

# Insecticide Options for Successful Management of Emerald Ash Borer



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**Emerald Ash Borer:**  
*Agrilus planipennis*





# Cooperators:

Joe Docola: **Arborjet**

Nate Royalty, John Smith, Bruce Monke: **Bayer Environmental Science**

Stephanie Darnell: **Bayer Crop Science**

Chuck Silcox: **I.E. DuPont**

Shawn Bernick: **Rainbow Treecare Scientific Advancements**

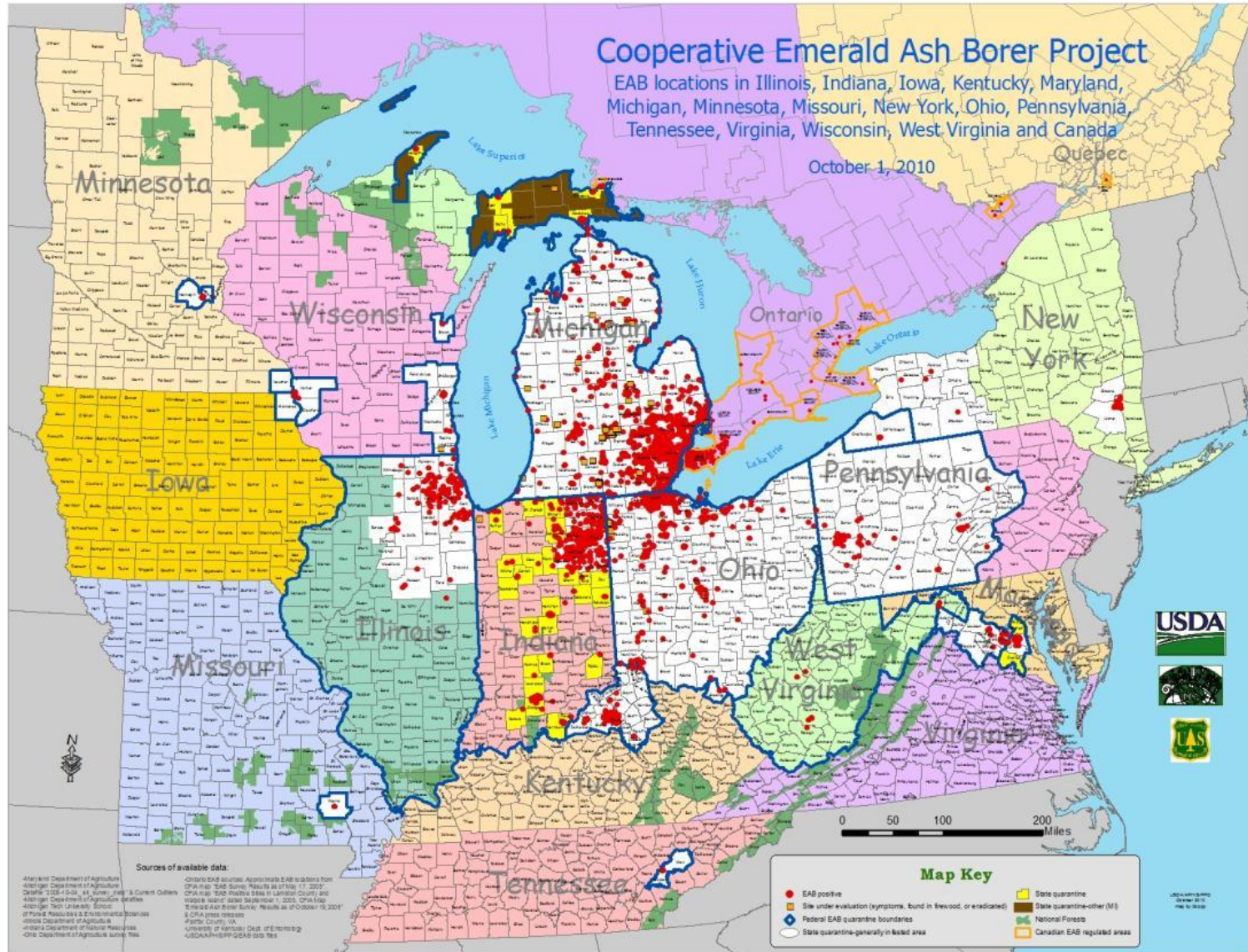
David Cox, Renee Keese, Steve Sanborn: **Syngenta Crop Protection**

Jason Fausy, Joe Chamberlin: **Valent U.S.A.**

# Summary Conclusions:

1. Insecticides effective on large trees even under intense pest pressure.
2. Imidacloprid soil drenches most effective on large trees when applied at the 2X (2.8 g ai / inch DBH) rate. Xytect is labeled for this rate.
3. Other imidacloprid formulations would need to be applied twice (e.g. fall and spring; twice in spring)
4. Most treatments must be applied annually. Spring better than fall.
5. Emamectin Benzoate provides 2-3 years of control.
6. Emamectin benzoate also controls banded ash clearwing borer.

