

# **Emerald Ash Borer**

## **Ash mortality and control options**



**Taylor Scarr**  
**Provincial Forest Entomologist**  
**Ontario Ministry of Natural Resources**

*Natural. Valued. Protected.*

## Forest Invasive Alien Species

- Canadian Food Inspection Agency has clear lead
  - Plant Protection Act very powerful: inspect, seize, quarantine, order disposal, restoration
- Canadian Forest Service – scientific support & research
  - honest broker, sounding board, less political







**Adult**

**8.5-13.5mm**

**Larva**

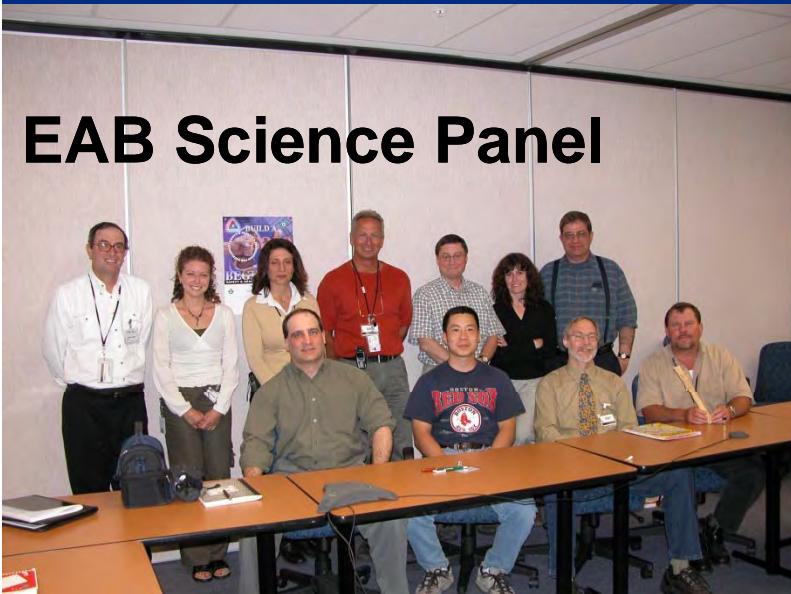
**26-32 mm**



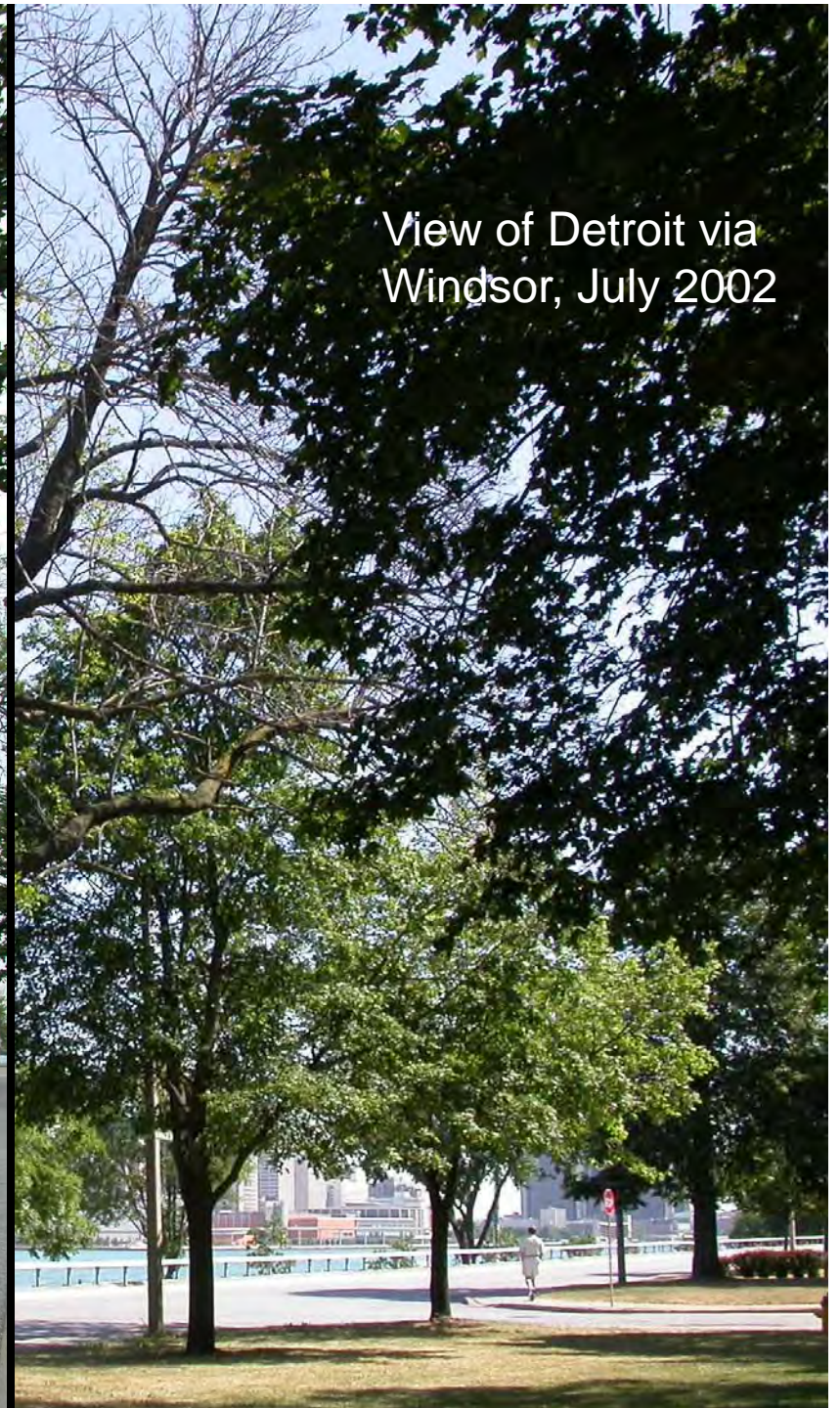
# MNR Role

- scientific advice
  - surveys, detection
  - research field support and funding
  - forest management expertise
  - Invasive Species Centre (Sault Ste. Marie)

## EAB Science Panel











**Crown dieback  
epicormic shoots**



**EAB very difficult to survey for:  
It's always further than you think**

## **Epicormic shoots**



## **Bark splitting**





## Bark splitting

Prefers 5-8 cm,  
branches or stems















# **Emerald Ash Borer**

## **larval tunnels**





## Natural controls

- none specific to EAB
- generalists: woodpeckers, birds, fungi?, predaceous beetles
- interspecific competition
- dispersal mortality
- host tree resistance?
- native parasitoids, currently low but highly variable







