

16 years post detection in Oregon: BMSB distribution, damage, and management



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Funding

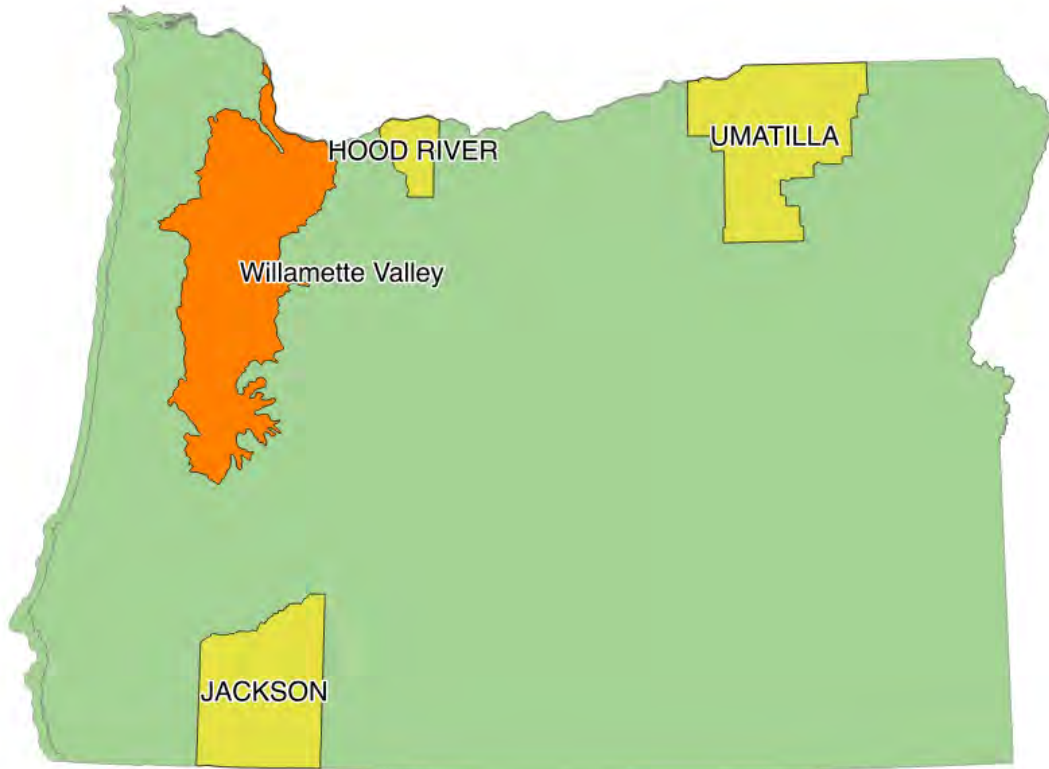
 **USDA** United States Department of Agriculture National Institute of Food and Agriculture
Specialty Crop Research Initiative

Collaborating Institutions

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Damaging BMSB populations



- Umatilla Co.**
 - Apples

- Mid-Columbia (OR/WA)**
 - Pears, cherries

- Willamette Valley**
 - Hazelnuts, tree fruits, small fruits, vegetables

- Jackson Co. (Rogue Valley)**
 - Pears

Traps used in threshold study – weekly monitoring 2016-2019



Sticky card on stake

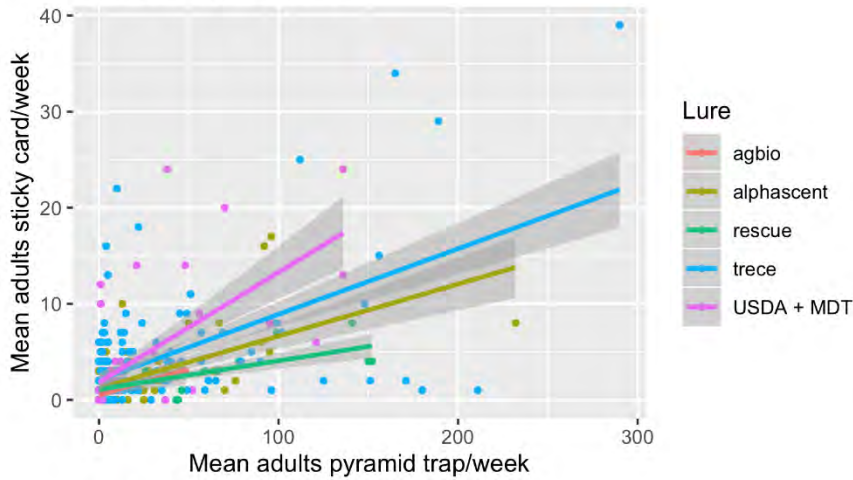


Pyramid trap

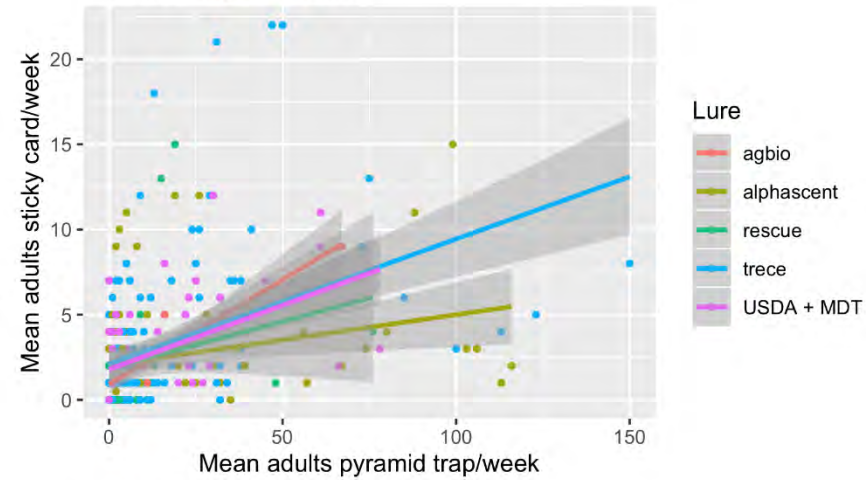
- three reps for each type
 - Alpha Scents combo
 - Agbio
 - Trecé
 - USDA: Septa + MDT (not used in 2019)

