The Invasive Brown Marmorated Stink Bug In Utah

Halyomorpha halys

Presenters:
Cody Holthouse and Zach Schumm
Advising faculty:
Lori Spears Ph.D and Diane Alston Ph.D
Department of Biology
Utah State University

BROWN MARMORATED STINK BUG IN THE URBAN LANDSCAPE: HOST PLANTS AND TRAP EFFICACY

UtahStateUniversity

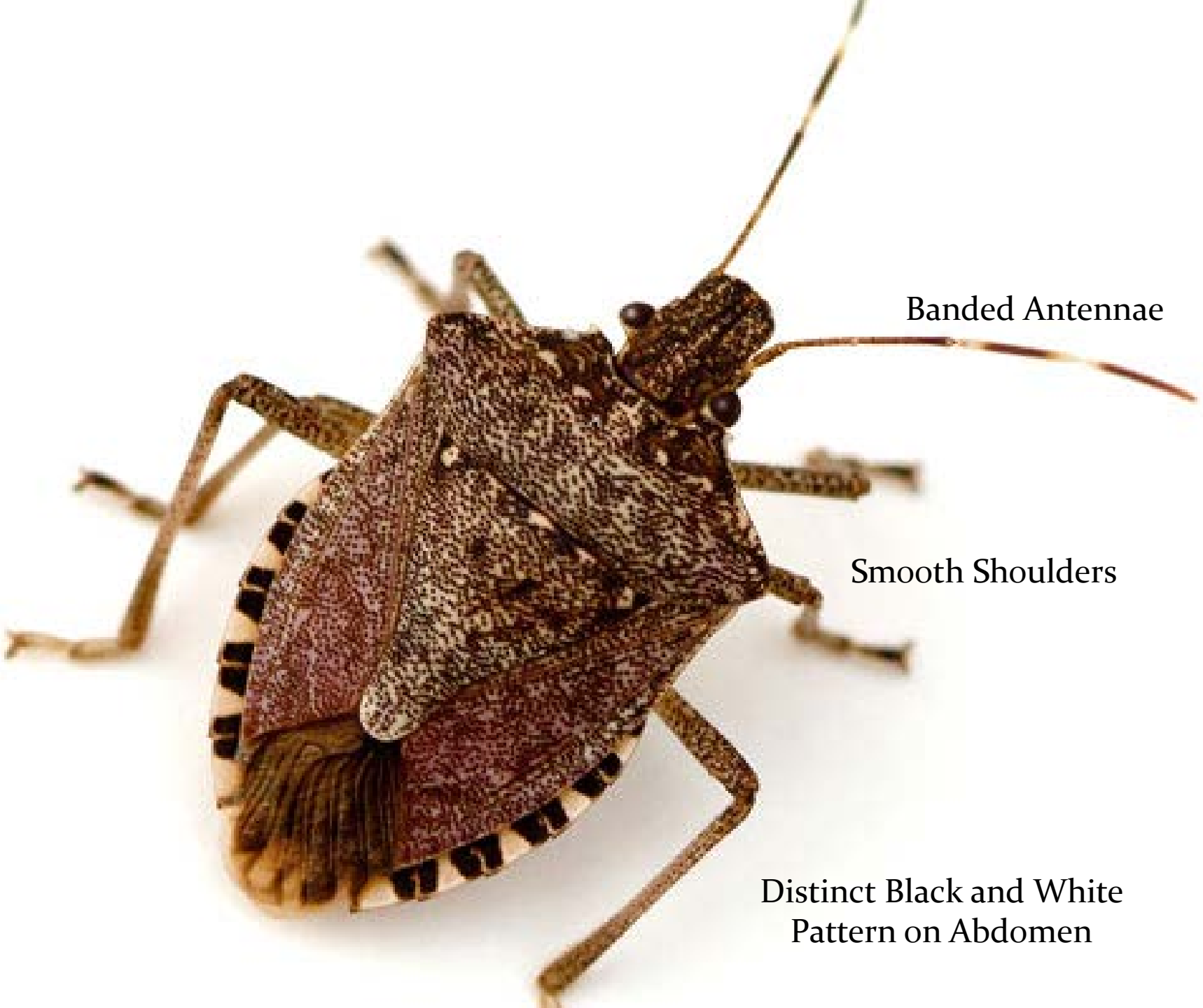
Brown Marmorated Stink Bug (BMSB)

Halyomorpha halys (Stål)

- Invasive from Asia
- Severe agricultural pest and urban nuisance
- Advantageous Traits
  - Polyphagous
  - Long distance dispersal
  - Overwinters in/on human structures

Photo: David Kee

Photo: Cami Cannon


Banded Antennae
Smooth Shoulders
Distinct Black and White
Pattern on Abdomen

Phenology

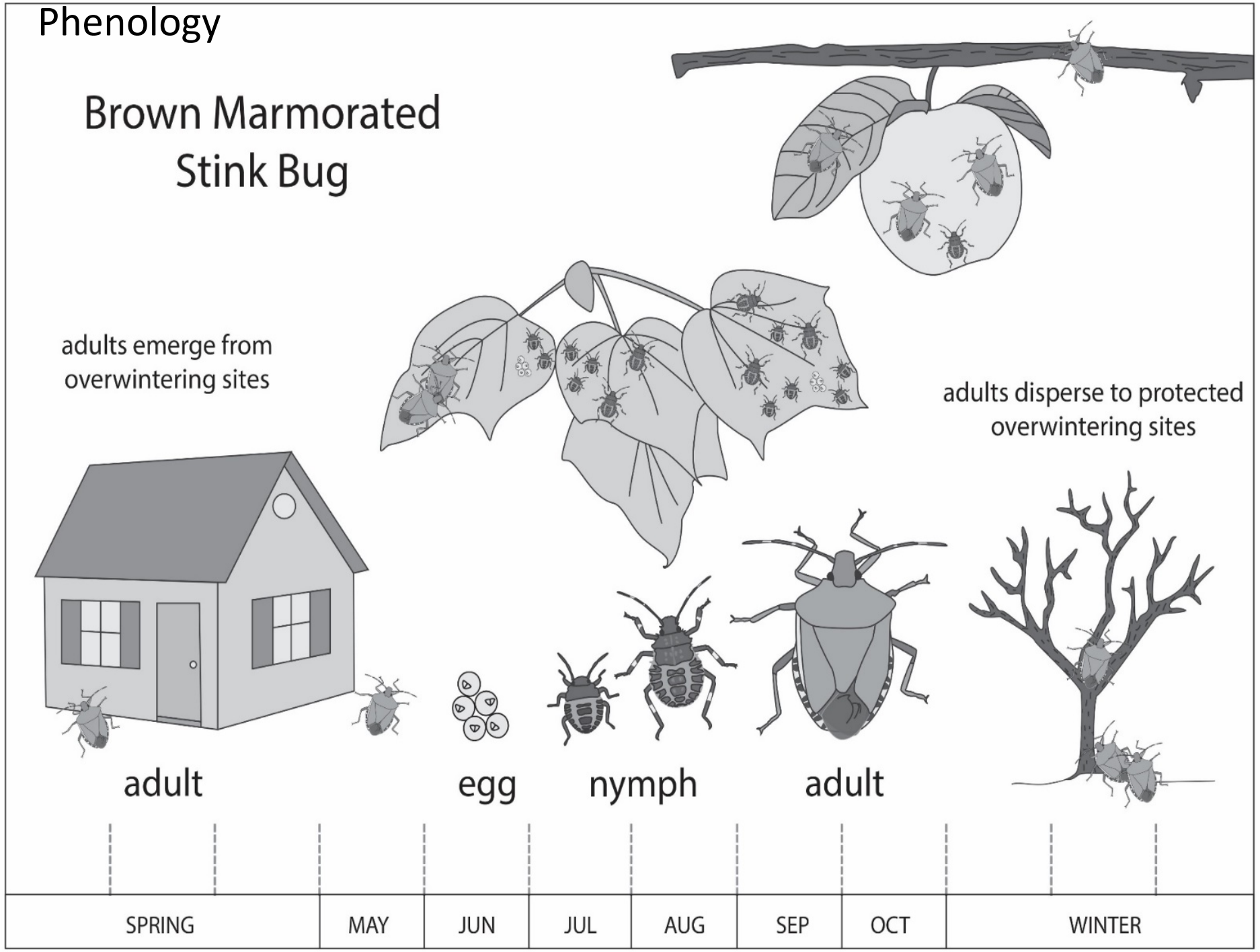
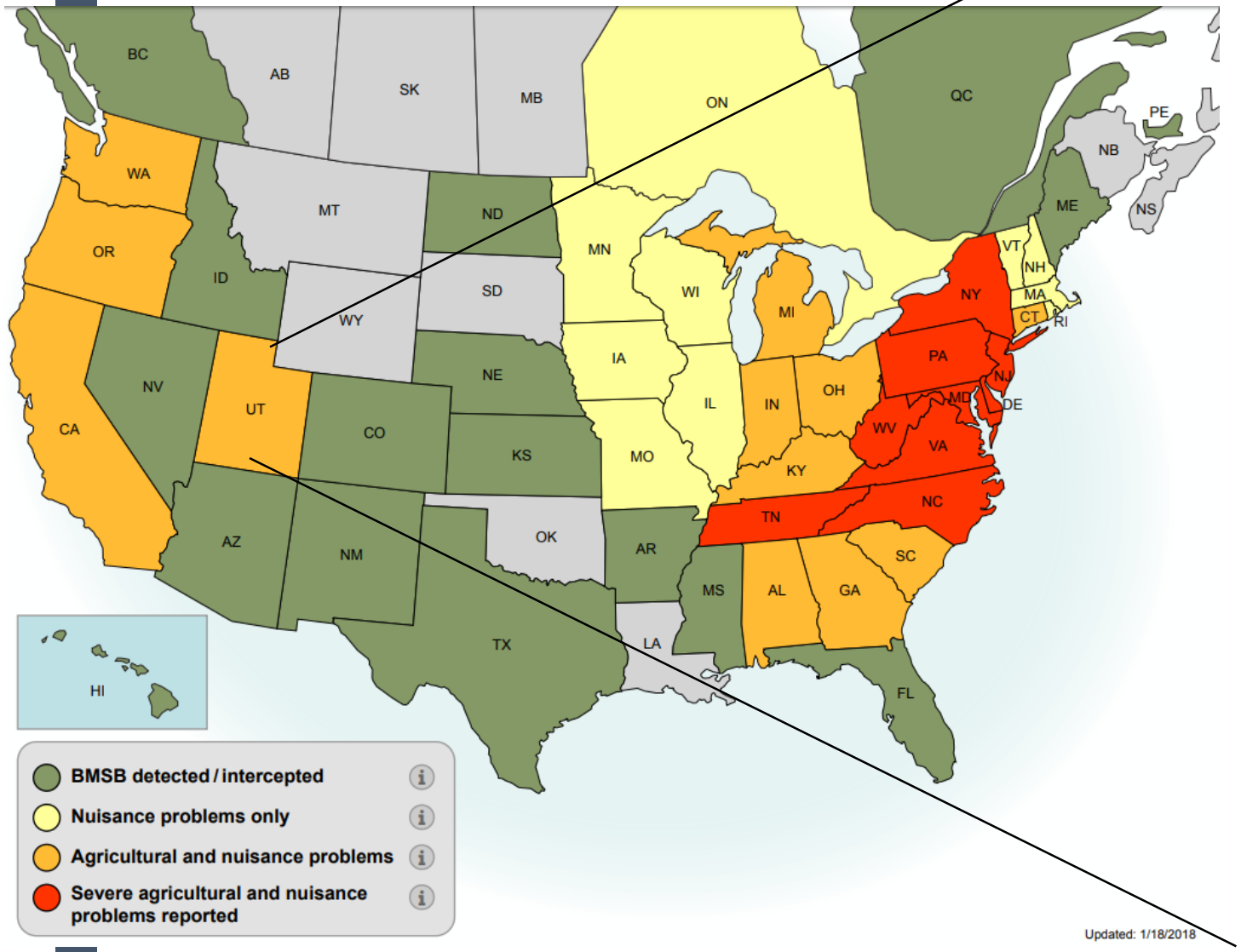
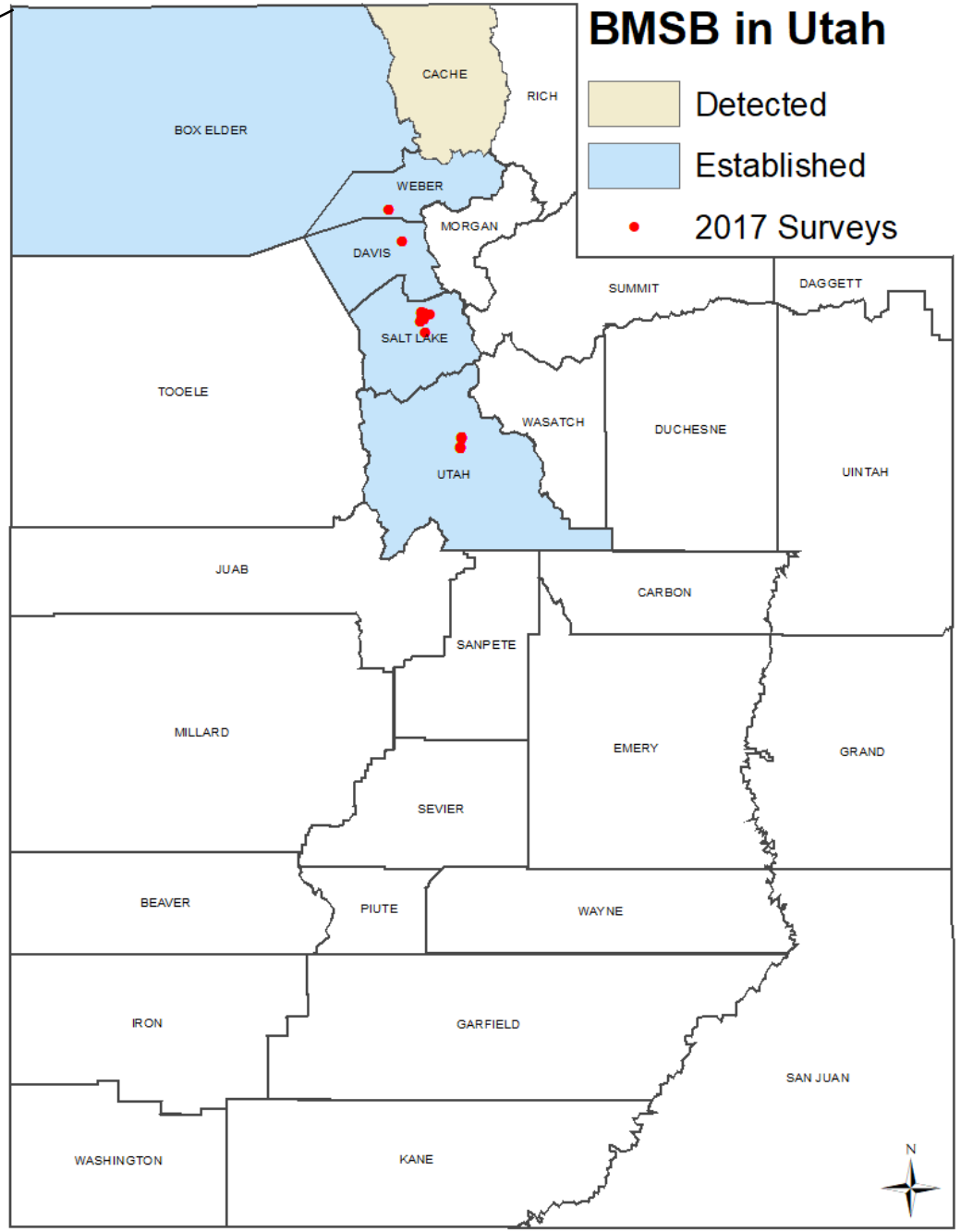


