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Evaluation Risk Reduction

National IPM Symposium
2006, St. Louis, MO

Impacts of an Areawide Codling Moth Management Approach

Jay F. Brunner

Washington State University
Tree Fruit Res. & Extension Center
Wenatchee, WA 98801

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Development and Adoption of Pheromone Technology in Apple IPM

It is possible to eliminate 70-80% of the active ingredient insecticide use in WA apple orchards by stopping use of one product.

What is that product?

Development and Adoption of Pheromone Technology in Apple IPM

Horticultural mineral oil !

Based on NASS surveys each pint (16 fl. oz) of oil equals 1 pound of active ingredient.

In Washington oil makes up between 73% and 83% of total active ingredient of insecticides used on apple.

Horticultural oil is a valuable tool used to establish an IPM program in WA.

Development and Adoption of Pheromone Technology in Apple IPM

Without consideration of oil organophosphate (OP) insecticides comprise most (69-80%) of the AI used on apple in WA. The main targets of OPs are codling moth and leafrollers.

Codling Moth is King in Western Orchards

Key direct pest of apple and pear
Well adapted to hot, dry climate
Potential to destroy 80% of crop
Damage levels exceeding 5% result in entire crop loss
Majority of the most toxic insecticides directed at control of codling moth and leafrollers

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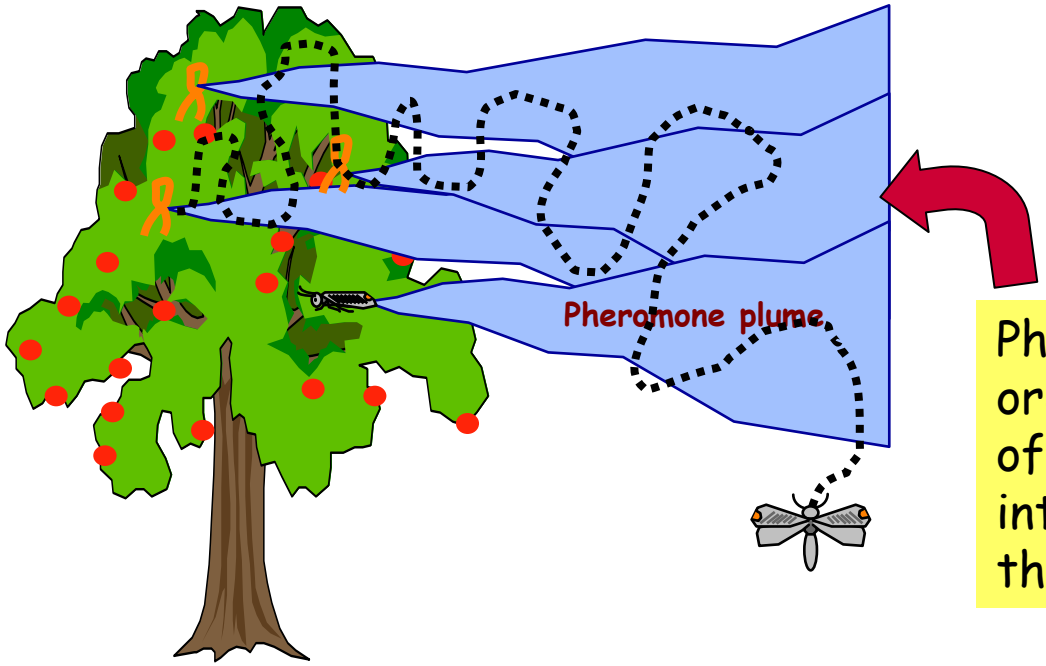
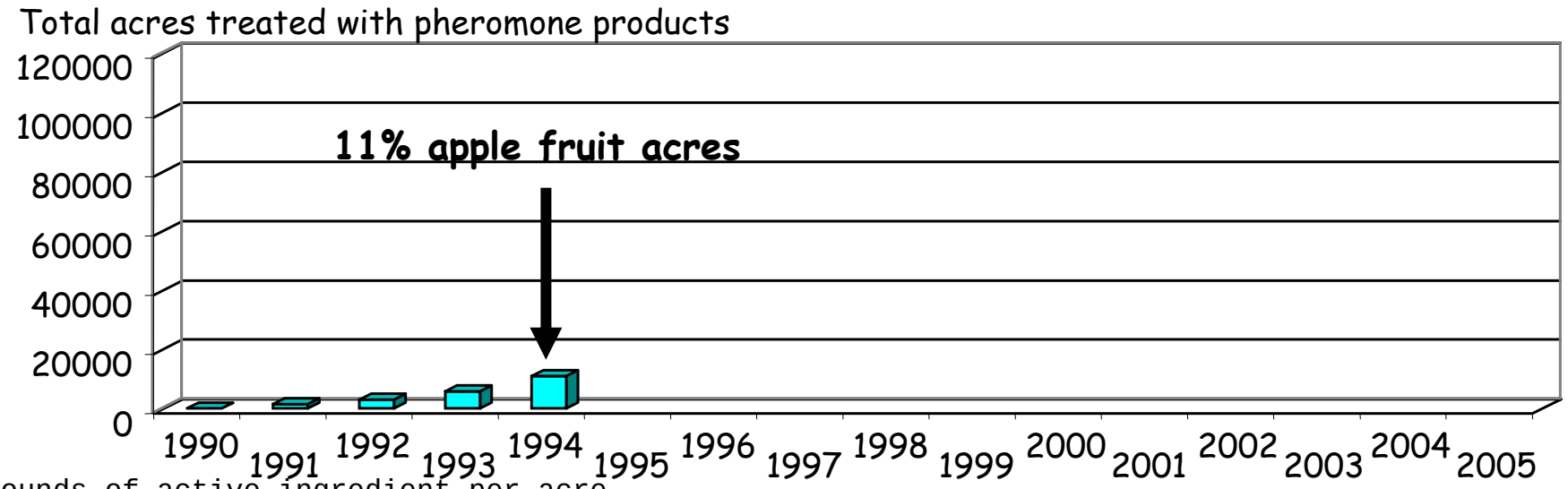
Development and Adoption of Pheromone Technology in Apple IPM

