Developing an **Effective** Integrated Pest Management (IPM) Program for Lygus bug

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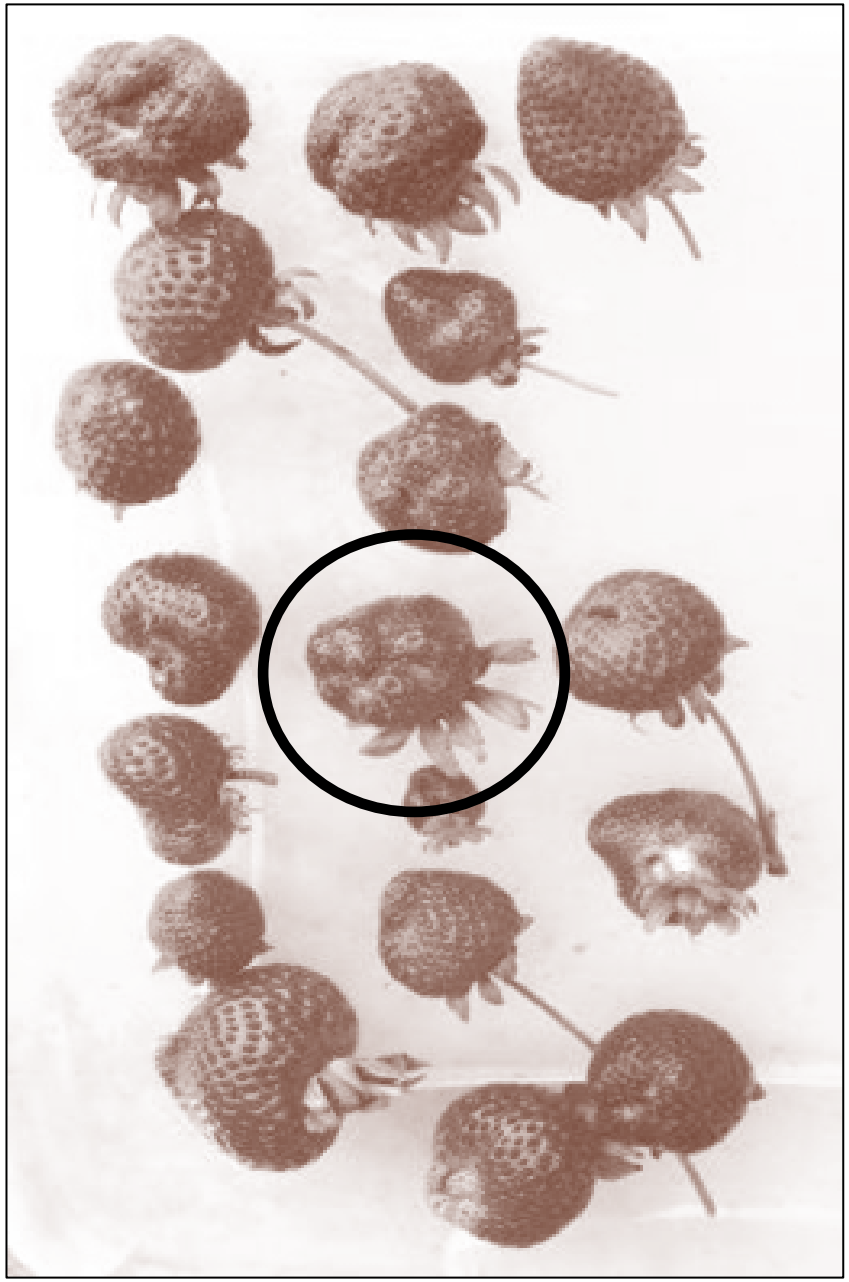
California STRAWBERRY COMMISSION



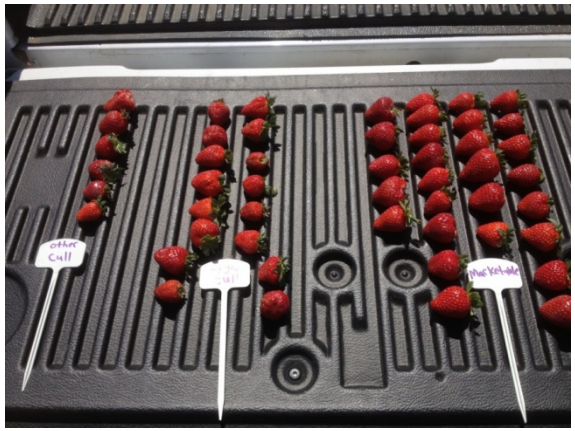
Slide credit: D. Legard

How much damage are they causing?