Illustration: Cami Cannon

Where is BMSB?





Photos by Cami Cannon


Photo by Lori Spears

Urban Landscape

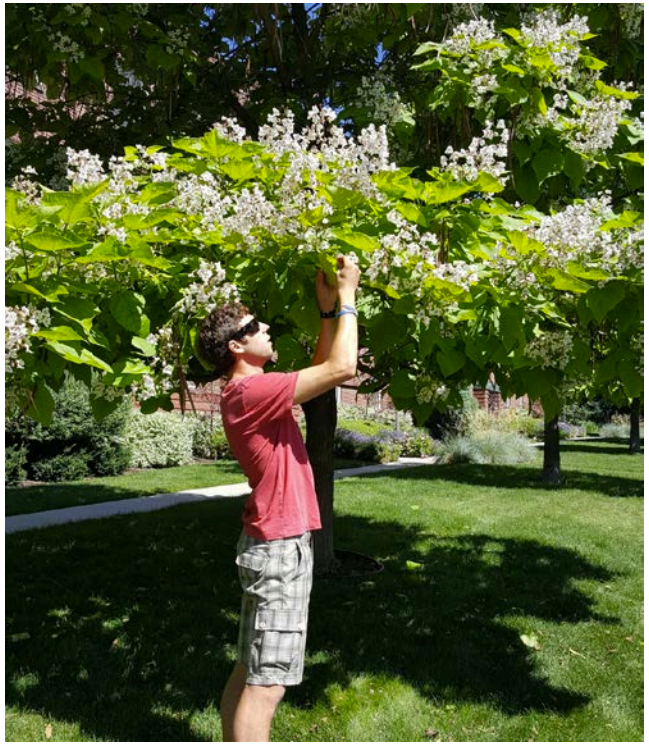
- High number of BMSB
- Wasatch Front contains the majority of Utah's human population
- Urban/suburban areas are within close proximity to agricultural lands

Objectives

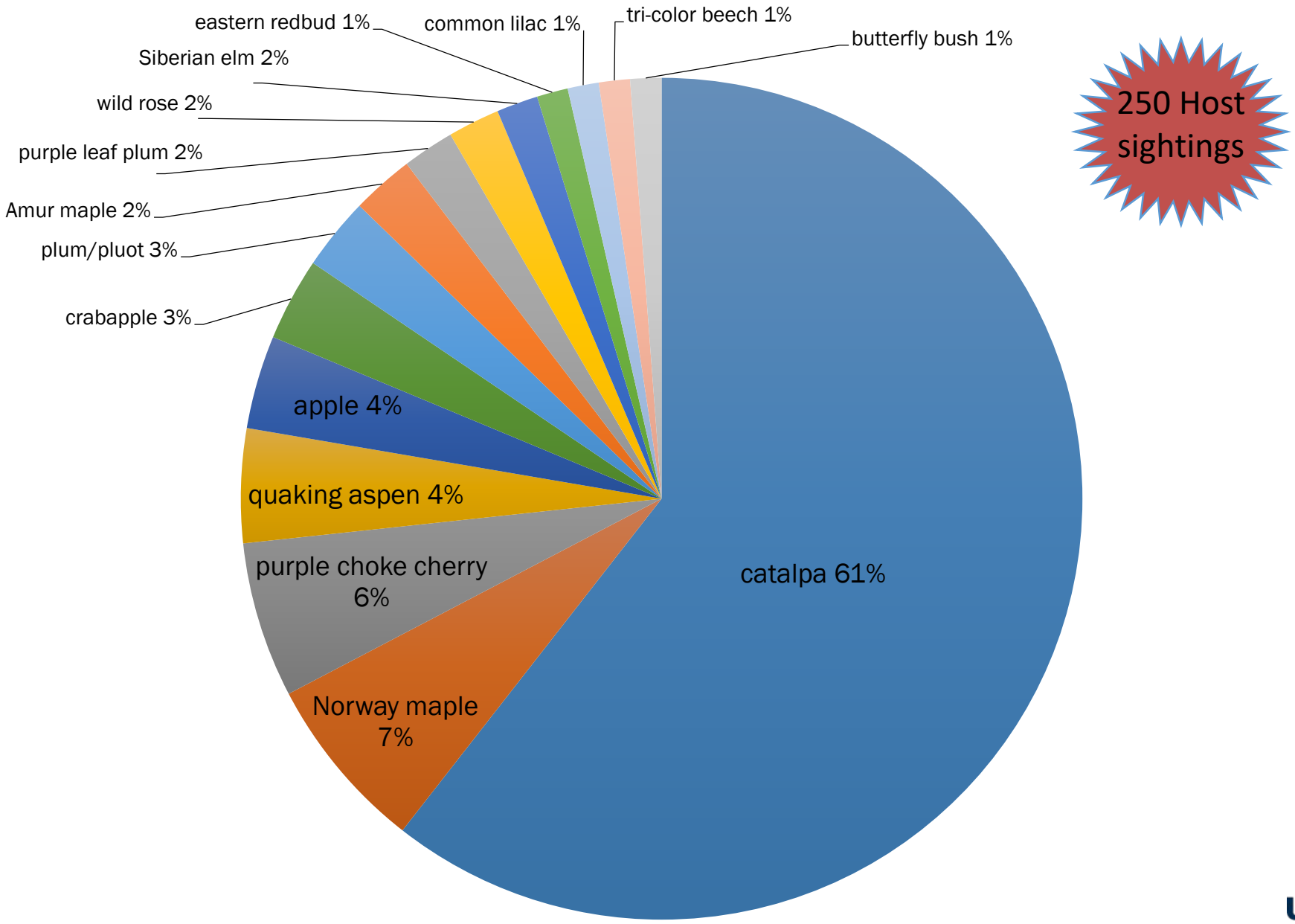
1. To survey and document the current host plants of BMSB in northern Utah
2. To compare trap types and their effectiveness in monitoring BMSB
3. To identify native and introduced parasitoid wasps and document their ability to successfully parasitize BMSB eggs

Host Plant Surveys

- 15 sites on Wasatch Front
- 200m long transect at each site
- 20 plants
- Visual inspection
- Beat sheet sampling