Lure and Trap Comparison

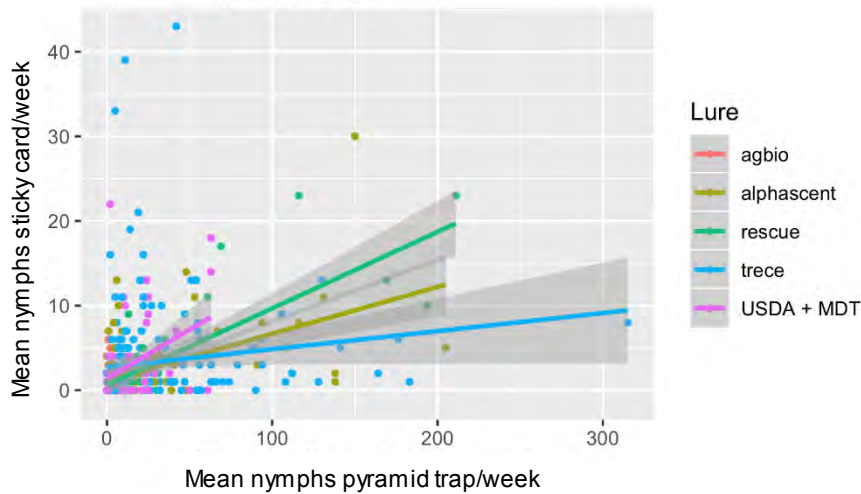
Border Traps: adults



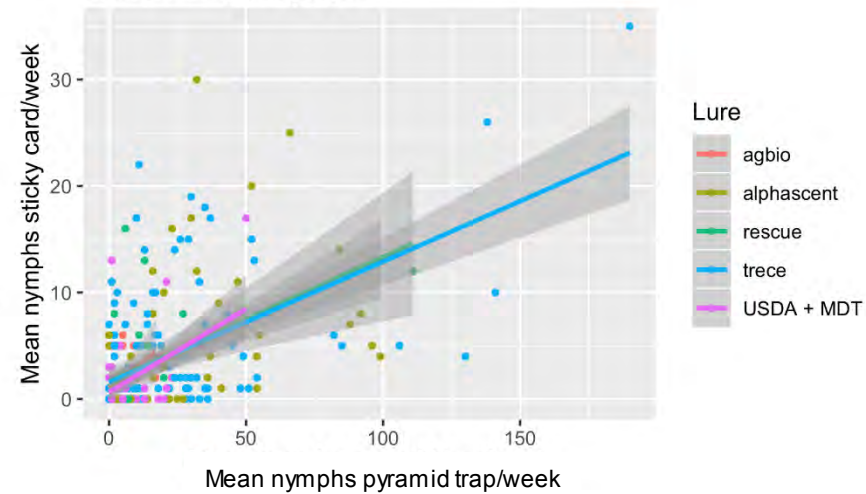
Interior Traps: adults



Border Traps: nymphs



Interior Traps: nymphs



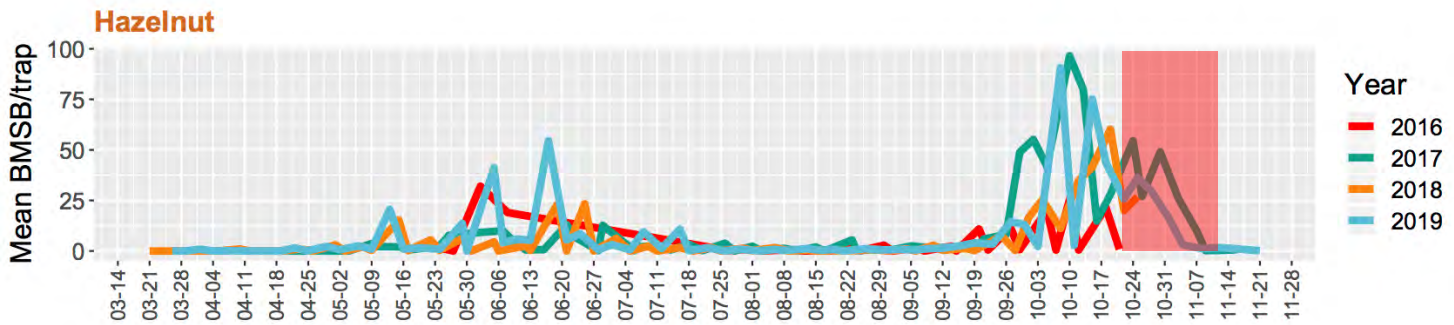
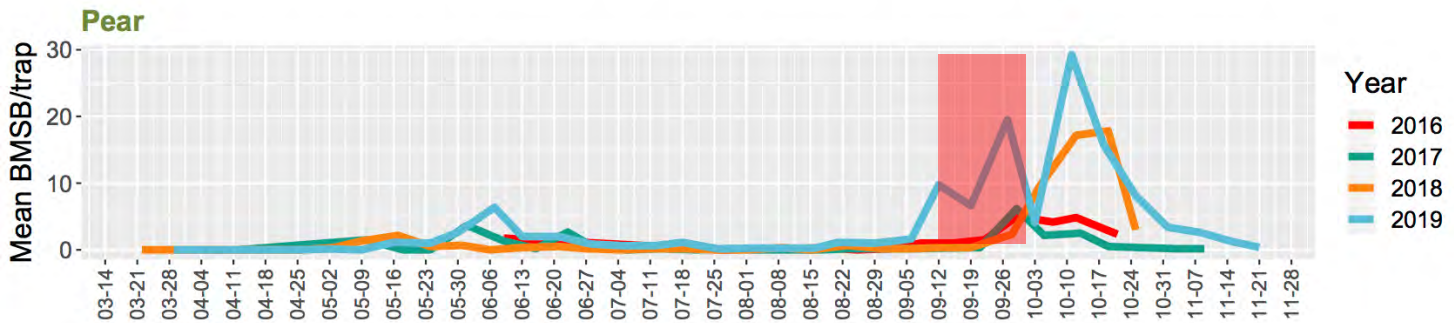
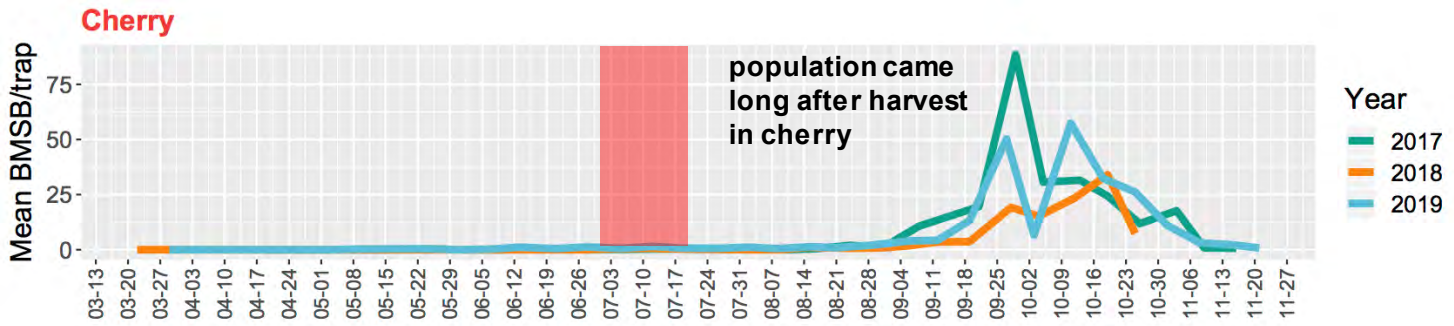
Trap thresholds

- Can we use traps to guide management?
 - Short et al. 2016 — 10 BMSB/wk on apple

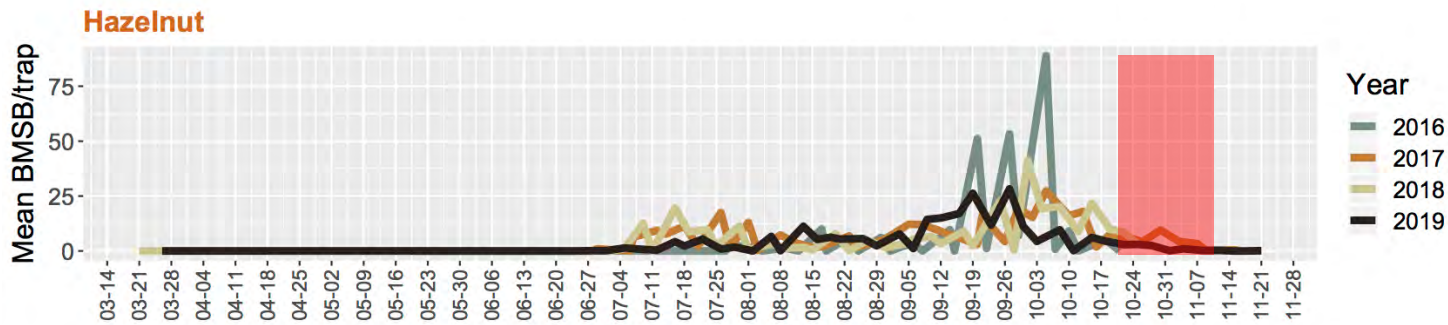
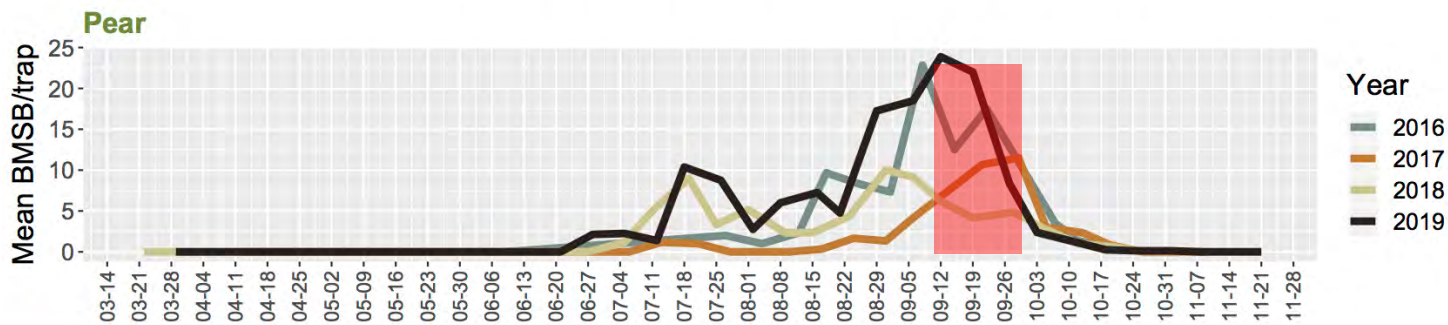
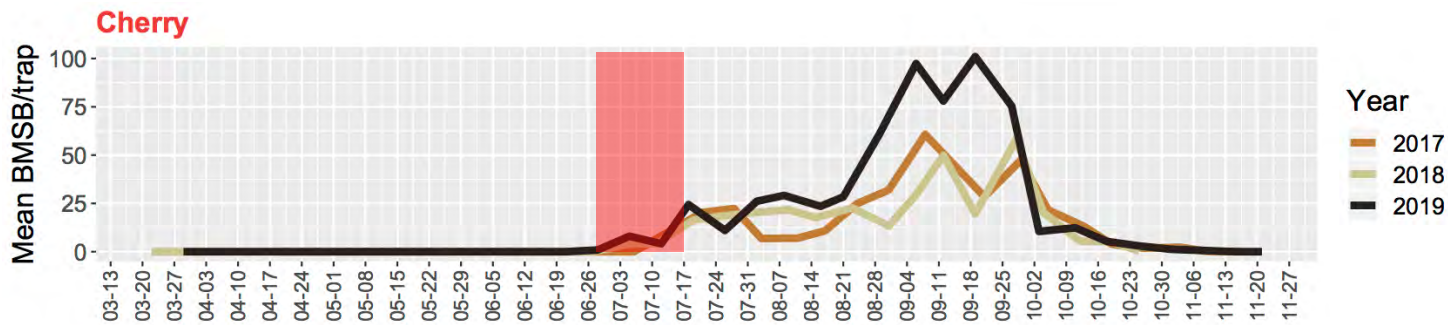


