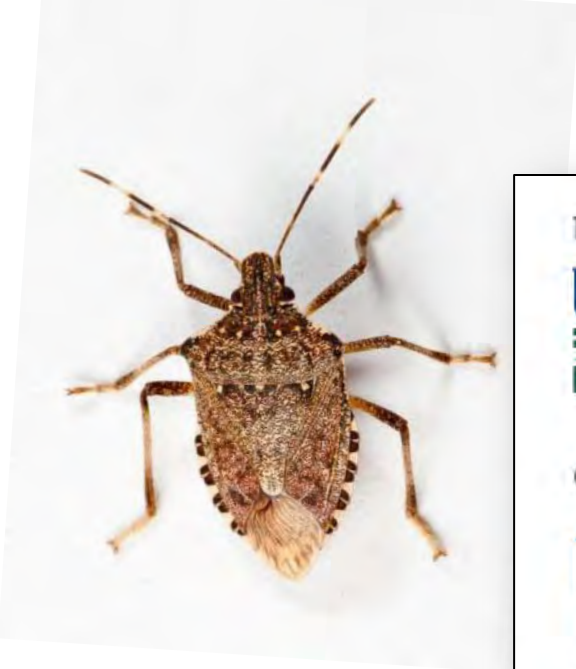


# 1.1.2. Movement to and from overwintering sites and overwintering survivorship.



Funding



United States Department of Agriculture

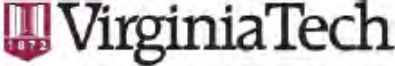
National Institute of Food and Agriculture

Specialty Crop Research Initiative Grant #2011-01413-30937

Collaborating Institutions



Cornell University



# Define Risk Posed by Overwintering and Foraging BMSB Populations Across the Landscape

- Where do BMSB populations overwinter across the landscape?
- When do BMSB disperse from overwintering sites? Do they respond to monitoring traps immediately after emergence?
- How far can BMSB disperse? To potentially reach overwintering site or agricultural production?

