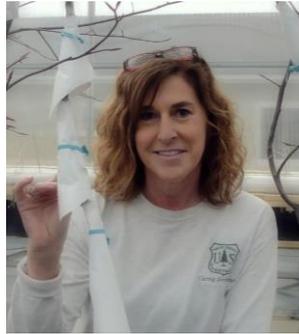


# A Call To Action For Ash Tree Conservation & Resistance Breeding

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Collaborators: Charlie Flower, Alex Royo, Tim Fox, Robert Long, Rachel Kappler, Brian Hoven, Therese Poland, David Carey, Mary Mason, Aletta Doran, Julia Wolf, Jason Kilgore, Bill Oldland, Andrea Hille, Radka Wildova

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[www.monitoringash.org](http://www.monitoringash.org)

# Emerald Ash Borer (EAB)

## EAB Adult Beetle



Photo by David Cappaert

## EAB Larva



Photo by Pennsylvania DCNR



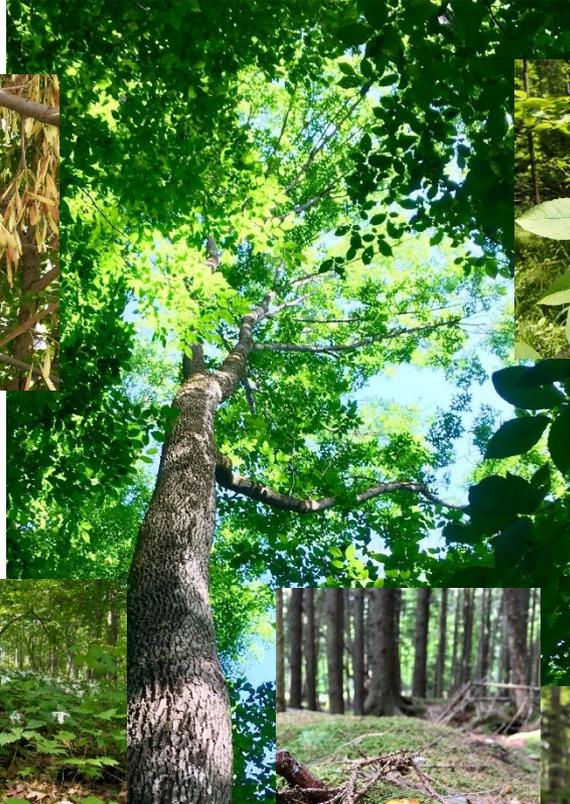
# Where is EAB?



# Foundation Species: Tree species affect forest



Gary Mueller



Vern Wilkins

5447472



Gyorgy Csoka

5410791



Dawltan Nelson



USDA FS Soils



Dawltan Nelson

# Effects of the loss of ash

- Effects in Urban Areas
  - Loss of ecosystem services
  - Economic impacts
- Effects on Forest Ecosystems
  - Dead trees and wood
  - Plant species composition
  - Hydrology
- Effects on Wildlife
  - EAB as a food source
  - Elimination of ash food source
  - Habitat change



So how can we respond to  
invasive pests like EAB?



**Preventative**  
Prevent / Eradicate  
Slow or prevent spread  
Risk assessment

**Cultural**  
Resistance breeding  
Environmental conditions  
Silvicultural practices

**Biocontrol**  
Introduced or native parasitoids or predators

**Chemical**  
Insecticide  
Associational protection

**Economically  
and  
Ecologically  
Acceptable  
Pest Impacts**

**Mitigating Impact**  
Restoration  
Ex-situ and In-situ genetic conservation

**Monitoring**  
Monitoring pest or pathogen  
Monitoring host  
Monitoring impacts

**Preventative**  
Prevent / Eradicate  
Slow or prevent spread  
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Introduced or native parasitoids or predators

