

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

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# Acknowledgements

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# Presentation Overview

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



# Urban Pesticide Facts

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- 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

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- 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

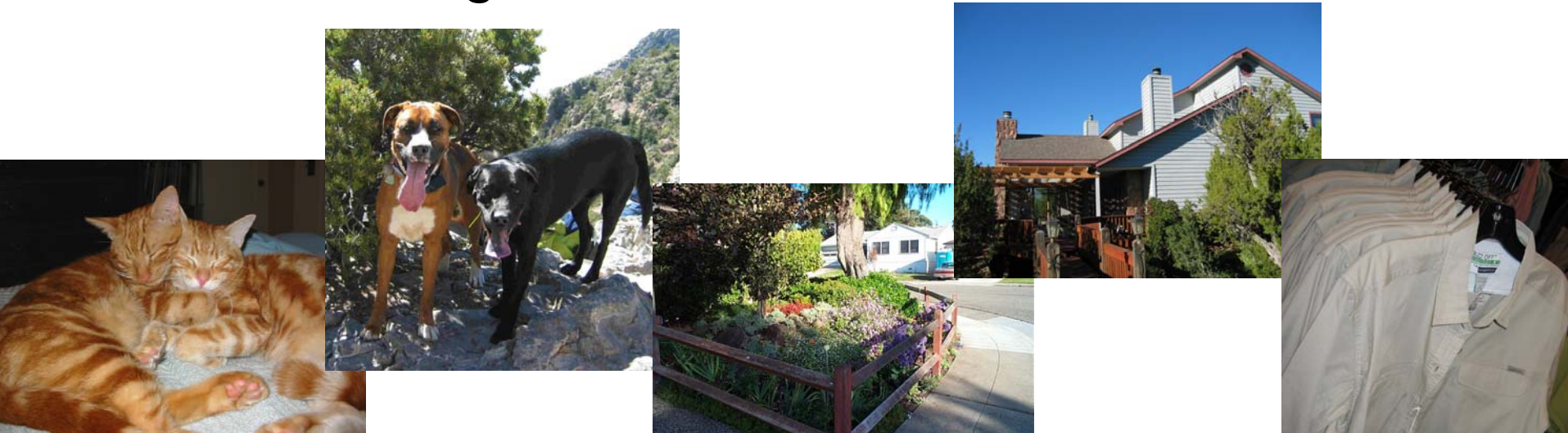
# Pyrethroids Are Causing Toxicity in California Waters

- 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

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- 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

