

Improving Urban Surface Water Pesticide Toxicity Reduction Efforts: Pesticide Use Data and Recommendations for Action

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Presentation Overview

- Part 1—Urban pesticide use update
- Part 2—Recommendations to improve urban surface water pesticide toxicity reduction activities



Urban Pesticide Facts

- California has >900 registered pesticide active ingredients in >11,000 registered pesticide products
- At least half of California pesticide use is in urban areas
- In the San Francisco Bay Area
 - >93.5% of all pesticide use is urban
 - >96% of pyrethroids use is urban
 - >96% of use of pesticides of concern is urban

Pesticides of Concern

- Pyrethroids
 - High risk of urban creek sediments toxicity
- Carbaryl & Malathion
- PHMB
 - Swimming pool and spa biocide
- Copper
 - Pool, spa, and fountain algaecides
 - Fungicides
 - Wood preservatives
- Metam sodium root killers
 - Contain NDMA
- Fipronil??





Priority Pyrethroids

- Greatest potential to cause adverse effects in aquatic ecosystems receiving urban discharges
 - Bifenthrin
 - Cyfluthrin and Beta-Cyfluthrin
 - Cypermethrin
 - Deltamethrin
 - Esfenvalerate
 - Lambda-Cyhalothrin
 - Permethrin
 - Possible addition: Tralomethrin

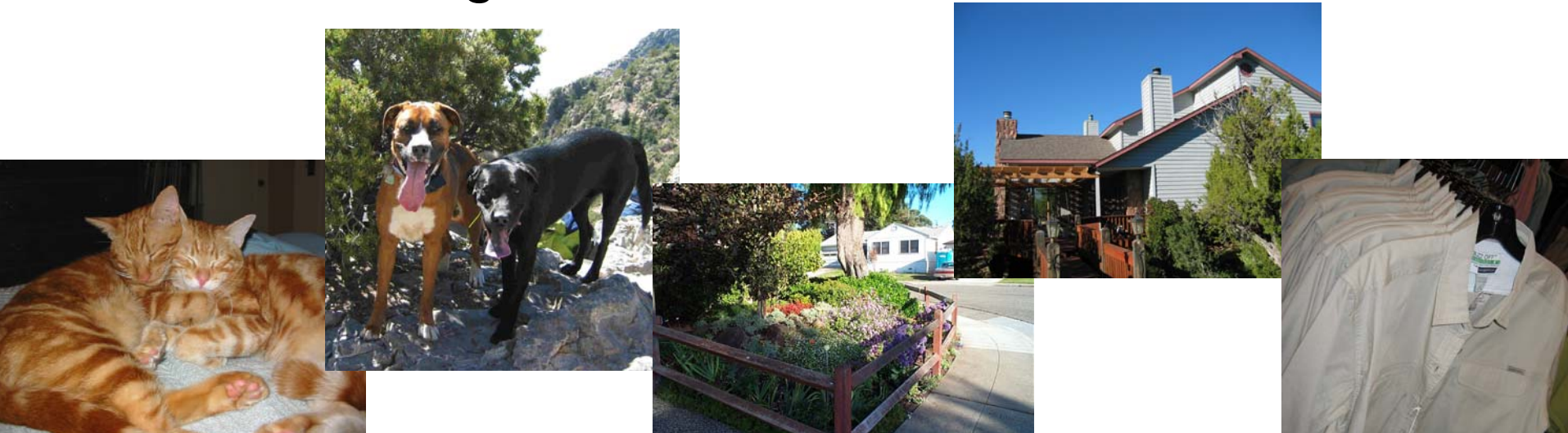
Pyrethroids Are Causing Toxicity in California Waters

- Most incidents involve organisms living in sediments
- Toxicity found in California rivers and streams
 - No data for salt water yet
- Future is a big concern
 - Is toxicity occurring in urban areas?
 - Is there more toxicity in creeks than in the lab? (Toxicity↑ as T↓)
 - Can they build up in sediments?
 - Use has increased dramatically