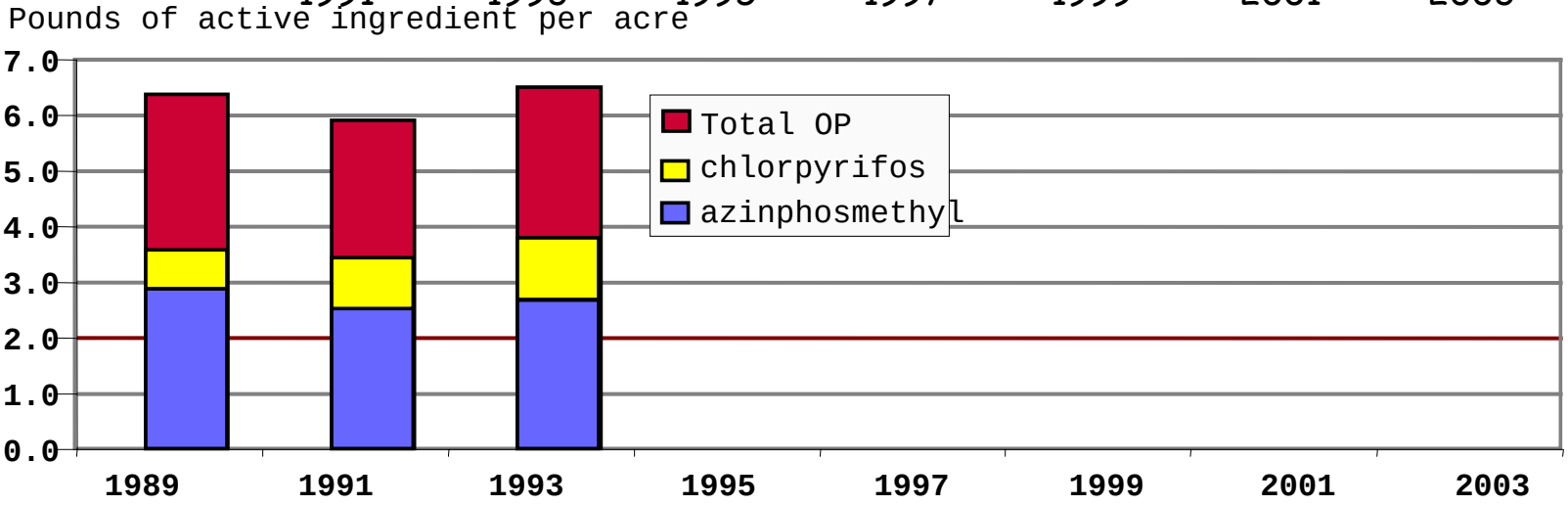
Pheromones (sex pheromones) are a selective, safe, and non-disruptive management tool useful for management of codling moth in pome fruit orchards. It represents a key tactic used against a key pest that is **the basis for transforming pest management** in western orchards.



Pheromones can be released in an orchard to interfere with the ability of the male to locate the female. This interference provides a reduction in the pest's population.

Development and Adoption of Pheromone Technology in Apple IPM: Adoption





Development and Adoption of Pheromone Technology in Apple IPM: Integration, Implementation & Adoption

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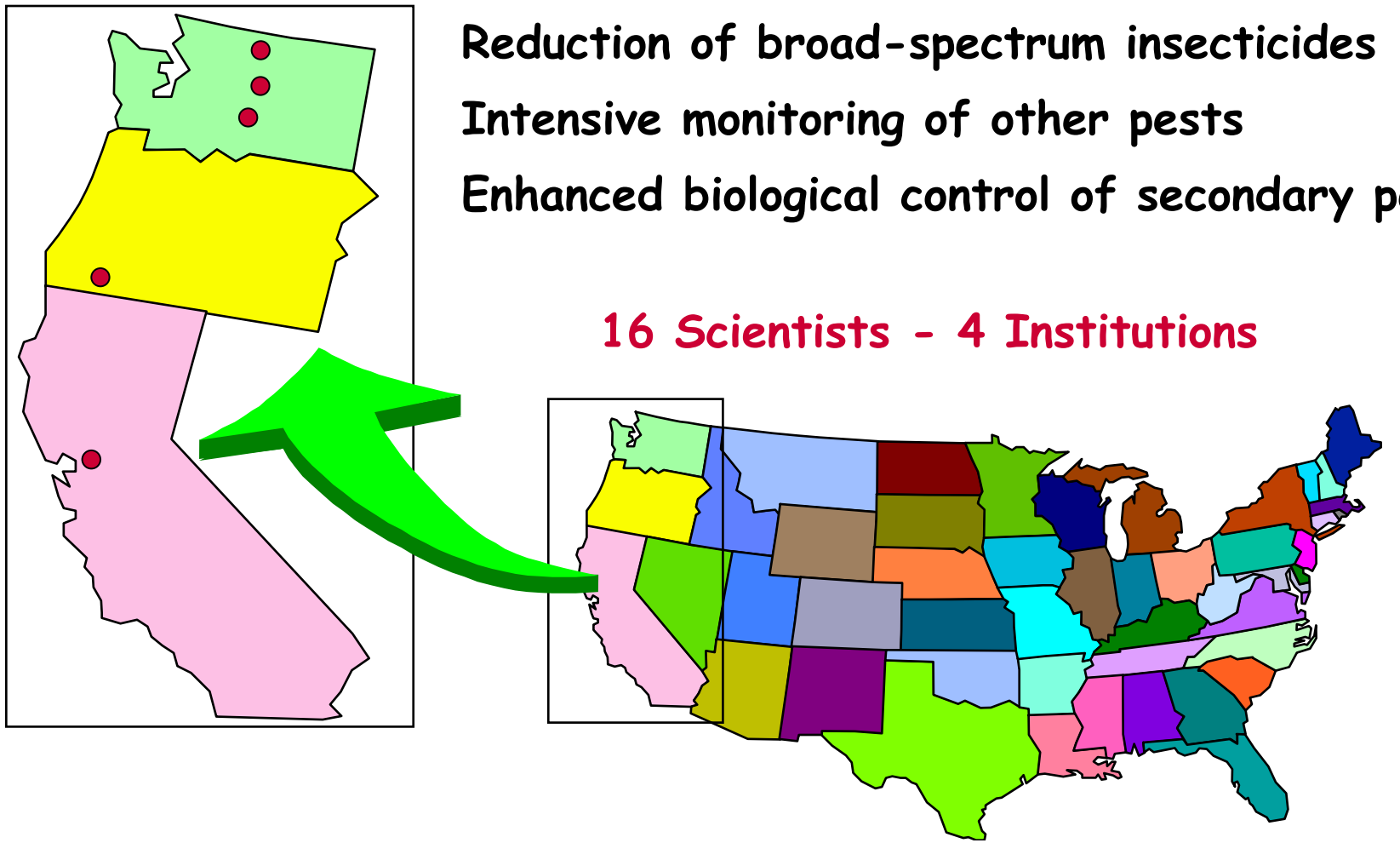
Codling moth control using pheromones