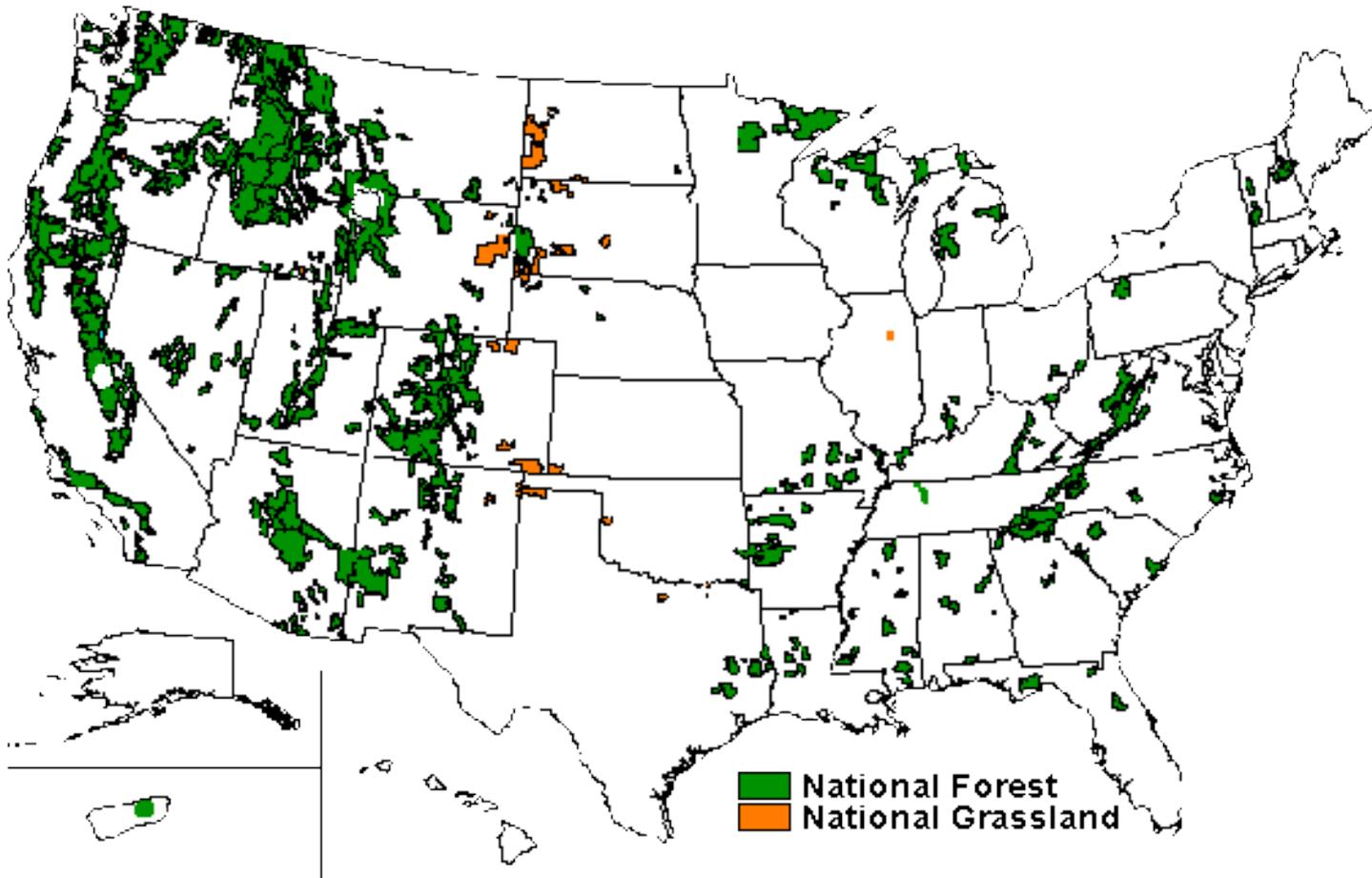
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**Economically  
and  
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Acceptable  
Pest Impacts**