# Two Types of Overwintering Sites Identified



- Conspicuous
- Highly aggregated

- Concealed
- Less Aggregated



## BMSB-Positive Trees

1. Standing
2. Large
3. Oak / Locust
4. Peeling bark
5. Porous
6. Dry



# Challenges in Surveying Landscape for Overwintering BMSB

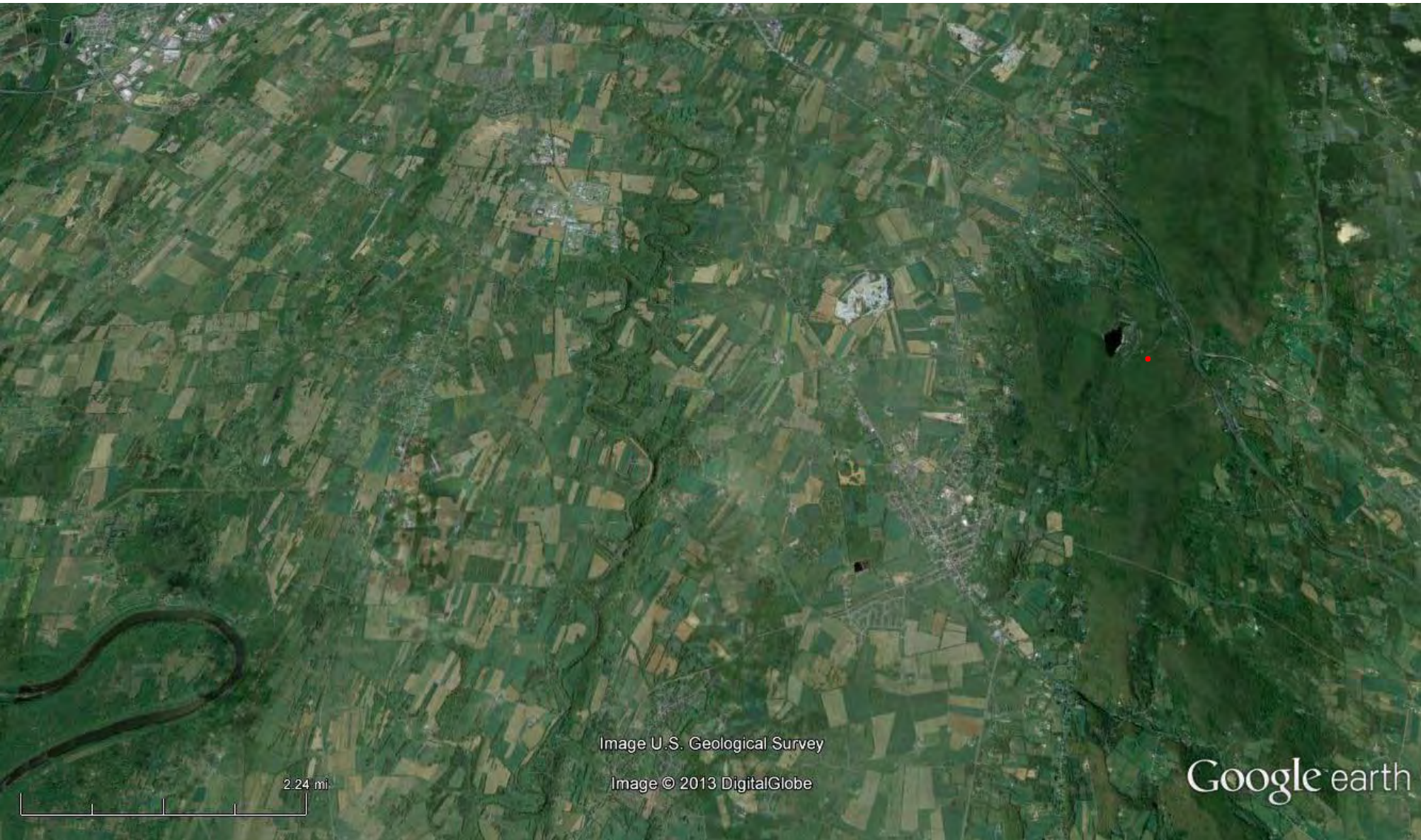


Image U.S. Geological Survey

Image © 2013 DigitalGlobe

Google earth

2.24 mi



National  
Detector  
Dog  
Training  
Center



# Laboratory and Semi-Field Training



Greater Than 85% Proficiency Reached

# Natural Landscapes

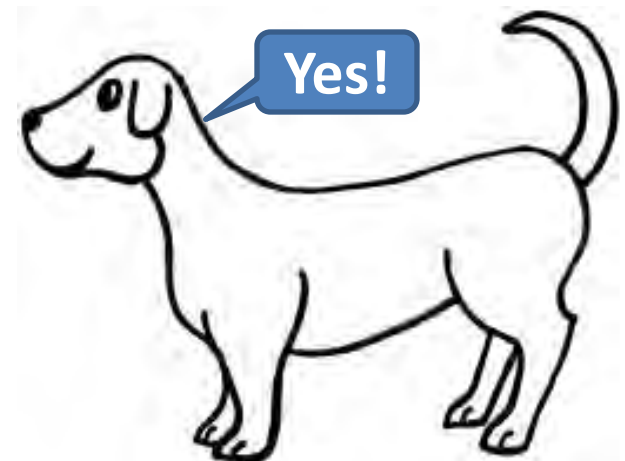






## BMSB-Positive Trees

1. Standing
2. Large
3. Oak / Locust
4. Peeling bark
5. Porous
6. Dry



20x Faster Than Human Surveyors

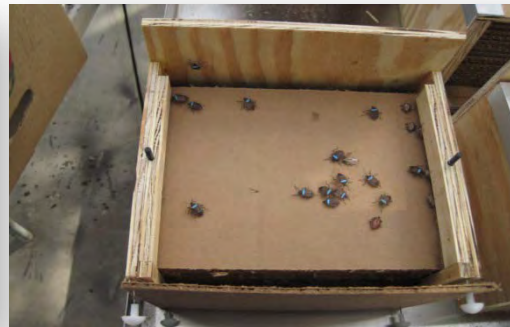
# BMSB Emergence from Overwintering Sites

- When do BMSB emerge from overwintering sites?
- Do BMSB adults respond to baited traps immediately after emergence?





Overwintering adult BMSB collected in January and held at 4°C



- Bugs marked on thorax
- Re-settled in shelters
- 300 per shelter (150/gender)