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

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

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

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

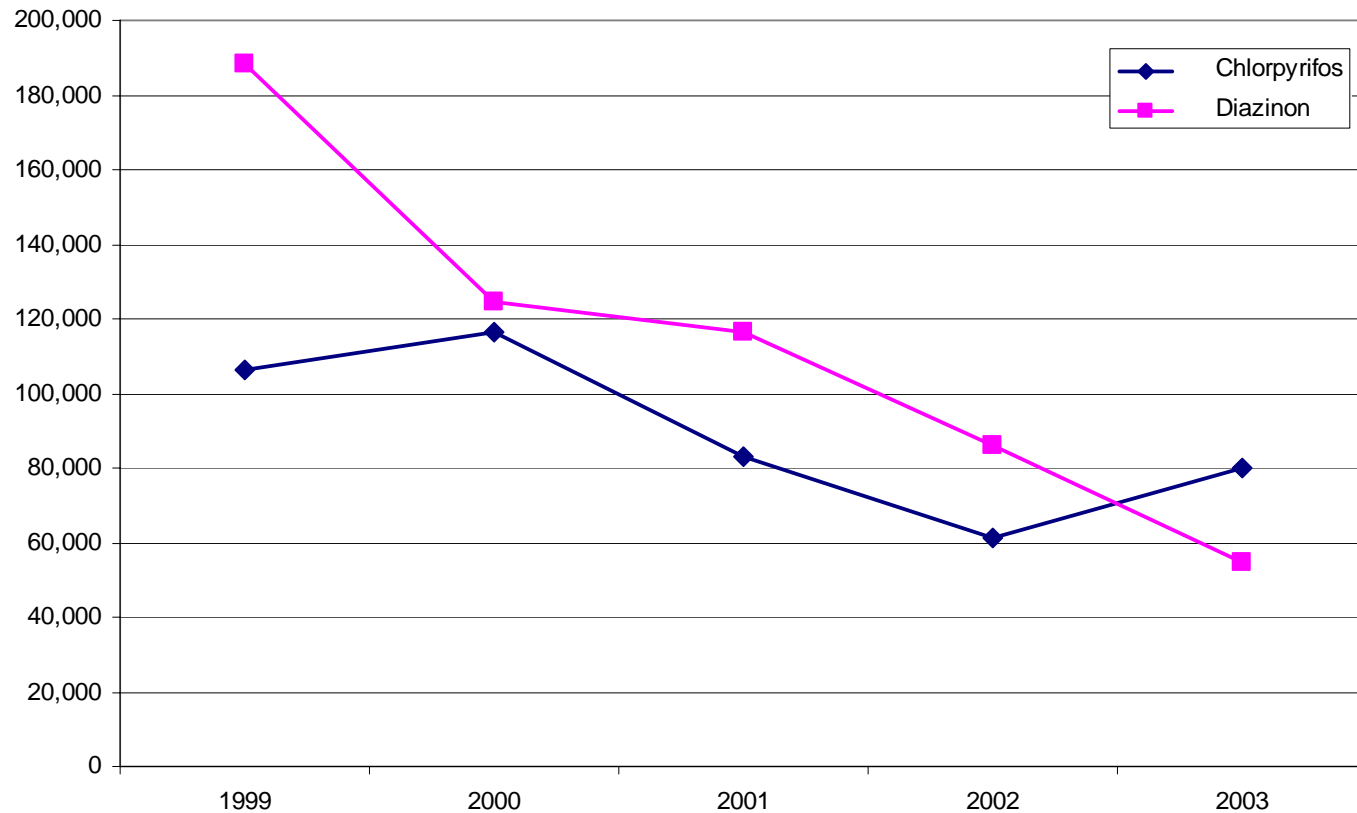


# Pesticide Use Estimates— Uncertainty in Data Sources

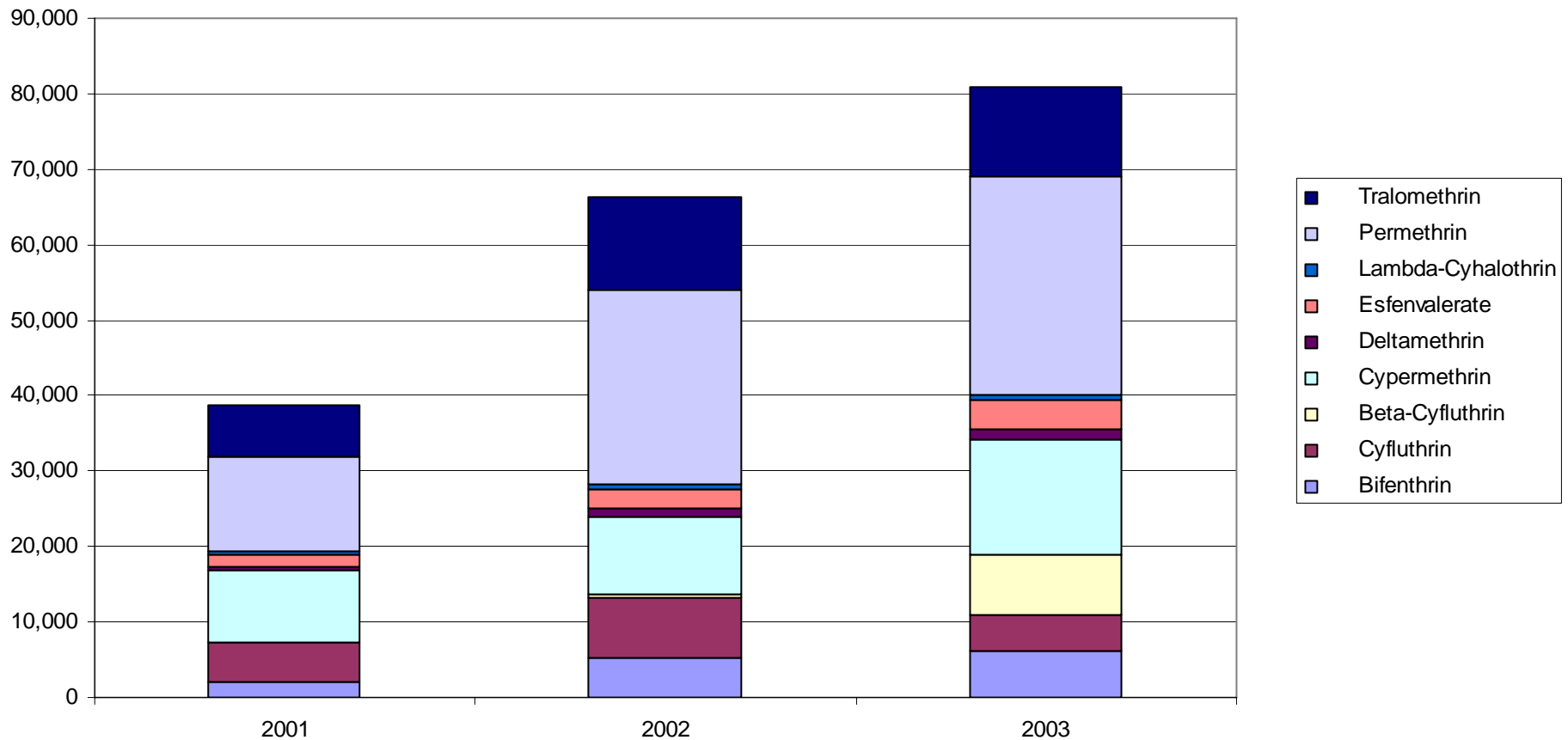
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- DPR Pesticide Use Reports
  - Under-reported (at least 10%)
  - Use data cannot differentiate above ground and subterranean applications
- DPR Pesticide Sales Data
  - Under-reported (on average 10%)