**Mitigating Impact**  
Restoration  
Ex-situ and In-situ genetic conservation

**Monitoring**  
Monitoring pest or pathogen  
Monitoring host  
Monitoring impacts

# Ash monitoring plots in Ohio and Pennsylvania (ANF)

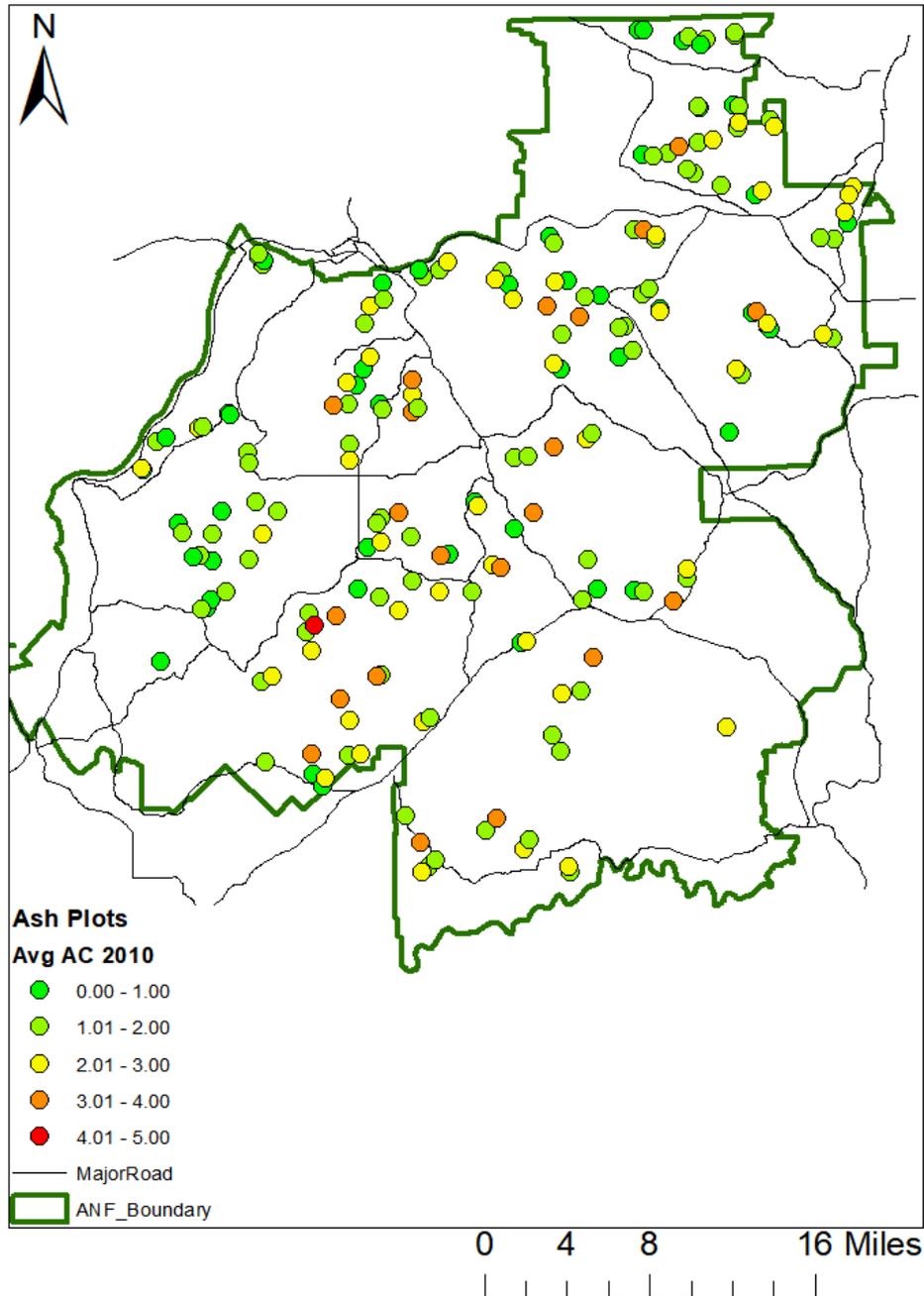


AC 2010

Allegheny  
National  
Forest

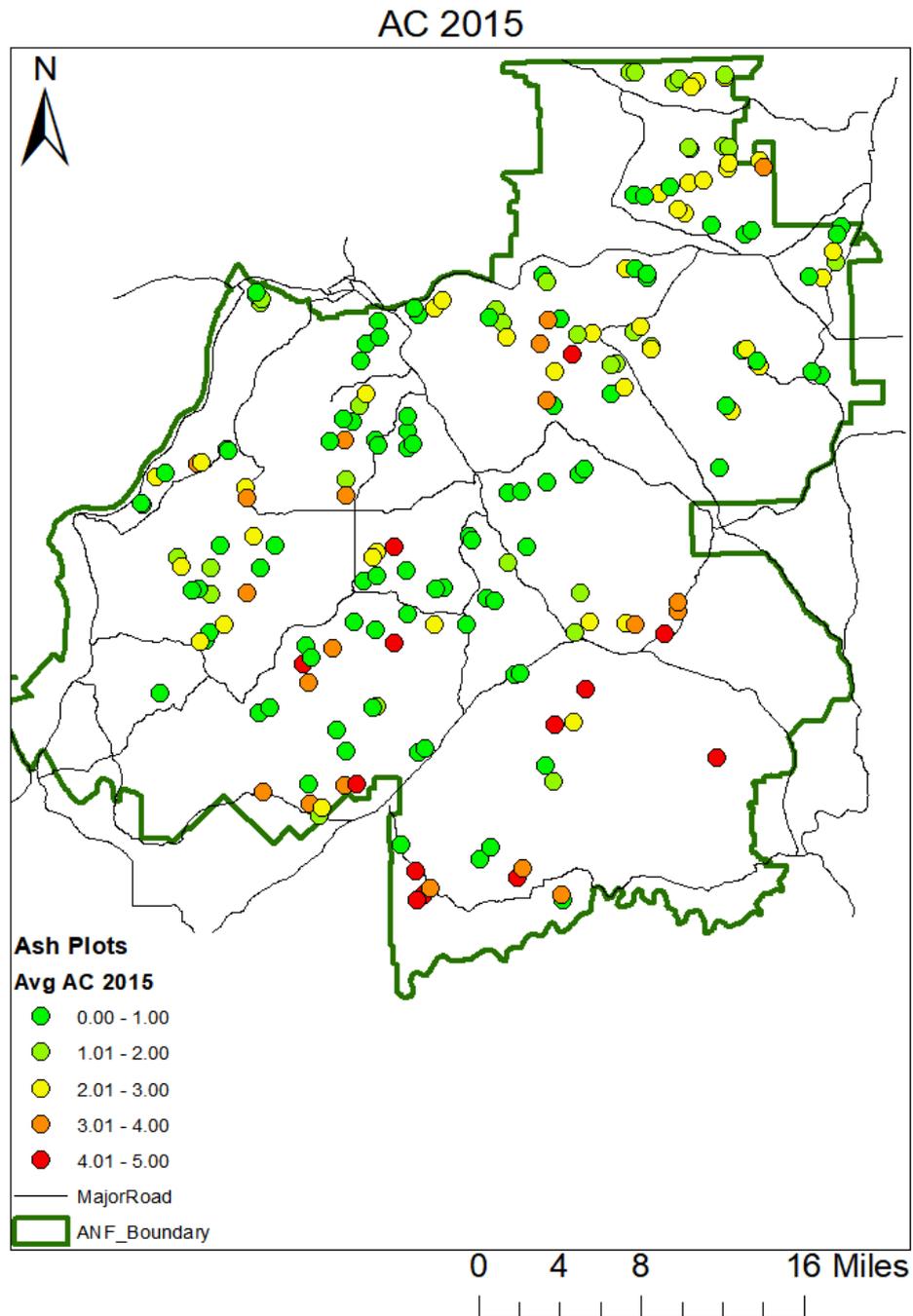
White ash  
monitoring  
plots