1. Sampled using the beat box method
 - 1 Lygus per 20 plants is the current treatment threshold
- 5 samples per block

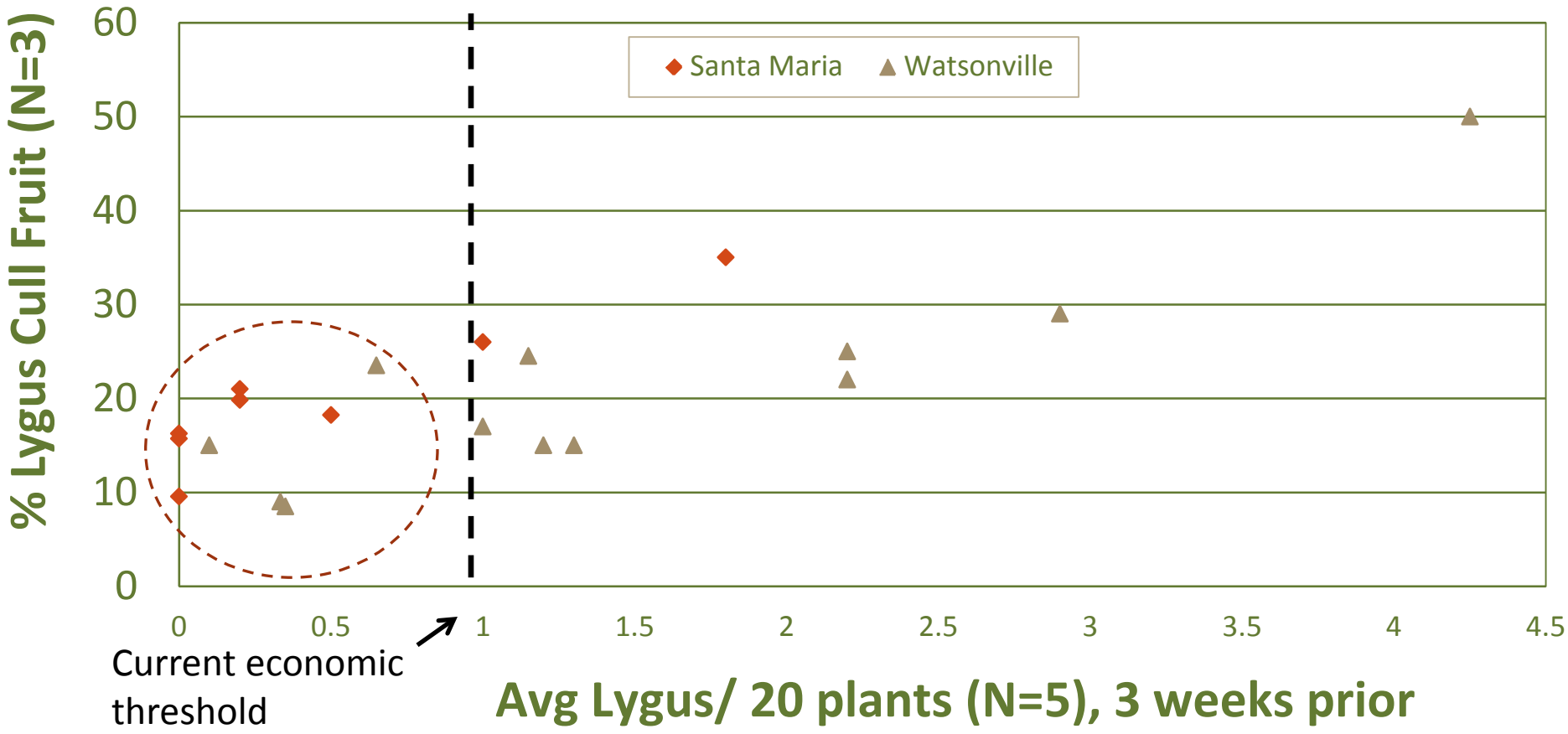
2. Recorded the number of Lygus adults and nymphs