Pyrethroids Have Many Uses

- Keeping insects out of buildings
- Underground termites
- Lawn/garden insects
- Pet fleas
- Clothing





Pesticide Use Estimates— Data Sources

- DPR Pesticide Use Reports
 - All applications by professionals must be reported (all ag use and some urban use)
- DPR Pesticide Sales Data
 - All pesticide sales must be reported
- Unreported uses are primarily urban
 - Residential & other urban applications by non-professionals
 - Consumer products & biocides (disinfectants, paints)



Approach to Estimating Bay Area Urban Pesticide Use

$$\text{Statewide Unreported Use} = \text{Statewide Sales} - \text{Statewide Reported Use}$$

$$\text{County Unreported Use} = \text{Statewide Unreported Use} \times \frac{\text{County Population}}{\text{State Population}}$$

$$\text{Urban Use in a County} = \text{Reported Urban Use} + \text{County Unreported Use}$$

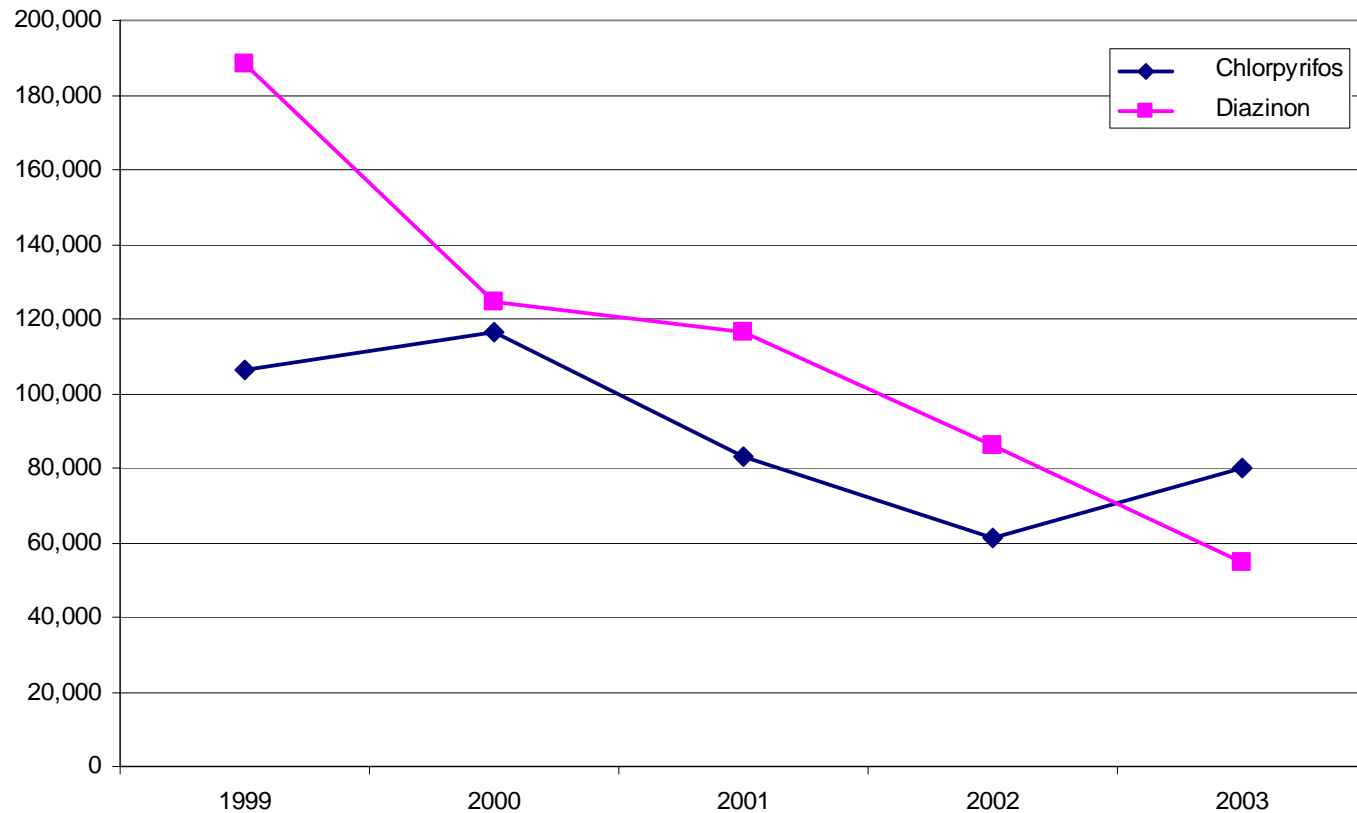
- *All unreported use is assumed to occur in urban areas*
- *Sales data is only available statewide*



