

A photograph of an orchard with rows of flowering trees under a blue sky with clouds. The trees are in full bloom with white flowers. The ground is covered in green grass and small yellow flowers. The sky is bright blue with scattered white clouds.

# Managing Pests While Extending the Life of Our Tools

Peter McGhee

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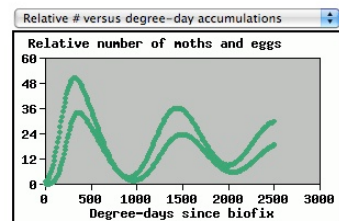
# Building an IPM Program



- More than what goes into a tank
- Focus on entire orchard operation
  - Common characteristics of orchards with good IPM programs
  - Common characteristics of orchards struggling to implement IPM

✓ Strategic Planning is the basis for a good IPM program

- Information intensive decision making



# Basic Tenets of IPM



- Use all tools available to you
  - Insecticide choice and timing (+ MD)
    - Monitoring densities and life-stages
      - Traps, DD Models, Visual inspections
      - Economic threshold = Risk threshold
  - Cultural control, farm practices
    - Pruning, thinning, sprayer technology
  - Resistance Management
- Impact on orchard ecology
- Worker safety
- Consumer demands

# Cultural Practices Influence IPM

*spray deposition more variable as canopy density increases*

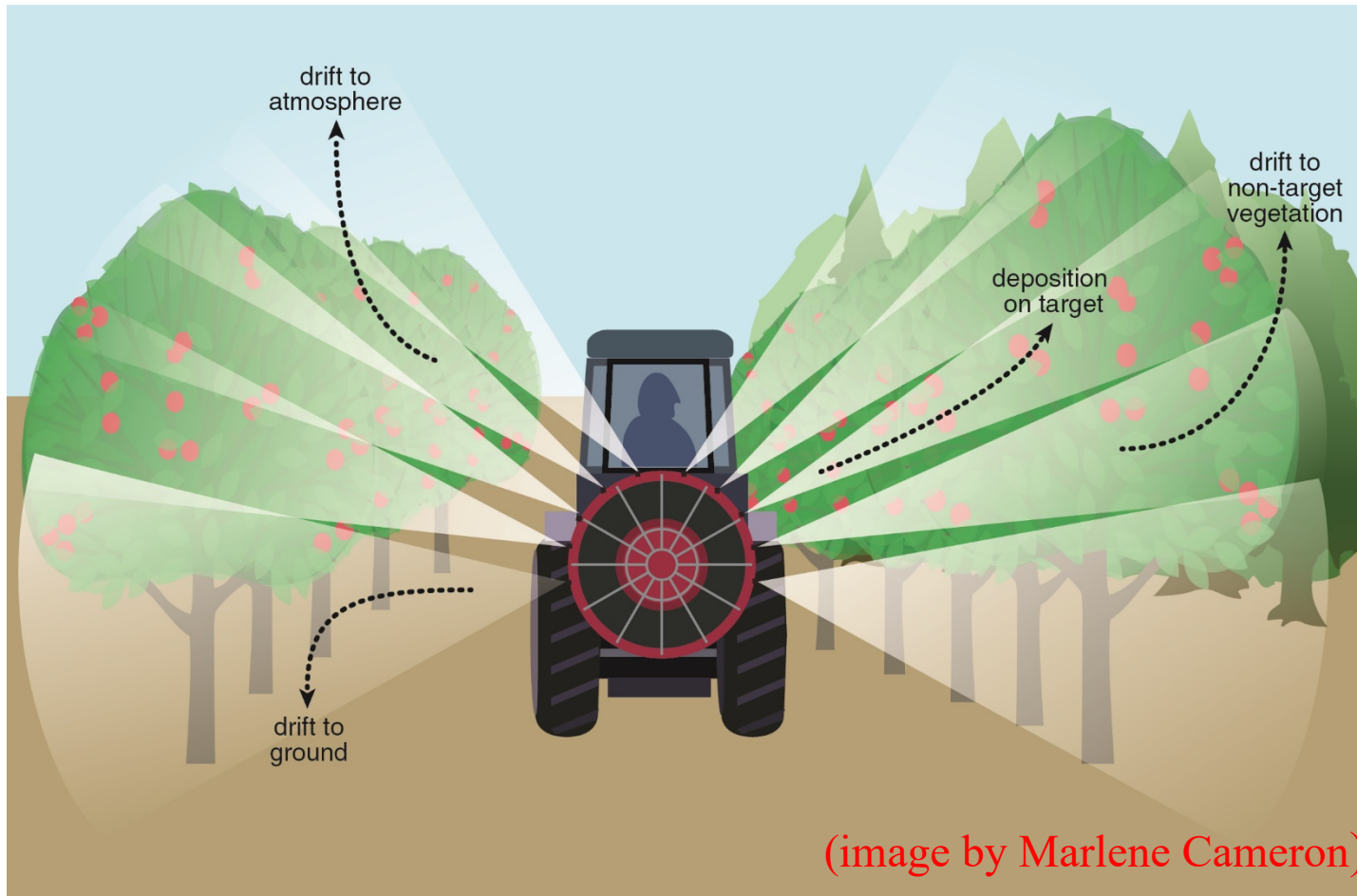


Very few reports of  
control failures



“Guthion doesn’t work  
as well as it used to!”  
Mike Doerr

# Fate of pesticides applied with ground sprayers



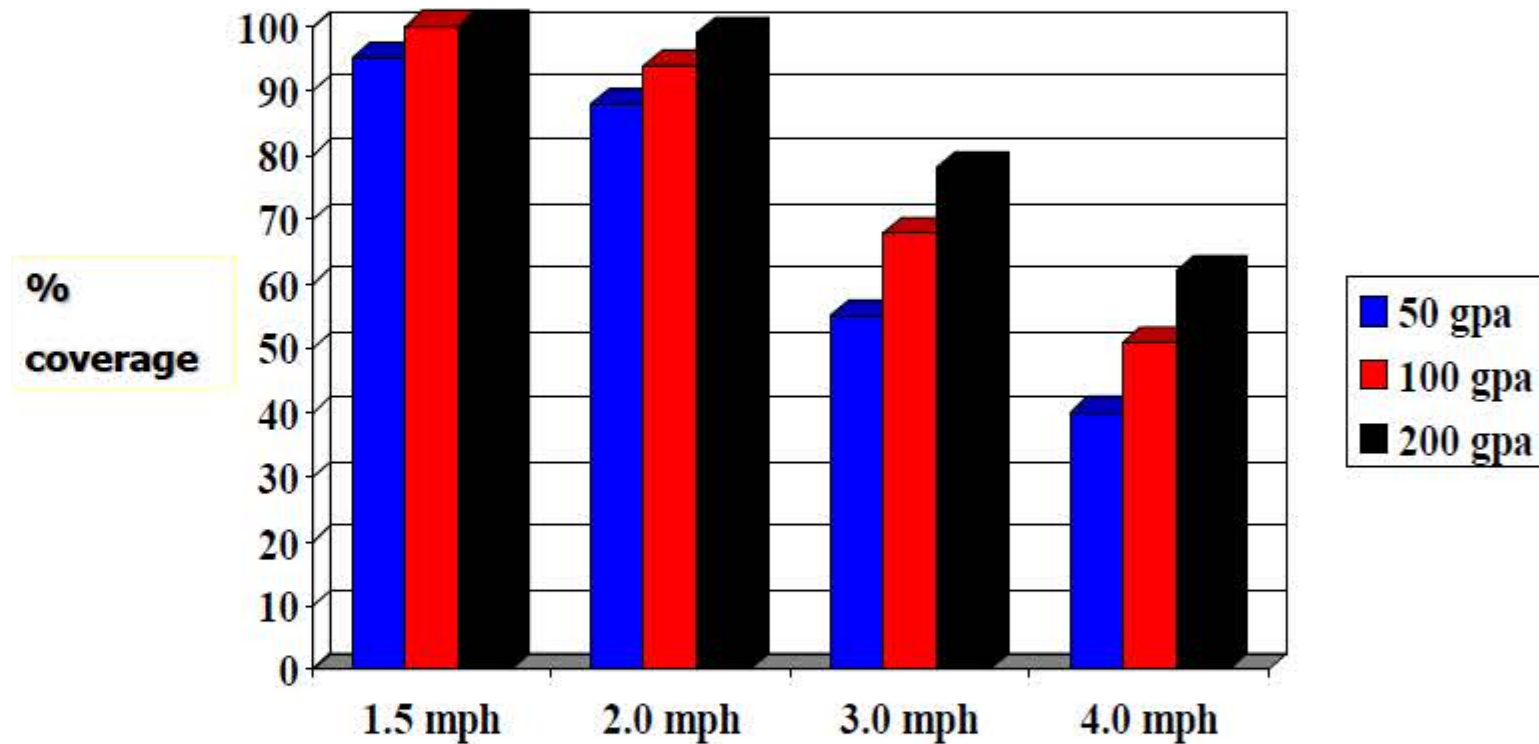
**Airblast** sprayers result in only 29 to 56% of solution being deposited **on the tree** canopy, and the remaining product drifting to ground or other off-target end points (Steiner 1969).

