Progress In Pheromone-Based Trapping

Tracy Leskey, Ashot Khrimian, Aijun Zhang, Don Weber, Doug Pfeiffer, Cesar Rodriguez-Saona, George Hamilton, Dean Polk, Chris Bergh, Paula Shrewsbury, Galen Dively, Greg Krawczyk, Jay Brunner, Peter Shearer, Peter Jentsch, and Art Agnello

USDA

- Visual Stimulus
  - Large black pyramid
- Olfactory Stimuli
  - BMSB aggregation pheromone
  - Synergist
- Capture Mechanism
  - Tapered pyramid to inverted funnel jar with DDVP toxicant strip
- Deployment Strategy
  - Traps placed in peripheral row of orchard

Broad Validation in Multi-State Trial

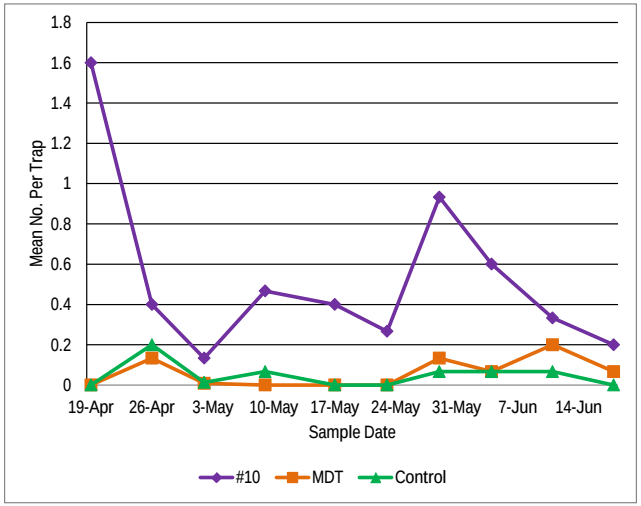
- Is BMSB attracted to #10 in the early season?
- Is BMSB attracted to #10 season-long?
- How attractive is this stimulus relative to MDT and unbaited traps?
- WV, MD, VA, PA, NJ, NY, DE, NC, OR, WA, and OH

General Protocol

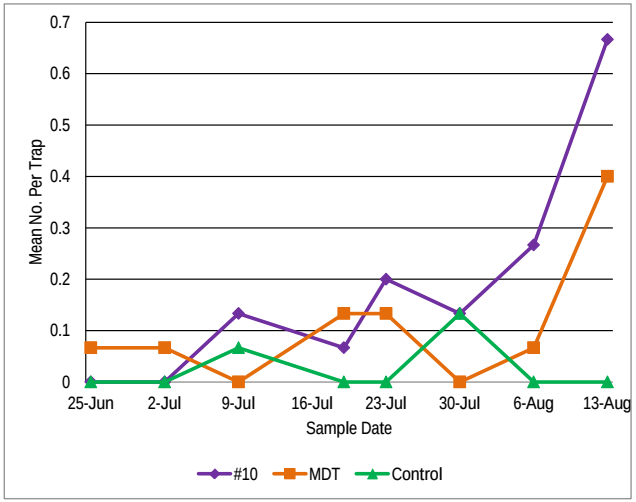
- Black pyramid traps
- Three odor treatments
  - 1) #10
  - 2) MDT
  - 3) unbaited control
- Traps are deployed between wild host habitat and agricultural production area.
- Traps were deployed in mid-April and left in place season-long.

Reliable Season-Long Monitoring in Commercial Orchards

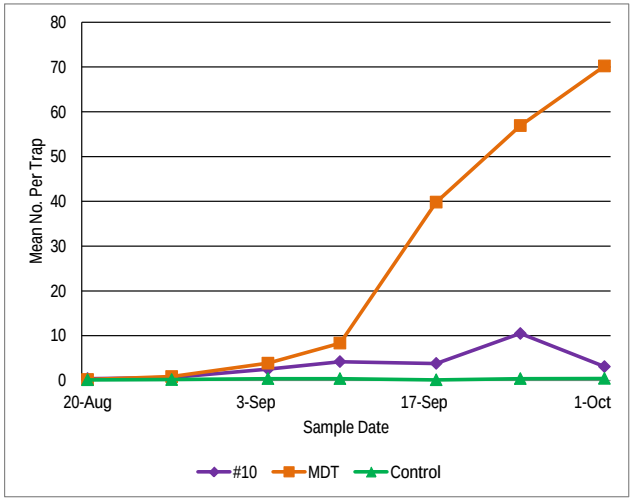
Early Season
Mid-April – Mid June



Mid-Season
Mid June - Mid August

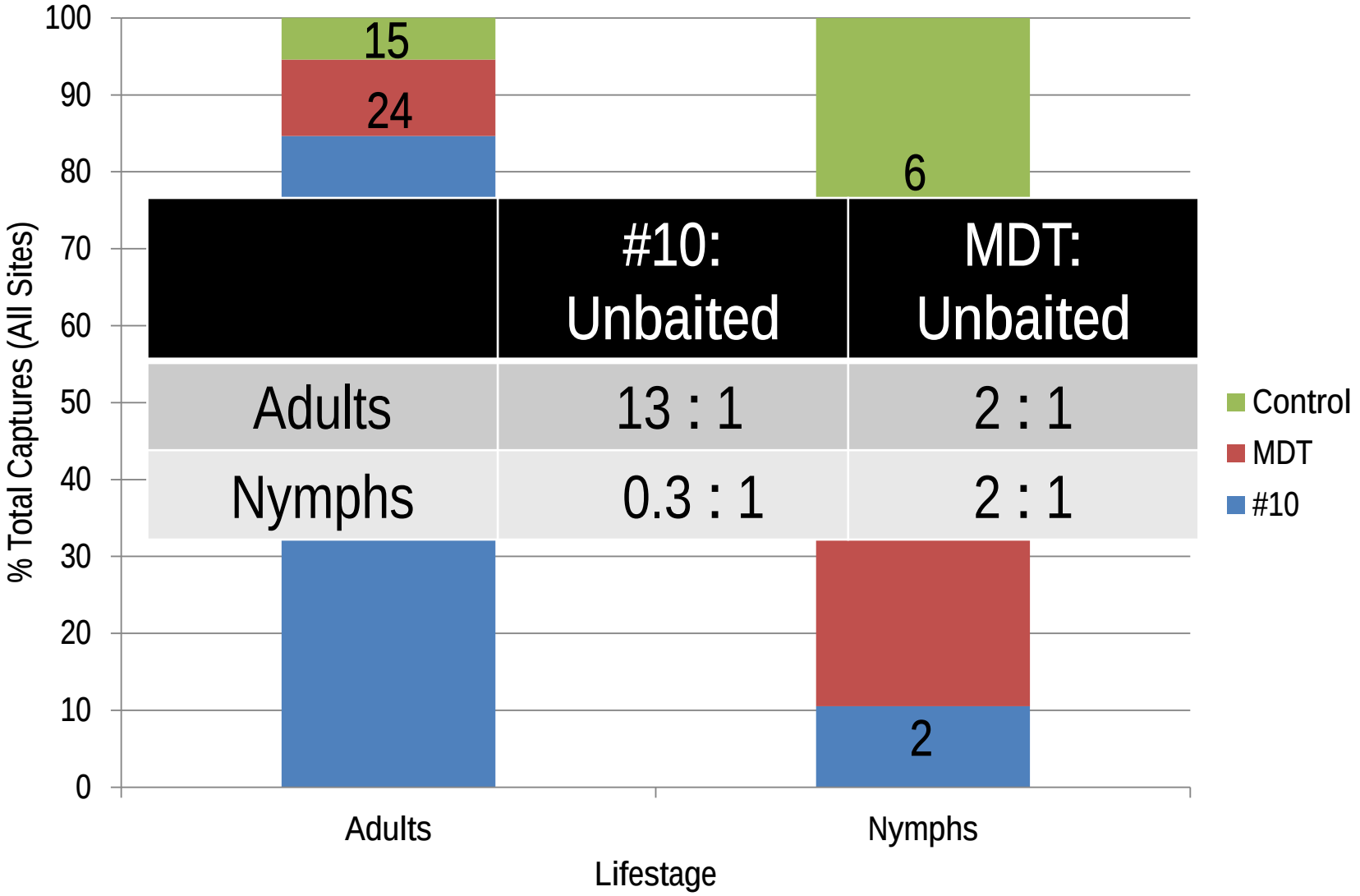


Late Season
Mid-August – Early October



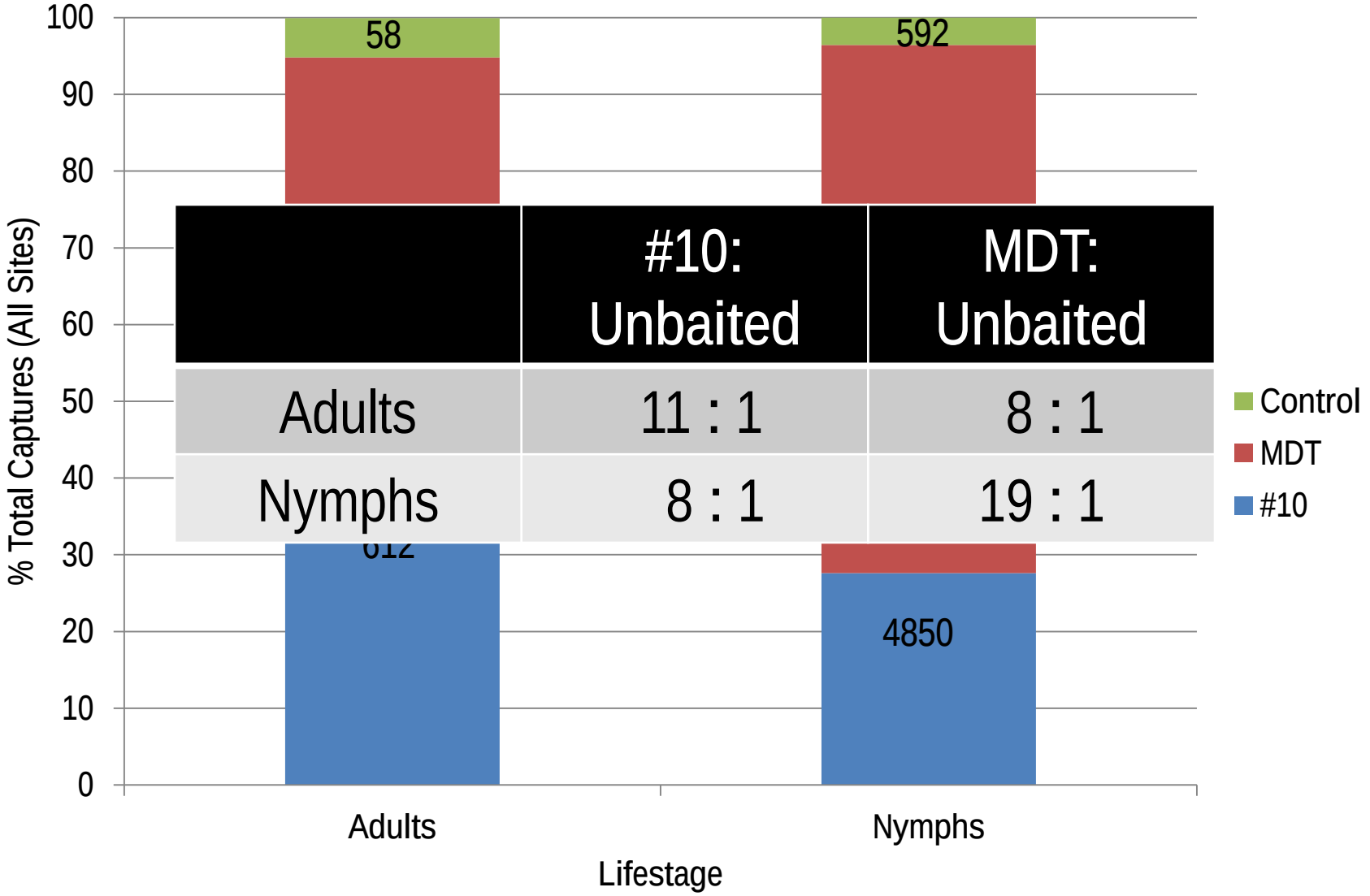
- BMSB reliably captured during early season.
- Low numbers during much of mid-season.
- MDT very attractive and #10 attractive in the late season.