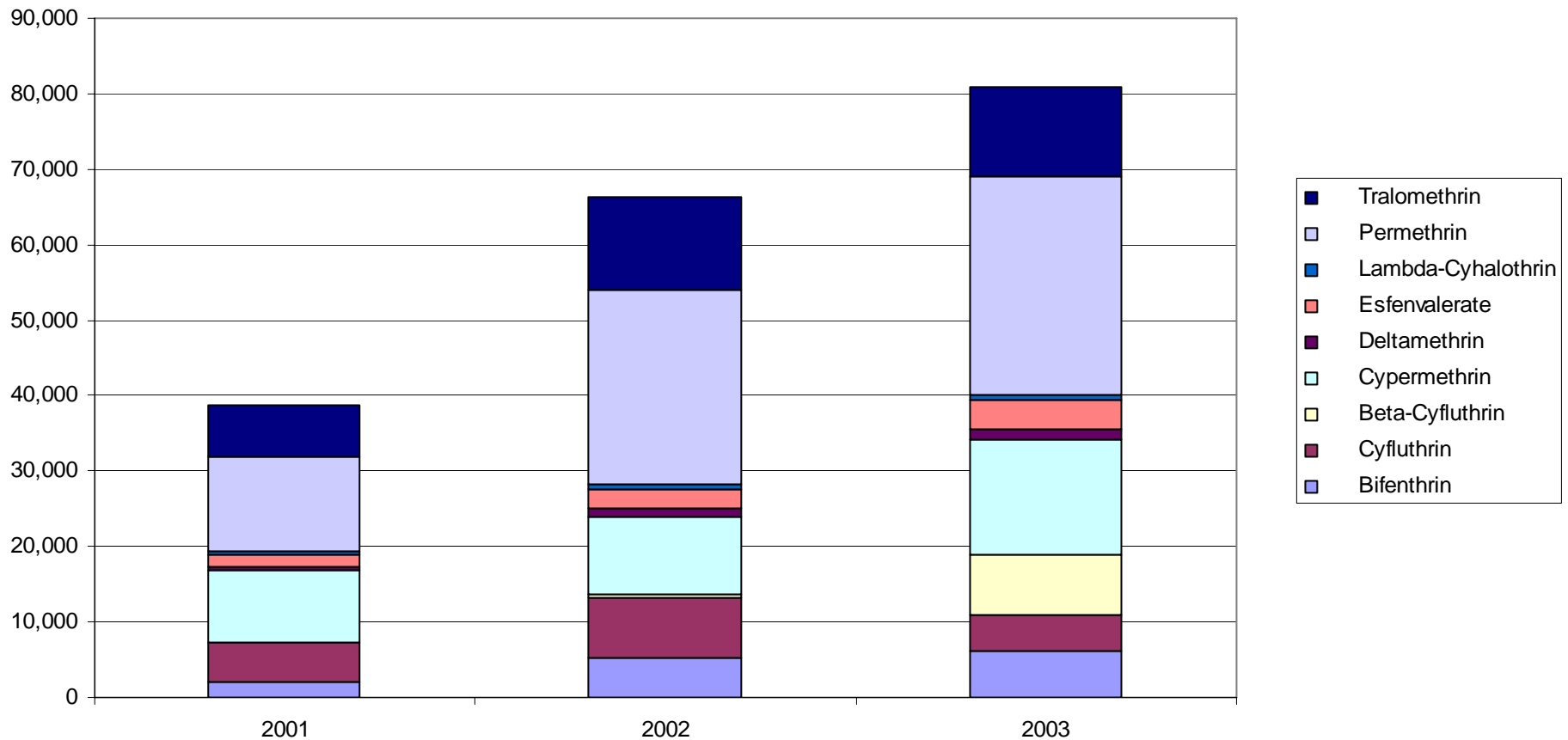
Pesticide Use Estimates— Uncertainty in Data Sources

