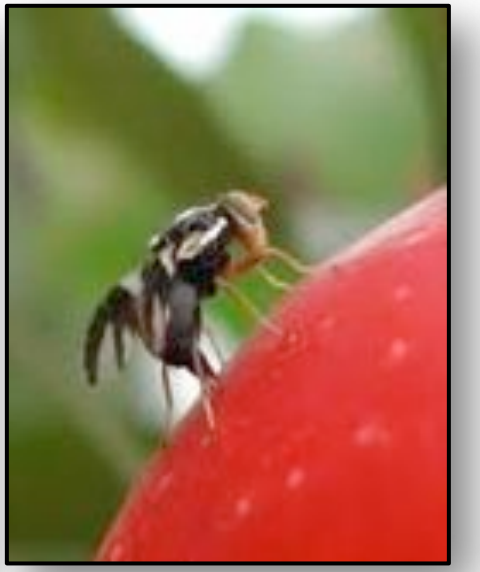
Native and Emerging Insect Management for Tree Fruit In Eastern NY


Long Island Agricultural Forum
January 14, 2016
Suffolk County Community College; Eastern Campus
Riverhead, New York Peconic Building.

Peter Jentsch
Senior Extension Associate – Entomology

Cornell University
College of Agriculture and Life Sciences

Hudson Valley
Research Laboratory

Insect and Mite Pests on Apple Requiring Control Measures, NY State (Cornell Guidelines)

American Plum Borer
Apple Maggot
Codling Moth
Oriental Fruit Moth
Cutworms
American Plum Borer
European Red Mite
Green Fruitworm
Obliquebanded Leafroller
Plum Curculio
San Jose Scale
Apple Blotch Leafminer
Variegated Leafroller
Woolly Apple Aphid
Rosy Apple Aphid
Stink Bug Complex

Apple & Spirea Aphid (32 insects)
Apple Rust Mite
Lesser Appleworm
Comstock Mealybug
Dogwood Borer
European Apple Sawfly
European Corn Borer
Mullein Plant Bug
Oystershell Scale
Redbanded Leafroller
Spotted Tentiform Leafminer
Tarnished Plant Bug
Sparganothis Fruitworm
(Leafhopper complex)
White Apple Leafhopper
Rose Leafhopper
Potato Leafhopper

Cornell University
College of Agriculture and Life Sciences

Hudson Valley
Research Laboratory

Insect and Mite Pests on Apple Requiring Control Measures, NY State - 2004

Fruit feeding

Apple Maggot
Codling Moth
European Apple Sawfly
Green Fruitworm
Lesser Apple Worm
Mullein Plant Bug
Obliquebanded Leafroller
Oriental Fruit Moth
Plum Curculio
Rosy Apple Aphid
San Jose Scale
Stink Bug Complex (3)
Tarnished Plant Bug
(14 insects)

Foliar & trunk feeders

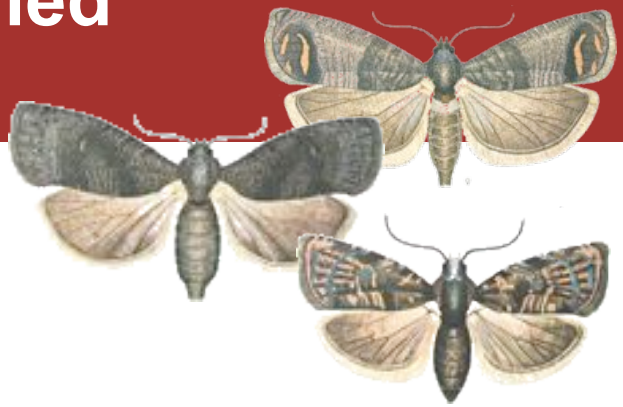
Apple & Spirea Aphid
Dogwood Borer
Mite Complex (ERM & TSSM)
Spotted Tentiform Leafminer
Potato Leafhopper
Rose Leafhopper
White Apple Leafhopper
(8 insects)

Total: 22 insect species

Cornell University
College of Agriculture and Life Sciences

Hudson Valley
Research Laboratory

Pest Complex Simplified



"I would not give a fig for the simplicity this side of complexity, but I would give my life for the simplicity on the other side of complexity."

Oliver Wendell Holmes (American Physician, Poet, Writer, Humorist and Professor at Harvard, 1809-1894)

Understanding the complex nature of pome fruit production is a necessary 'evil'.

Our goal is to arrive on the other side of complexity to obtain a **simple, sustainable yet effective management practice, achieving the highest levels of quality and yield.**

Cornell University
College of Agriculture and Life Sciences

Hudson Valley
Research Laboratory

SEASONAL ACTIVITY OF 3 MAJOR INSECT PESTS OF APPLES IN THE HUDSON VALLEY OF NEW YORK STATE

PC

OBLR OW

OBLR 1st G.

OBLR 2nd G.

AM.

PC / OBLR | PC / OBLR | PC | PC | OBLR | OBLR | AM | AM | AM/OBLR

April	May	June	July	August	Sept.	Oct.
TC - Pink	Bloom PF	1C-3C	4C-6C	7C-8C		

Reissig; NYSAES

Cornell University
College of Agriculture and Life Sciences

Hudson Valley Research Laboratory

SEASONAL ACTIVITY OF 3 MAJOR INSECT PESTS OF APPLES IN THE HUDSON VALLEY OF NEW YORK STATE

PC

OBLR OW

OBLR 1st G.

OBLR 2nd G.

AM.

PC / OBLR | PC / OBLR | PC | PC | OBLR | OBLR | AM | AM | AM/OBLR

April — TC - Pink

May — Bloom PF

June — 1C-3C

July — 4C-6C

August — 7C-8C

Sept.

Oct.

Reissig; NYSAES

Cornell University
College of Agriculture and Life Sciences

Hudson Valley Research Laboratory

IPM: Insecticides for Use in Suffolk County For Primary Tree Fruit Pests - Biology

Insect	Timing	Threshold/Activity
ERM	• Eggs	• Dormant oil
PC	• Adults moving into orchard though 40% oviposition	• PF Spray • + 2-3 applications through 308 DD50
OFM	• Biofix • 1st gen larvae • 2nd gen larvae	• Pheromone Monitoring • 350-375 DD45 from biofix • 175-200 DD45 from 2nd generation sustained adult
CM	• Biofix • 1st gen larvae • 2nd gen larvae	• Pheromone Monitoring • 250-360 DD50 from biofix • 250-350 DD50 from 2nd generation sustained adult
OBLR	• Overwintered brood • Biofix • Summer brood	• 3% infestation of bud clusters • Pheromone Monitoring • Rate fruit at 600 DD43 from biofix, 1 damaged fruit
AM	• First emergence • Continued emergence	• 5 flies per red baited sticky sphere (3 traps/block) • 5 flies per trap or 10-14 days

Insecticides for Use in Suffolk County For Tree Fruit Pests

Plum Curculio

- Avaunt (indoxacarb)
- Imidan (phosmet)
- *Leverage (cyfluthrin/ imidacloprid)
- Asana XL (esfenvalerate)
- Danitol (fenpropathrin)

* Restricted-use pesticide; certified applicator

Codling Moth

- Assail (acetamiprid)
- Delegate (spinetoram)
- Imidan (phosmet)
- Asana XL (esfenvalerate)
- *Baythroid (cyfluthrin)
- Danitol (fenpropathrin)
- *dimethoate

San Jose Scale

- Esteem (pyriproxyfen)
- Movento (spirotetramat)
- Hort. Oil (1-3%)
- Lorsban (chlorpyrifos)

Obliquebanded LR

- Delegate
- §B.t, (§Biobit, §Dipel, §Javelin)
- Asana XL
- Danitol
- *Ambush, *Pounce (permethrin)
- *Proclaim (emamectin benzoate)
- *Rimon (novaluron)

Apple Maggot

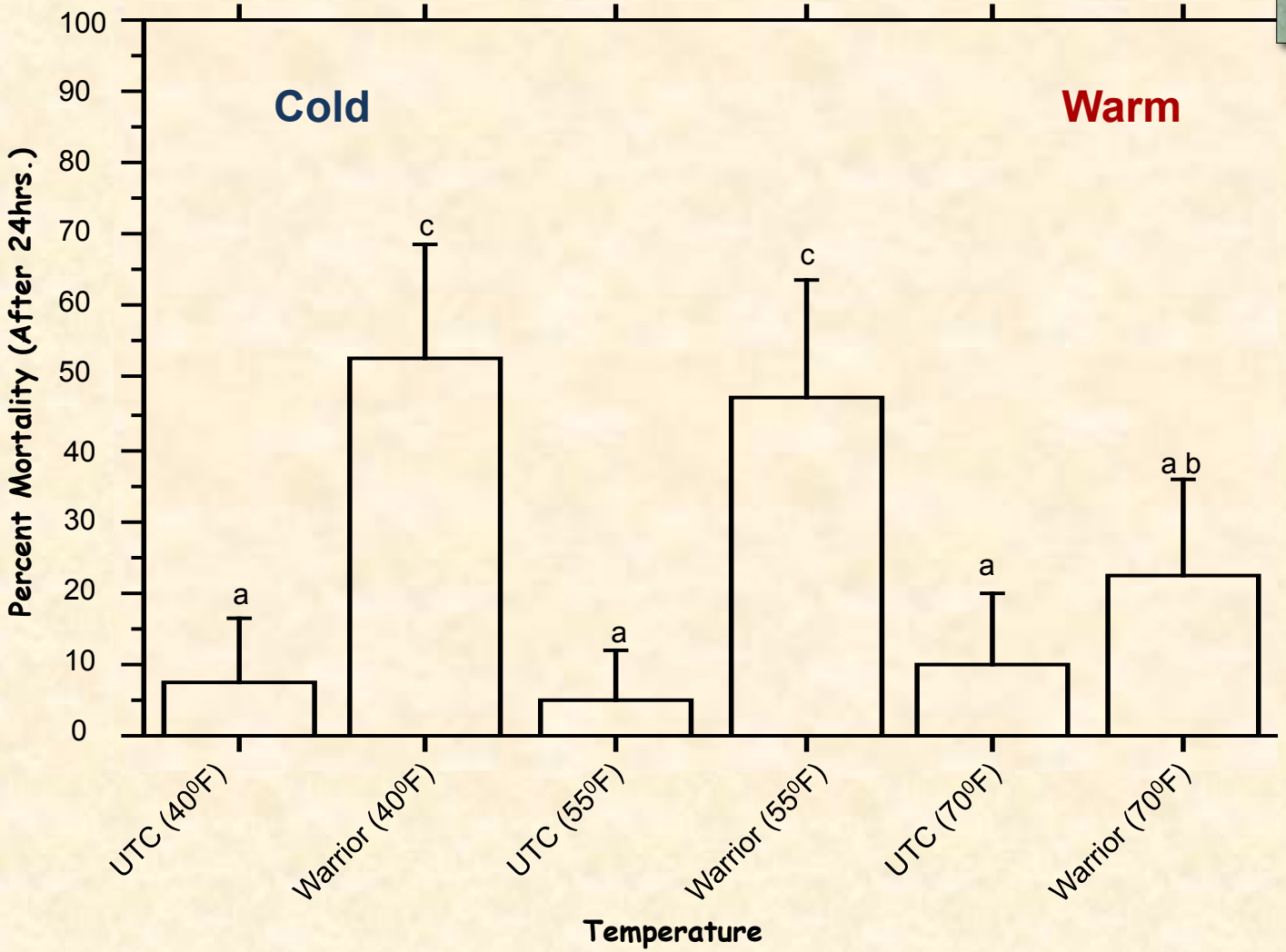
- *Ambush, *Pounce (permethrin)
- Asana XL
- Assail
- *Baythroid
- Danitol
- *diazinon
- *dimethoate
- Imidan
- *Leverage
- *Warrior (lambda-cyhalothrin)

IPM Protocols: Recommended Materials

- Avoid Pyrethroids
- Avoid Organophosphates/carbamates

Timing	Primary Target	Material
Early	PC	Avaunt – Indoxacarb Imidan – Phosmet, Organophosphate
Summer	CM, OBLR, OFM	Delegate – Spineotoram, NACHR modulator Bt – Biobit, Dipel, Javelin, MVP (OBLR) Assail – Acetamiprid, Neonicotinoid (CM, OFM)
Late	AM	Assail – Acetamiprid, Neonicotinoid Imidan – Phosmet, Organophosphate

Codling Moth Larvae Bioassay (susceptible 'Benzon' Colony), NYSAES, Highland NY 2009[1]



[1] Bioassay conducted on 1st instar codling moth larva topically treated with 1µL droplet of lamda-cyhalothrin at 0.0005 µg A.I./ 1000 mL or 0.0005 ppm [**3% of the labeled field rate**] placed in temperature controlled chambers over 24 hours. (df = 3, F-value = 8.648, P-value = 0.0001).