# 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

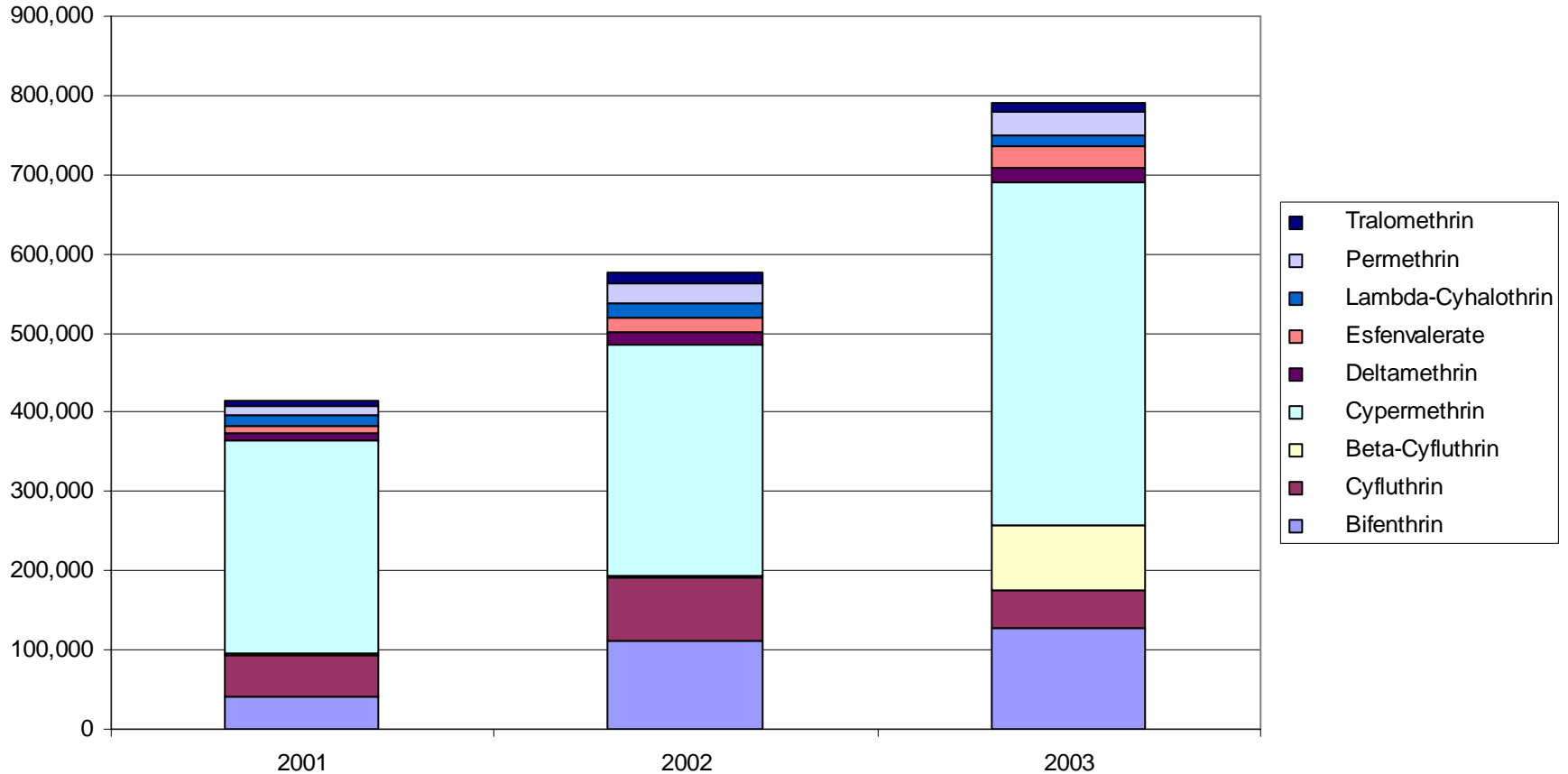
Source: Maund et al. 2002 (cypermethrin);  
Amweg et al. 2005 (all others).