Top 15 Host Plants 2017

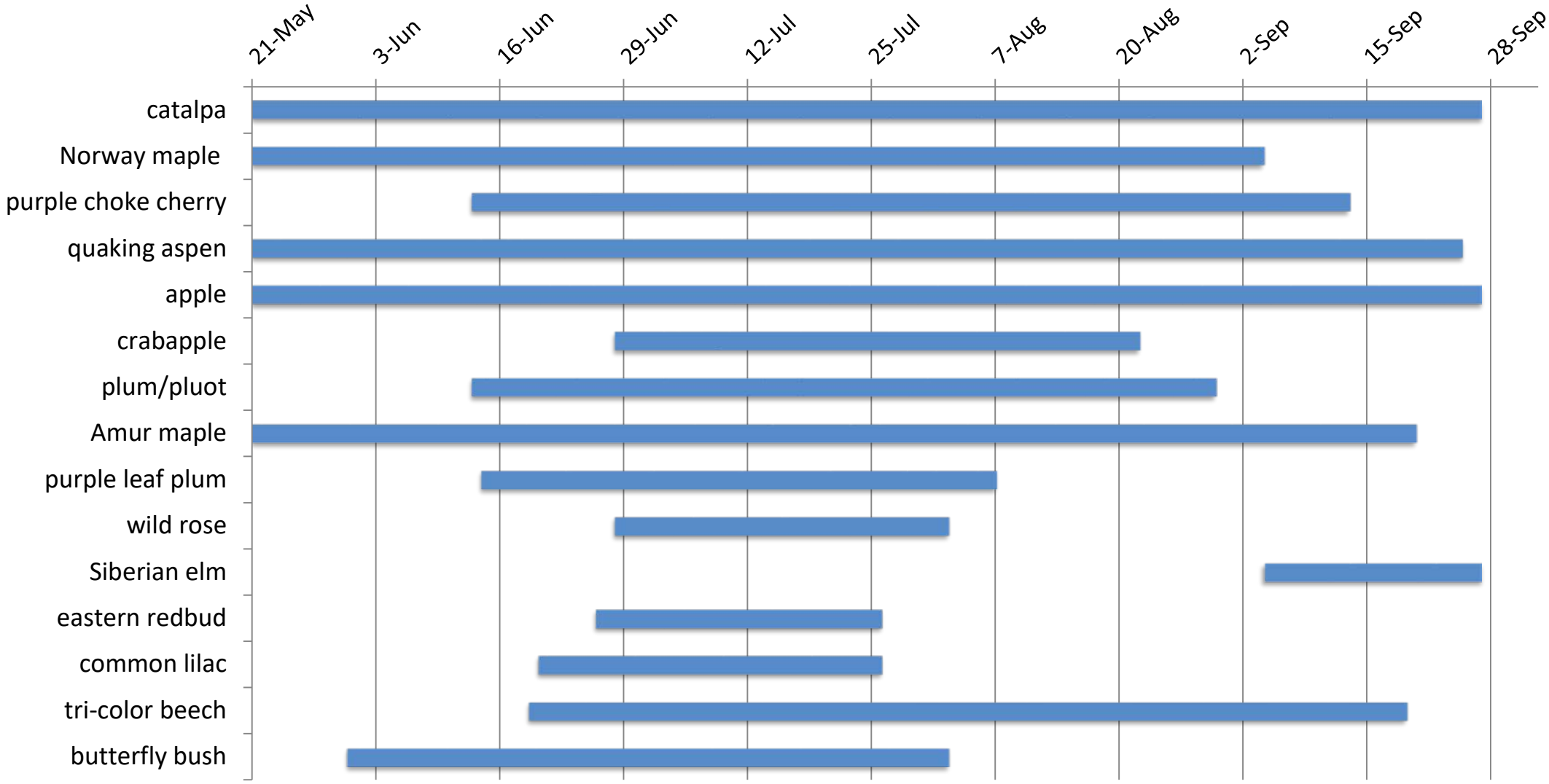


250 Host sightings

UtahStateUniversity

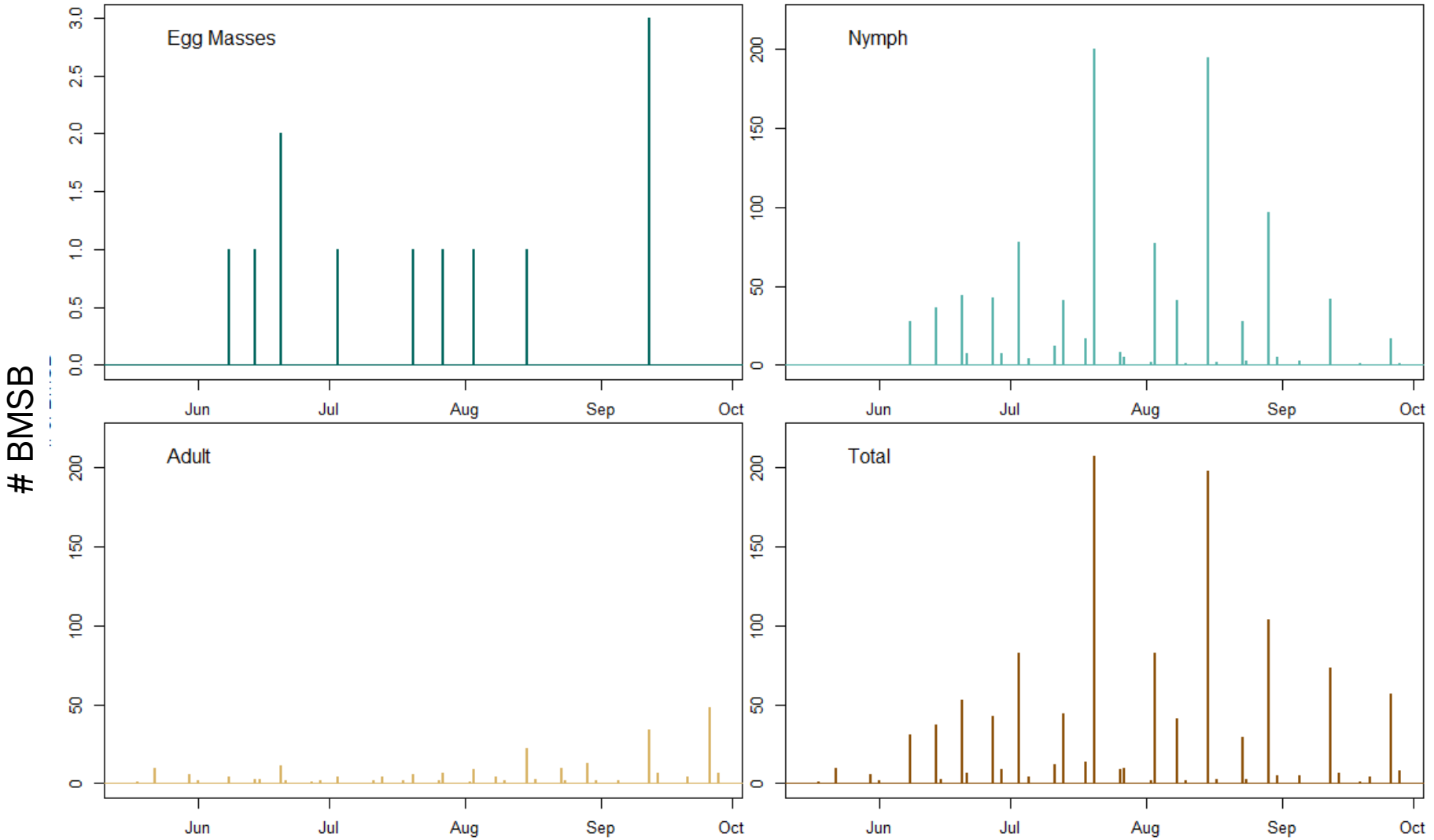
BMSB Seasonal Occurrence - Top 15 Host Plants