Squirrel feeding



Woodpecker feeding





**2003: no EAB**



**2004: severe EAB attack**





## Emerald ash borer in the summer





















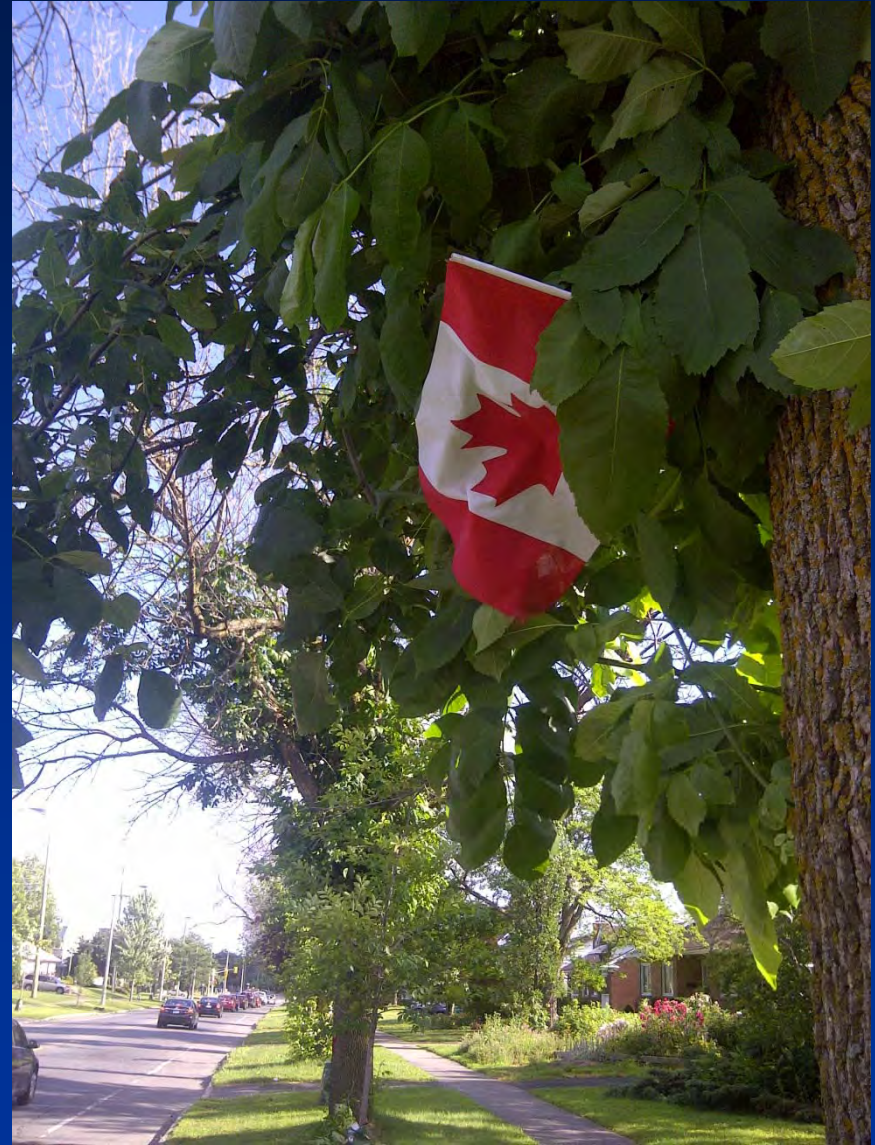






**Significant impacts in riparian zones**











Canopy opening followed  
by invasion by non-native  
plants

**After EAB**

**Before EAB**

Dave Kreutzweiser, CFS







Canopy opening followed  
by invasion by non-native  
plants

**After EAB**

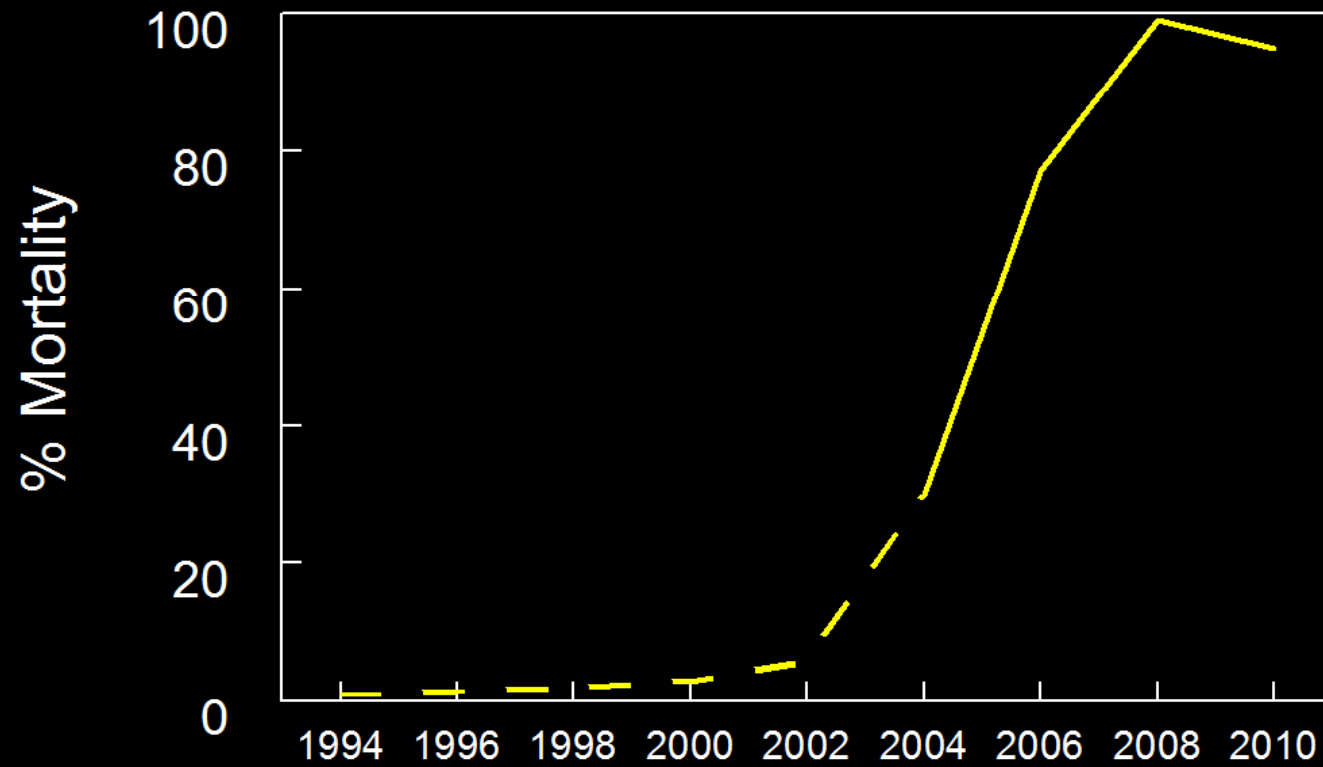
**Before EAB**



Dave Kreutzweiser, CFS



## Percent Ash Mortality (> 2.5 cm dbh)



Dan Herms, Ohio State Univ.