Early Season
Mid-April – Mid June



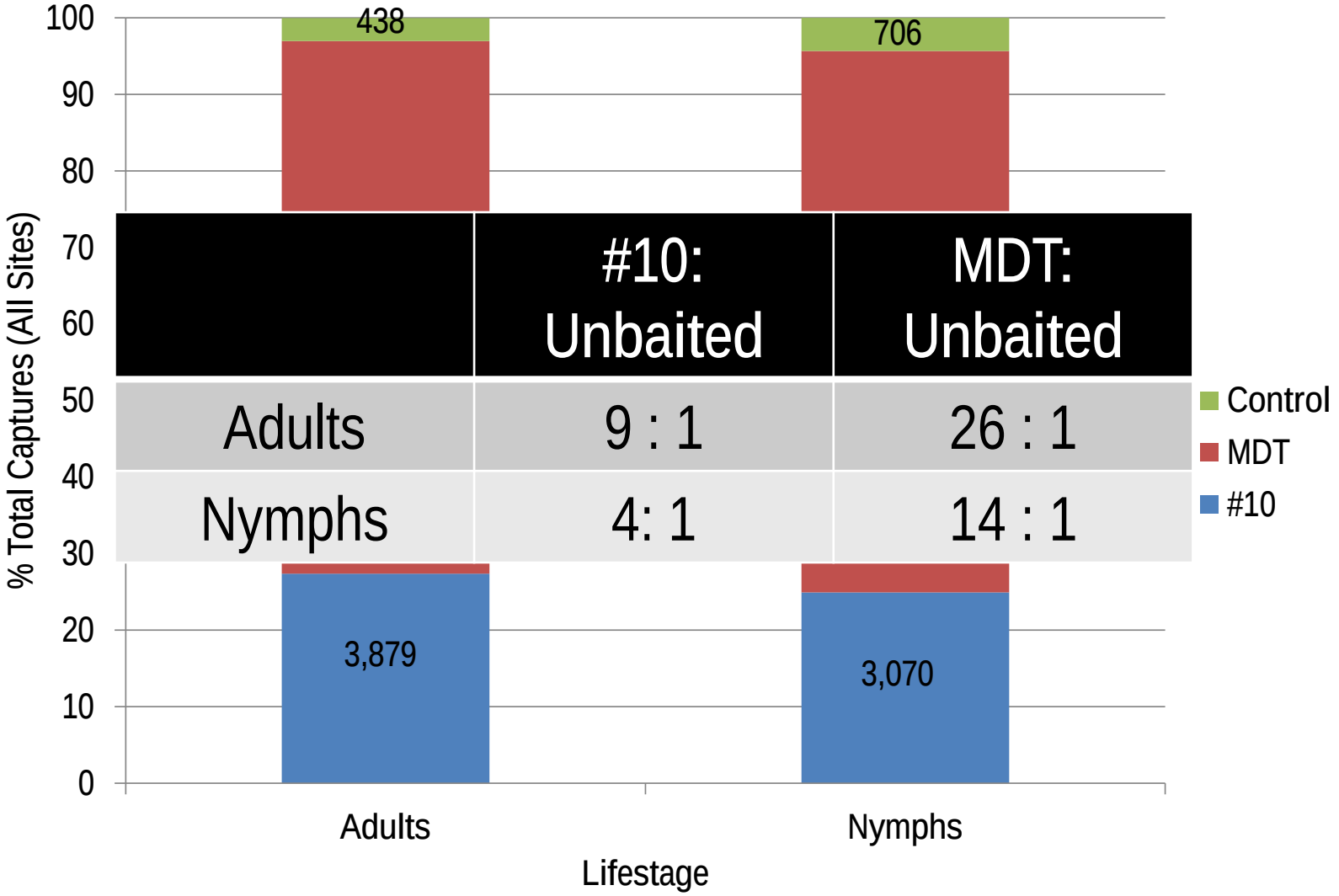
	#10: Unbaited	MDT: Unbaited
Adults	13 : 1	2 : 1
Nymphs	0.3 : 1	2 : 1

Mid-Season
Mid June - Mid August



	#10: Unbaited	MDT: Unbaited
Adults	11 : 1	8 : 1
Nymphs	8 : 1	19 : 1

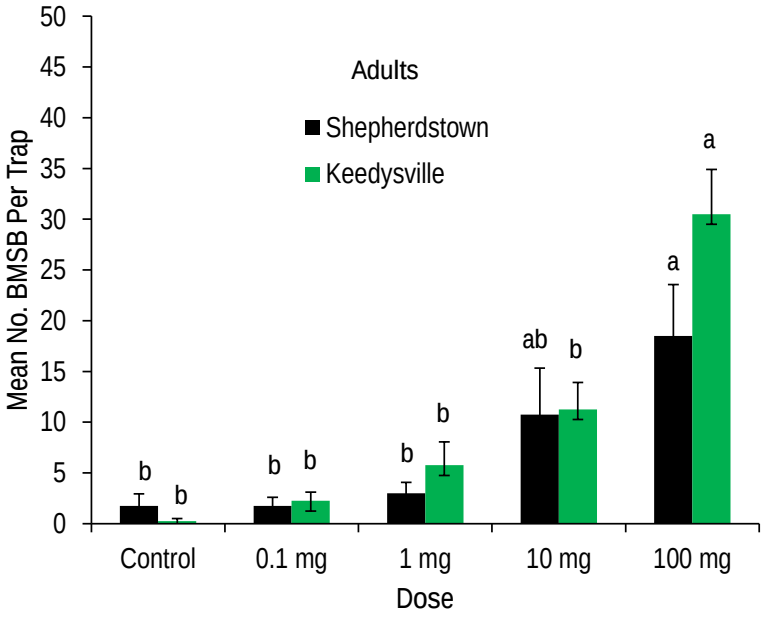
Late Season
Mid-August – Early October

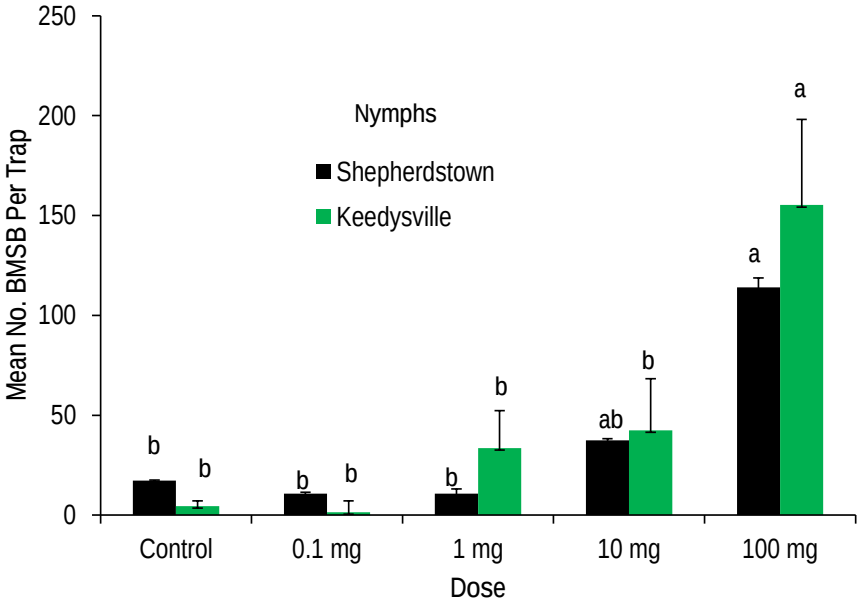


Dose Response Trial

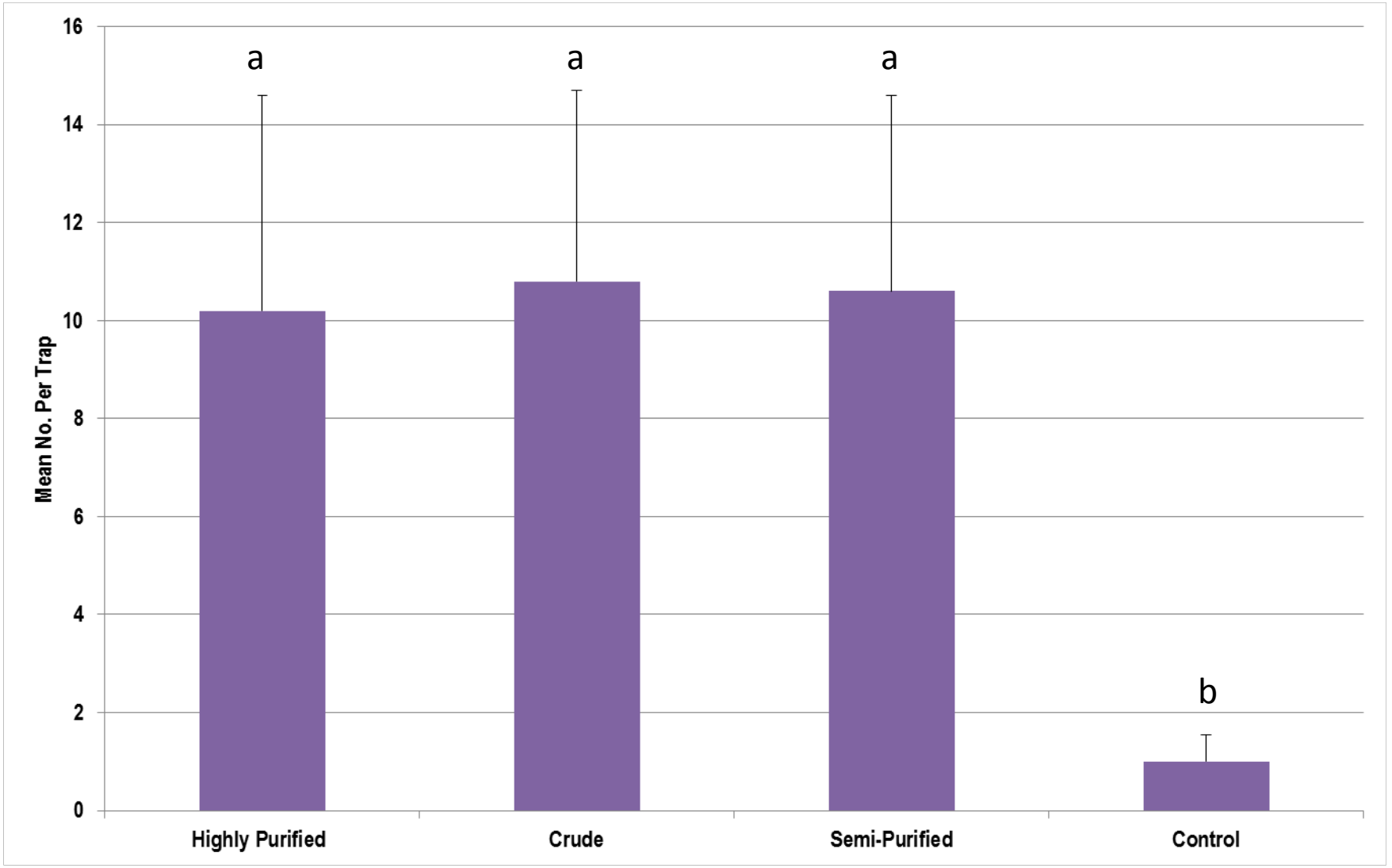
June 14-July 19, 2012

11:1 Ratio (Baited: Unbaited) for 10 mg lure
~25:1 Ratio (Baited: Unbaited) for 100 mg lure