- DPR Pesticide Use Reports
 - Under-reported (at least 10%)
 - Use data cannot differentiate above ground and subterranean applications
- DPR Pesticide Sales Data
 - Under-reported (on average 10%)

Bay Area Diazinon & Chlorpyrifos Use Decreased from 1999-2003



Bay Area Pyrethroid Use (Lb A.I.) Doubled Between 2001 and 2003



All Pyrethroids Are Not Equal

Pyrethroid Toxicity to *Hyalella azteca*

Pyrethroid	Average sediment 10-Day LC50 ($\mu\text{g/g}$ organic carbon)	Ratio to Permethrin LC50
Bifenthrin	0.52	21
Cyfluthrin	1.08	10
Beta-Cyfluthrin	1.08	10
Cypermethrin	0.38	29
Deltamethrin	0.79	14
Esfenvalerate	1.54	7
Lambda-Cyhalothrin	0.45	24
Permethrin	10.83	1
Tralomethrin	NA	Assume ~1

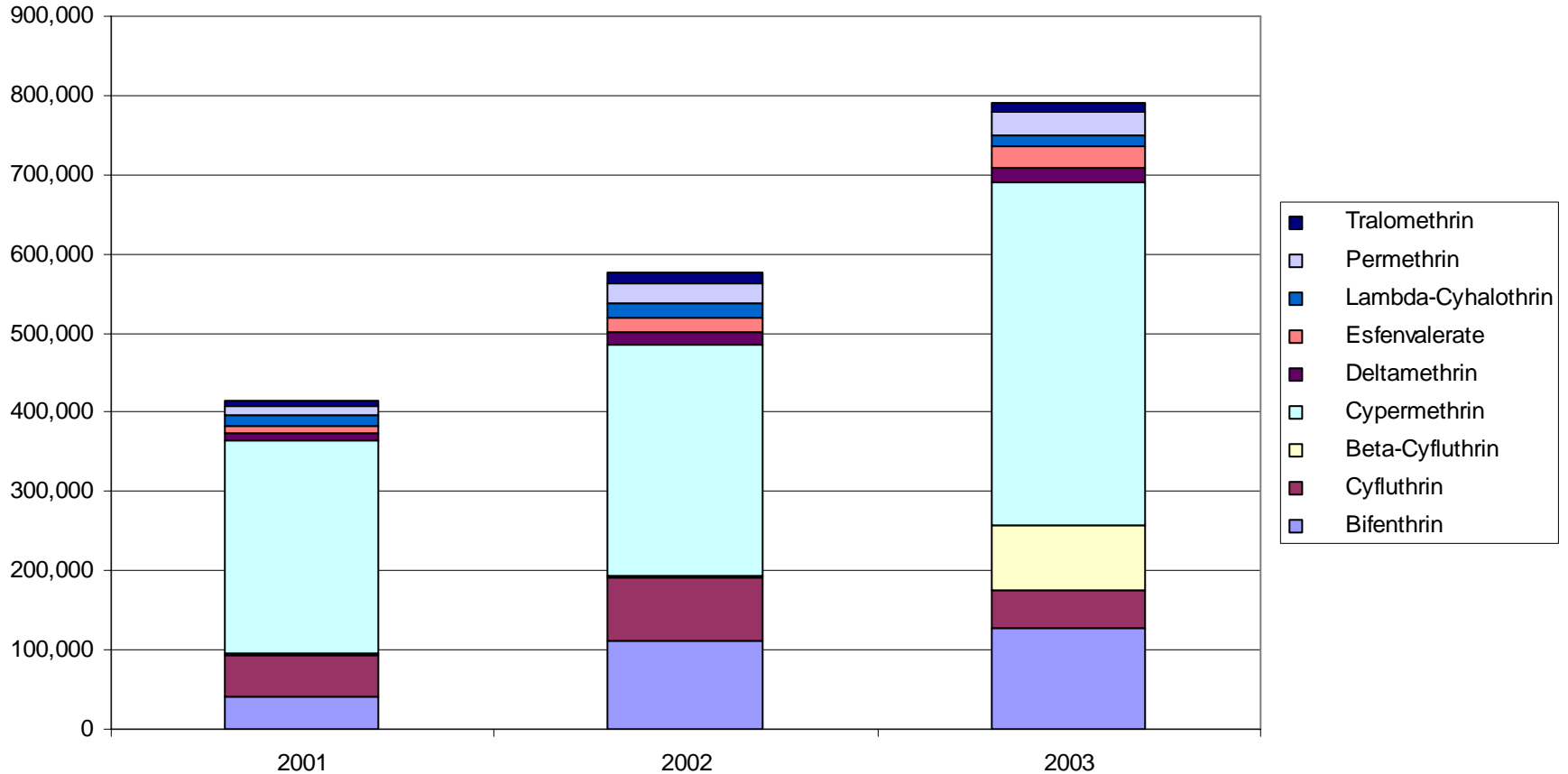
Source: Maund et al. 2002 (cypermethrin);
Amweg et al. 2005 (all others).



Hyalella azteca (amphipod)

Bay Area Cypermethrin & Bifenthrin Applications Contain the Most Toxicity

Bay Area Pyrethroid Use in Lbs of Permethrin Equivalents





Could Switching Pyrethroids Help? Maybe—But Which Ones?

Outdoor Application Rates

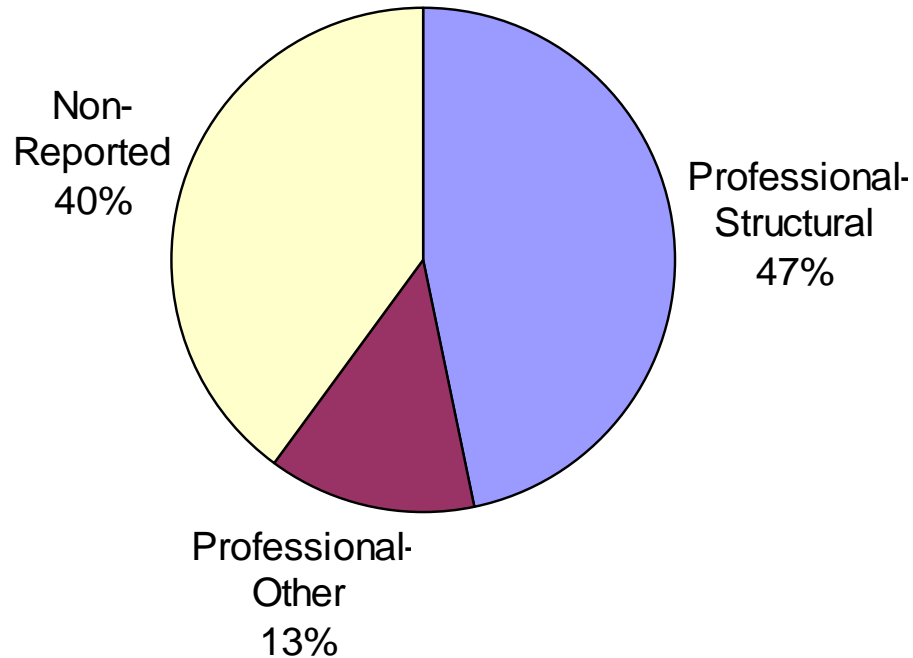
Pyrethroid	Quantity Applied per 1000 sq. ft. (grams)	Quantity Applied per 1000 sq. ft. (grams of Permethrin Equivalents)
Bifenthrin	2 to 4	46 to 91
Cyfluthrin	0.1 to 1.3	1 to 13
Cypermethrin	9 to 18	266 to 532
Deltamethrin	0.8 to 1.3	12 to 18
Esfenvalerate	0.3 to 2	2 to 14
Permethrin	4 to 74	4 to 74