Trees >10cm  
DBH



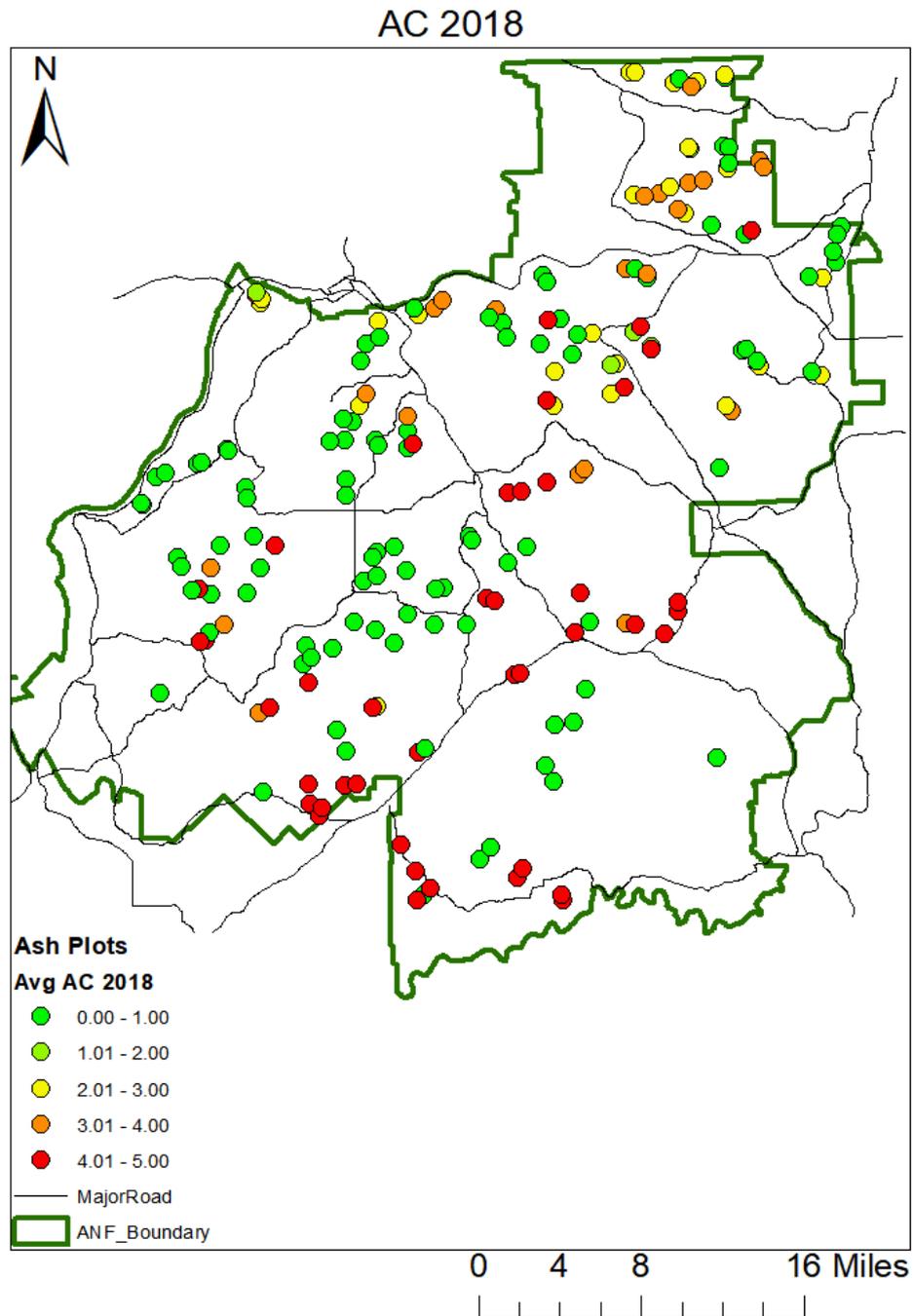
# Allegheny National Forest

## White ash monitoring plots



# Allegheny National Forest

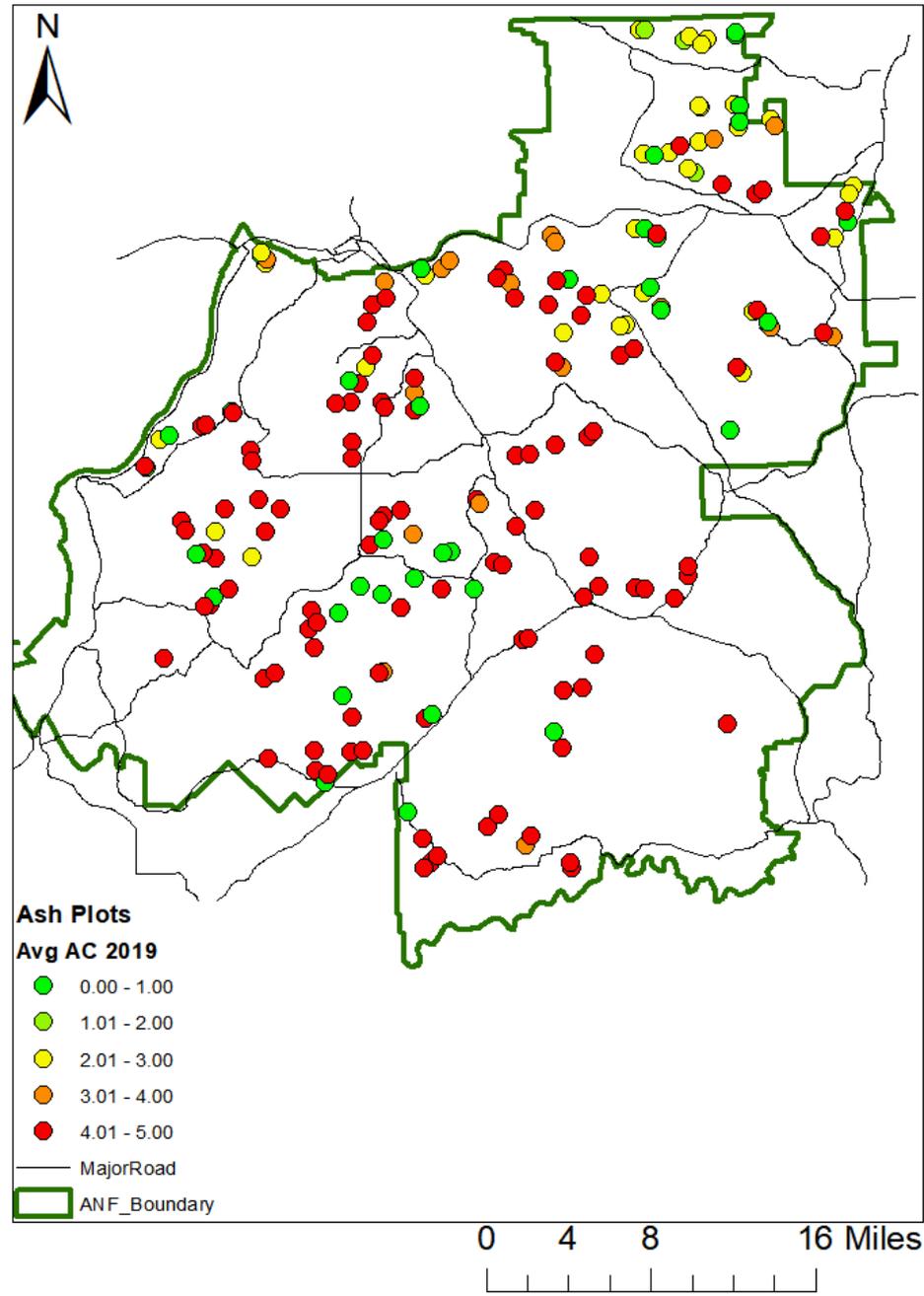
## White ash monitoring plots



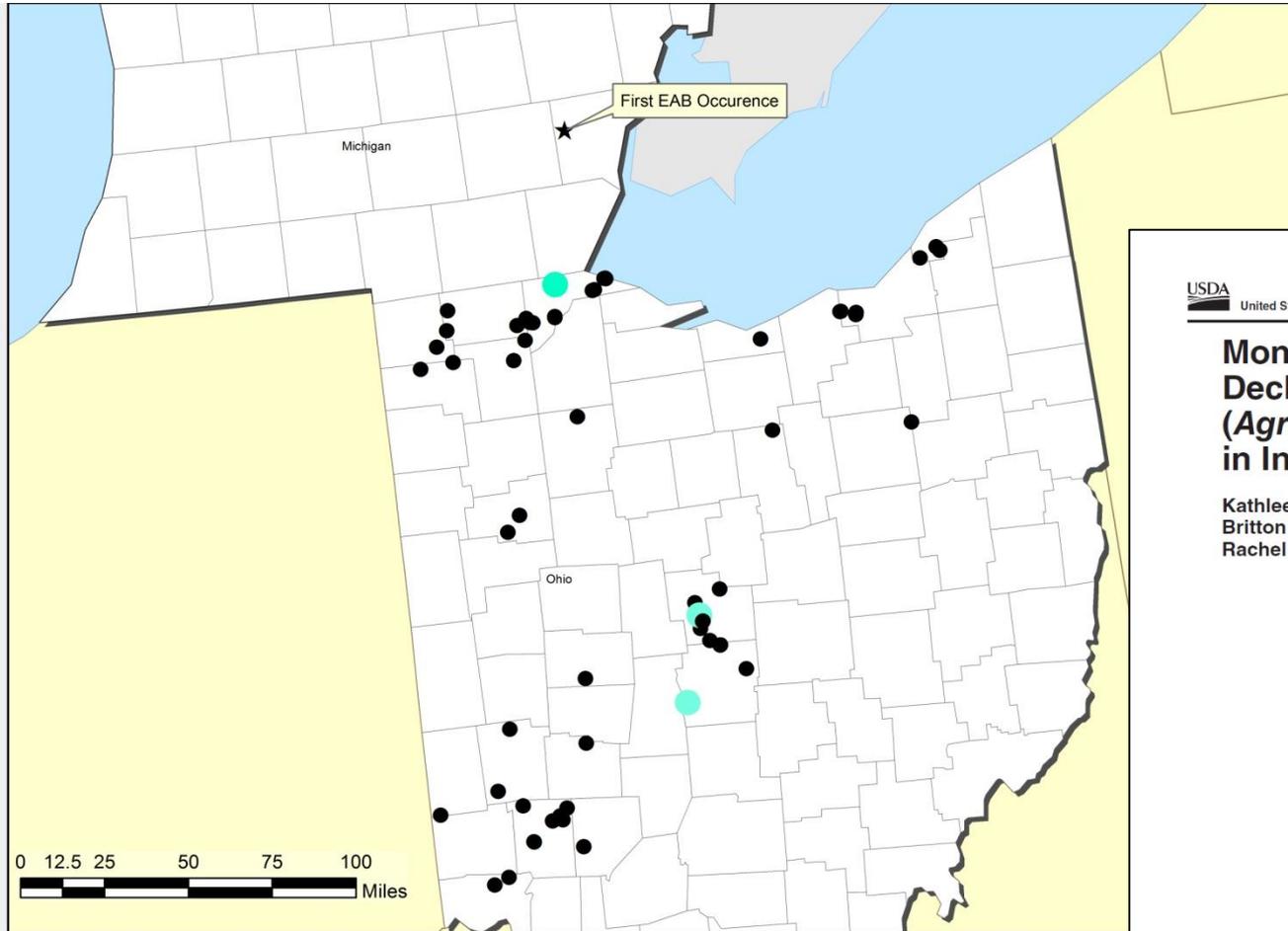
AC 2019

Allegheny  
National  
Forest

White ash  
monitoring  
plots



# EAB Forest Ecosystem Effects Research



>3000 ash trees tracked individually  
>6000 total trees tracked individually  
2005-2019  
5 ash species, range of ash densities and habitats

USDA  
United States Department of Agriculture

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### Monitoring Ash (*Fraxinus* spp.) Decline and Emerald Ash Borer (*Agrilus planipennis*) Symptoms in Infested Areas

