

# Attract-and-Kill Technology: Progress and Future Directions

Jim Hepler and Elizabeth Beers

Washington State University

Tree Fruit Research and Extension  
Center, Wenatchee, WA



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*Collaborating Institutions*

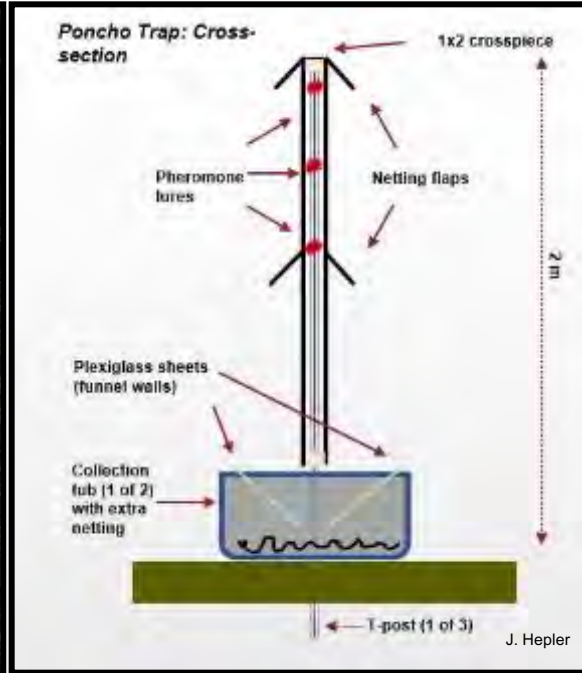
  

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# The Poncho Trap: A Novel Attract-and-Kill Trap Design





# Poncho Trap: Key Design Elements



- 1. Sewn-in arrestment flaps**
- 2. Retention tubs with collection funnels**
- 3. Dark coloration**



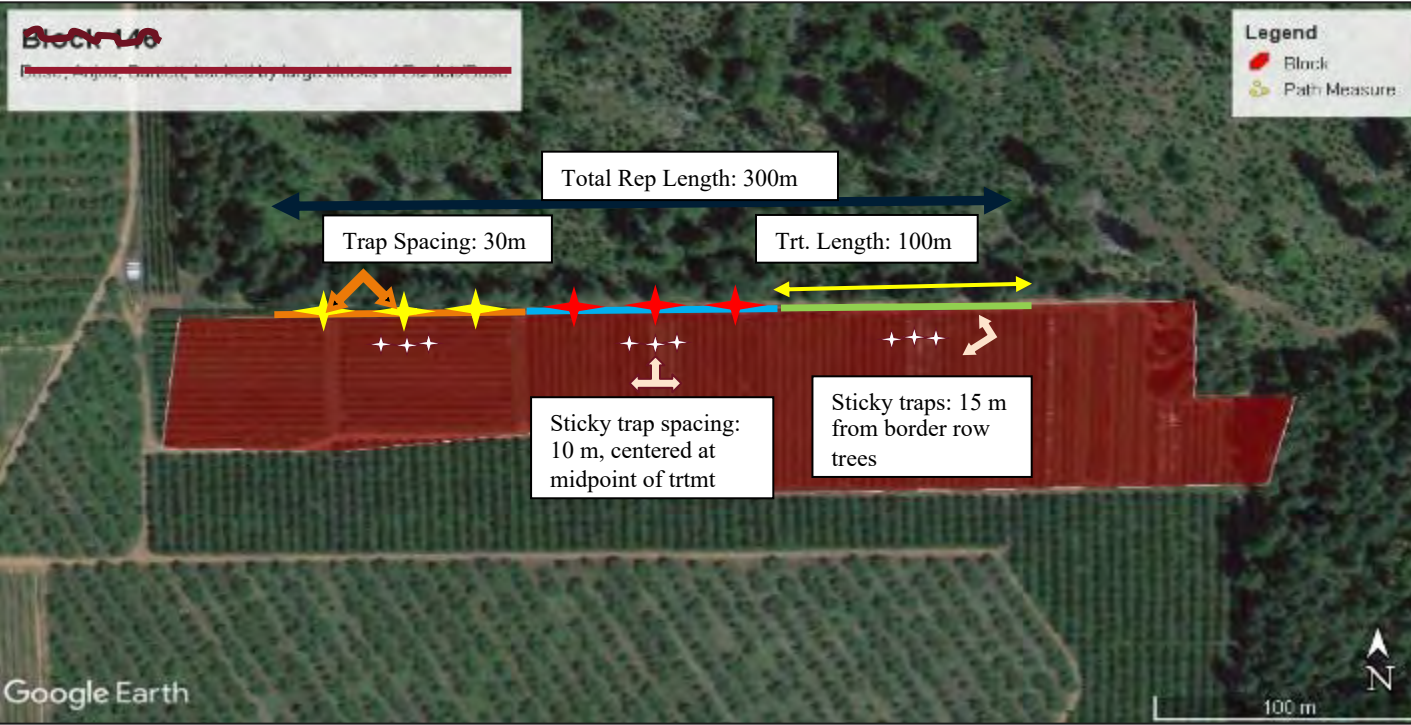
# 2019 Attract-and-Kill Field Trial

- **10 Replicates in CRBD**
- **Ghost vs. poncho vs. no AK**
  - traps along border (outside of orchard)
- **Trap contents collected 4 times from August-October**
- **Harvested fruit evaluations**
  - 10 fruit/tree from 8 trees in each treatment
  - Fruit placed in cold storage for ~3 mo.
  - Stink bug damage to be evaluated via dissection