Insecticides for Use in Suffolk County For Tree Fruit Pests (High Efficacy)

Plum Curculio (PC)

- **Avaunt** (indoxacarb) - IRAC 22
- **Imidan** (phosmet) - IRAC 1B
- ***Leverage** (cyfluthrin/ imidacloprid) – IRAC 4/3
- **Asana XL** (esfenvalerate)
- **Danitol** (fenpropathrin)

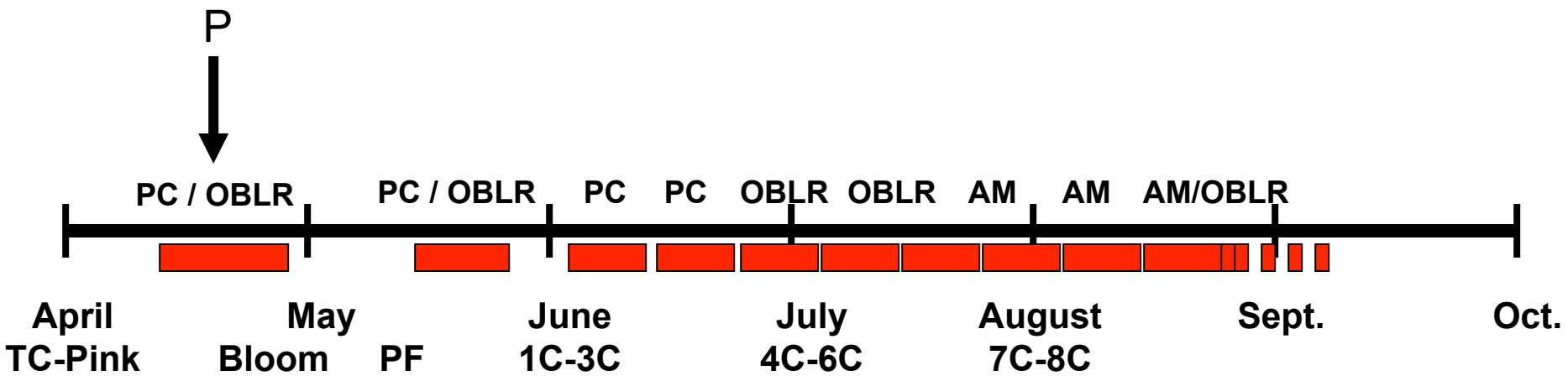
* Restricted-use pesticide; certified applicator required

Reduced Risk Insecticide (oxadiazine)	
Bee / pollinators	Moderate
Predatory insects & mite*	Low
Organophosphate	
Bee / pollinators	High
Predatory insects & mite	Low
Pyrethroid / Neonicotinoid	
Bee / pollinators	High
Predatory insects & mite	High
Pyrethroids	
Bee / pollinators	High
Predatory insects & mite	High

*Fungicide assessment for T.pyri conservation

* Low OBLR efficacy
** Low Int. Lep. efficacy
*** Low OBLR & Int. Lep. efficacy

Avaunt (+GFW, EAS, RBLR, OFM)
Imidan (+GFW, EAS, RBLR, OFM)
Leverage (+GFW, EAS, RBLR, OFM, RAA)
Pyrethroid / 1% oil (+GFW, TPB, EAS, OFM, SJS, WALH, RAA, STLM , MPB, ERM)
Lorsban / 0.25-1% oil foliar (+GFW, SJS, RAA, RBLR, ERM)
or
Lorsban trunk (DWB / BSB)

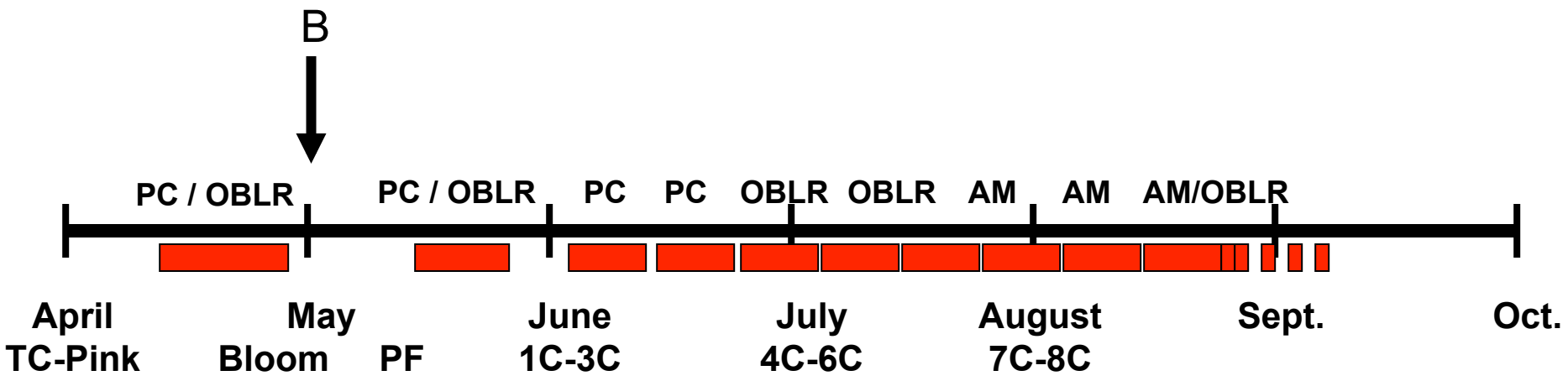


Cornell University
College of Agriculture and Life Sciences

Hudson Valley
Research Laboratory

* Low OBLR efficacy
** Low Int. Lep. efficacy
*** Low OBLR & Int. Lep. efficacy

Bt (GFW, RBLR) – low rate, tight intervals (3-4d)

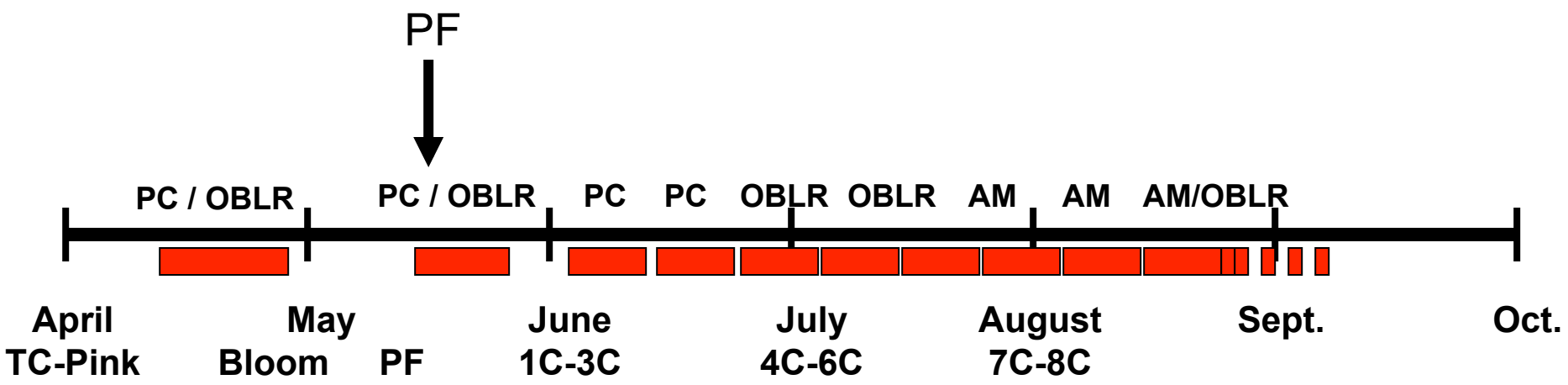


Cornell University
College of Agriculture and Life Sciences

Hudson Valley
Research Laboratory

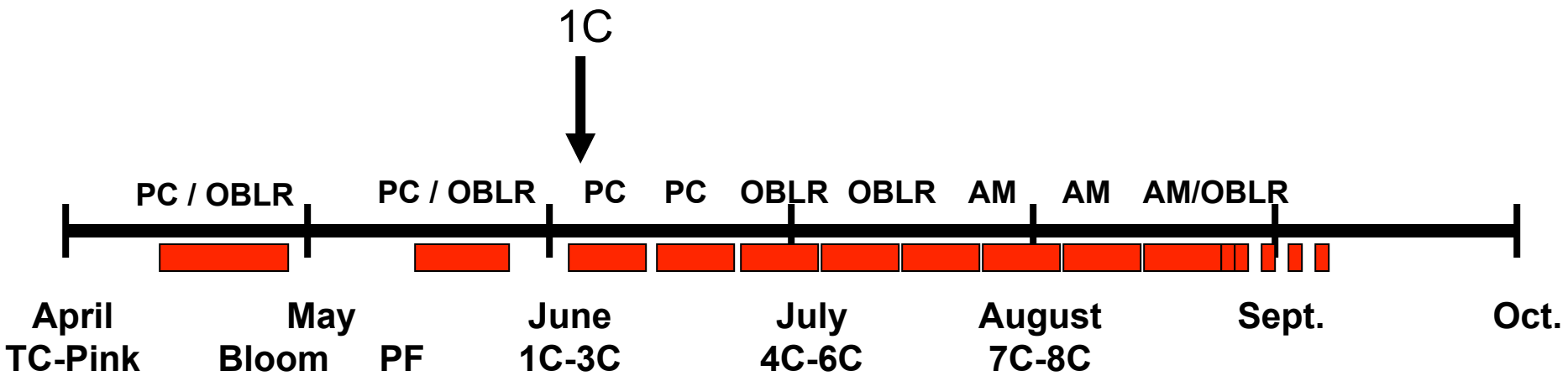
* Low OBLR efficacy
** Low Int. Lep. efficacy
*** Low OBLR & Int. Lep. efficacy

Imidan (+EAS, OFM)
Pyrethroids (+TPB, OFM)
***Avaunt (+EAS, OFM)** + Proclaim (OBLR)
Sevin XLR (+EAS, OFM, PGR)
Leverage (+TPB, RAA)
Surround



* Low OBLR efficacy
** Low Int. Lep. efficacy
*** Low OBLR & Int. Lep. efficacy

Imidan (+CM)
Pyrethroid (+CM, RLH, GAA)
Avaunt (+CM, RLH, GAA)
Sevin XLR (+CM)
Leverage **(+CM, RLH, GAA)**
Surround

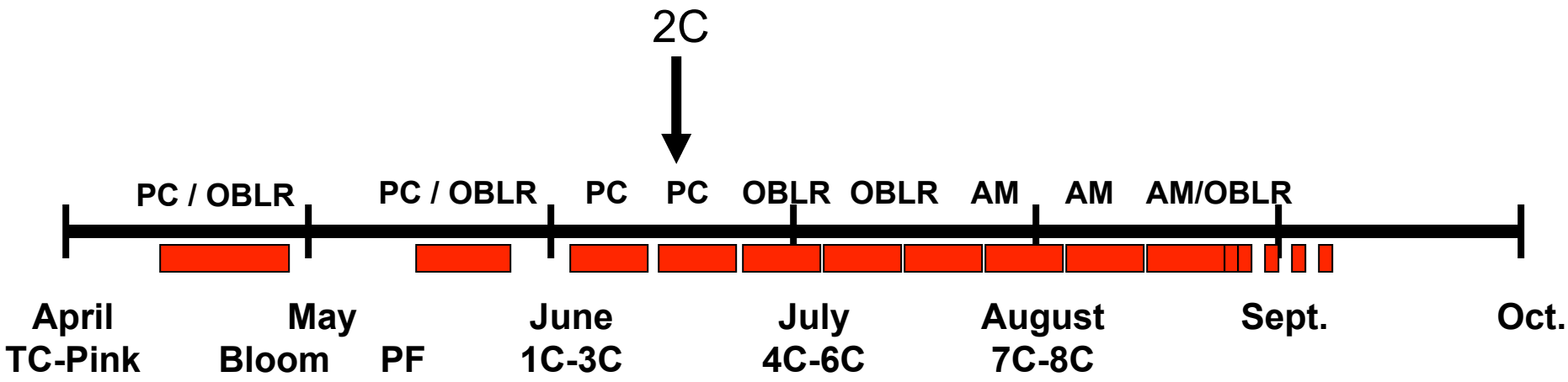


Cornell University
College of Agriculture and Life Sciences

Hudson Valley
Research Laboratory

* Low OBLR efficacy
** Low Int. Lep. efficacy
*** Low OBLR & Int. Lep. efficacy

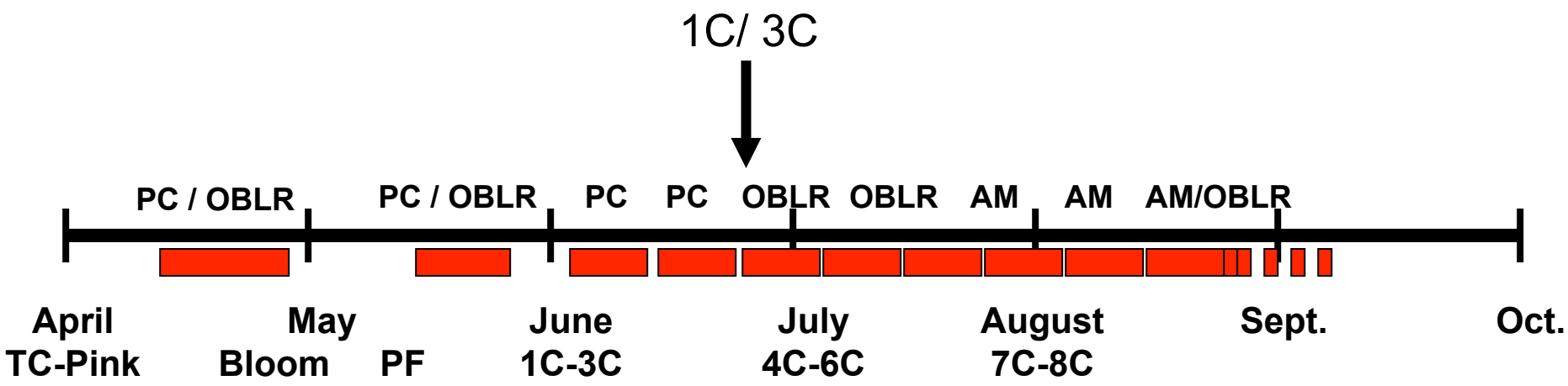
Imidan (+CM)
Pyrethroid (+CM, RLH, GAA)
Avaunt (+CM, RLH, GAA)
Leverage **(+CM, RLH, GAA)**
Surround



Cornell University
College of Agriculture and Life Sciences

Hudson Valley
Research Laboratory

1C Movento + penitrant (SJS)
1C Esteem (SJS)
1C Centaur (SJS)
3C Imidan @ 14d (SJS crawler)
Pyrethroids @ 14d (SJS crawler)
Assail @ 14d (SJS crawler)