May-September, 2017



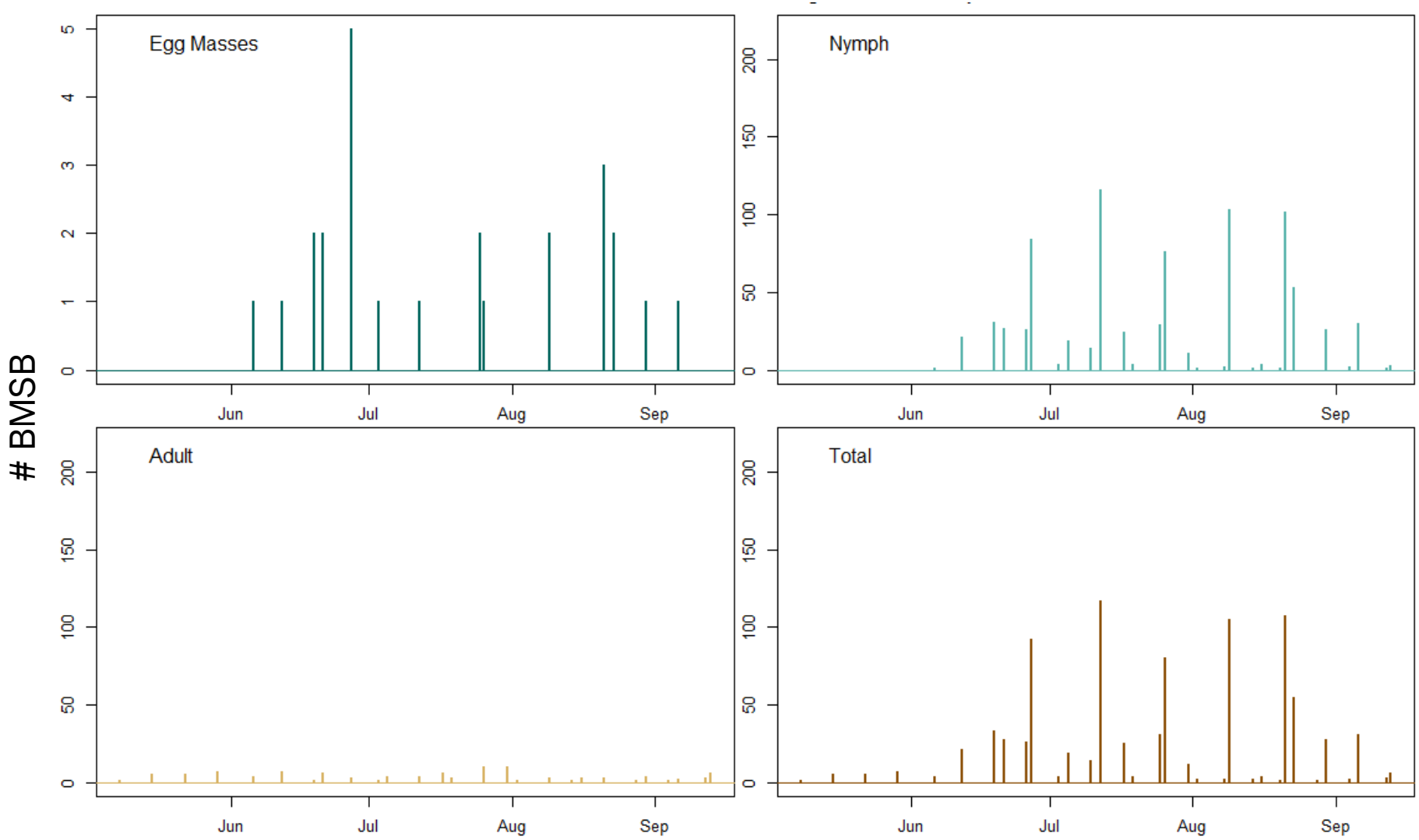
UtahStateUniversity

Seasonal Occurrence on All Host Plants 2017



UtahStateUniversity

Seasonal Occurrence on All Host Plants 2018



UtahStateUniversity

Trap Efficacy

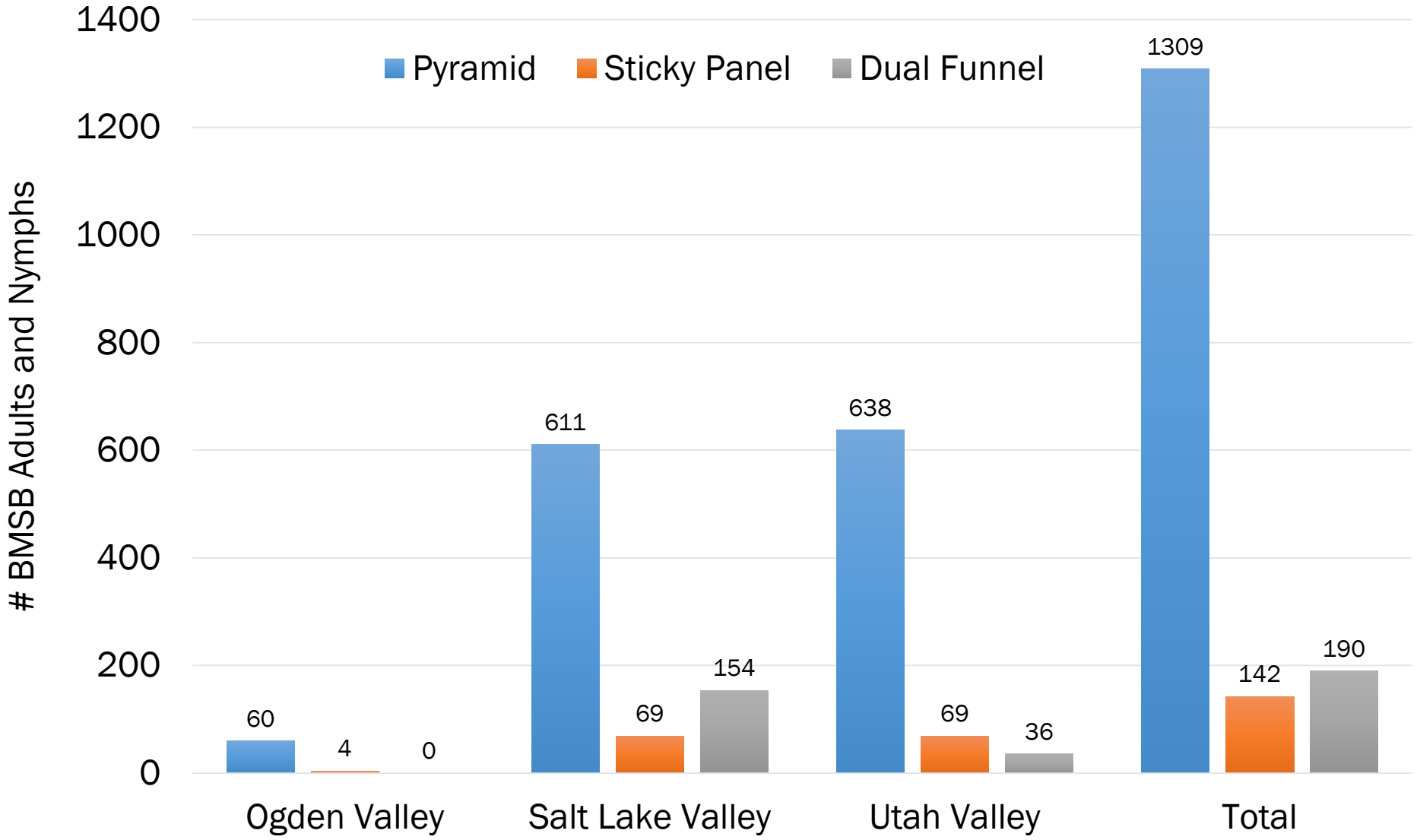
Pyramid

Sticky Panel

Dual Funnel

BMSB Trap Catch by Location

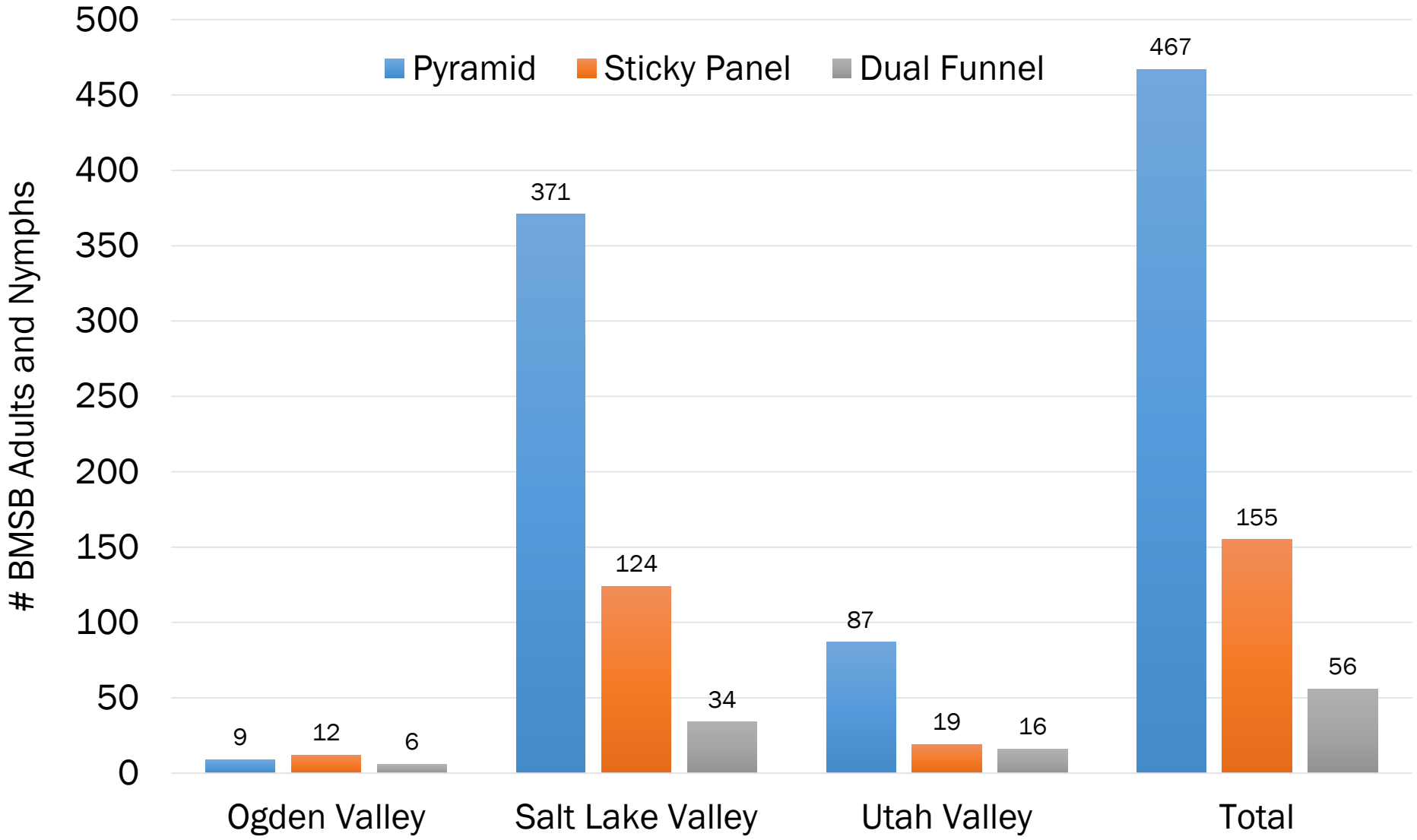
May 15 - October 23, 2017



UtahStateUniversity

BMSB Trap Catch by Location

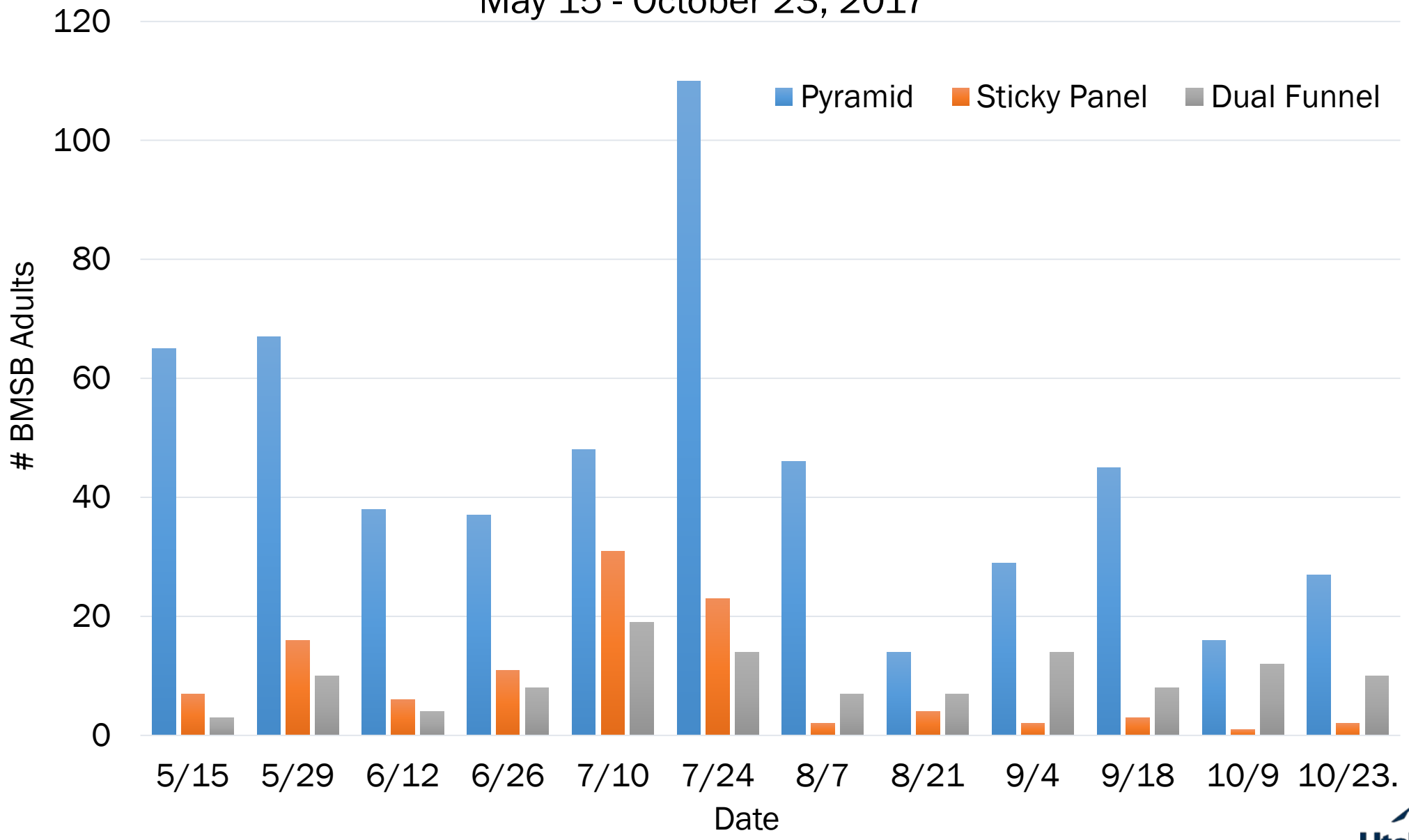
May 7 – September 10, 2018



UtahStateUniversity

Adult BMSB Trap Data

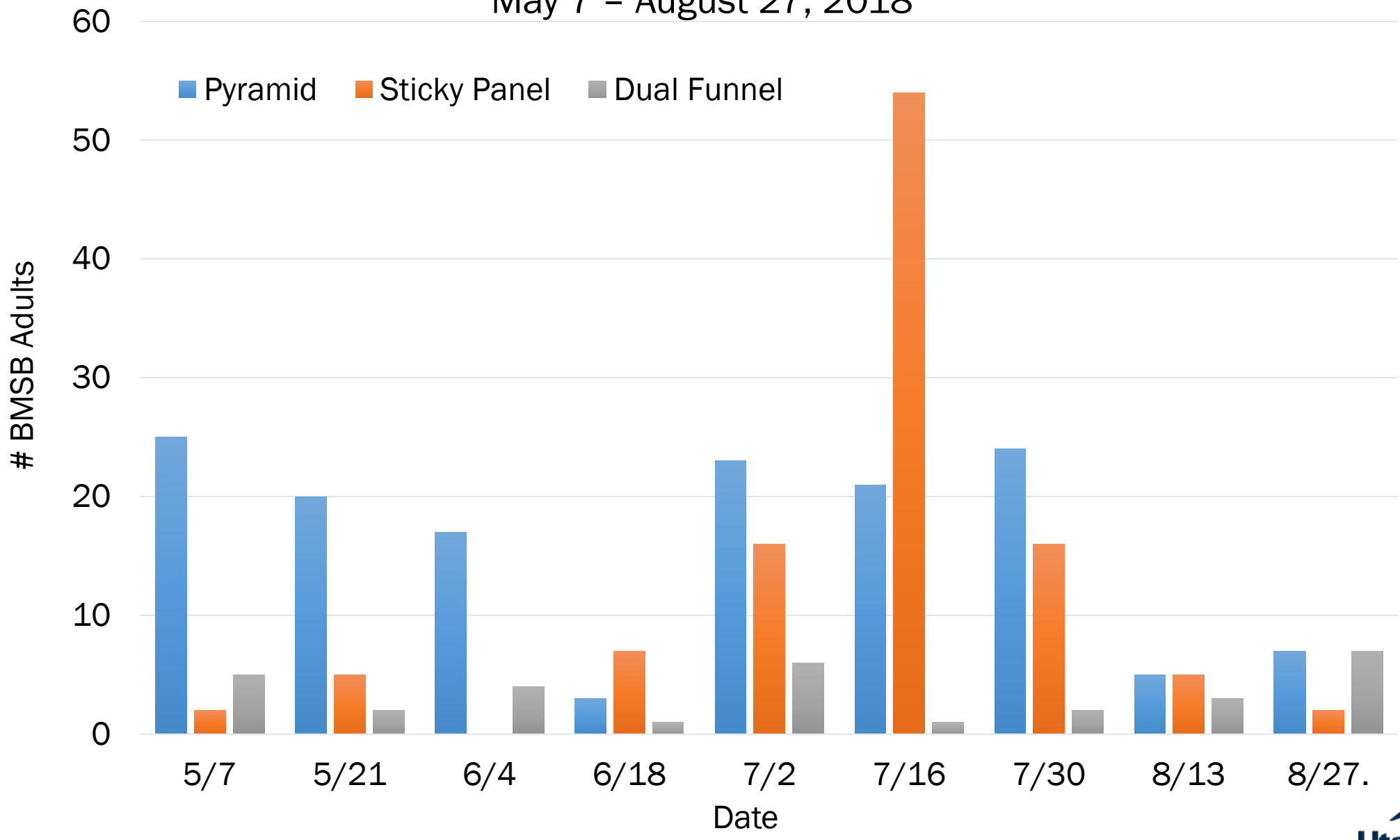
May 15 - October 23, 2017



UtahStateUniversity

Adult BMSB Trap Data

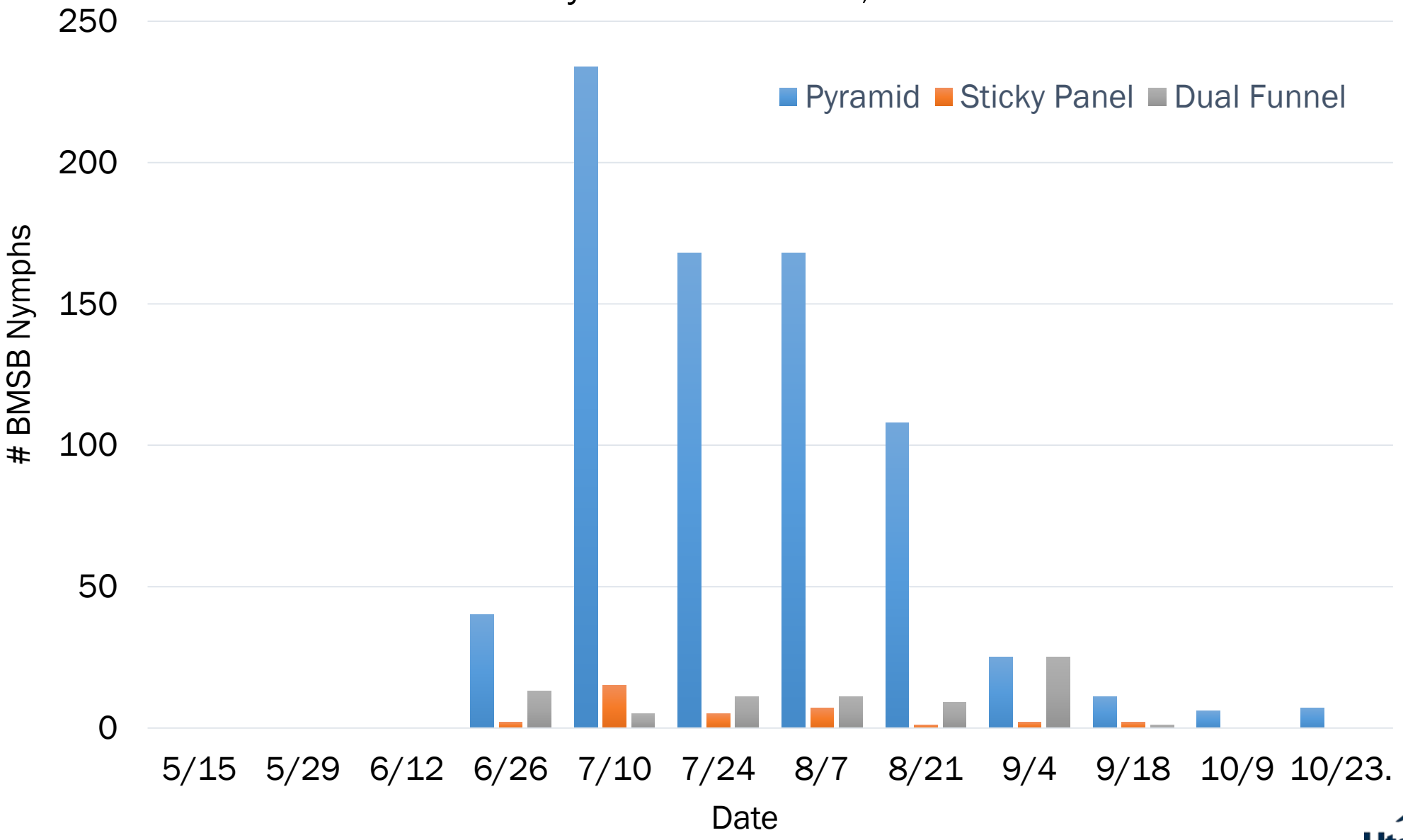
May 7 – August 27, 2018



UtahStateUniversity

Nymph BMSB Trap Catch

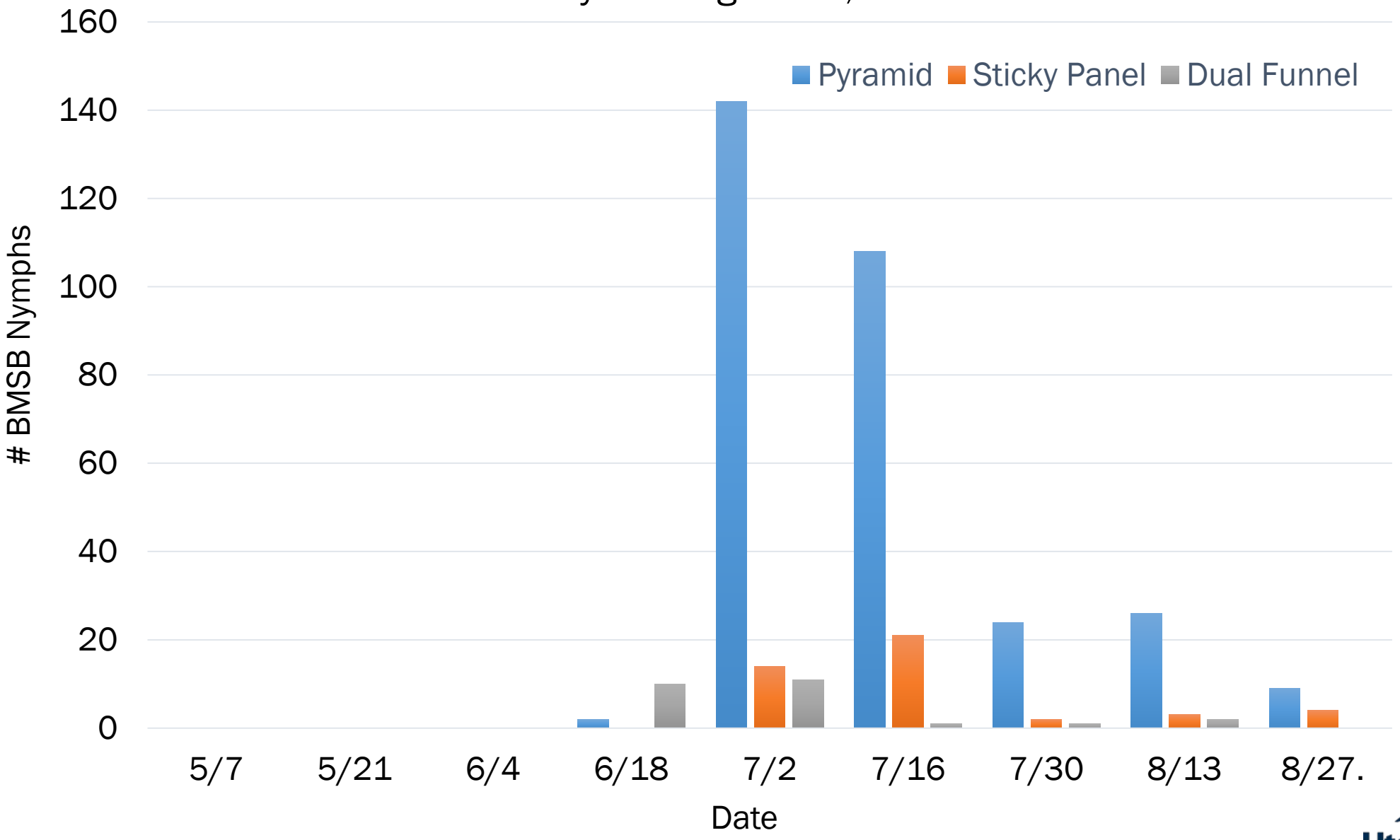
May 15 - October 23, 2017



UtahStateUniversity

Nymph BMSB Trap Catch

May 7 – August 27, 2018



UtahStateUniversity

Brown Marmorated Stink Bug in the Agricultural Landscape: Overwintering, Potential Damage to Fruits, Movement, and Biological Control

Focus of Research

- Overwintering ability in Utah