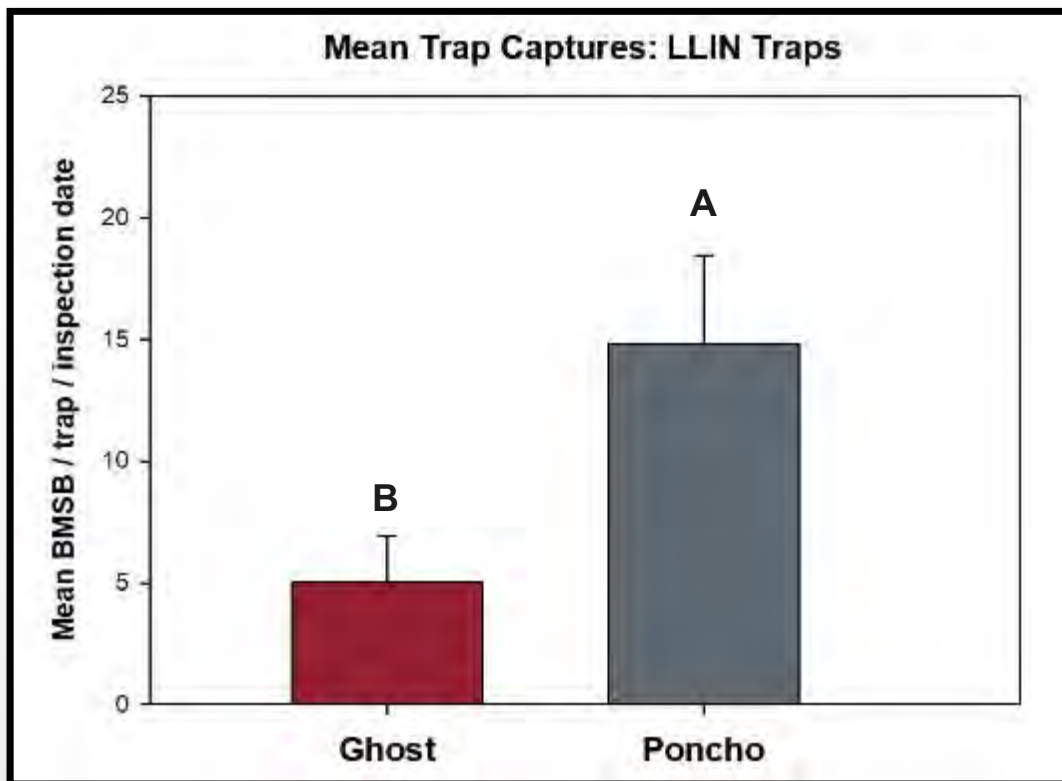




# 2019 Attract-and-Kill Field Trial

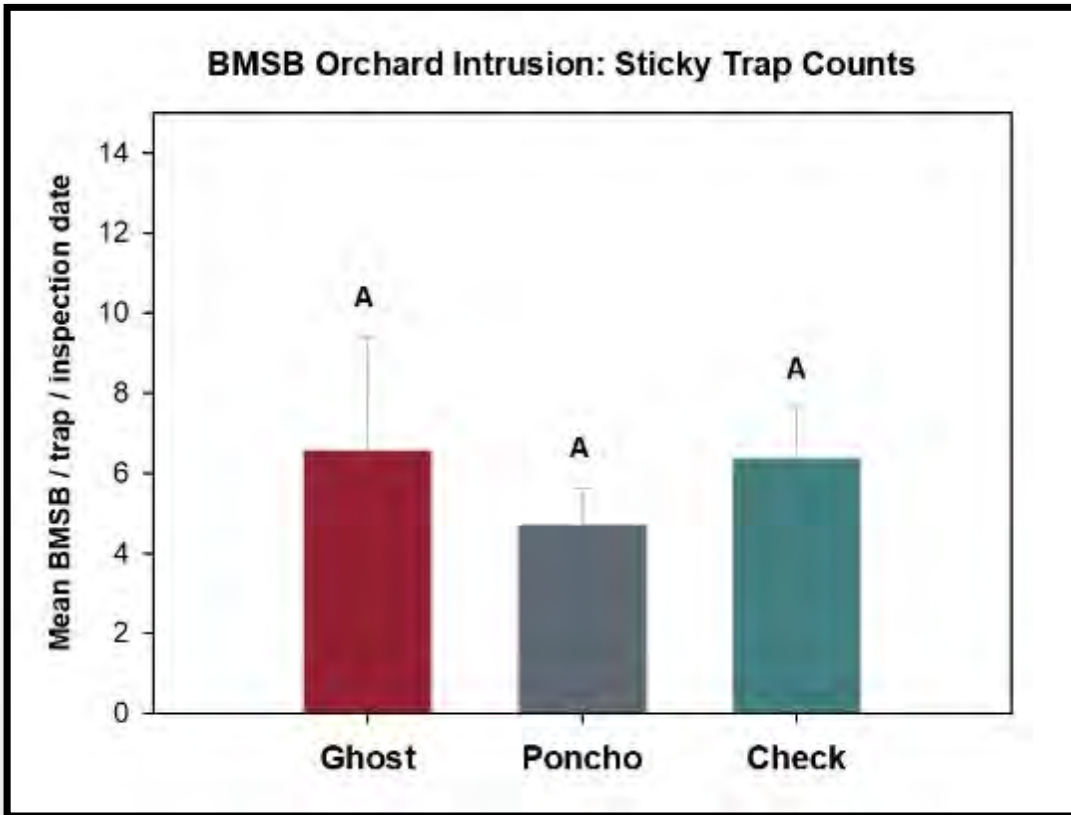


# 2019 AK Trial Results: LLIN Trap Captures



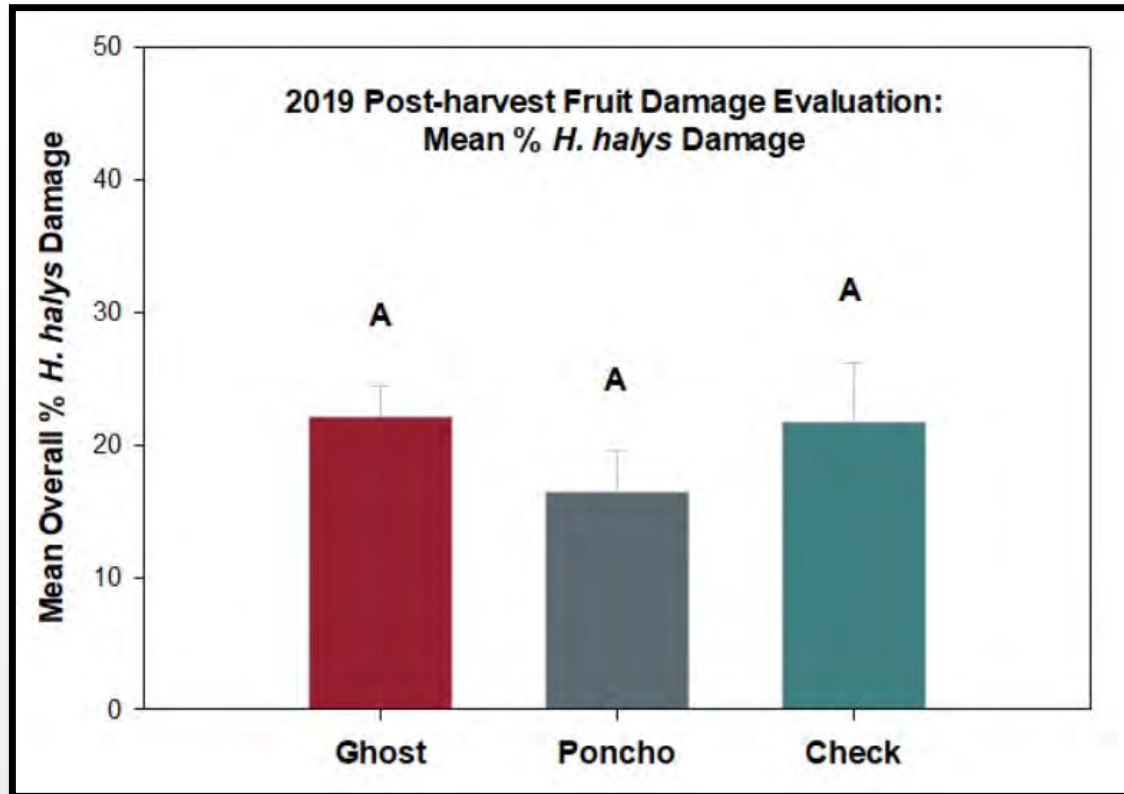


