

Ambrosia Beetle (*Xylosandrus germanus*) Infestations and Management Trials in High-Density Apple Orchards



UGA5209019

Arthur Agnello – Cornell NYSAES,
Geneva, NY

Deborah Breth & Elizabeth Tee –
Cornell Cooperative
Extension LOF Team, Albion, NY



Xylosandrus germanus – Black Stem Borer

“Ambrosia Beetle” (Curculionidae: Scolytinae)



Female drills a hole ~1mm in diameter, and hollows out a channel into heartwood of (usually small) physiologically stressed trees.



larva/pupa in brood chamber

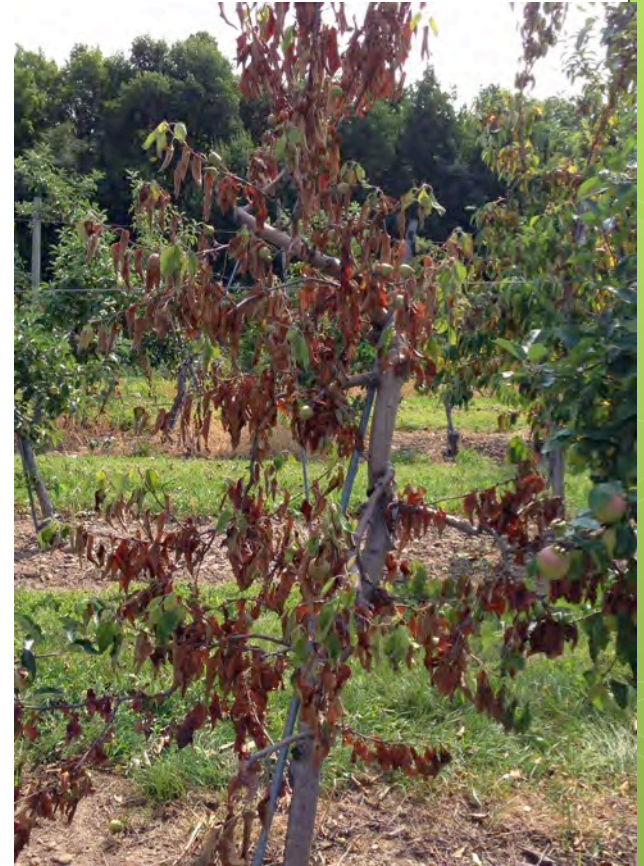
- Adults overwinter in galleries at the base of infested trees
- Females emerge from overwintering sites to infest new sites after 2-3 days with temps $\geq 68^{\circ}\text{F}$
- Female cultures a symbiotic fungus, *Ambrosiella hartigii*
- Food for larvae and adults
- Opportunistic colonizers of weakened or physiologically stressed trees (which produce ethanol)
 - flooding, drought stress, cold injury
 - “apparently healthy” trees also attacked



Liz Tee 2013

Damage

Discoloration and blistering of bark; compressed sawdust toothpicks from adult tunneling.
Tree's vascular system is shut down: wilting, dieback, death.