Coverage is Critical for Residual Control

difficult to eliminate a CM infestation



# Effect of Speed & GPA on Coverage



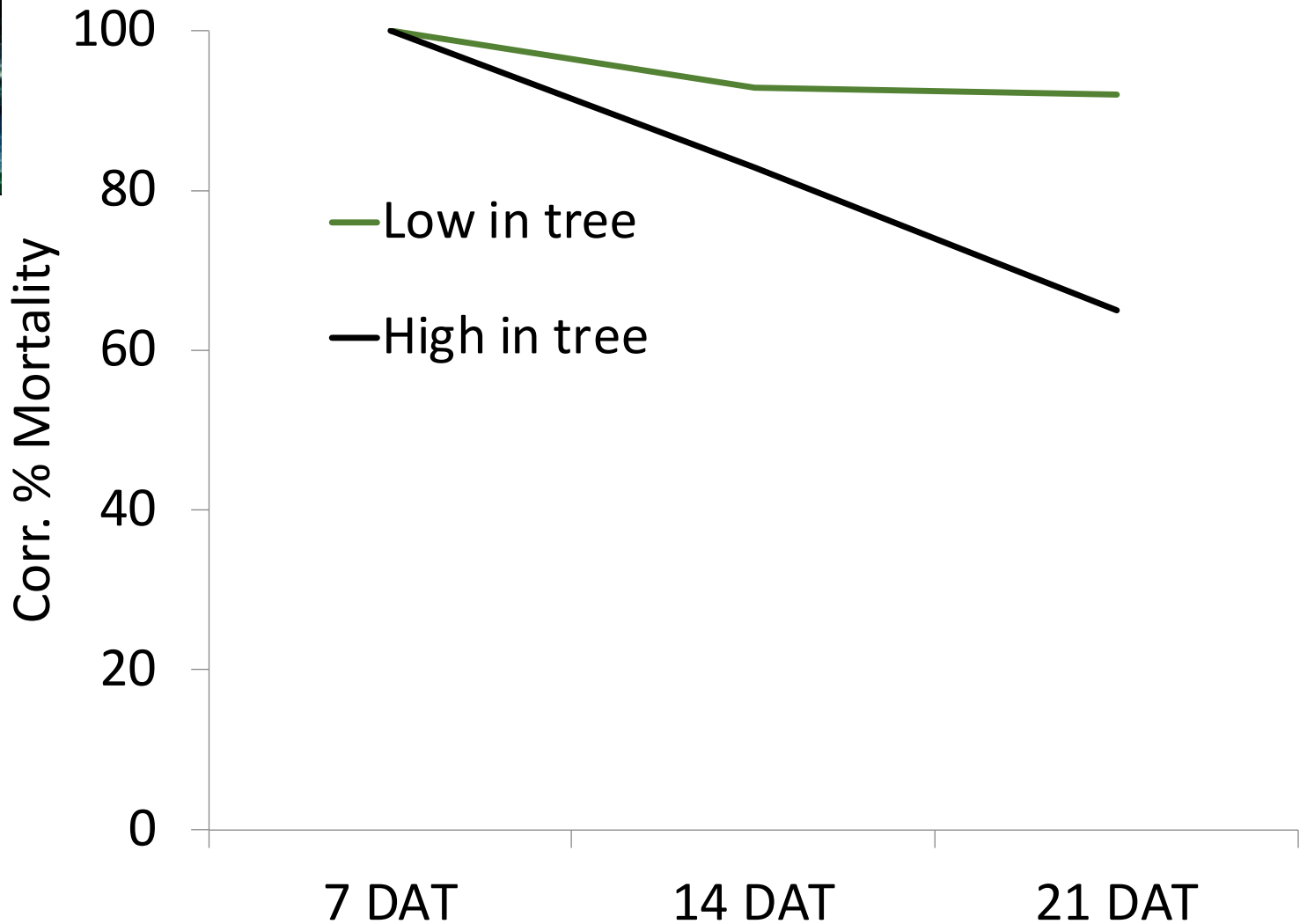
CSU Fresno 6/20/1996 Flame Seedless 42" T-Trellis Airblast Sprayer w/water sensitive paper randomly placed throughout the canopy.

# Effect of coverage on residual control



Success on  
OBLR

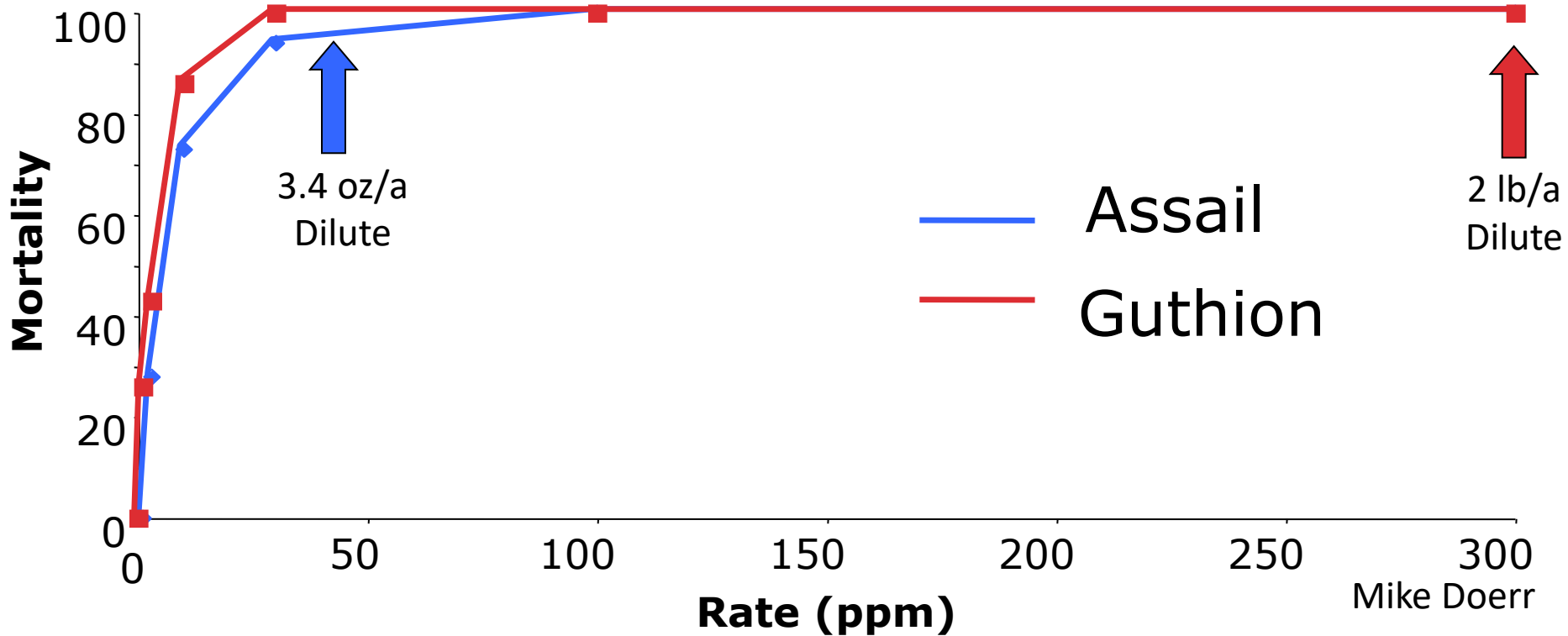
Leaves from  
different parts  
of tree





# New Chemistries

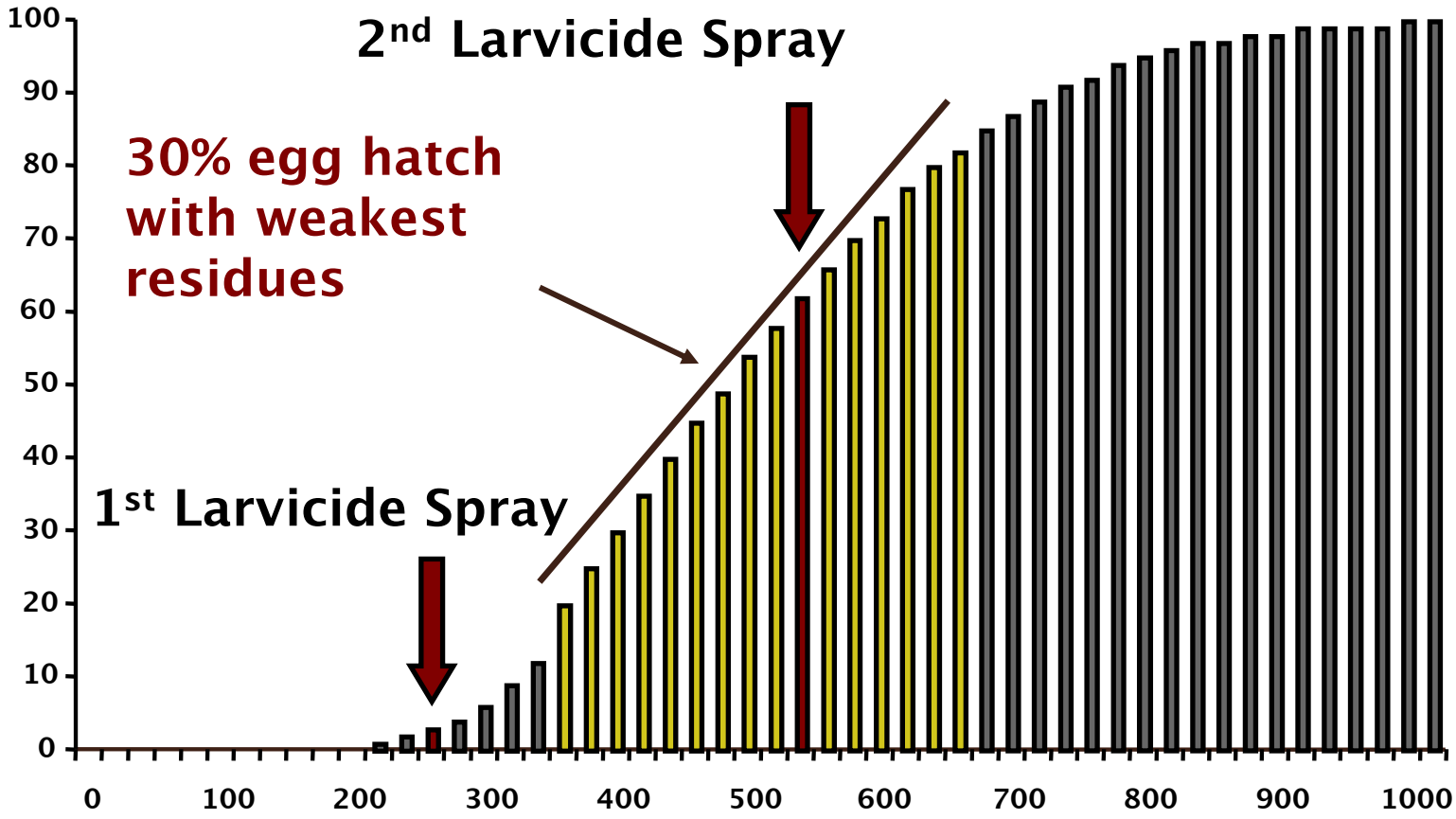
*Little margin for rate or application errors*



# Traditional Larvicide Applications

Percent Egg Hatch (1<sup>st</sup> Generation)