- Presence and severity in Utah crops
- Find, identify, and test the efficacy of natural enemies in Utah

BMSB Overwintering in Utah

BMSB prefers to overwinter inside manmade structures, but:

- Can BMSB overwinter in the UT natural landscape?
- If so, what structures / habitat types are acceptable?






Are these hosts acceptable for BMSB overwintering success?

Results

- Only 2 out of 144 BMSB survived the winter, both in natural structures
- BMSB were preyed upon inside the cages, but was likely postmortem

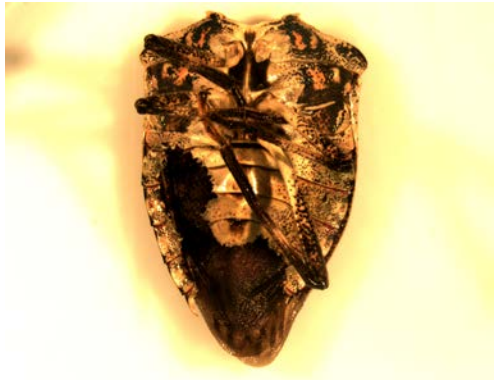


Table 1. Number of surviving and predated stink bugs from the overwintering study. Predation was the highest in the leaf litter treatment. Survival was low in all overwintering environments.

	Natural Structures				Human-Modified Structures	
	Pine	Aspen	Milkvetch Seed Pods	Leaf Litter	Uninsuated Shed	Insulated Attic
Survived	1	0	0	1	0	0
Predated	0	1	0	4	1	1

Presence and Severity in Crops

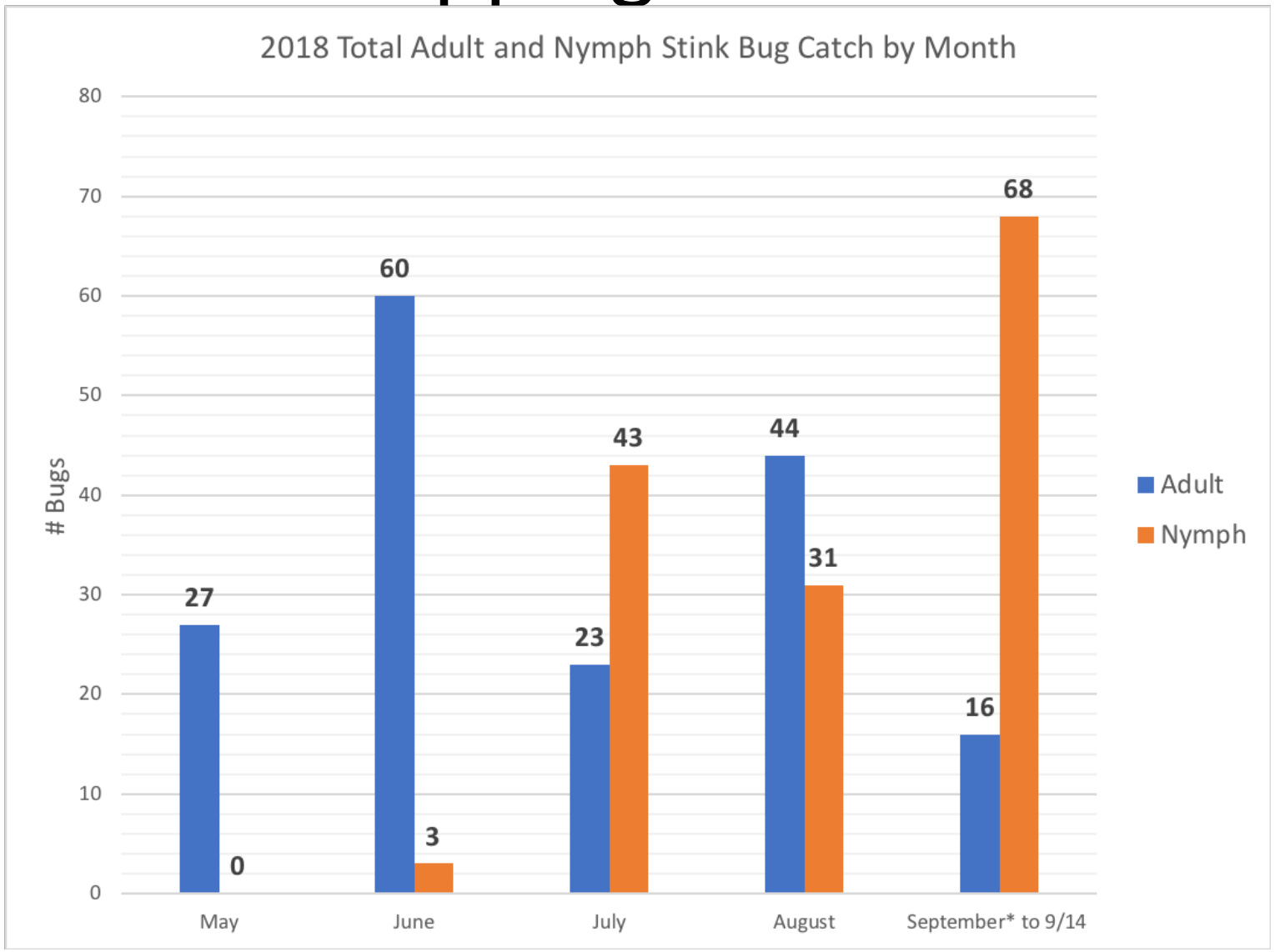
- ”Where are they, and when?”
- Monitor traps in Ag sites, and search for feeding damage.
- Artificially populate host plants of concern; Determine how feeding impacts fruit development.