History

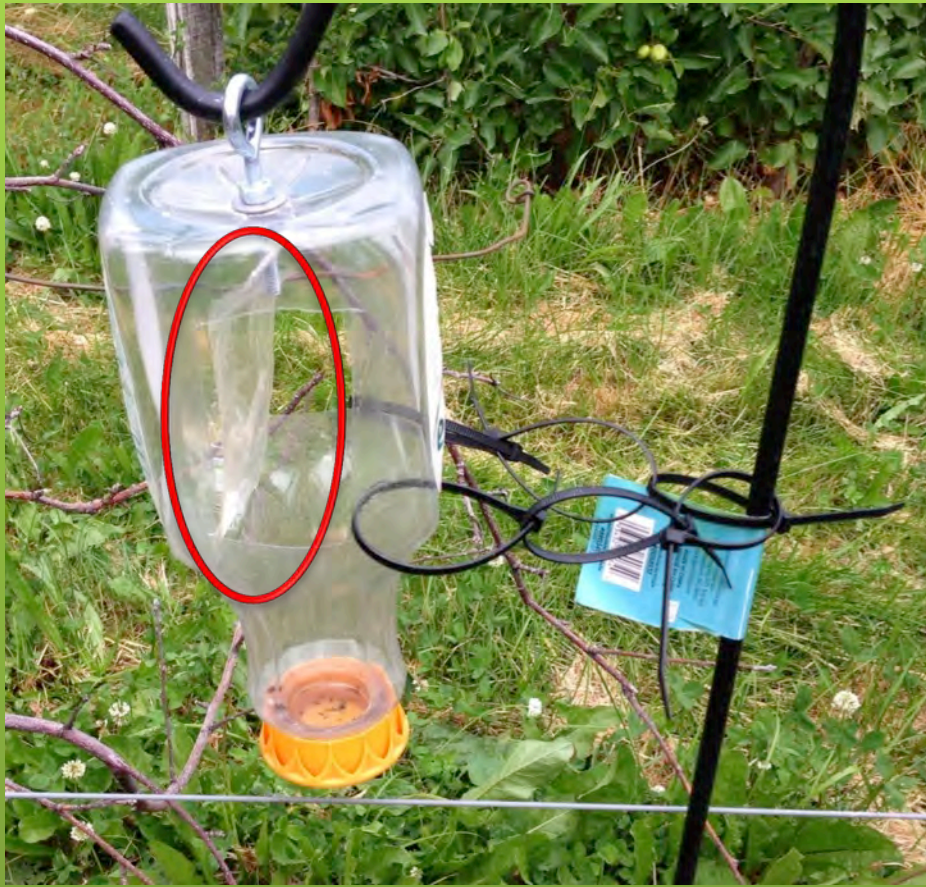
- Introduced from eastern Asia - first found in NY in 1932, now widespread in US
- Ambrosia beetle, general wood borers
- Attacks many ornamental/forest species
- American beech, maple, dogwood, black walnut, oak, magnolia
- Apple and sweet cherry reported in 1982
- Identified >30 sites with trees dying 2013-15; some at levels of 30%
- plantings 1–15 yrs old; Gala, Fuji, Honeycrisp, Gingergold commonly affected
- Similar reports in 2014 from MI and NJ (some *X. crassiusculus*, Granulate Ambrosia Beetle)

Trapping



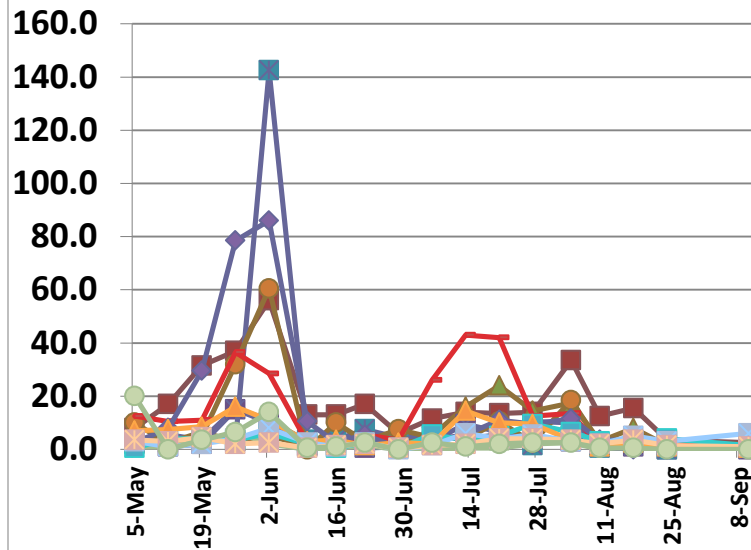
ex. P. Schultz, VA Tech
C. Ranger, USDA, OH

- Inverted “Simply” juice bottle traps, with rectangular openings cut in side panels
- Baited with AgBio ethanol lures
- Hung 2-3 feet off the ground
 - Placed on edge of woods next to orchard
 - Also in interior of orchard
 - Traps checked weekly