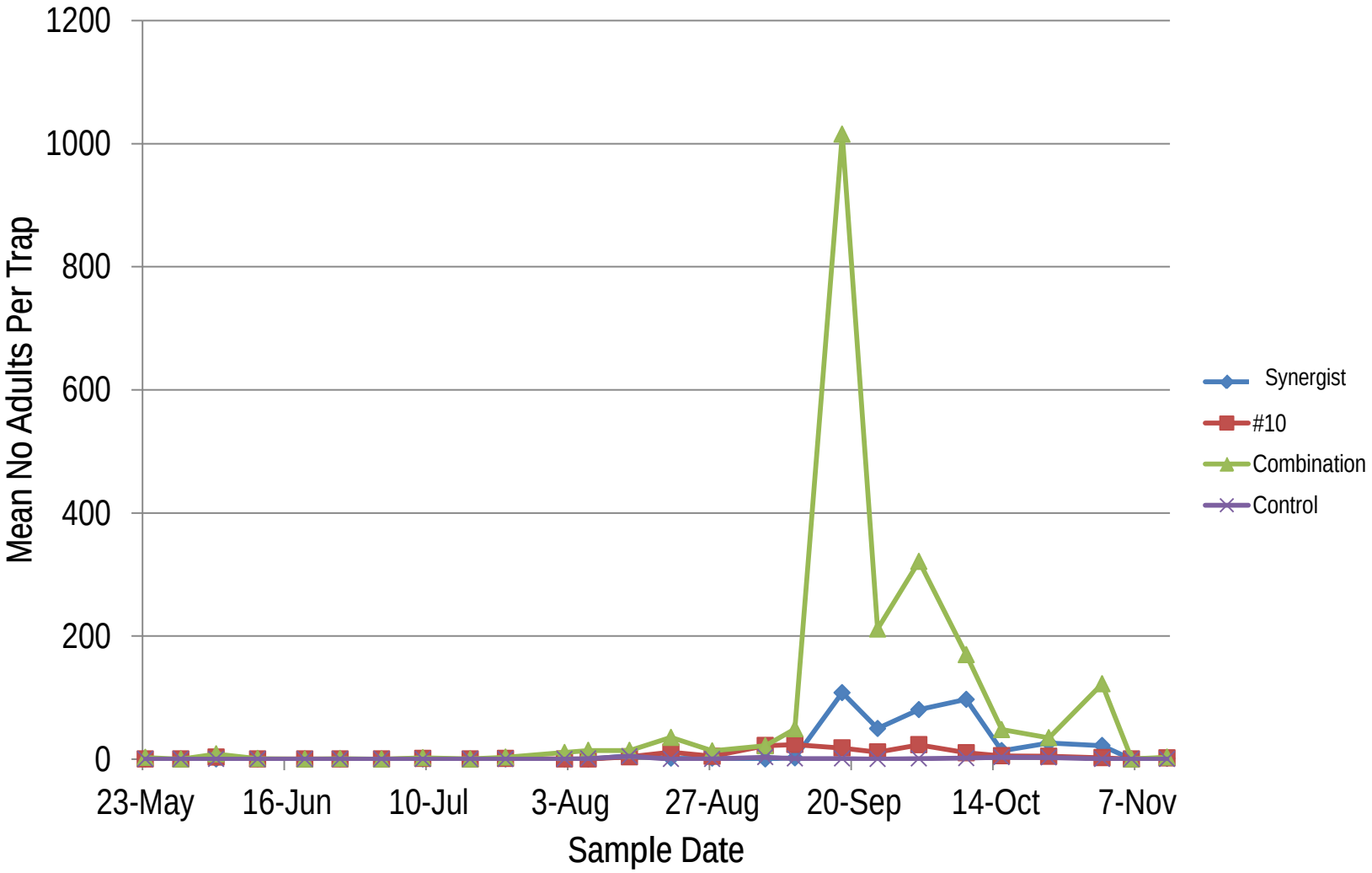
Lure Affordability: Encouraging Results from Purity Trial



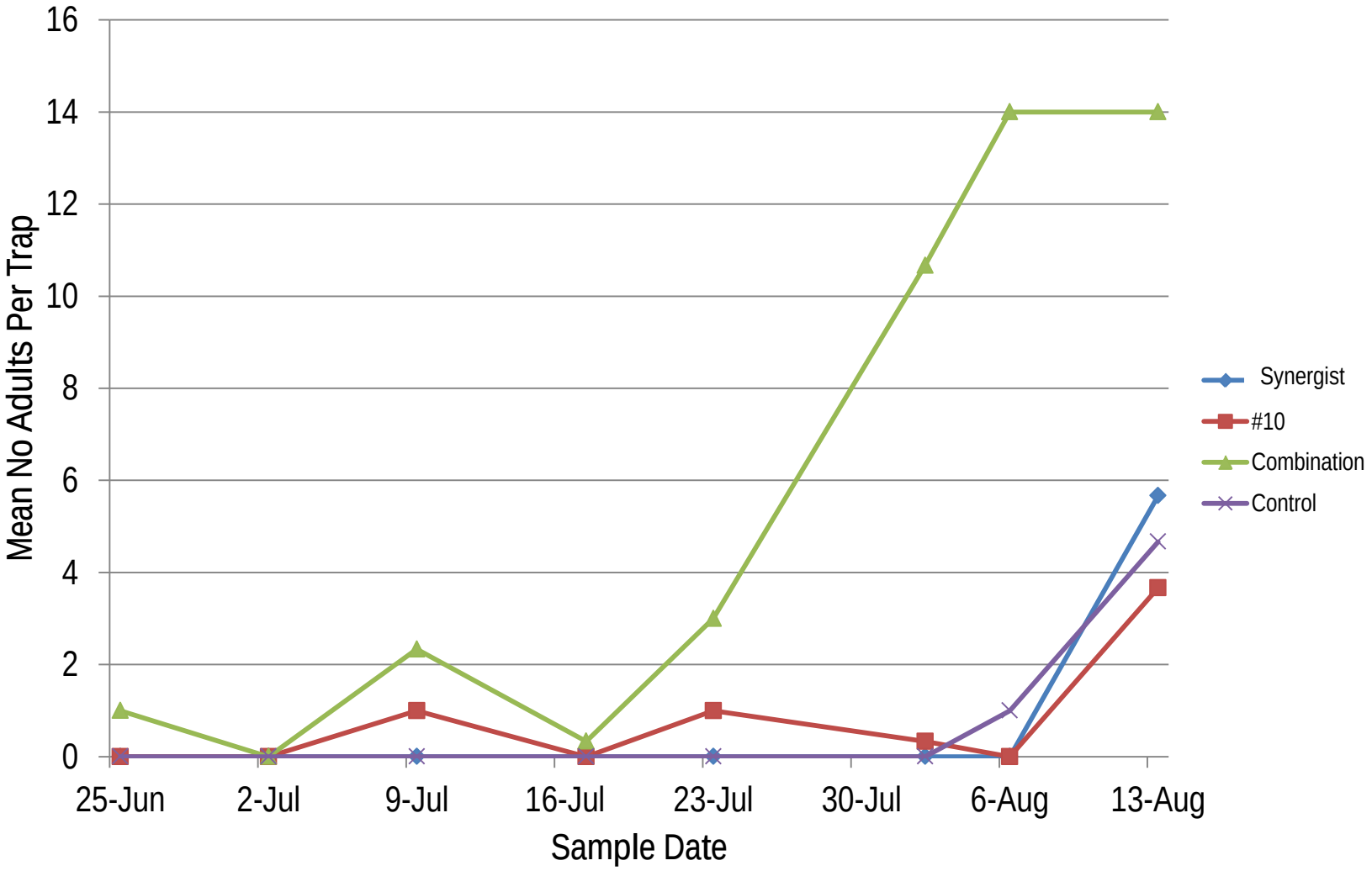
Effect of Synergist

Control	1 x	1 x
#10	8–11 x	2-4 x
#10 + Synergist	~5-120 x	~5-100 x

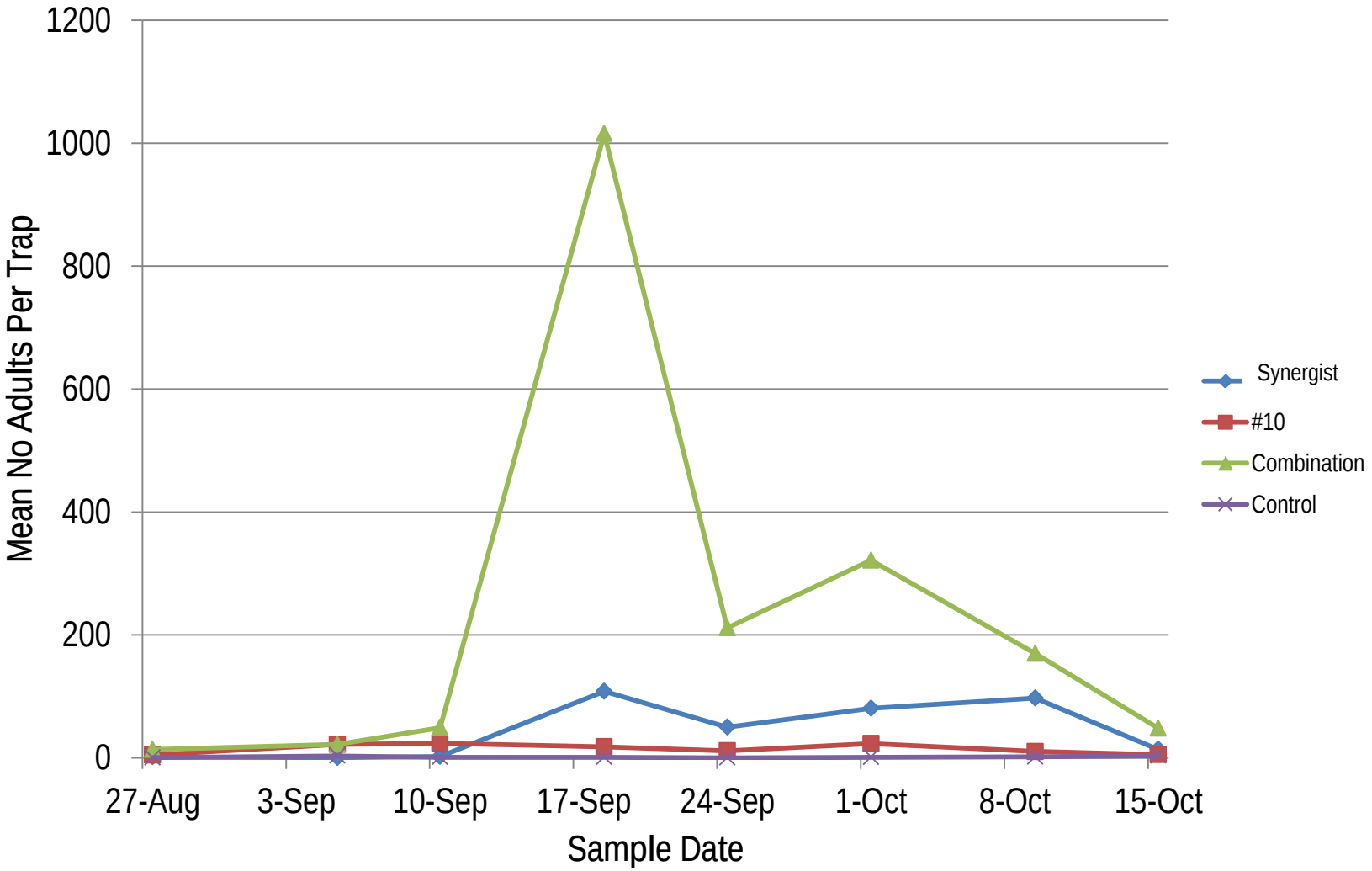
Season-Long Synergist Results Mid-May – Mid November



