

# Seasonal and orchard-related factors affecting BMSB activity and damage to almonds

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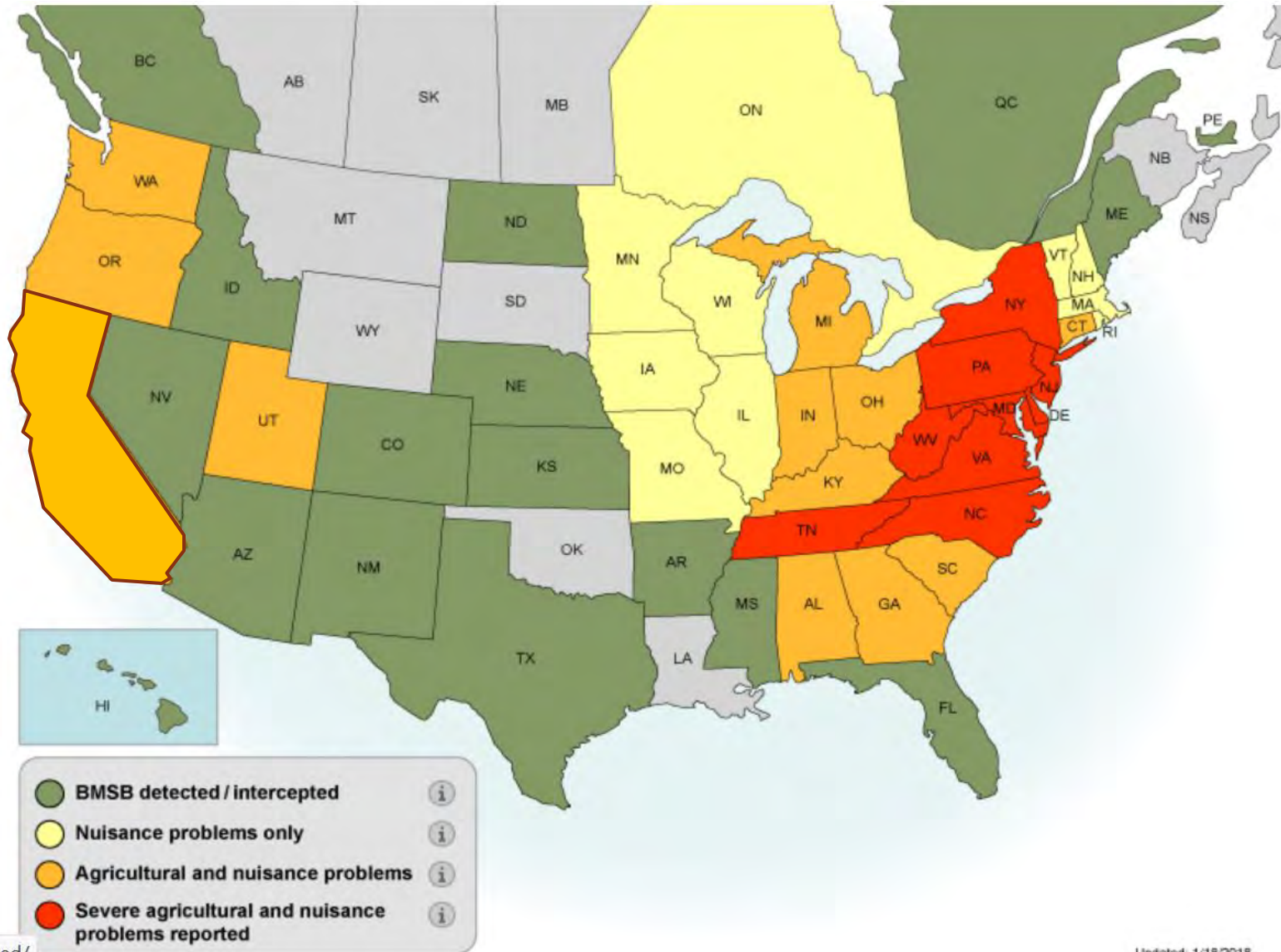
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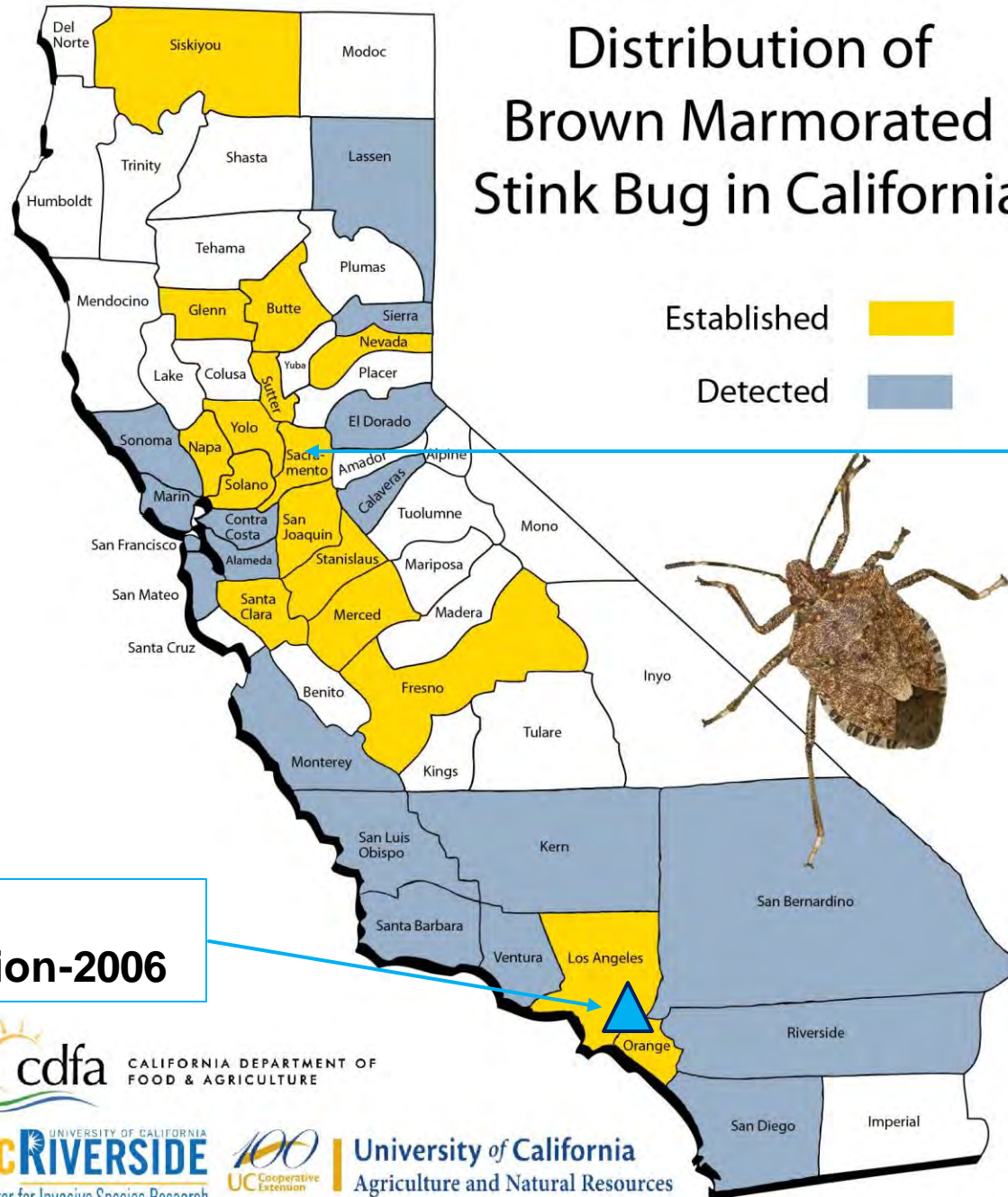
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# Current Distribution of BMSB in the U.S.