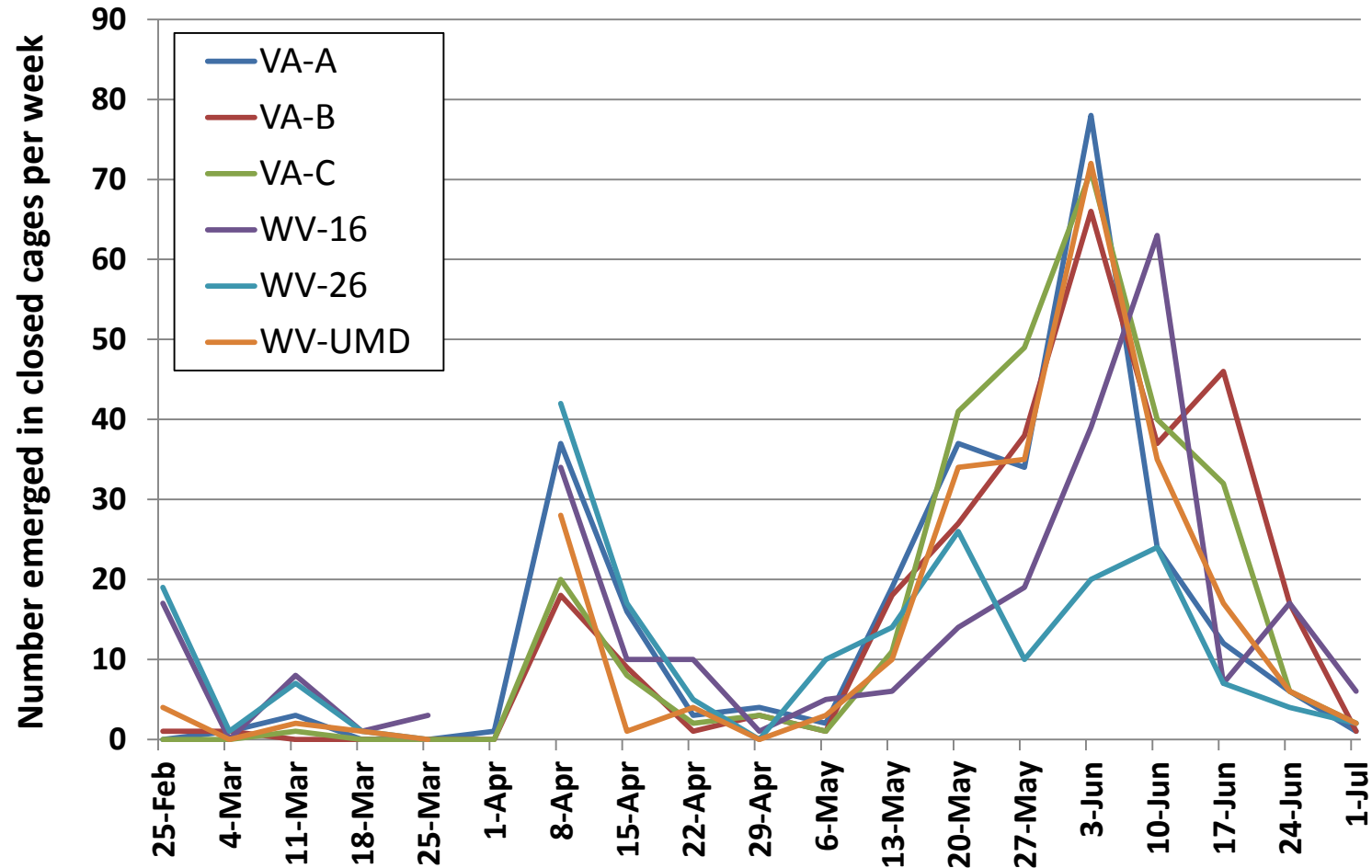


- Shelters placed individually in square, screened cages
- One cage with top on, other with top removed
- Deployed in pairs in protective domes at six woodland sites in mid February
- Temperature and humidity sensors.

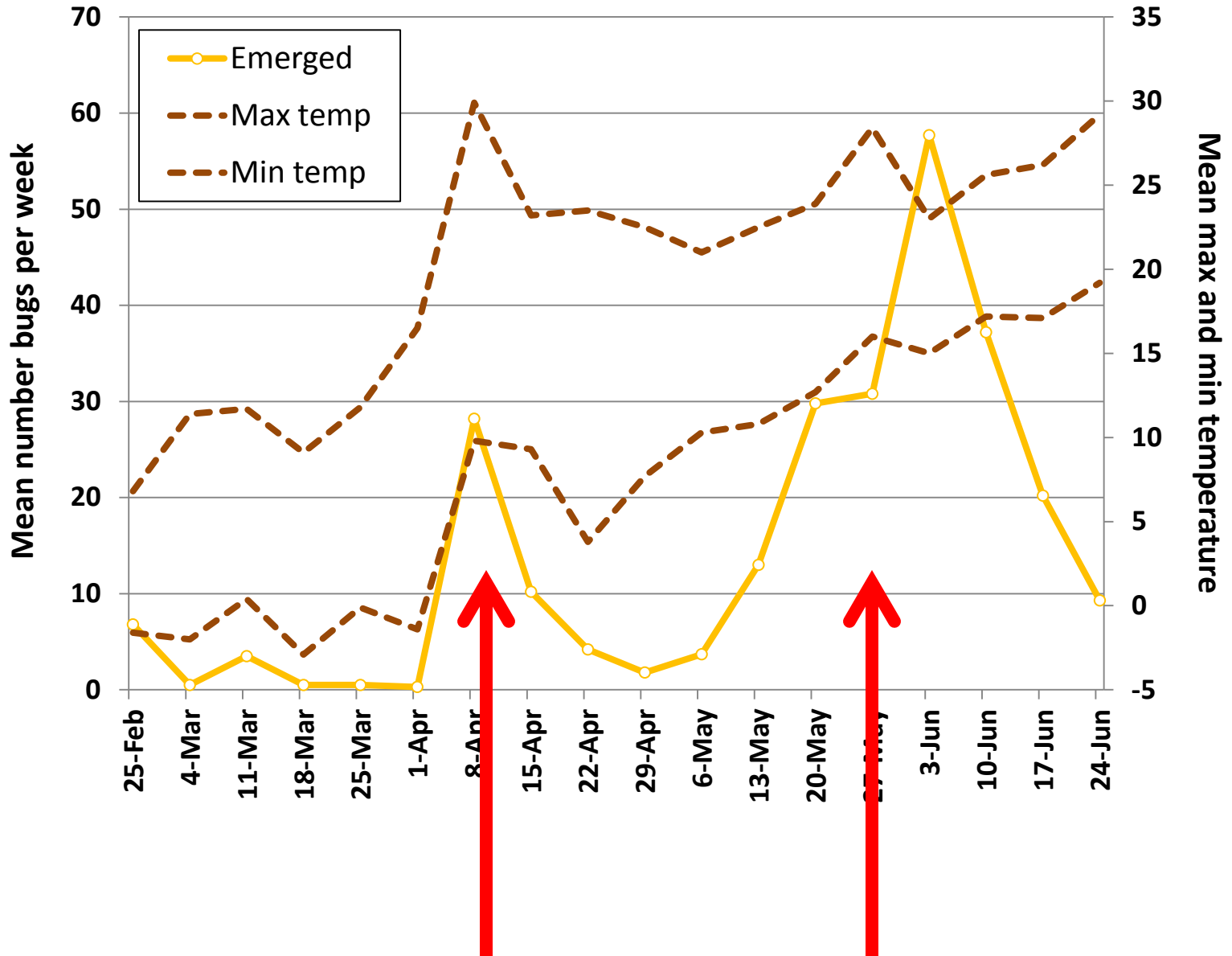
- Shelters encircled by 8 alternating baited and unbaited traps.
- Weekly or twice-weekly checks of shelters and traps.