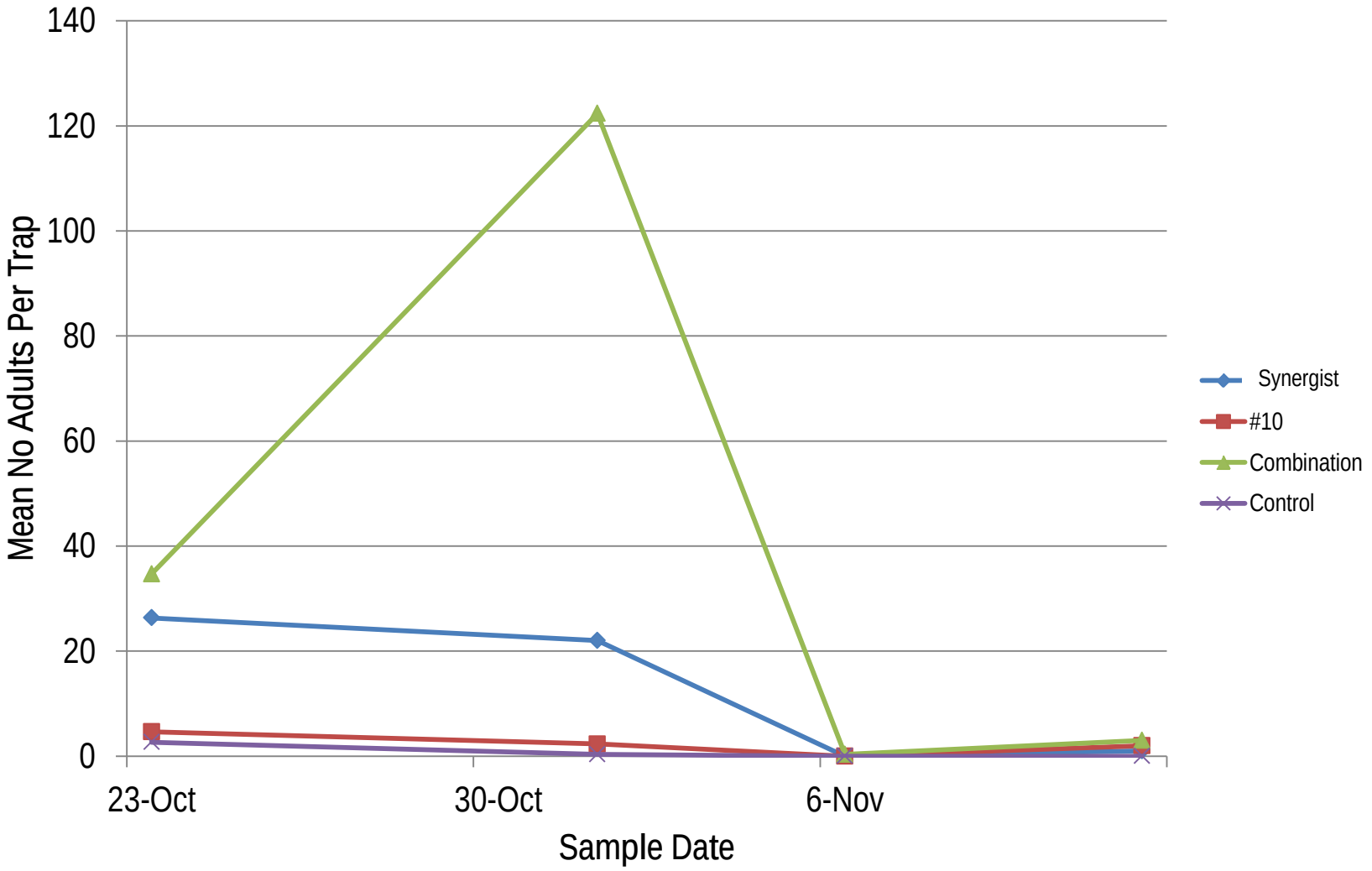
Mid-Season
Mid June - Mid August



Late Season
Mid-August – Mid October



Post-Harvest
Mid-October – Mid-November

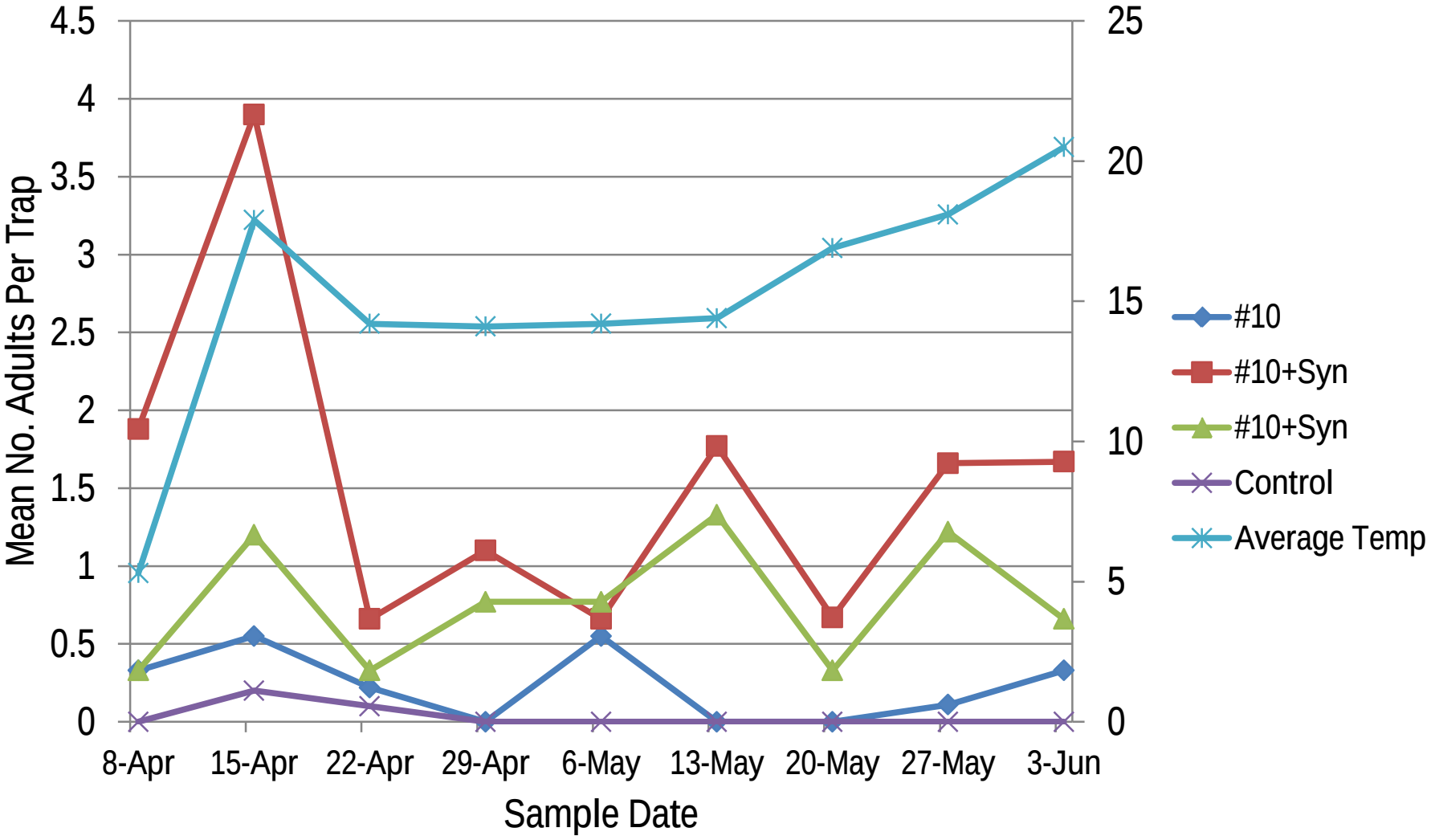


Broad Validation in Multi-State Trial in 2013

- Document season-long patterns of activity.
- Compare commercially available synergists in combination with #10
- ME, NH, CT, MA, PA, NJ, VA, WV, MD, DE, NC, FL, AL, MI, OH, IA, MO, UT, CA, OR, WA