# Distribution of Brown Marmorated Stink Bug in California



**Severe nuisance problem since Fall 2013**

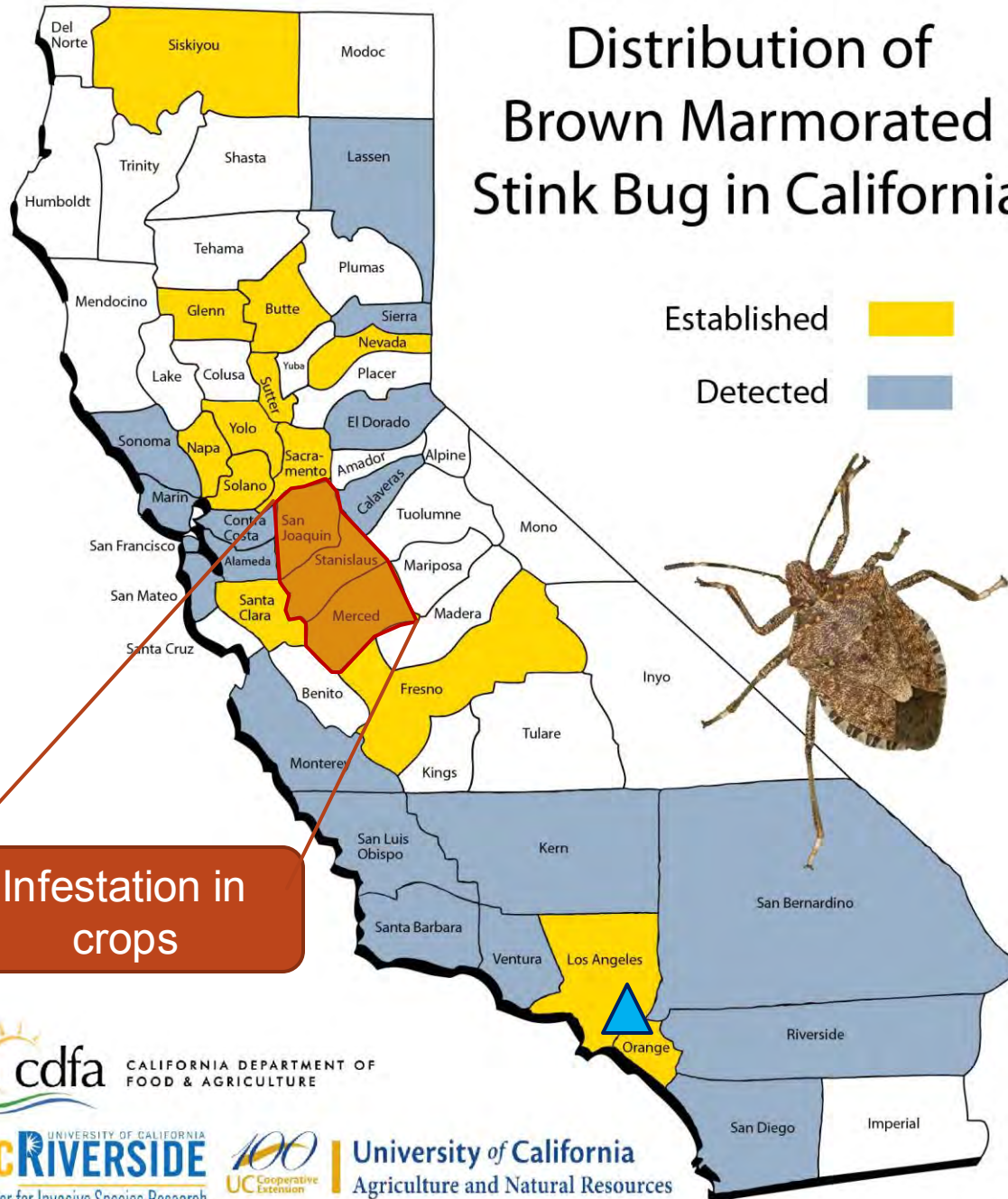
**Early infestation-2006**



# Distribution of Brown Marmorated Stink Bug in California



**Infestation in crops**



 CALIFORNIA DEPARTMENT OF FOOD & AGRICULTURE

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Center for Invasive Species Research