# A Toledo street before and after EAB



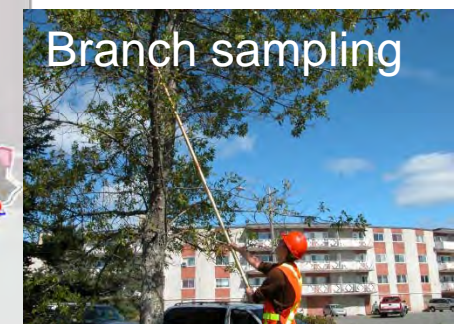
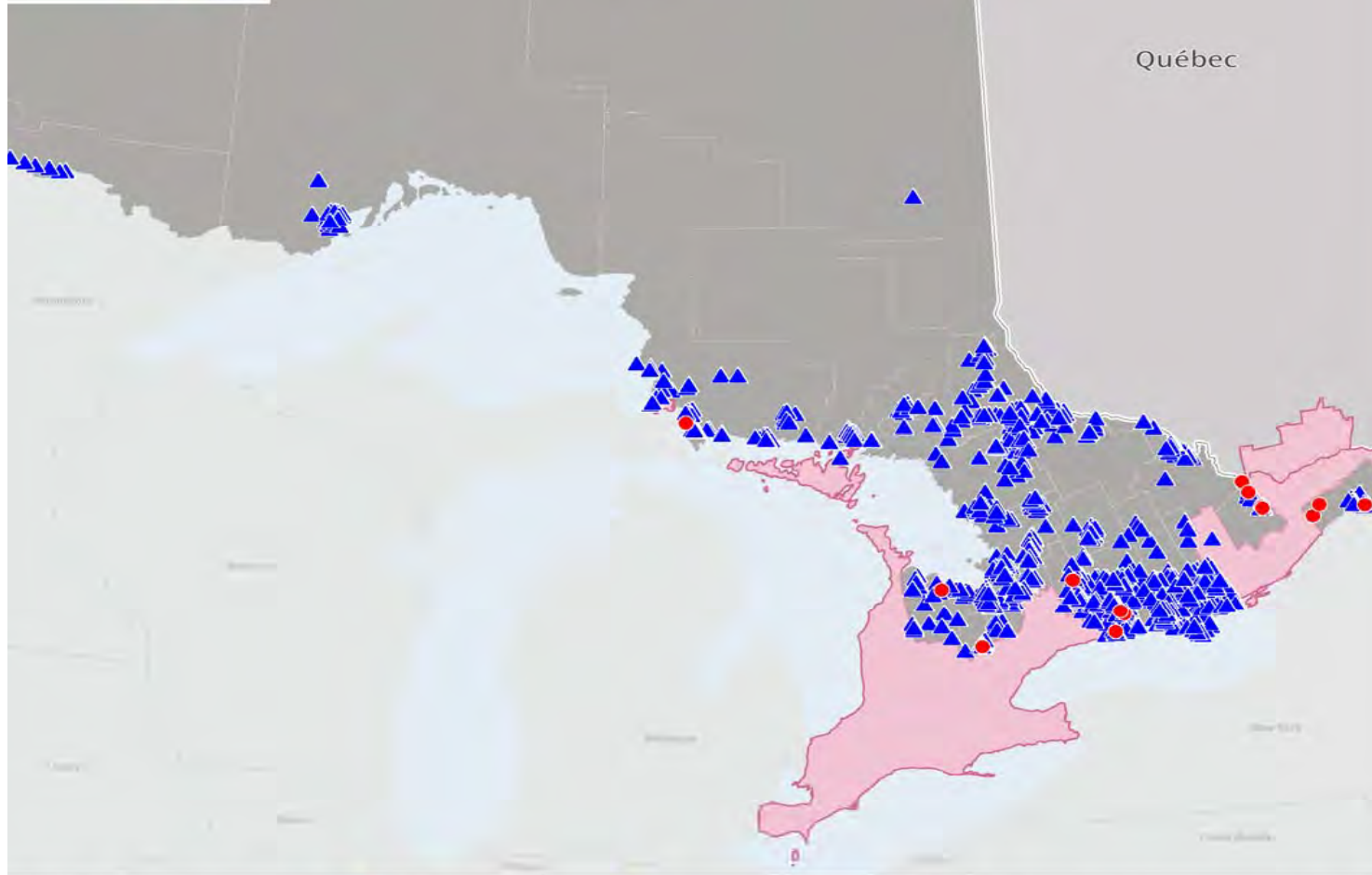
June 2006



August 2009



# EMERALD ASH BORER SURVEY | ENQUÊTE SUR L' AGRILE DU FRÊNE ONTARIO (2013)



Canada Atlas Lambert  
Octobre 21, 2013 Sources: © CFIA-ACIA, © DMTI, © ESRI  
Kanyaya

Positive site  
Site positif

Negative site  
Site négatif

Regulated  
Réglementée

© 2013  
The Canadian Food Inspection Agency (CFIA), Mapping and GIS Services, London, Ontario;  
L'Agence canadienne d'inspection des aliments, Cartographie et services SIG, London, Ontario;

100-Km

While this map may not be the best source of information, it is not intended to be used as a source of information. The CFIA makes no representations or warranties, either expressed or implied, as to the accuracy of the information presented and the user assumes the entire risk as to the use of any or all information.  
Bien que cette carte n'est pas le meilleur source d'information, elle n'est pas destinée à être utilisée comme source d'information. L'ACIA ne fait aucune garantie explicite ou implicite quant à l'exactitude de l'information présentée.