Kathleen S. Knight  
Britton P. Flash  
Rachel H. Kappler

Joel A. Throckmorton  
Bernadette Grafton  
Charles E. Flower



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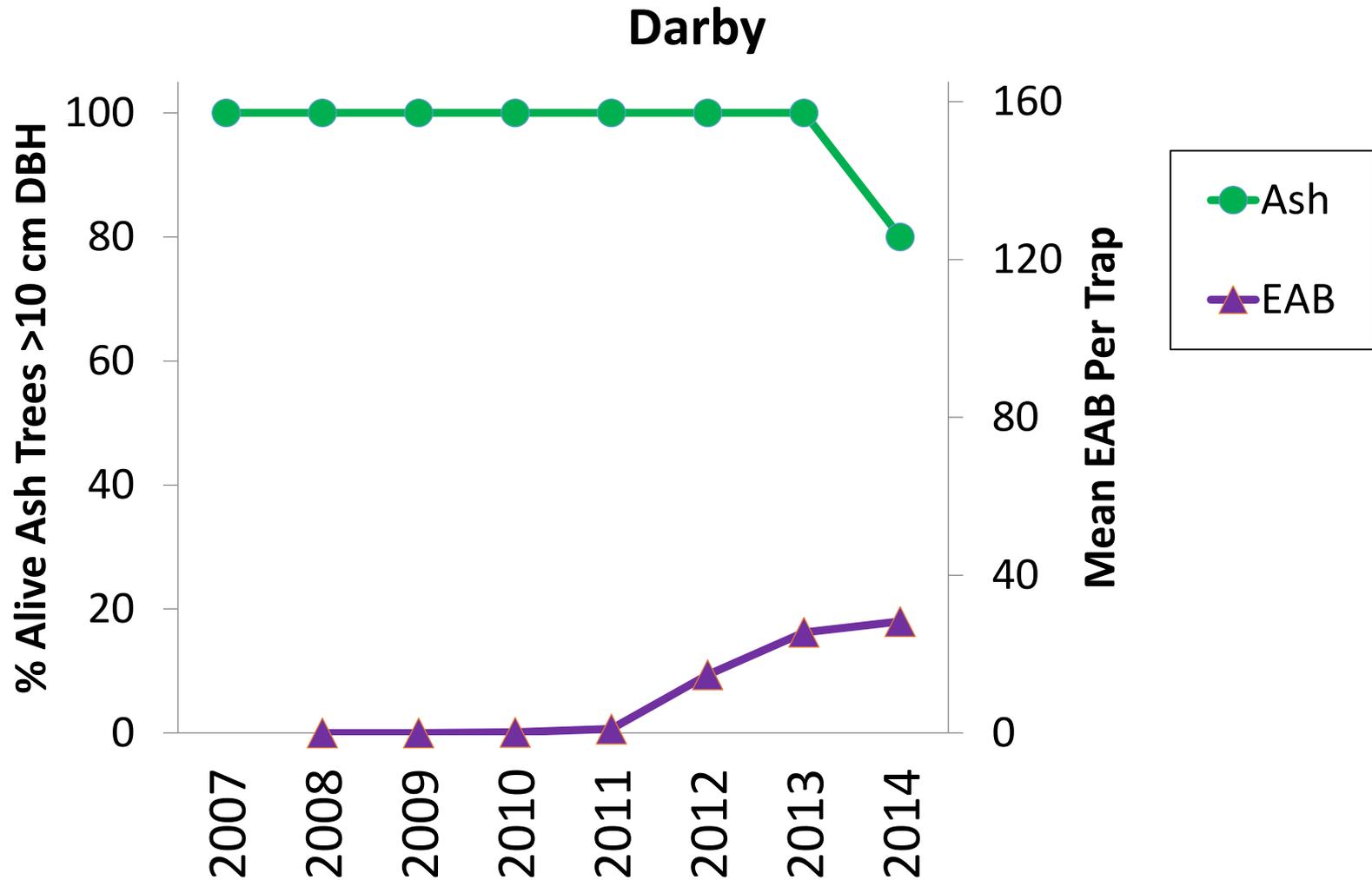
UAS Forest Service Northern Research Station General Technical Report NRS-139 September 2014