Reduction of broad-spectrum insecticides

Intensive monitoring of other pests

Enhanced biological control of secondary pest

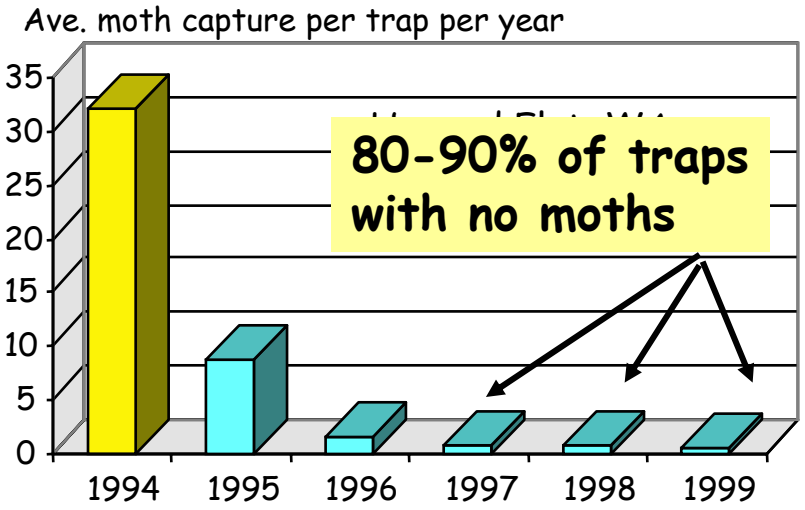


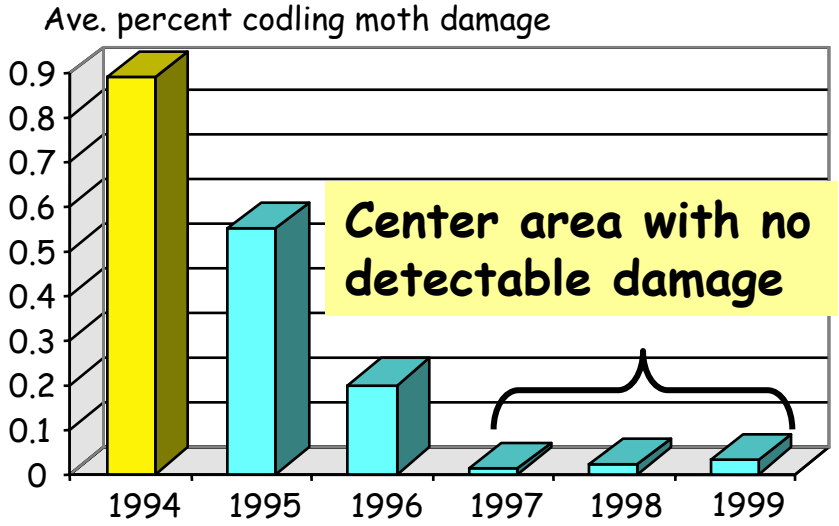
16 Scientists - 4 Institutions

Development and Adoption of Pheromone Technology in Apple IPM: Integration, Implementation & Adoption

Howard Flat example:

- Pre-project data showed codling moth was a problem (yellow bars).
- Moth numbers in traps declined.
- Percent fruit damage declined.





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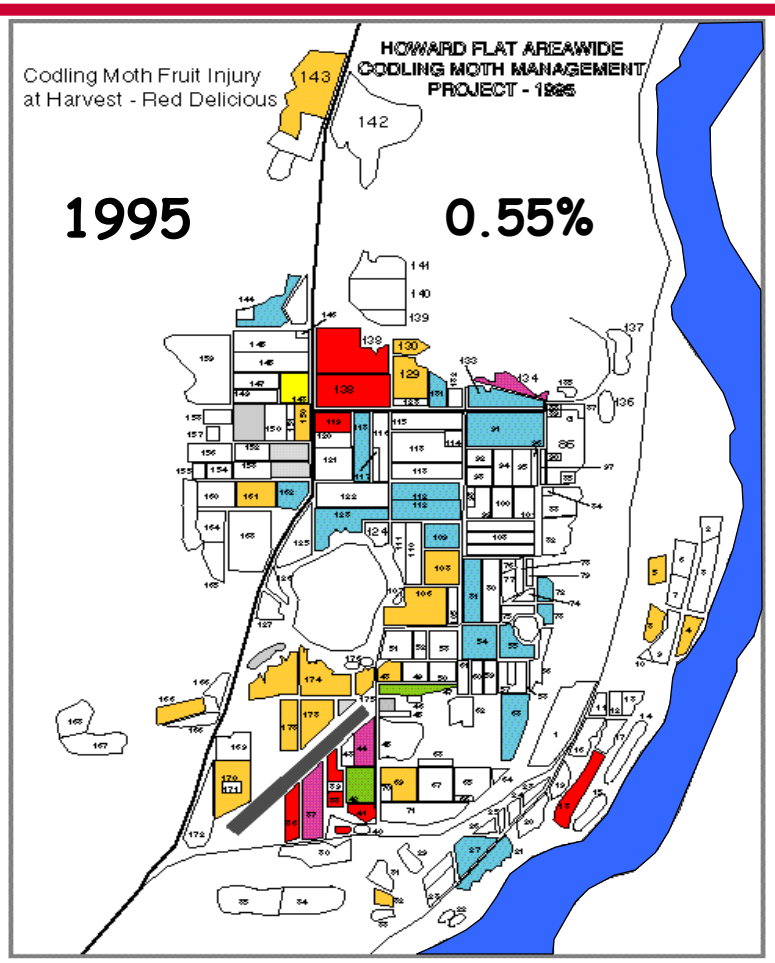
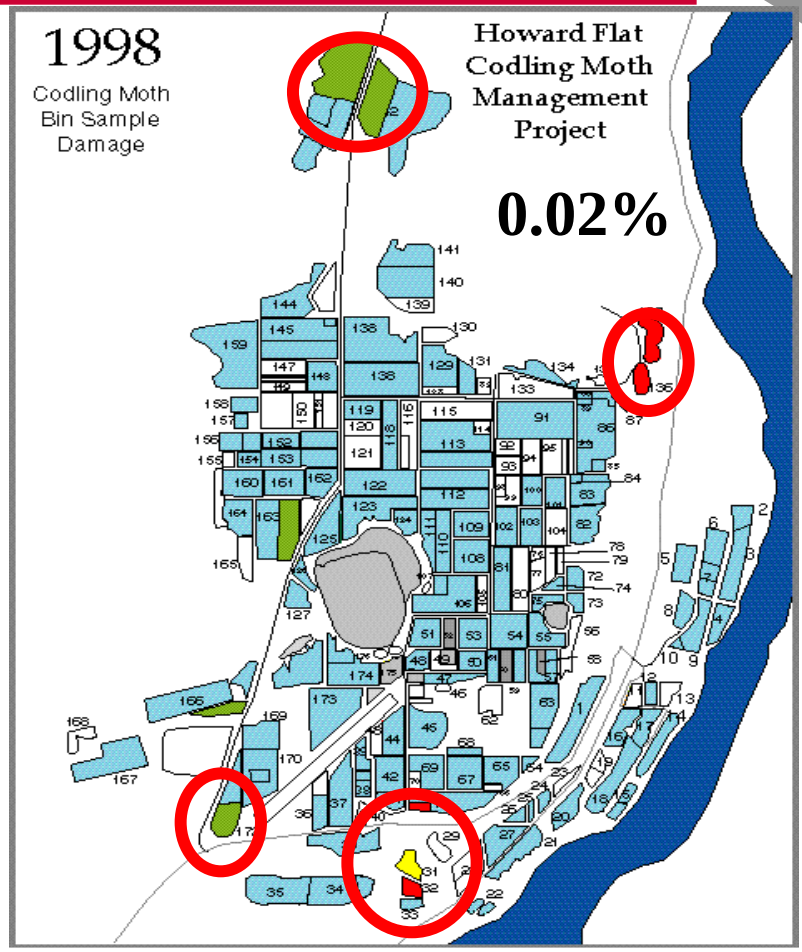
CAMP results - Howard Flat