Oregon specialty orchard crops: sweet cherry, European pear and hazelnut – in phenological order of harvest

Adults - captures



Nymphs - captures



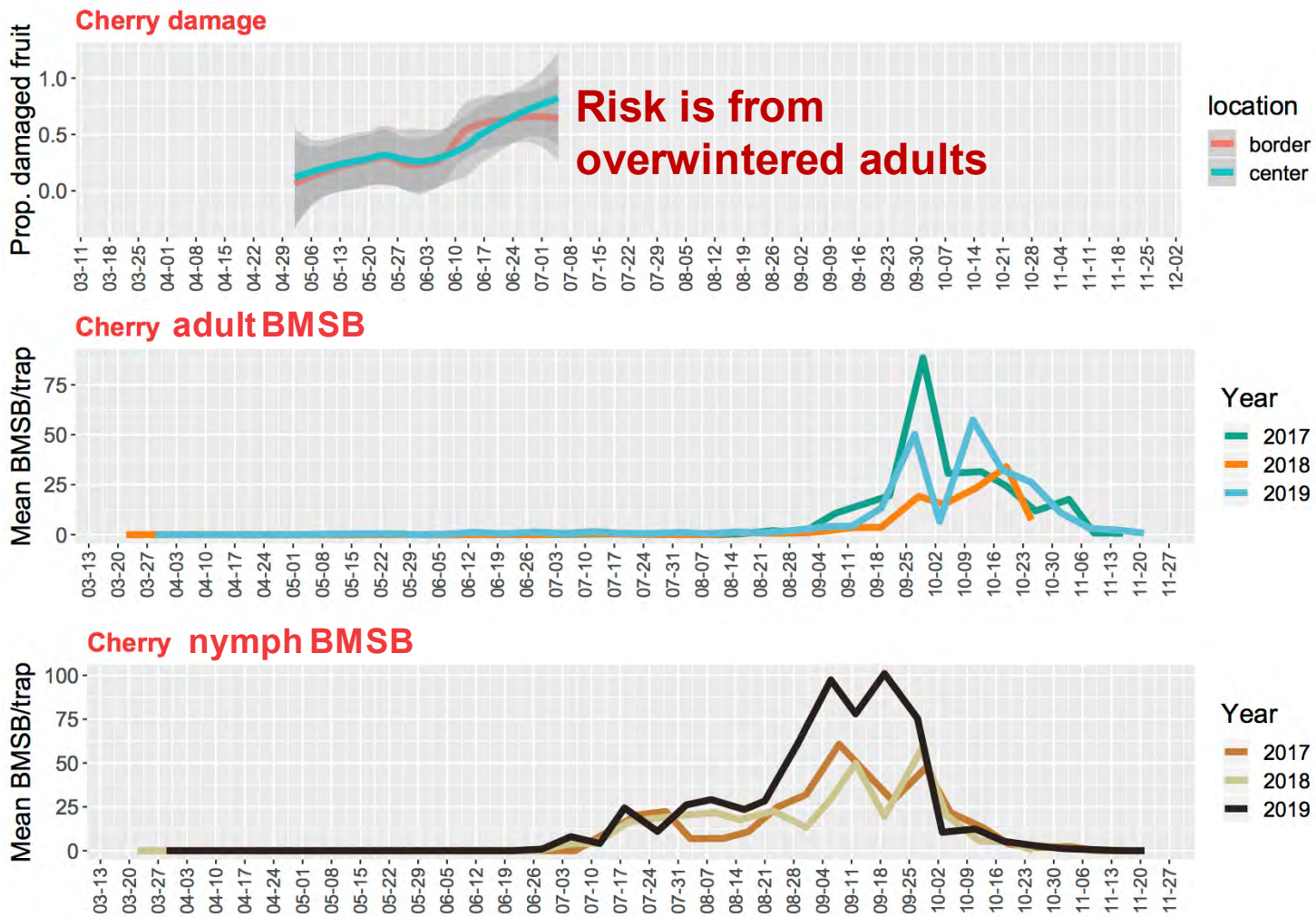
Damage assessment – 100 fruit harvested every 2 weeks from border and center



Sweet cherry



Crop damage: Cherry

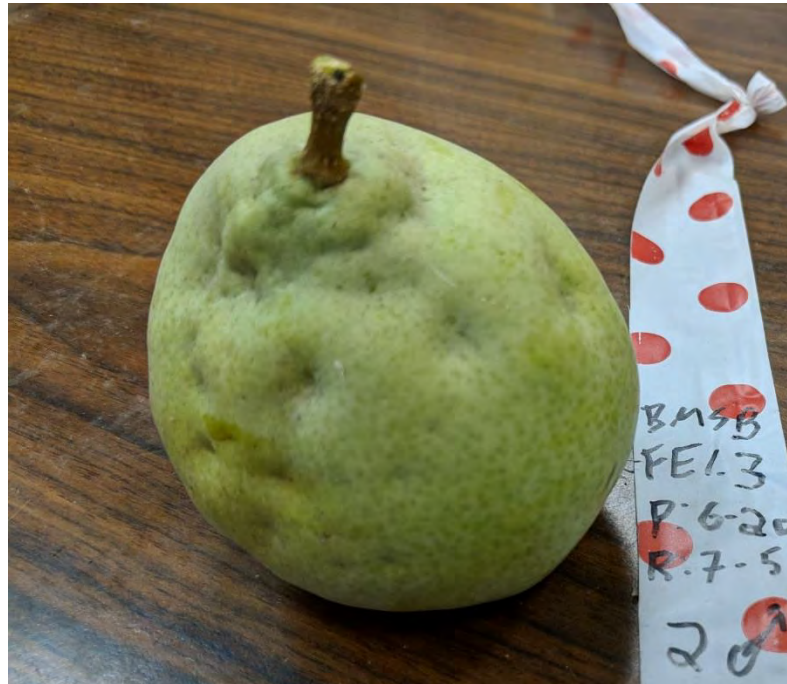


Two main categories of BMSB damage in pears:

Damage occurring early which can result in deep deformations in the fruit with extremely hard areas inside the fruit—very difficult to cut through
(can be confused with stony pit)

Damage occurring later in the season, most often around the stem end, depressions are shallower and injury is corky and can be easily cut through, this is the type of damage commonly associated with our native stinkbugs
(can be confused with cork spot in Anjous)

Misshapen fruit



Deep and severe injury





Fruit damage in untreated block at SOREC

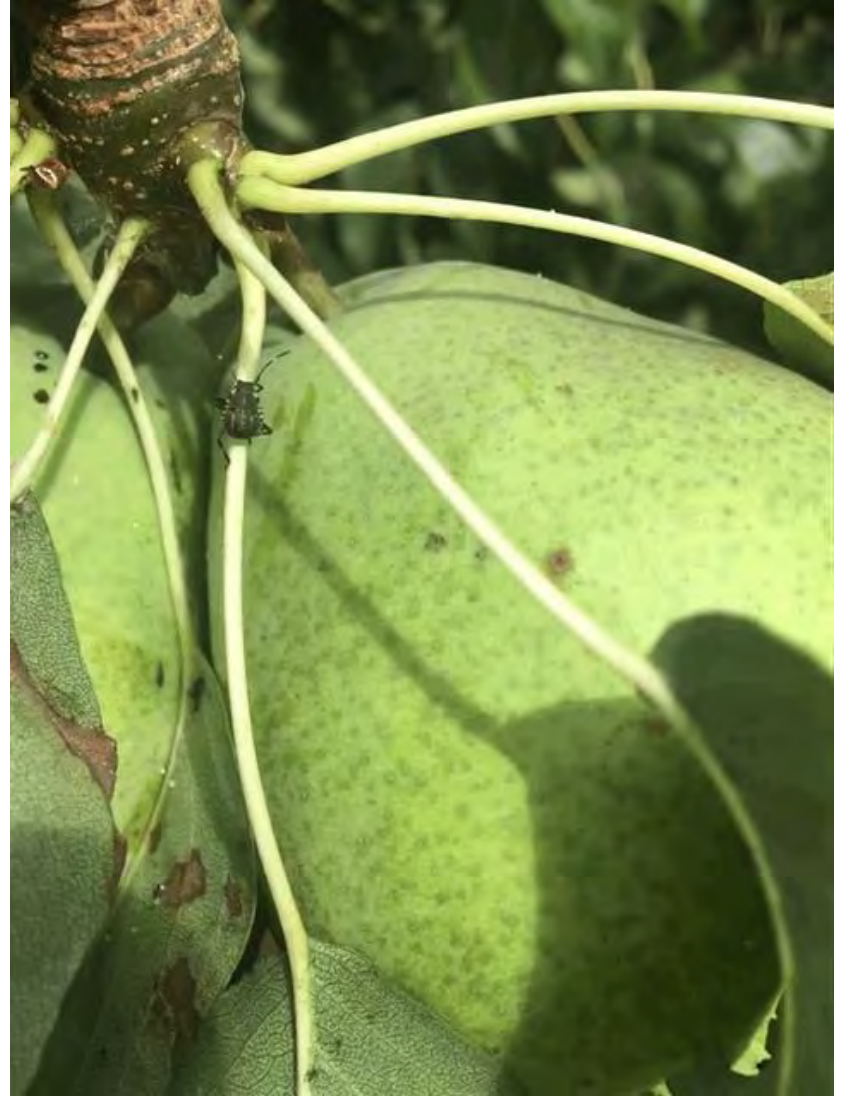
Pear Cultivar	% and type of fruit damage				
	Hard / Early		Soft / Later		Cork Spot
	Severe	Minor to Moderate	Severe	Minor to Moderate	
Bartlett (n=100)	32	19	1	10	---
Anjou (n=100)	33	21	0	19	1
Comice (n=50)	38	14	0	2	---

Avg. trap catch (n=3) was **95.3 adults + 19.7 nymphs**

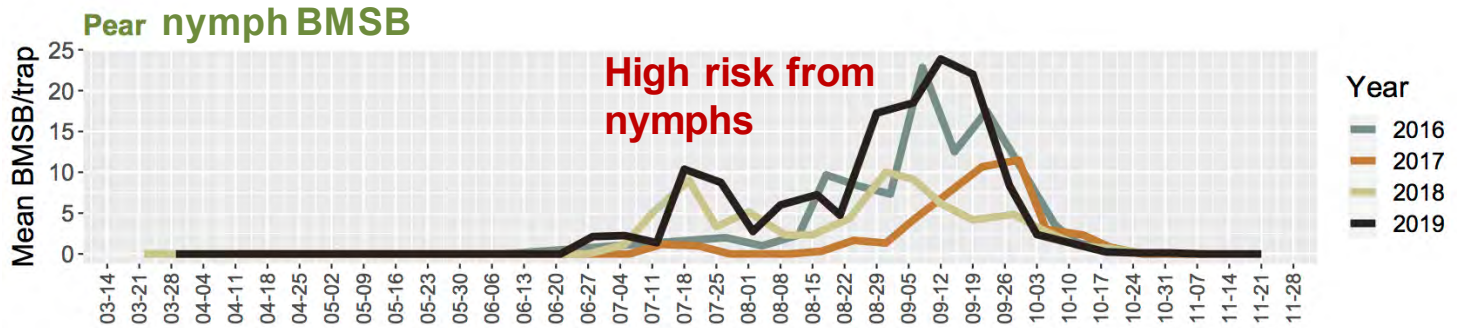
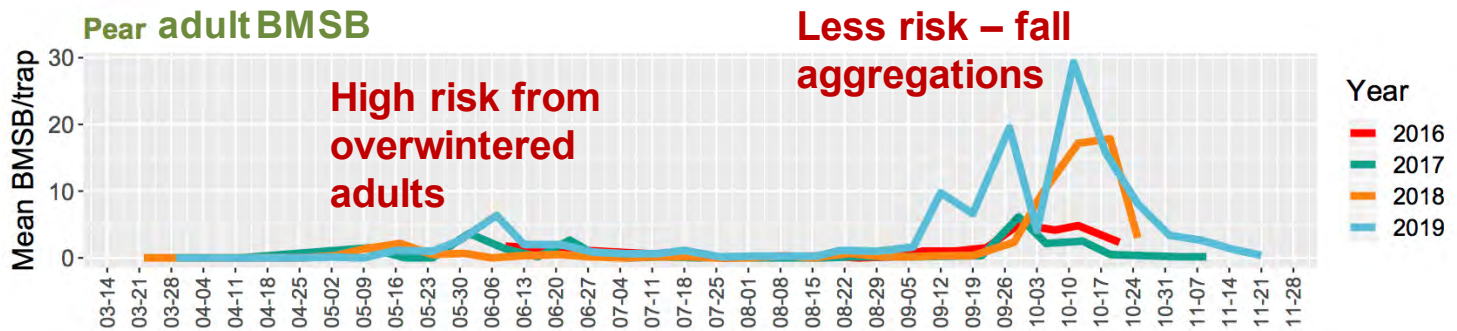
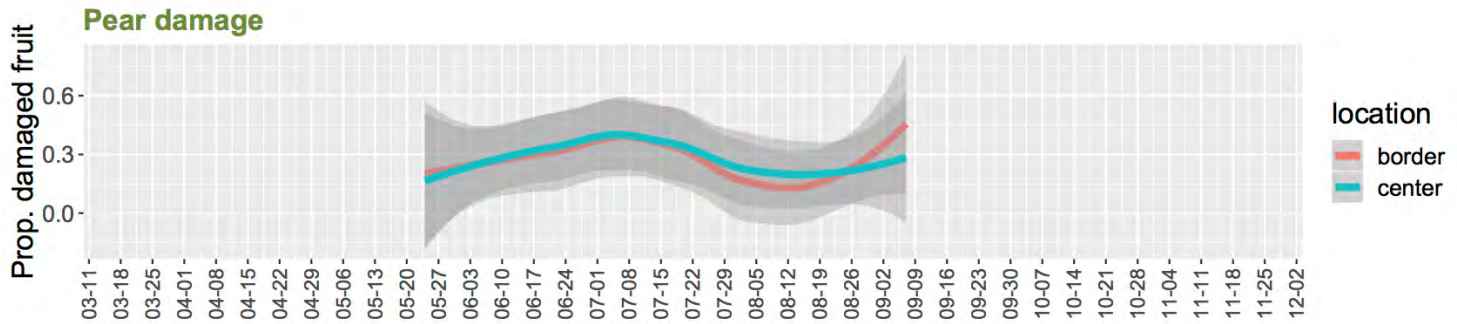
Late damage on Anjou

- ✓ Late (controlled) BMSB feeding injury did not show up at harvest.
- ✓ Surface pitting and flesh injury appear at 2 months in RA storage.
 - ✓ Severity of flesh injury increased after 5 months in storage.
- ✓ Flesh injury is characterized as whitish-spongy at the time of cutting.
 - ✓ Browning within several minutes after cutting.