Trapping Setup

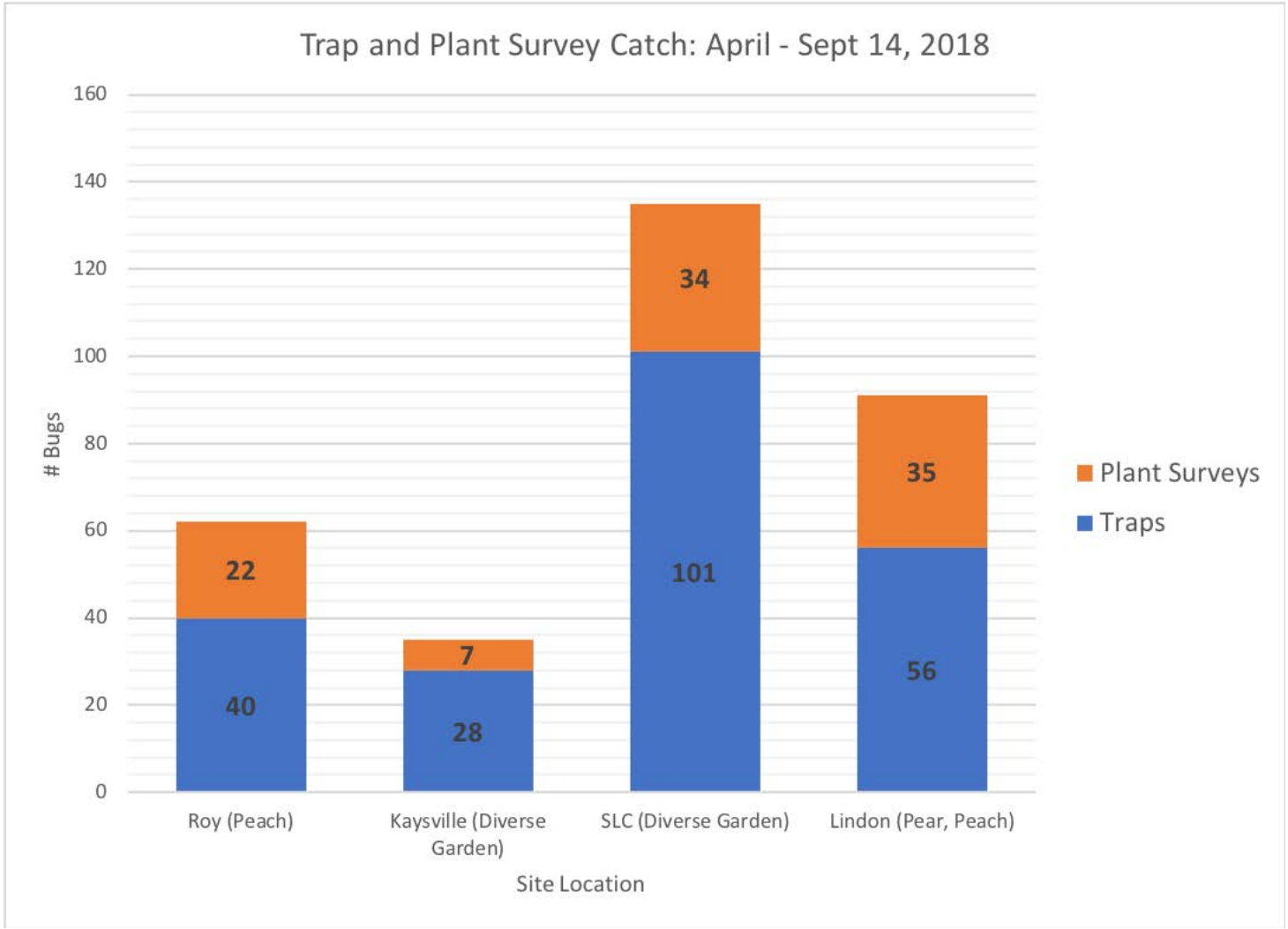
- Pyramid and Sticky Traps set up randomly in 2 transects
- Check traps weekly, search nearby trees for BMSB and fruit damage
- 4 sites used (2 large fruit orchards and 2 small polyculture sites)
- Groups of traps placed at plot center, and plot edges

Orchards - Traps 20m apart

Trapping Results



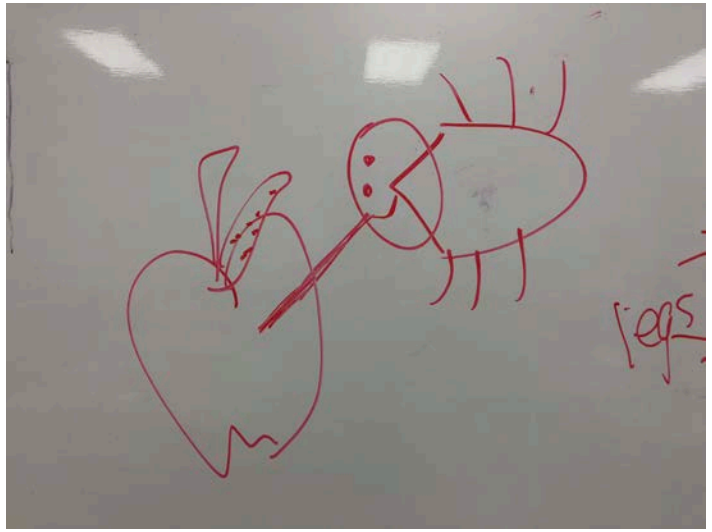
Trap Catch by Site



Potential Damage to Tart Cherry

- Tart cherry damage is a major concern for UT growers.

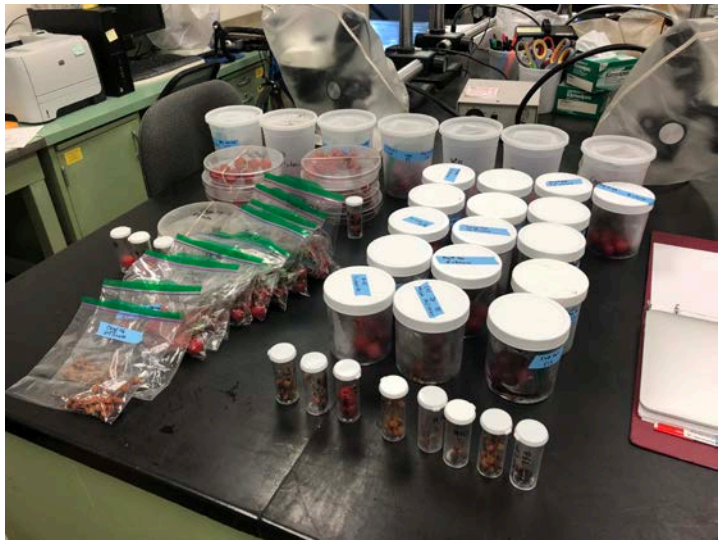
- Will BMSB feed on tart cherry, and how will feeding impact fruit development?

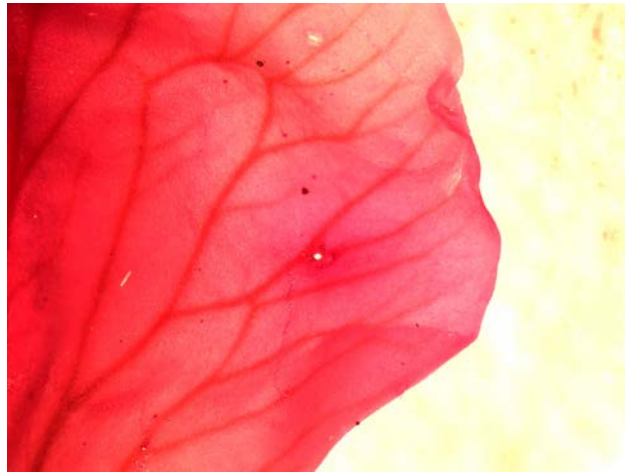


- Set up BMSB on tart cherry buds, flowers, early developing fruit, pit hardening, and mature fruit stages

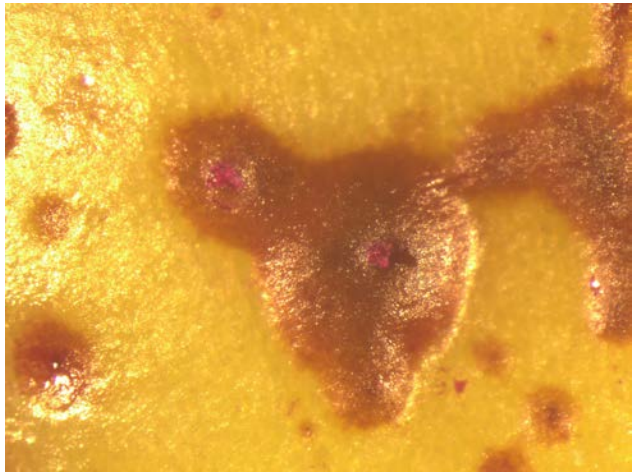
- Allow BMSB to feed for one week, and remove them and half of the fruits

- Analyze the removed fruits for evidence of feeding





Feeding hole on flower



Stylet sheath on young fruit

Stylet sheaths on near mature fruit

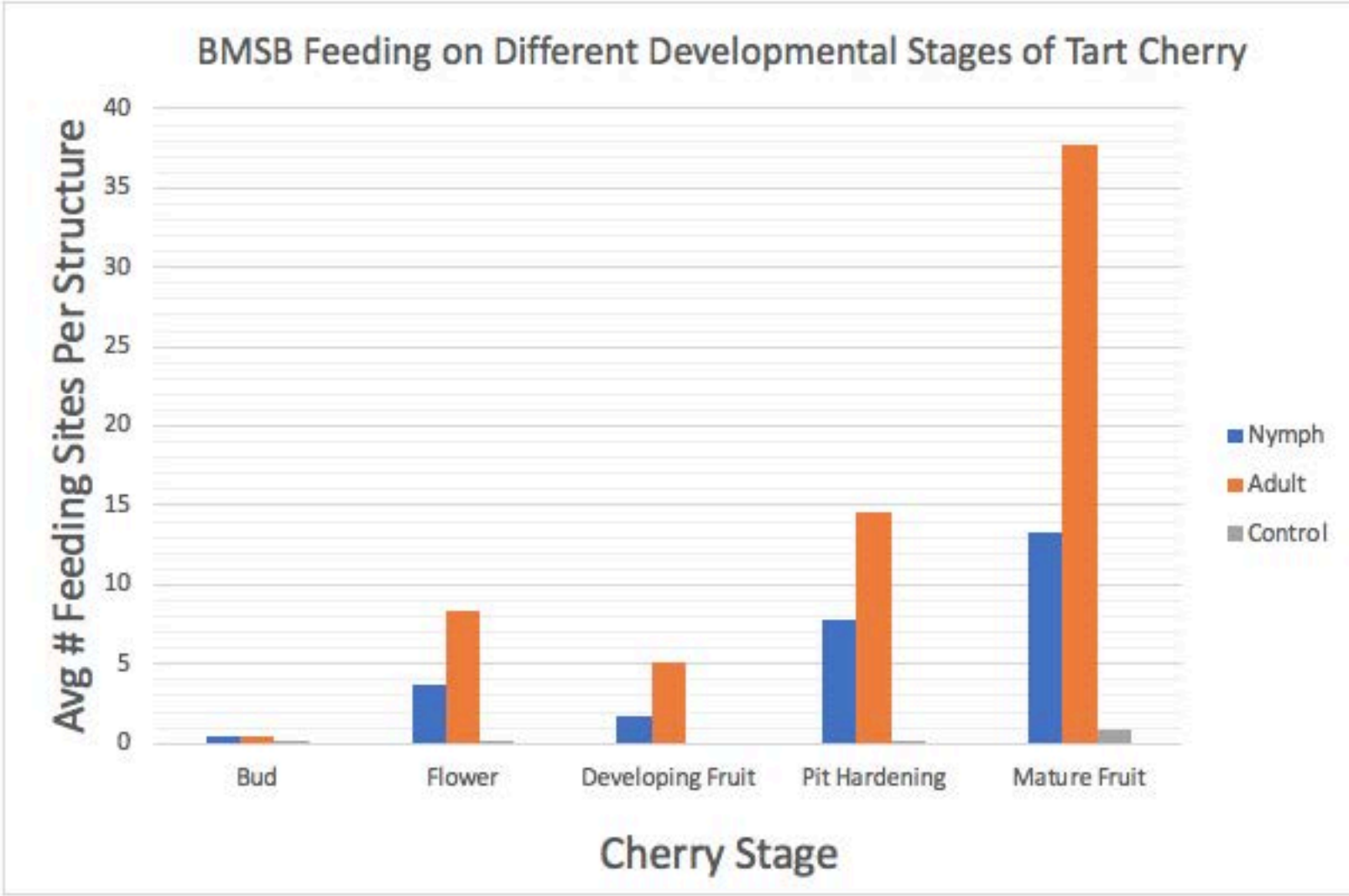
Corking damage on mature fruit

- Harvest the remaining fruits at typical harvest time and measure mass, size, softness, and sugar content.