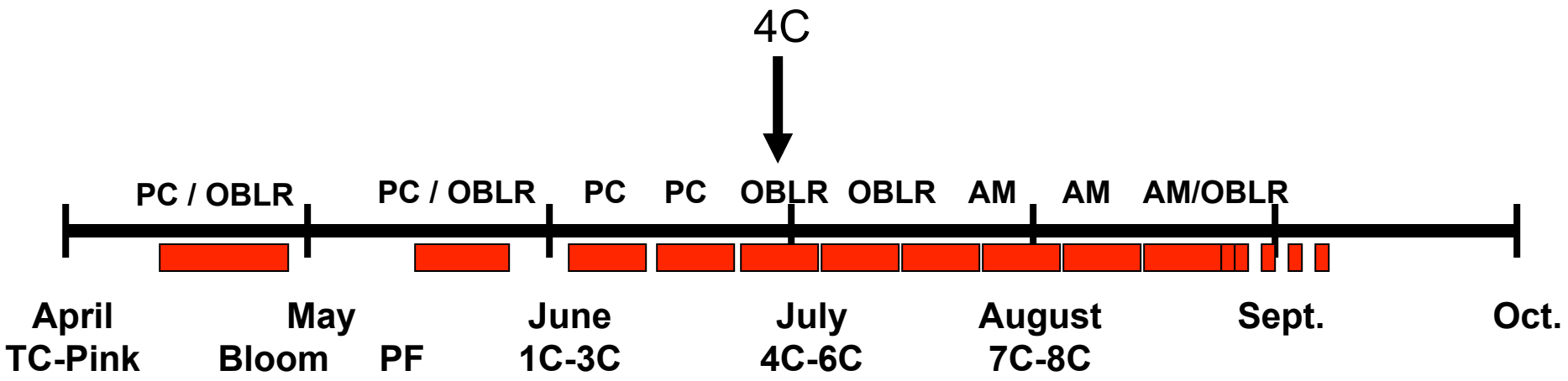


Cornell University
College of Agriculture and Life Sciences

Hudson Valley
Research Laboratory

* Low OBLR efficacy
** Low Int. Lep. efficacy
*** Low OBLR & Int. Lep. efficacy

Delegate (+AM, CM)
Pyrethroid
**Bt
Leverage
Proclaim / oil (+ERM)

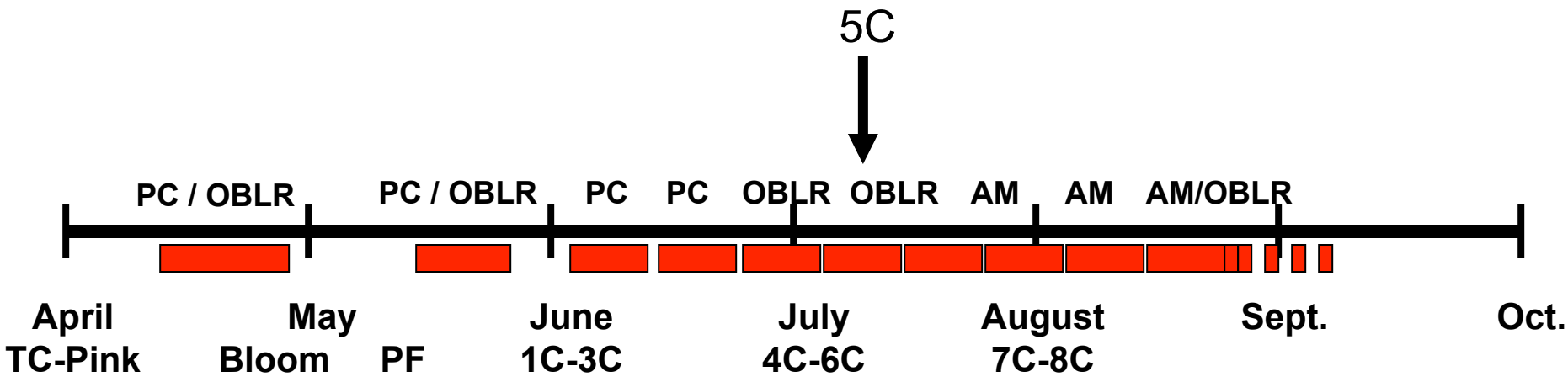


Cornell University
College of Agriculture and Life Sciences

Hudson Valley
Research Laboratory

** Low Int. Lep. efficacy

Delegate (+AM, CM)
Pyrethroid (+AM, CM)
****Bt (No CM)**
Leverage **(+CM)**
Proclaim / oil (+ERM)

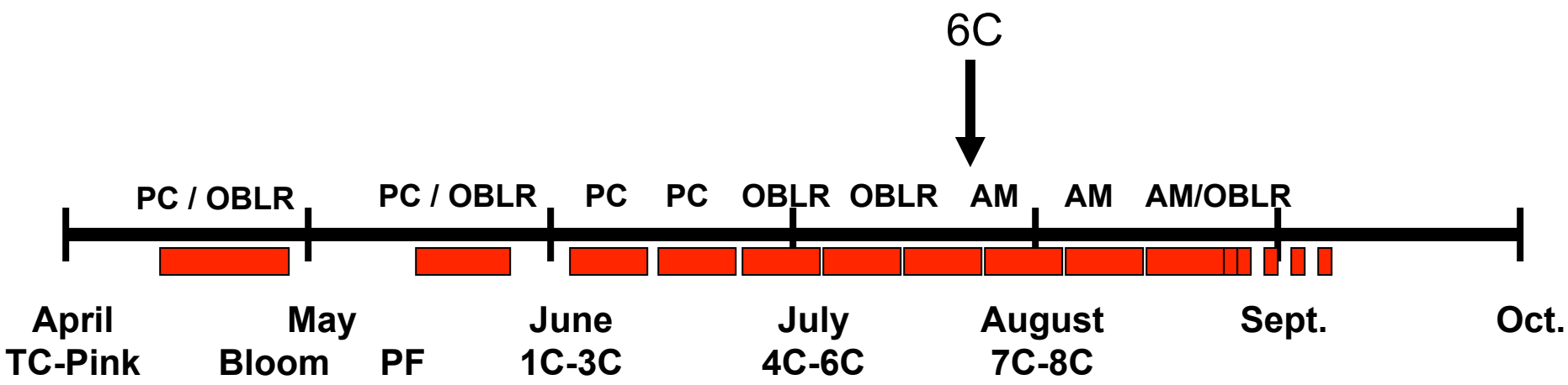


Cornell University
College of Agriculture and Life Sciences

Hudson Valley
Research Laboratory

Imidan (+OFM, CM, LAW)
Assail (+OFM, CM, LAW)
Pyrethroid (+OFM, CM, LAW)
Avaunt (+RLH) High Rate
Sevin **(+OFM, CM, LAW, RLH)**
Surround

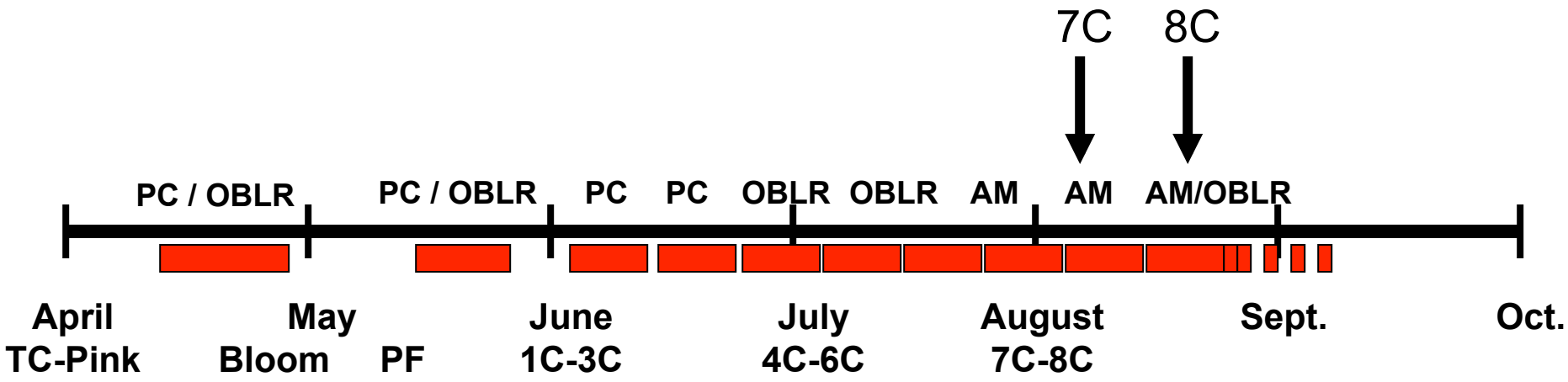
***DTH**



Cornell University
College of Agriculture and Life Sciences

Hudson Valley
Research Laboratory

Assail (+OFM, CM, LAW)
Pyrethroid (+OFM, CM, LAW)
Avaunt (+RLH)
Sevin **(+OFM, CM, LAW, RLH)**
Surround



Cornell University
College of Agriculture and Life Sciences

Hudson Valley
Research Laboratory

Table 10a Harvest Evaluations Of Insecticide Schedules For Controlling Early Season Insect Complex On Apple [A].
N.Y.S.A.E.S., Hudson Valley Lab., Highland, N.Y. - 2011.

	Treatment	Formulation	Application Date	Incidence (%) of insect damaged cluster fruit TPB	EAS	E.Lep	PC	InLep	ExLep	AMP	AMT	Clean
7	Imidan 70WP	3.0 lbs/A	PF-EOS	2.4 a	1.2 a	3.2 a	10.9 a	0.6 ab	0.2 a	0.5 a	0.3 a	83.6 a
	+ NIS	0.25% v/v	PF-EOS									
	Seven XLR	96 oz/A	4-6C									
8	Avaunt	6.0 oz/A	PF-EOS	3.9 a	2.3 a	5.1 a	9.9 a	0.0 a	0.3 a	2.4 abc	1.9 abc	79.3 ab
	+ NIS	0.25% v/v	PF-EOS									
9	Closer 2SC	3.0 fl.oz/A	TC	3.8 a	2.5 a	3.3 a	11.4 a	0.2 ab	0.8 a	0.8 ab	0.5 ab	77.6 ab
	Imidan 70WP	3.0 lbs/A	PF									
	Delegate WG	5.2 oz/A	1C-4C									
	+ Closer 2SC	1.5 fl.oz/A	2-3C									
	Intrepid 2F	12.0fl.oz/A	5-7C									
	+ Assail 30SG	4.0 oz/A	5-7C									
10	Untreated			4.0 a	2.8 a	14.1 b	58.6 d	8.1 e	15.3 b	17.8 e	15.5 f	22.0 d
P value for transformed data				0.666	0.424	0.017	0.000	0.000	0.000	0.000	0.000	0.000

[A] Evaluation made 4 August on 'Ginger Gold' cultivar.

Avaunt: good control of the insect complex, slightly weaker on AM under very high pressure.
Assail provided excellent control of late season pest complex (OFM, AM)

Table 10c Evaluations of insecticide schedules for controlling early season insect complex on apple [a].
N.Y.S.A.E.S., Hudson Valley Lab., Highland, N.Y. - 2011.

	Treatment	Application Formulation	Date	Incidence (%) of insect damaged cluster fruit TPB	EAS	E.Lep	PC	InLep	ExLep	AMP	AMT	Clean
7	Imidan 70WP	3.0 lbs/A	PF-EOS	0.0 a	0.6 a	1.2 a	6.2 ab	0.7 a	1.2 ab	1.3 a	1.3 a	86.1 a
	+ NIS	0.25% v/v	PF-EOS									
	Seven XLR	96 oz/A	4-6C									
8	Avaunt	6.0 oz/A	PF-EOS	0.0 a	0.7 a	0.0 a	3.1 a	7.8 b	5.7 ab	9.1 ab	6.5 ab	76.4 ab
	+ NIS	0.25% v/v	PF-EOS									
9	Closer 2SC	3.0 fl.oz/A	P	0.0 a	0.3 a	0.0 a	6.3 ab	0.8 a	0.6 a	0.8 a	0.8 a	91.1 a
	Imidan 70WP	3.0 lbs/A	PF4C									
	Delegate WG	5.2 oz/A	1-3C									
	+ Closer 2SC	1.5 fl.oz/A	2-3C									
	Intrepid 2F	12.0 fl.oz/A	5-7C									
	+ Assail 30SG	4.0 oz/A	5-7C									
10	Untreated			0.0 a	0.4 a	3.8 a	43.4 c	16.5 bc	10.8 b	22.8 b	22.8 b	27.4 c
P value for transformed data				0.099	0.829	0.594	0.133	<0.001	0.243	0.214	0.124	<0.001

[a] Evaluations made 27 September on Red Delicious.

Higher pressure from AM in Red Delicious in 2011

- Avaunt showed its weakness in a variety prone to AM injury.
- Assail provided excellent control against AM and the late lep complex.

Table 12 Evaluations Of Insecticide Schedules For Controlling San Jose Scale On Apple [A].
N.Y.S.A.E.S. Hudson Valley Lab. Highland N.Y. - 2011.

Treatment	Formulation	Application Date	Incidence (%) of San Jose Scale on fruit Ginger Gold	McIntosh	Red Delicious
7 Imidan 70WP	3.0 lbs/A	PF-EOS	0.0 a	1.0 a	8.5 a
+ NIS	0.25% v/v	PF-EOS			
Seven XLR	96 oz/A	4-6C			
8 Avaunt	6.0 oz/A	PF-EOS	0.0 a	15.0 b	24.3 ab
+ NIS	0.25% v/v	PF-EOS			
9 Closer 2SC	3.0 fl.oz/A	TC	0.0 a	2.0 a	0.5 a
Imidan 70WP	3.0 lbs/A	PF			
Delegate WG	5.2 oz/A	1C-4C			
+ Closer 2SC	1.5 fl.oz/A	2-3C			
Intrepid 2F	12.0fl.oz/A	5-7C			
+ Assail 30SG	4.0 oz/A	5-7C			
10 Untreated			0.3 b	2.3 a	7.5 a
P value for transformed data			0.432	0.002	0.006

Avaunt did not provide SJS control
Imidan at 3-5lbs./A appears to be consistant in managing SJS crawlers

Table 6 Harvest evaluations of insecticide schedules for controlling San Jose Scale on apple [a]. N.Y.S.A.E.S. Hudson Valley Lab. Highland N.Y. - 2011.