3. Fruit samples 3 weeks later (50 fruit/sample, N=3)



4. Sorted marketable and unmarketable fruit

% Cat-faced fruit due to Lygus feeding (2013)

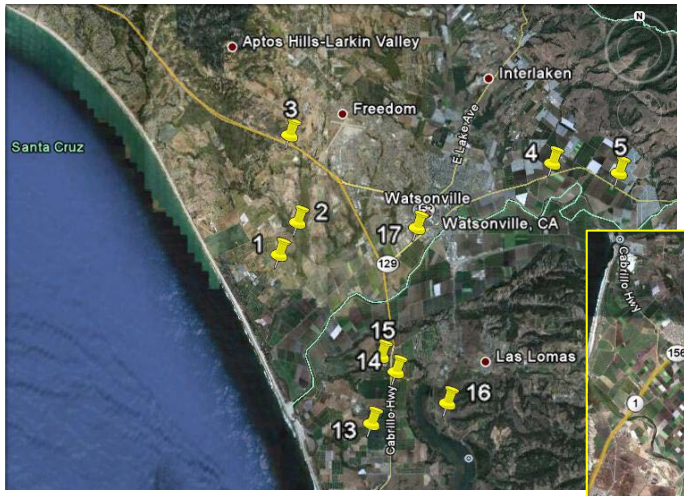


Lygus bug causes serious $$ loss for strawberry growers

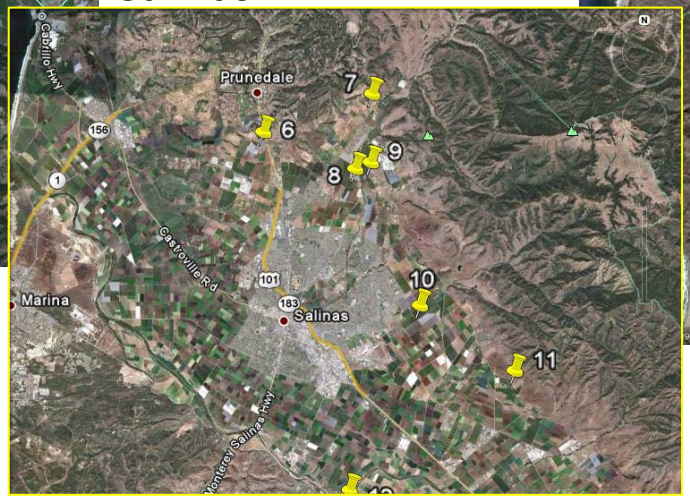
- Lygus losses average 10-20% of marketable yield in Watsonville/Salinas & Santa Maria districts
- At avg. FOB of $9.00 / tray, losses are between **$4,950-$9,900 / acre at threshold**
- Est'd 25,267 acres in Watsonville-Salinas and Santa Maria means total losses are **$125-250 million per year**
- **The economic threshold may not hold up**

CSC Lygus program: 4 seasons long and going strong…

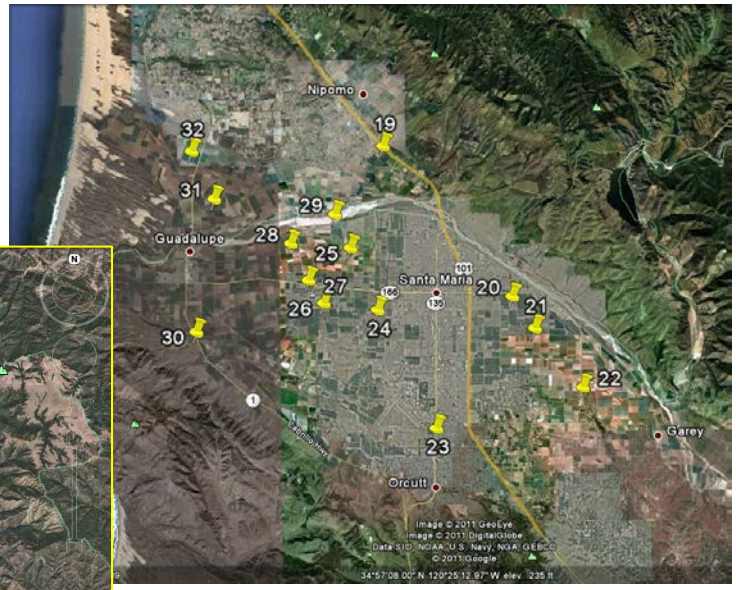
- Our team has evaluated the top recommended IPM tools on a large number of collaborating farms, in real production settings:



Watsonville



Salinas



Santa Maria

Here's what we have found…

Some tools don't work

…but our industry widely uses them anyway.

CSC laboratory tests showed that malathion avgs. less than 30% mortality

Insecticide trials: new registrations are few and far between

Pesticide use patterns can change through evaluation of sprays and training.

Some tools work

…but only when researchers use them.

Site #	DD started	DD accumulated 5/25†
1	4/21/2011	89*
2	4/13/2011	104*
3	5/6/2011*	MD
4		NS
5	5/24*/2011	Set 1 day
6	3/22/2011	160
7	4/29/2011	98
8	5/24/2011	set 1 day
9	5/24/2011	Set 1 day*
10	4/25/2011	94
11	5/18/2011*	15
12	5/6/2011	57
13	5/12/2011	MD
14	5/4/2011	MD
15	5/5/2011	21
16	Set 5/12/11	MD
17	5/4/2011	55
-	4/19/2011	111

†Sites 1-3 sampled on 5/24/2011
*actual degree days accumulated likely exceeds value

42 days late on avg.

and that's why they aren't used by industry.

Some tools work

…but they can be improved.

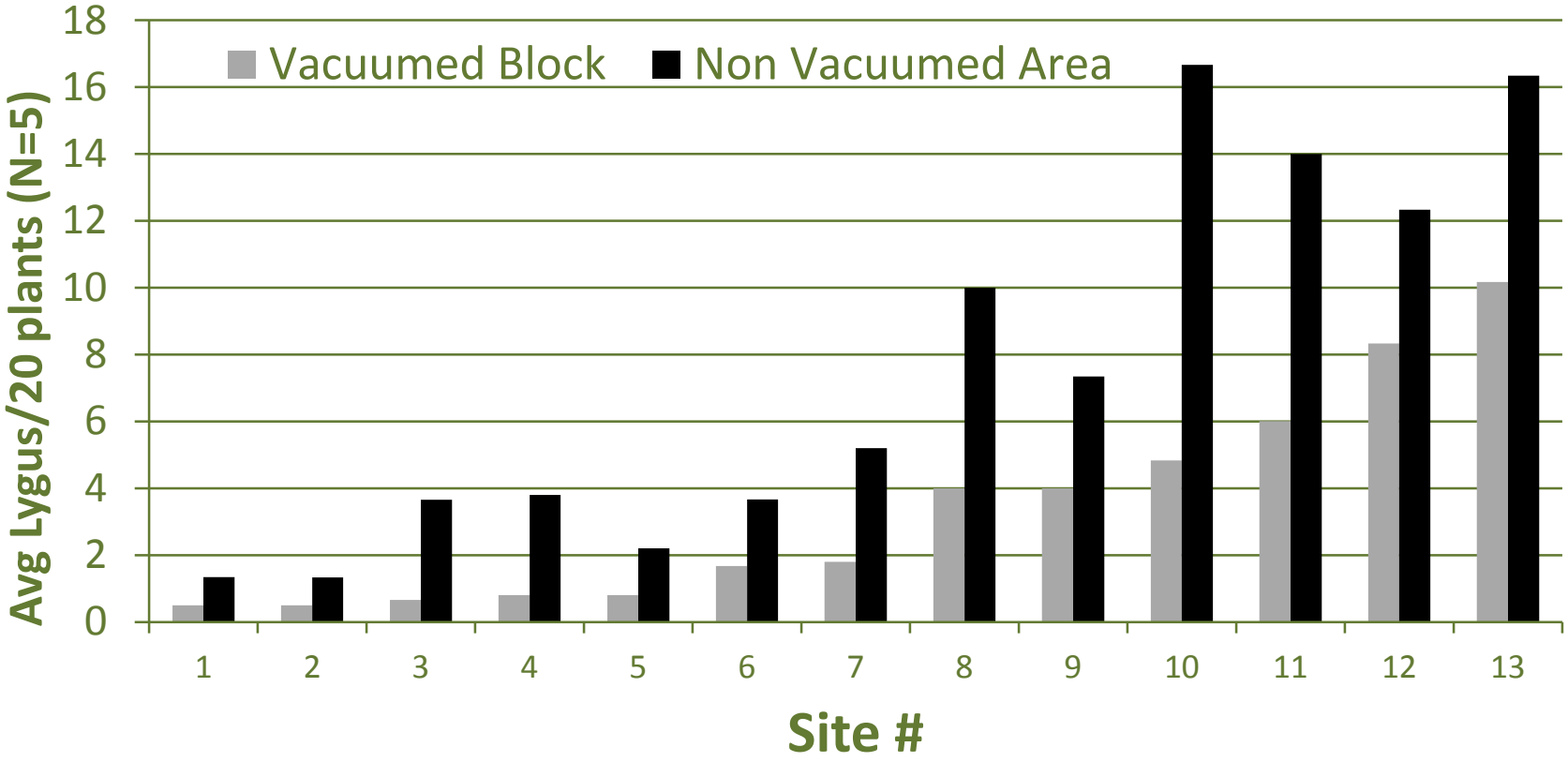
2013 CSC vacuum trials…

Lygus Vacuum Experiment

- 6 rows (avg .11 acres) in middle of field not vacuumed, rest of field vacuumed 2X per week
- Weekly sampling in each area of field using the beat box method

Vacuuming improves control

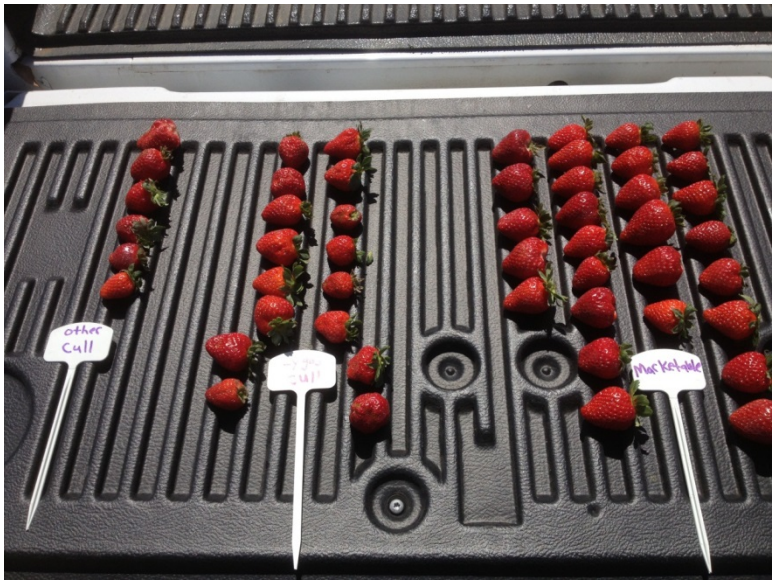
Mean diff = 1.52, SE: 0.32, p=0.0007, N=13