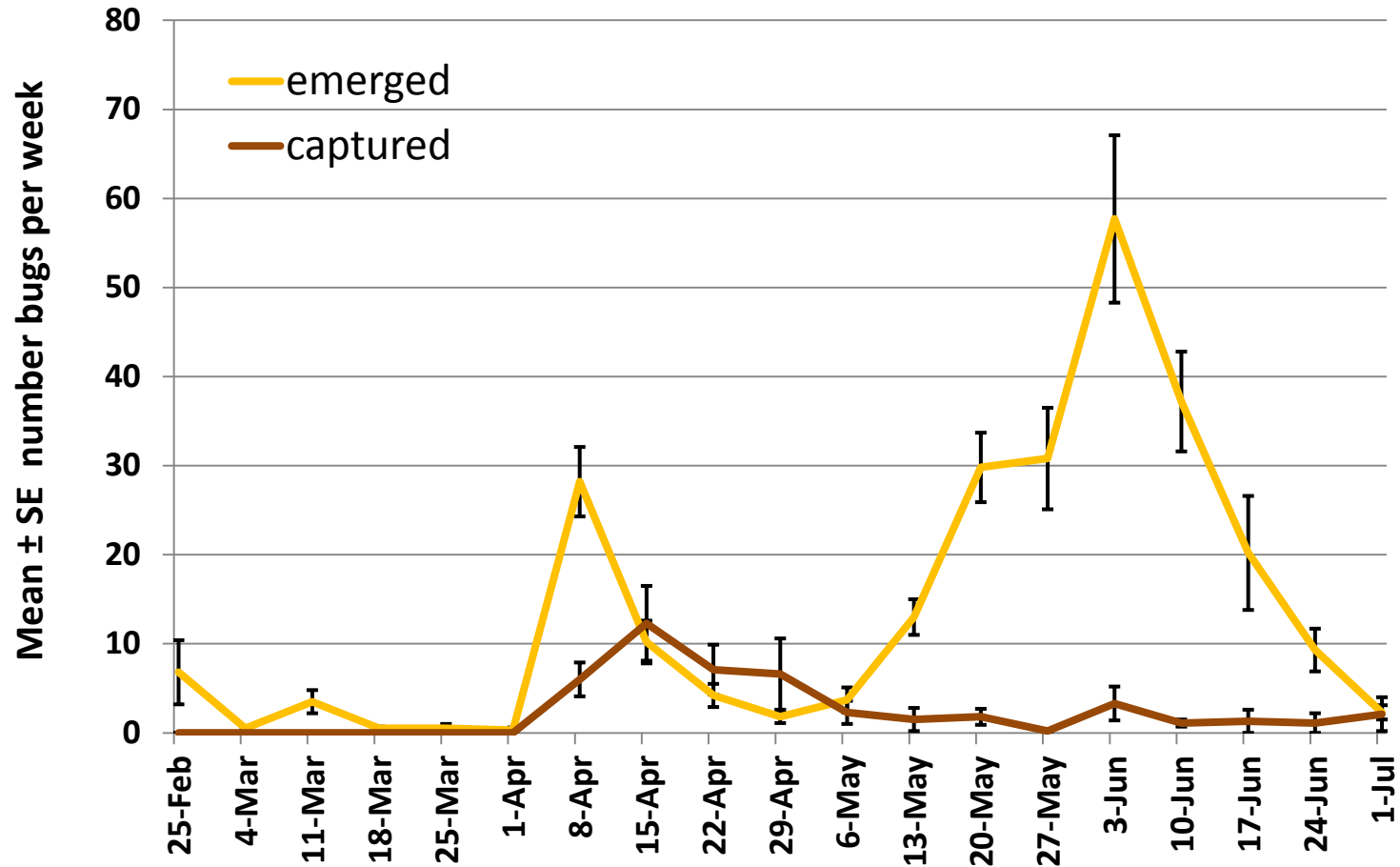
# Synchronous Emergence of BMSB from shelters in Closed Cages Across All Locations. Extremely Protracted.