Season-Long Captures in Apple in 2013

April 3-June 3 2013

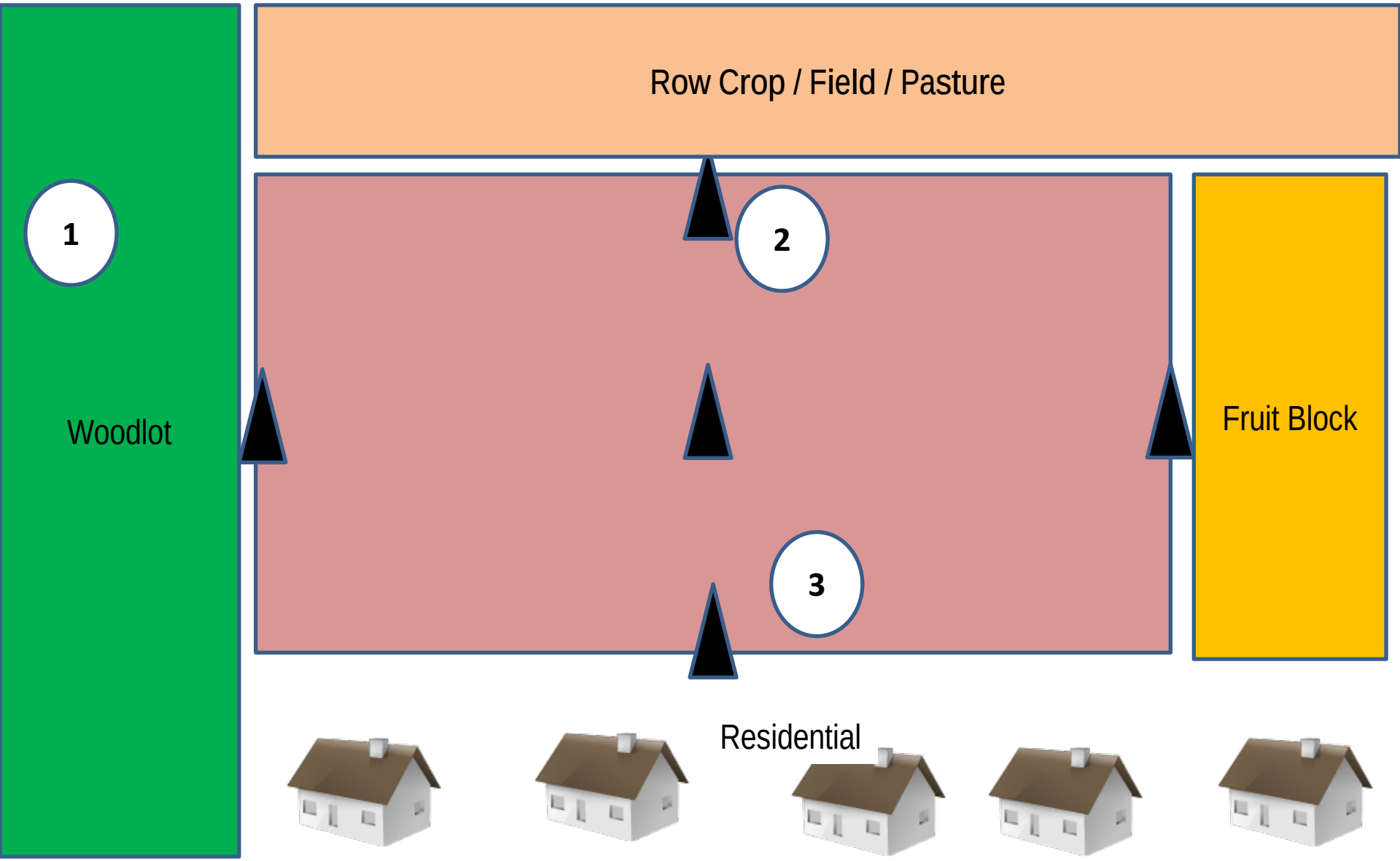


Coordinated Trial Results To Date

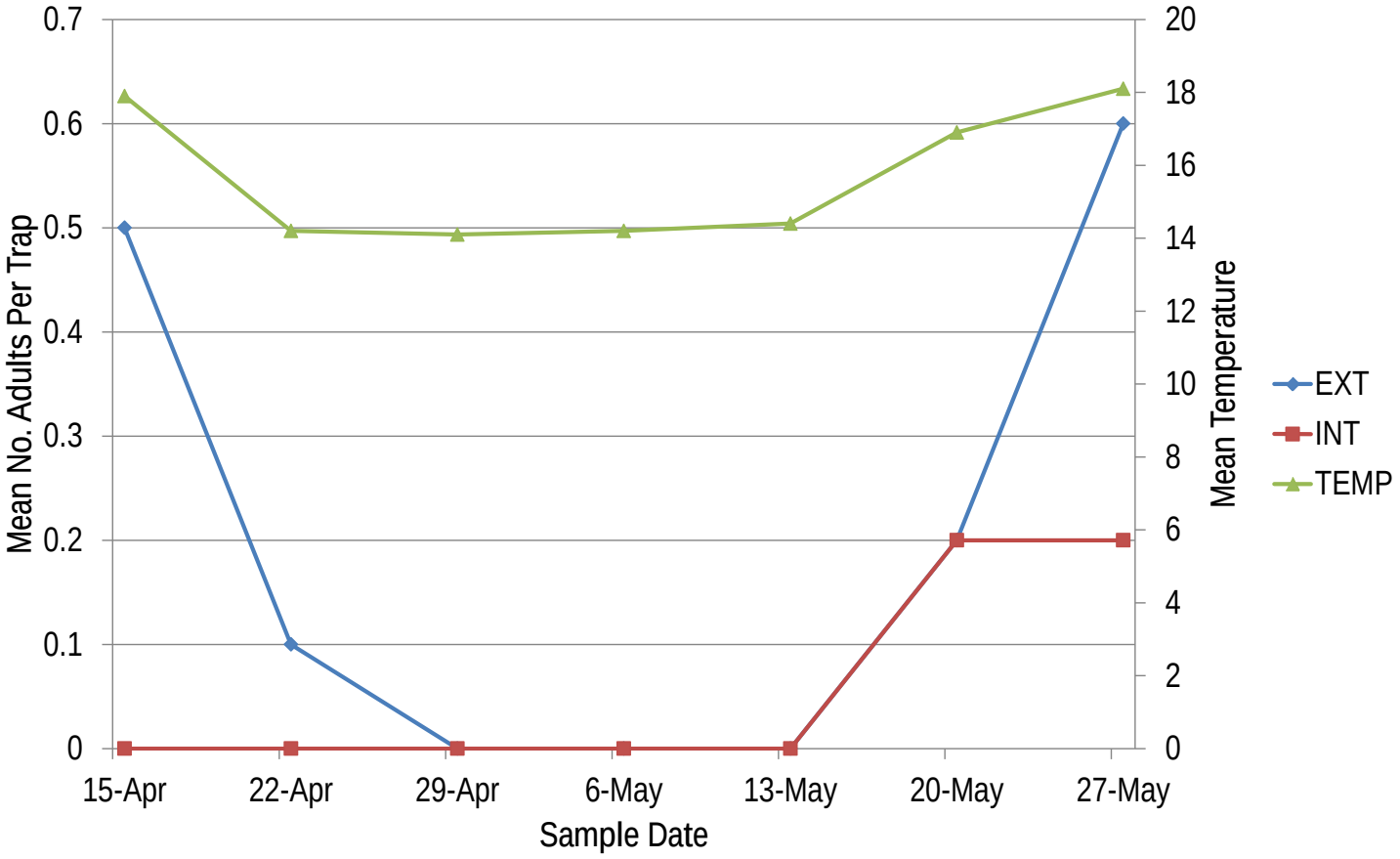
Total Captures	#10	#10 + Synergist	#10 + Synergist	Control
Adults	96	430	411	13

Results from WV, MD, PA, VA, NJ, OR, DE, NY and NC

Current Studies
Commercial Orchard Threshold Studies



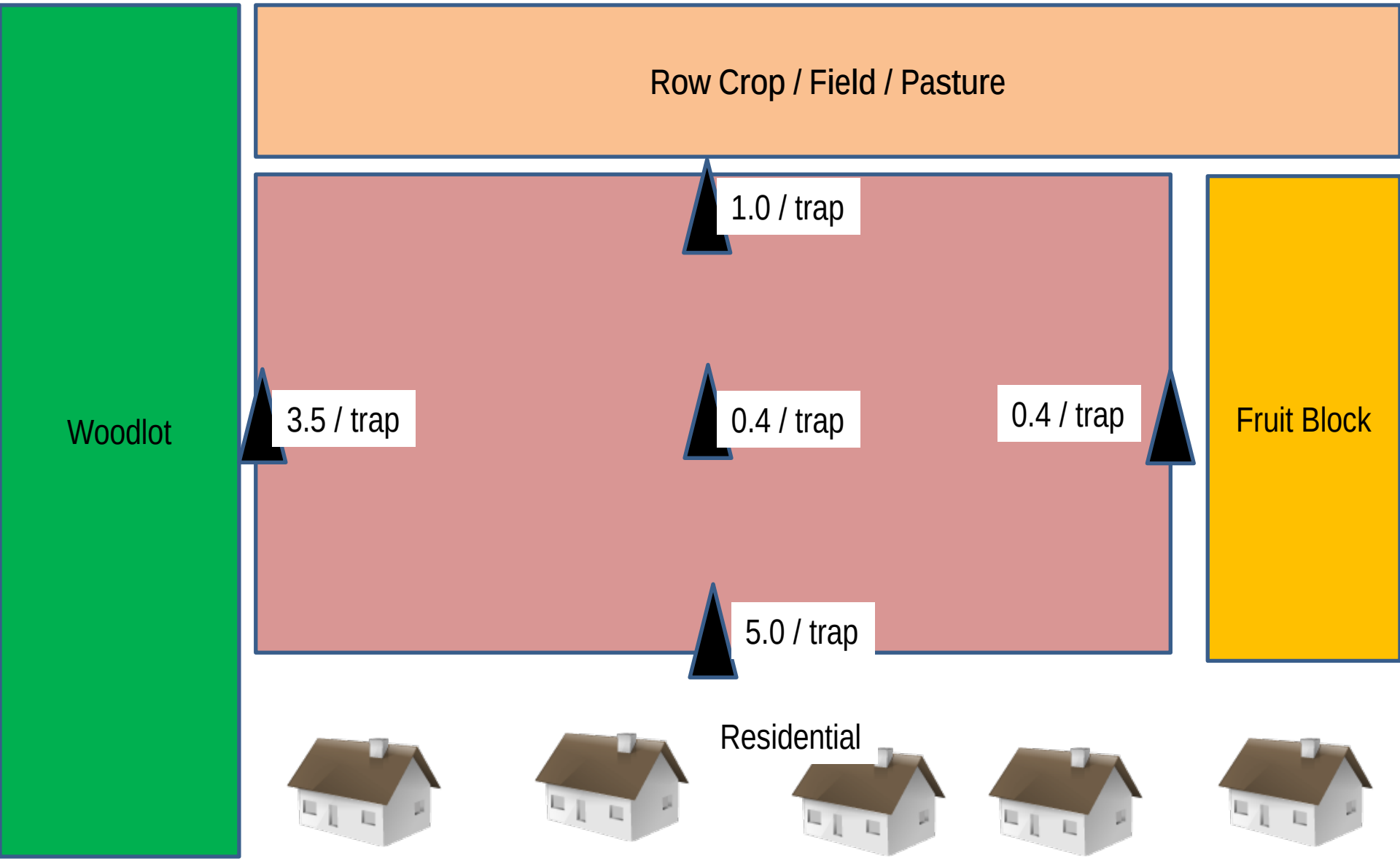
Preliminary Peach Results

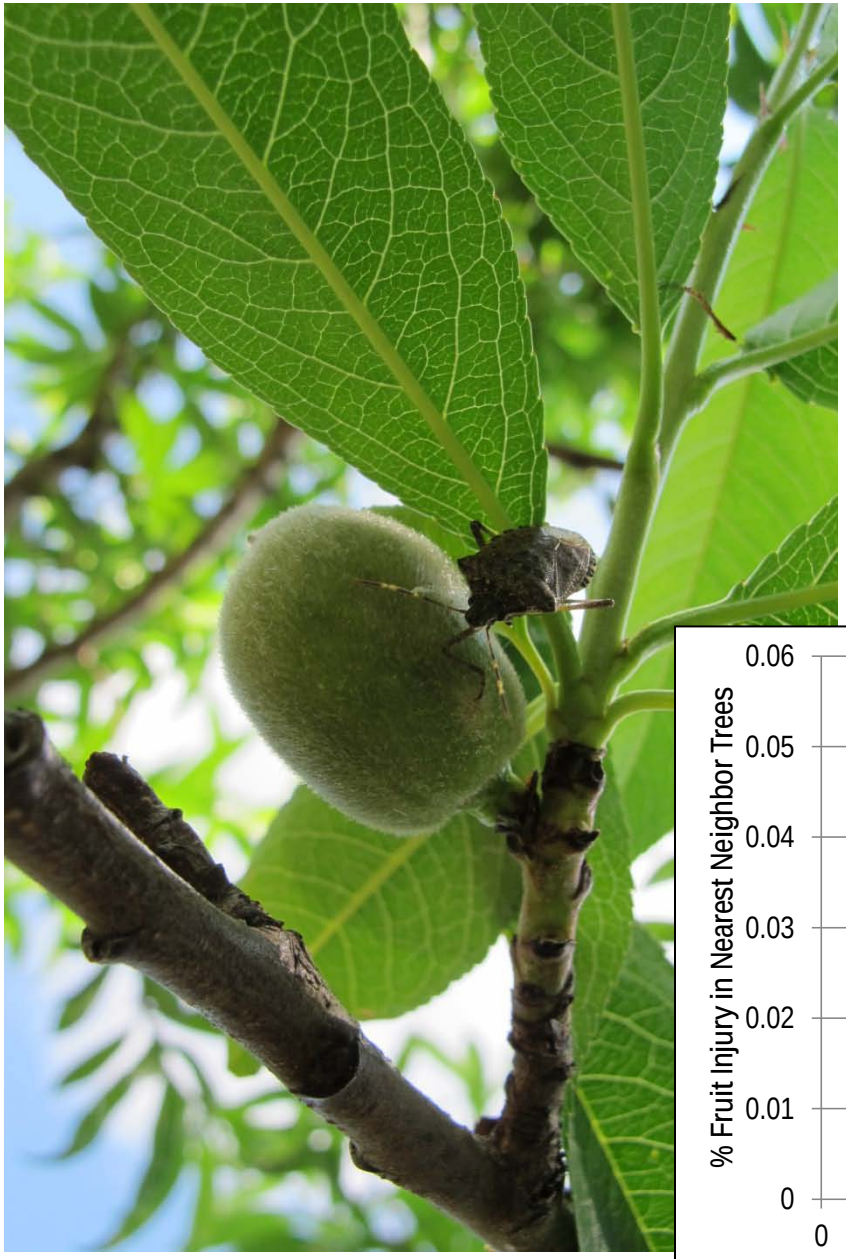


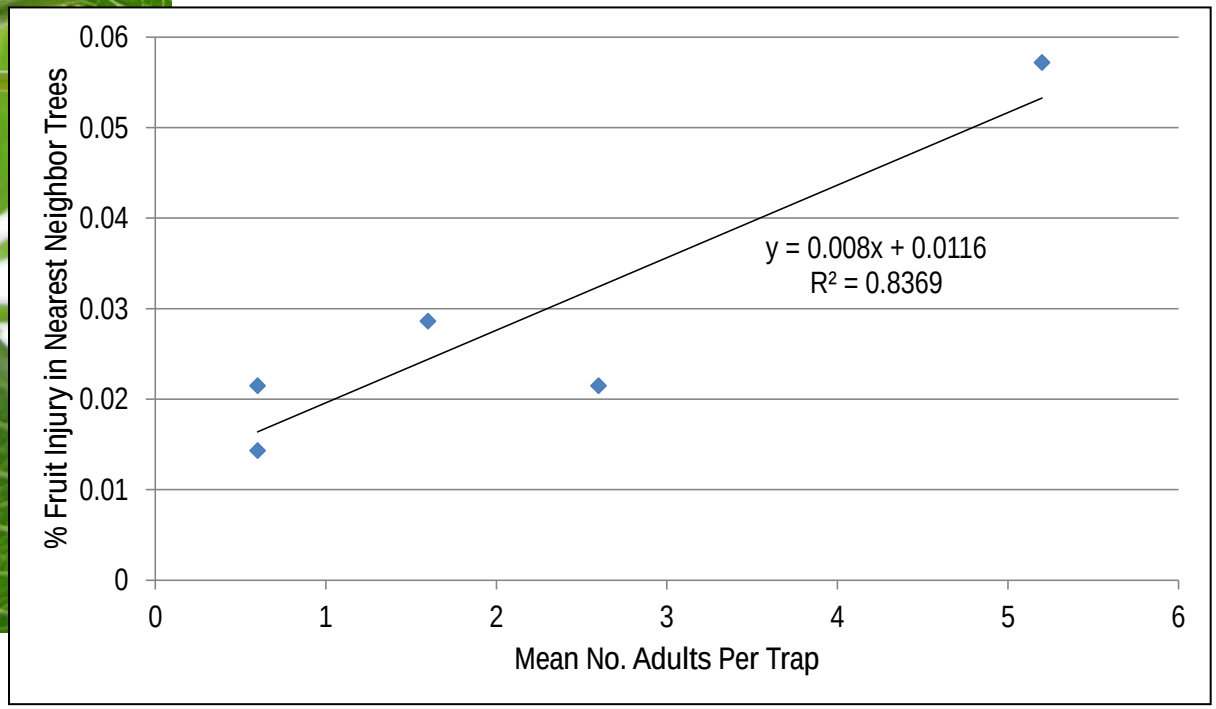
- Significant linear relationship between exterior trap captures and temperature ($P=0.002$; $r^2=0.89$) but not interior trap captures and temperature ($P=0.204$; $r^2=0.44$) .