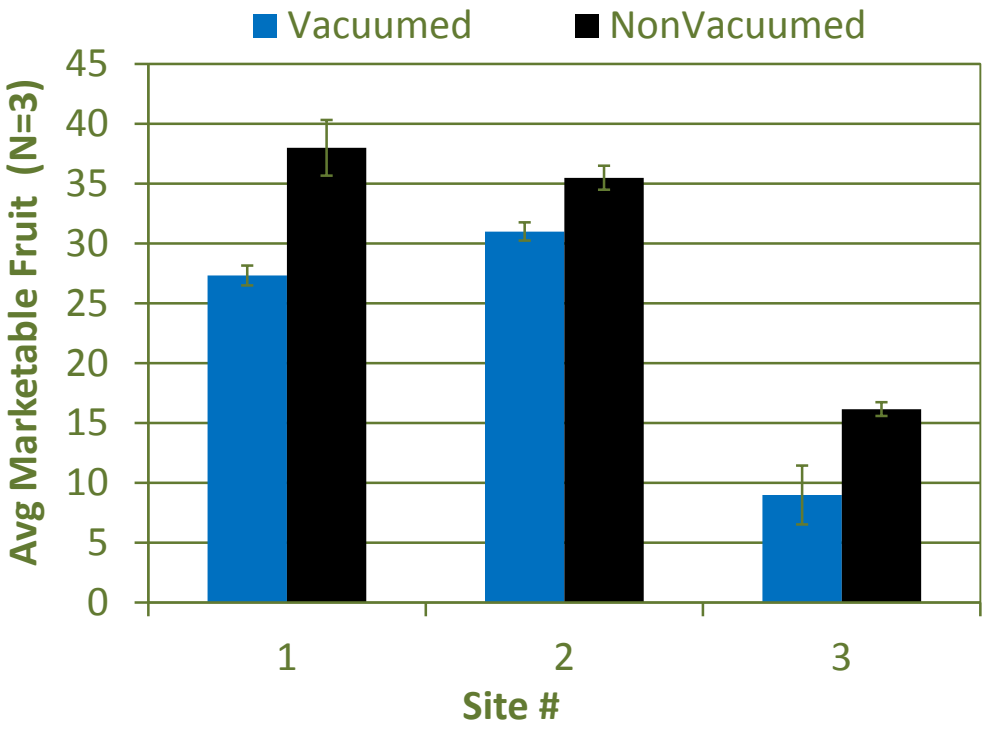


On average, the vacuumed area had 40.4%± 0.04 less Lygus than the non-vacuumed areas (N=13)

Vacuuming increased marketable fruit

- Fruit cull samples at each site after 6-8 weeks of vacuuming or not vacuuming
- Significantly more marketable fruit in vacuumed blocks at 9 of 13 sites



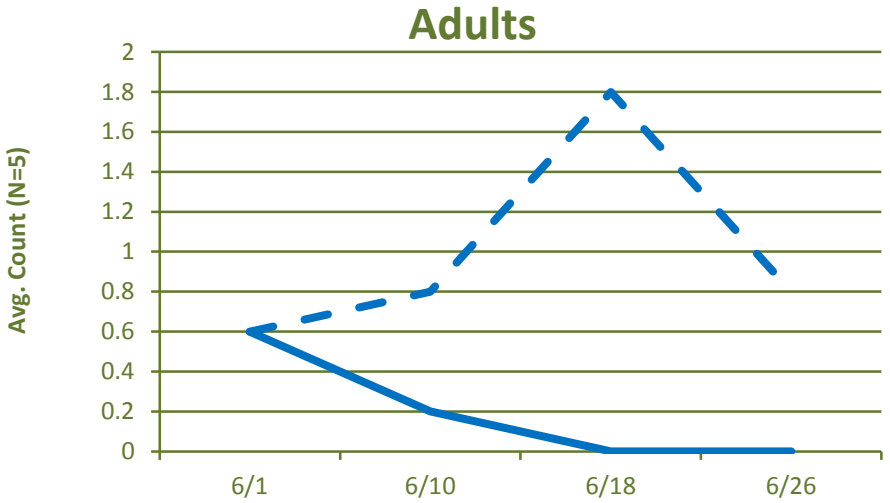


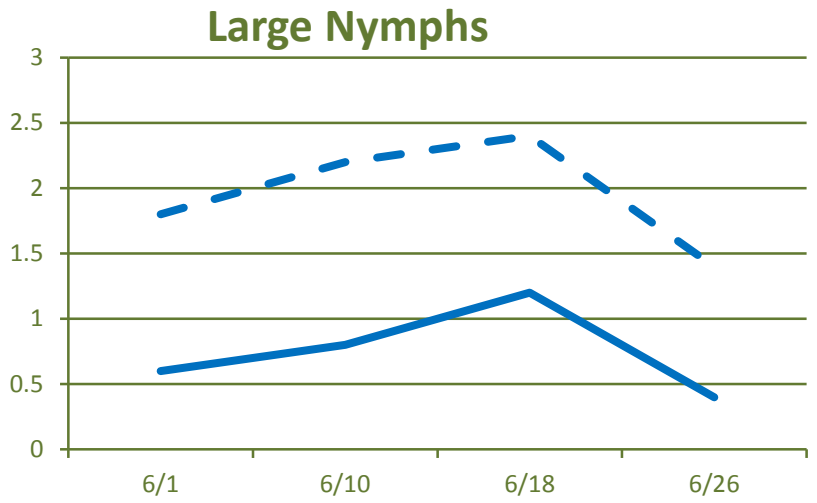
Is earlier intervention important?