21-day  
retreatment  
interval  
covers  
entire  
generation



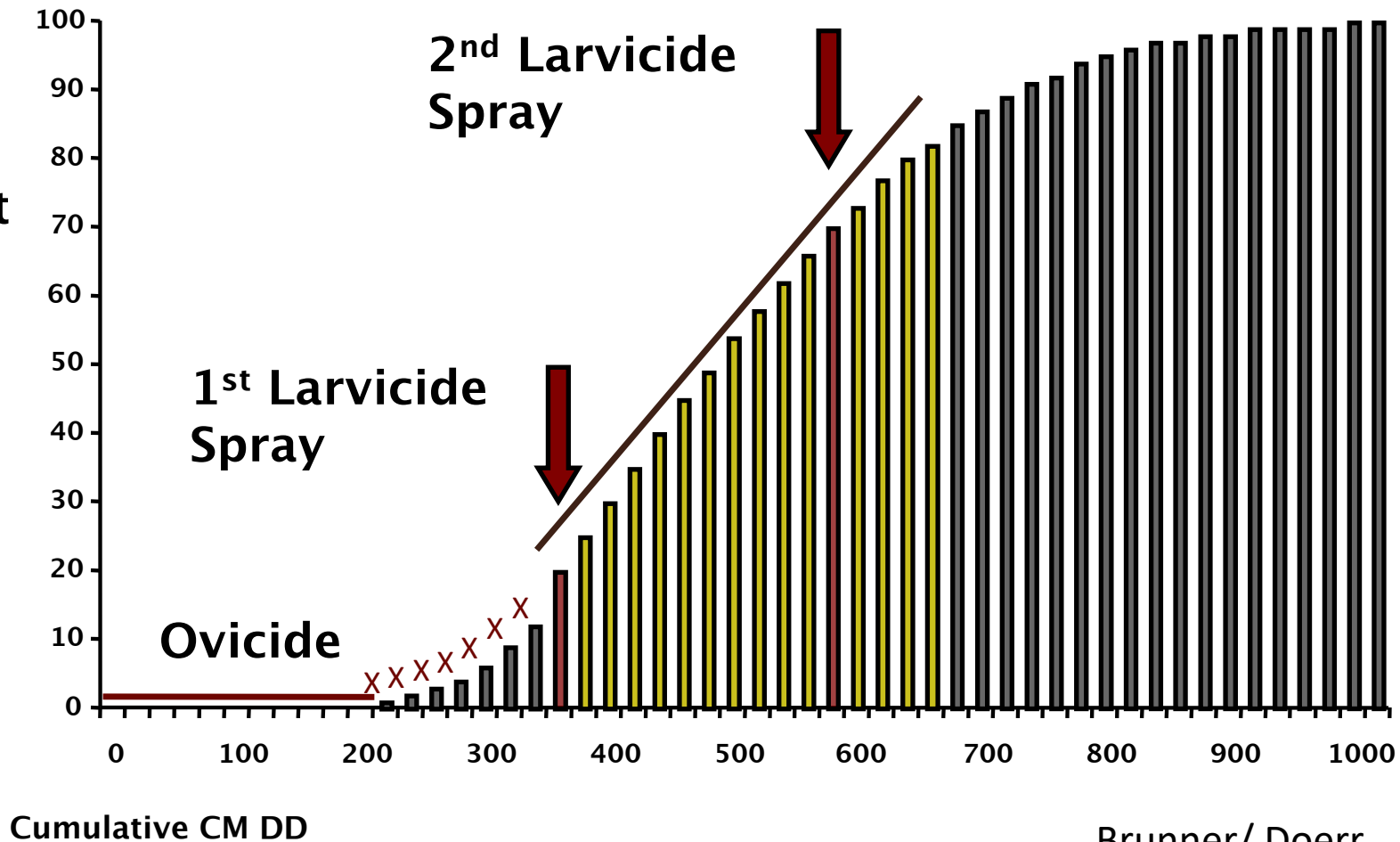
Cumulative CM DD

Brunner/ Doerr

# Optimized Larvicide Applications

Percent Egg Hatch (1<sup>st</sup> Generation)