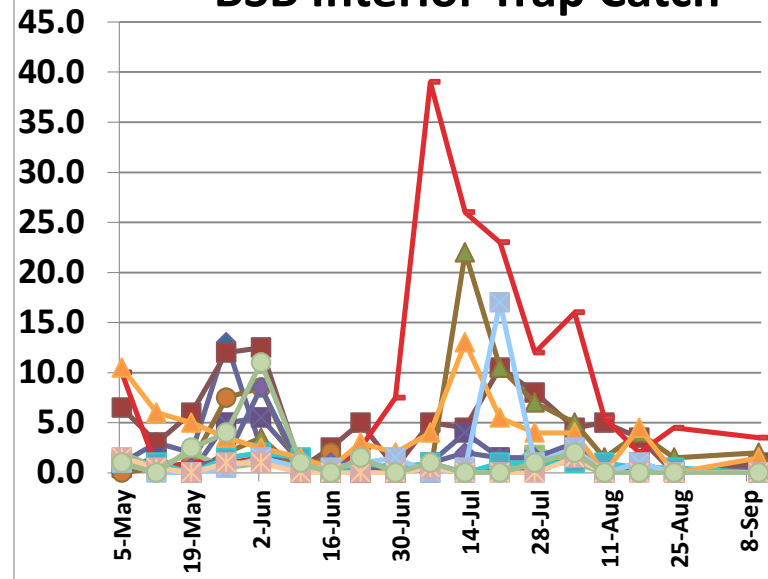


BSB weekly trap catch 2015

**Wayne County
BSB Edge Trap Catch**

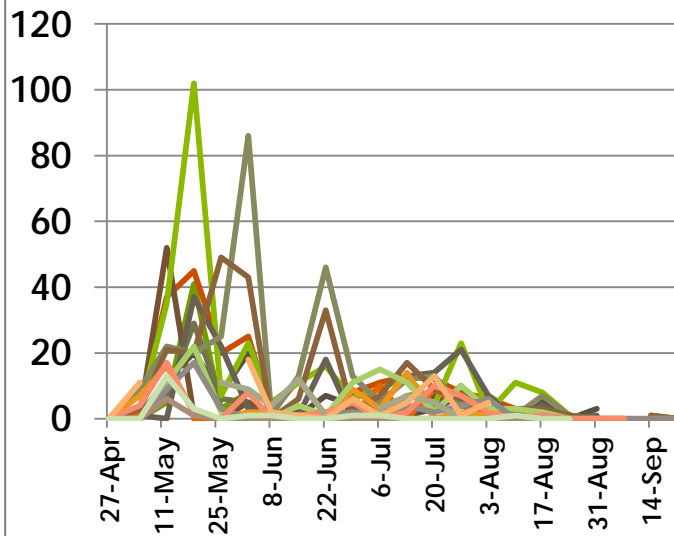


**Wayne County
BSB Interior Trap Catch**

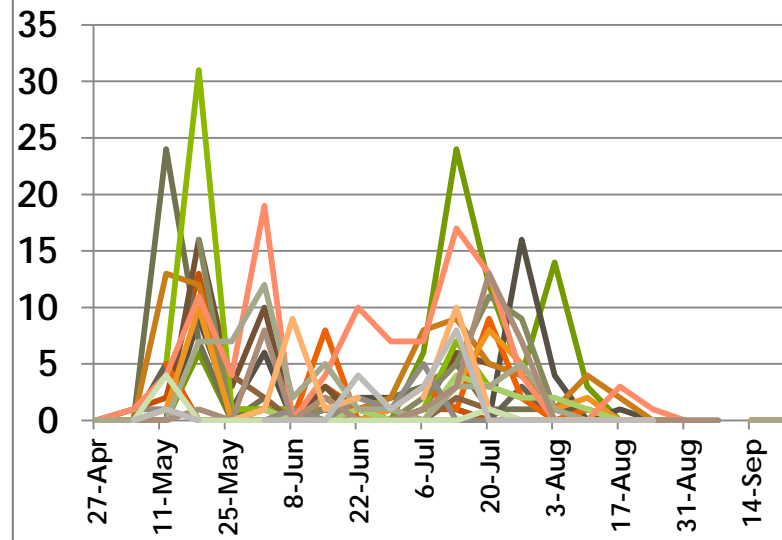


BSB weekly trap catch 2015

West of Rochester
BSB Edge Trap Catch



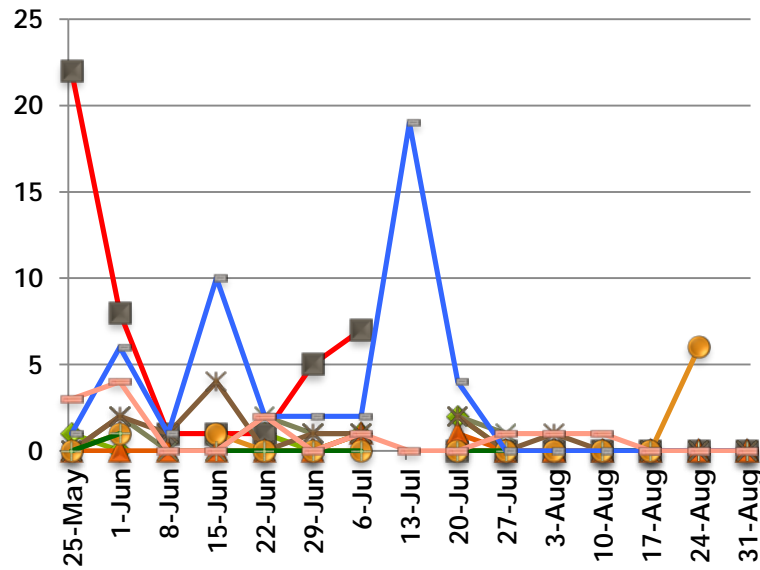
West of Rochester
BSB Interior Trap Catch



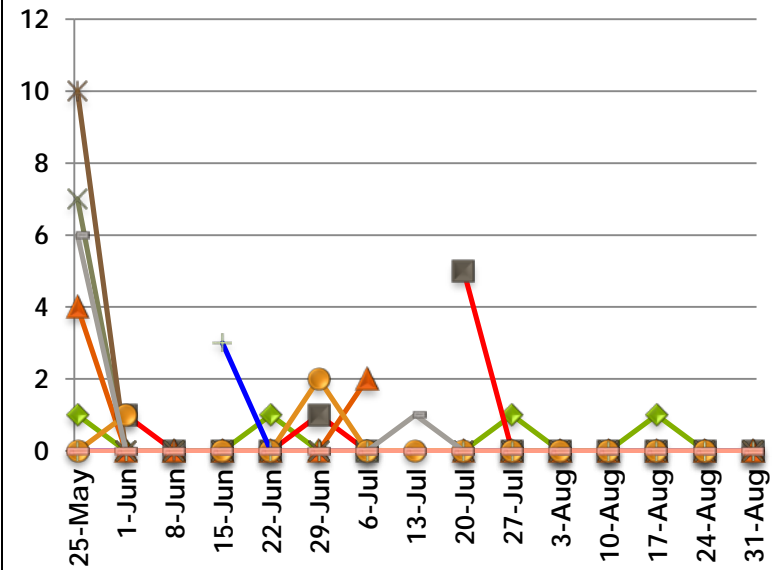
- First activity noted in WNY on May 5 after a few warm days over 68°F
- Higher counts along edges than in interiors
- June 2: peak for emergence from OW sites; July 6-27: 1st gen adults emerge; August 5: 2nd gen adults emerge, catch continues into September

BSB weekly trap catch 2015

Champlain Valley
BSB Edge Trap Catch



Champlain Valley
BSB Interior Trap Catch



- First activity noted in Champlain Valley on May 25 (first capture likely missed)