# Known Distribution of EAB



# A Toledo street before and after EAB



June 2006



August 2009

## Host Impact:

Larvae feed under bark; disrupt transport of water, nutrients, carbohydrates.

Healthy trees killed within 2-3 years of first symptoms.





## EAB management options:

1. Do nothing, let nature take its course.
2. Removal, replacement.
3. Persistent insecticide treatments.

# Insecticide options for EAB:

## Systemic Soil Injections / Drenches:

- Imidacloprid (e.g. Merit, Xytect, Bayer Advanced Tree & Shrub Insect Control)
- Dinotefuran

## Systemic Trunk Injections:

- Imidacloprid (IMA-jet, Imicide)
- Emamectin benzoate (TREE-äge)

## Systemic Trunk Sprays

- Dinotefuron (Safari)

Bark and canopy sprays: Astro, Onyx

# Soil Treatments: Drench / Injections



# Trunk Injections



# Systemic Basal Trunk Sprays



## Key questions:

Will systemic treatments work on larger trees?

What are optimal application rates?

Are fall treatments effective?

How long will treatments remain effective?

# Soil Drench Studies



# Multi-year evaluation of systemic insecticides for control of EAB on street trees

- Imidacloprid soil drenches
- Imidacloprid and Emamectin Benzoate trunk injections





# Imidacloprid Soil Drenches

1. Merit 2F, 1.4 g ai / inch DBH, spring
2. Merit 2F, 1.4 g ai / inch DBH, fall
3. Xytect 75WP, 1.4 g ai / inch DBH, fall
4. Xytect 75WP, 2.8 g ai / inch DBH, spring
5. Xytect 75WP, 2.8 g ai / inch DBH, fall