	Treatment / Formulation	Rate	Timing	Incidence (%) of insect damaged fruit Ginger Gold	McIntosh	Red Delicious
1	Actara 25WDG	4.5 oz/A	PF-1C	22.5a	47.3 c	35.8 c
	Belt	5.0 oz/A	1st CM-3C			
6	Baythroil XL 1L	2.4 fl.oz/A	TC	0.0 a	7.0 ab	1.5 a
	Calypso 4F	6.0 fl.oz/A	PF-2C			
	Movento + 1%oil	9.0 fl.oz/A	1st CM			
7	Baythroid XL 1L	2.4 fl.oz/A	TC	0.0 a	4.5 ab	0.0 a
	Calypso 4F	6.0 fl.oz/A	PF-2C			
	Movento + 1%oil	6.0 fl.oz/A	1st CM			
9	Baythroid XL 1L	2.4 fl.oz/A	TC	2.5 a	1.5 a	0.3 a
	Calypso 4F	6.0 fl.oz/A	PF-1C, 1st CM			
	Esteem 35W + 1%oil	5.0 oz/A	2-3C (500DD$_{50}$)			
	Danitol	21.33 fl.oz/A	4-7C			
10	Untreated			0.0 a	21.5 bc	1.2 a

Esteem and Movento provide consistant management of adults & emerging SJS crawlers

Table 6 Evaluations Of Insecticide Schedules For Controlling San Jose Scale On Apple [a]. N.Y.S.A.E.S. Hudson Valley Lab. Highland N.Y. - 2013.

Treatment / Formulation	Rate	Timing	% Damage Rating of SJS Infested Cluster Fruit (0-2) 0	1	2
1 Calypso	4.0 oz/A	P	98.3	1.3	0.5
Calypso	6.0 oz/A	PF-1C			
Movento	9.0 oz/A	PF			
+ Oil	1.%	PF			
Belt	5.0 oz/A	2-3C			
Lannate	3 pts./A	4, 6C			
Leverage 360	2.8 oz./A	5C			
2 Calypso	4.0 oz/A	P	97.5	0.5	2.0
Calypso	6.0 oz/A	PF-1C			
Movento	6.0 oz/A	PF, 2C			
+ Oil	1.%	PF, 2C			
Belt	5.0 oz/A	3-4C			
Leverage 360	2.8 oz./A	5C			
Lannate	3 pts./A	6C			
10 Untreated			26.8	39.8	33.5

[a] Evaluation made on July 2 on of 100 McIntosh fruit per treatment using a SJS rating in which 0 = clean, 1 = < 3 San Jose scale blackcaps; 2 = > 3 SJS blackcap San Jose scale.
Arithmetic means reported. All applications made using John Bean Airblast delivering 148.8 GPA at 200 psi. traveling at an average of 2.86 mph.

Table 6 Evaluations Of Insecticide Schedules For Controlling San Jose Scale On Apple [a]. N.Y.S.A.E.S. Hudson Valley Lab. Highland N.Y. - 2013.

				% Damage Rating of SJS Infested Cluster Fruit (0-2)		
	Treatment / Formulation	Rate	Timing	0	1	2
4	Centaur WDG	46 oz/A	DD	100.0	0.0	0.0
	+ Oil	1%	DD			
	Imidan 7	5.5 lbs/A	PF-1C, 5-6C			
	Calypso	6.0 oz/A	2C			
	Belt	5.0 oz/A	3-4C			
5	Lorsban 4E	64 oz/A	DD	91.7	4.2	4.2
	+ Oil	1%	DD			
	Imidan 70 WP	5.5 lbs/A	PF-6C			
	Actara	5.0 oz./A	2C			
6	Esteem	10.0 oz/A	DD	95.5	2.3	2.3
	+ Oil	1%	DD			
	Imidan 70 WP	5.5 lbs/A	PF-6C			
10	Untreated			26.8	39.8	33.5

[a] Evaluation made on July 2 on of 100 McIntosh fruit per treatment using a SJS rating in which 0 = clean, 1 = < 3 San Jose scale blackcaps; 2 = > 3 SJS blackcap San Jose scale.
Arithmetic means reported. All applications made using John Bean Airblast delivering 148.8 GPA at 200 psi. traveling at an average of 2.86 mph.

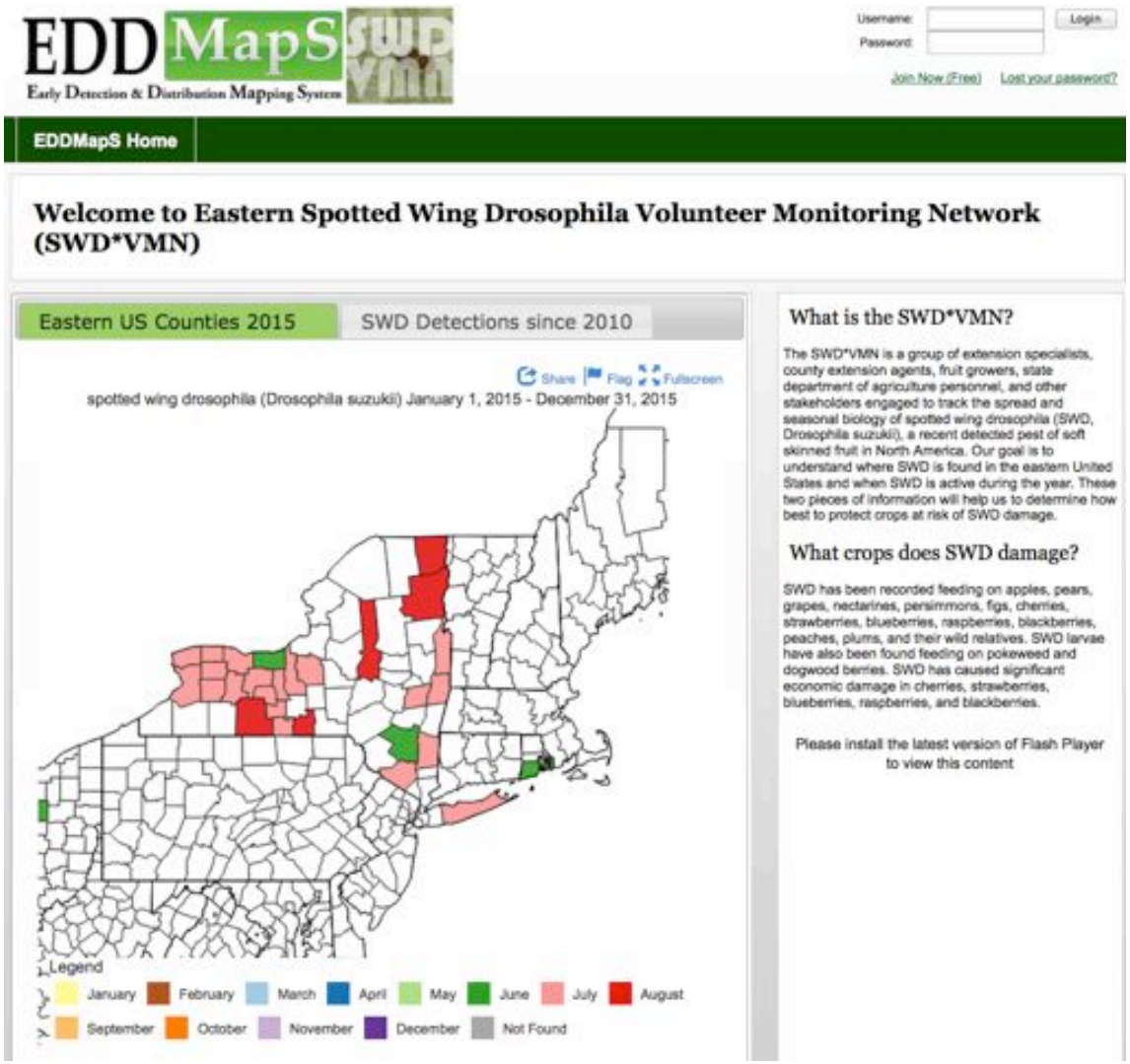
Use of Attract and Kill to Control Spotted Wing Drosophila (*Drosophila suzukii* Matsumura).

Peter Jentsch, Tim Lampasona, Mike Fraatz, ENY Hort Team: Dan Donahue

Cornell University
College of Agriculture and Life Sciences

Hudson Valley
Research Laboratory

SWD State-Wide Monitoring, 2015



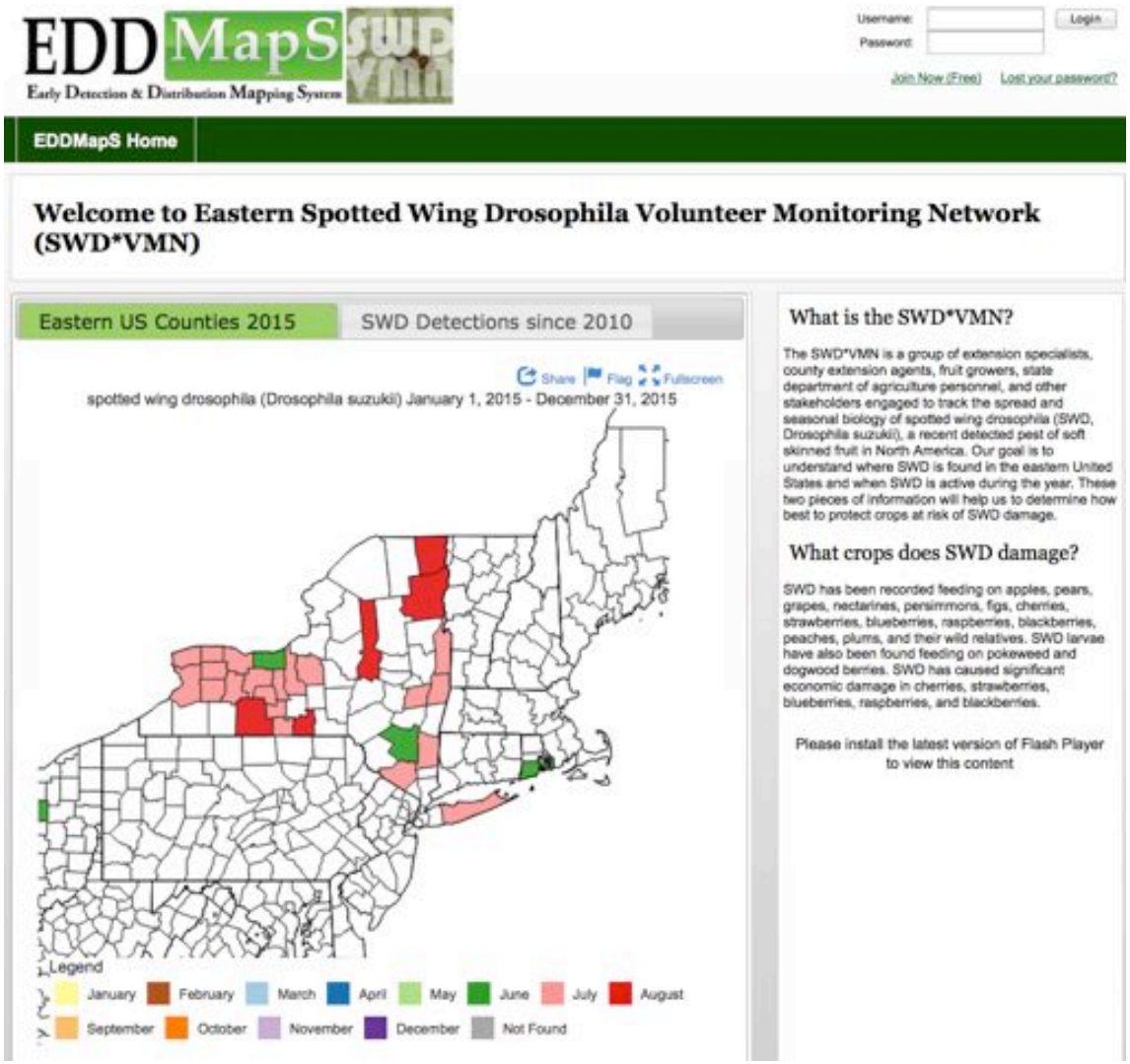
- First adult SWD captured
  Wayne County, 24 June
  Ulster County, 31 June

http://www.eddmaps.org/project/project.cfm?proj=9

Cornell University
College of Agriculture and Life Sciences

Hudson Valley Research Laboratory

SWD State-Wide Monitoring, 2015



http://www.eddmaps.org/project/project.cfm?proj=9

- First adult SWD captured
  Wayne County, 24 June
  Ulster County, 31 June

ENY Trap Sites: 15
HVRL & ENY Hort. Team

- Albany
- Central Washington
- Columbia
- Dutchess (3 sites)
- Orange
- Rensselaer (3 sites)
- Saratoga
- South Clinton
- Ulster (3 sites)

Cornell University
College of Agriculture and Life Sciences

Hudson Valley Research Laboratory

SWD Attract and Kill Stations

- 3.5” substrate woven polypropylene netting (PAK Unlimited, Cornelia, GA)
- Raspberry concentrate, cider vinegar, yeast, gelatin, Super Absorbent Polymer (SAP)
- 1% A.I. solution of insecticide active ingredient @ 2 mL/disk