17-day  
retreatment  
interval  
covers  
entire  
generation



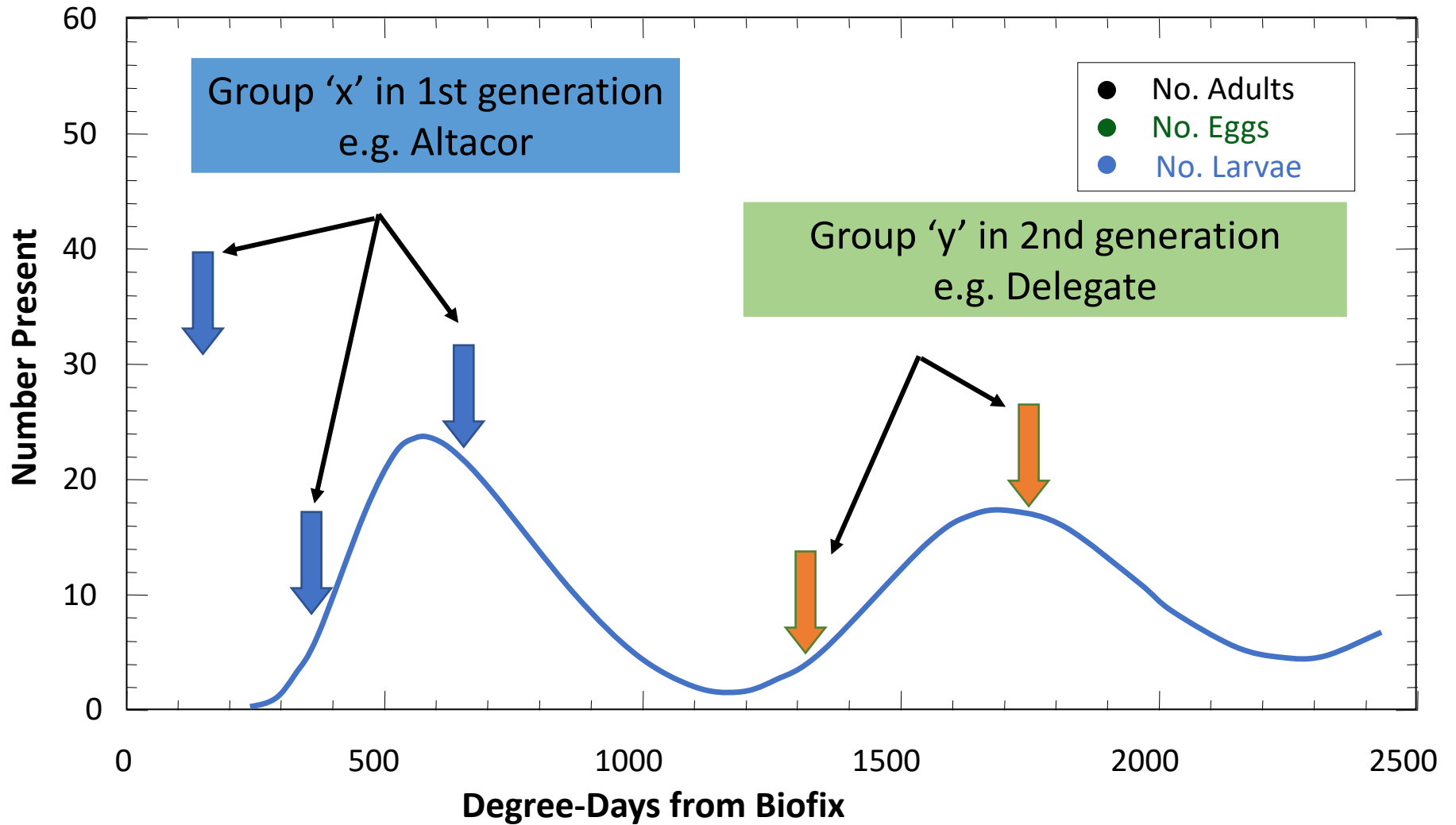
Brunner/ Doerr

# Pesticide Resistance Management



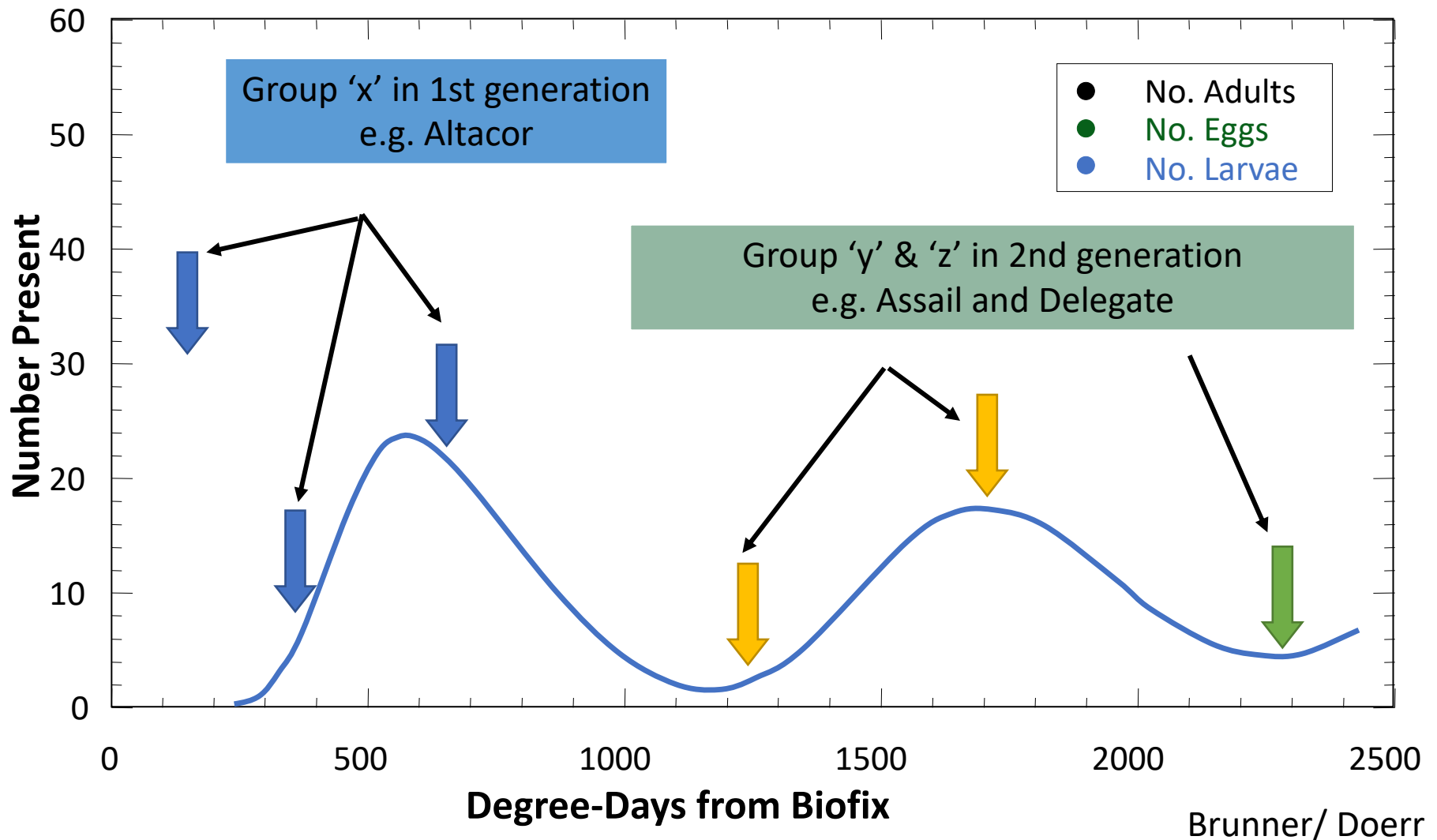
# Resistance Management

*Focus product group on one generation*



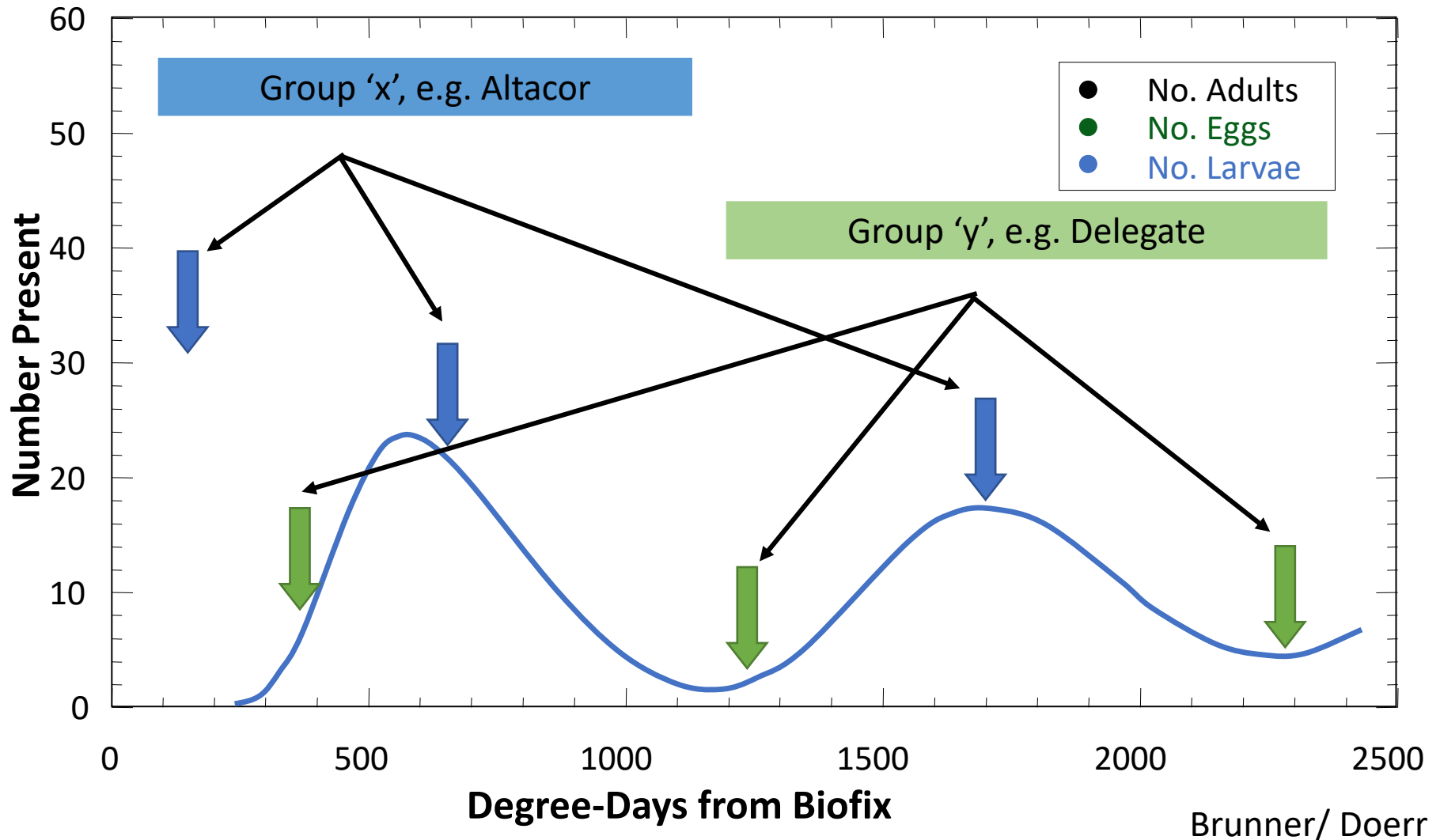
# Resistance Management







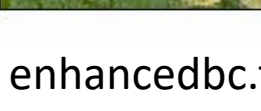
*Focus product group on one generation*



# Resistance Management

*Do not alternate within a single generation!*



Disruptive Value	Altacor	Cyazapyr	Delegate	Rimon	Warrior	Kumulus	Kocide/ Manzate
		-43	-55	-73	-62	-88	-54
	-12	-36	-96	-74	-99	-91	-77
	-100	-100	-96	-94	-100	-39	-39
	+5	+10	-96	-94	-100	-66	-32
	-87	-84	-21	-86	-100	-44	-11
	-3	-32	-43	-16	-39	+3	+12
	-59	-88	-83	-7	-91	-89	-23

Source: 2013 enhancedbc.tfrec.wsu.edu



Compound	AM efficacy	CM efficacy	Mite flaring
Imidan	Excellent	Resistance	Relatively safe
Exirel	Good-Excellent	Excellent	Relatively safe
Assail, Belay	Good-Excellent	Good-Excellent	Relatively safe
Delegate	Fair-Good	Excellent	Moderately toxic
Asana, Warrior, Danitol, Baythroid, Must. Max, Battalion	Fair-Good	Fair	Highly toxic
<u>Premixes</u>			
Leverage	Excellent	Fair	Highly toxic
Voliam Flexi	Excellent	Excellent	Moderately toxic
Minecto Pro	Good-Excellent	Excellent	Relatively safe
Endigo	Good	Good	Highly toxic

Gut/Wise

# *Potential new option*

## VERDEPRYN

- Active ingredient, diamide class
- Trade name registered for use in vegetables
- AM , CM, OFM, PC, leafrollers
- aphids, leafhopper, Jap. beetle



Summit Agro



Similar activity as FMC Exirel

Gut/Wise

# Fit in a program



Insecticide	CM	OFM	OBLR	AM
Avaunt	**	**	*	
Intrepid	**	**	***	
Esteem	**	*	**	
Delegate	***	***	***	**
Rimon	***	***	***	
Altacor	***	***	***	
Exirel	***	***	***	***
Verdepryn	***	***	***	***
Proclaim	***	**	***	
Assail	***	***		***

Gut/Wise

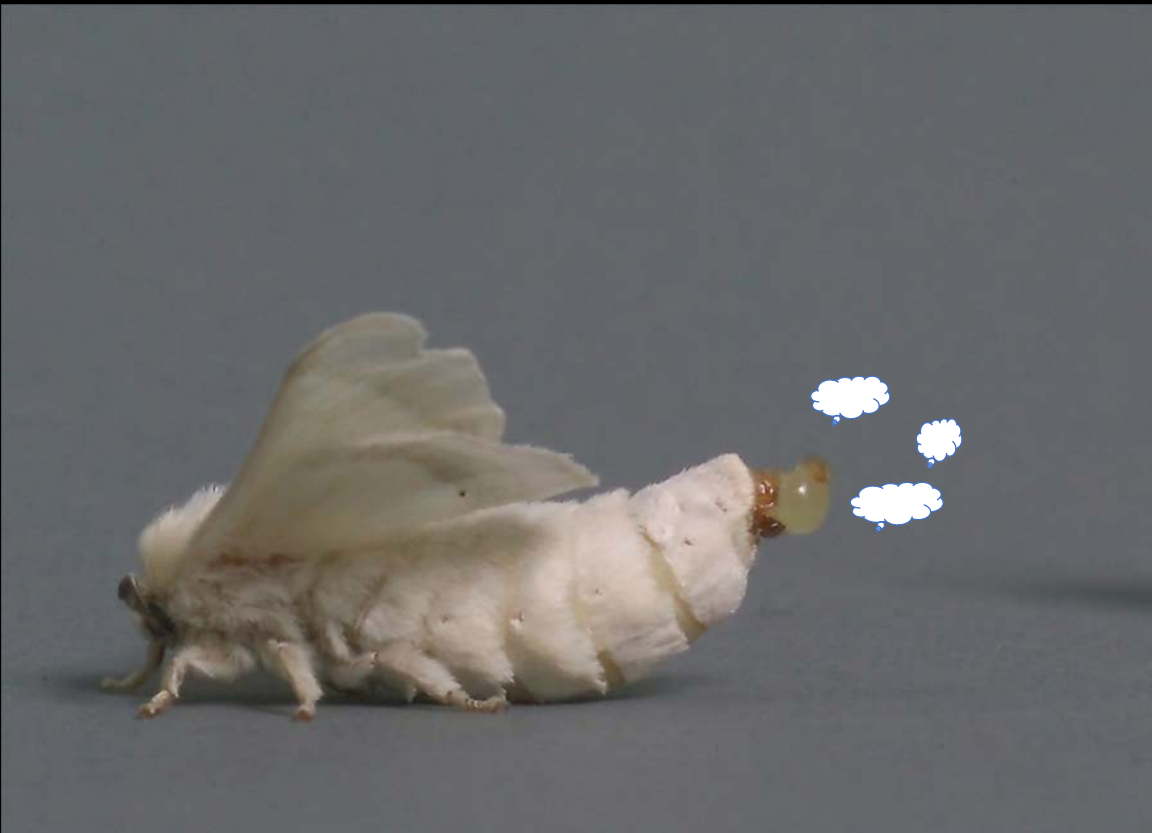
# What's in the Pipeline?



And now this....

# Pheromones

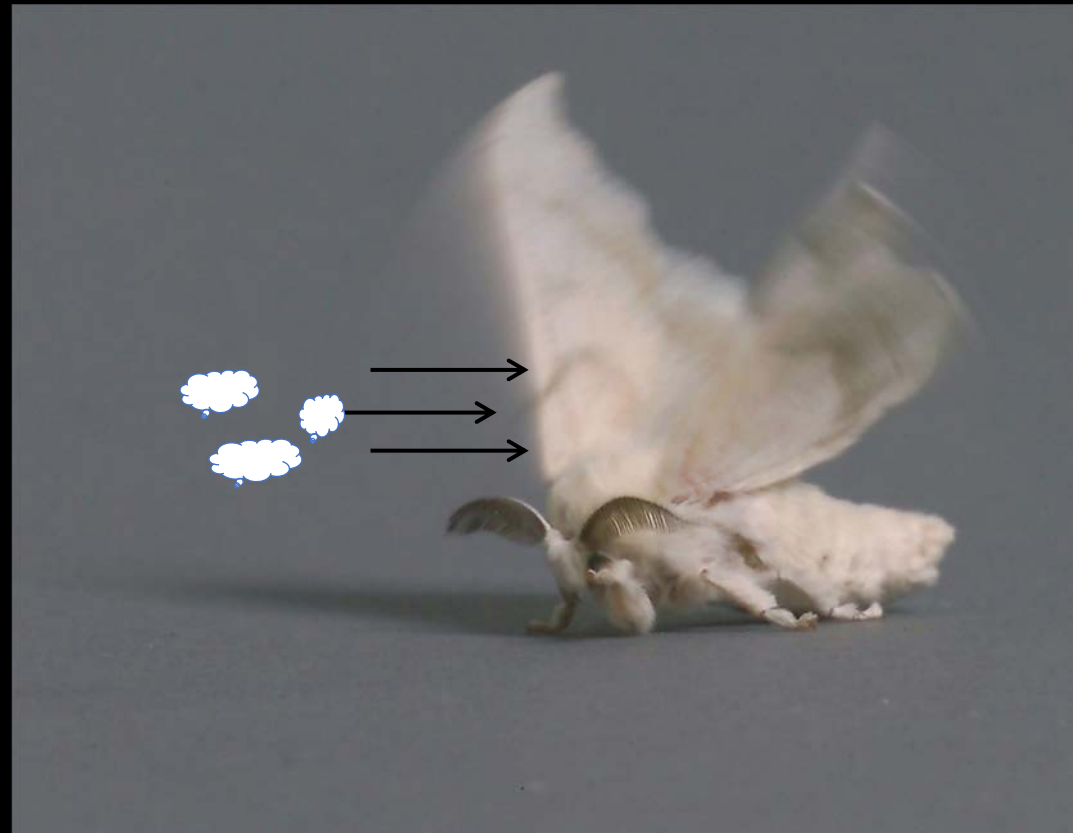
## Female Projection



# Pheromones

## Male Reception

Oh la la !