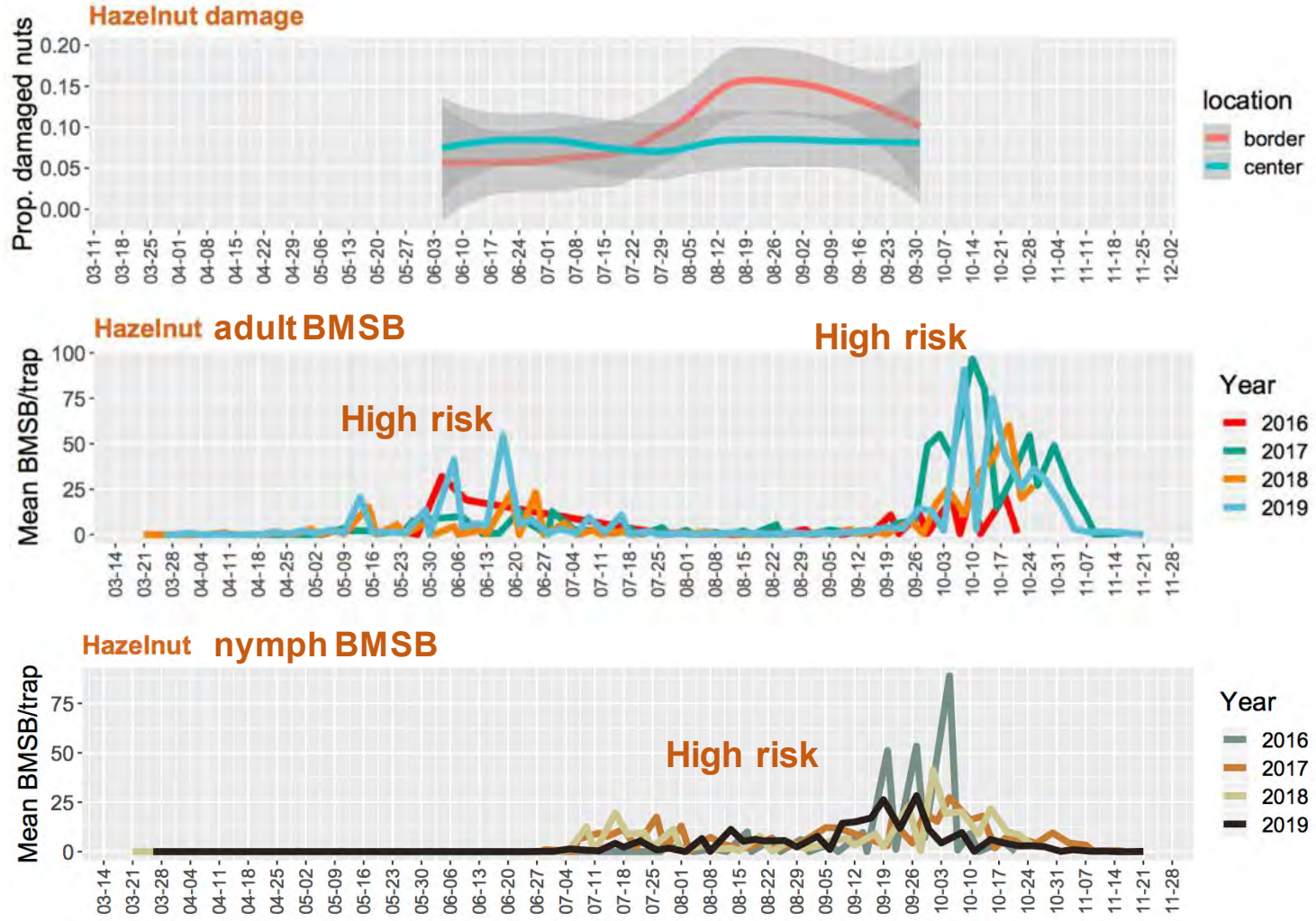




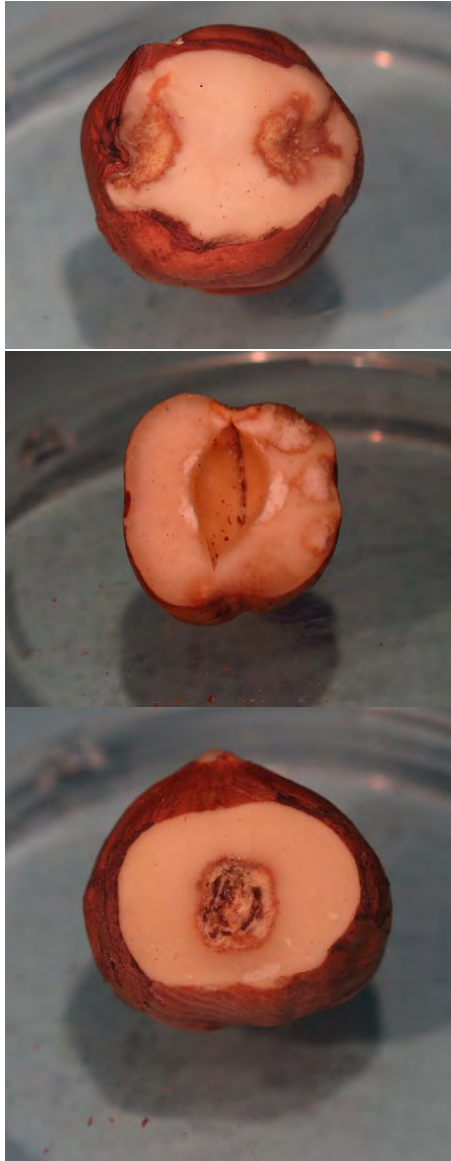
Crop damage: Pear



Crop damage: Hazelnuts

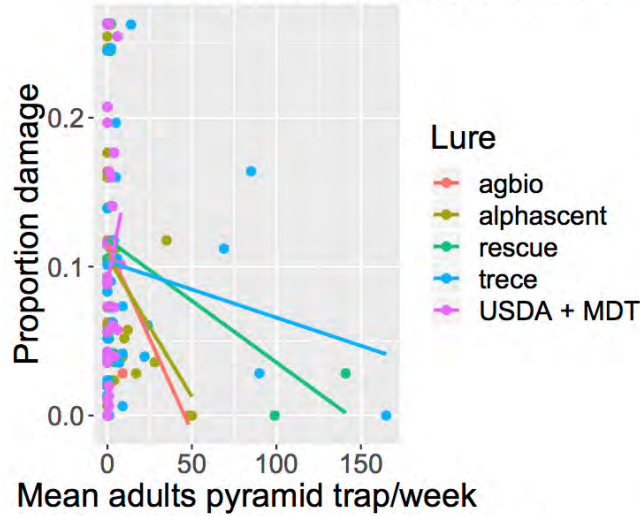


Crop damage vs. trap captures

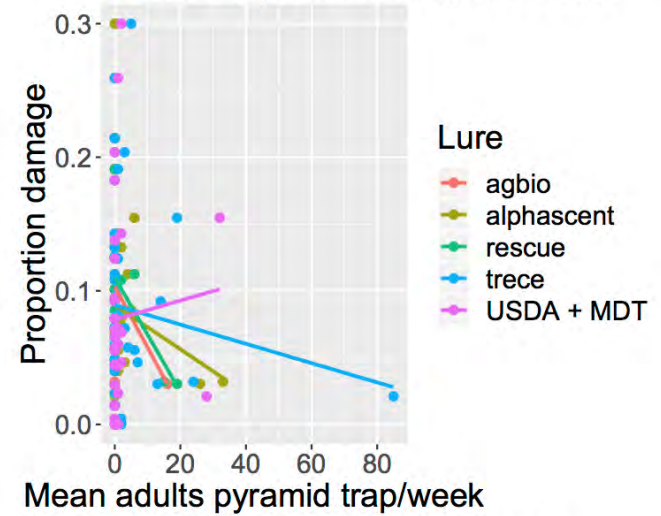


Hazelnut

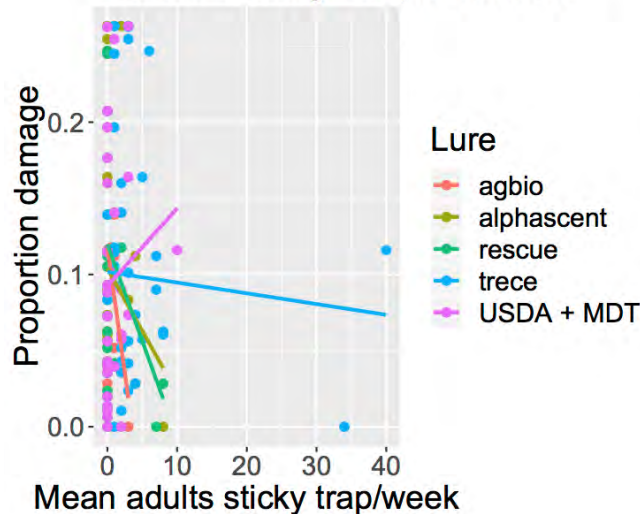
Border Pyramid Traps: adults



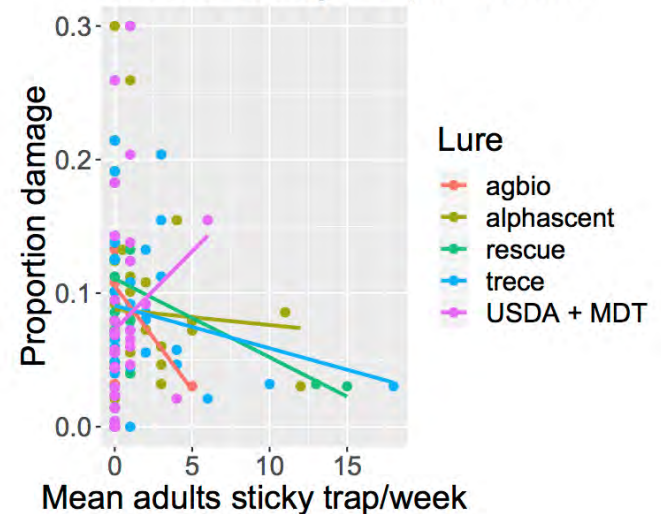
Center Pyramid Traps: adults



Border Sticky Traps: adults

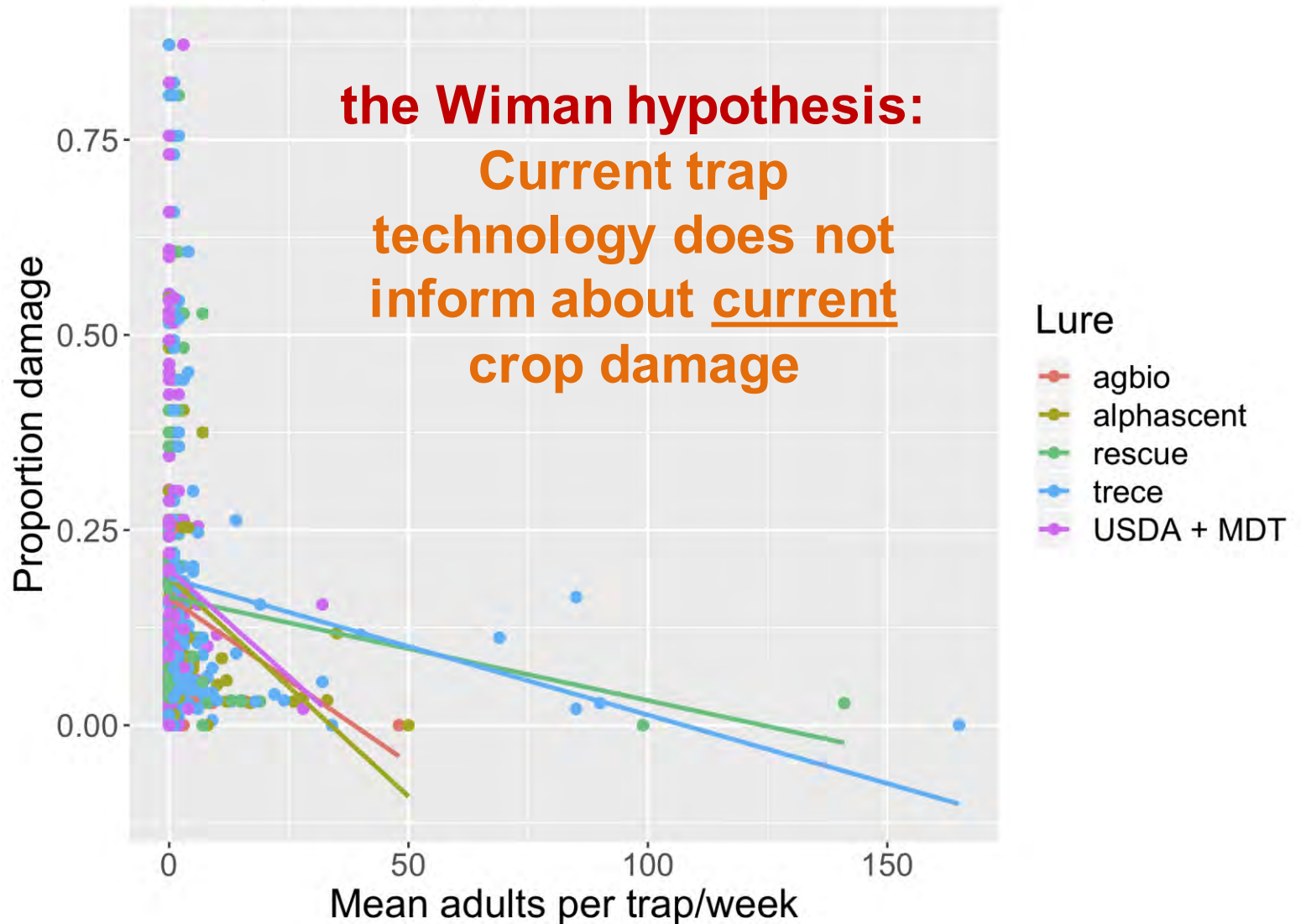


Center Sticky Traps: adults

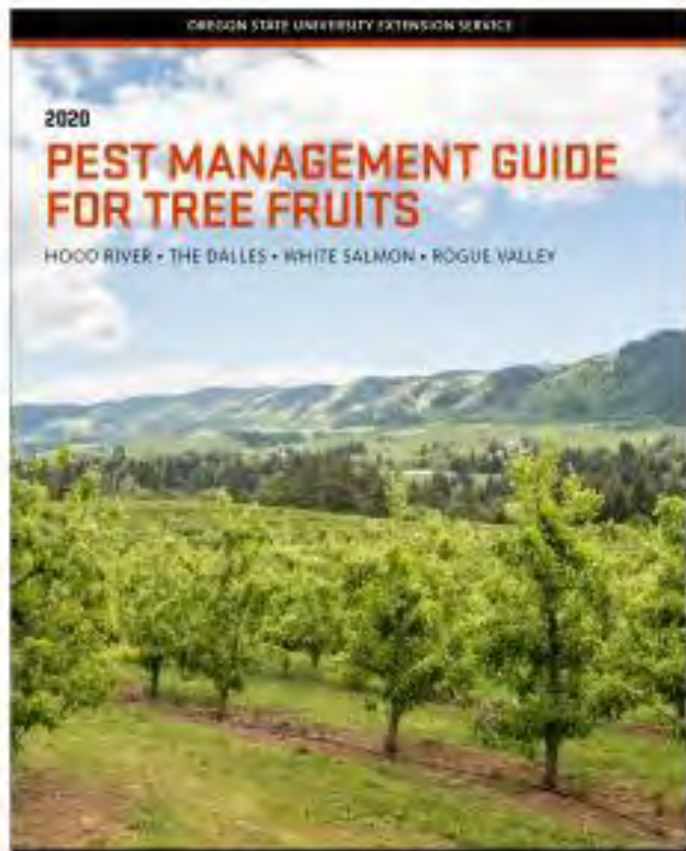


Crop damage vs. trap captures

All crops and traps



BMSB section in Pest Management Guide for Tree Fruits



Brown marmorated stink bug

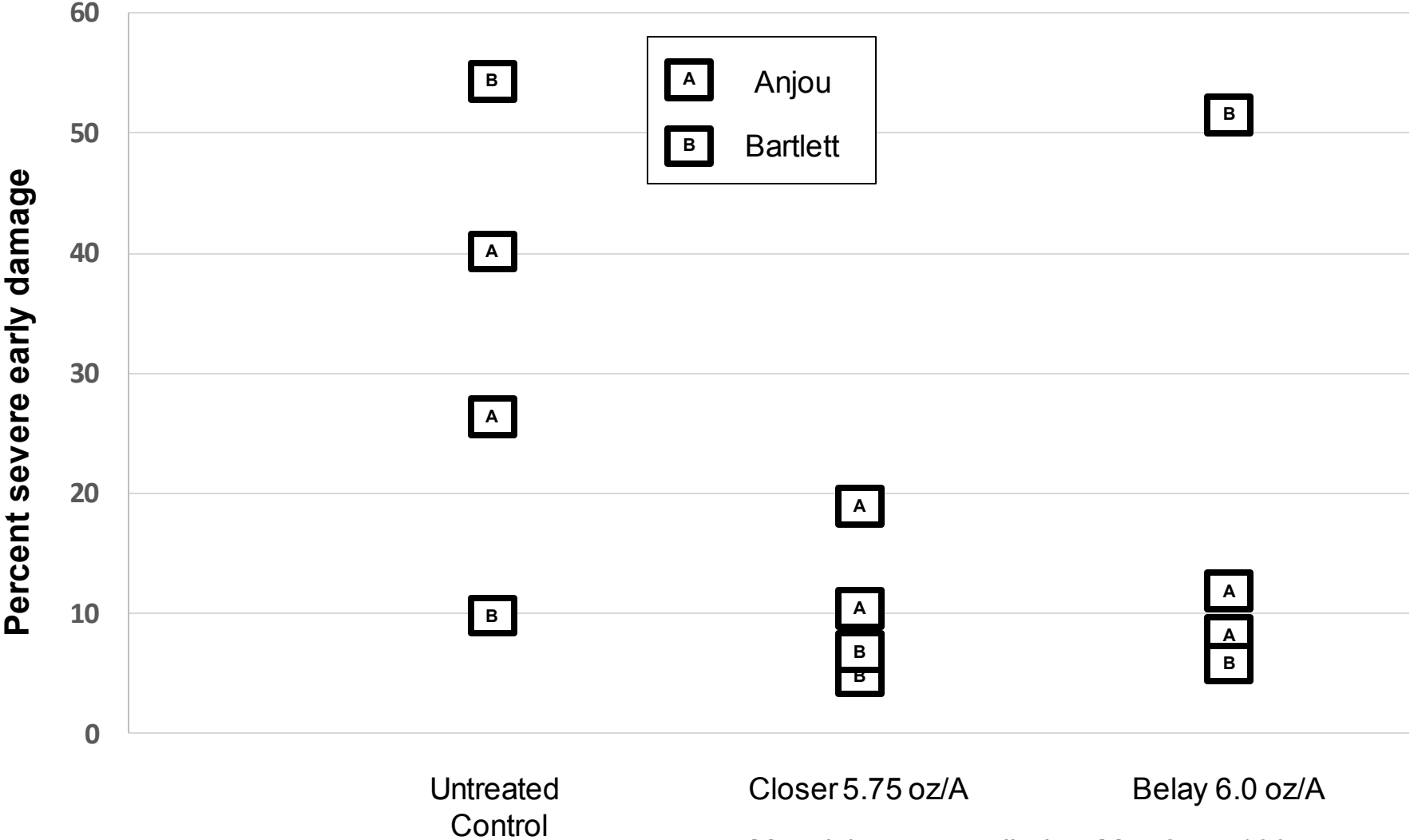