100-MI

Canadian Food  
Inspection Agency Agence canadienne  
d'inspection des aliments

Canada

Canada

29





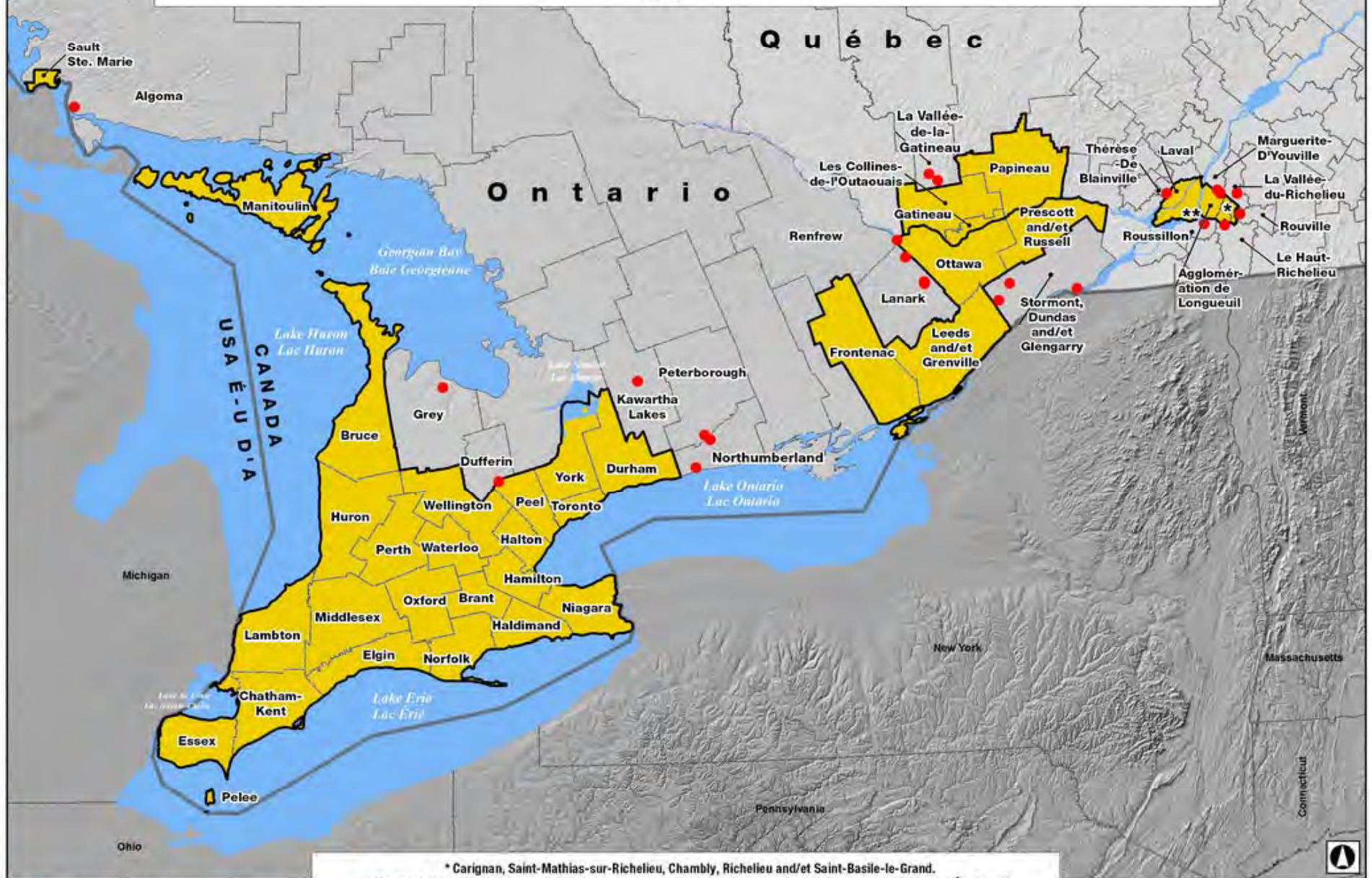
Canadian Food  
Inspection Agency

Agence canadienne  
d'inspection des aliments

## Emerald Ash Borer Regulated Areas of Canada

2013

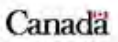
## Lieux réglementés pour l'agrile du frêne au Canada



● Positive site / Site positif (2013)  
Areas regulated / Lieux réglementés