2015

2016

- SWD Monitoring
- Weather Resistant

Cornell University
College of Agriculture and Life Sciences

Hudson Valley Research Laboratory

SWD Attract and Kill Stations

- 3.5” substrate woven polypropylene netting (PAK Unlimited, Cornelia, GA)
- Raspberry concentrate, cider vinegar, yeast, gelatin, Super Absorbent Polymer (SAP)
- 1% A.I. solution of insecticide active ingredient @ 2 mL/disk
- **Placed in succession:** honeysuckle, perimeter and rows of raspberry and blueberry
- W-pattern alternating at 3’ intervals at 18” and 36” within row canopy

2015

2016

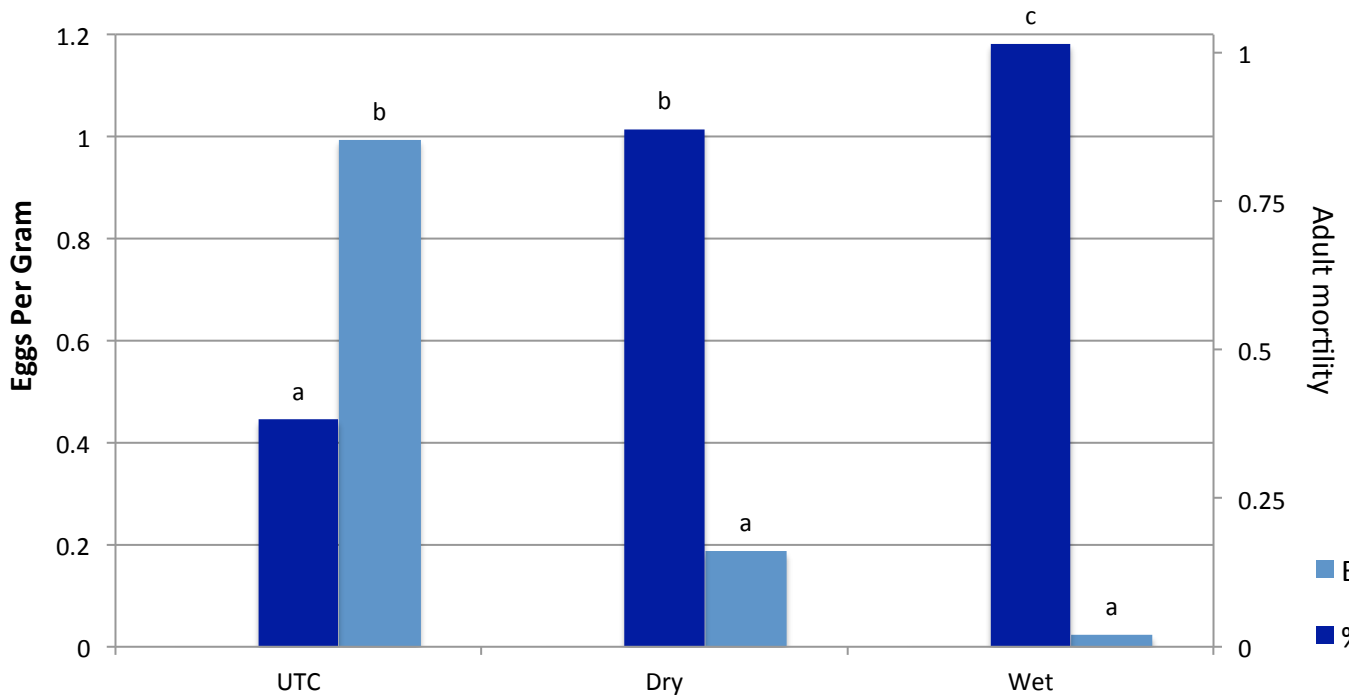
- SWD Monitoring
- Weather Resistant

Cornell University
College of Agriculture and Life Sciences

Hudson Valley Research Laboratory

ATK Insecticide Screening Studies: Entrust

- ATK disc with A.I.+ solution (RRC/ACV + yeast)
- Placed into cage with 25 adult SWD within 24h (wet) or after 30d (dry)
- Maintains high attractiveness and ovipositional deterrence



Cornell University
College of Agriculture and Life Sciences

Hudson Valley Research Laboratory

SWD Attract and Kill Management 2015

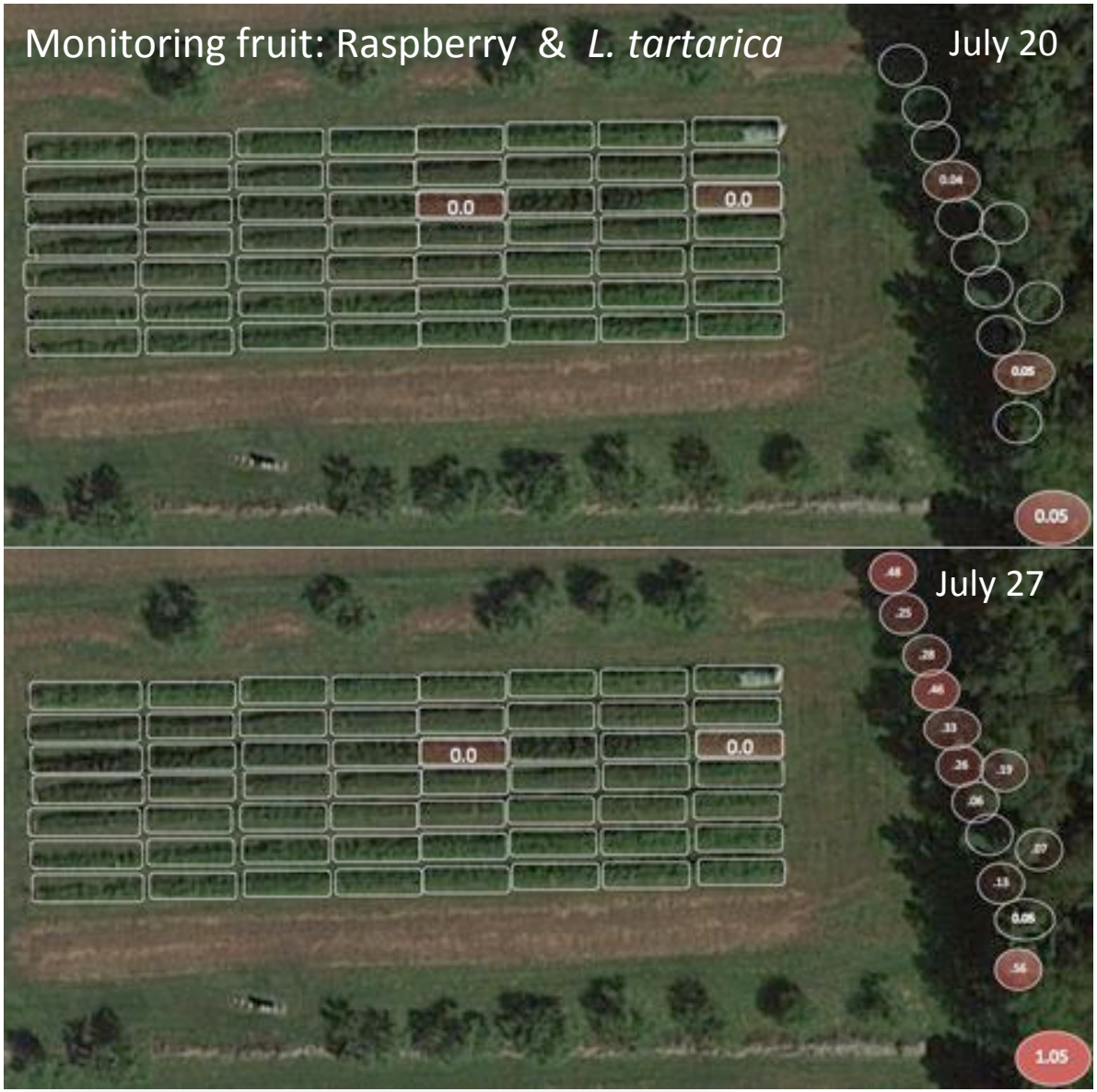
Manage SWD in both landscape and agricultural crops

- Honeysuckle is a primary host for SWD; *L. tartarica* fruit favored over raspberry in June-August.

Cornell University
College of Agriculture and Life Sciences

Hudson Valley Research Laboratory

SWD Attract and Kill Management 2015



WestWind Farm

- Honeysuckle is a primary host for SWD; *L. tartarica* fruit favored over raspberry in June-August
- First SWD eggs found in *L. tartarica* on 20 July
- SWD populations build over several weeks prior to migration to commercial fruit.

Cornell University
College of Agriculture and Life Sciences

Hudson Valley Research Laboratory

SWD Attract and Kill Management 2015

WestWind Farm

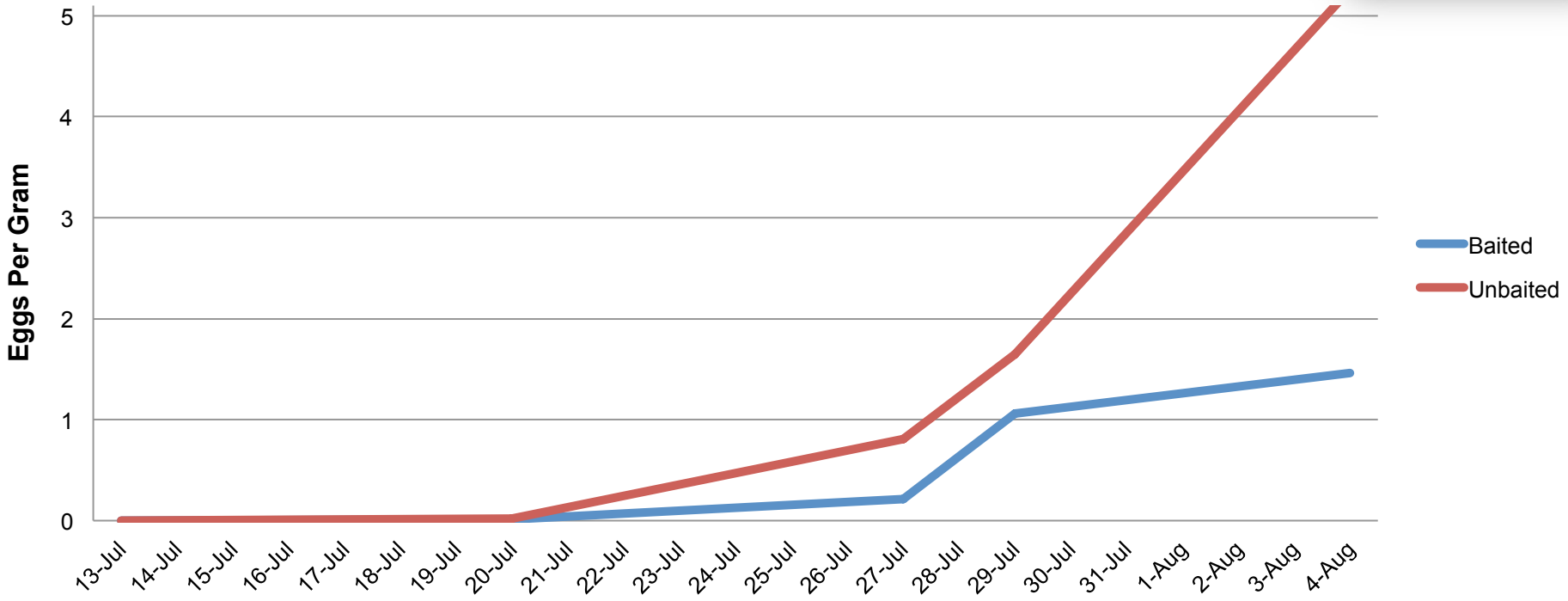
- Honeysuckle is a primary host for SWD; *L. tartarica* fruit favored over raspberry in June-August
- First SWD eggs found in *L. tartarica* on 20 July
- SWD populations build over several weeks prior to migration to commercial fruit.
- First SWD eggs found in raspberry on 4 August.
- Raspberry collections taken through to the end of season.