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# BMSB in Commercial Crops

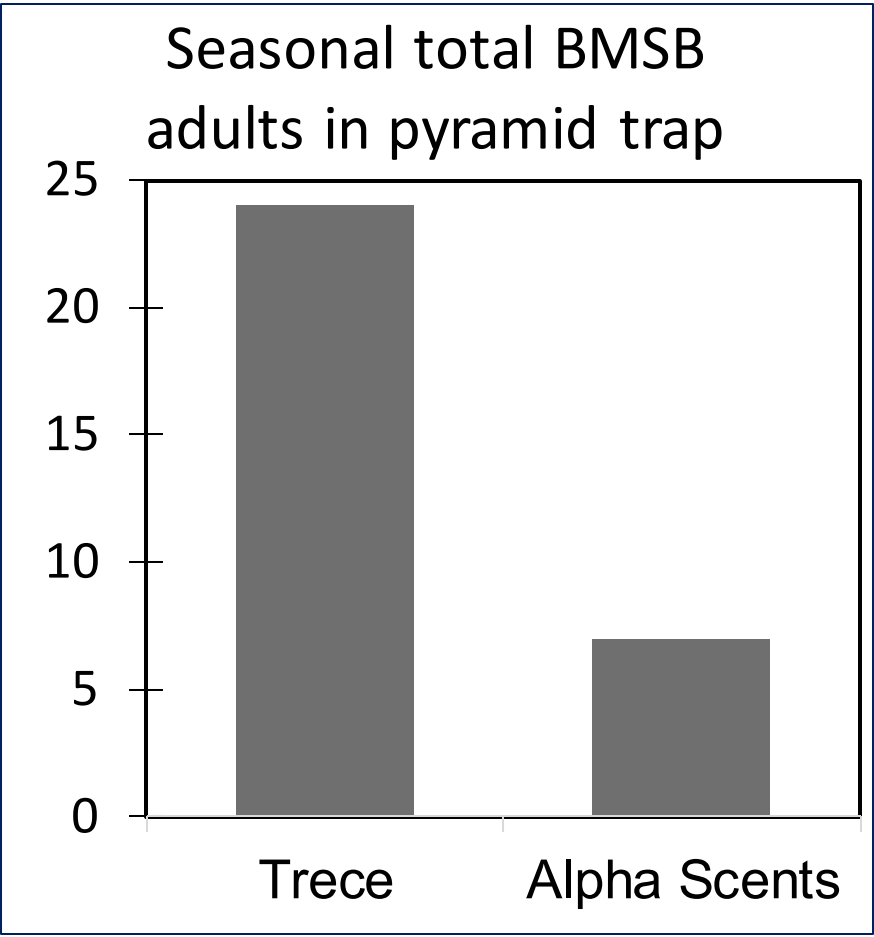
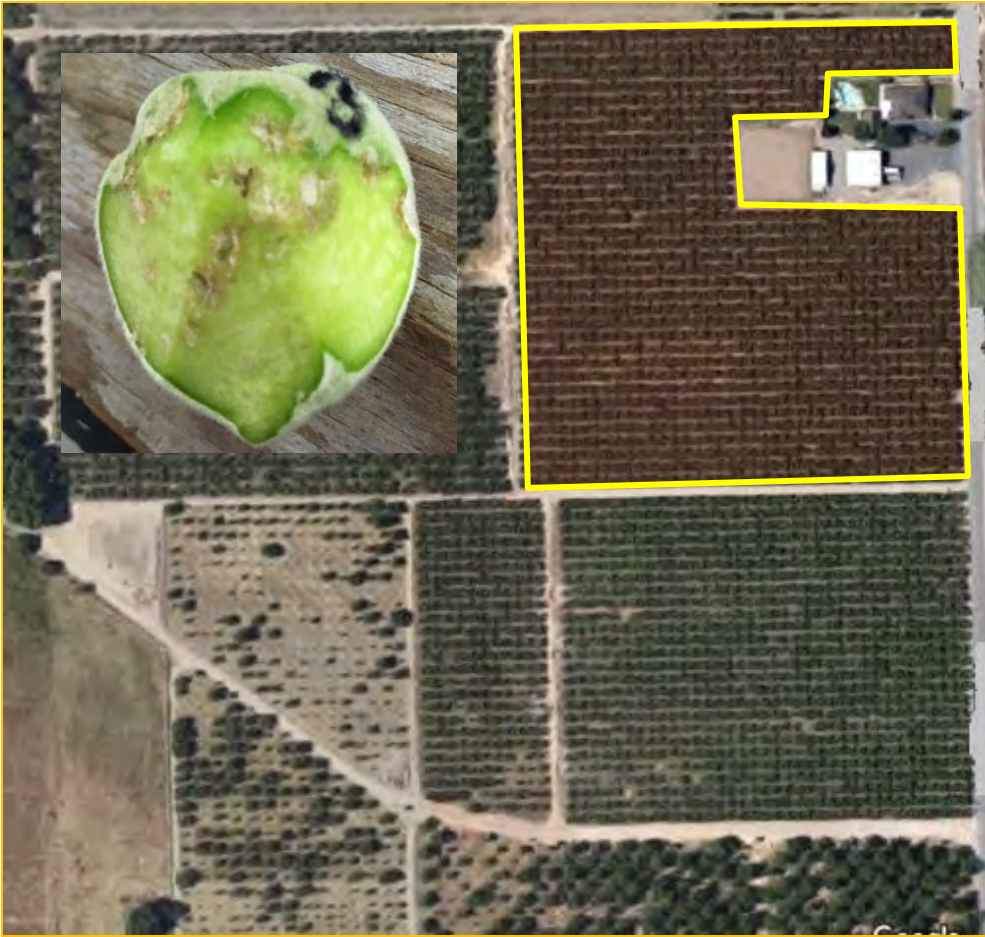
## Southern CA

2002	Detected in Riverside Co.
2006	Established in LA area

## Northern CA

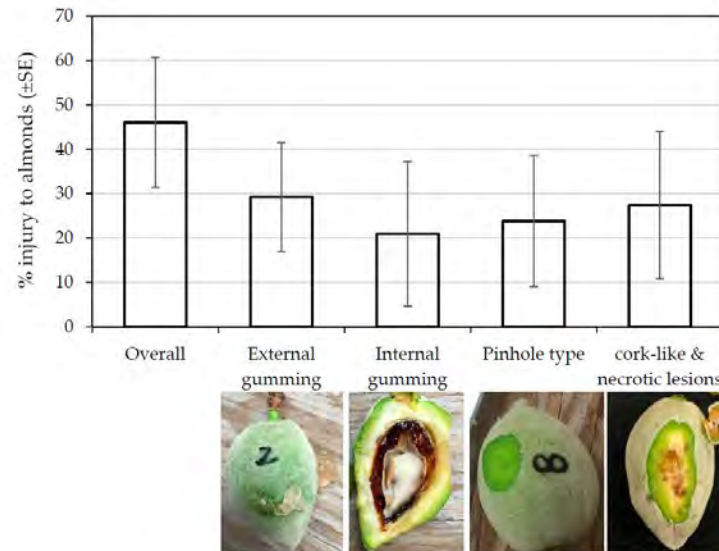
2013	Established in Sacramento area
2015	Reproducing population in NSJV 2015
2016	First crop infestation (peach) in NSJV
2017	First almond infestation in NSJV
2018	BMSB expanded to multiple <b>peach and almond orchards</b> also to Merced
2019	Continue to spreading to more orchards - economic damage