# Relationship Between Emergence and Abiotic Conditions



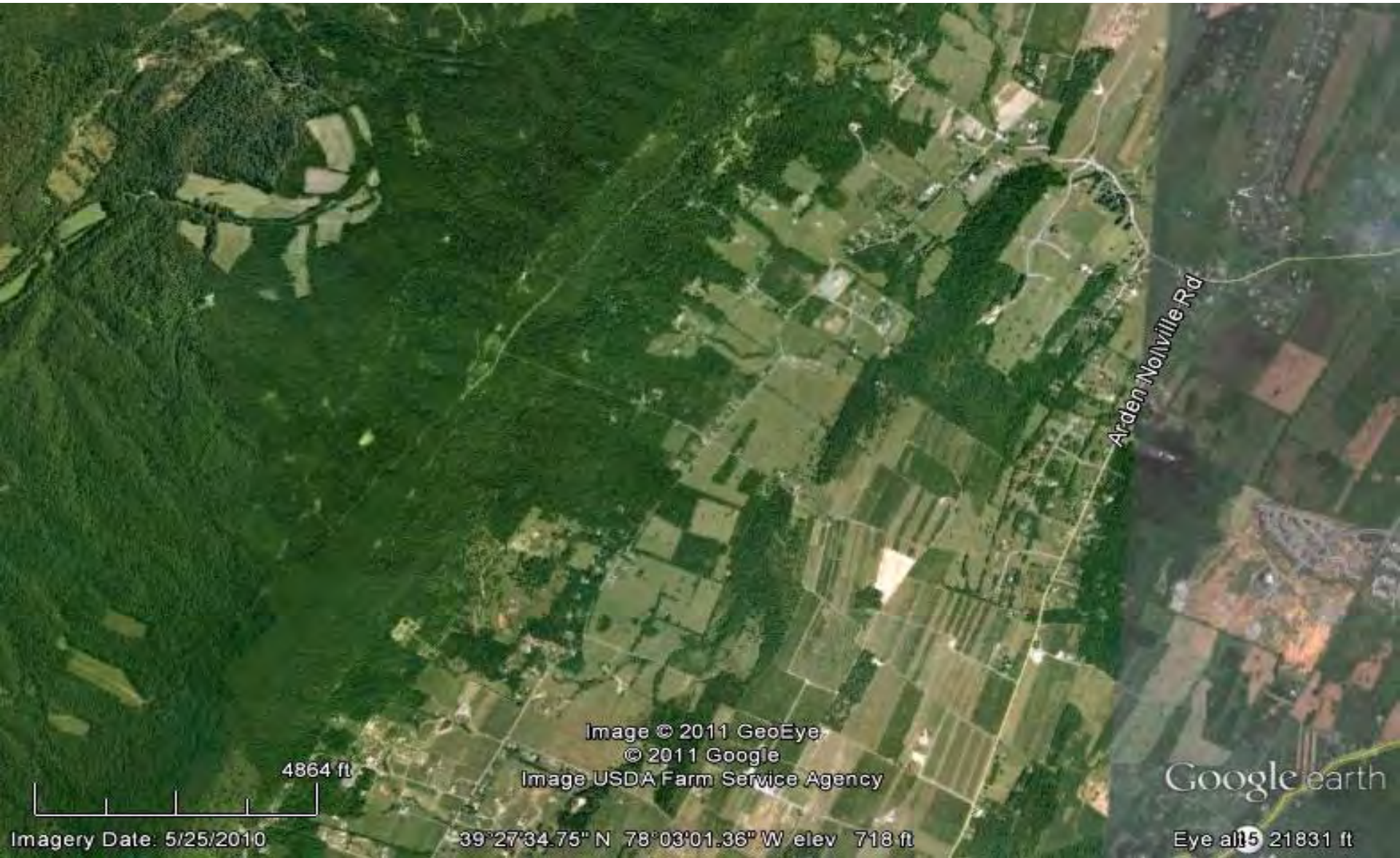
# Relationship Between Emergence and Trap Captures