\* Carignan, Saint-Mathias-sur-Richelieu, Chambly, Richelieu and/et Saint-Basile-le-Grand.  
\*\* Montréal, Baie-d'Urfé, Beaconsfield, Côte-Saint-Luc, Dollard-des-Ormeaux, Dorval, Hampstead, Kirkland, L'Île-Dorval, Montréal-Est, Montréal-Ouest, Mont-Royal, Pointe-Claire, Sainte-Anne-de-Bellevue, Senneville and/et Westmount.

W 100 km  
M 100 km  
SCALE / ÉCHELLE







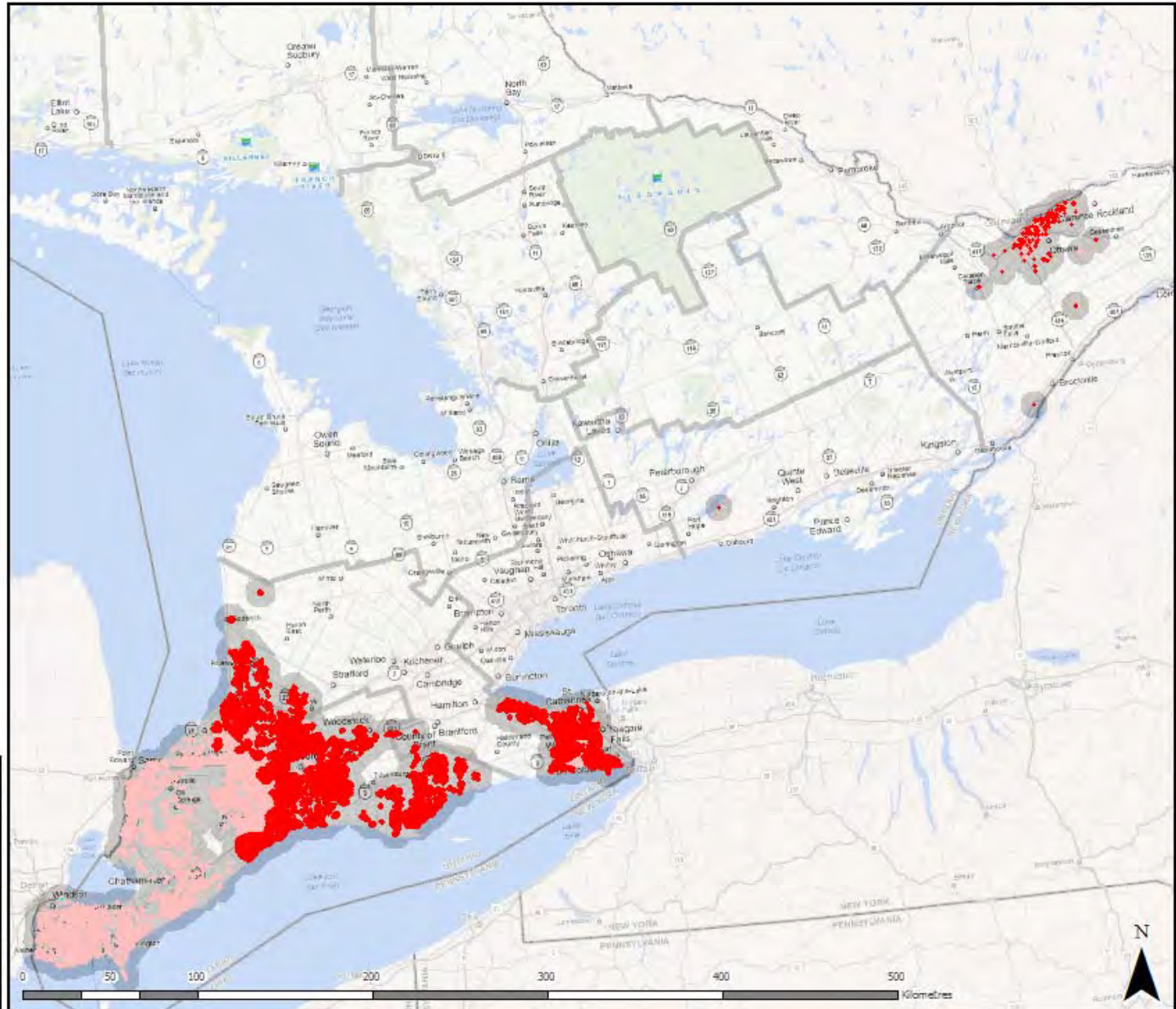
# Emerald Ash Borer (*Agrilus planipennis* Fairmaire)