2-5% 1-1.9% 0.5-0.9% 0.25-0.5% 0.25-0.01% 0.0%

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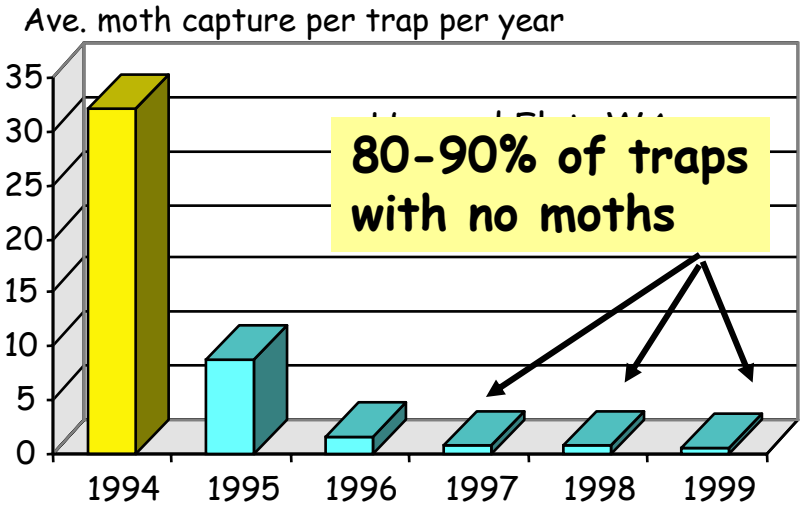
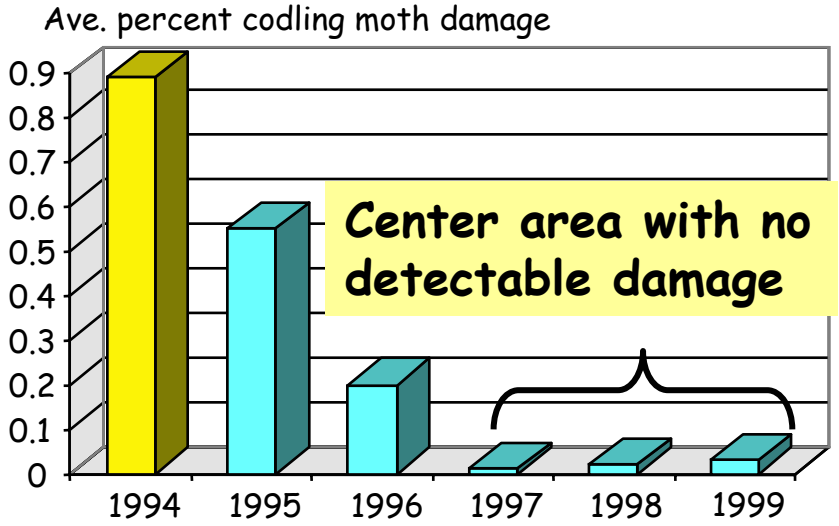
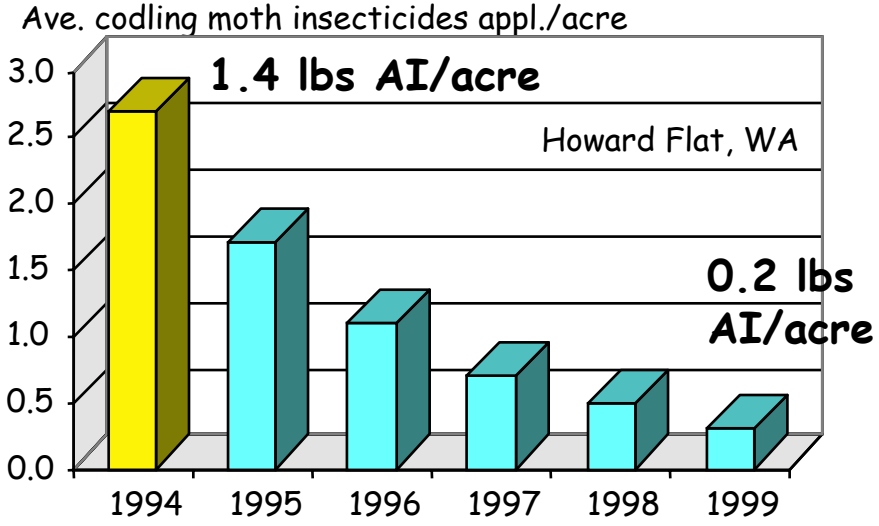
Development and Adoption of Pheromone Technology in Apple IPM: Integration, Implementation & Adoption

Howard Flat example:

- Pre-project data showed codling moth was a problem (yellow bars).
- Moth numbers in traps declined.
- Percent fruit damage declined.
- Number of supplemental insecticides declined.