# EAB population dynamics



# EAB population dynamics

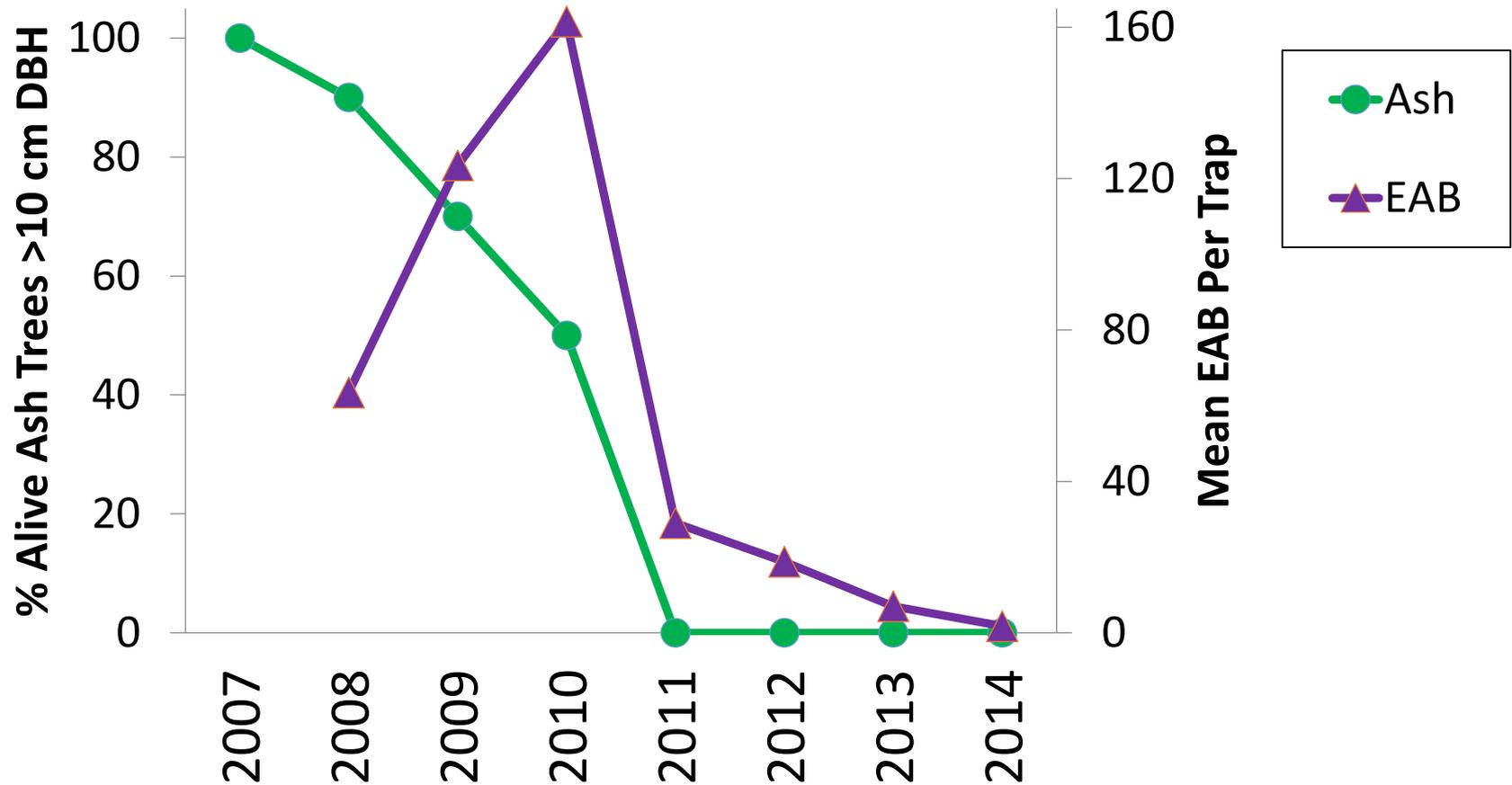
Early infestation: EAB populations gradually build



# EAB population dynamics

As EAB populations peak, ash mortality accelerates

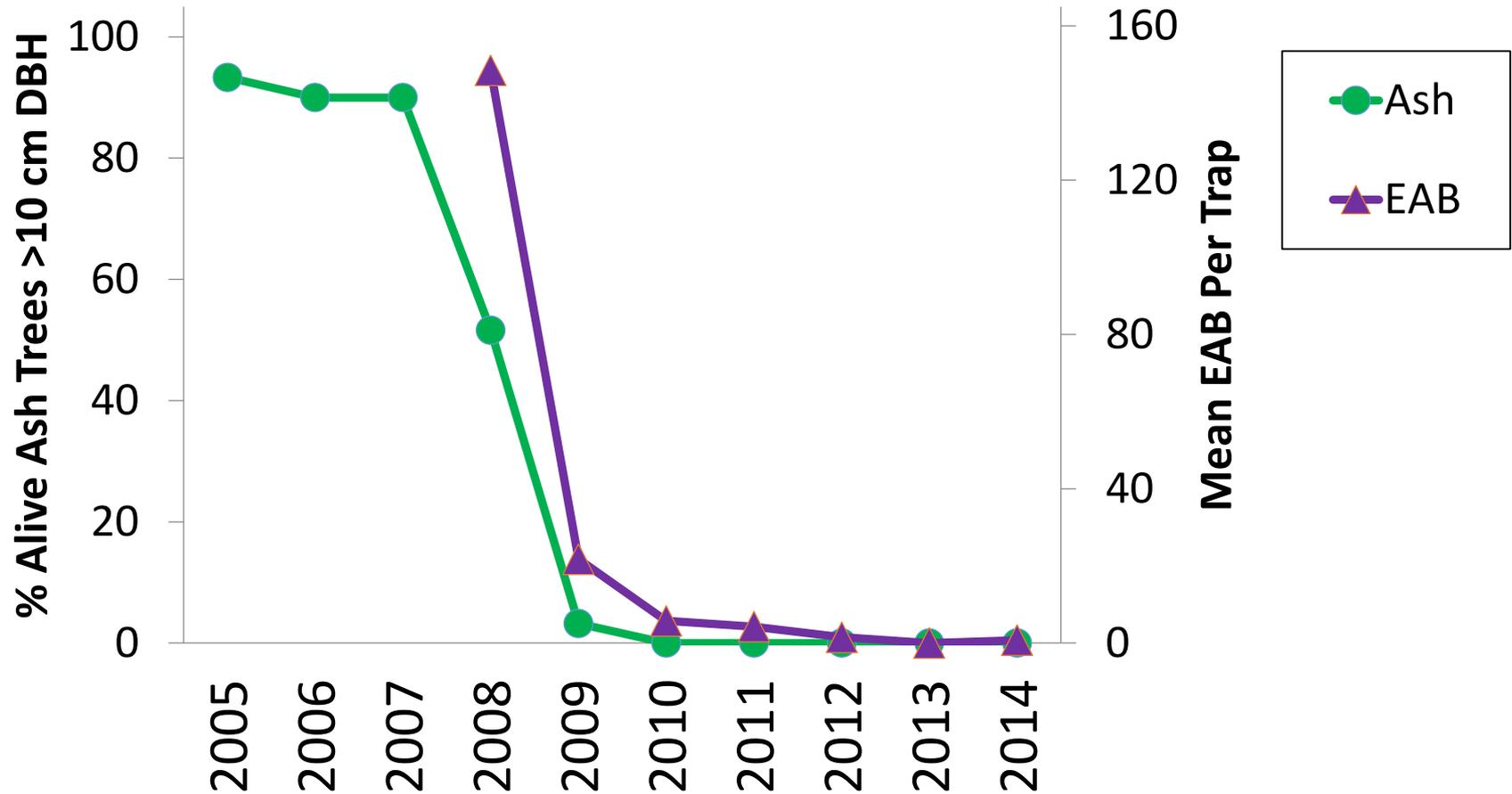
## Stratford



# EAB population dynamics

After most ash is dead, EAB popns drop to near 0 but persist

## Wildwood



So what's left after the large ash trees die?