## 2019 AK Trial Results: BMSB Intrusion





# 2019 AK Trial Results: Post-harvest Damage Assessments





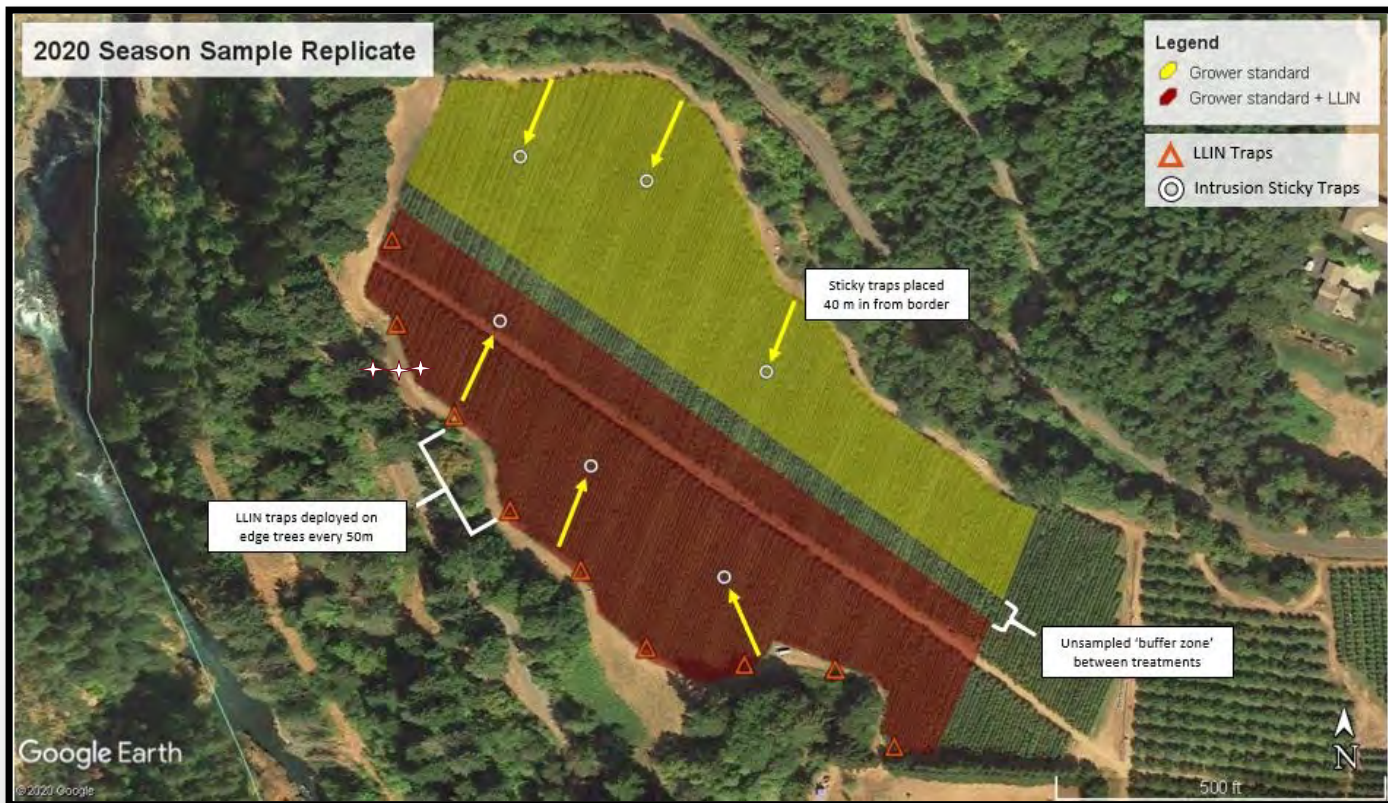


# 2020: Modified Approach

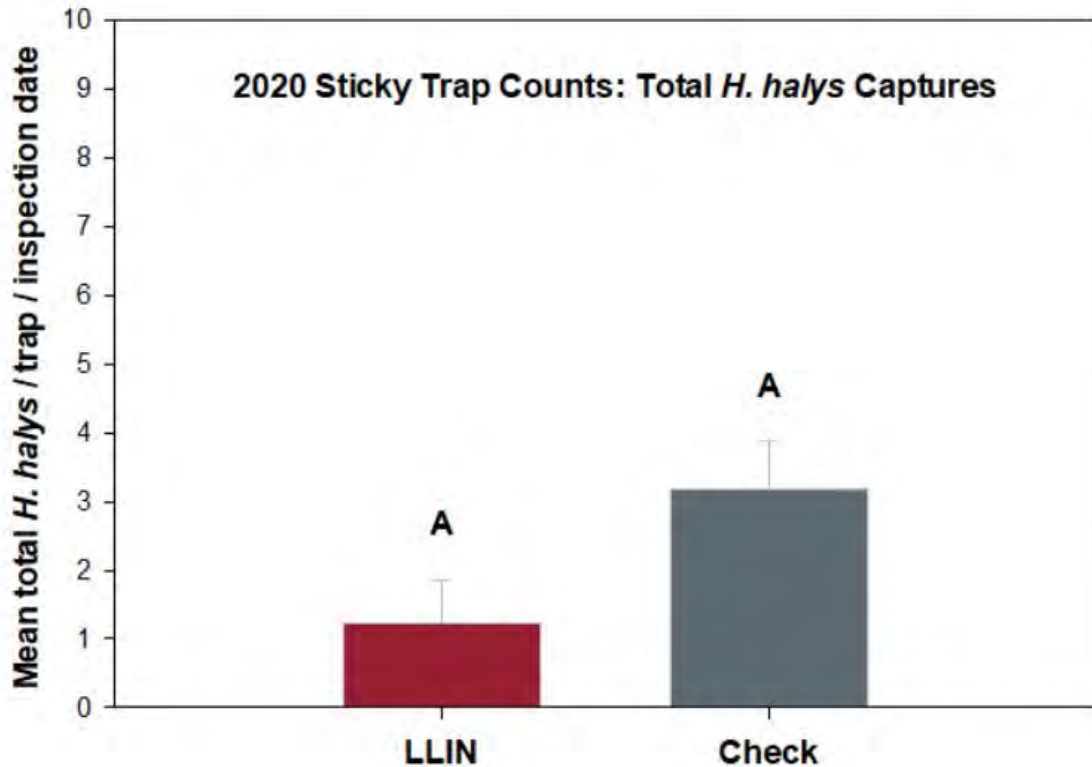
- **Simplified traps: LLIN hung directly on border trees, 50m spacing**
- **Increased border coverage**
- **Sticky traps 40 m into orchard interior to monitor intrusion**
- **Grower standard vs. grower standard + LLIN**
- **Fruit damage assessments**