# BMSB in Peach Orchard-2016



Rijal and Duncan 2017, JES

# BMSB in Almond Orchard-2017



# 2018-19: BMSB Infestation in Commercial Orchards -Stanislaus and Merced Counties





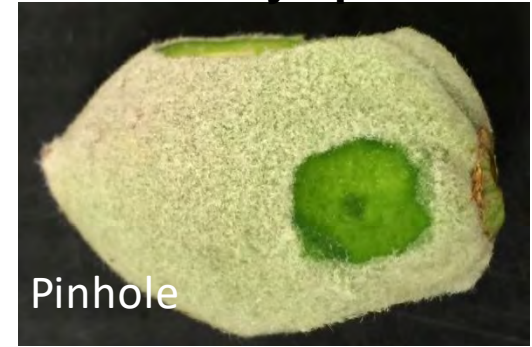
## External symptoms



# BMSB Feeding Injury in Developing Almonds



## Internal symptoms



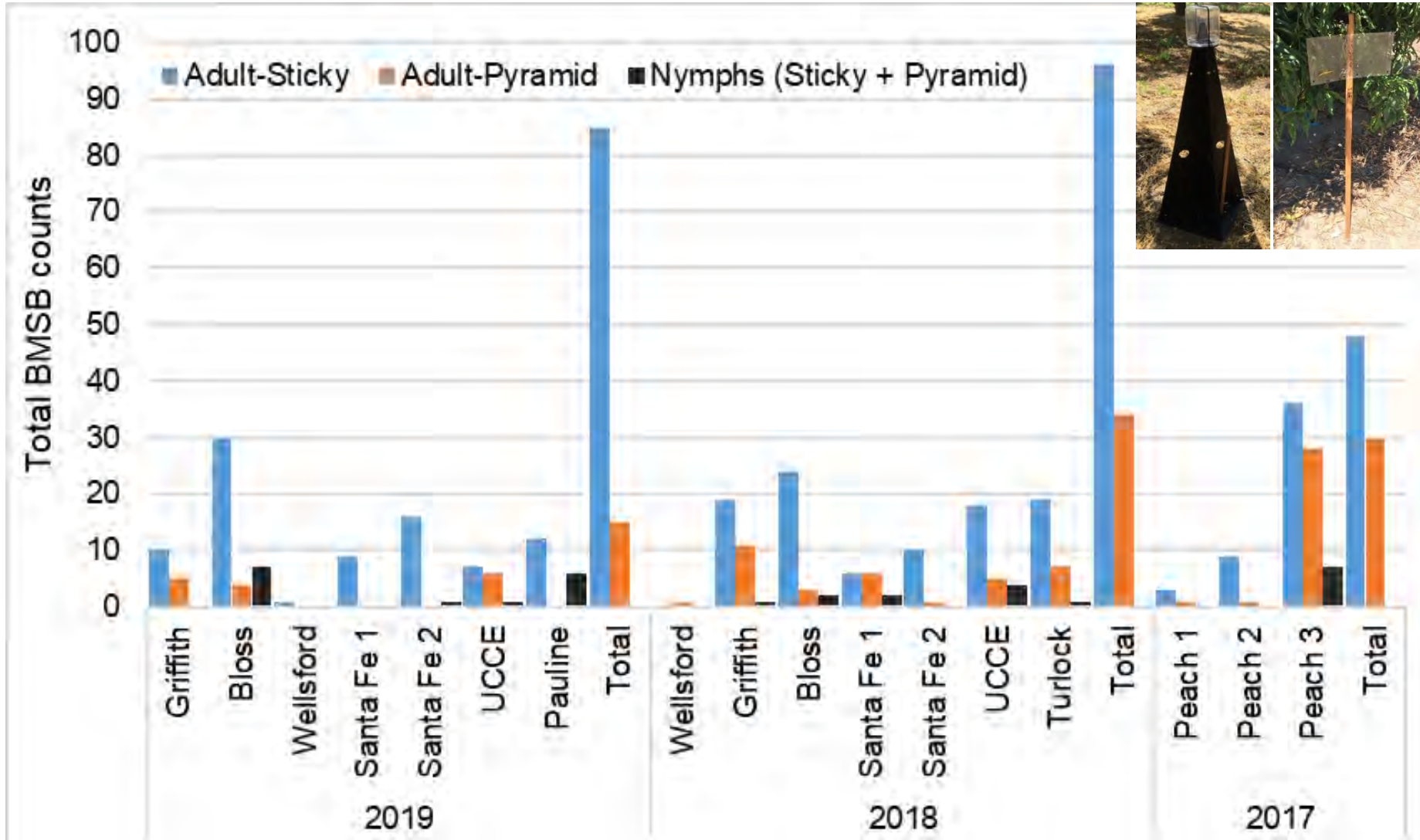
# Substantial Nut Drop by BMSB Feeding in Commercial Orchards (April-2018)



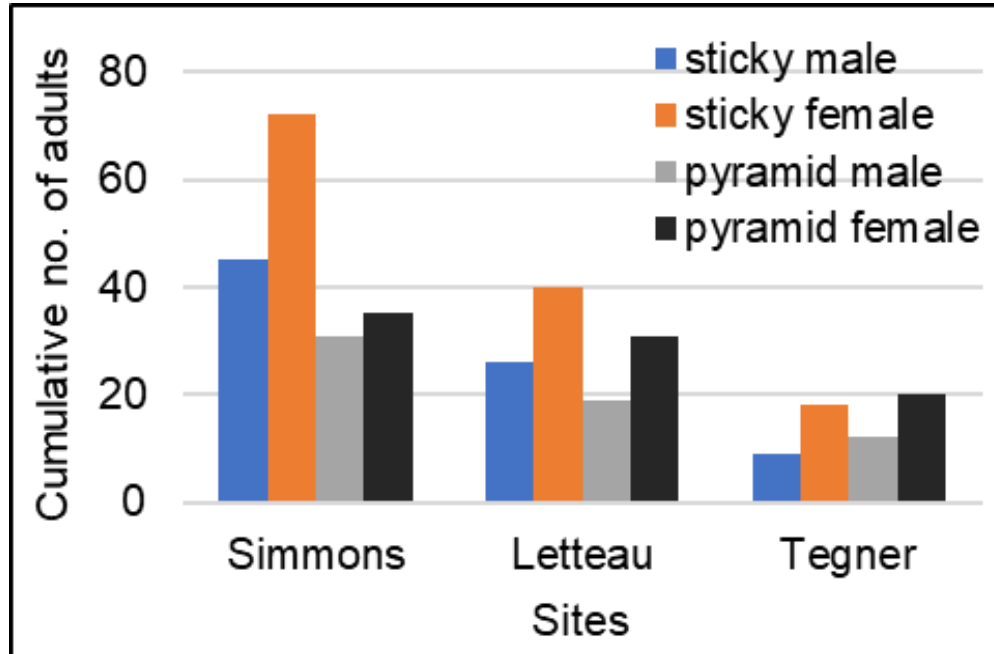
# BMSB Infestation in Commercial Orchards (April-May, 2019)



# BMSB Monitoring in Peach Orchard

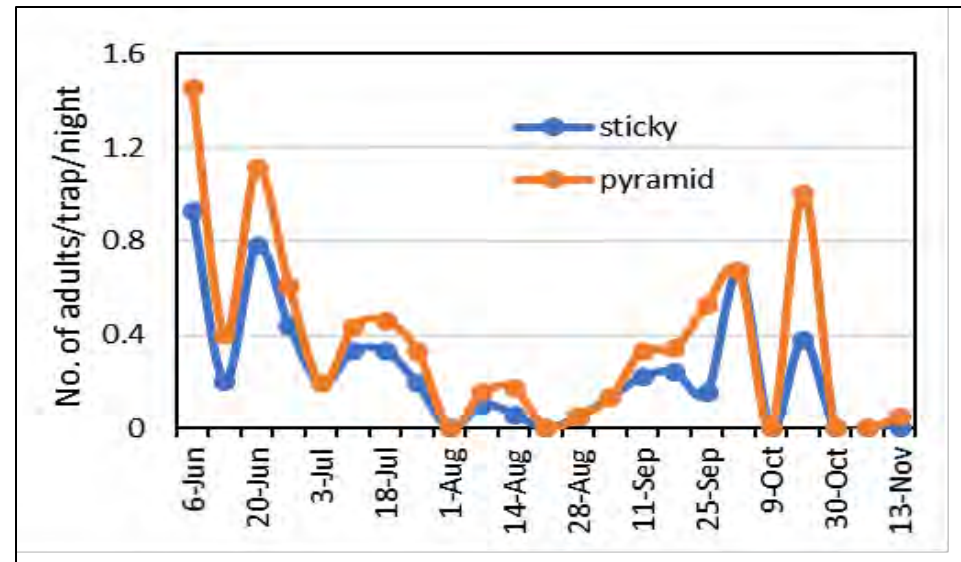
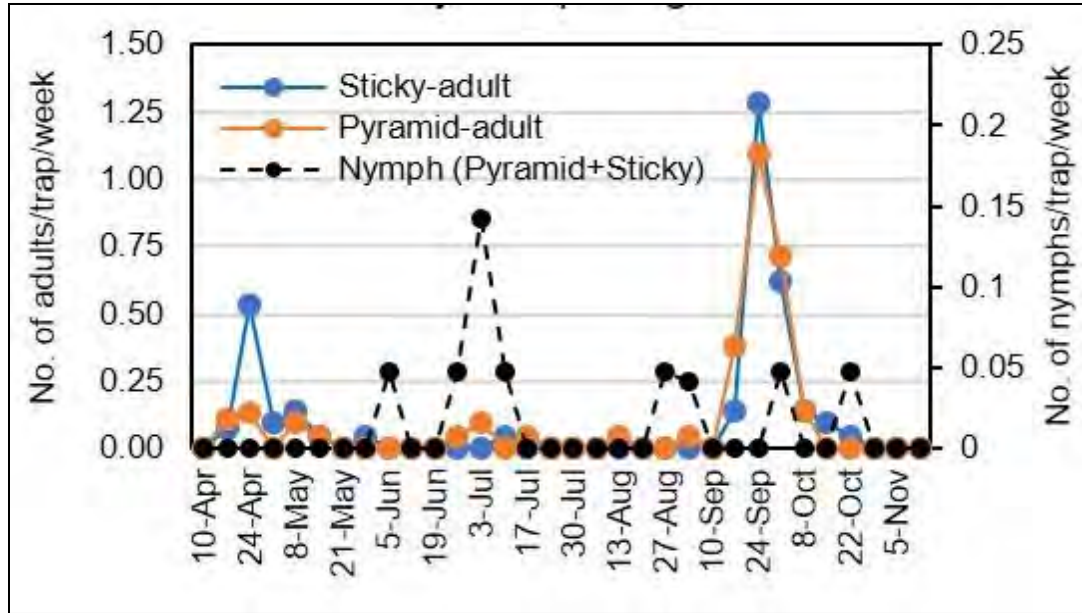