Cornell University
College of Agriculture and Life Sciences

Hudson Valley Research Laboratory

Assessment of ATK Stations in *L. tatarica*

Goal: To reduce SWD populations prior to migration into raspberry fields

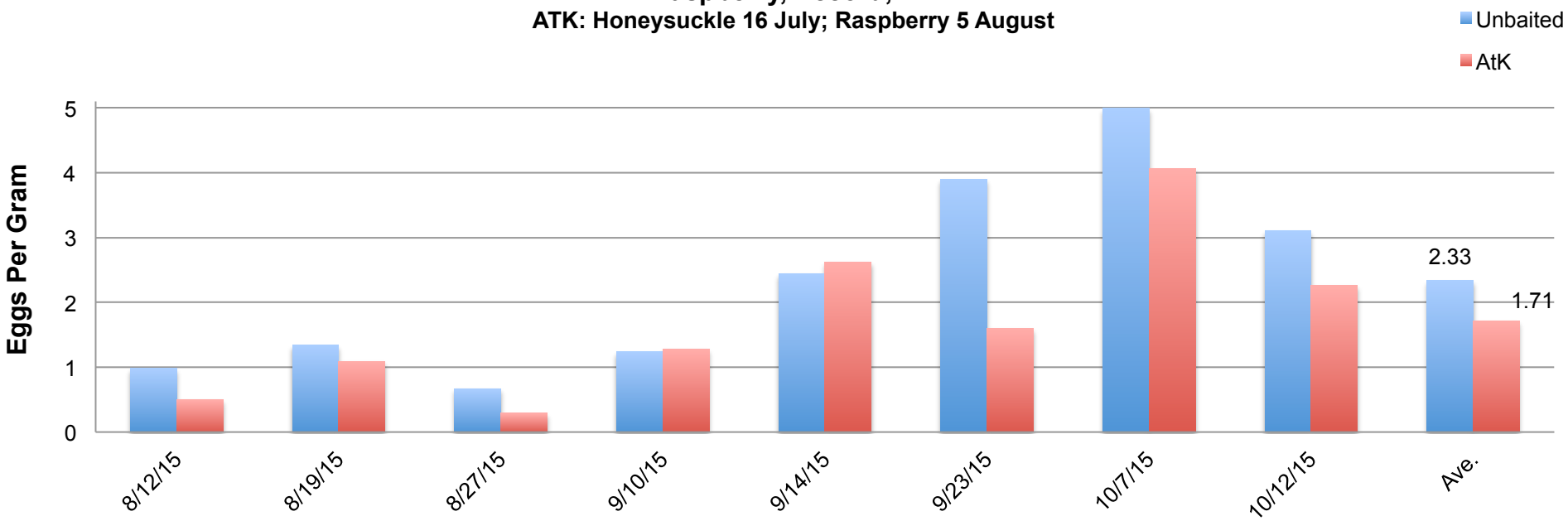


Cornell University
College of Agriculture and Life Sciences

Hudson Valley Research Laboratory

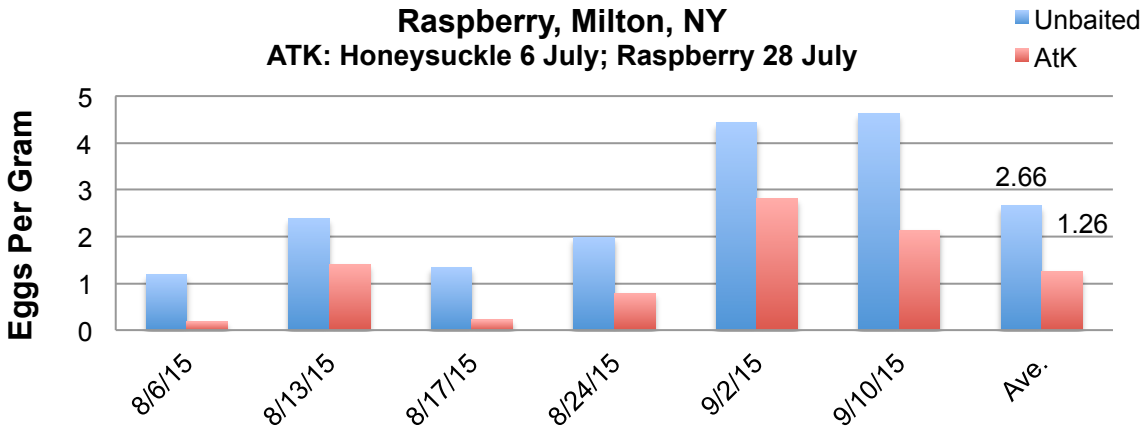
Raspberry, Accord, NY

ATK: Honeysuckle 16 July; Raspberry 5 August

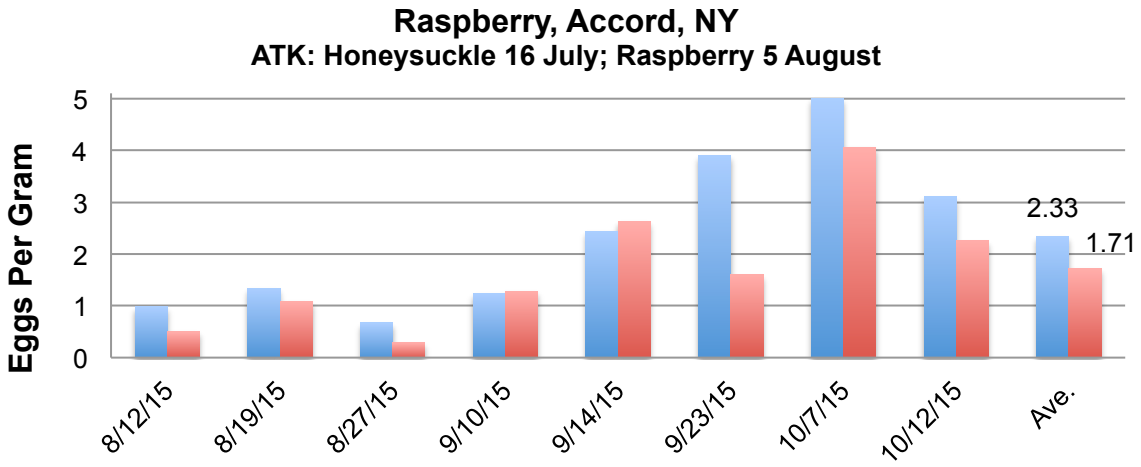


Cornell University
College of Agriculture and Life Sciences

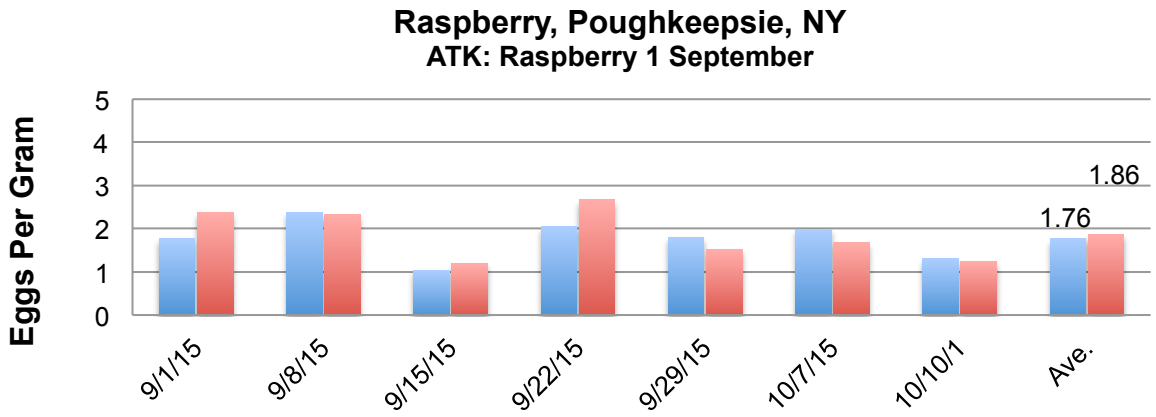
Hudson Valley Research Laboratory



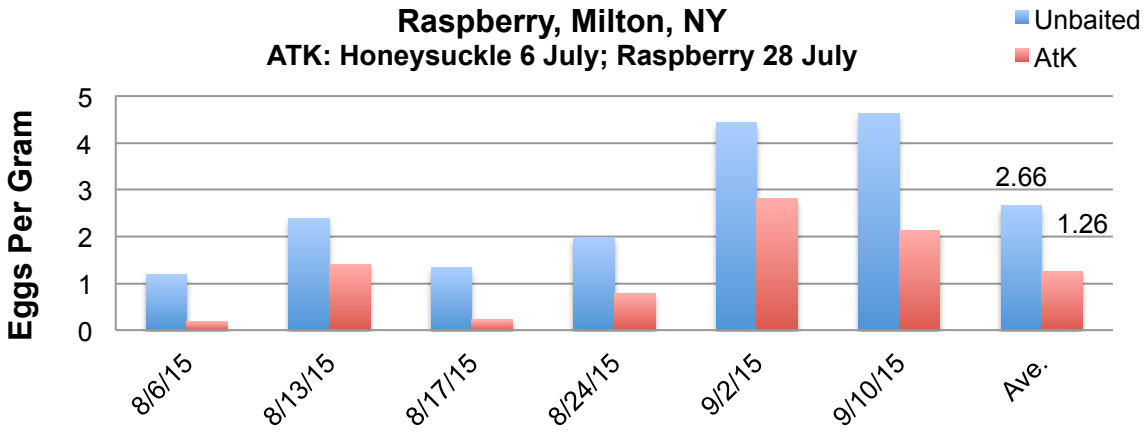
ATK Placement: Early (SWD Adults)
44.0% reduction in eggs/gram fruit

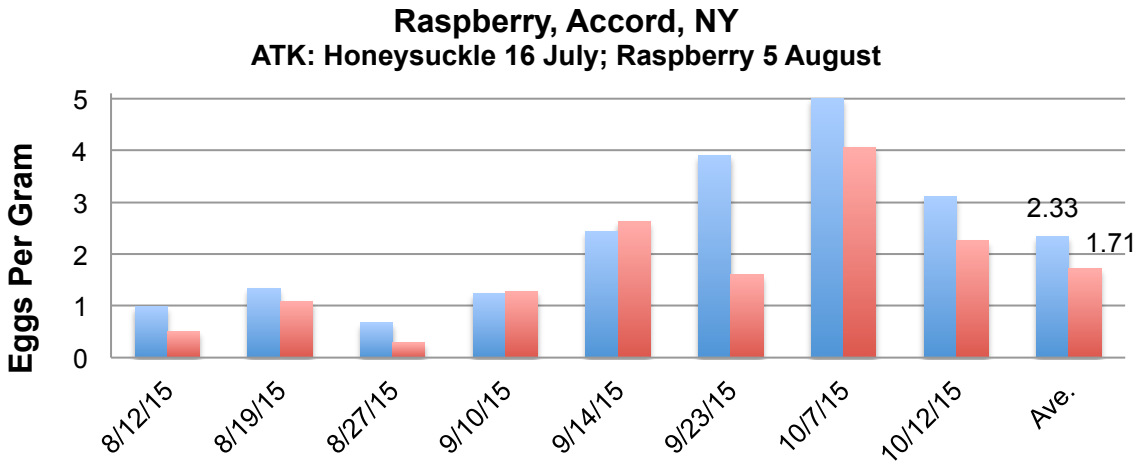


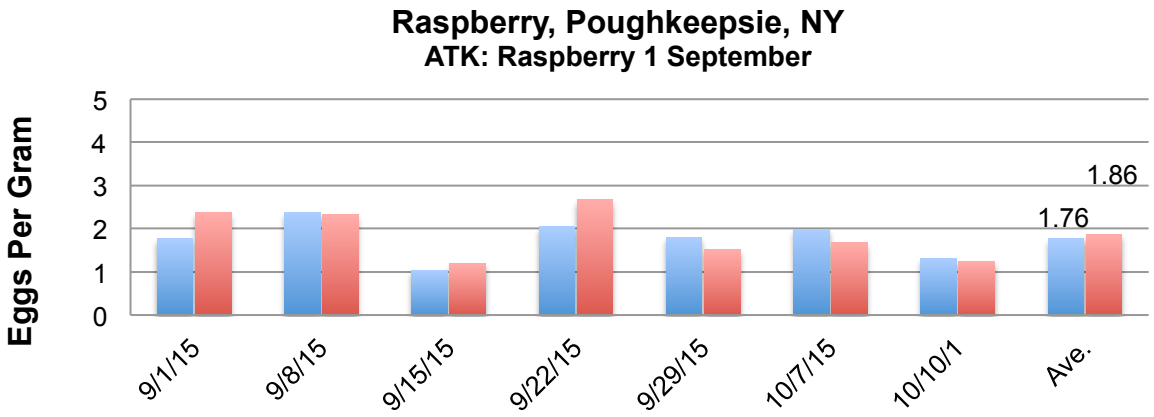
ATK Placement: Mid
26.6.0% reduction

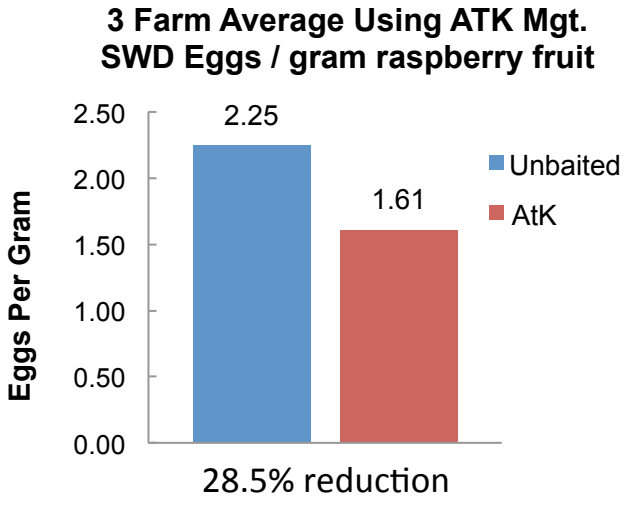


ATK Placement: Late
5.4% increase


Raspberry, Milton, NY
ATK: Honeysuckle 6 July; Raspberry 28 July
Unbaited
AtK
Eggs Per Gram
5
4
3
2
1
0
2.66
1.26
8/6/15
8/13/15
8/17/15
8/24/15
9/2/15
9/10/15
Ave.


Raspberry, Accord, NY
ATK: Honeysuckle 16 July; Raspberry 5 August
Eggs Per Gram
5
4
3
2
1
0
2.33
1.71
8/12/15
8/19/15
8/27/15
9/10/15
9/14/15
9/23/15
10/7/15
10/12/15
Ave.


Raspberry, Poughkeepsie, NY
ATK: Raspberry 1 September
Eggs Per Gram
5
4
3
2
1
0
1.86
1.76
9/1/15
9/8/15
9/15/15
9/22/15
9/29/15
10/7/15
10/10/1
Ave.