# 2020 Simplified AK Field Trial

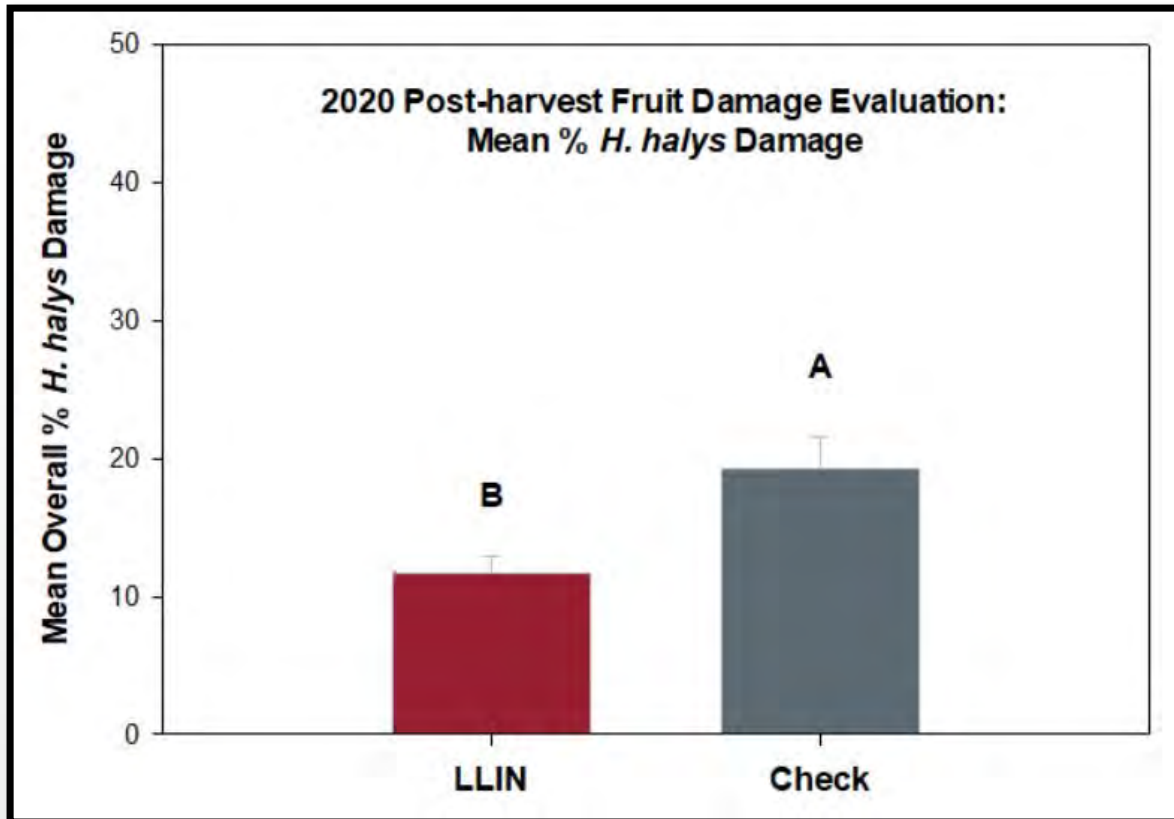


# 2020 AK Trial Results: Sticky Trap Captures



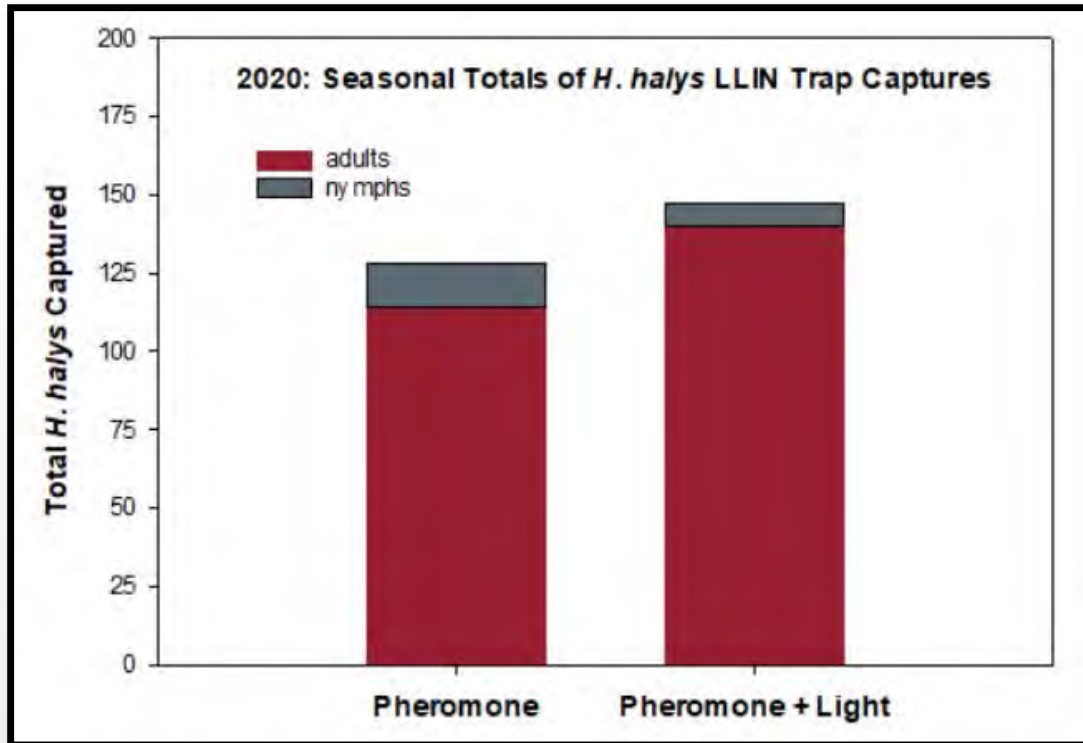


## 2020 AK Trial Results: Fruit Damage



# 2020 Light Trap + Poncho Trap Pilot Study

Early August – early November





# ORCHARDS WITH GHOST TRAPS



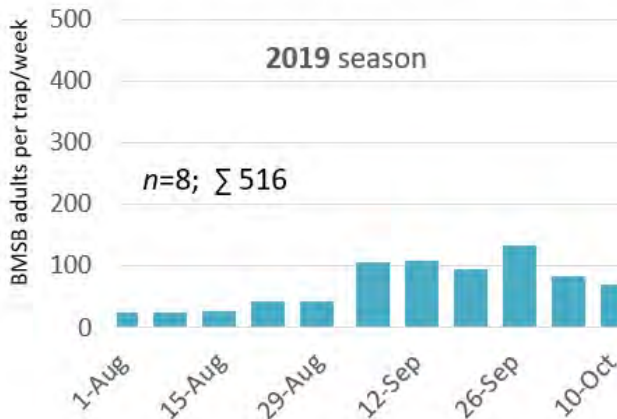
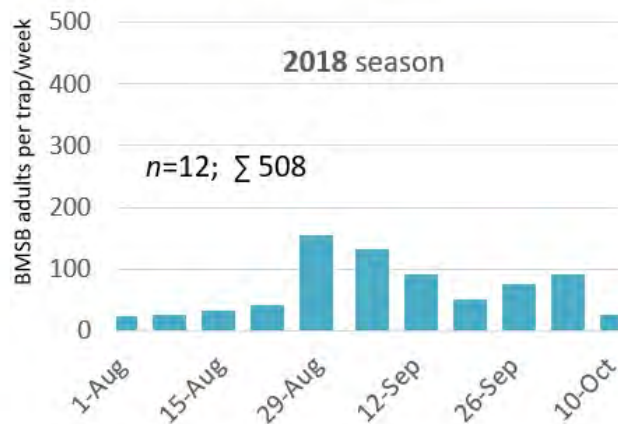
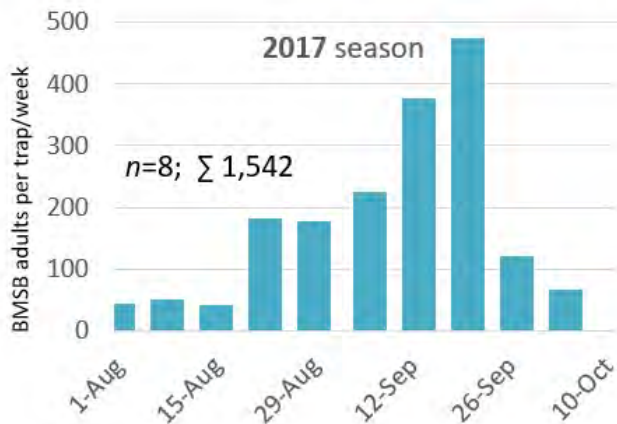
Krawczyk Lab  
Penn. State University