# BMSB Monitoring in Almond Orchard



Trap type-stage	BMSB counts across seven almond orchard sites, 2019						
	Vernalis	Bent	Letteau	Tegner	UCCE	Pauline	Simmons
Sticky-adults	0	2	66	27	4	9	117
Sticky-nymphs	0	0	5	0	0	4	10
Pyramid-adults	0	0	50	32	0	0	66
Pyramid-nymphs	0	0	3	5	1	4	60

# BMSB Phenology in Almond Orchard



# Objectives (2018-19)

1. Characterize the nature of damage by BMSB feeding in almonds
  - temporal feeding damage,
  - damage comparison with other bugs
  - varietal difference
2. Assess the degree of BMSB damage in commercial orchards
  - edge effect



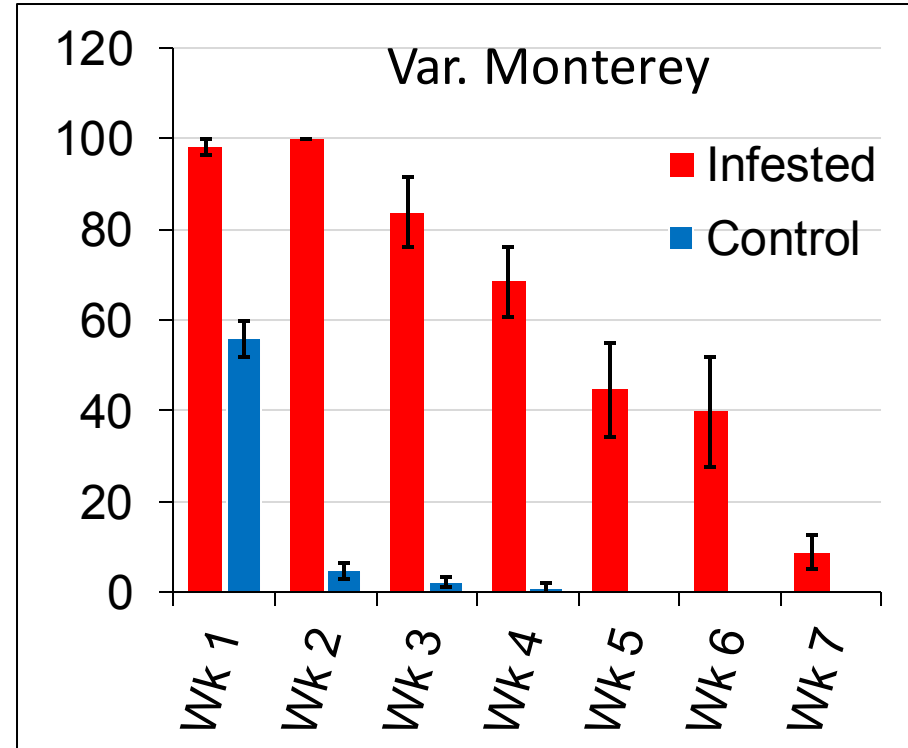
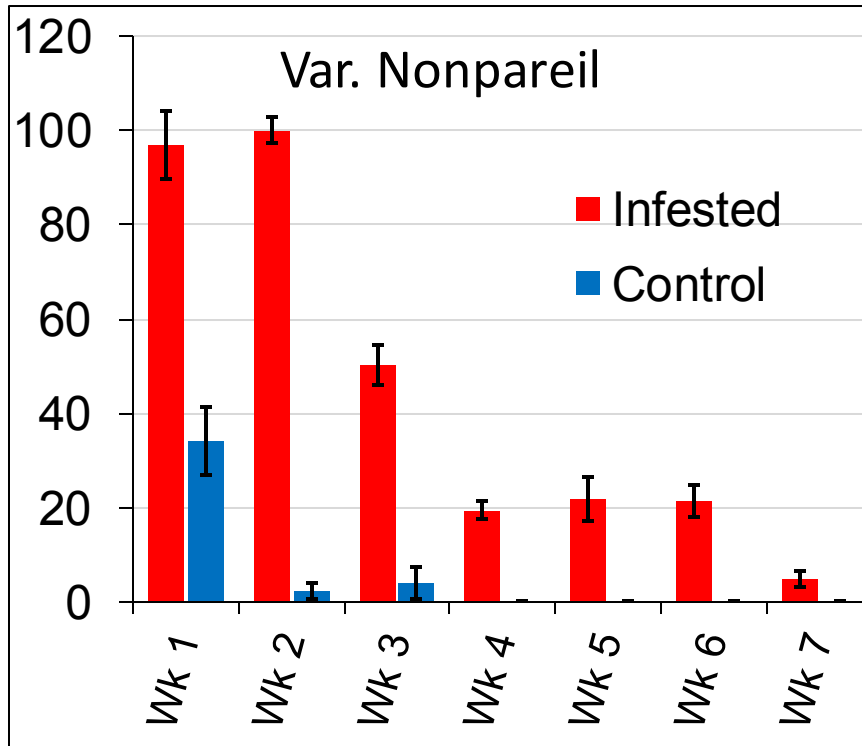
## **Temporal feeding study using fabric cages**

- 2 varieties: Nonpareil and Monterey
- Cage placed at early fruit set stage covering 7-15 nuts/cage
- 9 cages/variety infested weekly
- 3 BMSB adults/cage
- Begun last wk. of March through harvest (18-22 weeks)