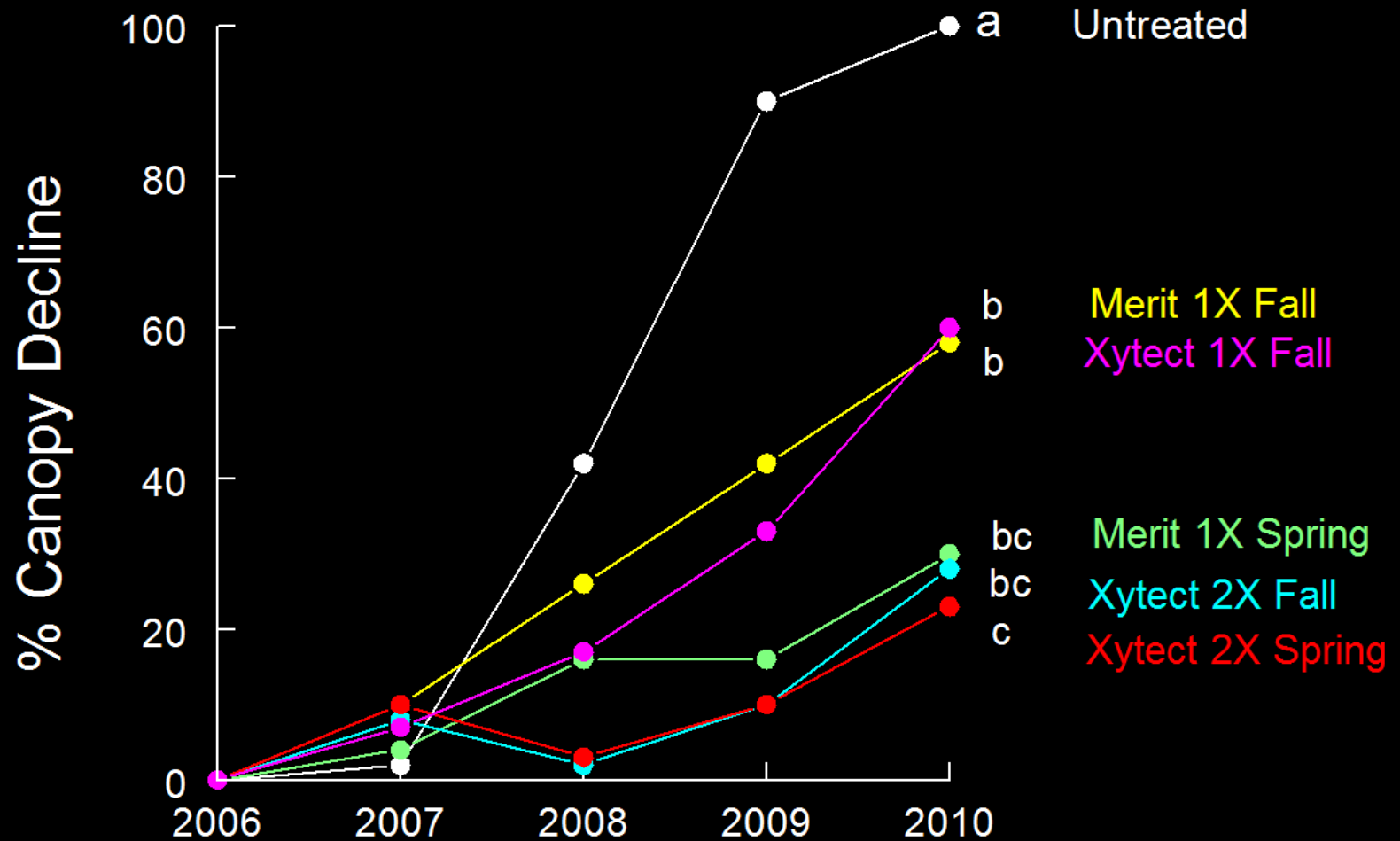


# Treatment evaluation:

- Canopy decline rating using photographic scale  
(Smitley et al. 2008. *J. Econ. Entomol.* 101:1643-1650)



# Imidacloprid Soil Drenches (14-20 inch DBH)





2006



2009

# Four years of imidacloprid soil drenches

(D. Smitley, MSU)