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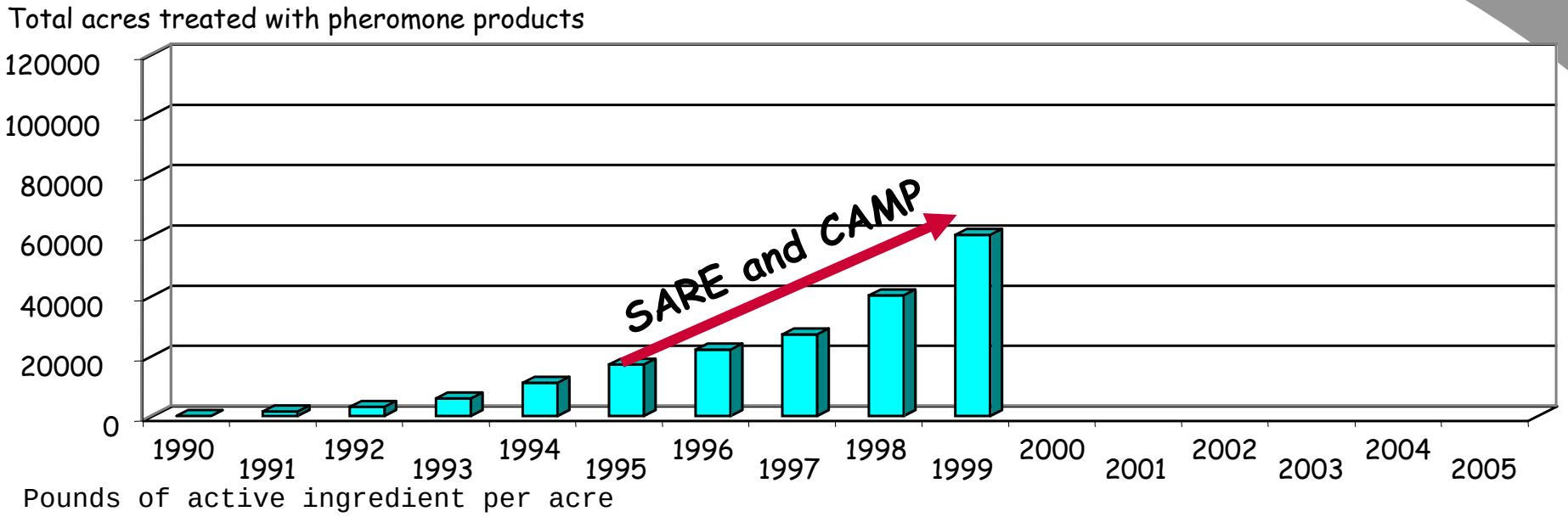
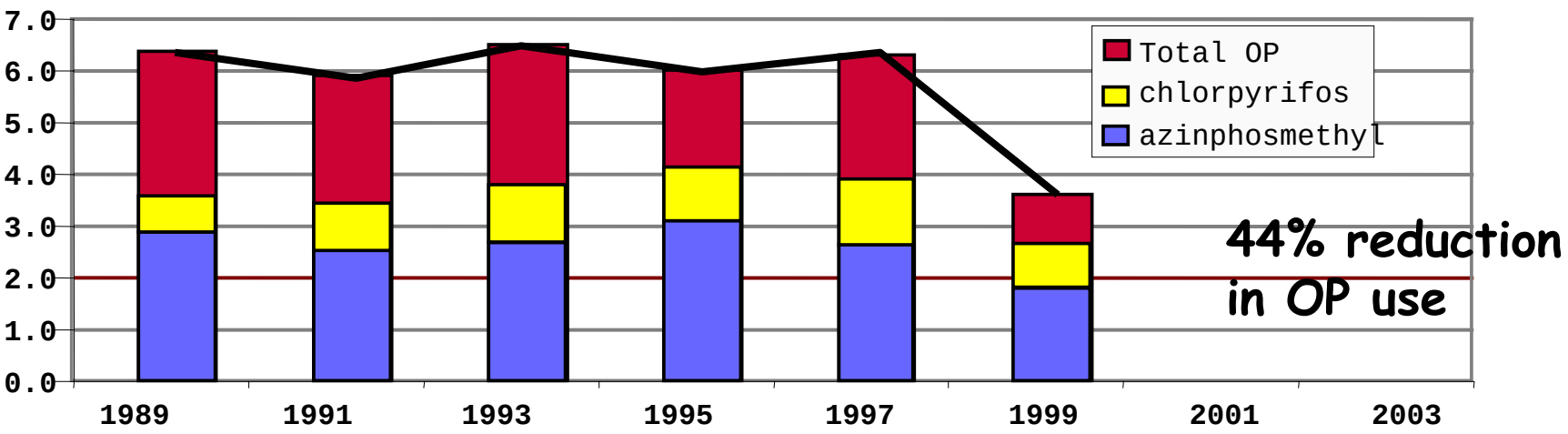
Adoption and Organophosphate Reduction





44% reduction in OP use

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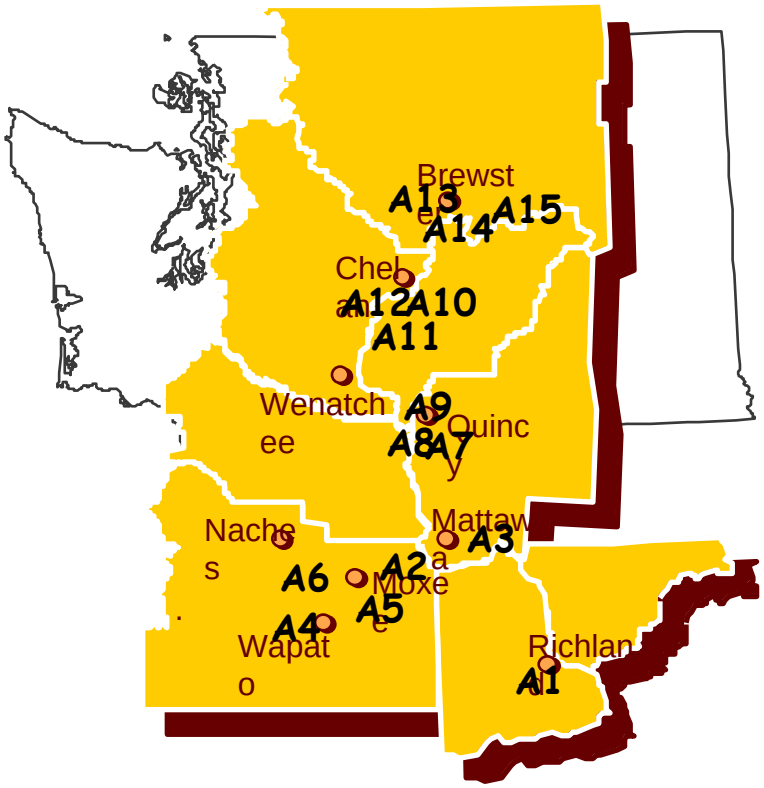
Pheromone-based Pest Management Implementation 2000-2003



http://entomology.tfrec.wsu.edu/stableipm/

15 Apple Orchards (20-40 acre plots)
Same history prior to study.
All used codling moth pheromone.
Supplemental controls **OP** or **No-OP**

chlorpyrifos **azinphosmethyl** **formetanate-hydrochloride** **endosulfan** **imidacloprid** **acetamiprid**	Oil **methoxyfenozide** **pyriproxyfen** **Bt** **indoxacarb**