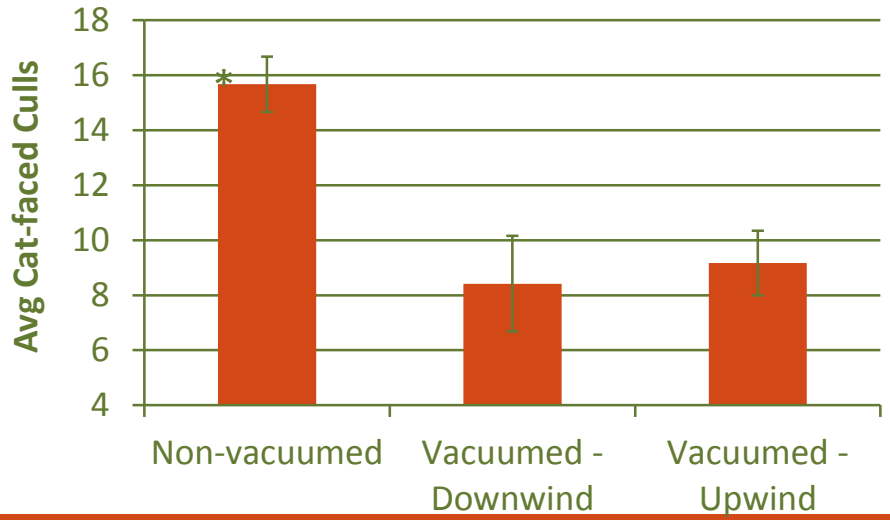
- Monterey, San Andreas, Albion, 2 proprietary varieties
- Only two sites had an avg. Lygus count below 1 (purported economic threshold) when we started to exclude vacuuming

- Avg/20 plants (N=5) for 2nd year fields: **1.74**±0.36 in April
- Avg for 1st year fields: **3.43**±0.81; various start times, May-June

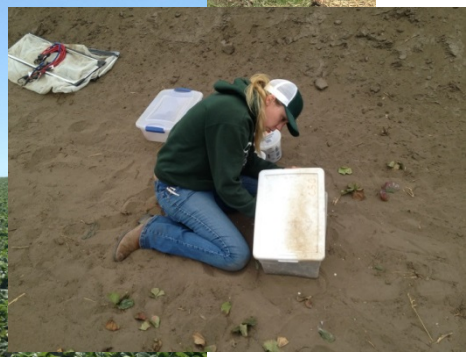
Second year fields did a fairly good job, but they started vacuuming in April







Can vacuums be improved?



Vacuums aren't killing all the Lygus they suck up

- Small lygus nymphs, Drosophila, thrips and beneficial insects were common in the samples

- Some beneficials survived (Orius, Nabis)