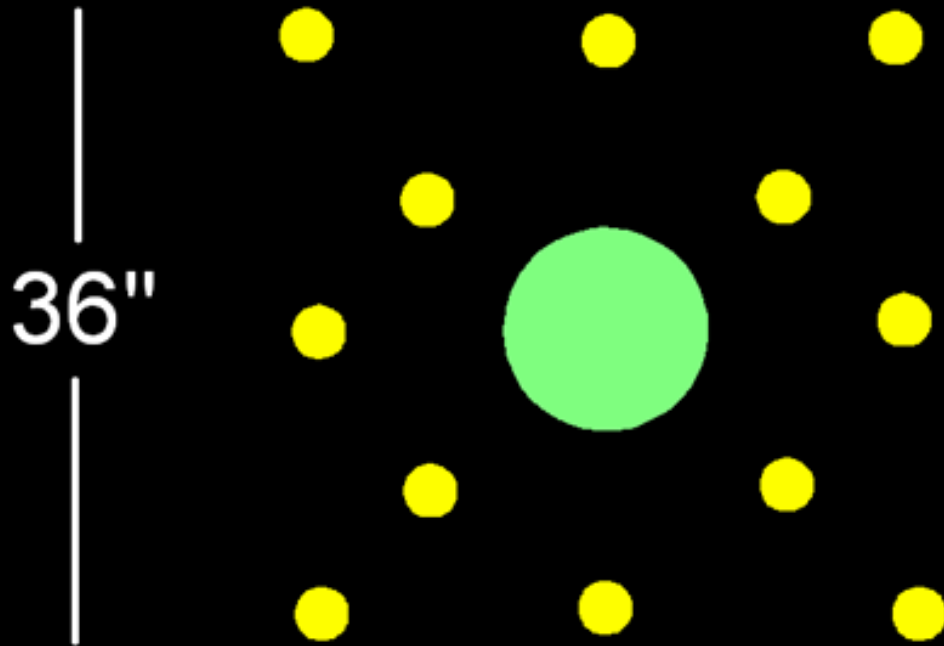




**Placement?** Fine root density is highest adjacent to the trunk.



24" tree: 12 injections, each 1 qt

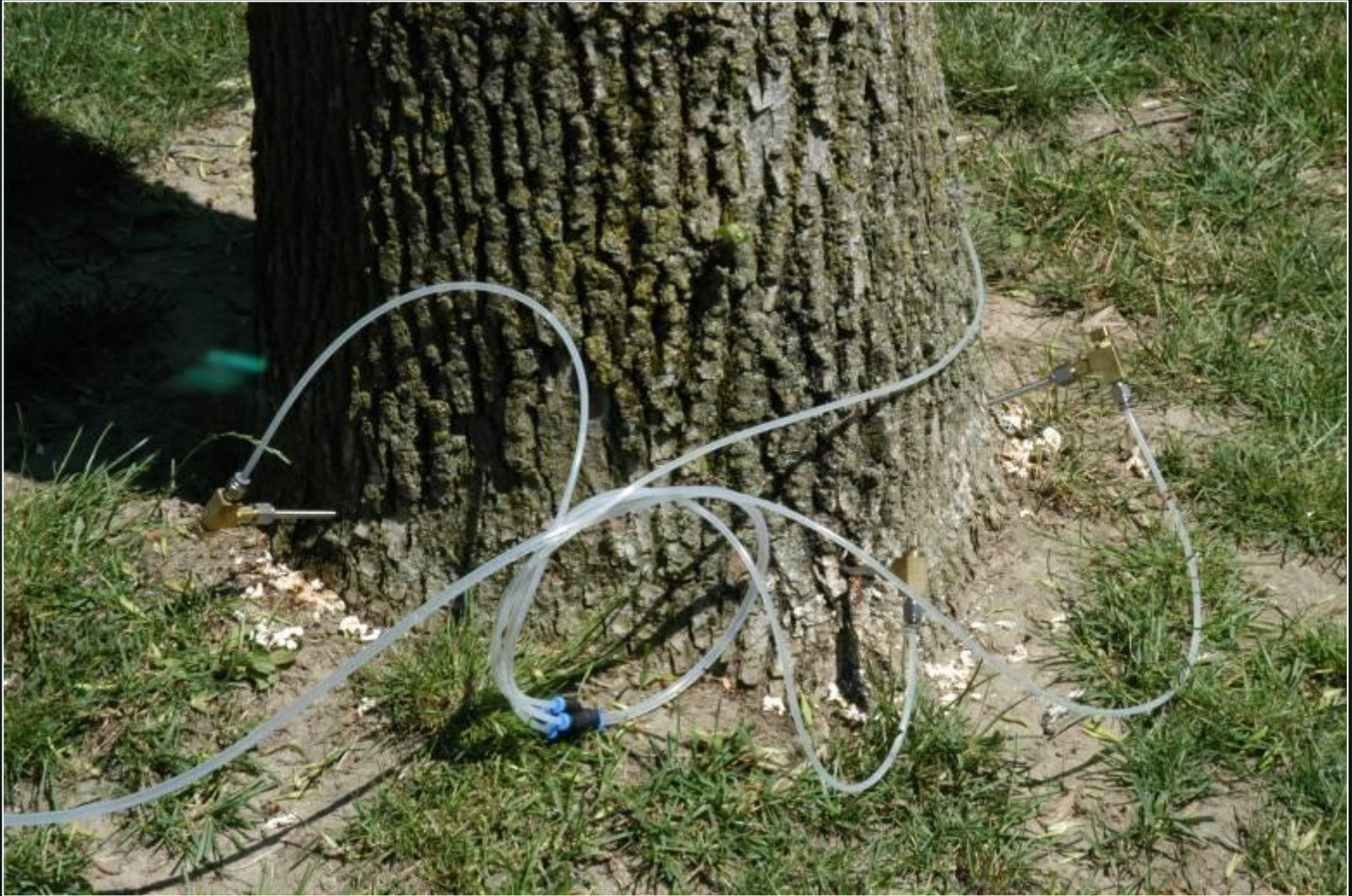


## How much water to apply? Balancing the trade-off.

- **Not enough water:** poor distribution
- **Too much water:** dilutes the soil solution, which may reduce uptake rate and concentration in the plant



# Trunk Injections



# Emamectin Benzoate: duration of control at different rates (DBH: 20-25")

## Emamectin benzoate (Tree-äge)

0.1 g ai / inch DBH (2.5 ml / inch - low)

0.2 g ai / inch DBH (5 ml / inch – med)

0.4 g ai / inch DBH (10 ml / inch – med / high)

0.8 g ai / inch DBH (20 ml / inch)

Treat in 2006 and see how long they work.