own marmorated stink bug (BMSB) was first detected in the Hood River area in 2012 near downtown Hood River. Since then it has spread throughout the Hood River Valley, and in 2017 it caused economic damage in several area pear orchards. Due to the relatively recent introduction of BMSB to North America and Oregon, integrated management programs are still being developed. For information on BMSB biology, life cycle, potential crop damage, monitoring, and control, see <http://www.stopbmsb.org/> and <http://www.stopbmsb.org/stopBMSB/assets/File/BMSB-in-Orchard-Crops-English.pdf>. The list below is adapted from that publication and includes insecticides registered for use on pear, apple, and cherry in Oregon that have shown efficacy on BMSB in laboratory and/or field trials conducted elsewhere. Limited local experience exists with some of these products at timings and rates most effective for BMSB control. Follow all label restrictions and precautions.

Product name	Pre-harvest interval (days) (nr = not registered for crop)			Active ingredient	Resistance management group
	Apple	Pear	Cherry		
Baythroid XL RUP	7	7	7	beta-cyfluthrin	3A
Leverage 360 RUP	7	7	7	beta-cyfluthrin + imidacloprid	3A + 4A
Bifenture, Brigade, Sniper RUP	nr	14	nr	bifenthrin	3A
Belay RUP	7	7	nr	clothianidin	4A
Tombstone RUP	7	7	7	cyfluthrin	3A
Danitol RUP	14	14	3	fenpropathrin	3A
Declare, Proaxis RUP	21	21	14	gamma-cyhalothrin	3A
Admire Pro, Alias, Wrangler RUP	7	7	0	imidacloprid	4A
Warrior II, Lambda-Cy, Silencer RUP	21	21	14	lambda-cyhalothrin	3A
Endigo RUP	35	35	14	lambda-cyhalothrin + thiamethoxam	3A + 4A
Lannate RUP	14	nr	nr	methomyl	1A
Aclara RUP	35	35	14	thiamethoxam	4A
Mustang Maxx RUP	14	14	14	zeta-cypermethrin	3A

RUP = restricted use pesticide.