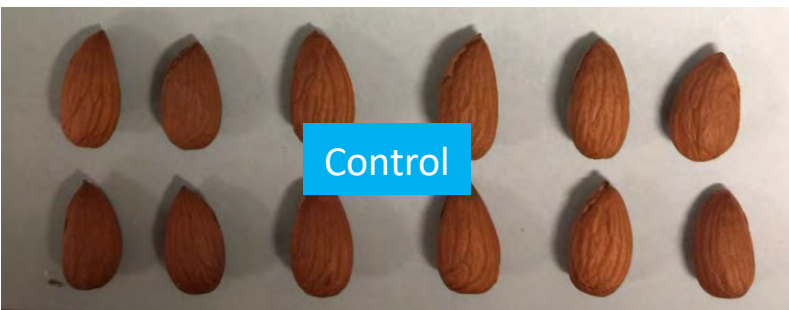
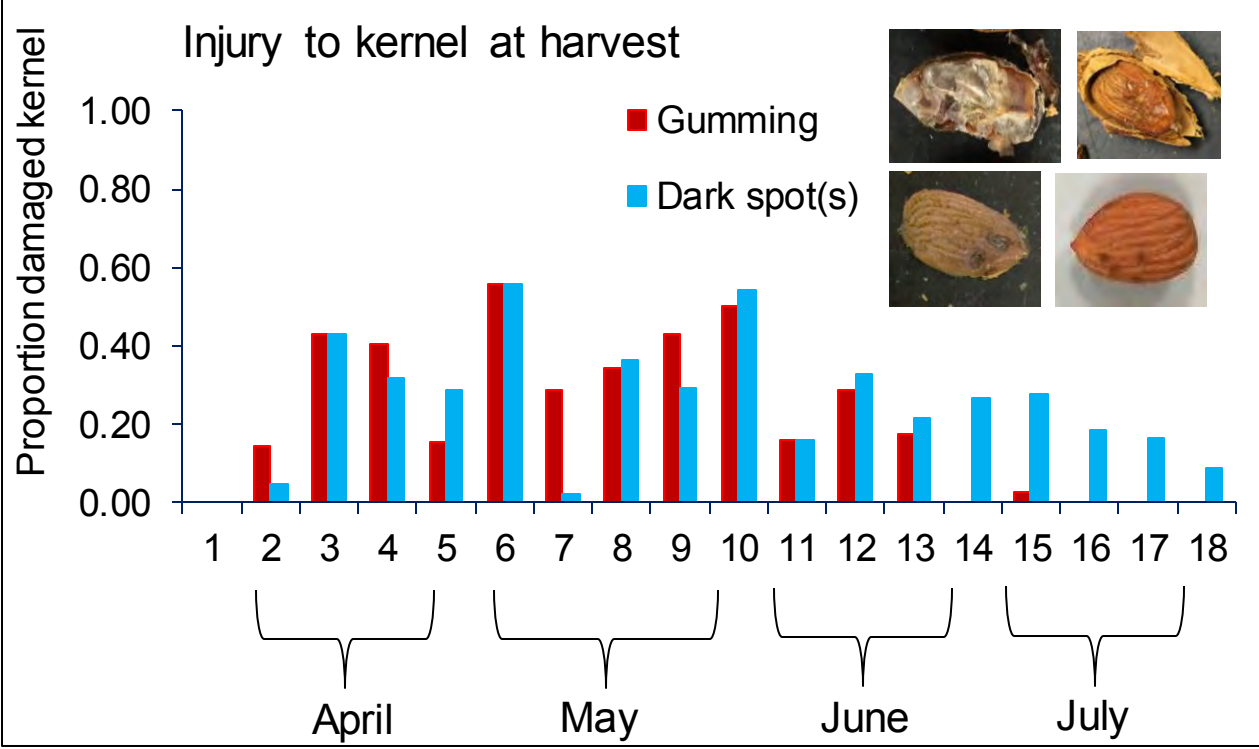
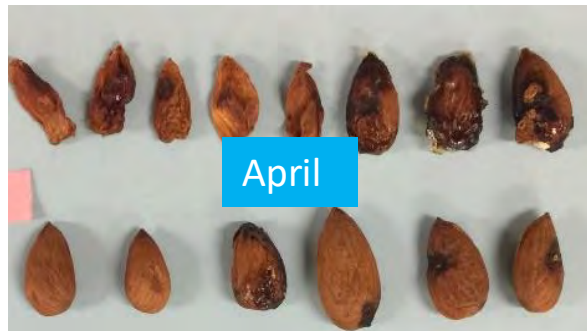
# Temporal feeding damage

% nut drop in cages

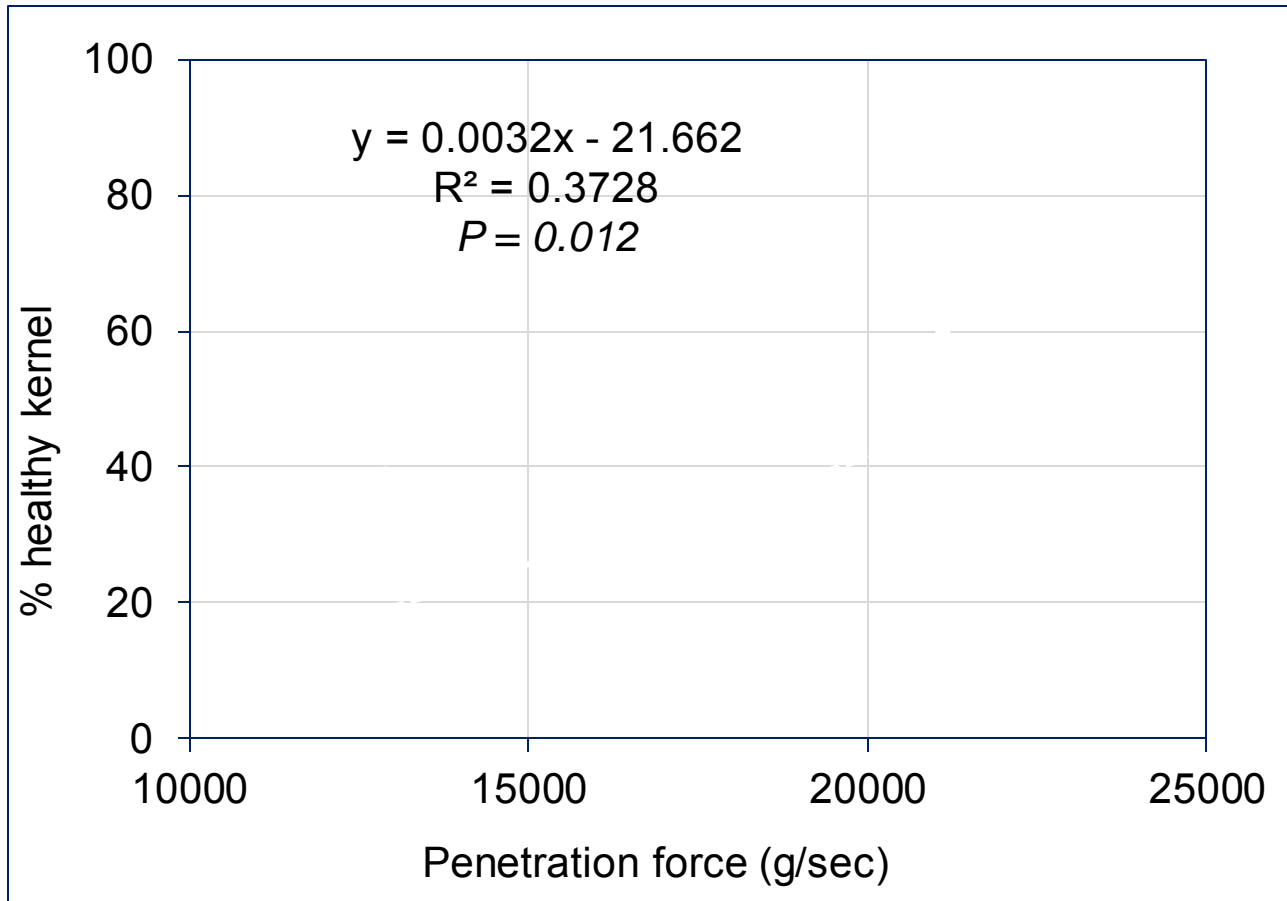


In the early part of the season (March-April),  
40-98% drop in Nonpareil; 28-96% drop in Monterey