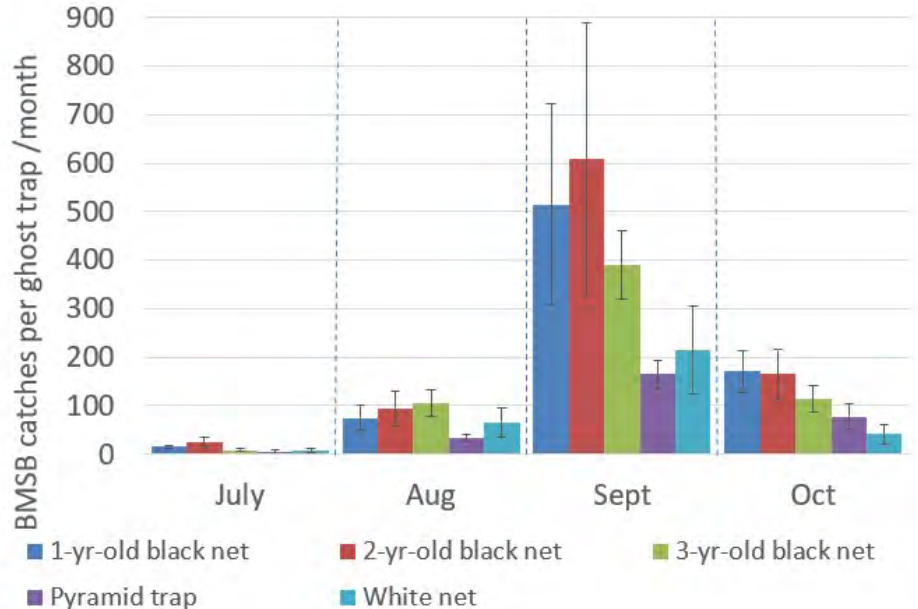
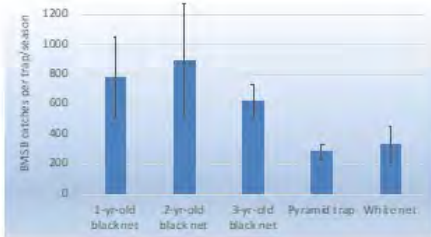
# BMSB CAPTURES IN GHOST TRAPS

BL Orchard, Adams County, PA



# BMSB MONITORING, NET AGE COMPARISON

Pherocon BMSB lure, 2019 season

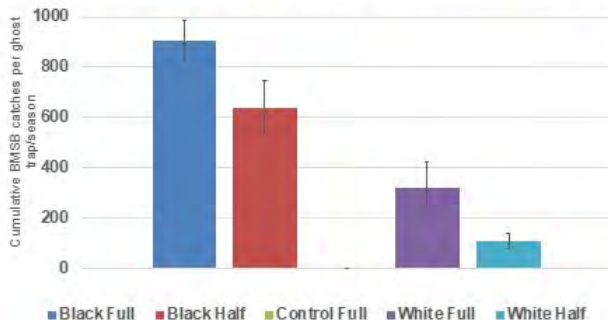


Each ghost trap was baited with 3 Pherocon BMSB commercial lures. July-Oct 2019  
Greg Krawczyk, PSU FREC 2020

# BMSB MONITORING, NET SIZE COMPARISON

Pherocon BMSB lure, 2019 season

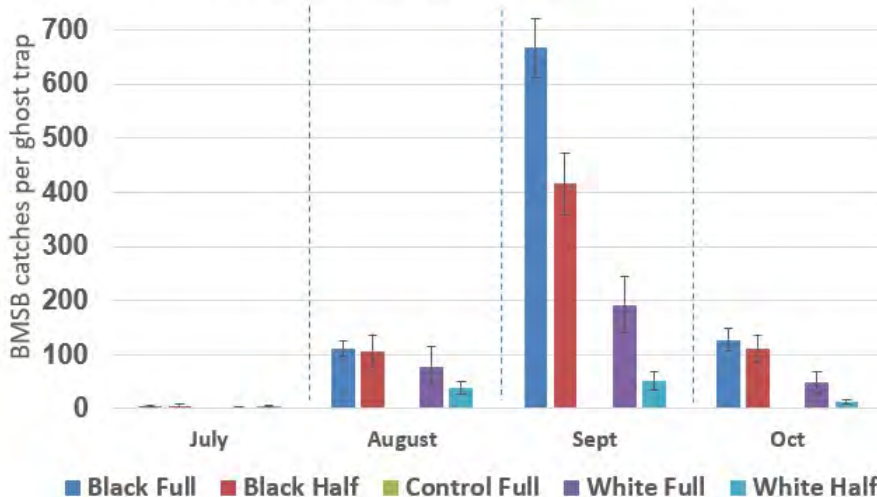
Net size comparison



Each trap was baited with 3 Pherocon BMSB commercial lures (Trece, Inc.)  
July-Oct 2019