2019 Insecticide Trial—SOREC

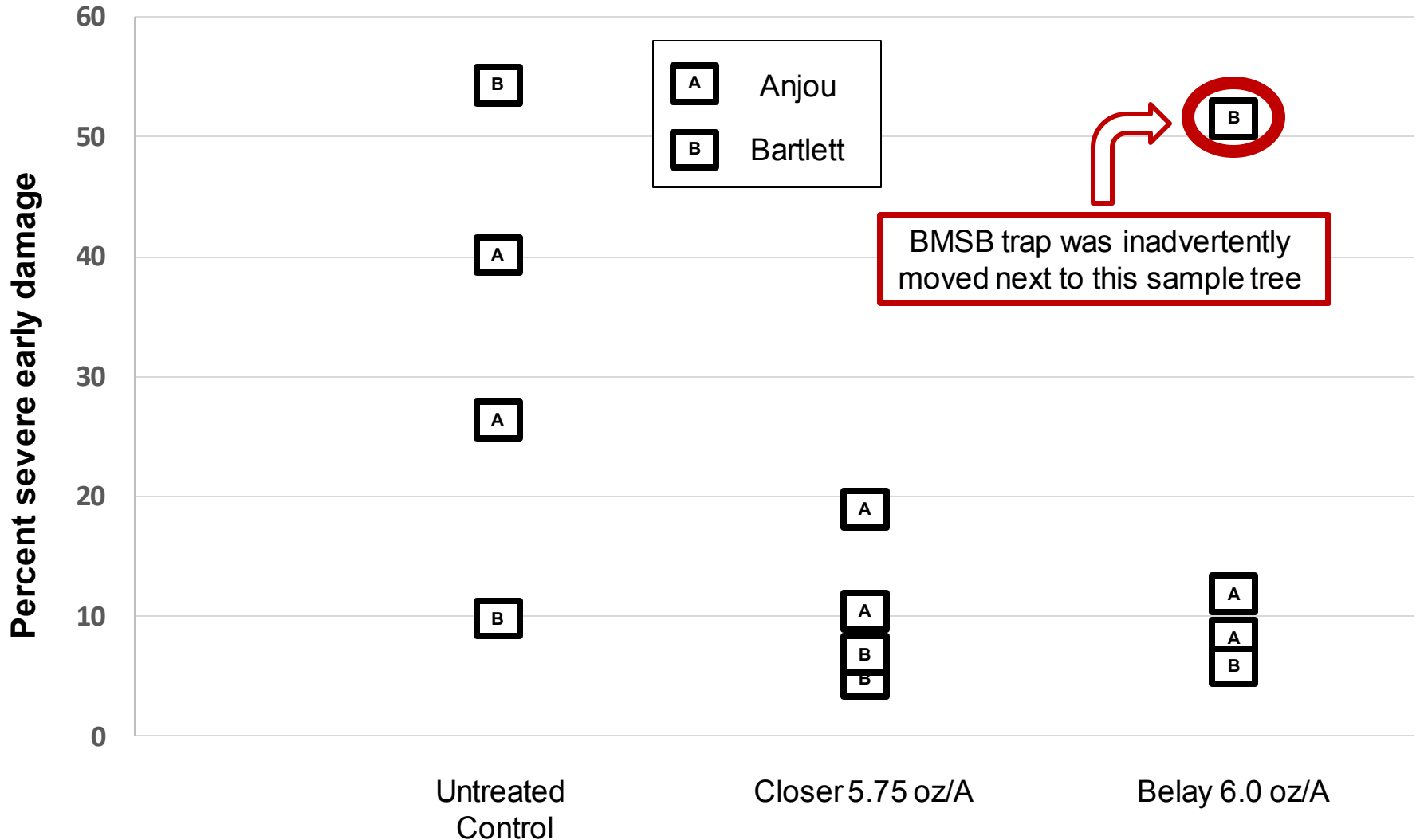
Effect of early season treatment on severe early season BMSB damage to pear fruit (four replicates per treatment)



Materials were applied on May 27 at 100 gpa

2019 Insecticide Trial—SOREC

Effect of early season treatment on severe early season BMSB damage to pear fruit (four replicates per treatment)



Materials were applied on May 27 at 100 gpa

Fruit damage in relation to trap proximity (n=3) from sampling done in a commercial orchard

Fruit Location	% and type of fruit damage (Red Anjou)				
	Hard / Early		Soft / Later		Cork Spot
	Severe	Minor to Moderate	Severe	Minor to Moderate	
Next to a trap (n=150)	14.7	10.7	31.3	20.7	10.7
Not next to a trap (n=200)	0	1.5	1.0	2.0	9.5

Avg. trap catch was **16.3 adults + 20.3 nymphs**



**Permanet: 0.4%
technical grade
Deltamethrin**

**Ghost
traps**



From Greg Krawczyk



Illuminated traps



GreenFuture Solar Powered Insect Killer

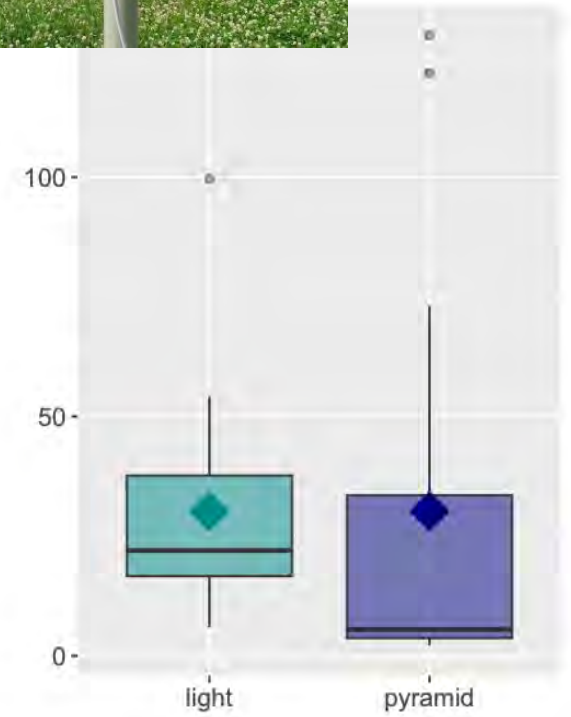
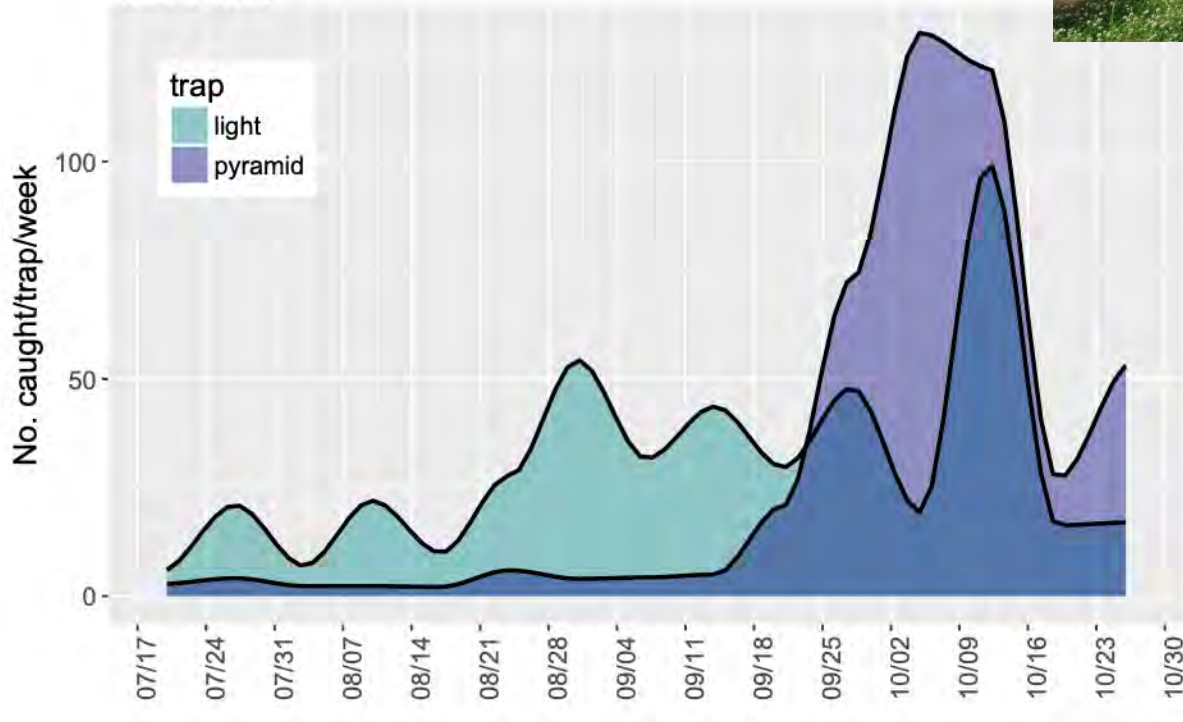


- 30W solar panel
- 12V Battery
- UV/white light bulb
- Rain sensor
- Temp sensor < 40 F
- 3600V electrocution grid
- Self-cleaning
- Easy setup
- 3-4 acre coverage

Light trap increases sensitivity in early season



Light traps vs. standard traps
BMSB Adults



Night shot



Conclusions

- **BMSB is causing damage to Oregon orchard crops**
 - First in hazelnuts, now pears, and potentially in cherries
- **Apparent disconnect between the appearance of BMSB injury and BMSB responding to traps (Wiman Hypothesis)**
 - Early season response is poor relative to late season
 - Yet high levels of injury can occur early in the season
- **Traps can be good for detection**
 - May need to be supplemented with scouting
 - Will increase crop damage in the area near the trap
 - How can we exploit the aggregation pheromone for attract and kill?

Acknowledgements

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