## Emerald Ash Borer 2004-2013

Map 1  
Southern Region  
Areas-within-which  
emerald ash borer caused  
moderate-to- severe  
decline to ash species.

-  2013 - Area of Moderate-to- Severe Decline and Mortality
-  2004 – 2012 Area of Moderate-to- Severe Decline and Mortality  
\*no 2008 data



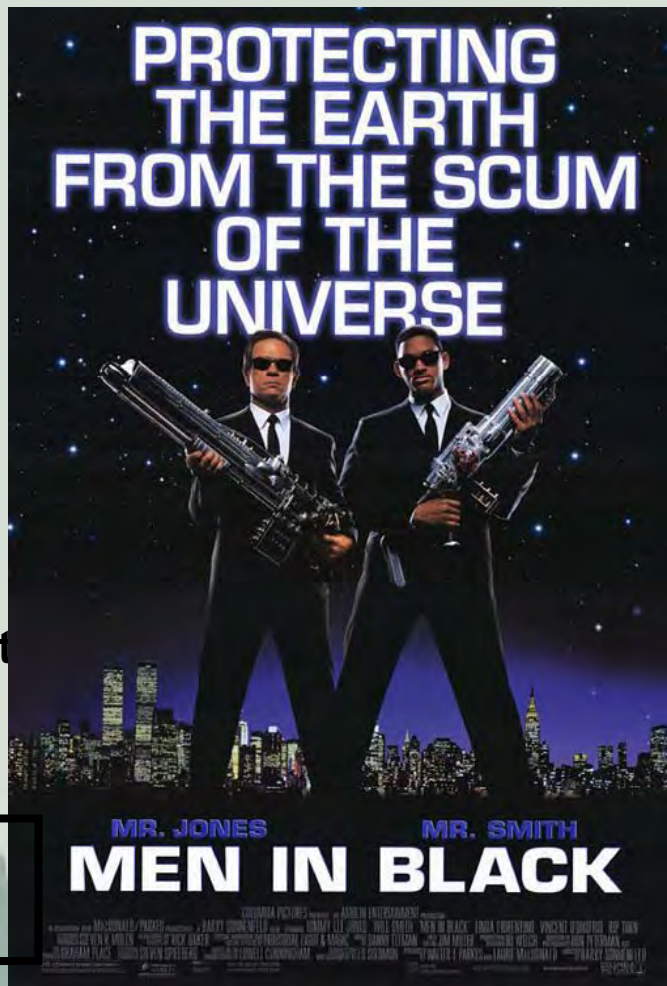


*Natural. Valued. Protected.*

## Components of an Invasive Alien Species Strategy

1. Prevention
2. Detection
3. Identification
4. Delimitation
5. Risk Assessment
6. Control
7. Restoration, rehabilitation
8. Evaluation

*All supported by research  
and communications*





*Natural. Valued. Protected.*

## **Control (management)**

- Objectives
- Inventory
- Priorities: protect, remove, replace trees
- Public guidance, support, incentives
- Budget
- Restoration
- Communications and R&D plans

## **Approaches:**

- Remove
- Remove and replace
- Protect, remove, & replace
- Spread losses over time

*The most expensive option is remove & replace!*



## Components of an Invasive Alien Species Strategy

### Control Options : *Insecticides*

**Q1: Will an insecticide achieve my objective(s)?**

**Q2: What characteristics should the insecticide have?**

**Q3: What insecticides are registered that have these characteristics?**

**Q4: How do these products compare (cost, efficacy, safety, acceptance, easy of use, restrictions or limitations, non-target impacts, customer support, availability, track record)?**

***3 products now registered in Canada***

- ***Acecap 97***
- ***Confidor 200SL***
- ***TreeAzin***

**N.B.: all pesticides must be federally registered and provincially classified**



## Acecap 97 and Confidor have unproven efficacy



“Treatment reduces populations of emerald ash borer larvae and the damage they cause, but may not provide control of this pest.” *Acecap 97 label*

**CONFIDOR® 200 SL**  
**GROUP 4A**  
**INSECTICIDE**  
**Systemic Insecticide**

**NATURE OF RESTRICTION:** ...This product can only be used in conjunction with a federal, provincial or municipal government control program, consult local pesticide regulatory authorities about use permits which may be required

*Confidor 200 SL label*

\*Treatment with Confidor® 200 SL Systemic Insecticide may provide only suppression.