- No significant correlation between exterior and interior trap captures.

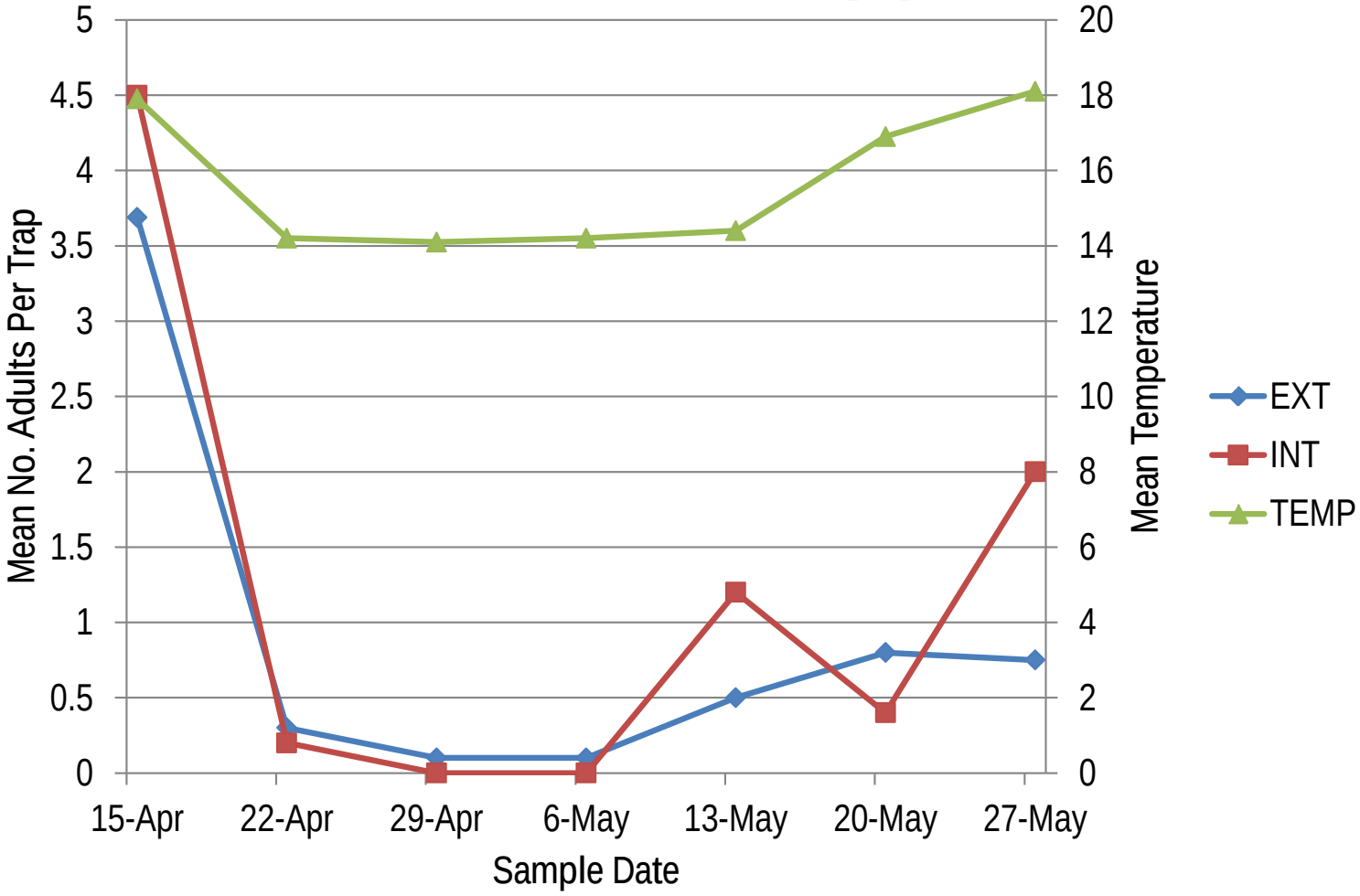
Preliminary Trends in Trap Captures and Border Landscapes in the Early Season in Peach






% Fruit Injury in Nearest Neighbor Trees
0.06
0.05
0.04
0.03
0.02
0.01
0
y = 0.008x + 0.0116
R² = 0.8369
0
1
2
3
4
5
6
Mean No. Adults Per Trap

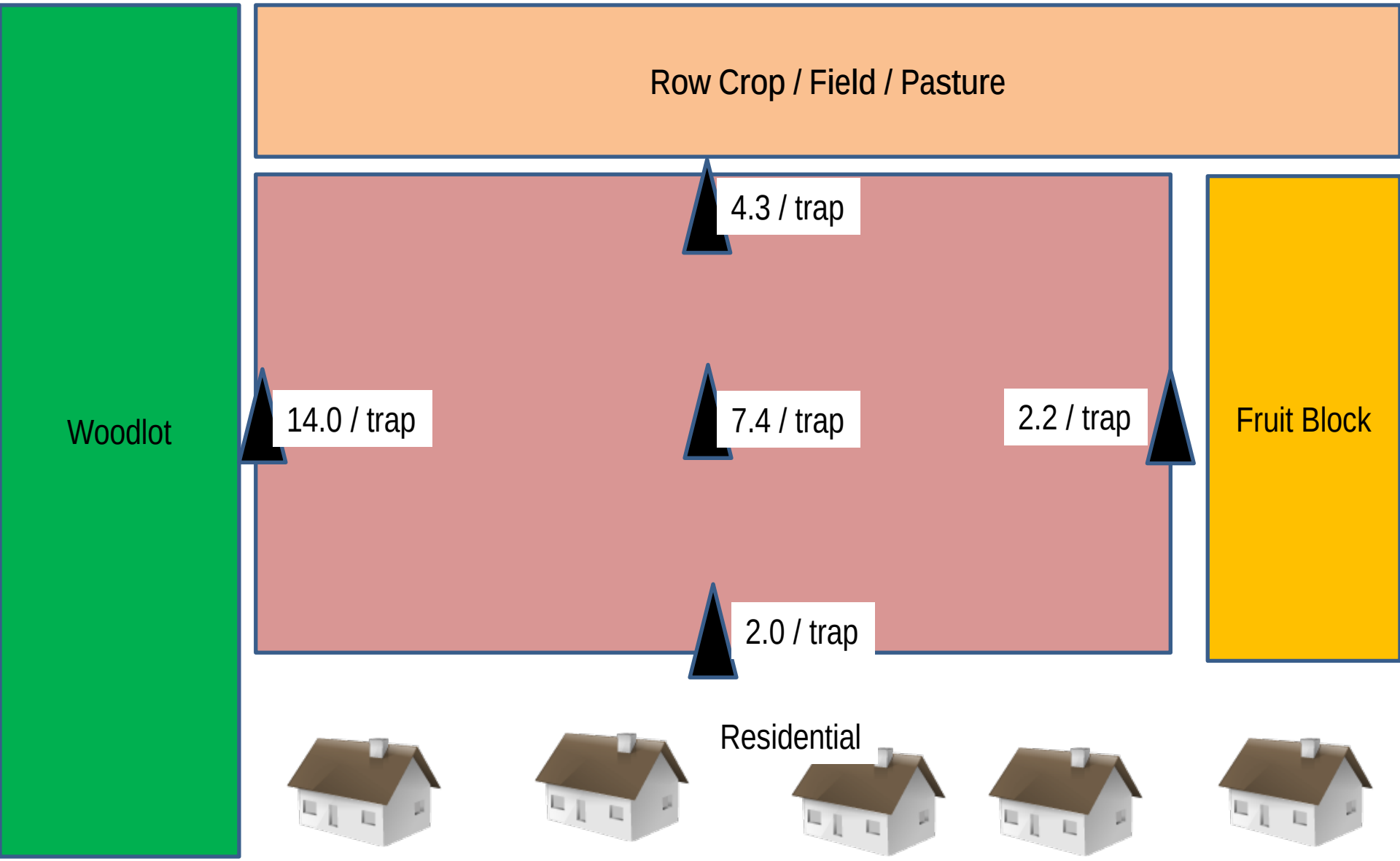
Preliminary Apple Results



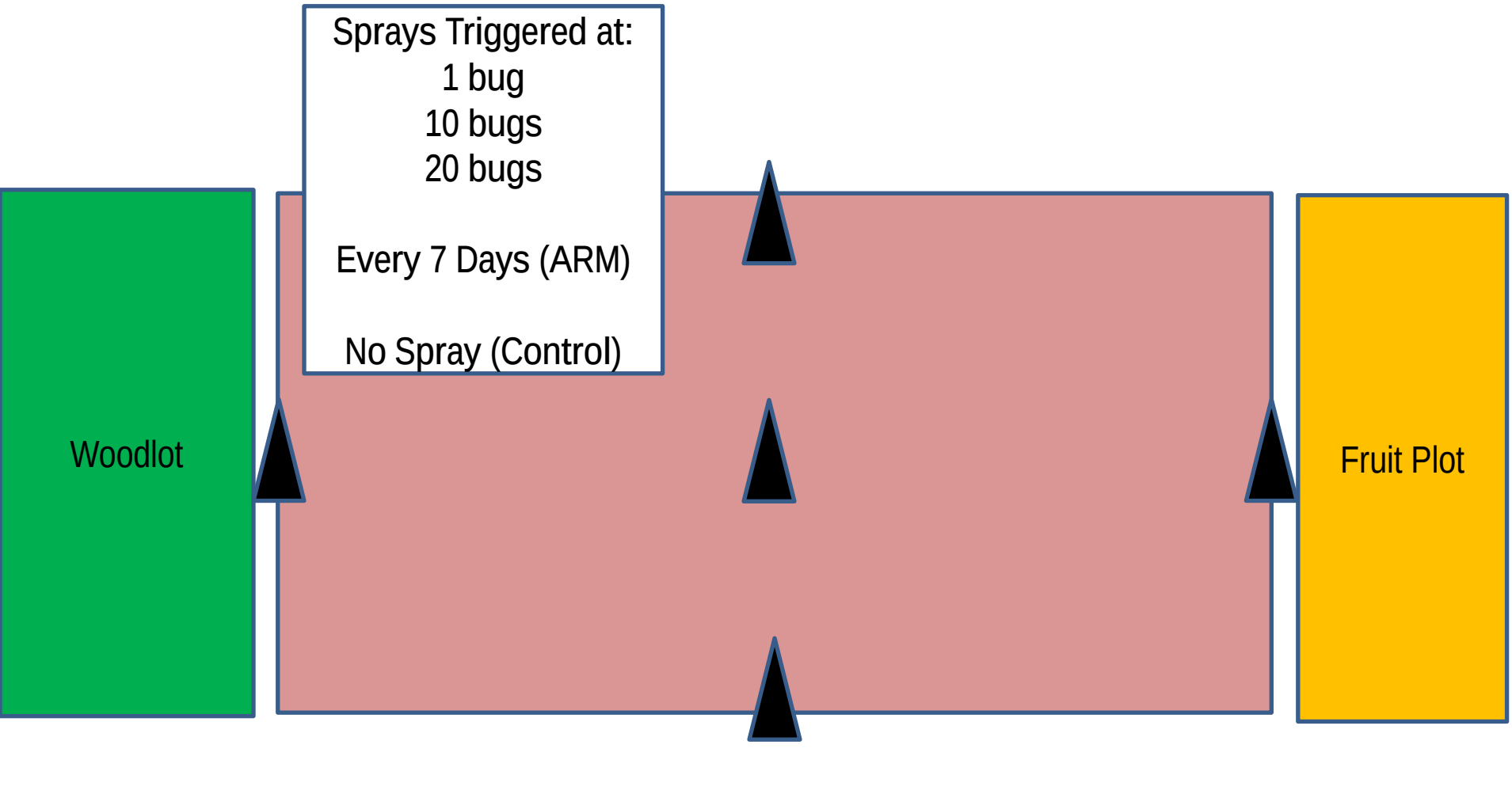
- Linear relationship between exterior trap captures and temperature at P = 0.0955; r^2=0.46 and interior trap captures and temperature at P = 0.0594; r^2=0.54