Persistence in creeks also matters—but we have little creek fate data
Bifenthrin >> Permethrin (Gan et al. 2005) Others??

Note: Use rates from Insecticide Market Trends Report (TDC Environmental 2003), which did not include Beta Cyfluthrin, Lambda Cyhalothrin, or Tralomethrin

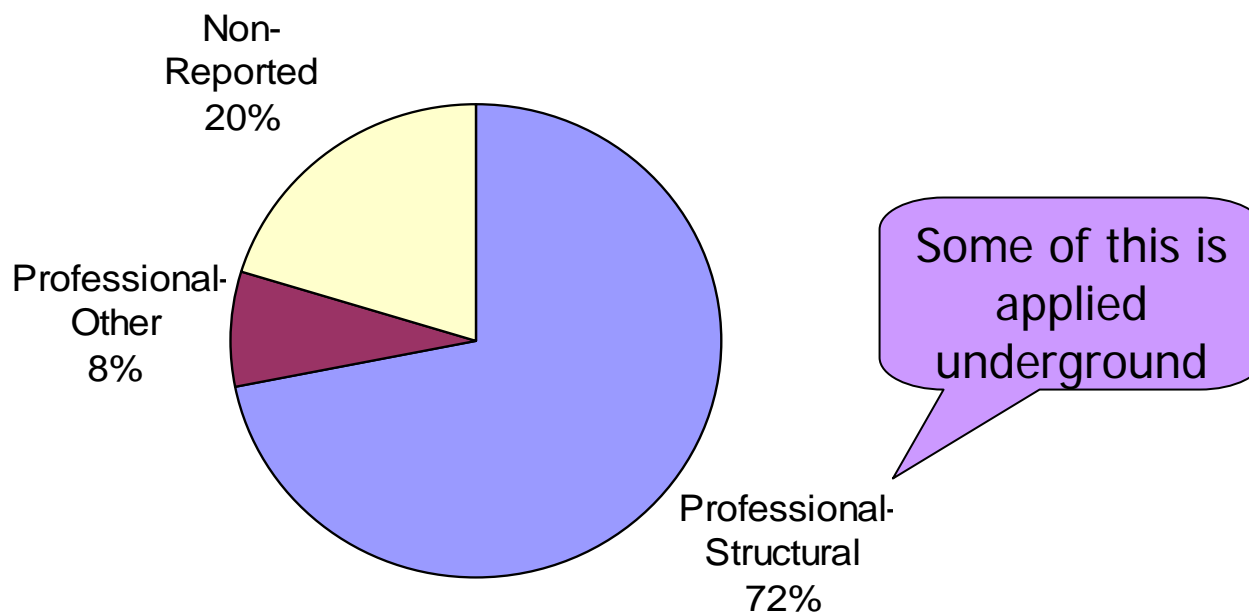
Most Urban Pyrethroid Use Is by Professionals

San Francisco Bay Area Study List
Pyrethroids Urban Uses, 2003 (Lb. A.I.)