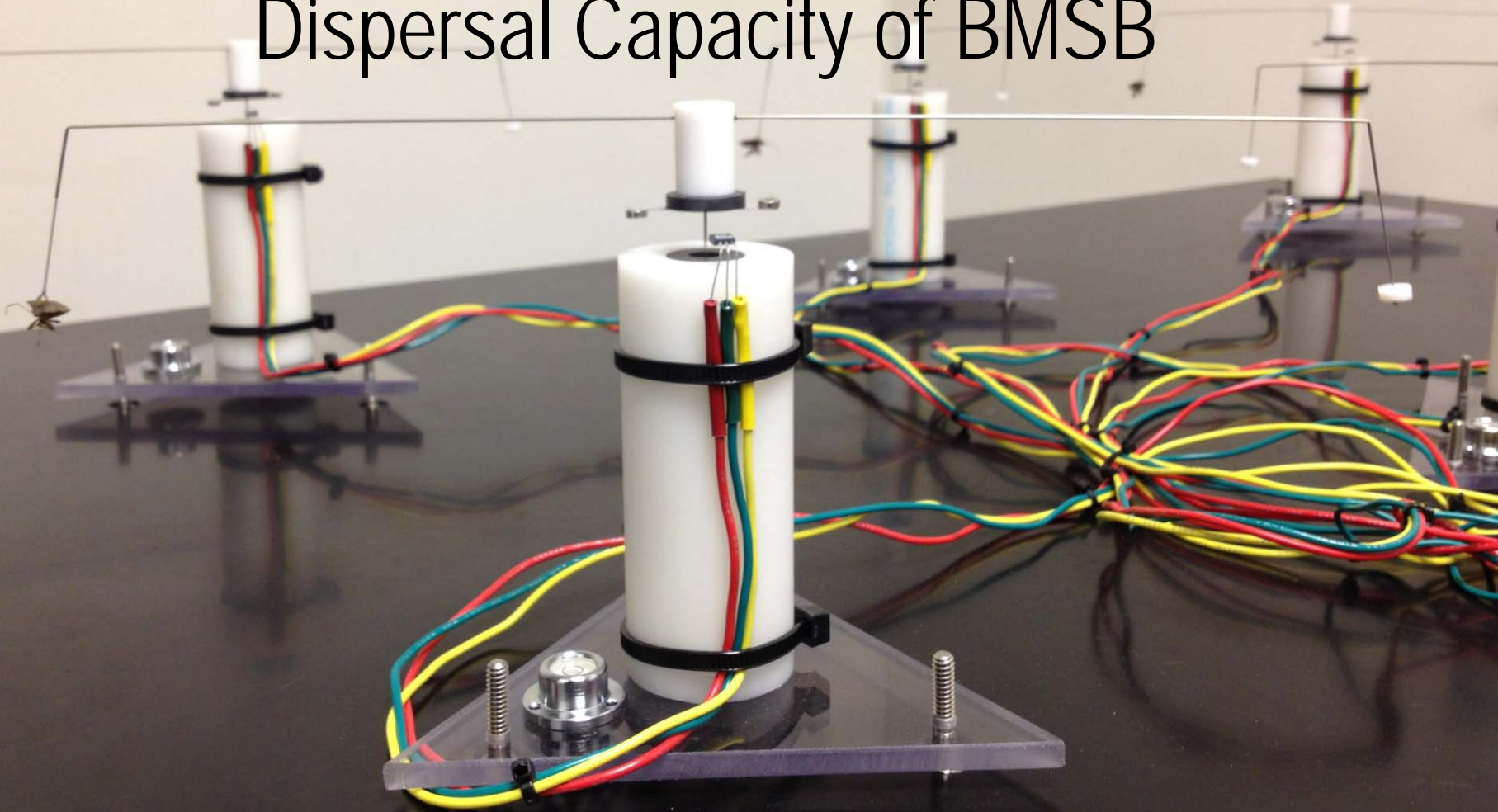
No Marked Bugs Captured. Obligatory Dispersal Flight?



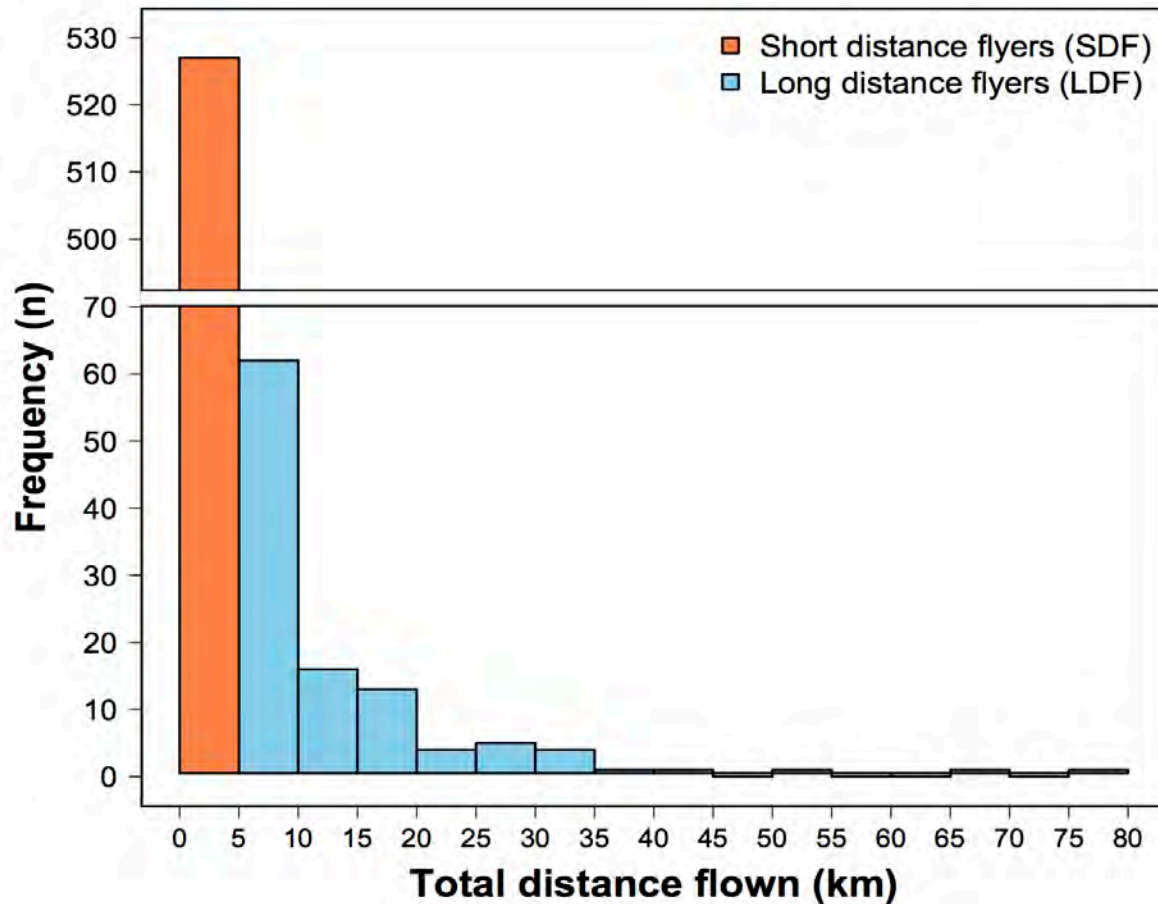
# Define Risk Posed by Overwintering and Foraging BMSB Populations Across the Landscape