- Significant relationship interior trap and exterior trap captures (P=0.002; r^2=0.89)

Preliminary Trends in Trap Captures and Border Landscapes in the Early Season in Apple



On-Station Threshold Studies in Apple

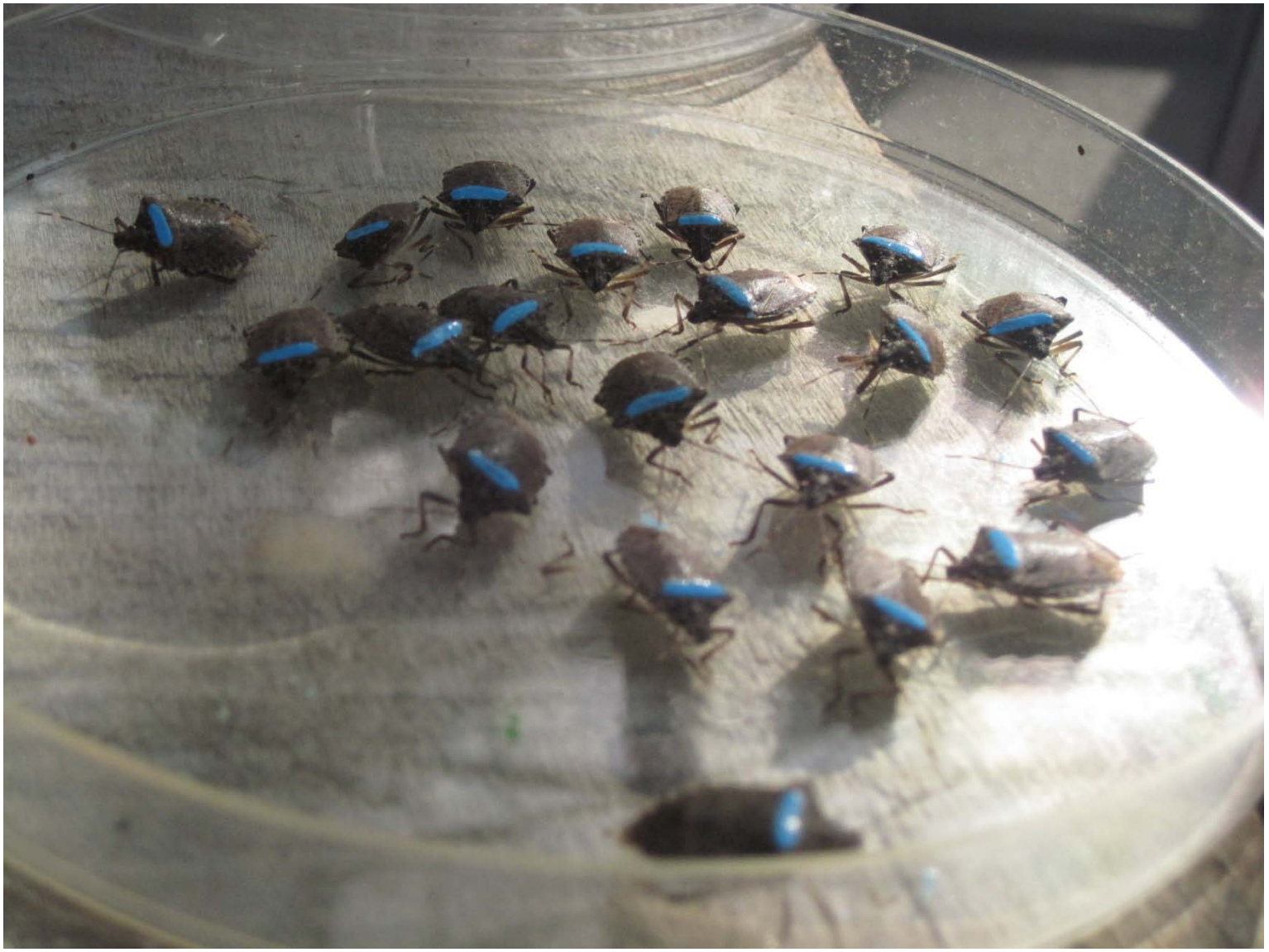


Dispersal from Overwintering Sites

- Under what abiotic conditions (temperature), do BMSB become active?
- What does the pattern of emergence from overwintering sites look like?
- Do they respond to pheromone traps immediately after exiting overwintering sites?