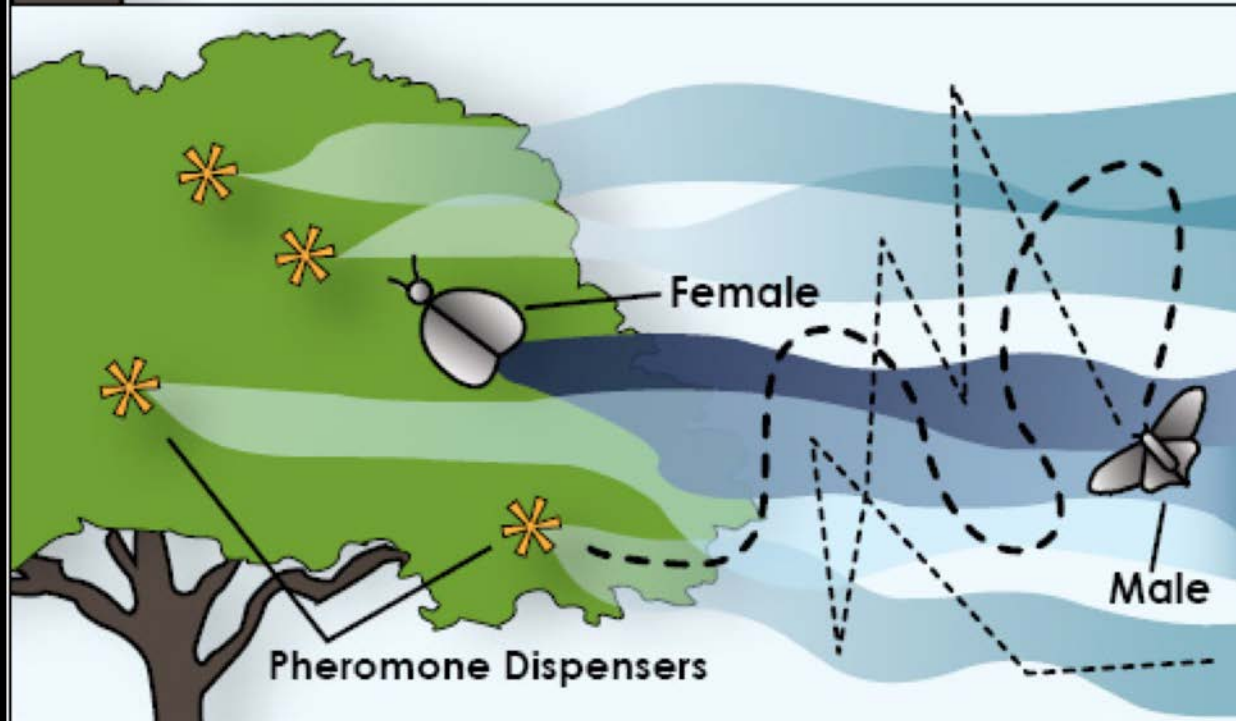
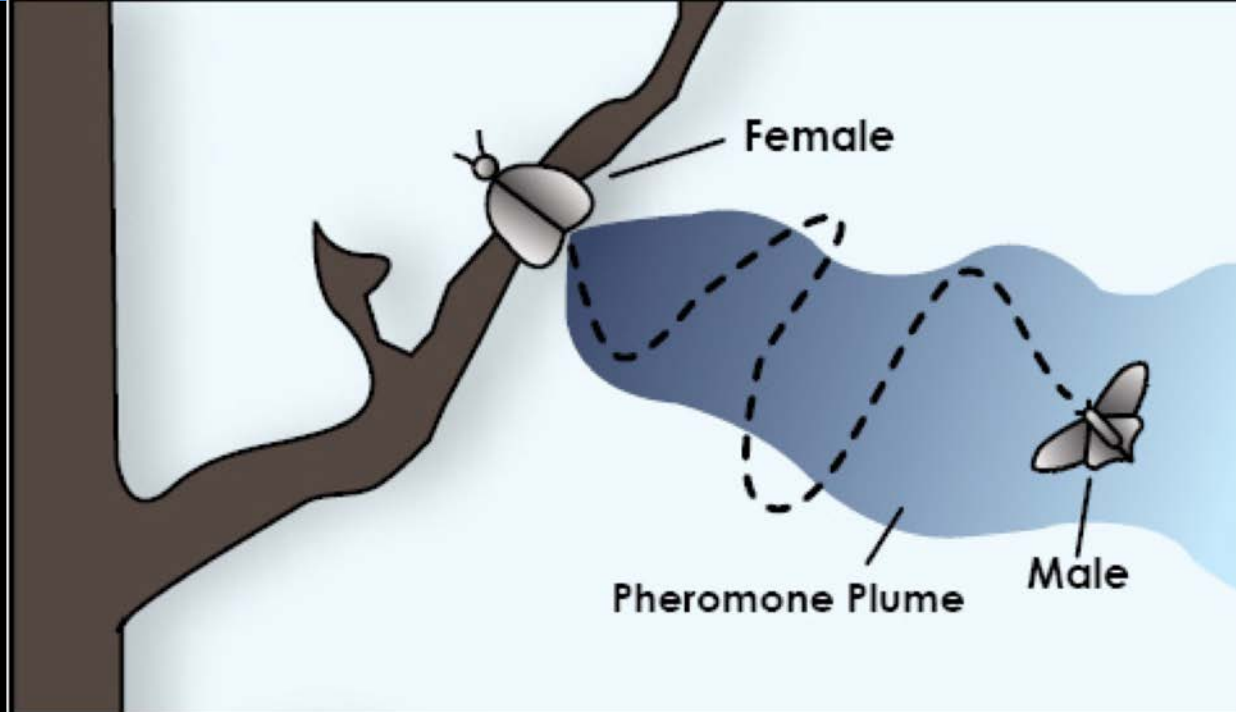






# MD Technologies





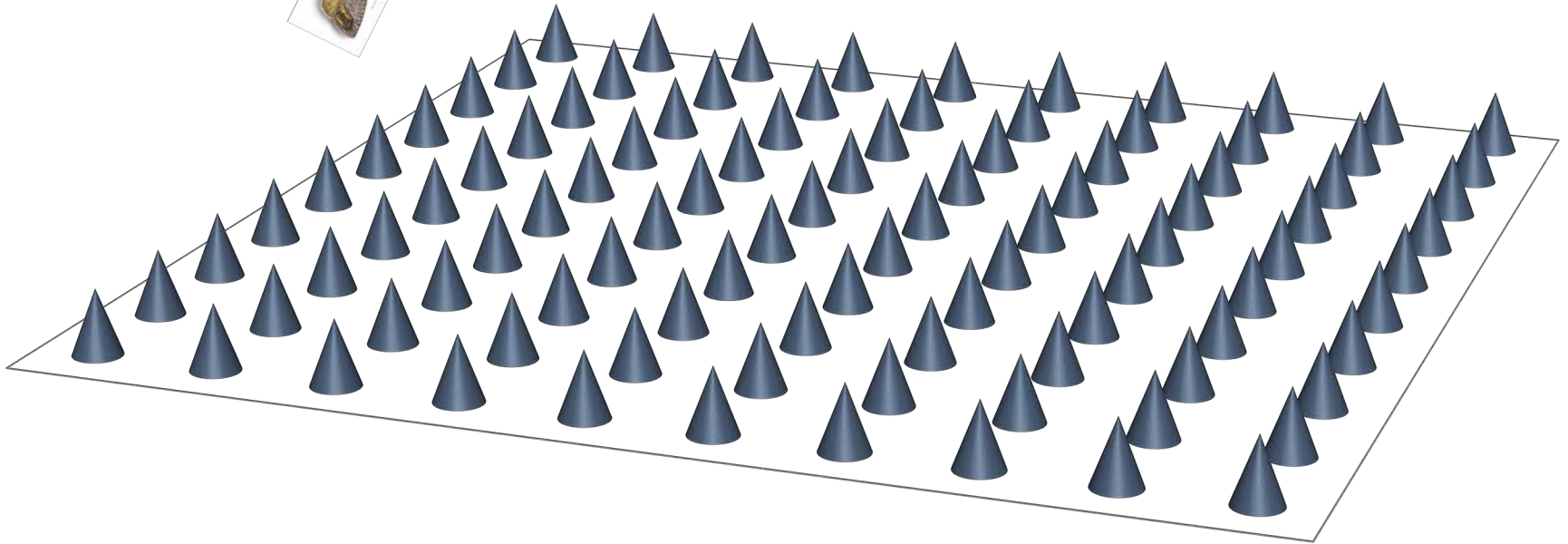
So, how's your sex life lately?

Not good!  
I'm thinking about artificial insemination.