3 Farm Average Using ATK Mgt.
SWD Eggs / gram raspberry fruit
Eggs Per Gram
2.50
2.00
1.50
1.00
0.50
0.00
2.25
1.61
Unbaited
AtK
28.5% reduction

Horticultural, Disease and Insect Complex Causing Severe Late Season Tall Spindle Tree Collapse in NYS Orchard Systems

Peter Jentsch
Senior Extension Associate – Entomology

Cornell University
College of Agriculture and Life Sciences

Hudson Valley Research Laboratory

Tall Spindle Tree Decline on M.9

- **In 2015, four commercial orchards were surveyed showing severe tree decline in the Hudson Valley**

Counties: Orange, Ulster & Columbia (totaling 700 trees)

Varieties: Pink Lady, Fuji, Zestar, Ginger Gold, Empire

Systems: High Density Tall Spindle on M.9. (Pajam, Nic29, 337)

Tall Spindle Tree Decline on M.9

4 Orchard survey symptoms included:

- **(4) Tree yellowing, decline and death**
- **(3) Black Stem Borer, (BSB) *Xylosandrus germanus* boring**
- **(3) Dogwood Borer, (DWB) Synanthedon scitula presence**
- **(3) Trunk / Rootstock cambian / bark separation**
- **(1) Cankering on North face of trunk (Herbicide interaction?)**
- **(1) Slug feeding on roots**

Tall Spindle Tree Decline on M.9

Orchard I*: Pink Lady on M.9/Nic 29 rootstock in 2nd leaf
Highland, NY: 22nd of May 2015

- Decline in 15% of trees with < 1% dead; **terminal dieback**
- Purchased from Willow Drive Nursary, WA in 2014
- Evidence of Black Stem Borer, *Xylosandrus germanus* (Frass)
- No exposure to standing or excessive water (ETOH)
- 2014-15 season without irrigation on gravel loam.
- 300 yards from wooded edge

*(John Whiteman-CPS, Highland)

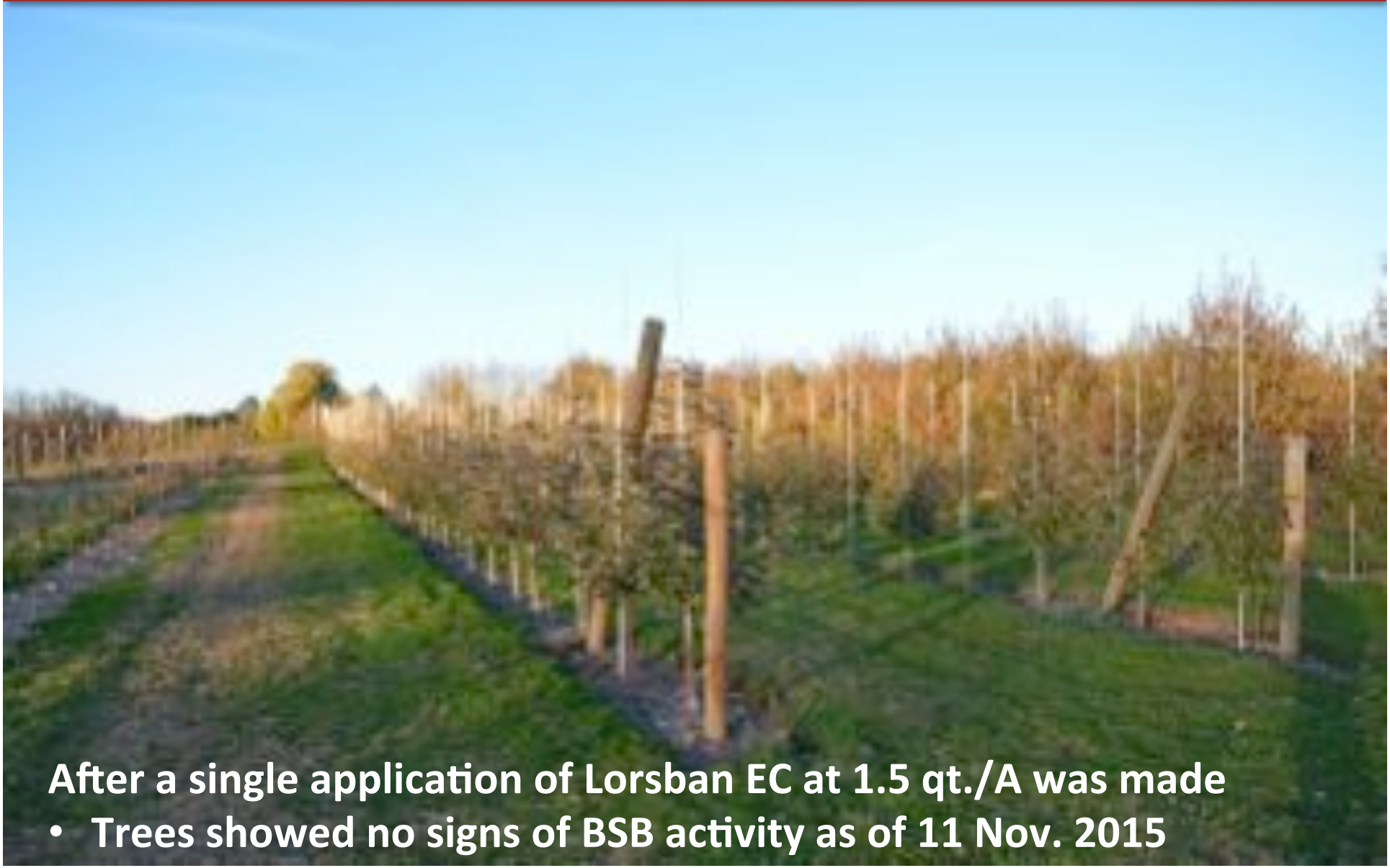
Cornell University
College of Agriculture and Life Sciences

Hudson Valley Research Laboratory

Tall Spindle Tree Decline on M.9

Tall Spindle Tree Decline on M.9

Tall Spindle Tree Decline on M.9



After a single application of Lorsban EC at 1.5 qt./A was made

- **Trees showed no signs of BSB activity as of 11 Nov. 2015**

Tall Spindle Tree Decline on M.9

II. Marlboro, NY: October 14, 2015.

Varieties: Fuji on M.9 (500 Tree Block, 4 rows, 5’ x 14’, single wire)

Symptoms included:

- Yellowing foliage, decline and death
- Black Stem Borer, (BSB) *Xylosandrus germanus* frass, gallaries
- Dogwood Borer, (DWB) *Synanthedon scitula* larva
- Trunk / Rootstock cambian / bark separation
- Cankering on North face of trunk (Herbicide interaction?)

Tall Spindle Tree Decline on M.9

Injured

- Foliage Yellowing (September), browning tree death
- Dogwood Borer
- Black Stem Borer
- Cankering
- Bark separation and cambium decline and death


Dead
Browning Foliage
Yellowing Foliage

Tall Spindle Tree Decline on M.9

Injured

- Yellowing
- Dogwood Borer (burr knot, bark scales & cambian feeding)
- Black Stem Borer
- Cankering

Injured

- Yellowing
- Dogwood Borer
- Black Stem Borer
- Cankering

Tall Spindle Tree Decline on M.9: Fuji

DWB Bark Scale Feeding

- **Cambian and wood**
- **Above and below graft union**
- **Larva over winter in webbed frass**

Dogwood Borer

Tall Spindle Tree Decline on M.9: Fuji

<u>Injury</u>

- Bark separation and cambium decline and death

Tall Spindle Tree Decline on M.9: Fuji

Injury

- Yellowing
- Dogwood Borer
- Black Stem Borer
- Cankering

Gallary sites


Black Stem Borer
Frass
Dogwood Borer
Frass

Tall Spindle Tree Decline on M.9: Fuji

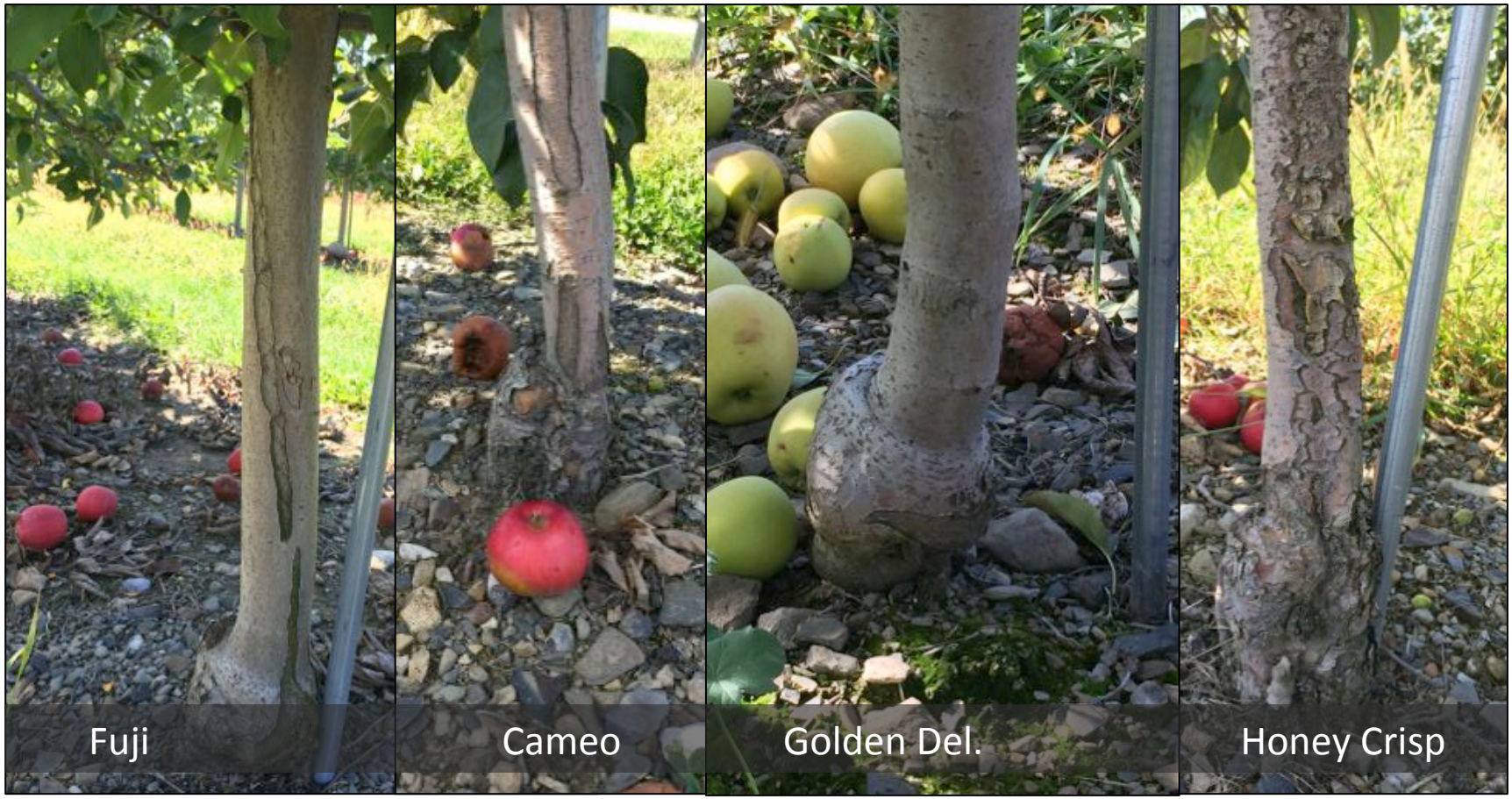
Tall Spindle Tree Decline on M.9: Fuji

Cankering - bark separation

Tall Spindle Tree Decline on M.9

Healthy Trees: Growth Habit of Variety

- Bark Splitting
- Bark Flaking
- Sound rootstock



Fuji M.9 Collapse

Tree Yellowing Associated to Dogwood and Black Stem Borer

No yellowing	% Yellowing	% Slight Yellowing	% Extreme Yellowing	% DWB	% BSB
41.8	58.2	46.7	11.5	52.0	26.0

Percentage of Trees in % Damage Rating Categories (DWB, BSB and or Dead Bark)

0 injury	0-60	61-80	81-90	100
9.0%	41.8%	8.2%	4.9%	30.3%
		43.4%		

Percent of trees with visible canker

% Cankers	73.6
% Without Cankers	26.4

Canker Observations

Canker Location	# Trees	% Canker by Location
In Row	72	59.5
Out Row	17	14.0
None	32	26.4
Total Trees Assessed	121	

Tall Spindle Tree Decline on M.9

Lorsban / Chlorpyrifos (all formulations)

EPA issued a proposed revocation of Chlorpyrifos on Oct. 31, 2015, notifying the 9th Circuit Court of a final rule in **December 2016.**

(Chlorpyrifos levels found in drinking water, petition submitted by the Natural Resources Defense Council (NRDC) and Pesticide Action Network North America (PANNA)

Loss of Chlorpyrifos to the tree fruit industry. Pre-bloom mgt. of

- Dogwood Borer
- Black Stem Borer
- San Jose Scale
- Obliquebanded leafroller & green fruitworm complex

Tall Spindle Tree Decline on M.9

Lorsban treatment: Inexpensive

Estimated costs of applying chlorpyrifos (Lorsban 4E) based on a plant density of 800 trees per acre

- $12 per hour for labor
- $30 per gallon for Lorsban 4E
- 1.5 Qts./A; $25 per acre

Alternatives to Lorsban:

Replacement Insecticides

- Assail 30SG, Delegate, Belt and Rynaxypyr WG options for DWB Mgt.

- Presently Assail 30SG is labeled in NY.

Tall Spindle Tree Decline on M.9

Alternatives to Lorsban:
Mating disruption in blocks of 5 acres or more using Isomate (CBC (America) Corp.)

Treatment with Isomate-DWB dispensers

- 150 per acre the first season
- 100 per acre thereafter
- Labor $63.60 per acre for the first season
  $42.40 per acre in subsequent seasons.

- No special equipment is needed
- Improved worker safety? (A. Agnello)

Cornell University
College of Agriculture and Life Sciences

Hudson Valley Research Laboratory

Tall Spindle Tree Decline on M.9

Future Research: Management without Lorsban

Mating Disruption (MD) DWB

- Application on (3) 5 acre blocks
- Assess overwintering DWB population
- Monitor DWB adult trap shutdown in MD blocks
  - In non-MD blocks

Efficacy Screening: On farm and HVRL plot evaluation for DWB mgt:
Trunk applications: Assail 30SG, Delegate, Belt and Rynaxypyr WG

Whole tree applications:
Dilute applications: Lorsban, Imidan, 'Trap Crop' of ETOH soaked wood

Monitoring Zaprionus indianus Gupta in NY's Hudson Valley

Peter Jentsch, Tim Lampasona, Mike Fraatz, ENY Hort Team: Dan Donahue

Cornell University
College of Agriculture and Life Sciences

Hudson Valley
Research Laboratory

African Fig Fly, *Zaprionus indianus* Gupta

- **Introduction:** The fig fruit fly is native to tropical Africa, but has been found in South America, including Brazil in 1999 (Vilela 1999).