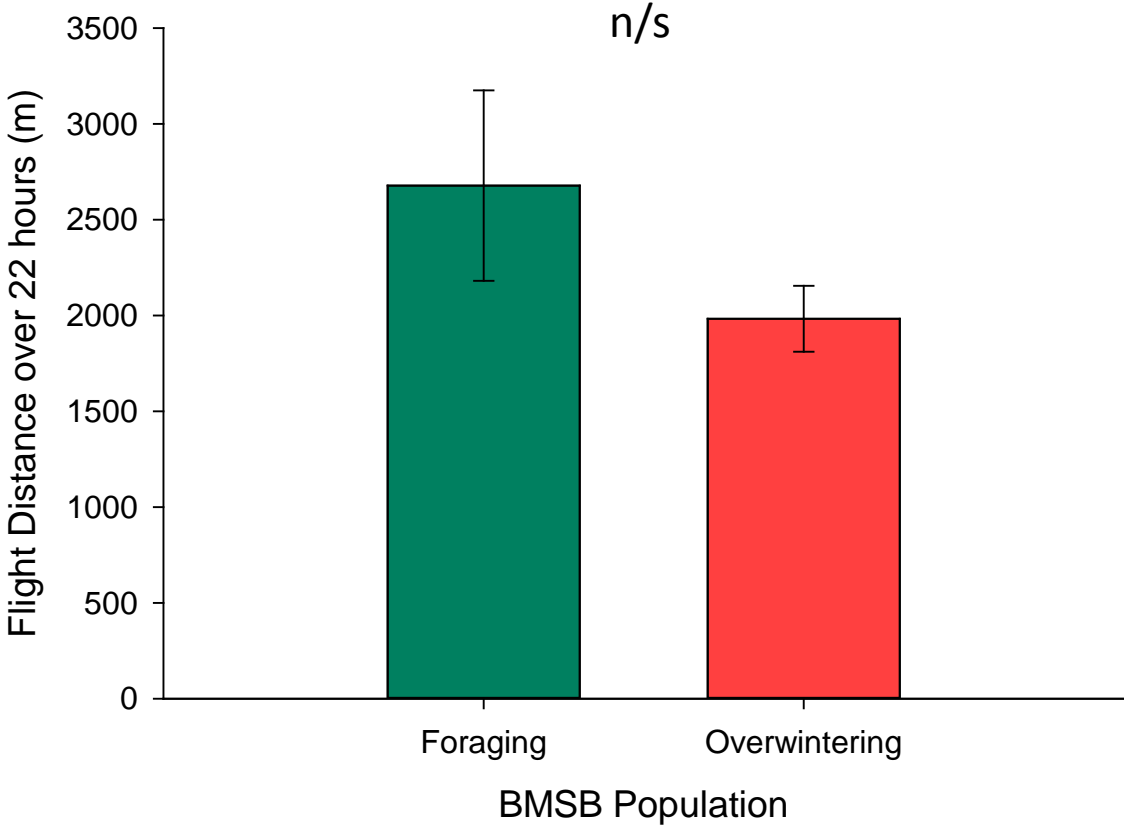
# Laboratory and Field Approaches to Measure Baseline Flight Biology and Dispersal Capacity of BMSB