- Lower numbers than WNY but definite populations still documented
- 3 general peaks of flight activity

Preventive trunk sprays in apples

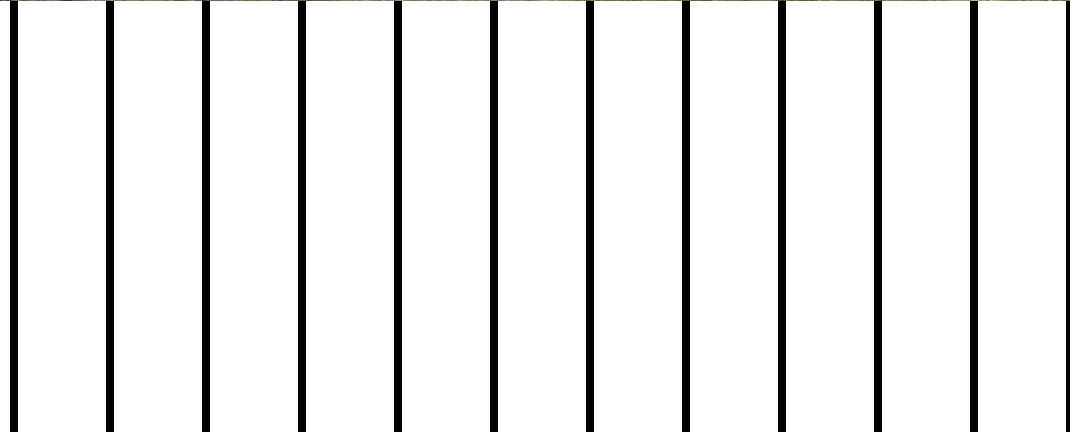
- ✓ potted 2-yr old Mutsu trees from nursery
- ✓ pots placed into larger pot, flooded to induce stress
- ✓ placed in the rows between orchard trees; 5 pots per replicate, 4 reps, on 2 farms in WNY
- ✓ trunks of the potted plus orchard trees sprayed using handgun sprayer on May 7-8, before main adult flight
 - ✓ chlorpyrifos (Lorsban Advanced); 1.5 qt/100 gal
 - ✓ lambda-cyhalothrin (Warrior II); 2.56 fl oz/100 gal
 - ✓ gamma-cyhalothrin (Declare); 2.05 fl oz/100 gal
 - ✓ untreated check (potted trees only)
 - ✓ Grower Standard (Lorsban using airblast sprayer)
- ✓ all trees examined for infestations after 1st flight (July 9); final eval: potted trees destructively sampled August 19