# Treatment evaluation:

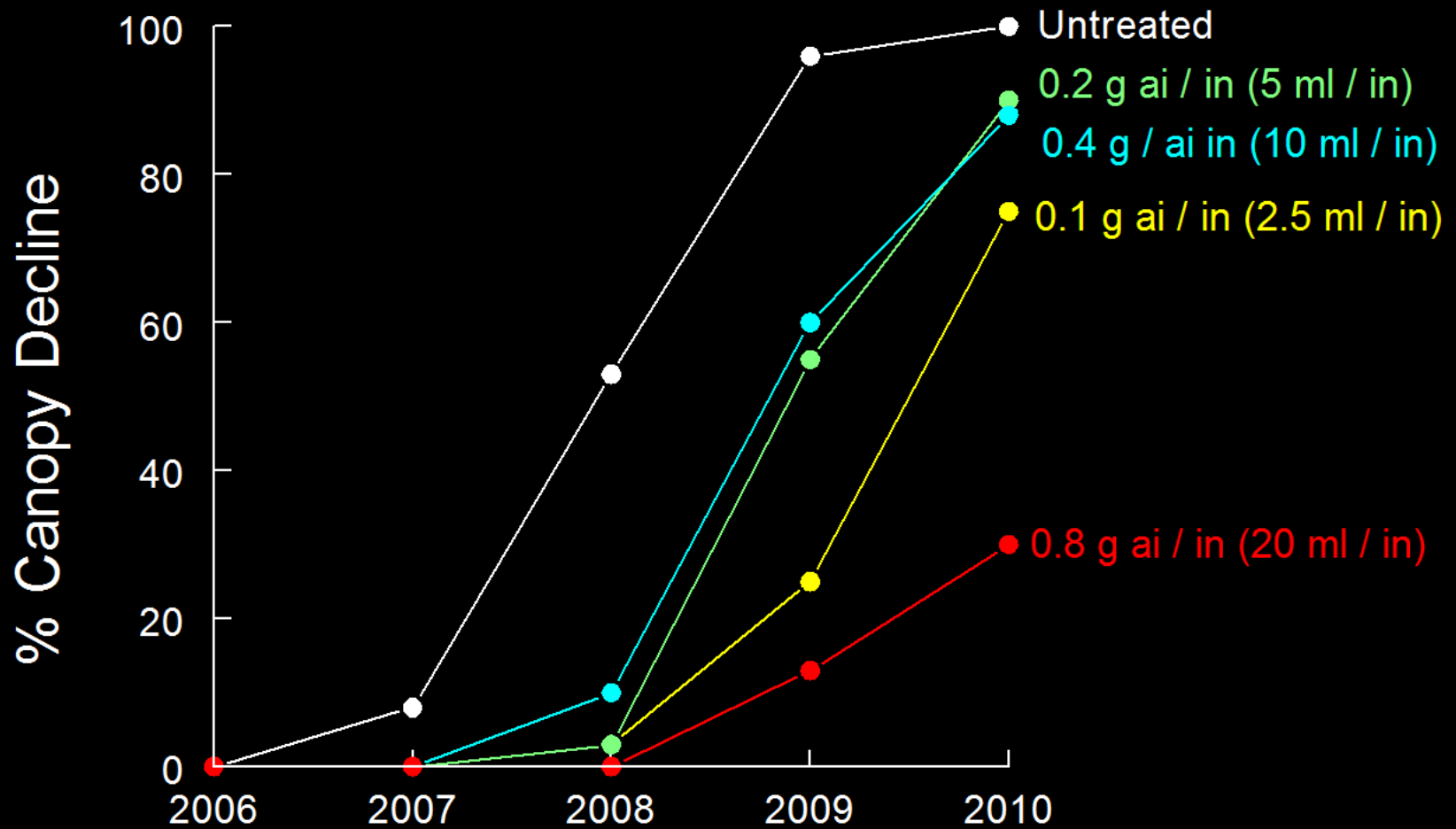
- Canopy decline rating using photographic scale (Smitley et al. 2008. *J. Econ. Entomol.* 101:1643-1650)
- Exit hole density in canopy branches.



# Effect of Emamectin Benzoate Applied in 2006 for Control of EAB

| Treatment           | % Canopy Decline |      |      |       |
|---------------------|------------------|------|------|-------|
|                     | 2006             | 2007 | 2008 | 2009  |
| Untreated           | 0                | 8    | 53 a | 96 a  |
| Emamectin benzoate  |                  |      |      |       |
| 0.1 g ai / inch DBH | 0                | 0    | 3 b  | 13 bc |
| 0.2 g ai / inch DBH | 0                | 0    | 3 b  | 38 b  |
| 0.4 g ai / inch DBH | 0                | 0    | 10 b | 38 b  |
| 0.8 g ai / inch DBH | 0                | 0    | 0 b  | 5 c   |