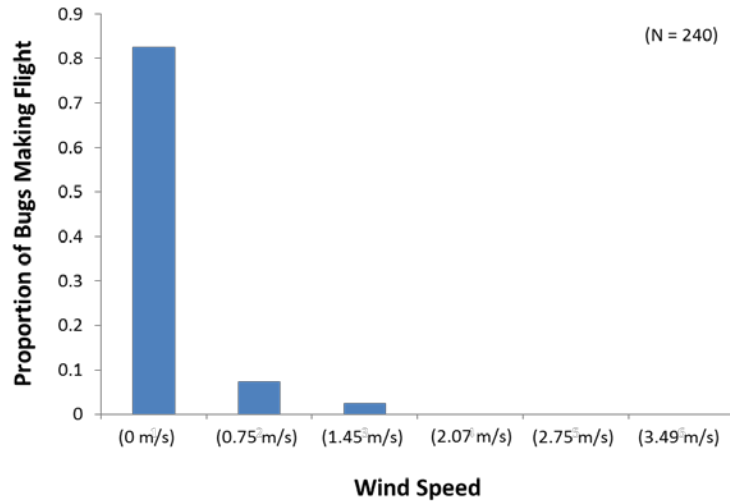
# BMSB has Strong Flight Capacity



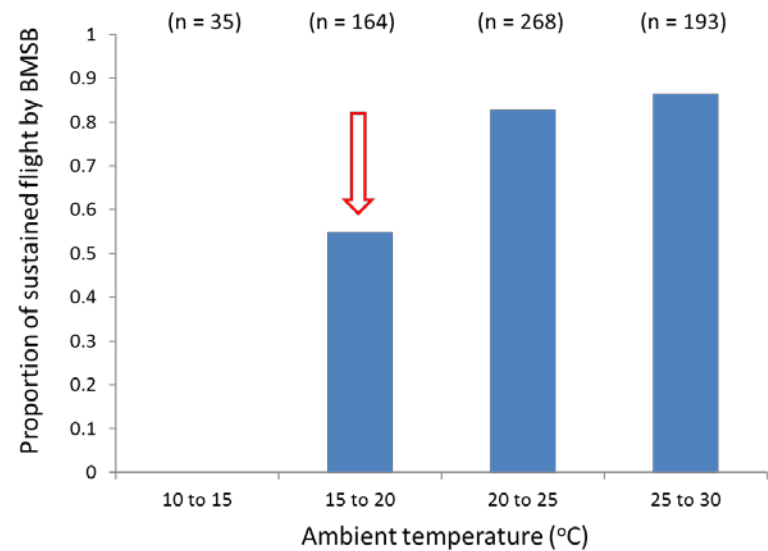
# BMSB Maintains Flight Capacity Throughout The Year



## BMSB Flight is Negatively Affected by Wind Speed



## BMSB Flight is Affected by Temperature

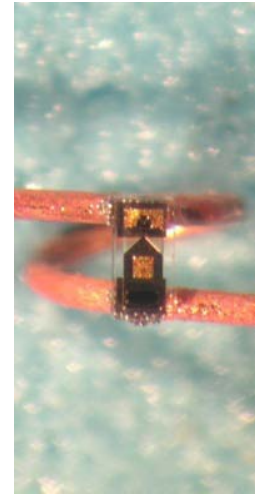
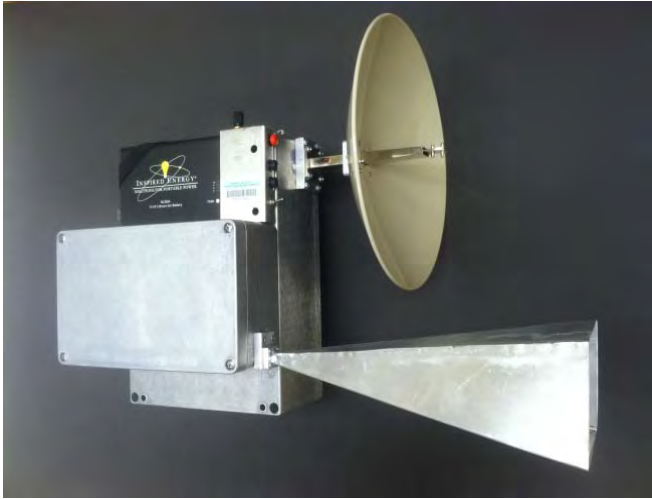


# Summary and Implications

- BMSB overwinter in natural and human-made structures. Overwintering throughout the landscape. *Re-emphasizing the importance of landscape-level approaches to management.*
- BMSB emergence from overwintering sites is protracted (mid-April – late-June). Adults may make obligatory dispersal flight before responding to stimuli. *BMSB adults pose a landscape-level threat.*
- BMSB can fly on average 2 km / day in the laboratory with some LDF flying >20 km. BMSB could easily disperse from overwintering sites to agricultural production areas. BMSB can easily disperse among hosts. *BMSB adults pose a landscape-level threat.*
- BMSB flight are more likely to initiate flight when ambient temperatures are >17°C and winds are calm. *Implications for arrival into crops, activity within those crops and timing of insecticide treatments.*
- What do they do after arrival?



# Tracking BMSB Presence and Movement Using Harmonic Radar



# High Detectability Has Been Achieved

Experimental Site	Detection Rate	Time To Locate Tagged BMSB	Sample Size
60-m Circular Field	100%	120 $\pm$ 11 sec	30
Peach Tree Canopy	93%	121 $\pm$ 32 sec	30
Hedgerow	100%	94 $\pm$ 15 sec	29
Field	93%	141 $\pm$ 18 sec	30

- How long will a BMSB forage within a fruit tree canopy or on a host plant?
- Do BMSB leave cultivated hosts and return to wild host plants?
- What effect do abiotic conditions have on BMSB foraging activity?
- Diurnal patterns of activity?