Herms DA, McCullough DG, Smitley DR, Sadof C, Williamson RC, and Nixon PL. 2009. Insecticide options for protecting ash trees from emerald ash borer. North Central IPM Center Bulletin. 12 pp.

“In another MSU study, ACECAP® trunk implants (active ingredient is acephate) did not adequately protect large trees (greater than 15-inch DBH) under high pest pressure”

“Trunk injections with imidacloprid products have provided varying degrees of EAB control in trials conducted at different sites in Ohio and Michigan”

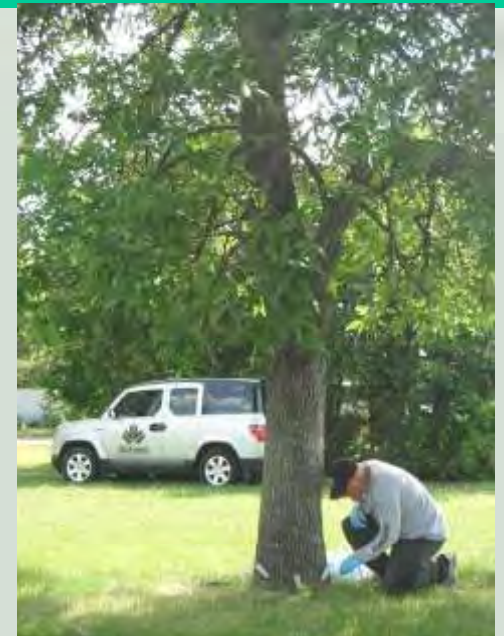
*For products with the active ingredient imidacloprid (e.g. Confidor), efficacy depends on the specific formulation, and injection system. Some products work, some don't.*



## ***Insecticides in Canada: only TreeAzin has proven efficacy***

### **TreeAzin**

- **emergency registration since 2007**
- **full registration 2012**
- **no restrictions or caveats on the label**
- **efficacy and safety backed by peer reviewed articles**



McKenzie et al. 2010 – Azadirachtin: An Effective Systemic Insecticide for Control of emerald ash borer. **J. Economic Entomology 103(3): 708-717**

Grimalt et al. 2011. Foliar residue dynamics of azadirachtins following direct stem injection into white and green ash trees for control of emerald ash borer. **Pest Management Science. 67 (10): 1277–1284**

Kreutzweiser et al. 2011– Environmental safety to decomposer invertebrates of azadirachtin as a systemic insecticide to control emerald ash borer. **J. Ecotoxicology and Environmental Safety 4-21**



# TreeAzin & Ecoject injector

- active: azadirachtin from Neem tree of India
- 2 years efficacy
- emergency registration since 2007, fully registered 2012
- cost depends on size of tree
- organic certification



Pre-loaded canisters











Acecap treated  
tree Sault Ste.  
Marie 2013



## Other insecticide options(Canada)

- Safari: dinotefuran
  - Neonicotinoid. Submitted for full registration by EngageAgro.
  - Basal bark spray. Published efficacy data.
- boreGONE!
  - Btg (*Bacillus thuringiensis galleria*. EPA experimental use permit. Aerial spray.
- Other imidacloprid products and injections systems



## Dutch elm disease

- escapees, resistance?
- seed bank allows reproduction
- trees reproduce before susceptible to DED
- equilibrium: elm increases, DED increases. Elm decreases, DED decreases



## Emerald ash borer

- “lingering” trees, but no obvious resistance
- exception: blue ash
- attacks saplings
- no seed bank
- Eventually equilibrium, with much less ash on landscape

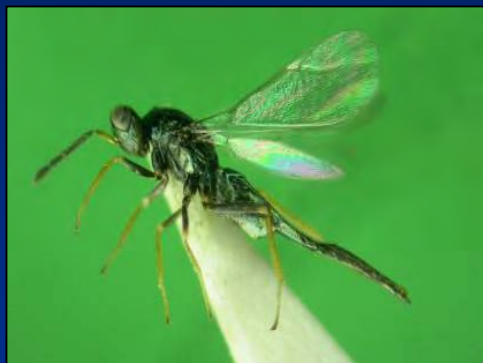




# Classic Biocontrol/Foreign Exploration USDA-FS and USDA-APHIS



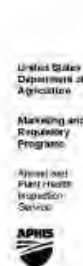
*Spathius agrili*



*Tetrastichus planipennisi*



*Oobius agrili*



## Proposed Release of Three Parasitoids for the Biological Control of the Emerald Ash Borer (*Agrilus planipennis*) in the Continental United States