- Compare these to the number of feeding sites per fruit.

3 general outcomes from feeding:

Feeding Site Results



Biological control

- Natural enemies of BMSB exist throughout the country
  - Predators (egg eaters, egg “suckers”)
  - Parasitoids (egg parasitoids)

- Little is known about the presence and composition of natural enemies in Utah.

- Survey for parasitoids and determine effectiveness against BMSB

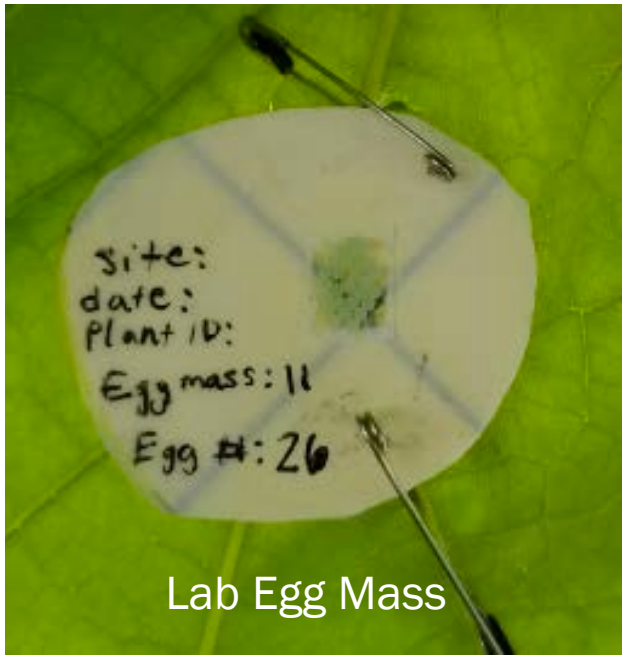
Where to Search

Parasitoid on BMSB egg mass in peach.
Roy, UT – August 2017

Biological Control: Parasitoid Wasps

- Egg deployment and collection
  - 232 egg masses deployed (2017 & 2018)
  - 27 guarding parasitoids (17 ag, 10 urban)*

  * 2018 survey ongoing – parasitoids not yet identified



Lab Egg Mass


Wild Egg Mass

Parasitoids: Generalist

- *Anastatus mirabilis* (Walsh & Riley)
- Family: Eupelmidae
- Location: Salt Lake City (urban site)
- Progeny emerged

Parasitoids: Specialist

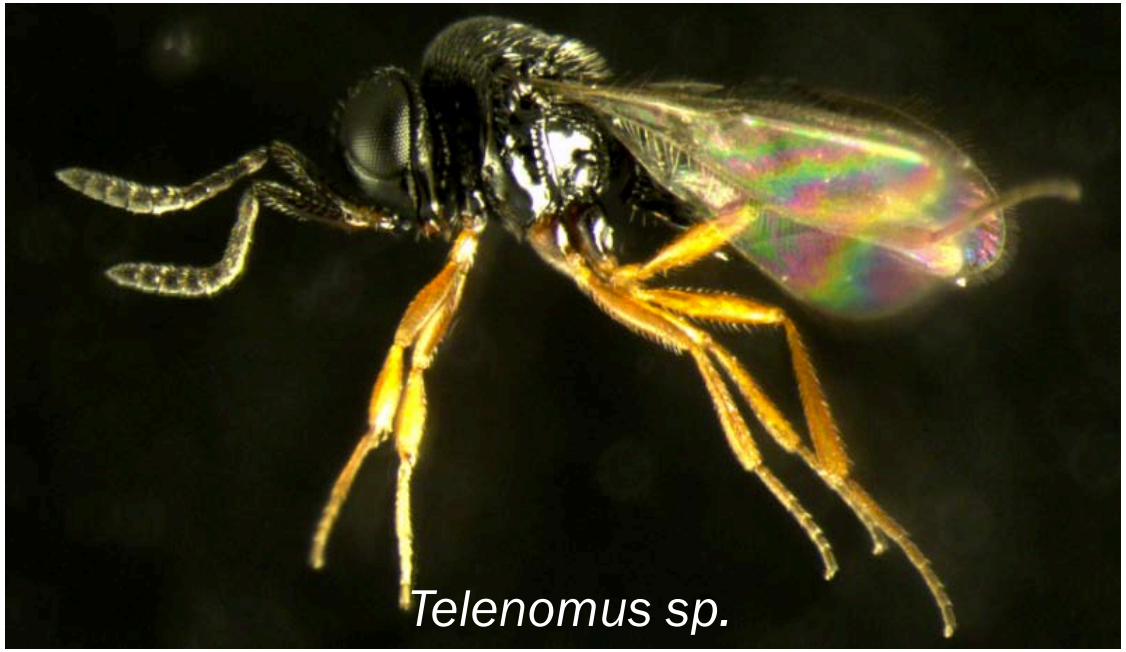
- *Trissolcus erugatus* Johnson
- Family: Scelionidae
- Location: Roy (Ag site)
- Progeny did not emerge

Parasitoids: Specialist

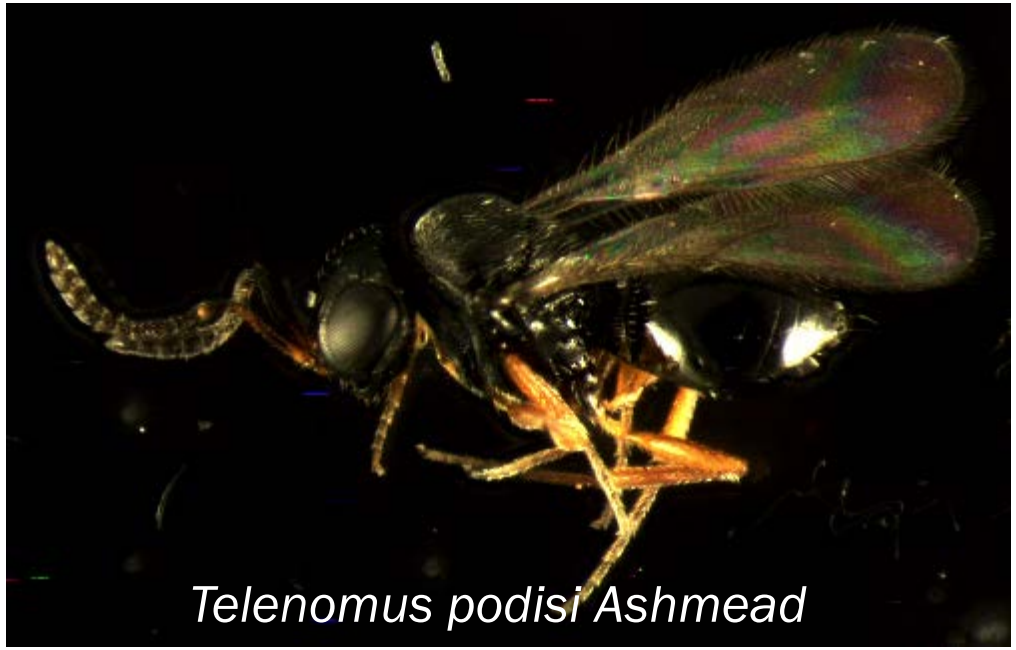
- *Trissolcus euschisti* (Ashmead)
- Family: Scelionidae
- Location: Salt Lake City, Roy (ag and urban sites)
- Progeny emerged

Parasitoids: Specialist

- *Telenomus spp.*
- Family: Scelionidae
- Location: Salt Lake City (ag and urban sites)
- Progeny did not emerge



Telenomus sp.

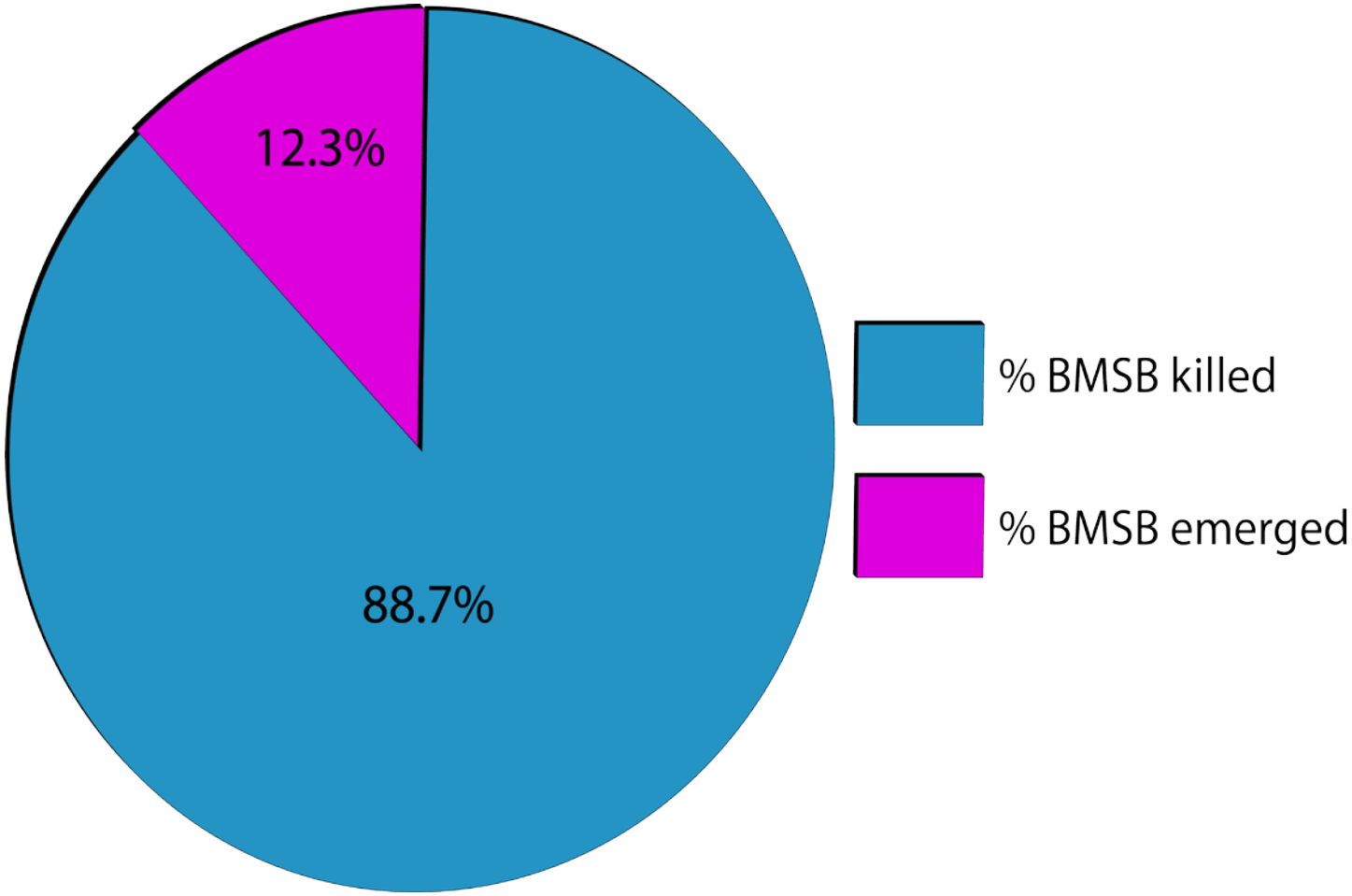


Telenomus podisi Ashmead

Parasitoids: Specialist

- *Trissolcus utahensis* (Ashmead)
- Family: Scelionidae
- Location: Roy (ag site)
- Progeny did not emerge (plus efficacy testing)