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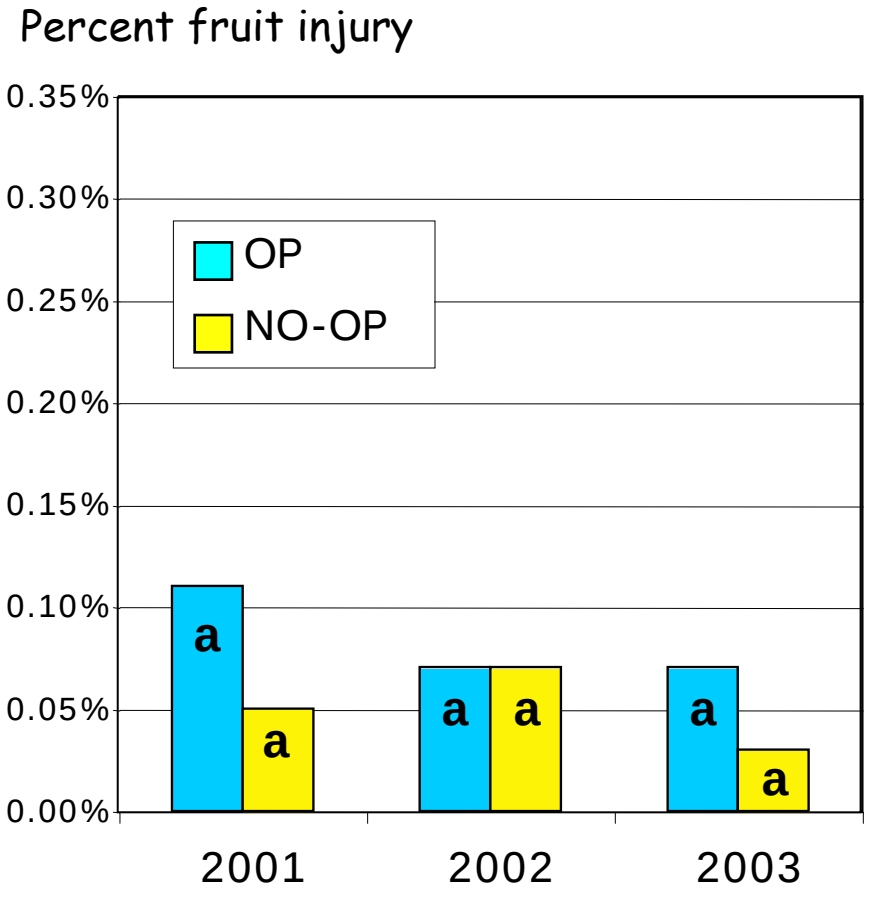
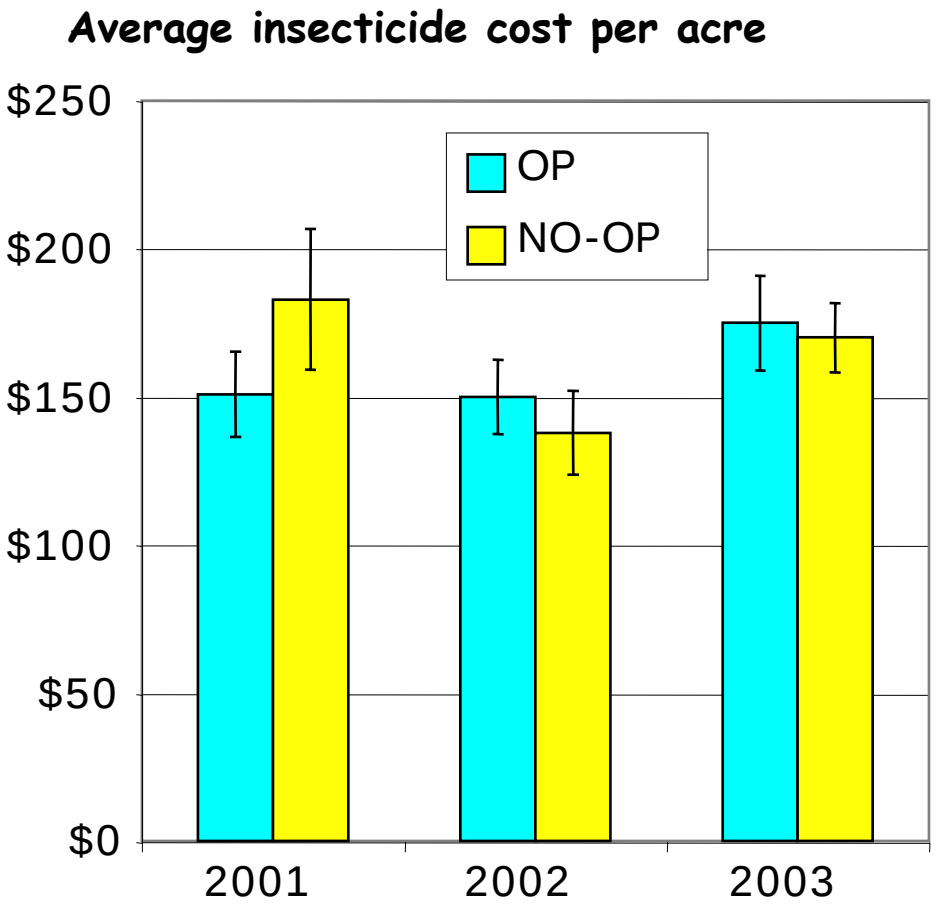
Pheromone-based Pest Management Implementation