# Kernel damage by BMSB feeding in different times of the year



# Shell hardness vs. healthy kernel (at harvest) relationship



**TA.XT Plus**  
texture  
analyzer

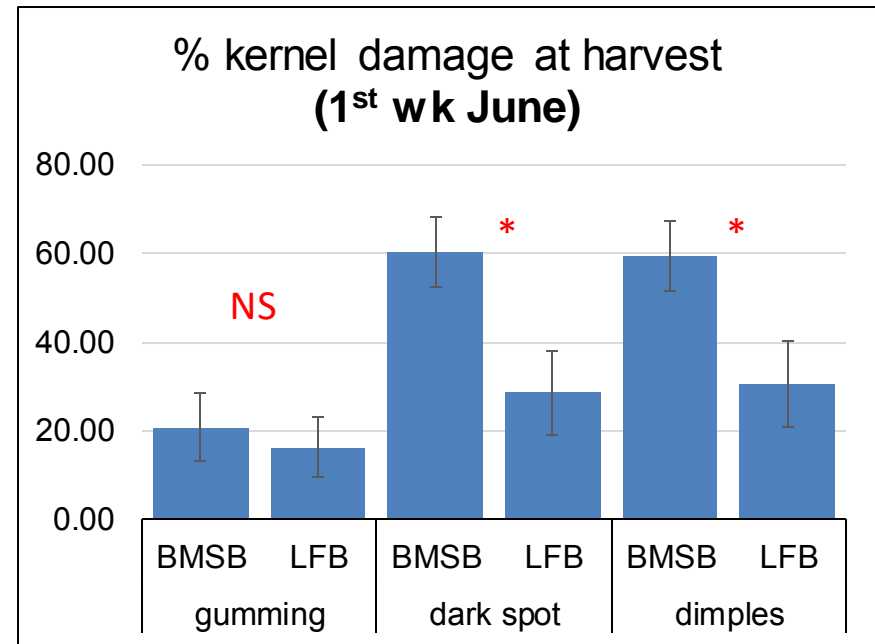
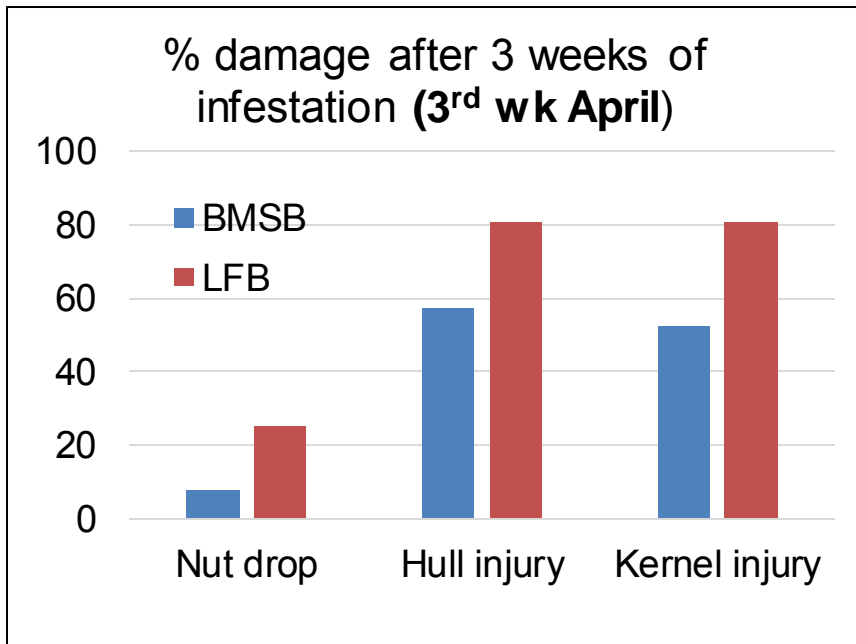
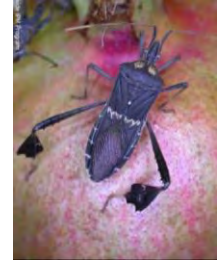
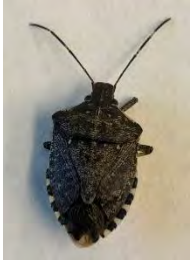




**Feeding damage  
difference  
between  
leaf-footed bug vs.  
BMSB**

- Cage placed at early fruit set stage covering 7-15 nuts/cage
- Released 2 BMSB and 2 LFB adults in mid-May for seven days
- 6 nuts/cage
- 3 varieties: Nonpareil, Fritz, Monterey

# Feeding damage difference between leaffooted bug vs. BMSB



At the 3-week evaluation, 8% and 25% nut due to feeding by BMSB and leaffooted bug, respectively