# Tree-age rate study (20-25 inch DBH)

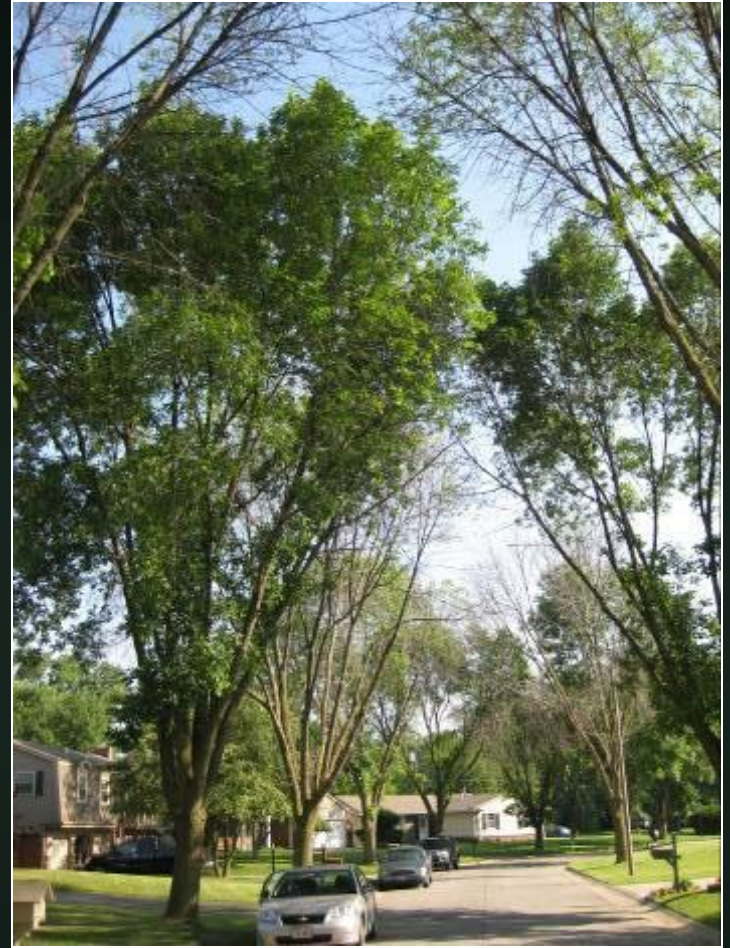


# Effect of Emamectin Benzoate Applied in 2006 for Control of EAB

| Treatment           | Exit Holes / m <sup>2</sup> |         |
|---------------------|-----------------------------|---------|
|                     | 2008                        | 2009    |
| Untreated           | 19.2 a                      | 24.6 a  |
| Emamectin benzoate  |                             |         |
| 0.1 g ai / inch DBH | 0.2 b                       | 2.9 c   |
| 0.2 g ai / inch DBH | 0.5 b                       | 10.1 ab |
| 0.4 g ai / inch DBH | 1.4 b                       | 3.3 c   |
| 0.8 g ai / inch DBH | 0.0 b                       | 0.5 c   |



2006



2009



# Systemic trunk injections: comparison of treatment schedule (avg DBH = 19 inch)

## Emamectin benzoate (Tree-äge)

Rate: 0.4 g ai / inch DBH

1. 2006
2. 2006 & 2008

## Imidacloprid (Ima-jet),

Rate: 0.4 g ai / inch DBH

1. 2006 & 2007
2. 2006 & 2008



# Systemic Trunk Injections for Control of EAB

## % Canopy Decline

| Treatment             | 2006 | 2007 | 2008 | 2009  |
|-----------------------|------|------|------|-------|
| Untreated             | 0    | 6    | 51 a | 90 a  |
| Tree-äge, 2006        | 0    | 0    | 0 b  | 13 c  |
| Tree-äge, 2006 & 2008 | 0    | 0    | 3 b  | 6 c   |
| Ima-jet, 2006 & 2007  | 0    | 0    | 0 b  | 33 b  |
| Ima-jet, 2006 & 2008  | 0    | 0    | 9 b  | 20 bc |

# Systemic Trunk Injections for Control of EAB

Exit holes / m<sup>2</sup>

| Treatment             | 2007  | 2008   | 2009   |
|-----------------------|-------|--------|--------|
| Untreated             | 0.6 a | 15.3 a | 34.7 a |
| Tree-äge, 2006        | 0.1 b | 0.1 b  | 1.9 c  |
| Tree-äge, 2006 & 2008 | NA    | 0.1 b  | 0.6 c  |
| Ima-jet, 2006 & 2007  | 0.1 b | 0.1 b  | 3.8 c  |
| Ima-jet, 2006 & 2008  | NA    | 4.4 b  | 11.9 b |

# Safari (Dinotefuron) Trials in Bowling Green

- Basal trunk sprays
- Low volume soil injection



## Insecticide failures associated with:

Application rate: not using the highest rate

Placement: grid to dripline rather than basal treatment

Injecting too deep (below feeder roots): inject no more than 4 inches

Initial degree of infestation too high

Soil moisture: treatment during drought

Size of tree: large trees

Pest pressure trajectory

# Optimal Timing of Treatments

- **Soil treatments:** in spring allowing time for uptake before adults begin feeding and eggs begin to hatch. Fall treatments can also be effective.
- **Trunk injections:** in spring just after the canopy has fully developed

EAB adult emergence begins when black locust blooms.