- Central Florida on 26 July, 2005, Virginia and Mississippi in 2012.

- *Zaprionus indianus* Gupta were found in Milton, NY on 4 September, 2012 from apple cider / yeast baited traps . Yearly trap captures are low. Presently not a threat to NY wine grape or small fruit.

African Fig Fly, *Zaprionus indianus* Gupta

- **Description:** A striking pair of white stripes from the antennae, dorsally along distinctive red eyes to the end of the thorax with two black lines bordering each white stripe.

- The body is yellow in color approximately 3.5 mm in length

- Survive an average of 82 (male) to 93 (female) days, with offspring averaging 58 per female (Setta and Carrereto 2005).

- Development time is approximately 19 days from egg to adult.

- The African fig fruit fly are capable of producing numerous generations in a season.

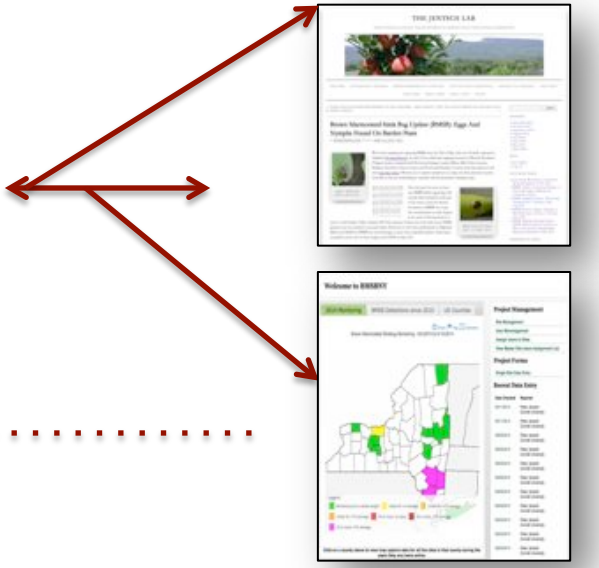
African Fig Fly, *Zaprionus indianus* Gupta

- **Monitoring: SWD Bait + ACV Traps**
- **Damage: Predominately to citrus and grape**
- **No AFF in 2013; 3 adults in 2014 & 2015 in the Hudson Valley**
- **Reports from Rutgers, NJ of wine grape injury independent of SWD injury.**

SUMMARY

- Insecticides are the primary method of control for SWD
- Multiple factors go into choosing insecticide to use
- Rainfastness is serious challenge to residual activity & spray intervals
- Sugar increases efficacy of some insecticides

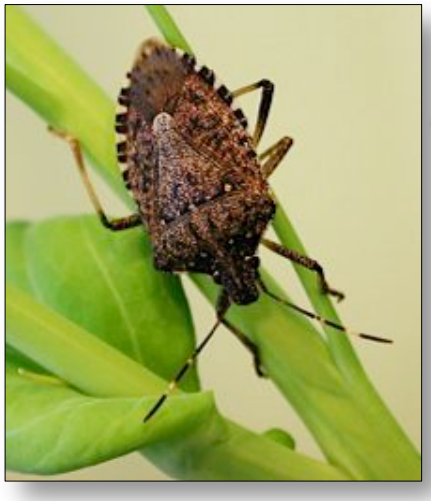
Developing Pest Thresholds for Managing the Invasive Brown Marmorated Stink Bug, *Halyomorpha halys* (Stål): (Pentatomidae) In NY Tree Fruit.



Developing Pest Thresholds for Managing the Invasive Brown Marmorated Stink Bug, *Halyomorpha halys* (Stål): (Pentatomidae) In NY Tree Fruit.

- Conduct State-wide Trap Monitoring of BMSB in NY

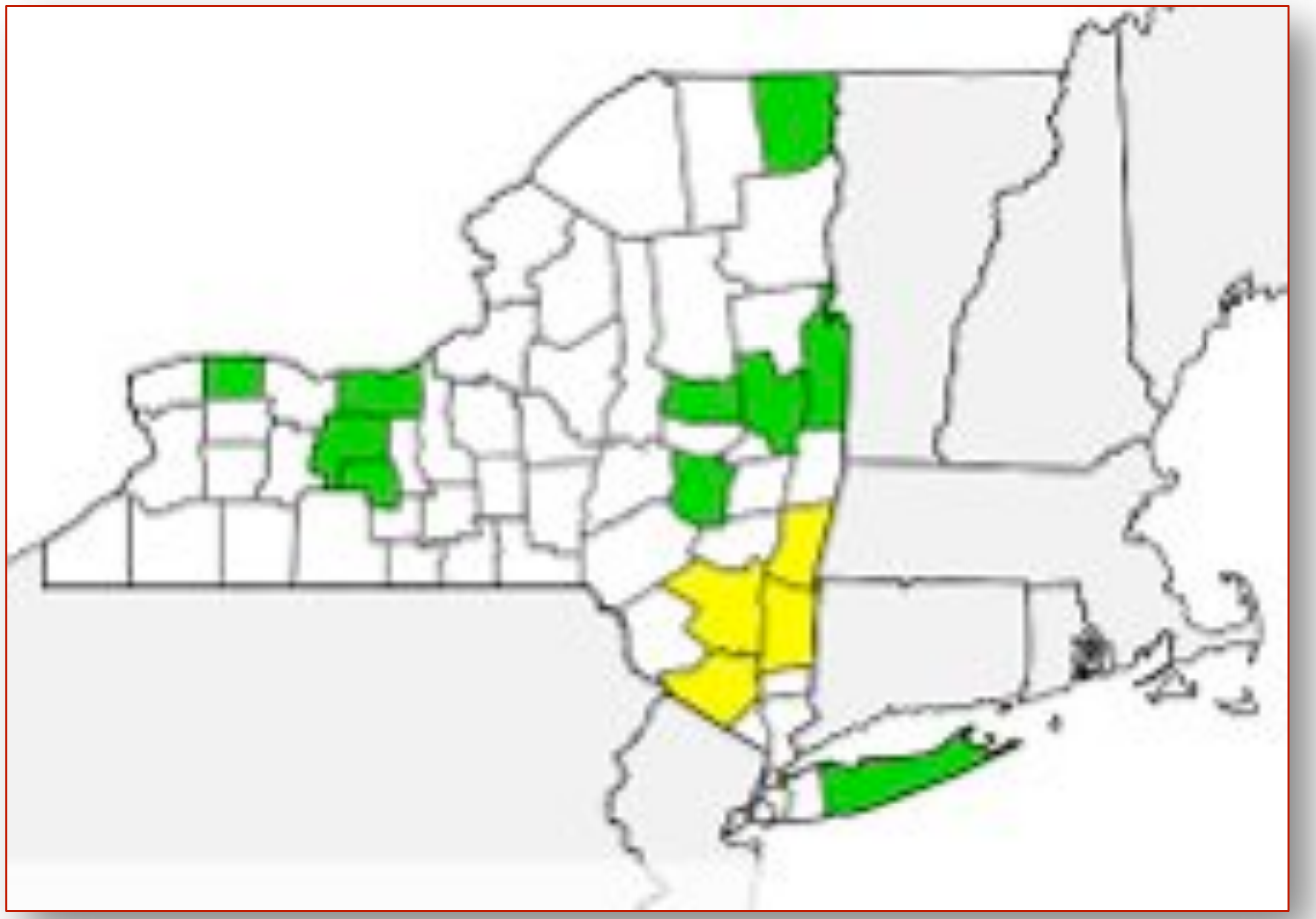
- **12 Cooperators**
  - **CCE Suffolk County**
  - **NYSAES**
  - **WNY Fruit Team**
  - **ENY Hort. Team**
  - **HVRL Staff**



- **40 Traps**
- **20 Farms**
- **14 Counties**

Developing Pest Thresholds for Managing the Invasive Brown Marmorated Stink Bug, *Halyomorpha halys* (Stål): (Pentatomidae) In NY Tree Fruit.

- Conduct State-wide Trap Monitoring of BMSB in NY

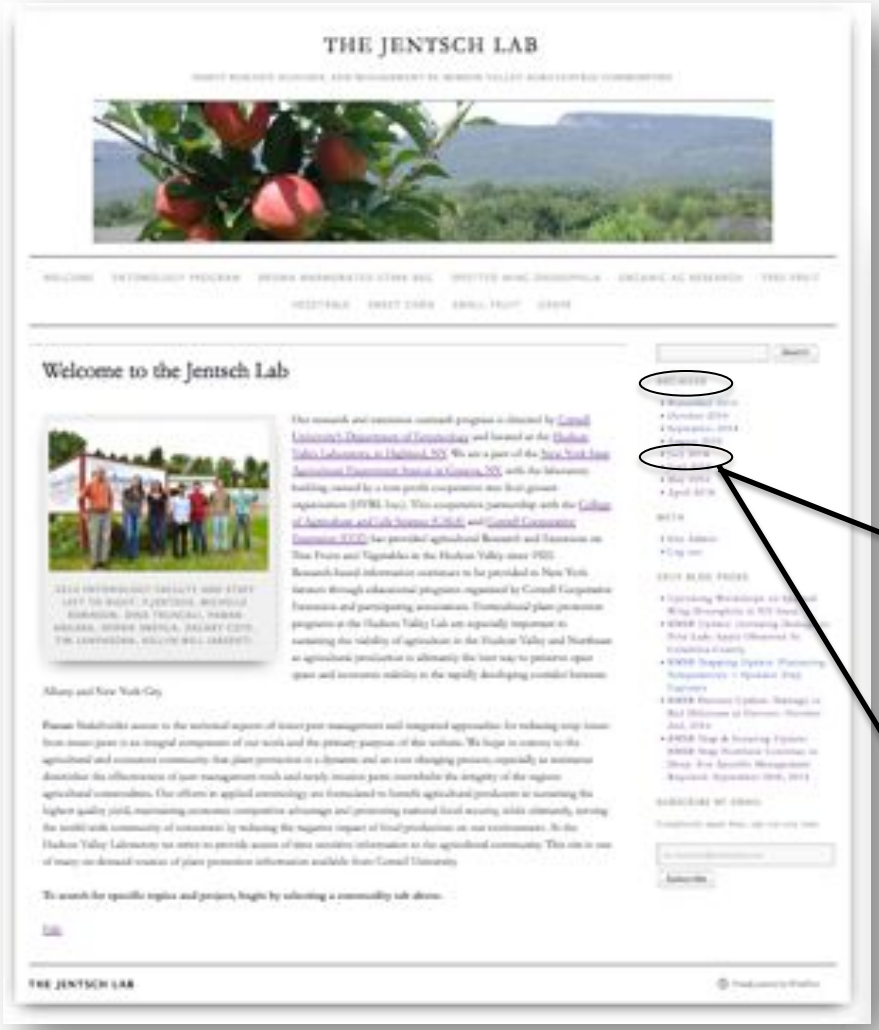


BMSB Management Threshold: Communication

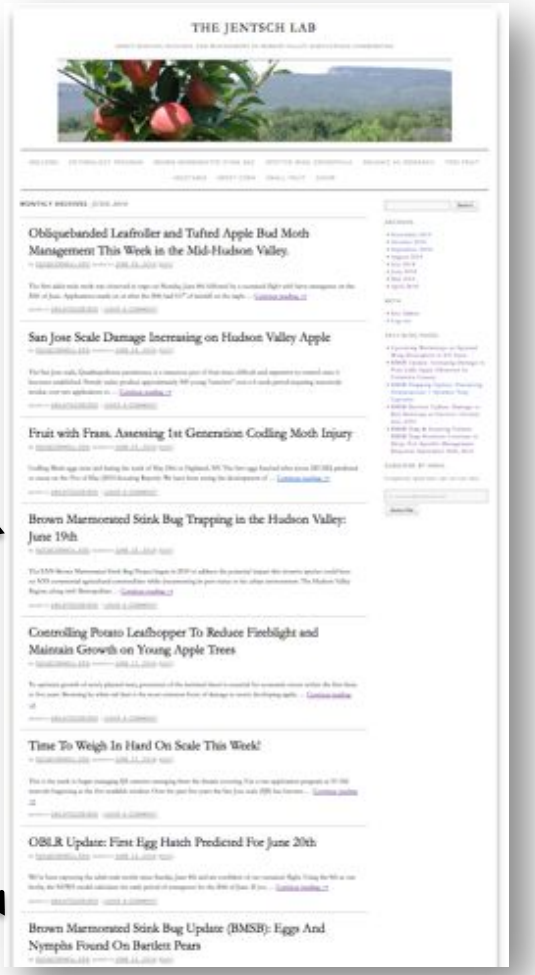
- **Employed a 10 Adult / Trap Threshold**
- **Subscribed growers to receive email Internet based link for BMSB mgt. recommendations weekly**
- **Worked with CCE to broaden outreach to apple and vegetable growers with threshold recommendations**
- **Data was entered into a NYS map to disseminate BMSB data using county-wide thresholds**
- **Recommendations for boarder row applications and alternate row**

BMSB Management Threshold: Communication (Blog)

Jentsch Lab Site: Developed 2014



Insect Alerts & Recommendations



BMSB Management Threshold: Communication

Brown Marmorated Stink Bug: August 15th Update

by PJJ5@CORNELL.EDU posted on AUGUST 16, 2014

Brown Marmorated Stink Bug (BMSB) numbers last week show continued increase of late instar nymph movement to pheromone baited Tedders traps. The late start to the season may have pushed forward the emergence of the

BMSB Update: August 20. Confirmed Late Season Feeding to Apple, Peach and Pepper

by PJJ5@CORNELL.EDU posted on AUGUST 20, 2014

Extensive damage from BMSB Observed On Peach in Highland, NY: August 25th

by PJJ5@CORNELL.EDU posted on AUGUST 25, 2014

Thank You

Technical staff and assistants