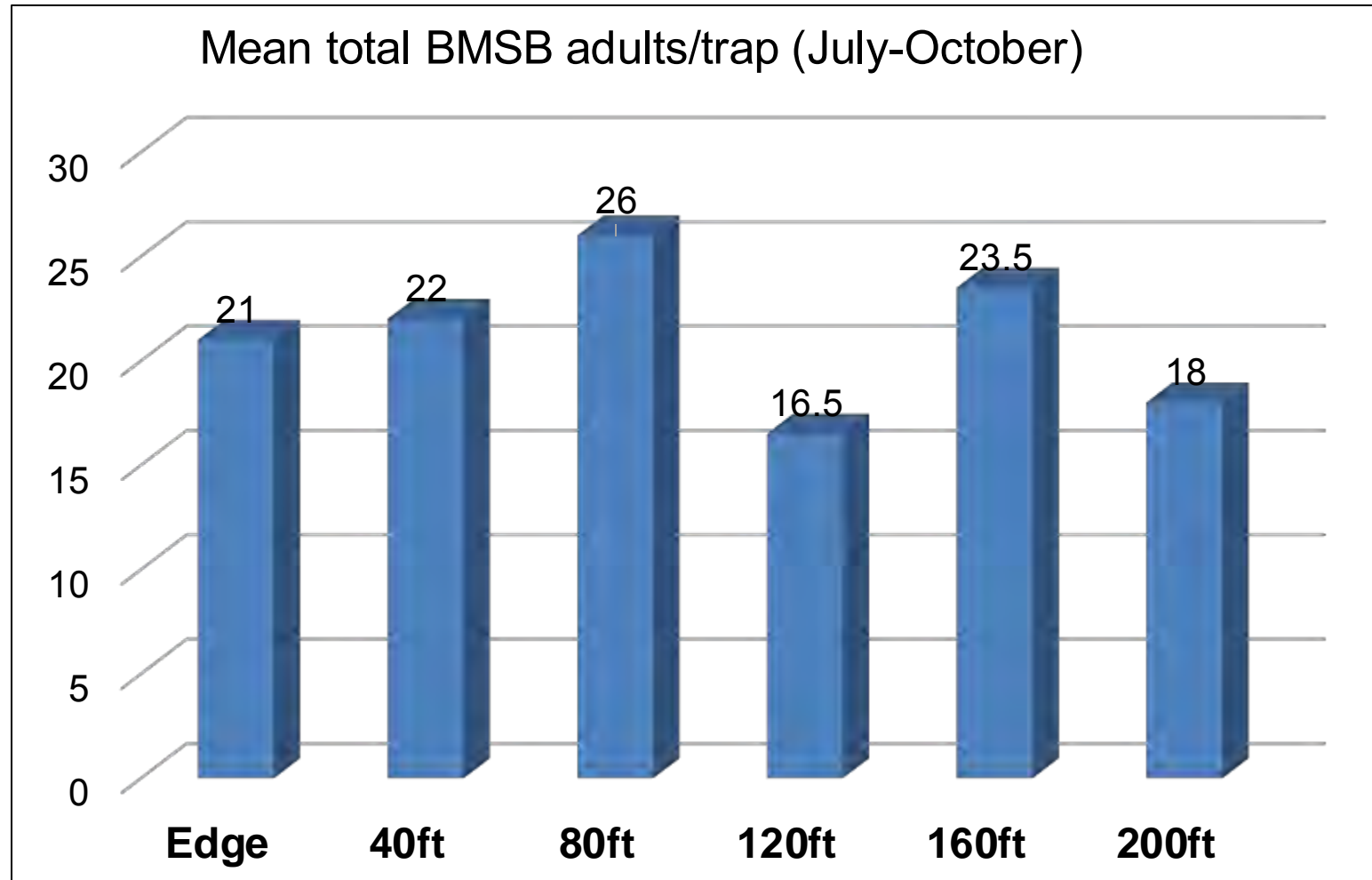
# Edge Effect-Field Study



Other parameters:

- Dropped nuts
- In-season damaged nuts
- Damaged nuts at harvest

# Edge Effect-Adult Capture in Traps

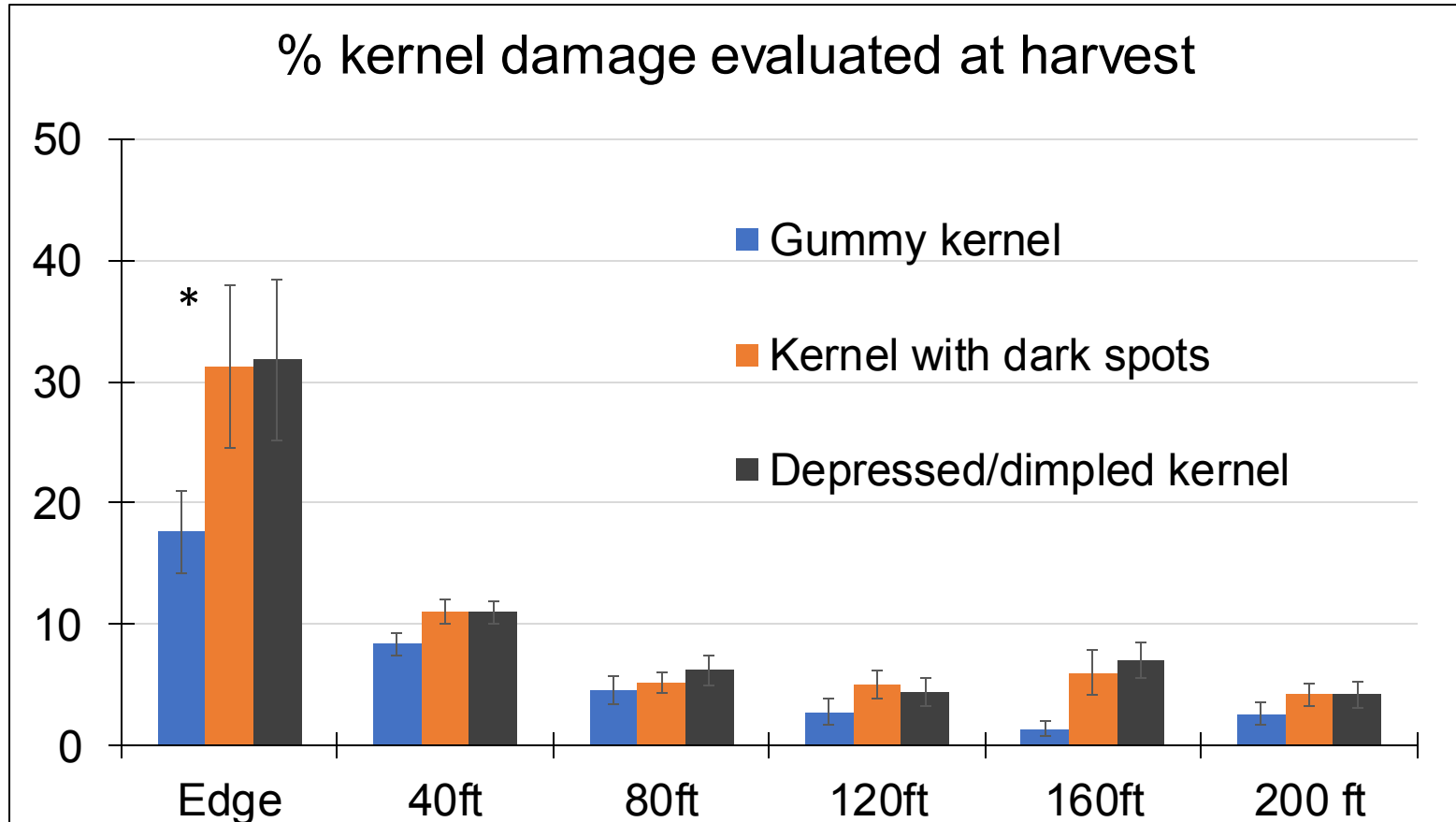


- Not different in overall captures of BMSB in edge vs. interior. This might be that this study did not include the trap counts during the spring and early summer

# Edge Effect-Kernel Damage at Harvest

10 samples/treatment (5 north, 5 south)

# nuts/sample = 50



- Edge produced significantly more damaged kernels compared to all other distances.





Almond Orchard



# Conclusion

- In CA, BMSB was first found in peaches (2016) and almonds (2017) orchards in the northern San Joaquin Valley
- BMSB has been spreading to crop production areas in CA, causing substantial economic damage in some orchards
- BMSB can cause significant injury to the developing nuts leading to nut drop early stage, and damaged kernels at mid-to-late season
- Feeding signs of BMSB and leaffooted bug resembles, although feeding dynamics seems to be different
- In the field, the damage to almond seems to be highly border-driven

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