Environmental Assessment,  
July 2007

USDA-APHIS biocontrol production  
laboratory - Brighton, Michigan (full time  
operation January 2009)



D. Barry Lyons, CFS



# Areas of China Surveyed for Ash, EAB, and Natural Enemies from 2003 to 2005



Leah Bauer,  
USDA FS



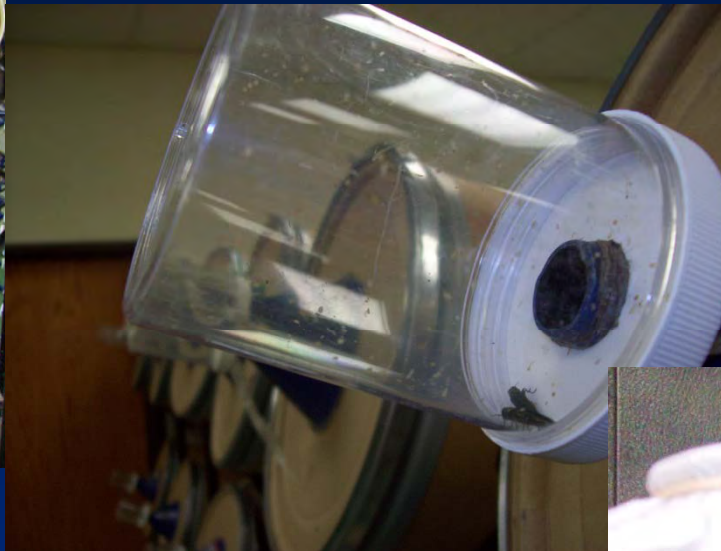


***Tetrastichus planipennisi***  
(Hymenoptera: Eulophidae),  
a gregarious larval  
endoparasitoid



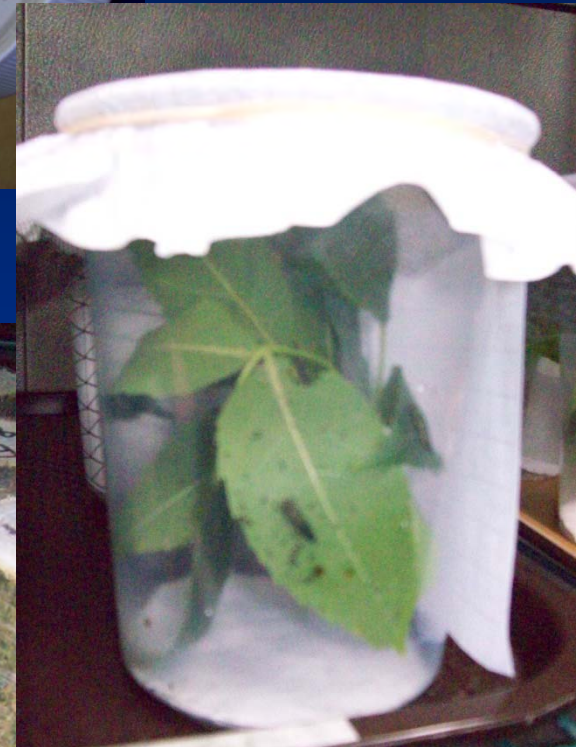
Leah Bauer,  
USDA FS





Tetrastichus  
planipennisi

Larval  
parasitoid









## Native Parasitoids

### Augmentative Biological Control/Local Exploration

*Phasgonophora sulcata*



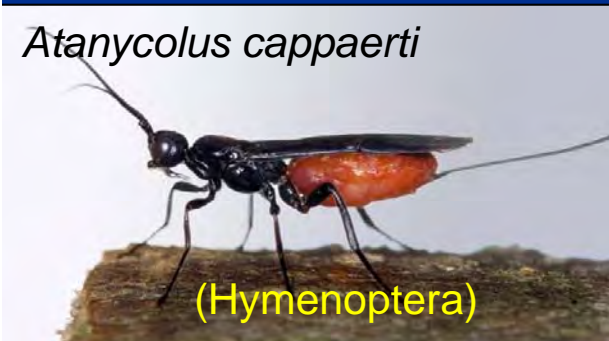
(Hymenoptera)

*Balcha indica*



(Hymenoptera)

*Atanycolus cappaerti*



(Hymenoptera)

#### Rearing (Essex Co. site 1 - 2006)

54 *P. sulcata*

9 *B. indica*

6 *Atanycolus* spp.

146 *A. planipennis*

Parasitism = 32.1%

#### Rearing (Essex Co. site 2 - 2006)

8 *P. sulcata*

0 *B. indica*

3 *Atanycolus* spp.

648 *A. planipennis*

Parasitism = 1.2%

#### Sticky Band Captures (Essex Co. site 1 - 2007)

407 *P. sulcata*

600 *A. planipennis*

Parasitism = 40.7%

Barry Lyons, CFS



## LONG TERM OUTLOOK

- continued spread
- slower in north (2-yr life cycle)
- slower in contiguous forest
- eventual equilibrium
- greatly reduced ash component
- native parasitoids switch to EAB, unknown in contiguous forest
- potential for introduced parasitoids, but long term,
- continued research advances: detection, control, impacts, strategies







**Free Methodist Church**

**(905) 852-3162**

**Sunday Worship 10:45am.**



**WHOEVER'S PRAYING  
FOR SNOW ...  
PLEASE STOP**



**THE END**