Control Trial

Each Plot:
10-12
orchard
trees
plus
5 potted
trees

Wooded Margin

I Check	III Declare
I Warrior	III Lorsban
I Declare	III Check
I Lorsban	III Warrior
II Check	IV Declare
II Lorsban	IV Warrior
II Declare	IV Lorsban
II Warrior	IV Check



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Control Trial

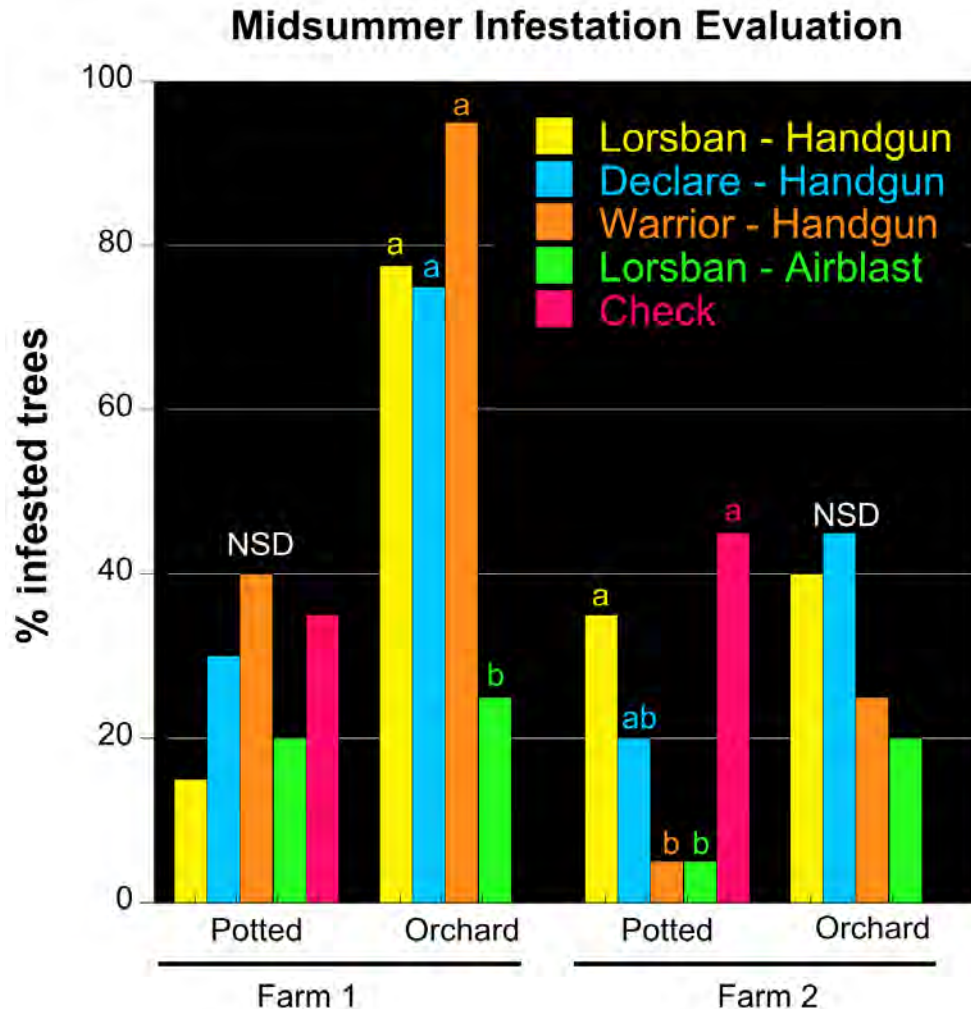
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II Warrior	IV Check



