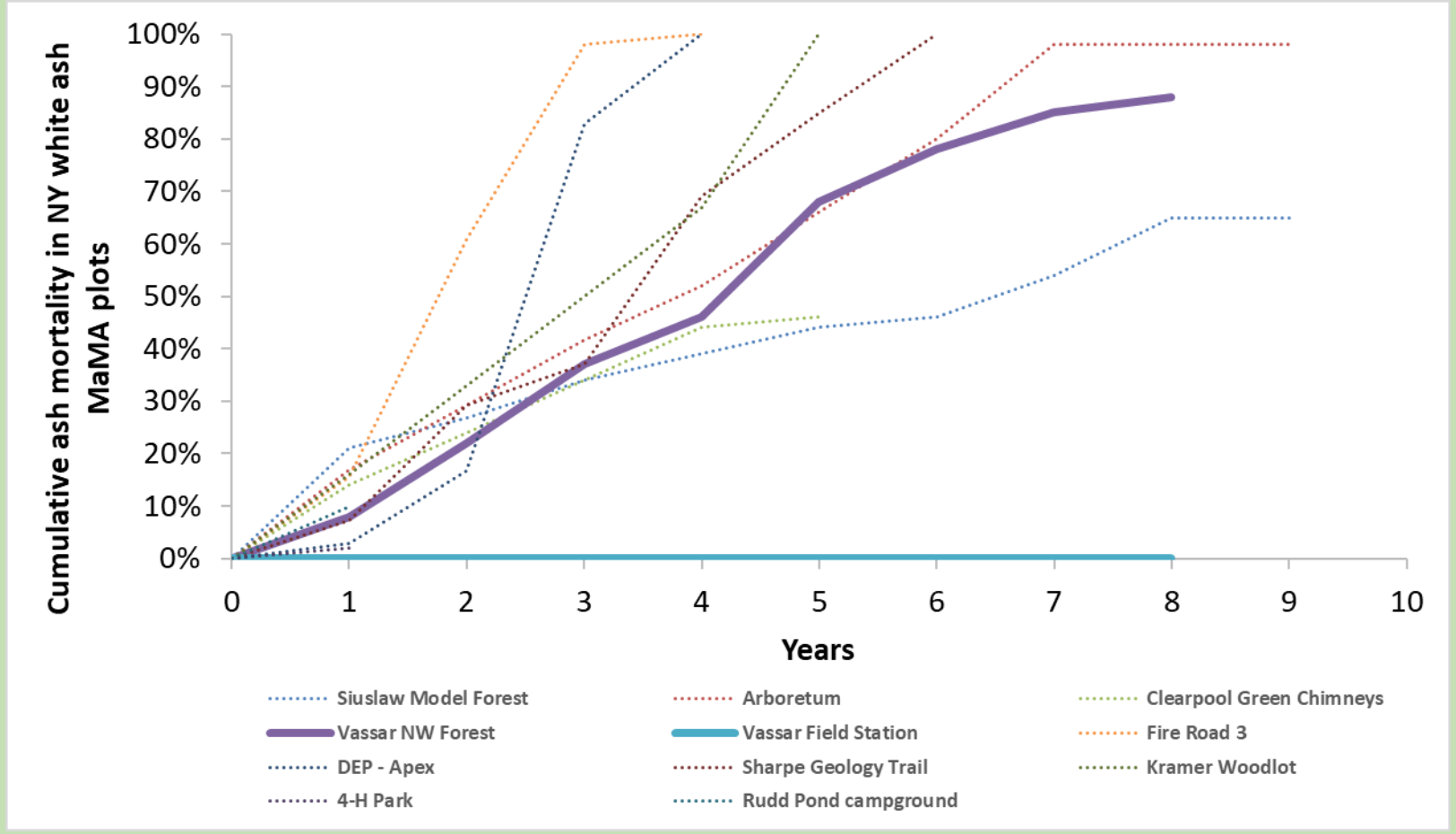
Photos: R. Wildova



Photos: Kate Goewey & Anne Colby

# Monitoring plots can inform management

- Plots often reveal mortality overestimated and/or wrongly attributed to EAB
- Plots reveal variation in mortality trajectories, which can affect management timelines



# How you can enable LA detection: Data collection

- Establishing MaMA monitoring plot (requires 40 mature trees, w/ commitment not to cut or treat)
- Doing RAMAs for high mortality areas (also requires 40 trees).
- Searching for LA if mortality sufficiently high
- Doing Ash/EAB Surveys in areas more recently invaded.