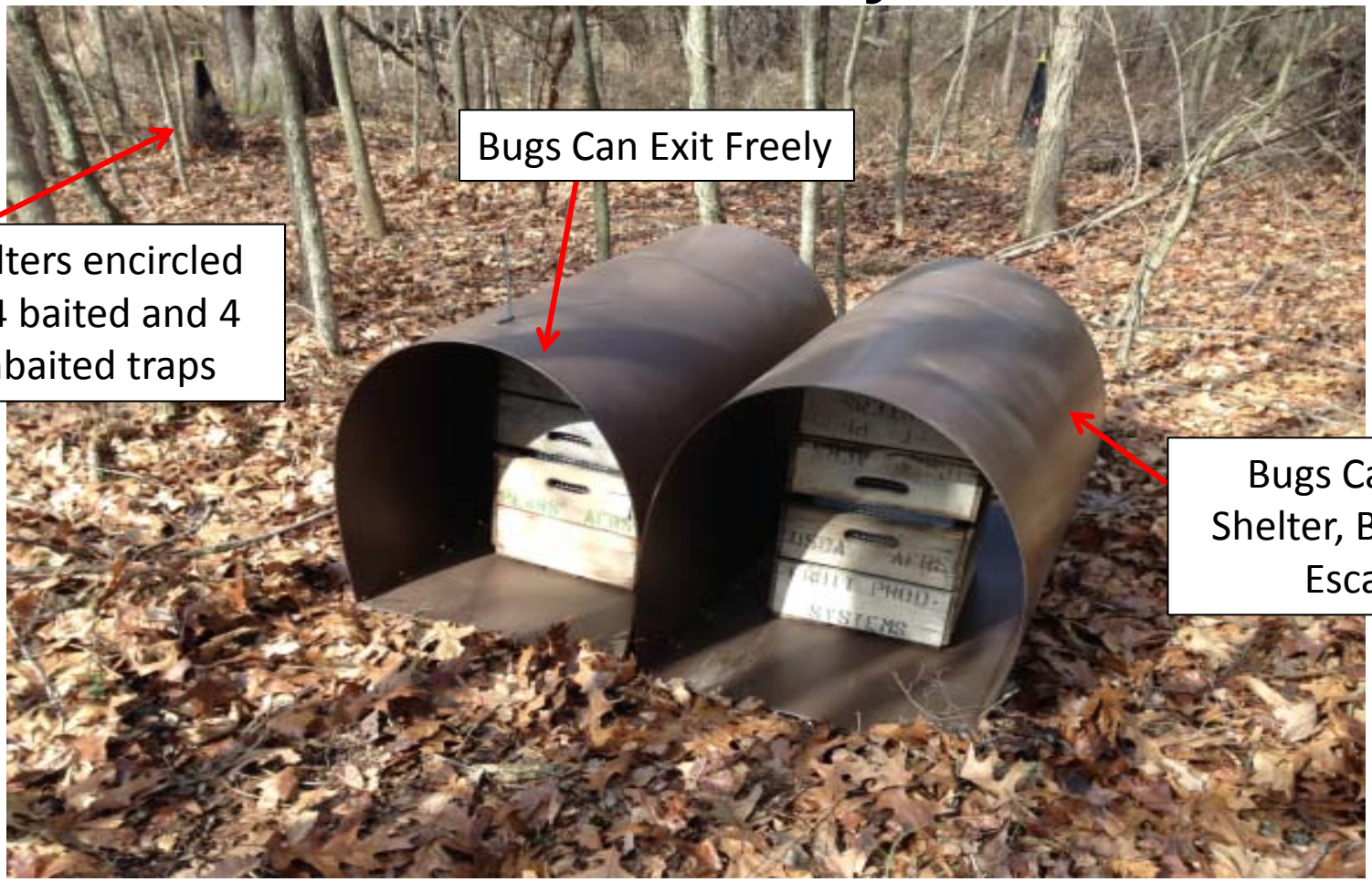
Collect Overwintering Bugs

Marked Over 4,000 Bugs For Release

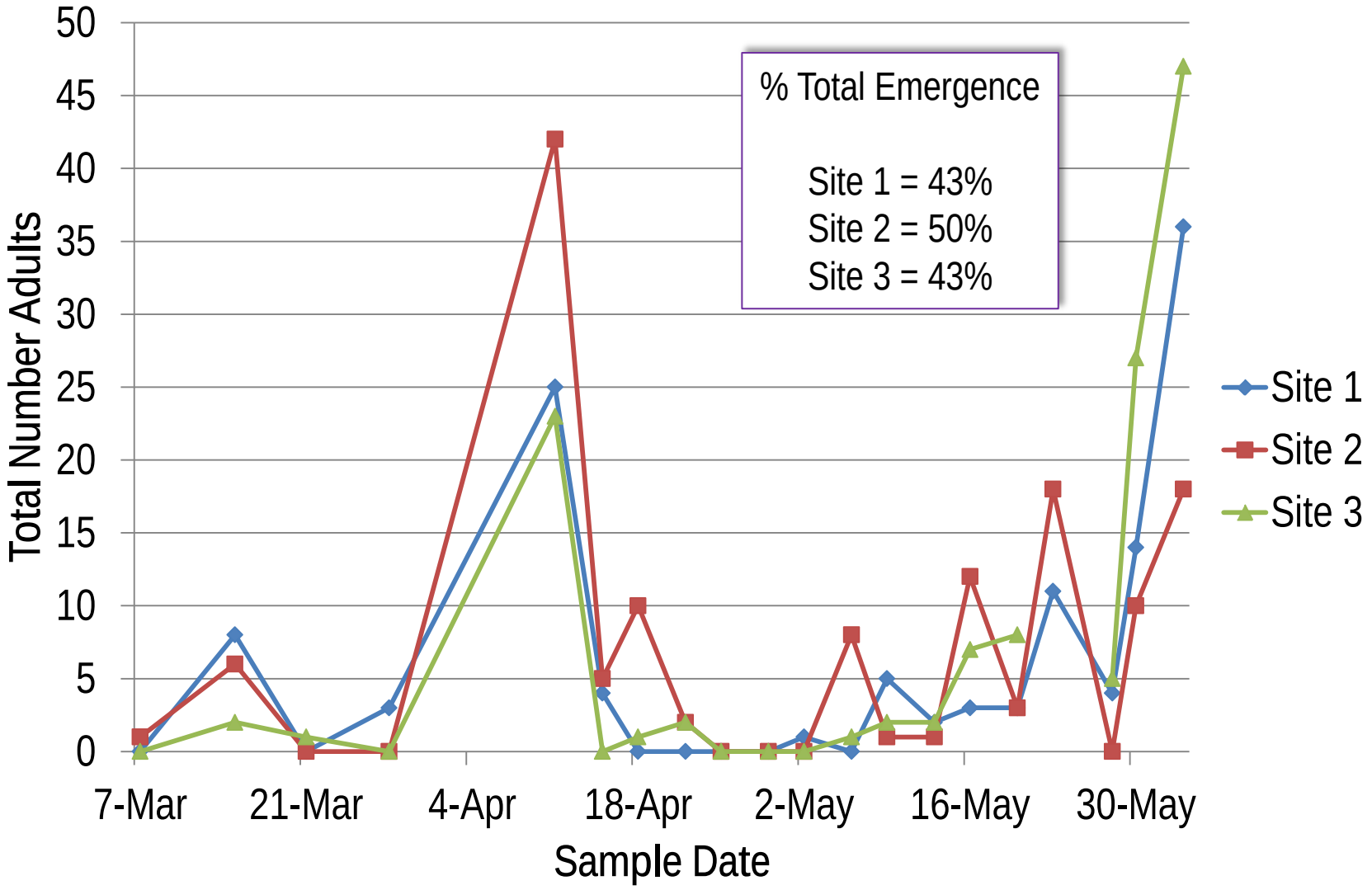


Provisioned Each Overwintering Shelter With 300 Marked Bugs

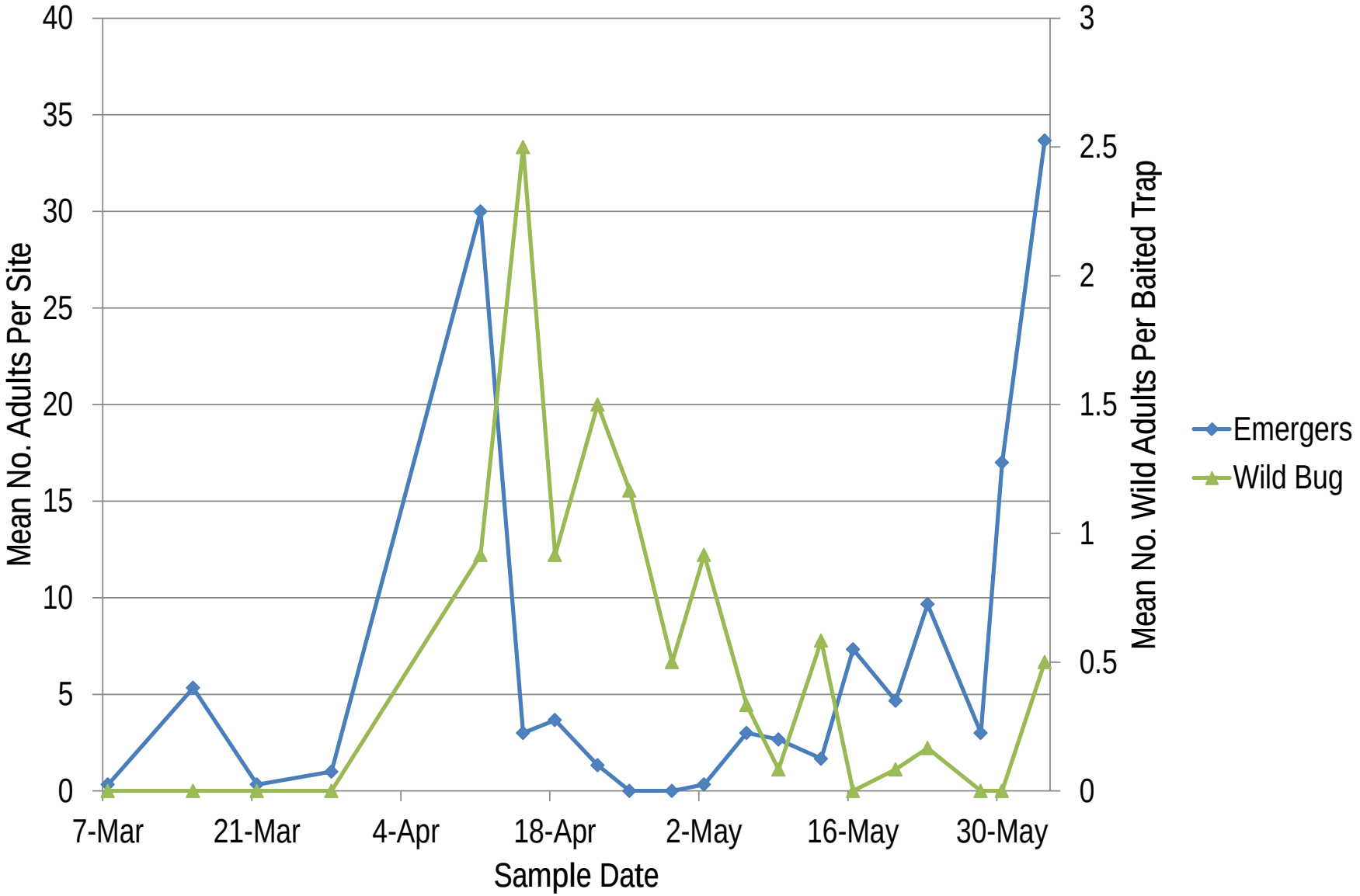
Deployed Paired Overwintering Shelters and Baited Traps in Wooded Locations in Late February



Emergence Results to Date



Emergence and Wild Bug Captures



Emergence and Wild Bug Captures

- Similar patterns of emergence at all sites.
- Similar pattern of wild bug activity in traps and emergence.
- No marked bugs. Obligatory dispersal flight?

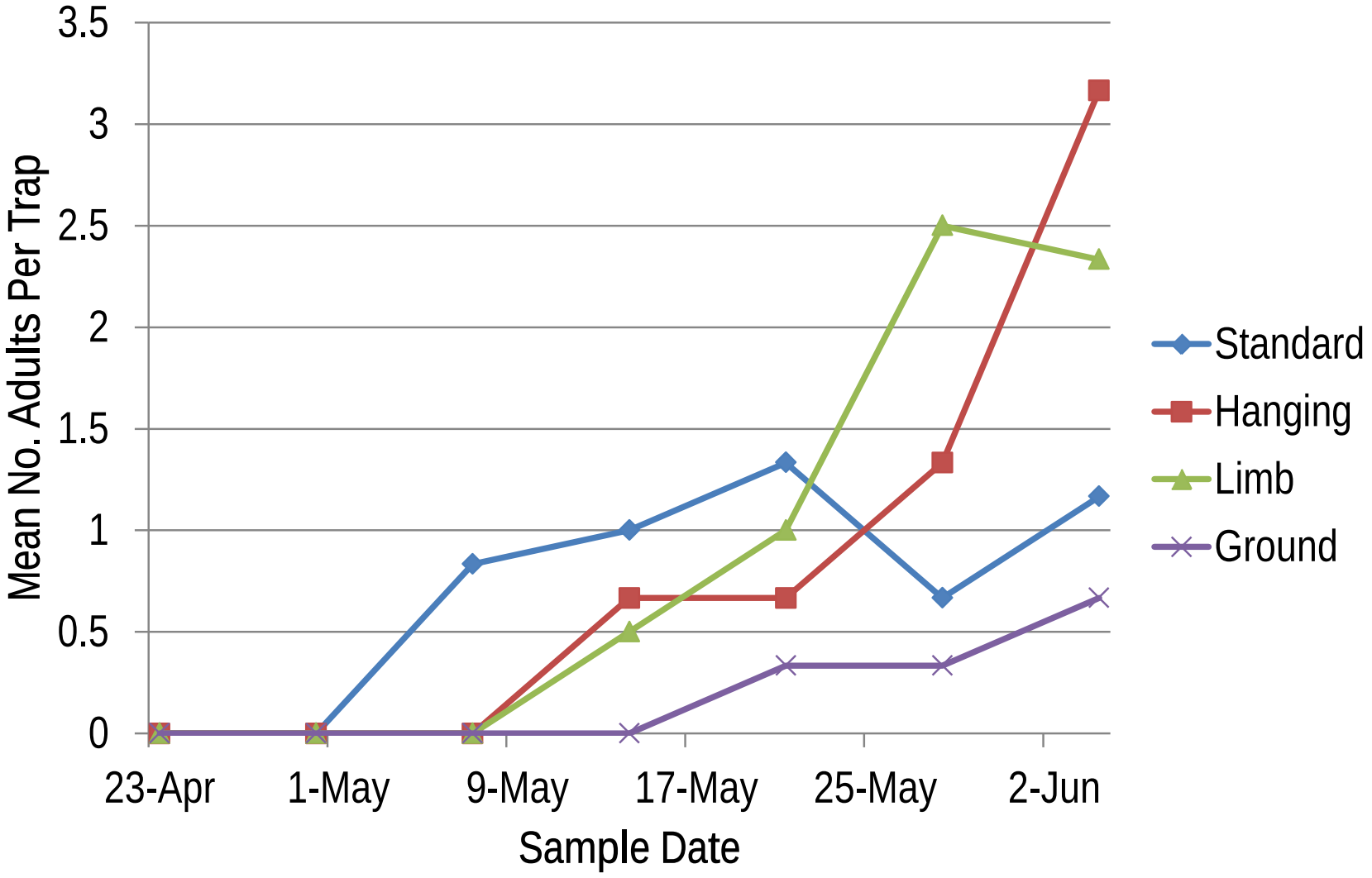
Trap Type Study

- Are capture patterns similar among ground-mounted standard 4-ft pyramid trap and smaller pyramid style traps?

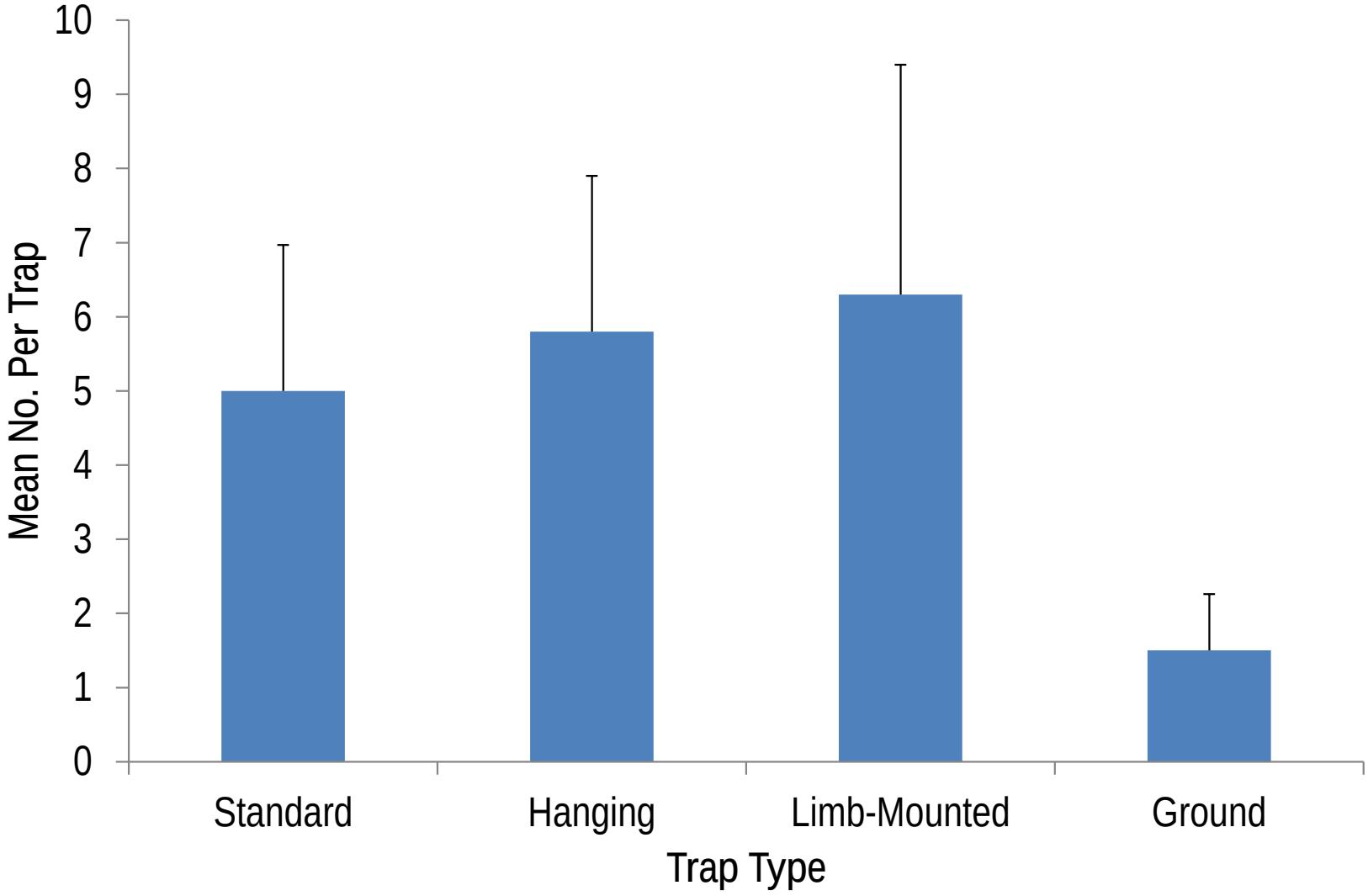
Season-Long Trial in Commercial Apple Orchards




Preliminary Results



Preliminary Results



Conclusions

- Aggregation pheromone of BMSB has been identified.
- Synergist has been identified.
- These stimuli provide reliable detection of BMSB activity.
- Applied questions can now be addressed.

Acknowledgements

- USDA-ARS, USDA NIFA SCRI # 2011-51181-30937, VDACS, and USDA-APHIS

To learn more about this project and find links to BMSB information, visit

StopBMSB.org