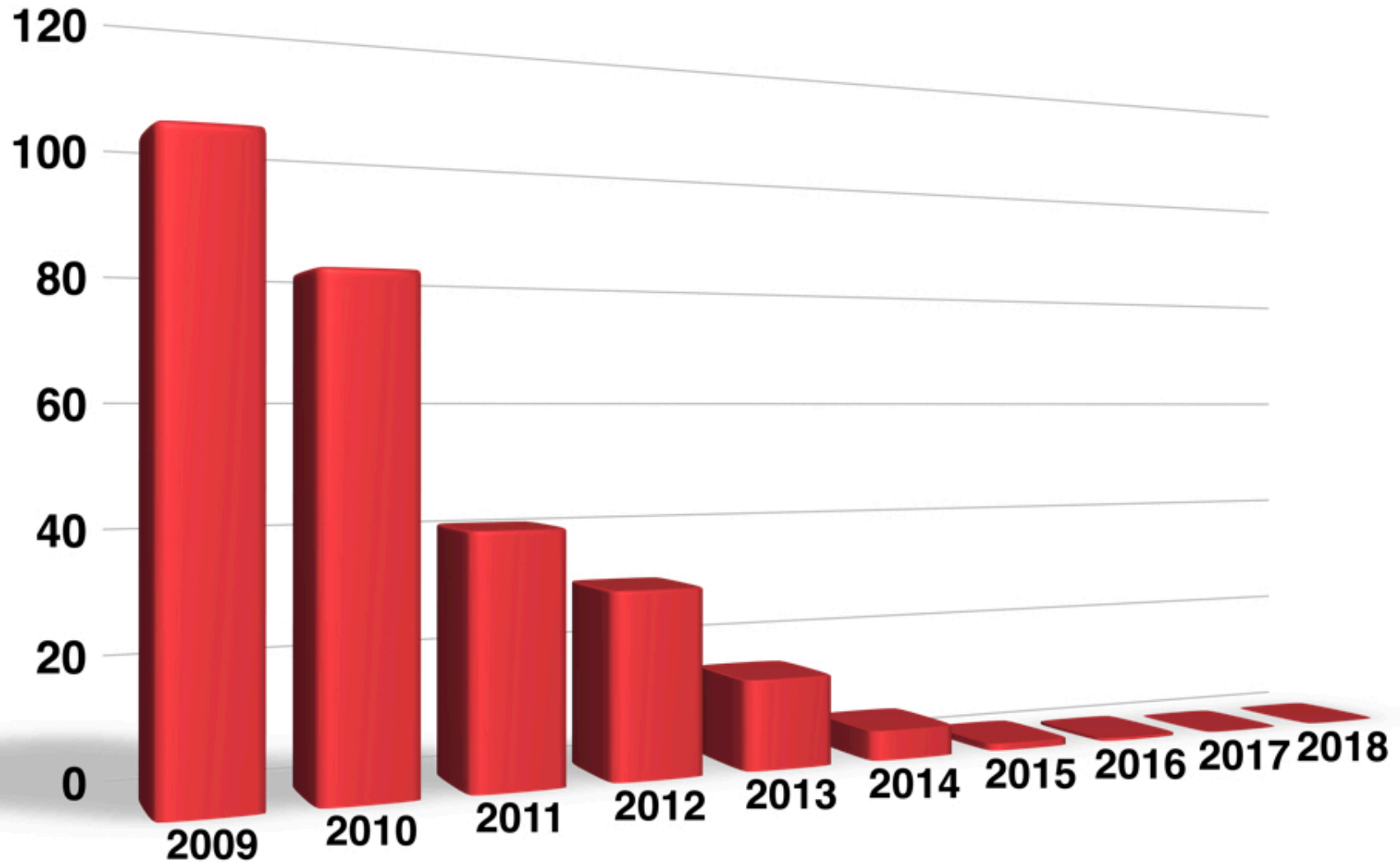
No bull!?



# Hand Applied

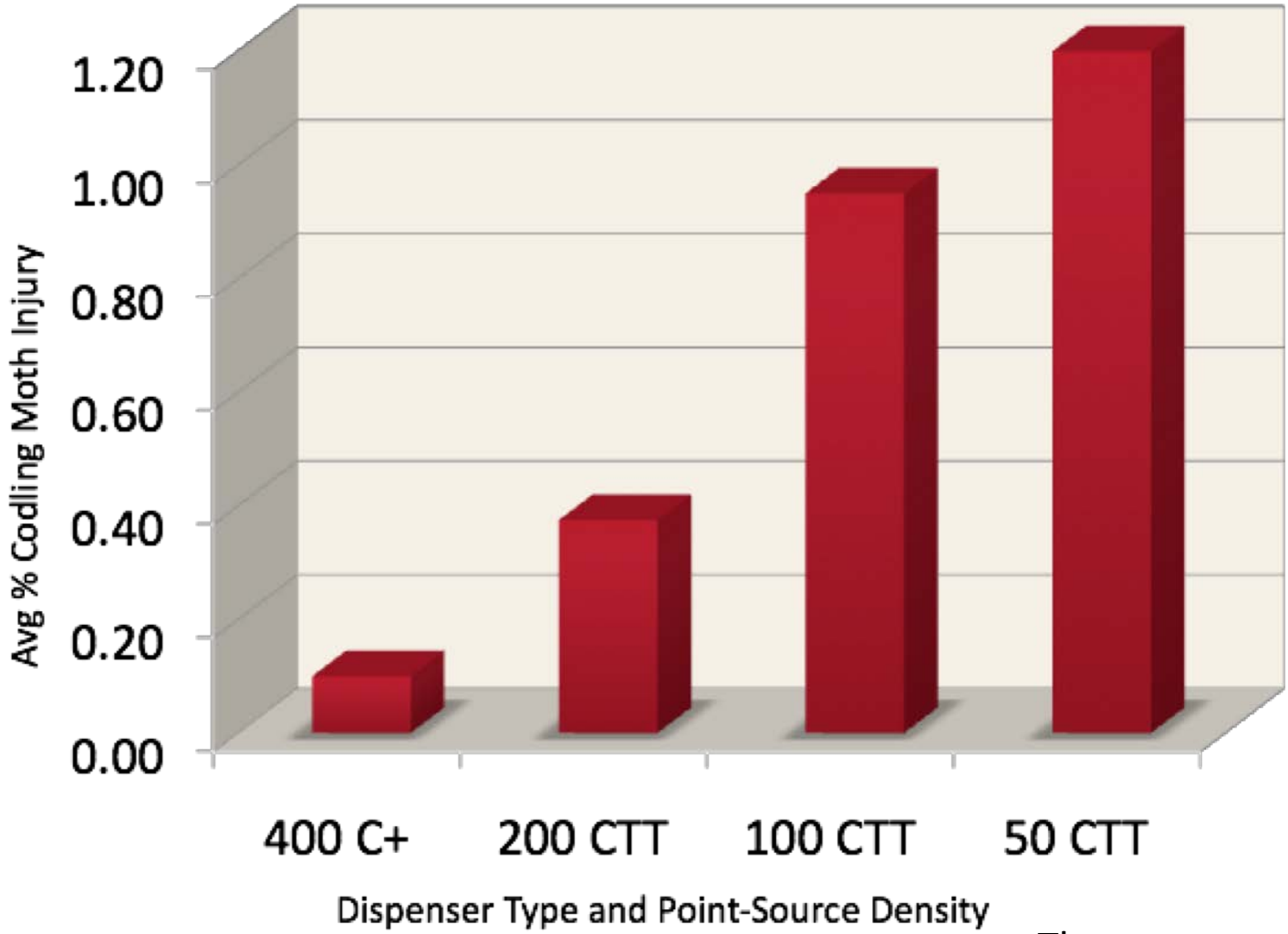
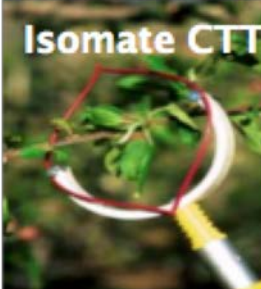
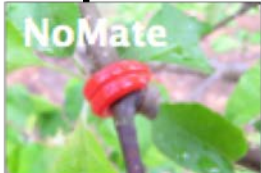


# Manage CM Populations → 0



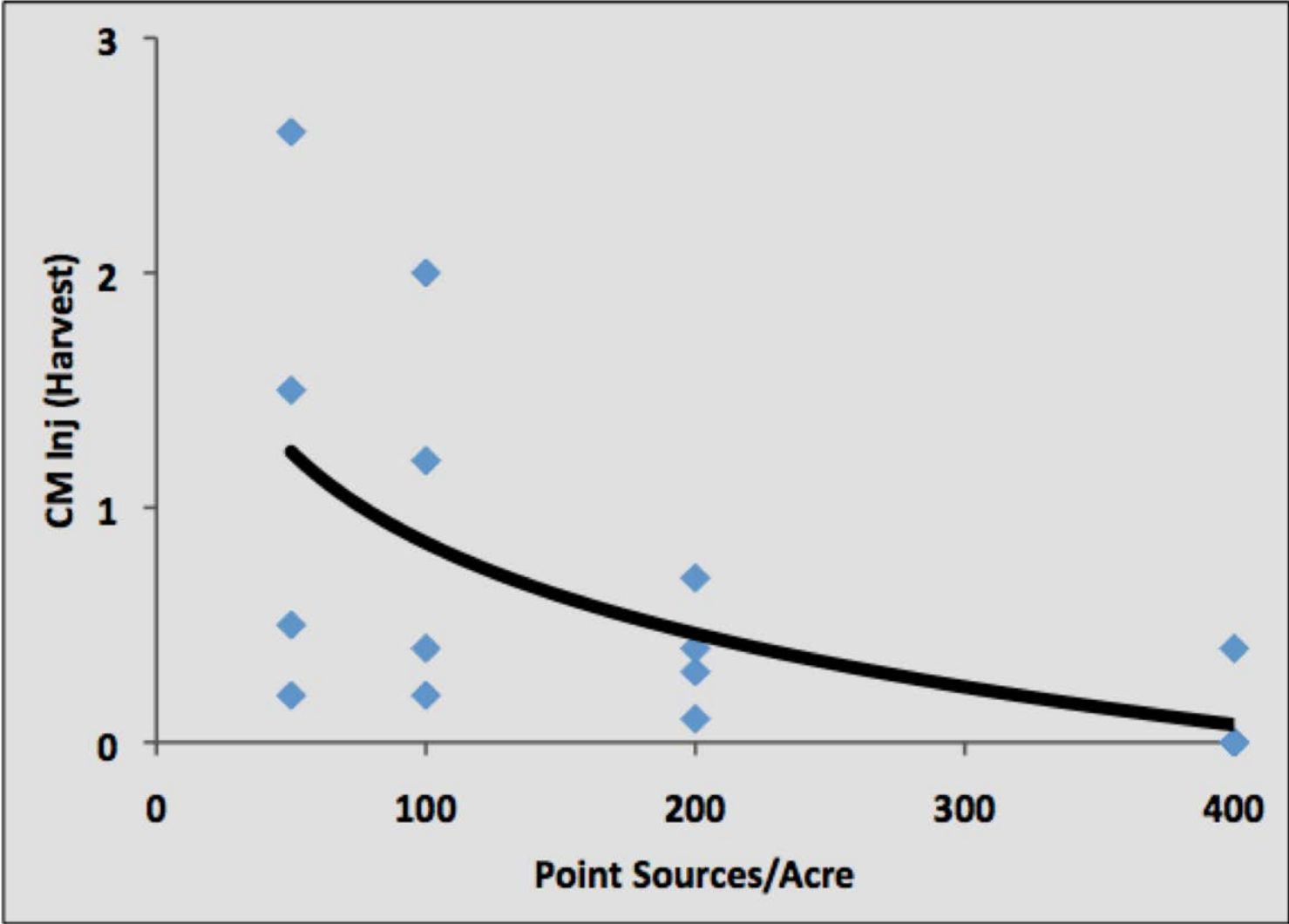
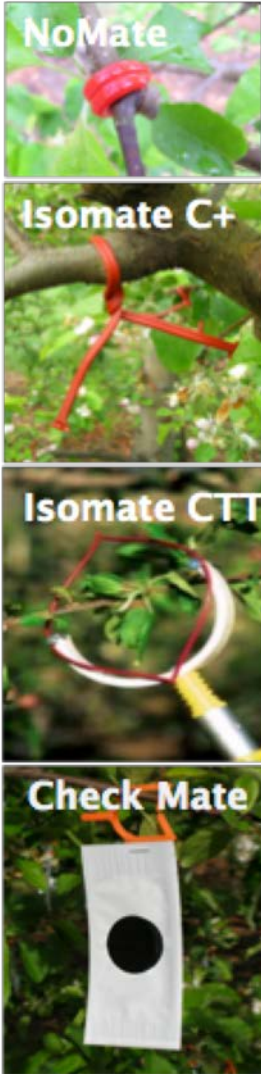
# Hand-Applied Mating Disruption