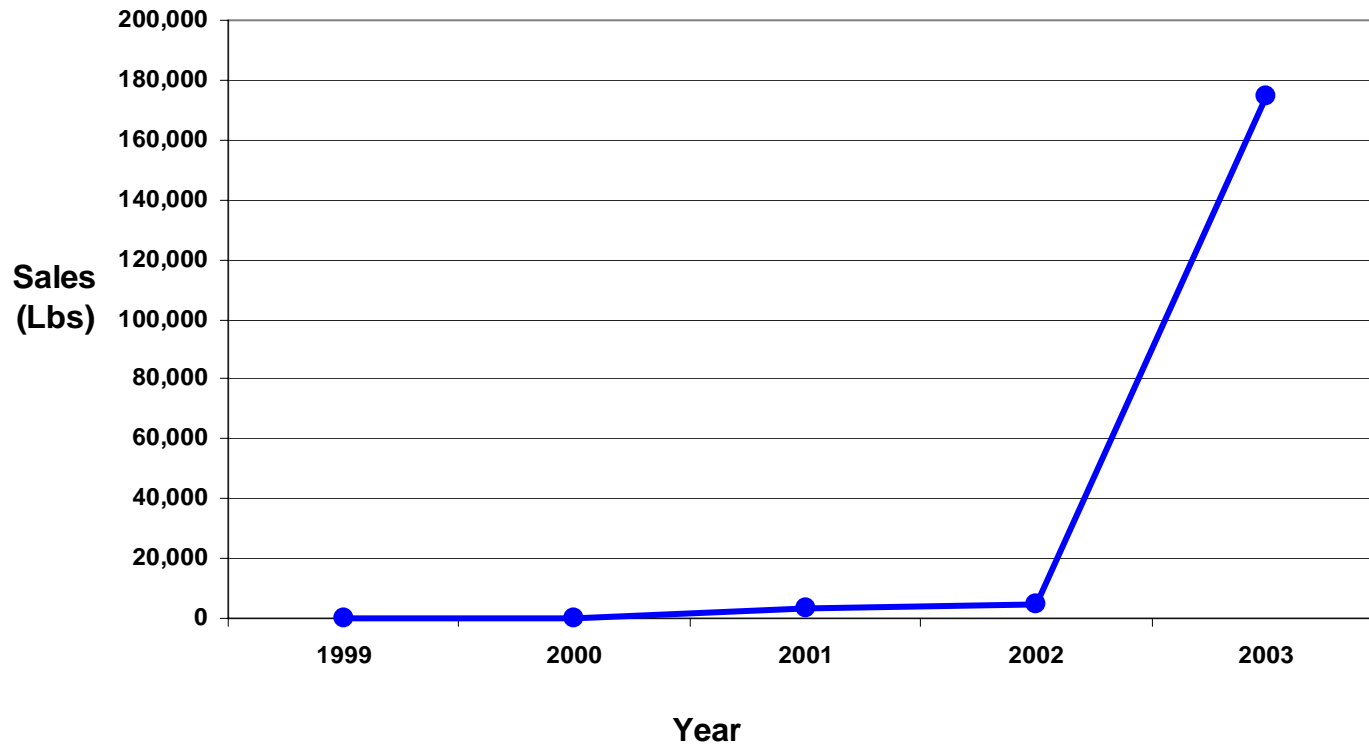
Most Urban Pyrethroid Toxicity Is Applied by Professionals for Structural Pest Control

San Francisco Bay Area Study List Pyrethroids Urban Uses, 2003 (Permethrin Equivalents)



Expressed in pounds permethrin equivalents, based on ratio of each compound's sediment toxicity to *Hyallolela azteca* to permethrin's toxicity (Amweg et al. 2005; Maund et al. 2002)