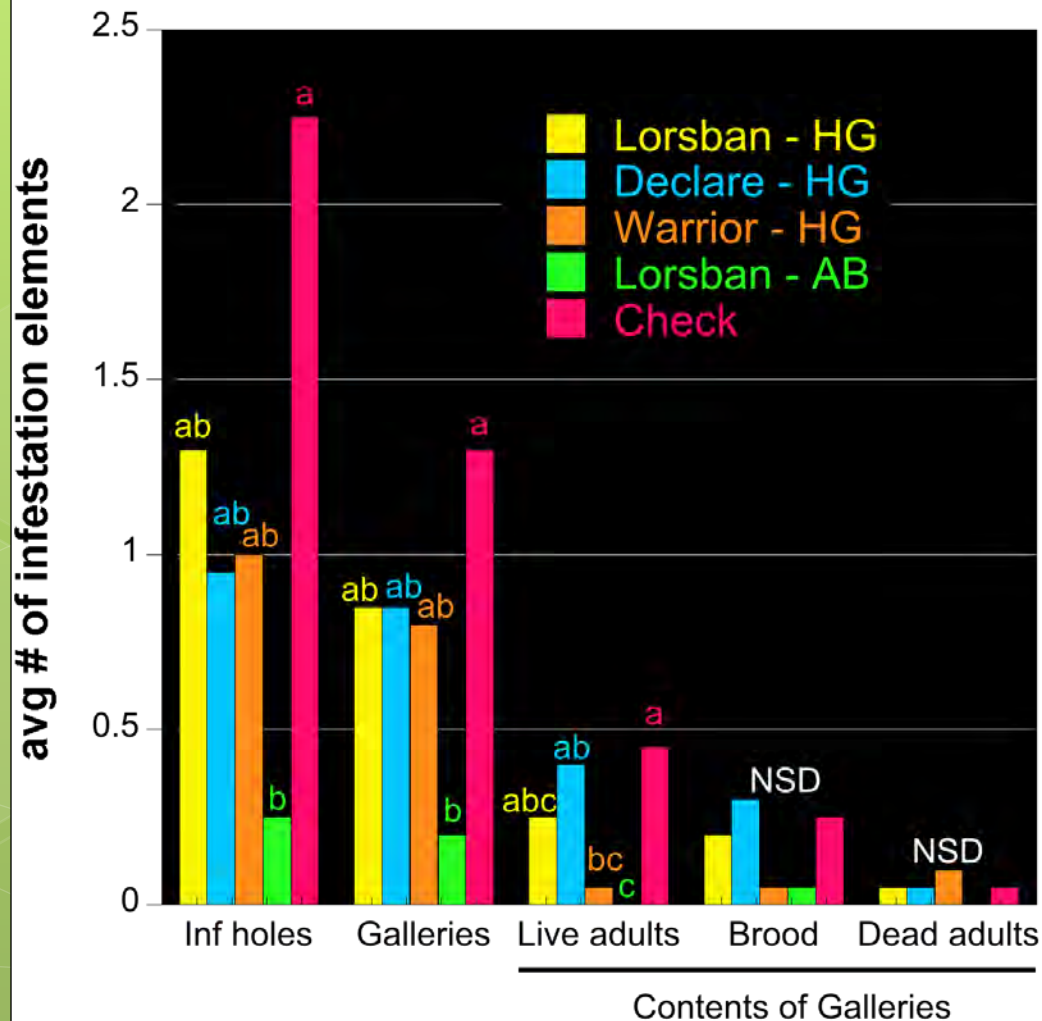
Preliminary Evaluations – July 9



- Efficacy of handgun treatments (e.g., Lorsban vs. Warrior) not consistent between sites
- Damage in Lorsban airblast trt low at both sites; however, these plots were not located in same part of orchard
 - potential site variability