Net Comparison project, Adams Co. 2019



# NC Attract and Kill Studies on Apples

Walgenbach Lab, NCSU

- Depending on cost of the most effective use pattern, A&K is likely to be a supplement to insecticidal control
  - Highly susceptible cultivars (e.g., Granny Smith, Pink Lady)
  - Situations where late-season insecticide use is difficult (e.g., pick-your-own operations)
- Objectives
  - Compare lure dose as an attractant
  - Compare distance between A&T stations

# A&K Lure Dose Study

(7 site replications. Granny Smith, Rome)

## A&K Stations

- 7' metal fence post
- Deltamethrin netting
- Trécé Dual Lures



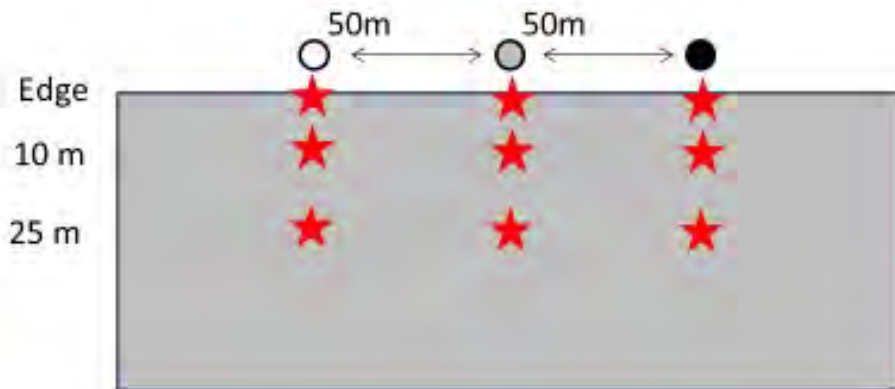
## Experimental Design

○ None

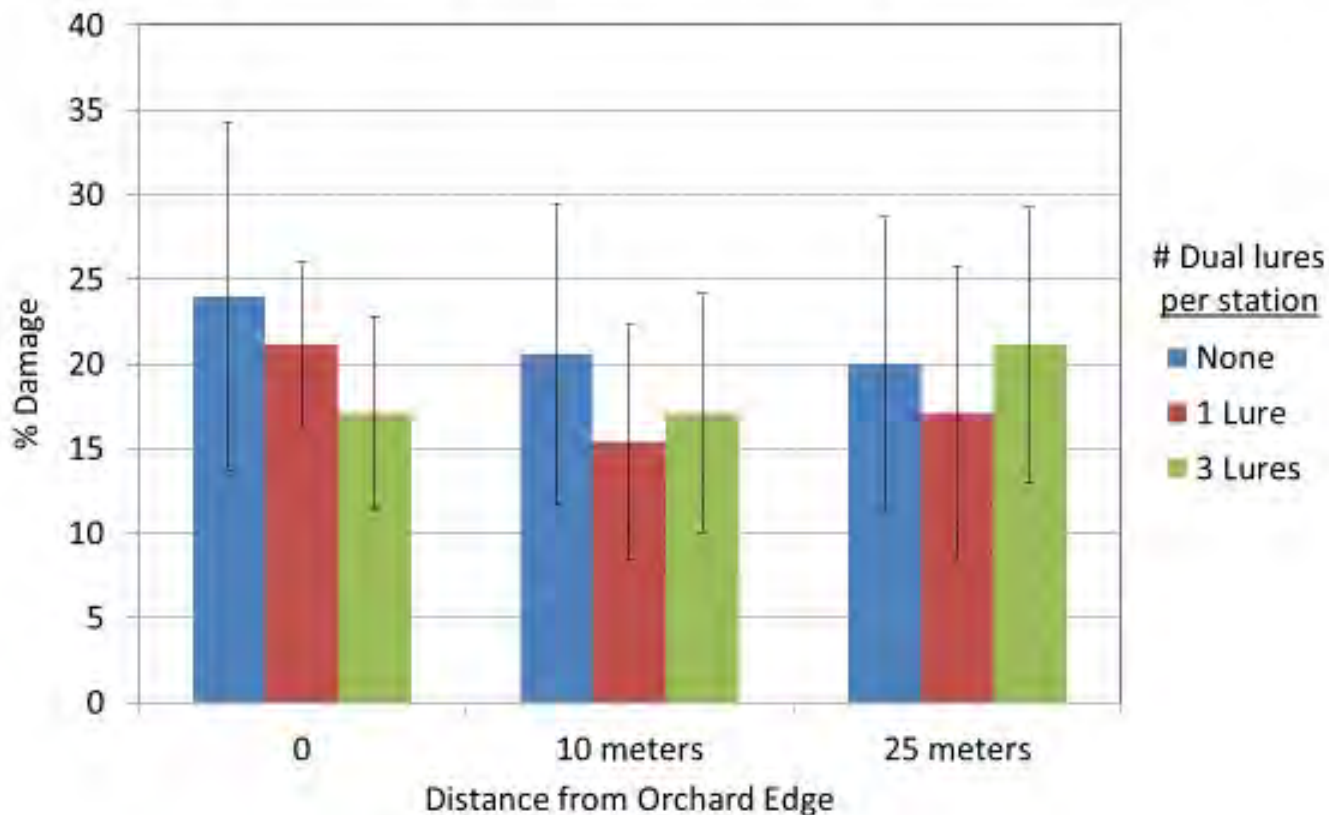
◐ 1 lure

● 3 lures

★ Fruit Sample sites



## BMSB Damage in Attract & Kill Studies - 2020

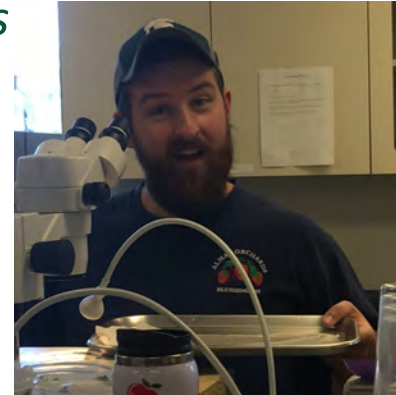






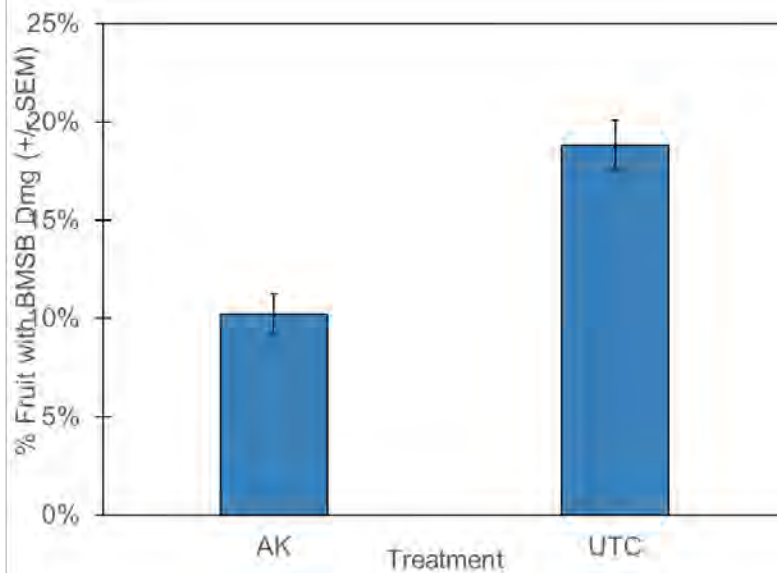
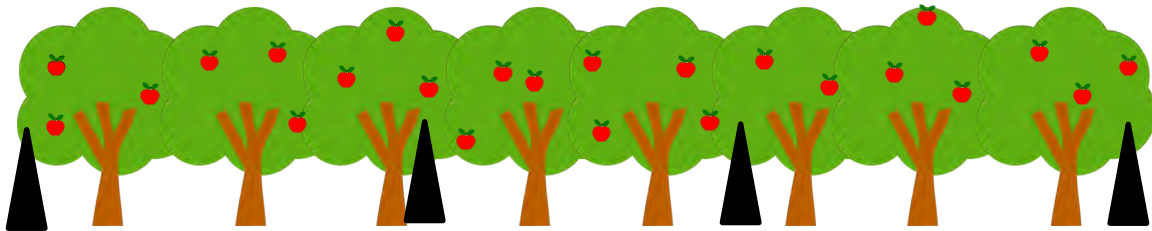
## *Attract and Kill using LLIN traps*

- Deployed at 3 sites; 3-7 acre plots
  - 30m apart along perimeter, baited with high-dose BMSB dual-component lure
  - Fruit injury counts at harvest
- 
- 4' x 3' sheet of deltamethrin netting
  - hung ~3' from the ground
  - secured shepherd crook post, wooden post or fence
  - Weed barrier cloth placed on ground directly underneath the netting



Research coordinated by  
John Pote





- AK treatment significantly reduced damage
- Still, 10% damage in AK, requires supplementing controls
- Difficult to deploy LLIN traps along borders of commercial orchards
- Need to test the efficacy of AK using Rescue traps

Transitioning From Spraying Baited Trees to Deploying Baited Long-Lasting Insecticide Treated Nets As A Killing Agent for Attract and Kill in Apple Orchards (2017-2020)



KEY QUESTION: Where should nets be positioned relative to the orchard trees to maximize behavioral manipulation of and impact against BMSB?