What's Next? Fipronil





Part 2: Recommendations to Improve Urban Pesticide Toxicity Reduction Activities

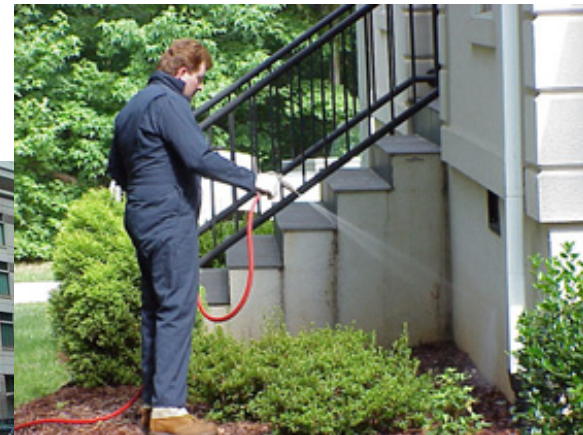


General Approach

- Shift from reacting to problems to proactively preventing pesticide-related toxicity and compliance problems
 - Monitoring—get information on problems
 - Regulatory—U.S. EPA and DPR need to protect water quality
 - Outreach/Education—Promote least toxic pest control methods

Priority Actions

- Target outdoor use of pyrethroids
 - Structural applications are the priority
 - Both business & residential
 - Lawn & garden a lower priority





Priority Actions

- Seek to change the way ants are kept out of buildings
 - IPM methods—baits and exclusion
 - Switching pesticides may create new problems (we need to learn from history)
 - Completing a formal evaluation of methods to keep ants out of buildings with PCO participation would be useful (DPR?)



Priority Actions

- Avoid recommending against/terminating use of an insecticide without promoting/requiring a less problematic substitute
 - Simply banning pyrethroids is not the answer
 - We need to change the way we control pests



Priority Actions

- Recognize that widespread use of any pesticide in an urban watershed can have significant adverse cumulative impacts on surface waters and POTWs



Recommendations— Outreach & Education

- Continue to discourage use of pyrethroids, carbaryl and malathion
- Continue to exercise discretion with recommendation of alternative pesticides for outdoor use
 - Particularly imidacloprid, pyrethrins, and fipronil
- Promote baits, pest prevention & pest exclusion



Recommendations— Monitoring & Research

- Develop standard procedures for pyrethroid sample collection & handling
- Try out pyrethroid methods in all media
- Develop chemical analysis methods for new pesticides of concern & their degradates (Fipronil, PHMB)



Recommendations— Monitoring & Research

- Conduct surveillance monitoring for pesticides of concern
 - Current priority: sediments/toxicity
 - Salt water, fresh water, POTW discharges
 - Need stable funding source for monitoring
- Publish monitoring data
- Inform U.S. EPA and DPR of any pesticide-related toxicity



Recommendations— Monitoring & Research

- Obtain additional information about pyrethroid use in urban areas
- Use U.S. EPA risk assessments to improve assessments of pyrethrins & synergists (PBO)
- Assess the water quality implications of fipronil





Recommendations— Regulatory Programs

- Improve U.S. EPA's and DPR's pesticide regulatory programs such that they:
 - Protect urban surface water quality
 - Prevent incidents of noncompliance with water quality standards and NPDES permits.
- Strengthen the network of water quality agencies working on urban pesticides

Recommendations— Regulatory Programs

- When implementing pesticide regulatory controls:
 - Consider the environmental properties of replacements
 - Design a program to avoid environmental impacts



Recommendations— Regulatory Programs

- Modify California pesticide use reporting forms:
 - Differentiate between outdoor and underground/indoor pesticide applications
- Field verify California pesticide use reporting data



Recommendations—

Funding

- Obtain funding necessary for California and Federal environmental agencies to implement the above recommendations
- Develop a stable funding mechanism to continue technical support for California water quality agency pesticide work

UP3 Project

A faint, green-tinted image of a city skyline with several skyscrapers is visible in the top right corner of the slide.

For more information:

www.UP3Project.org