% codling moth fruit injury bin samples

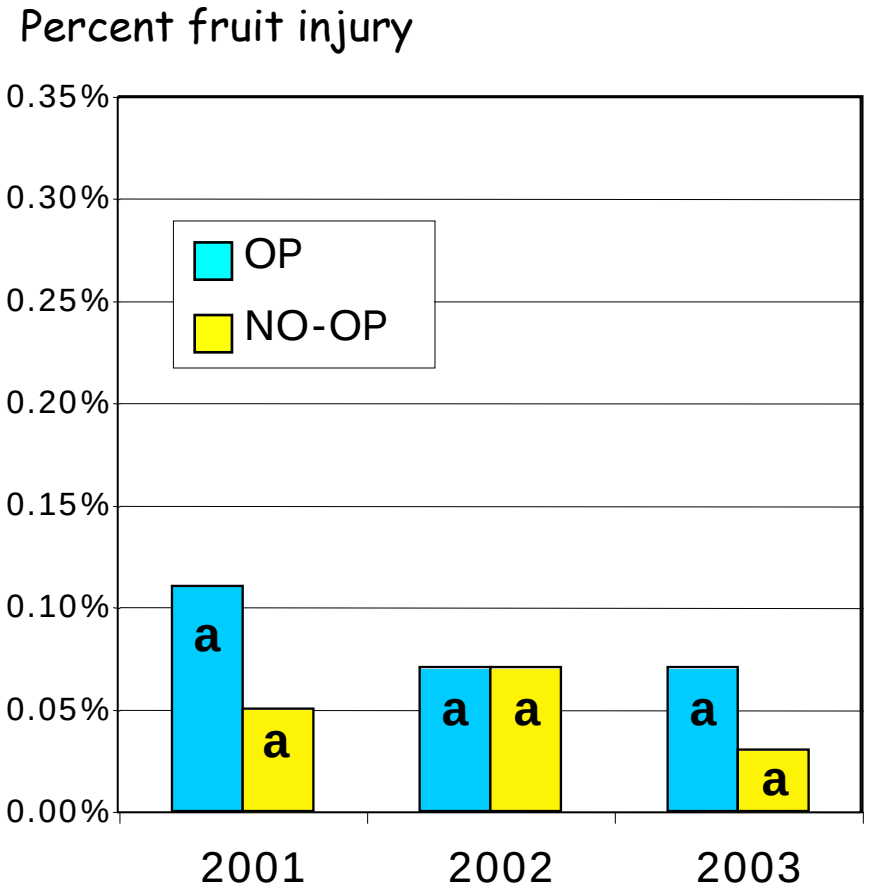


Cost of program

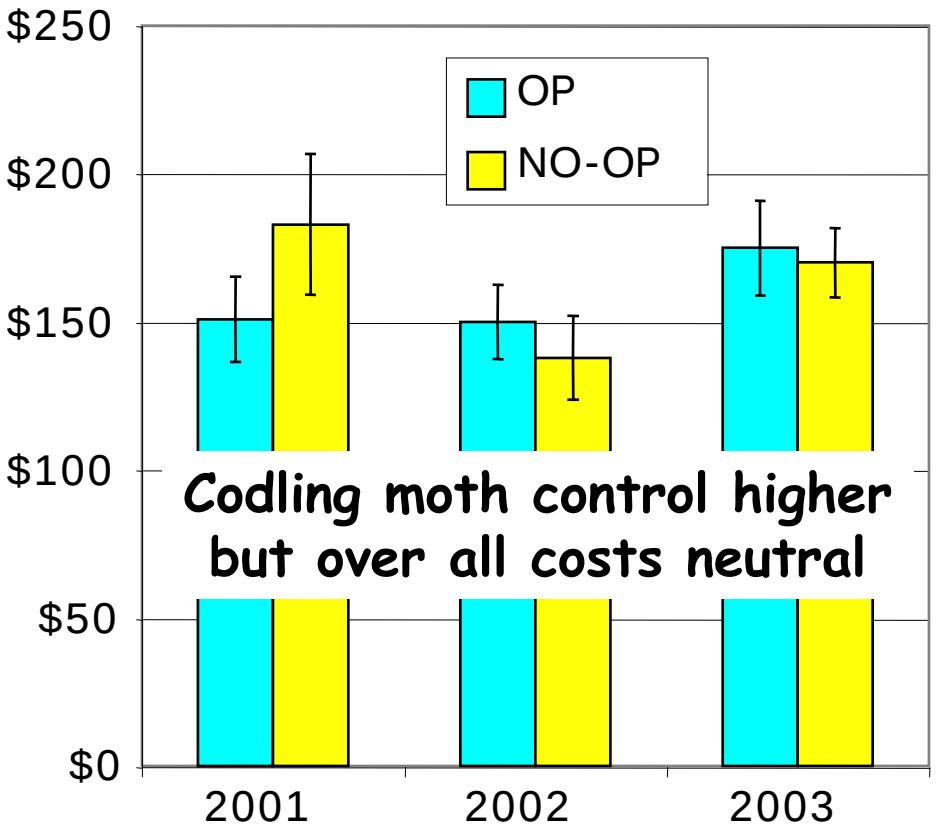


Pheromone-based Pest Management Implementation

% codling moth fruit injury bin samples



Cost of program



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Development and Adoption of Pheromone Technology in Apple IPM

What factors contribute to the impact of a pesticide on environment and human health?

Acute toxicity (LC_{50} or LD_{50} values)

Chronic toxicity

Carcinogenicity, reproductive effects, etc.

Persistence - soil and water

Mobility - leaching, runoff, etc.

Bio-magnification or accumulation

Bio-availability

Effects on non-target organisms - biological control

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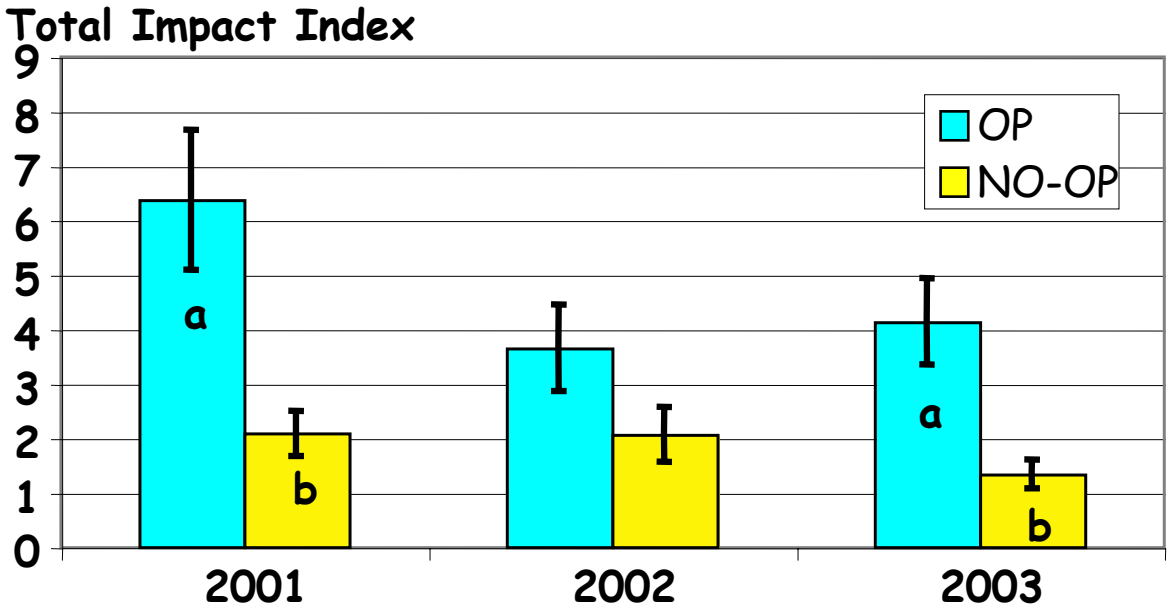
Total Impact Index rating for pheromone-based IPM