# Ash regeneration

- Seedlings and saplings too small for EAB remain and grow (in some places)
- Seed bank is short-lived



# Survivor “Lingering” ash trees

<1% of the larger ash trees  
remain alive at a few sites

<1 in 1000 trees on the  
landscape



Live ash trees near dead  
ash trees killed by EAB  
earlier.

Doubtful that EAB just  
“missed” live trees.



# So what's going to happen to these lingering ash trees?

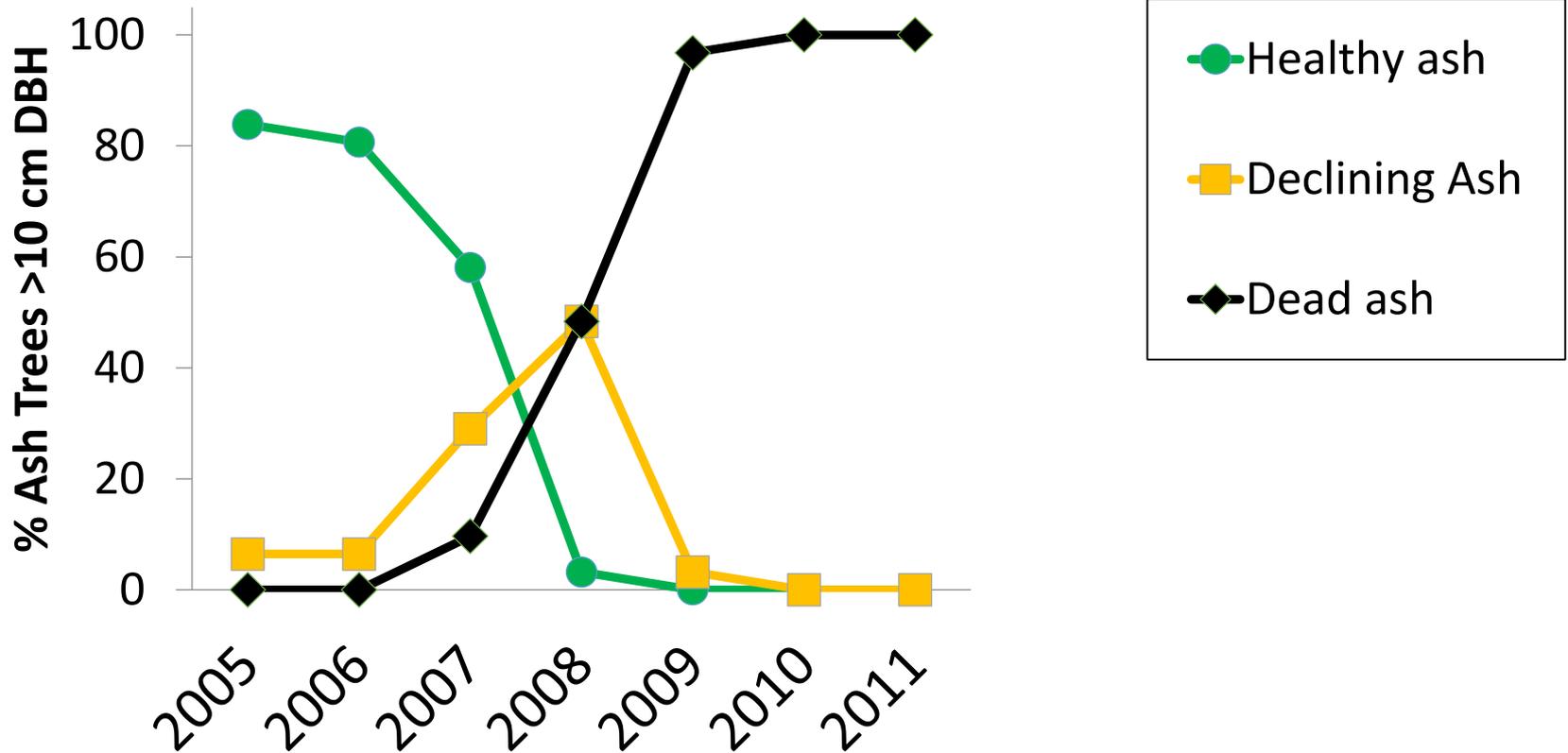
- EAB is persisting at low densities
- Monitoring populations over time – many healthy lingering ash trees stay healthy
- Modeling work – long-term dynamics, management actions
- Collaboration with Jennifer and Therese to test resistance in these trees.



# How do we choose which trees to test?

## Timing is key!

### Wildwood



# Selection Criteria for Lingering Ash

- >95% mortality of mature ash trees has occurred at least 2 years ago (~4 yrs after 50% mortality)
- Tree was large enough to be infested during the peak EAB infestation (> 4" DBH)
- Tree currently has a healthy canopy
- Natural Trees only! (planted cultivars have already been tested)

# Thank you!

Many summer seasonal field crews

Partners:



Funding sources:



United States Department of Agriculture  
National Institute of Food and Agriculture