Photo: R. Wildova, ERI

# Another way to help LA detection: reporting stands of black or green ash

- Black ash rather rare in CT; green ash also not as common as white ash
- Even if you don't have health data, let us know of locations of stands of these species, so we can arrange for appropriate data collection.



# How you can enable LA detection: incorporating into cutting/treatment plans

- Leaving enough standing healthy ash uncut and untreated for possibility of some turning out to be LA.
  - *Trees not in monitoring plot can be cut as soon as they begin to decline.*
- When most ash are dead or in severe decline, protecting from cutting any remaining healthy mature trees
  - *These are potential LA, and some could turn out to be actual LA.*


# What to do if you find lingering ash

- Once LA found, report them (on Anecdata MaMA Lingering Ash Search project or TreeSnap)
- Protect from cutting at least until after scion collected.
- Once reported/verified, can chemically treat to prolong health.
- Can also target LA for seed or pollen collection.



*Photo: R. Wildova, ERI*

# Tasks for each stage of EAB infestation

Pre-infestation EAB not yet present	Early infestation Some EAB signs; mix of healthy and declining trees	Mid-infestation Widespread EAB signs; some ash mortality; few healthy trees	Late infestation Ash largely dead, with remainder very unhealthy except for <i>rare lingering ash</i>
Assess ash presence/importance			
Document infestation onset using <b>MaMA EAB/Ash surveys</b>			
Decide which trees to be treated vs. cut vs. left for mortality monitoring/lingering ash detection as part of overall management strategy			
Identify/implement other site-appropriate silvicultural and mitigation (for, e.g., invasive plants, hydrological changes) approaches			
		Identify sites for parasitoid release; conduct releases	
Establish/use <b>MaMA Mortality Monitoring Plots</b> ; detect when thresholds reached			
 <p>©2017 – 2026 Ecological Research Institute</p>		Do <b>Rapid Ash Mortality Assessments (RAMAs)</b> in areas with ash mortality; detect when thresholds reached	
		<p>— Record, report, protect <b>potential lingering ash</b></p>	
		<p>*scion = twigs used for grafting</p>	<p>Find/mark, protect <b>lingering ash</b>, report for possible <b>scion collection</b>, possibly collect their seed</p>
		<p>using <b>MaMA Lingeri ng Ash Search</b></p>	



- 20.5" DBH female lingering black ash found in 2025 at Hudson Valley site that first had EAB signs in 2014

*Photo: R. Wildova, ERI*

*Video: J. Rosenthal, ERI*

# For more info. on MaMA

- Visit MaMA website, [www.MonitoringAsh.org](http://www.MonitoringAsh.org) (now being updated)
- Email the coordinators of the MaMA program:  
Jonathan Rosenthal  
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([RWILDOVA@ecoresearchinstitute.com](mailto:RWILDOVA@ecoresearchinstitute.com))



# Using Anecdata and joining MaMA projects

Using phone to collect data in the field:

## anecdata

- After downloading the app search for MaMA projects
- Join projects that you want to contribute data for
- For all MaMA projects, electronic data forms have same info as paper data sheets.
- Can submit data through Anecdata app or Anecdata.org or via email, etc.

Handouts and paper data forms at

<https://www.monitoringash.org/data-forms-for-mama-projects/>



- Mapping app used for MaMA RAMAs, lingering ash searches
- Instructions available at [www.MonitoringAsh.org](http://www.MonitoringAsh.org)

# Acknowledgements

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