## Importance of Point Sources



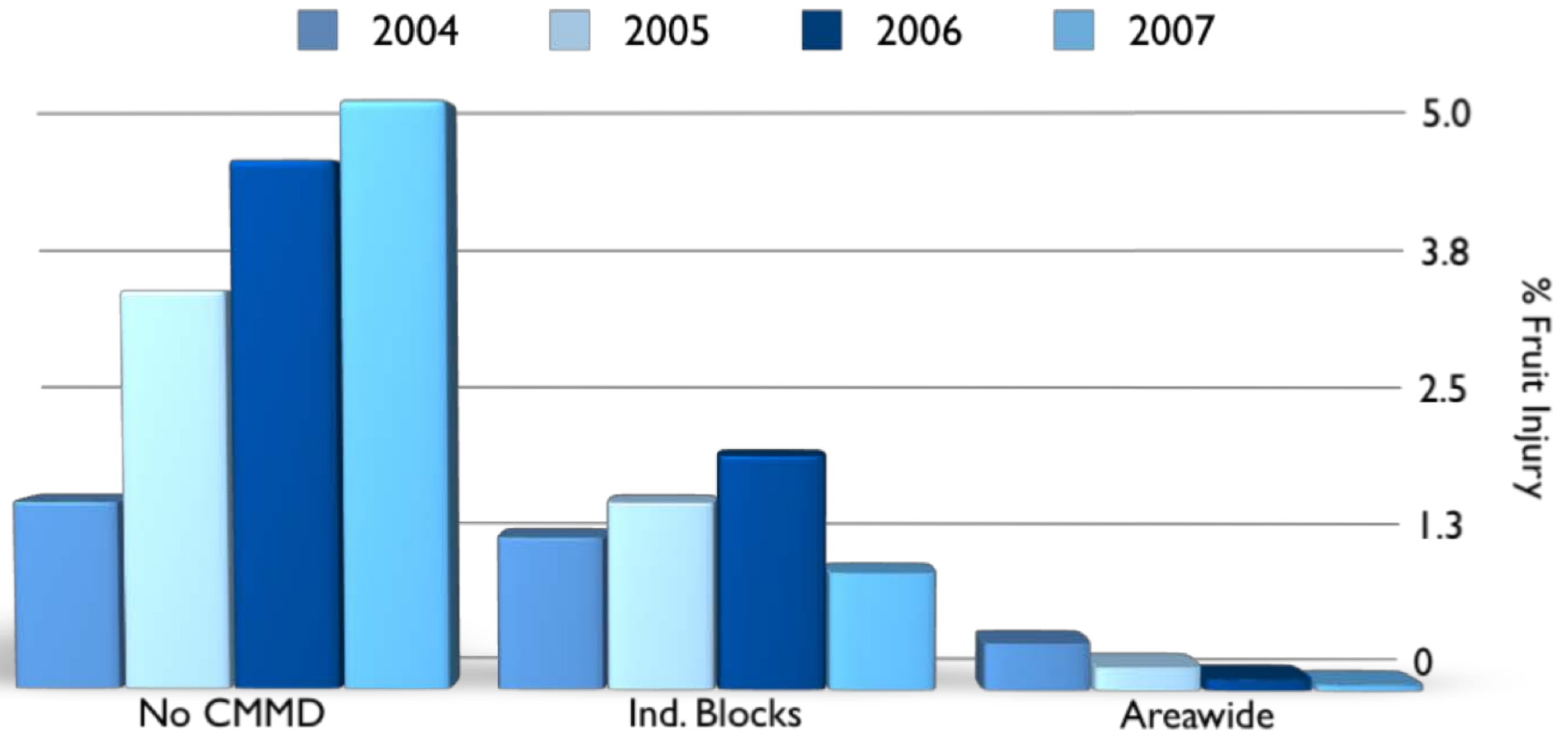
Thomson

# Fewer Point Sources = More Variability



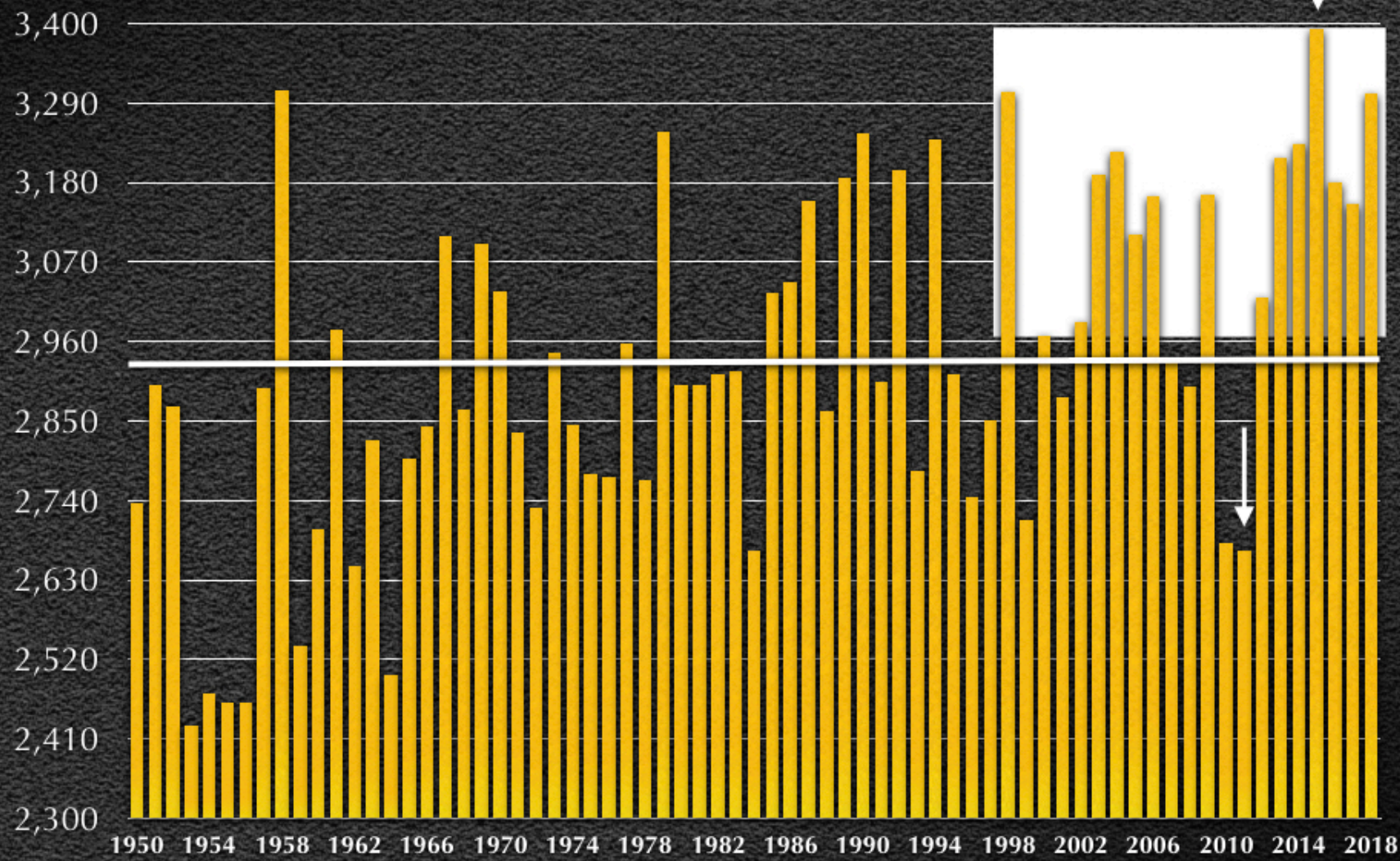


# Areawide Implementation of Mating Disruption (MSU)



# CM °Day Accumulation - Wenatchee, WA

April 1 to September 30



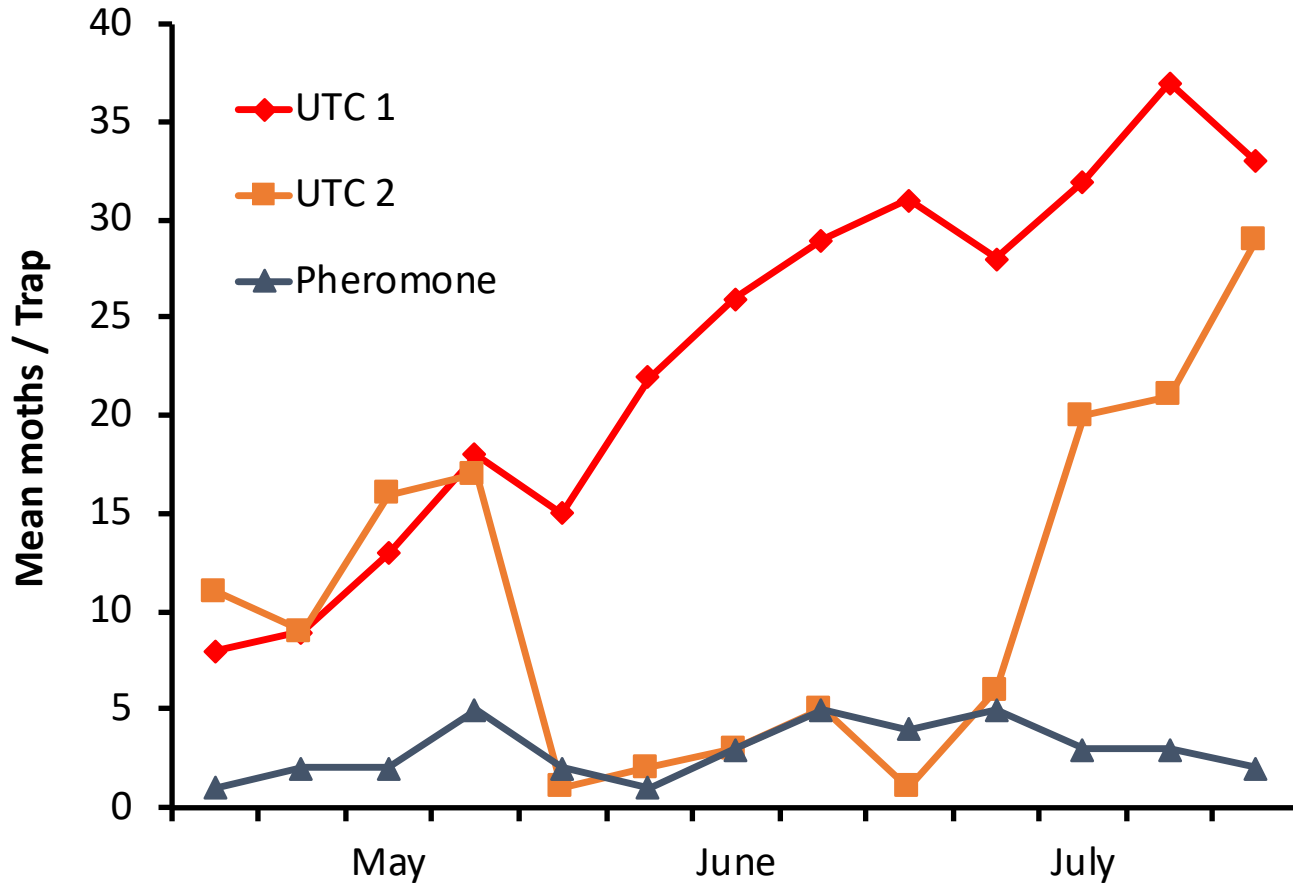
Average 2,930 DD (1950 to 2018)