Black locust, *Robinia pseudoacacia*

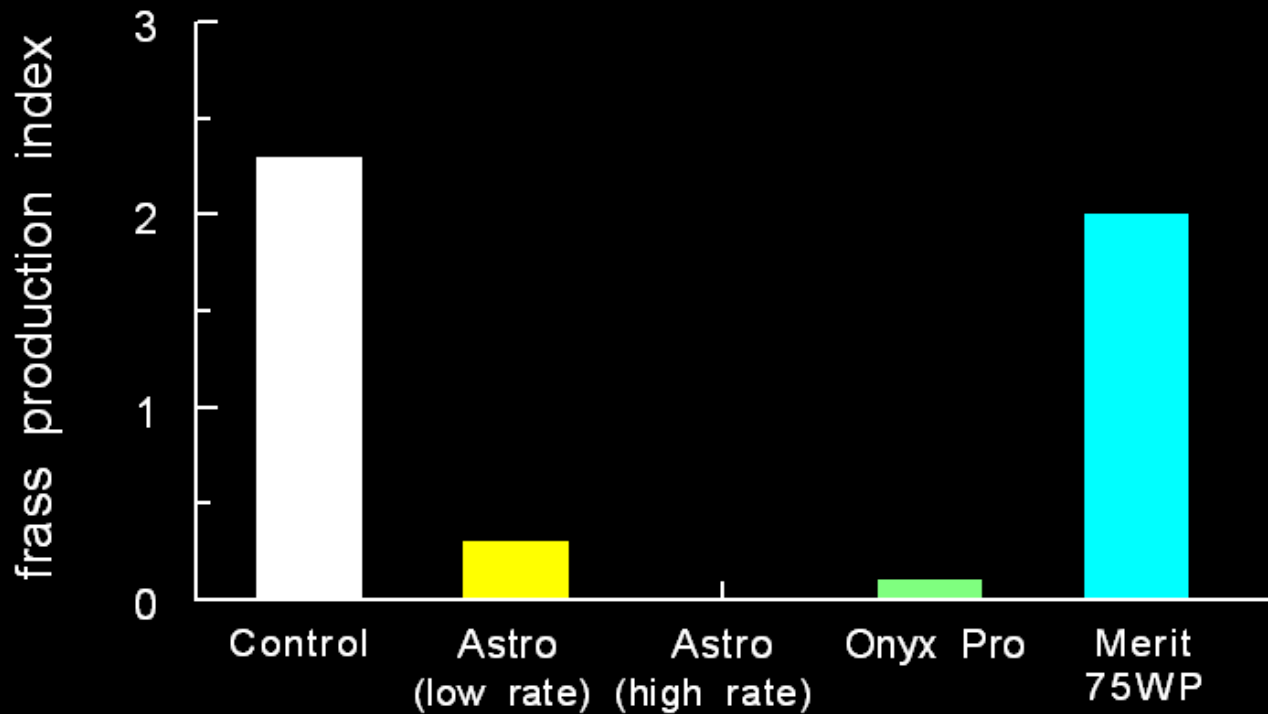


# Banded Ash Clearwing Borer

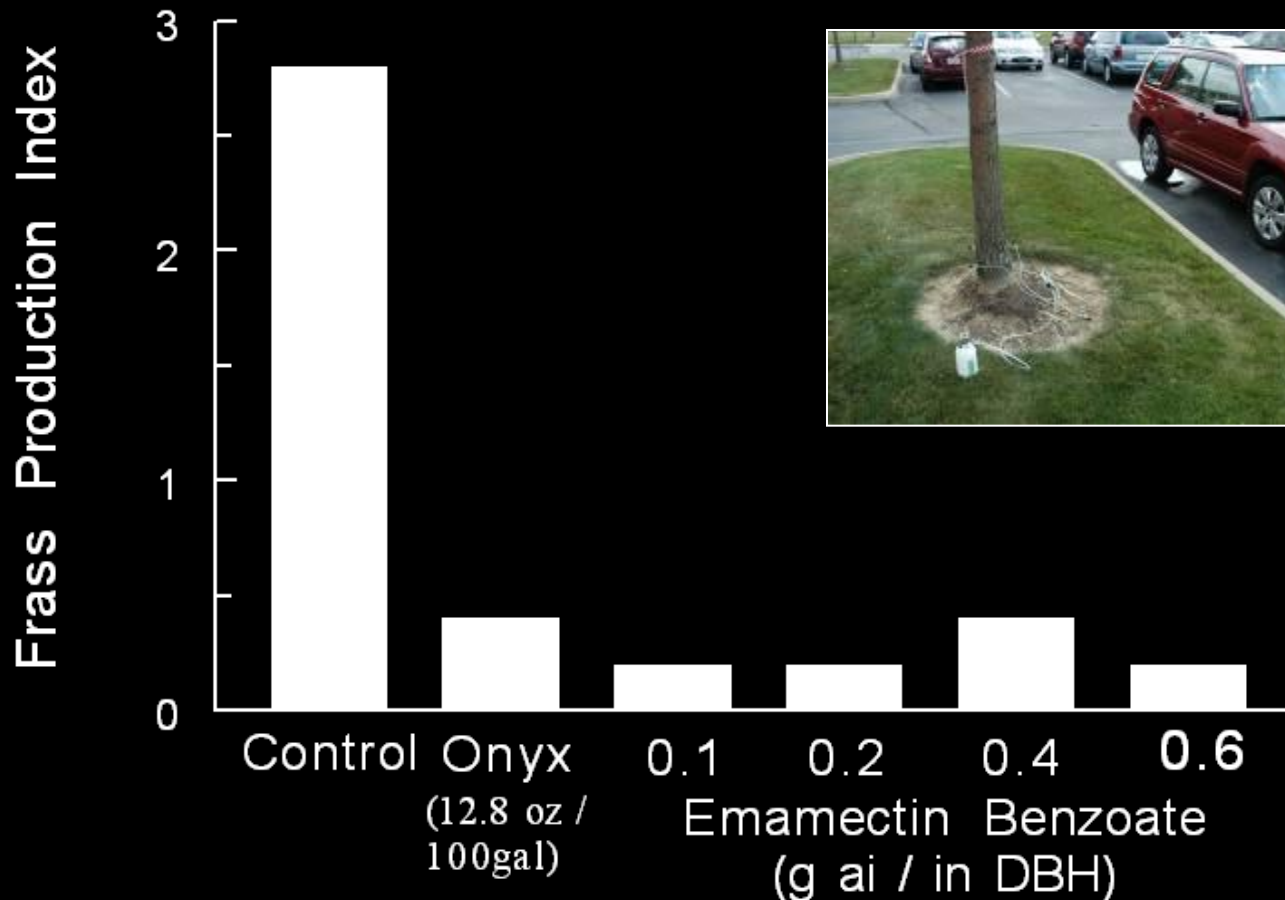




# Banded Ash Clearwing Borer



# Emamectin Benzoate Controls Banded Ash Clearwing Borer



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# Ash is pollinated by wind, not bees



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<http://www.cas.vanderbilt.edu/bioimages/biohires/f/fram2-fmale18150.JPG>



# Special thanks to:



Craig Scharr, City of Toledo



Dave Bienemann,  
City of Bowling Green

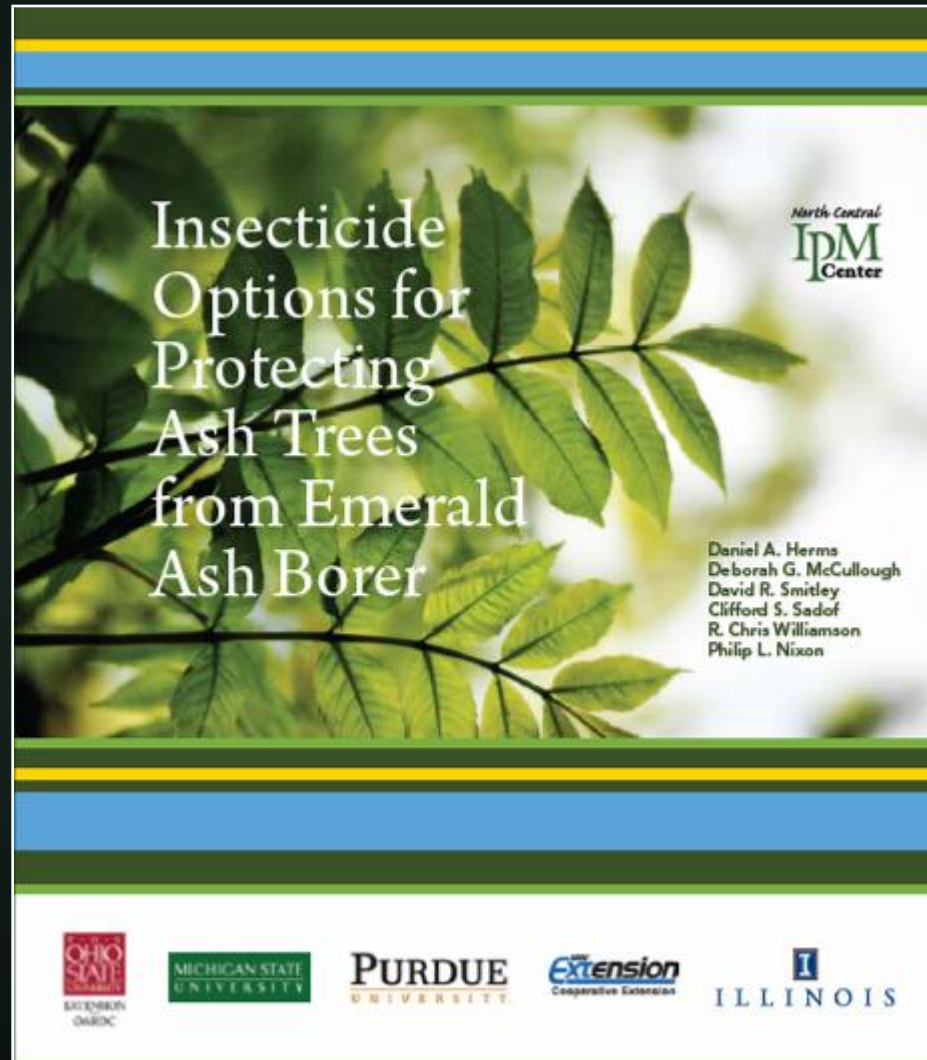


Ron Howell, Howell Tree  
Service



Amy Stone & Master Gardeners,  
OSU Extension, Lucas County

[www.ashalert.osu.edu](http://www.ashalert.osu.edu)



The cover features a central photograph of green ash tree leaves. The title is overlaid on the left side of the image. The authors' names are listed on the right. The top and bottom of the cover have decorative horizontal bands in green, yellow, and blue. At the bottom, logos for the participating institutions are displayed.

**Insecticide  
Options for  
Protecting  
Ash Trees  
from Emerald  
Ash Borer**

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**IPM**  
Center

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