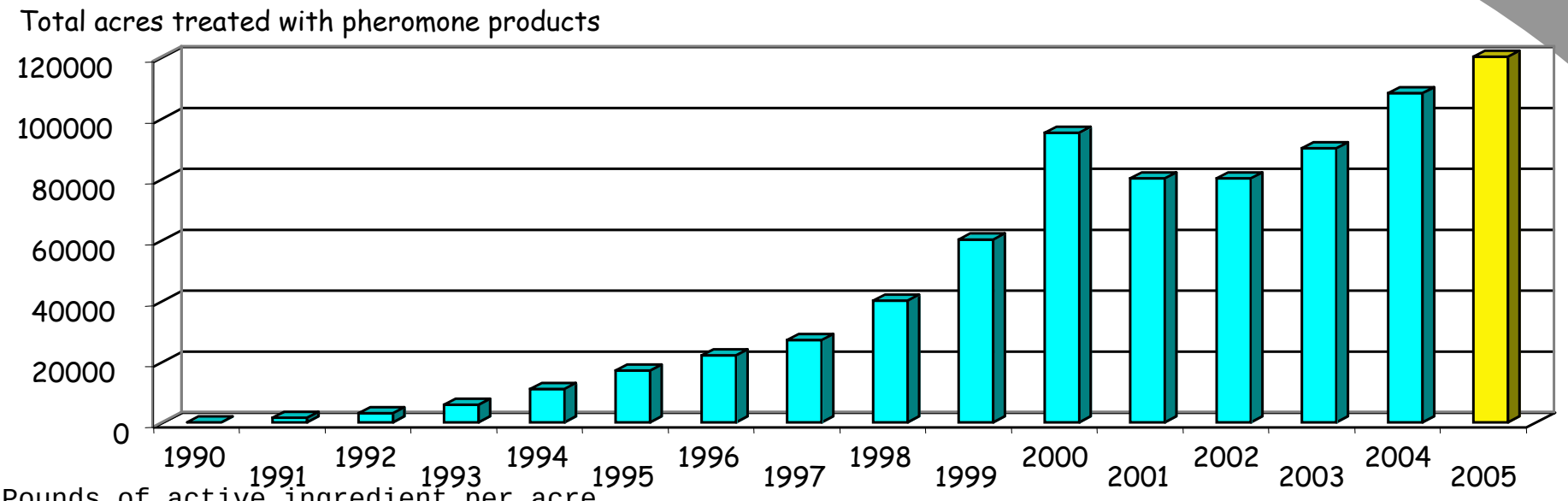
The average **Impact Index** for the 15 orchards using the NO-OP approach to supplementing pheromone treatments for codling moth was significantly lower in two of three years compared to those orchards using OP and other more toxic alternatives.

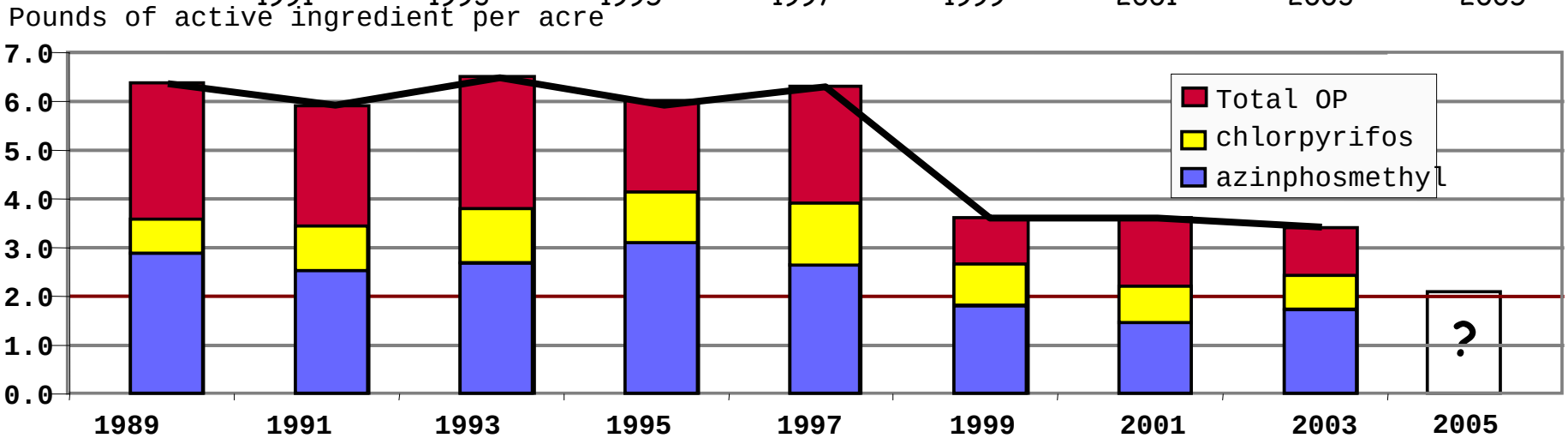


Material	Impact Index
Guthion 50W	3.000
Guthion 50W	0.750
Imidan 70W	7.420
Imidan 70W	0.090
Lorsban 4E	4.000
Oil	0.960
Oil	0.240
Pheromone-Isomate C+	0.000
Pheromone-Isomate C+	0.001
Sevin 80W	0.732
Sevin 80W	0.488
Success	0.011
Total	17.69

Material	Impact Index
Esteem EC	0.067
Intrepid 2F	0.030
Intrepid 2F	0.030
Oil	0.960
Oil	0.240
Oil	0.120
Oil	0.240
Oil	0.480
Oil	0.480
Pheromone-Isomate C+	0.000
Pheromone-Isomate C+	0.001
Sevin 80W	0.610
Success	0.011
Success	0.019
Total	3.19

Development and Adoption of Pheromone Technology in Apple IPM: Adoption





Development and Adoption of Pheromone Technology in Apple IPM: New Technology

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Sprayable dispenser systems

NoMate fiber technology
Hercon flake technology
Suterra encapsulated technology

- ✓ Promise of reduced labor, reduced cost to grower, flexibility of control (not year long), and enhanced efficacy.
- ✓ Technologies still being evaluated, mechanism, rates, application methods, etc.

Ground and aerial application


Thank You!