Final Evaluations – Aug 12

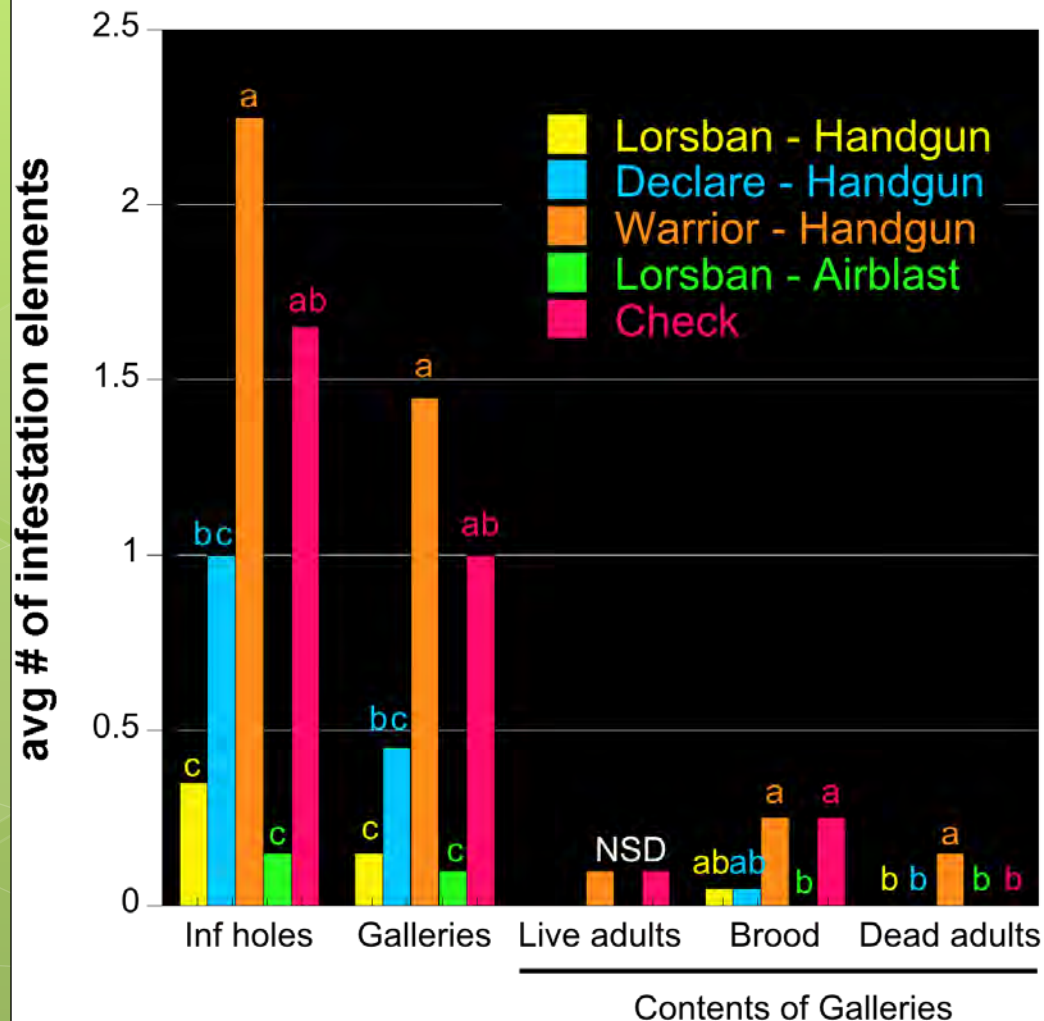
Final Infestation Evaluation - Farm 1



- Slight trend toward lower infestations in sprayed vs. check treatments
- No real separation among handgun chemicals
- Grower Standard (Lorsban Airblast) lower in all categories

Final Evaluations – Aug 12

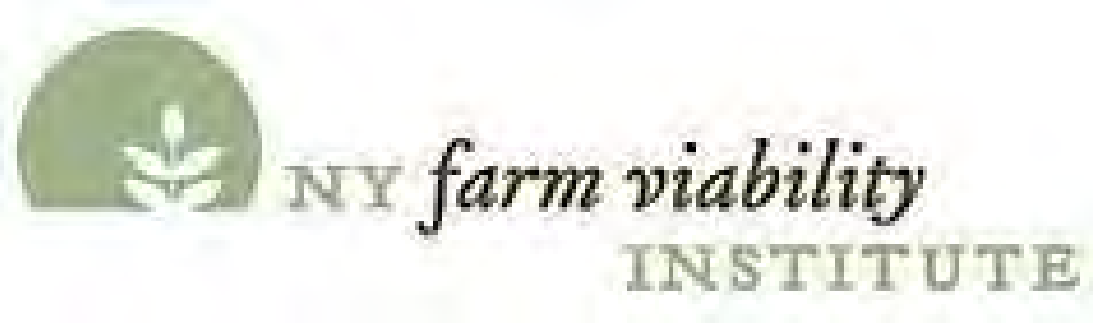
Final Infestation Evaluation - Farm 2



- Lorsban Handgun plots generally had the lowest infestations
- Pyrethroid products did not perform as well as Lorsban
- Grower Std (Lorsban Airblast) again lower in all categories