# Treatments Evaluated in Commercial Orchards



## 1. Baited LLINS Outside Orchard

*\*decouples attractive stimuli (host plant and pheromone combined) from killing agent*



## 2. Baited LLINS on Border Trees

*\*best behaviorally as it combines attractive stimuli (host plant + pheromone) with killing agent*



## 3. Standard Grower Program

*(Control)*



## 4. Baited LLINS Next To Border Trees

*\*compromise between behavior and regulatory issues*



## MONITORING IS A CRITICAL PIECE

- Monitoring BMSB in center of attract and kill and grower standard blocks with baited clear sticky panels deployed atop wooden posts.
- Utilize a threshold of 4 adults/trap (cumulative) to trigger ARM or Complete Sprays.
- Any behaviorally-based management strategy can require intervention when relative densities of pest populations become too high.





Baited LLIN Outside Orchard

- **12.5-12.7%** Injury At Harvest (Blocks with LLINS Outside)
- **3.5-7.0%** Injury At Harvest in Sprayed Control

*NOT AS EFFECTIVE. INJURY HIGHER THAN SPRAYED ORCHARDS. More threshold-triggered sprays.*



Baited LLIN ON Orchard Trees

- **2.0-9.2%** Injury At Harvest (Blocks with LLINS on Apple Trees)
- **2.5-13.5%** Injury At Harvest in Sprayed Control

*MORE EFFECTIVE. INJURY LOWER OR EQUIVALENT TO SPRAYED ORCHARDS. Fewer threshold-triggered sprays.*

*\*\*\*CLOSELY ASSOCIATES HOST TREE, PHEROMONE LURE AND KILLING AGENT, MAXIMIZING ATTRACTION, RETENTION AND KILL*



Baited LLIN NEXT TO Orchard Trees

- **6.5%** Injury At Harvest (Blocks with LLINS Next To Apple Trees)
- **7.0%** Injury At Harvest in Sprayed Control





# Acknowledgements



- BMSB SCRI CAP Team and Leskey Lab Members

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**Thank You**

**It's time for a few polling  
questions**