Effectivenss of *T. utahensis* When Stinging BMSB Eggs



The Future

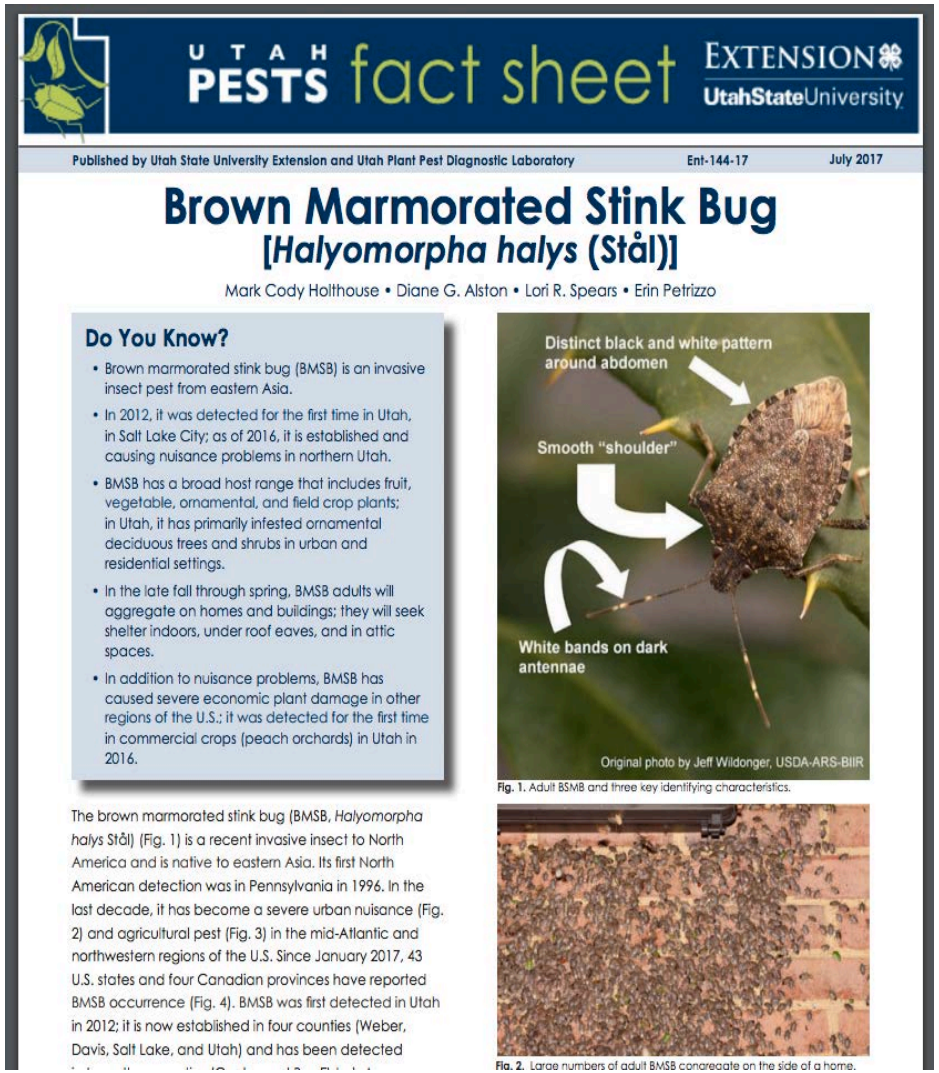
- Hoping to find *Trissolcus japonicus* in Utah
  - Highly effective parasitoid native to Southeast Asia now found in several U.S. States.
  - Different populations likely have different effectiveness against BMSB.

Photo: Elijah Talamas

So…BMSB is here…
What Can YOU Do?

- Monitor/Prevent:
  - set traps, visually inspect plants, understand your area's risk (host plants nearby) before you have an infestation
- Act:
  - Exclude BMSB from small home gardens by applying kaolin clay, covering planters with hoops/netting, wrapping tree fruit branches in mesh, and other cultural controls
  - Broad spectrum insecticides
    - Pyrethroids, neonicotinoids, etc. for extreme cases

Outreach Material



UTAH PESTS fact sheet

EXTENSION
UtahStateUniversity

Published by Utah State University Extension and Utah Plant Pest Diagnostic Laboratory | Ent-144-17 | July 2017

Brown Marmorated Stink Bug
[*Halyomorpha halys* (Stål)]

Mark Cody Holthouse • Diane G. Alston • Lori R. Spears • Erin Petrizzo

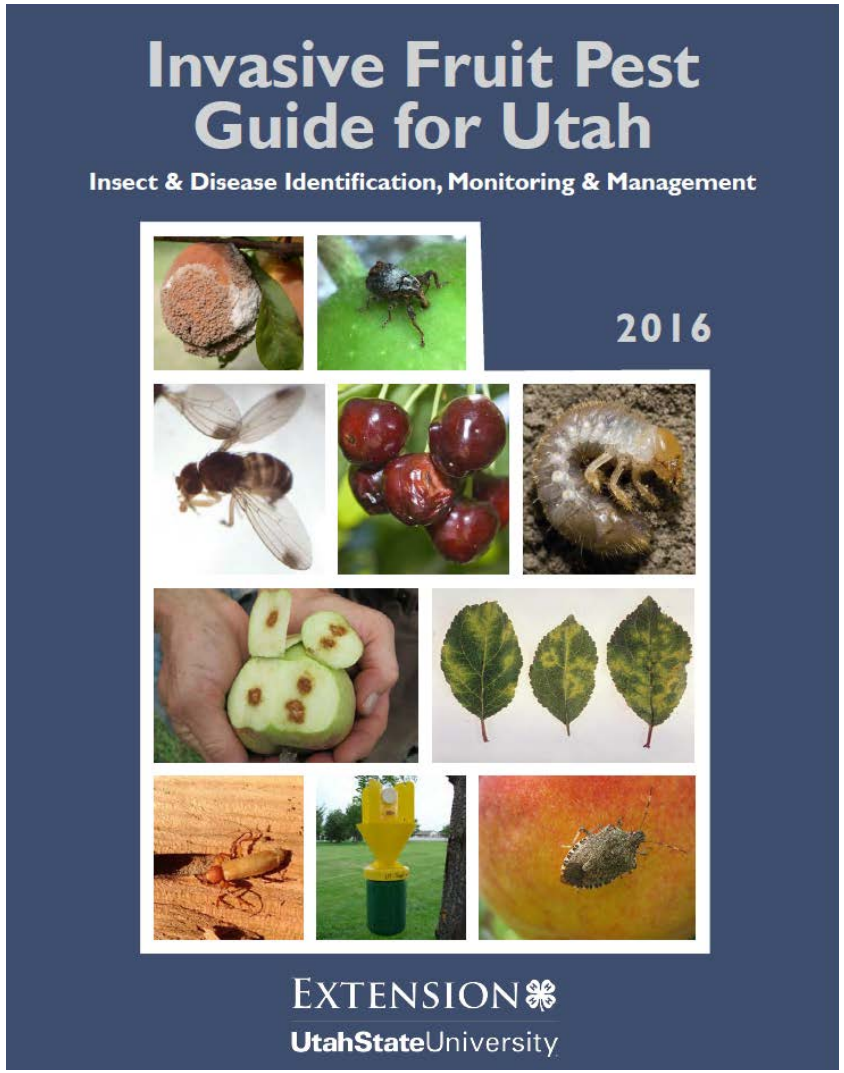
Do You Know?

- Brown marmorated stink bug (BMSB) is an invasive insect pest from eastern Asia.
- In 2012, it was detected for the first time in Utah, in Salt Lake City; as of 2016, it is established and causing nuisance problems in northern Utah.
- BMSB has a broad host range that includes fruit, vegetable, ornamental, and field crop plants; in Utah, it has primarily infested ornamental deciduous trees and shrubs in urban and residential settings.
- In the late fall through spring, BMSB adults will aggregate on homes and buildings; they will seek shelter indoors, under roof eaves, and in attic spaces.
- In addition to nuisance problems, BMSB has caused severe economic plant damage in other regions of the U.S.; it was detected for the first time in commercial crops (peach orchards) in Utah in 2016.

Fig. 1. Adult BSMB and three key identifying characteristics.

The brown marmorated stink bug (BMSB, *Halyomorpha halys* Stål) (Fig. 1) is a recent invasive insect to North America and is native to eastern Asia. Its first North American detection was in Pennsylvania in 1996. In the last decade, it has become a severe urban nuisance (Fig. 2) and agricultural pest (Fig. 3) in the mid-Atlantic and northwestern regions of the U.S. Since January 2017, 43 U.S. states and four Canadian provinces have reported BMSB occurrence (Fig. 4). BMSB was first detected in Utah in 2012; it is now established in four counties (Weber, Davis, Salt Lake, and Utah) and has been detected

Fig. 2. Large numbers of adult BMSB congregate on the side of a home.



Smash that BMSB!!!!

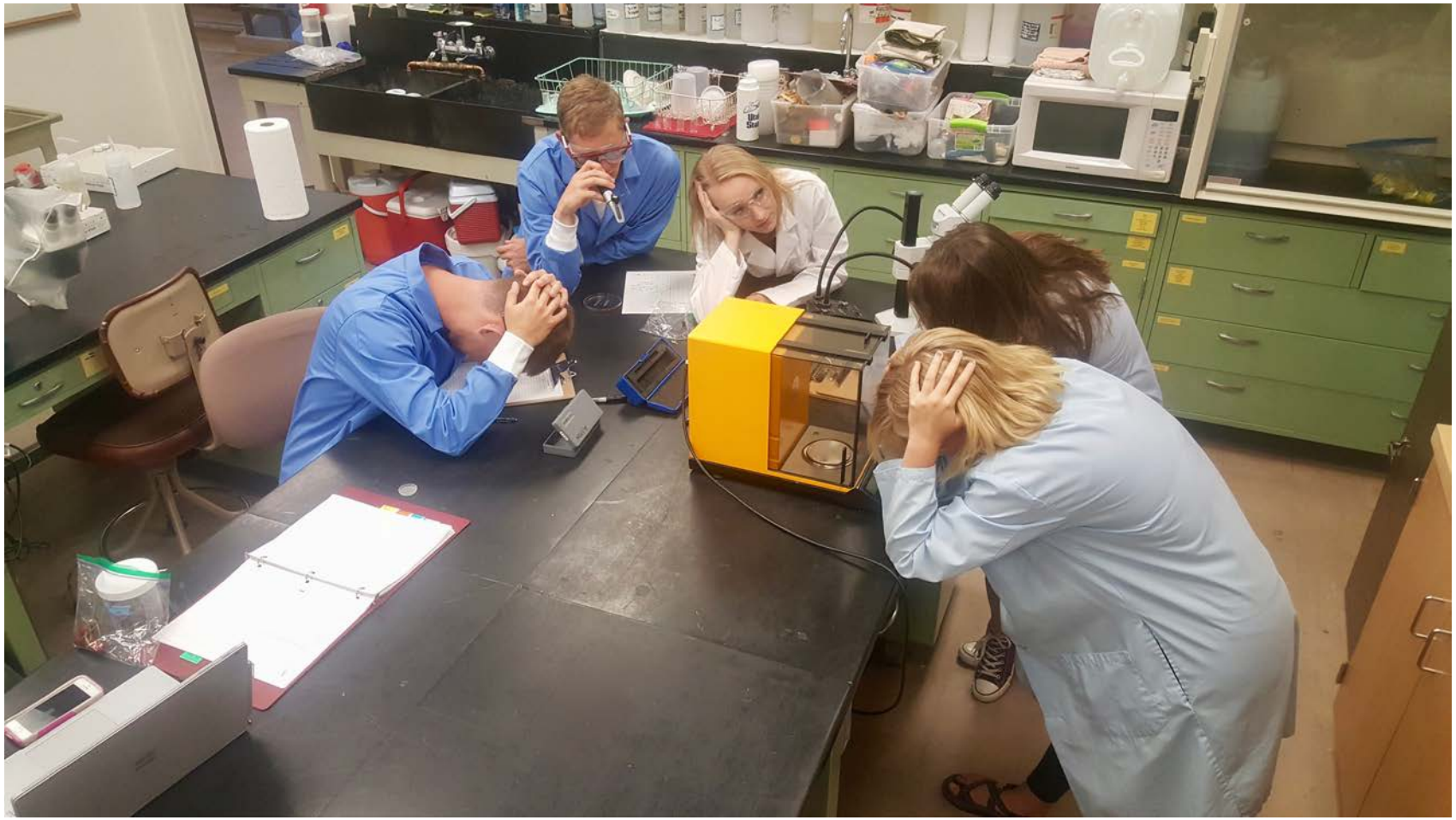
Smash that BMSB!!!!

Smash that BMSB!!!!

Smash that BMSB!!!!


Smash that BMSB!!!!

Questions?



Acknowledgements

Utah Specialty Crop Block Grant Program
Utah Agricultural Experiment Station
Utah State University Extension
USDA NIFA SCRI, USDA APHIS PPQ

Field and lab technicians:

Ben Steadman
Chelise Dever
Hanna Kirkland
Kate Morgan
Lily Bourett
James Withers
Loren Linford

This material is based upon work that is supported by the National Institute of Food and Agriculture, U.S. Department of Agriculture, Specialty Crop Research Initiative under award number 2016-51181-25409.