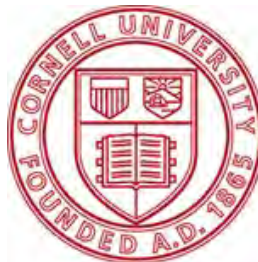
Still formulating recommendations

- Important to avoid stress to trees
- Trapping/monitoring adults using ethanol lures is useful
- Remove and destroy infested trees
- Ambrosia beetles are difficult to control with insecticides
 - ❖ must be closely timed with beetle attacks
 - ❖ multiple applications may be necessary
 - ❖ long residual activity a plus
 - ❖ best timing likely against emerging OW brood
 - ❖ systemic insecticides not effective
 - ❖ loss of Lorsban imminent



Results of Nursery Tree Trials in 2015

Deborah Breth & Elizabeth Tee
CCE-LOF



Cornell University
Cooperative Extension

Control Trials in Apple Nurseries

**Potted sleeping eye
on B9
8 Treatments,
4 trees per treatment,
4 reps
2 sites**





Treatments

Untreated – no flood

Untreated flooded (F)

Lorsban + F

Lorsban/Permup + F

Permup x2+ F

Grizzly Z x2 + F

Grizzly Z/Keyplex + F

Metarhizium x2 +F



- Applied treatments with CO₂ handgun – 40 psi
- 25 ml/tree sprayed both sides
- Rates based on 100 gallons dilute on label.
- Only saw a few holes while in pots.
- Many more holes visible when we pulled trees and scraped bark.

Potted Nursery Trees

Wafler - 2015		Total/16 trees					
Stress	Treatment	% Infested	Holes	Gallery	Adults	Brood	Adult dead
No F	untreated	0	0	0	0	0	0
F	untreated	38	14	3	3	2	2
F	Lorsban	13	2	0	0	0	0
F	Lorsban then Permup	13	2	0	0	0	0
F	Permup x2	38	10	0	3	0	4
F	Warrior x2	56	16	1	3	0	2
F	Warrior then Keyplex	25	6	2	7	1	3
F	Metarhizium	6	1	0	0	0	0

Potted Nursery Trees

Roberts - 2015		Total/16 trees					
Stress	Treatment	% Infested	Holes	Gallery	Adults	Brood	Adult dead
No F	untreated	0	0	0	0	0	0
F	untreated	0	0	0	0	0	0
F	Lorsban	13	5	0	0	0	0
F	Lorsban then Permup	0	0	0	0	0	0
F	Permup x2	38	6	1	2	1	0
F	Warrior x2	6	1	0	0	0	0
F	Warrior then Keyplex	13	5	4	1	4	3
F	Metarhizium	0	0	0	0	0	0

Results

- Lorsban clearly worked the best in Wafliers
- Without infestation in untreated checks, Roberts trial is unclear – the larger adjacent trees were more attractive than tiny nursery trees.
- Trees were probably too stressed.
- *Metarhizium* was interesting – but burned all green leaves that it contacted.

Control must be an integrated approach!

- Prevent stress ?

It is all about **site selection** – water drainage, irrigation, air drainage, frost protection

Good disease prevention – fire blight, phytophthora

- Remove and destroy infested wood – don't just push in a pile in hedgerow...

You might wait until after the first flight before pulling trees.

Remove the stump too !



**Correct the
problem
before
replanting.**



Acknowledgements

- **Agnello – Hatch grant to monitor and test controls in established orchards**
- **Breth – NYFVI grant to monitor and test controls in apple nurseries**
- **Cox – identified pathogenic fungi and bacteria associated**
- **John Vandenberg and Lab – USDA, Ithaca**
- **Elizabeth Tee collected trap data**

Cooperators & Assistants

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- Gary Roberts, Roberts Fruit Farms, Medina, NY
- Wafler Nursery, Wolcott, NY
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