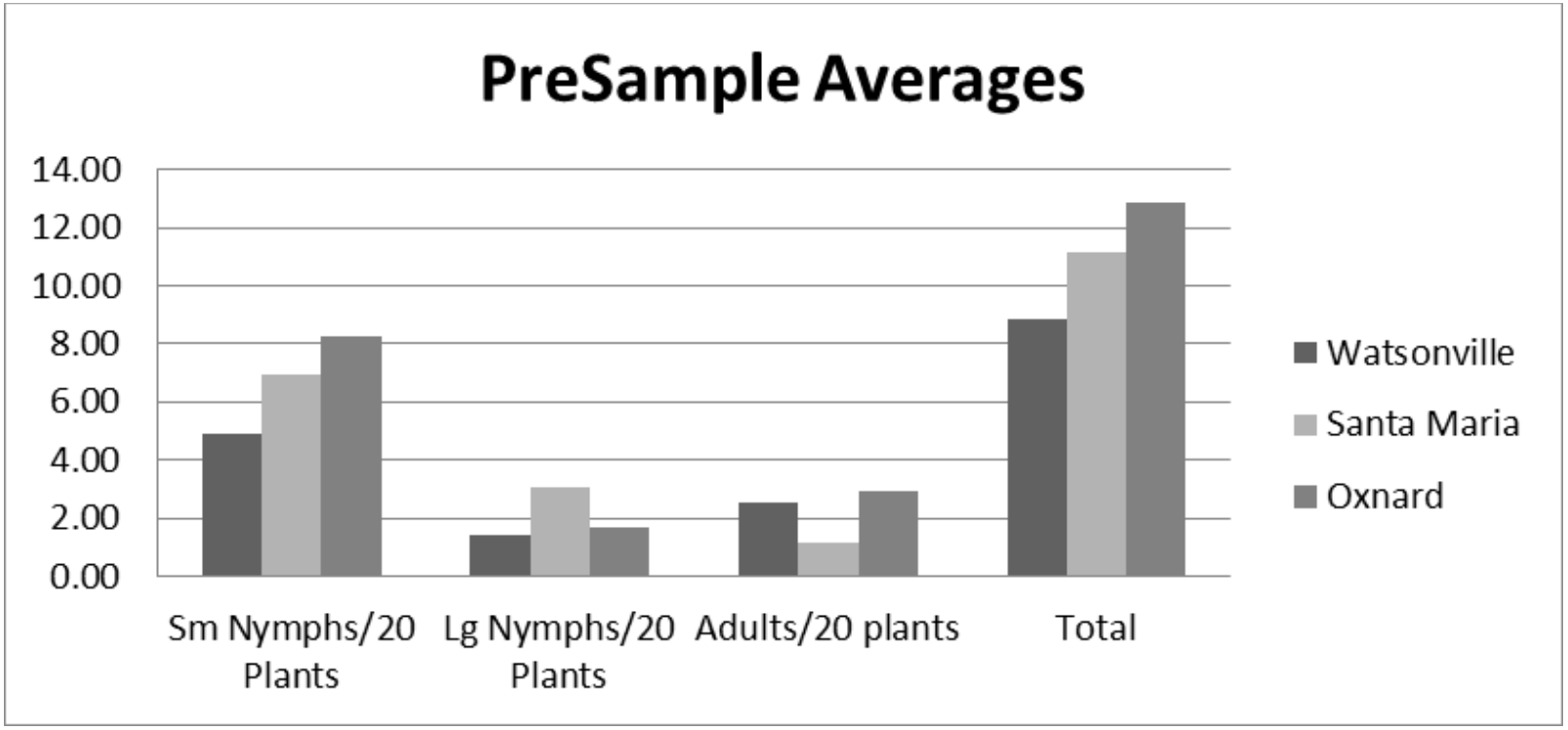
- **32% of small nymphs, 28% of large nymphs and 22% of adults remain viable after exiting fan blade**

Vacuum performance was variable, and individual vacuums performed differently over time

- High variation in performance
- Avg. windspeed at fan: 29 mph (N=15)
- No significant correlations between the parameters we measured and performance
- Maintenance and operators may have affected vacuum performance over time
- Are they optimized?

site	% dead adults
1	25.81
2	49.74
3	75.14
4	78.19
5	80.10
6 - organic	89.48
7	93.55
8	100*

Lygus was above threshold in all fields when we did the performance assessments



Avg of 10.77±2.62 Total Lygus

Monitoring is **critical**

…but it isn't widely used by growers and PCAs.

Systematic monitoring

- Know whether you have Lygus
- Target treatment options for life stages of Lygus
- Evaluate treatment efficacy

We think this can be improved through **effective** training.

What we know right now

- Growers don't know how much yield ($$) they are losing to Lygus because they are not evaluating it AND we detect Lygus problems too late
- We (researchers) have been advocating IPM tools that don't work in a production setting, along with some tools that do
- Pest management can be improved by training on several key tools
- There are remaining research questions that need to be addressed in innovative ways…

Lygus Research: What's next for 2014

- Early season detection & intervention
- Vacuum Redesign
- Improve sampling & detection methods
- More vacuum research: intensity, frequency and timing