Thomson/McGhee

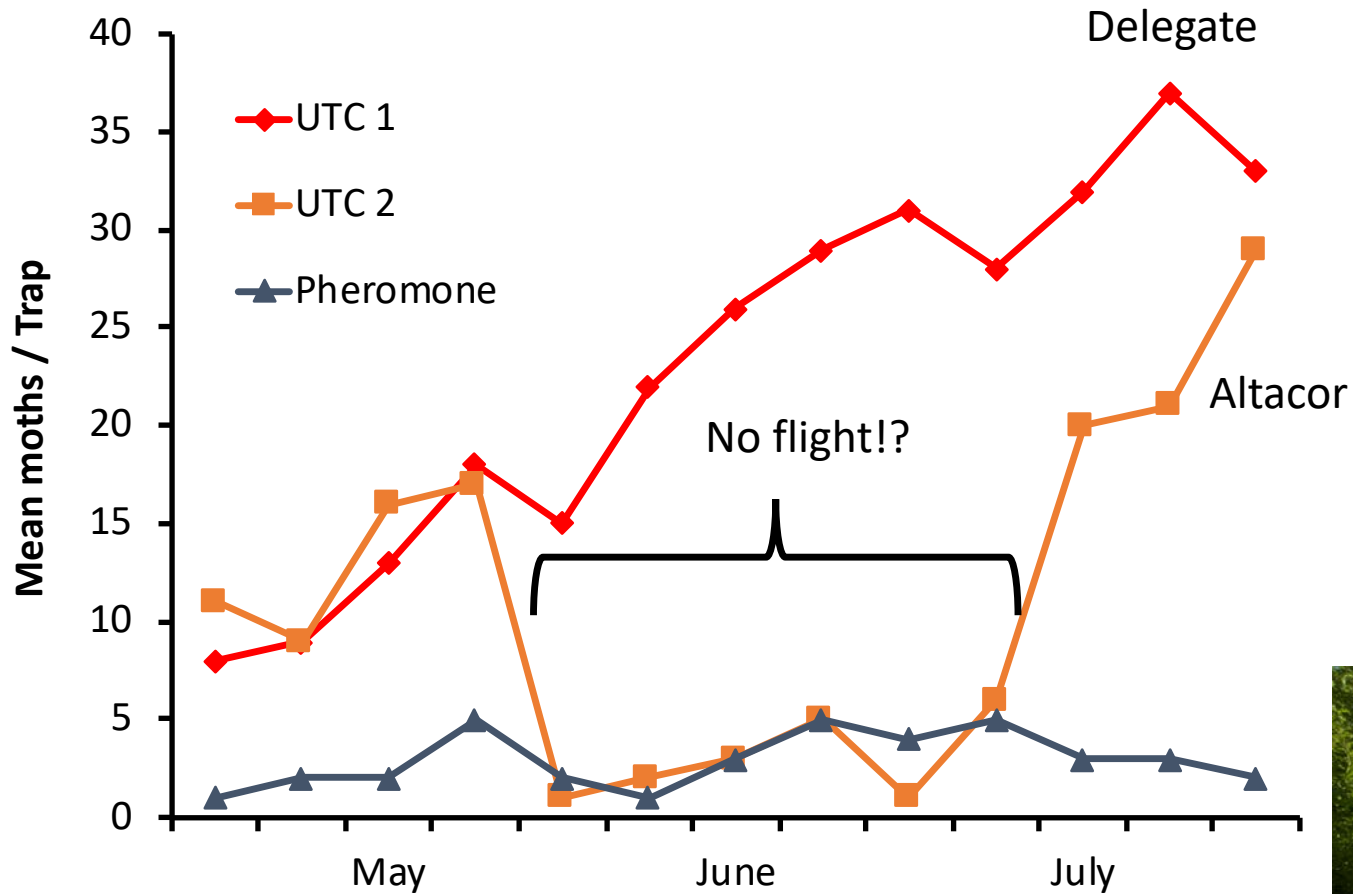
# Sub-lethal Effects of Pesticides



# The Curious Case of Altacor<sup>®</sup>



# The Curious Case of Altacor<sup>®</sup>

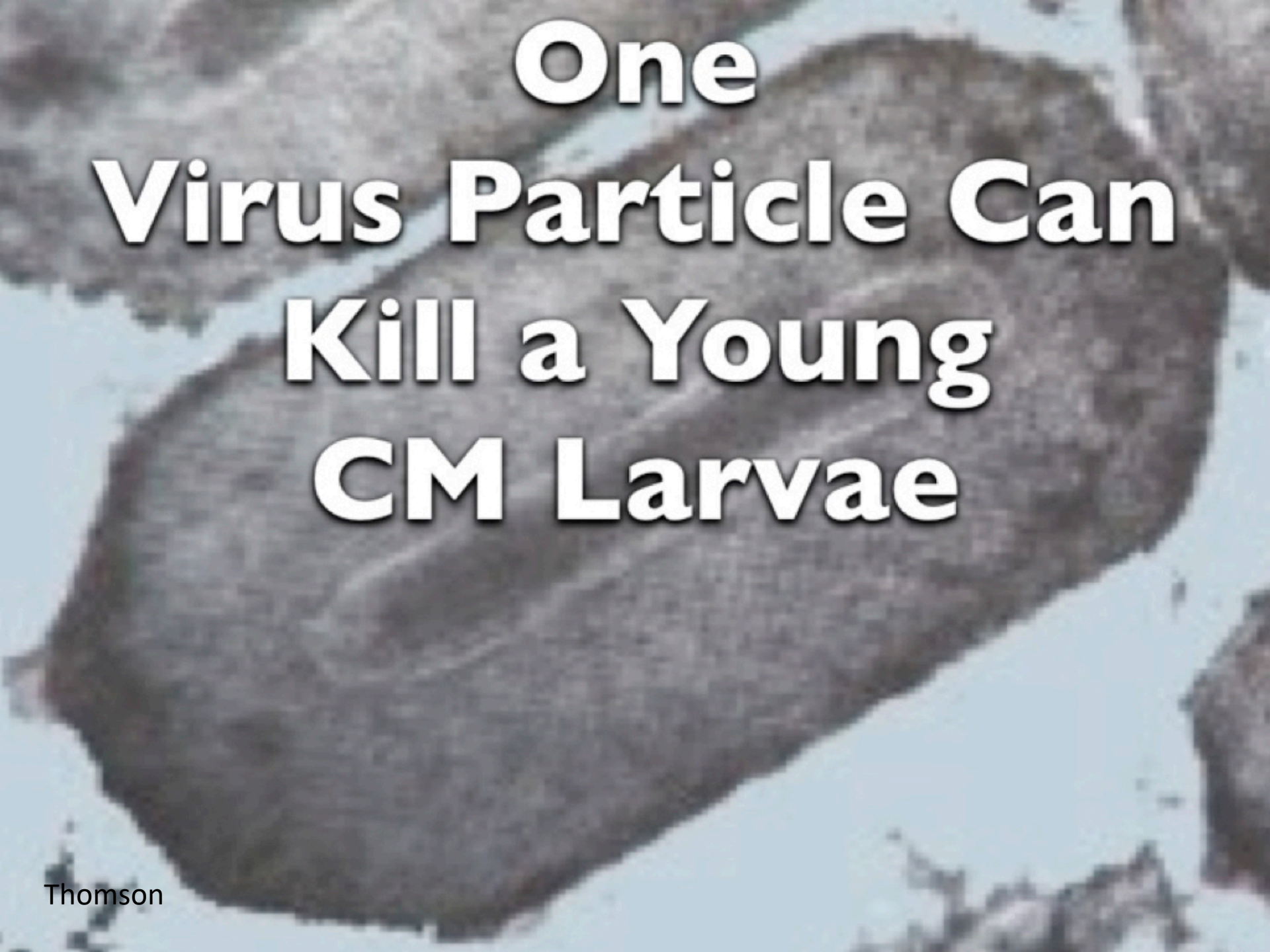


# *Codling Moth Granulovirus*



Thomson

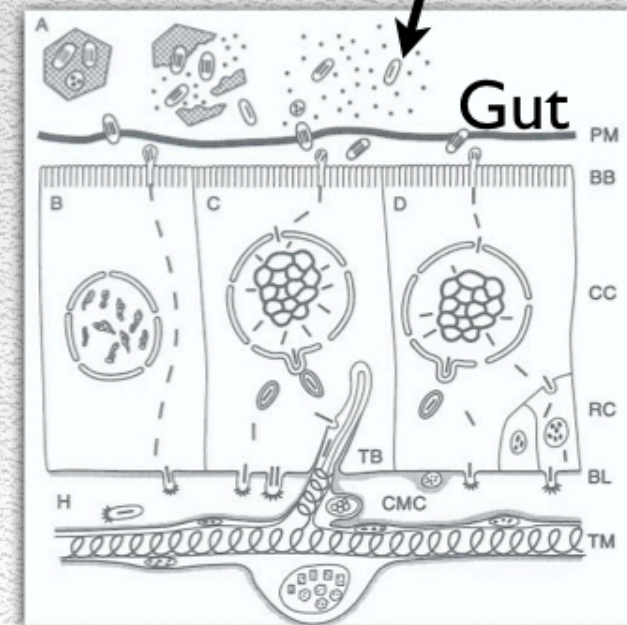
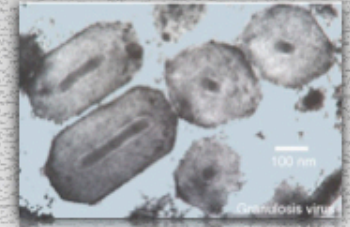
Granulosis virus

A grayscale electron micrograph showing a large, roughly oval-shaped structure with a textured, granular surface. The structure is the central focus of the image. The background is a lighter, mottled gray. The text is overlaid on the central part of the structure.

**One  
Virus Particle Can  
Kill a Young  
CM Larvae**

# Mode of Action

- Ingestion by the CM Larvae
- Dissolves in the Alkaline Gut
- Infects the Gut Cells
- Moves to Fat Body & Other Organs; Replicates





# *Limitations of CM Virus*

- **Slow to Kill**
  - Results in Stings
- **UV Susceptible**
  - Frequent Applications



**Must be applied PH Neutral!!**

# CM Granulovirus - Toxicity

- Field-aged residues (1st vs. 2nd generation)