*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

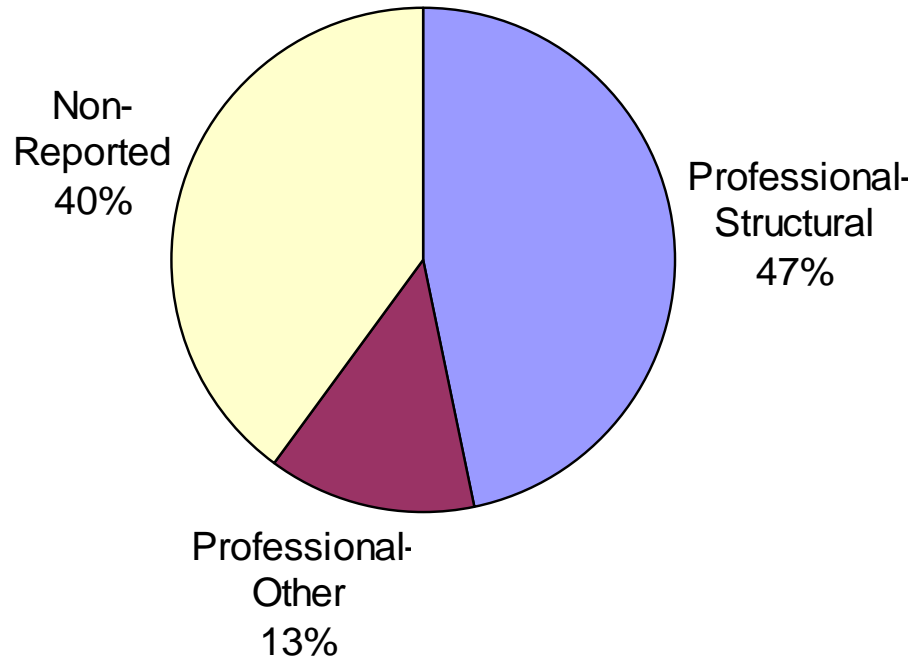
<b>Pyrethroid</b>	<b>Quantity Applied per 1000 sq. ft. (grams)</b>	<b>Quantity Applied per 1000 sq. ft. (grams of Permethrin Equivalents)</b>
Bifenthrin	2 to 4	46 to 91
Cyfluthrin	0.1 to 1.3	1 to 13
Cypermethrin	9 to 18	266 to 532
Deltamethrin	0.8 to 1.3	12 to 18
Esfenvalerate	0.3 to 2	2 to 14
Permethrin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

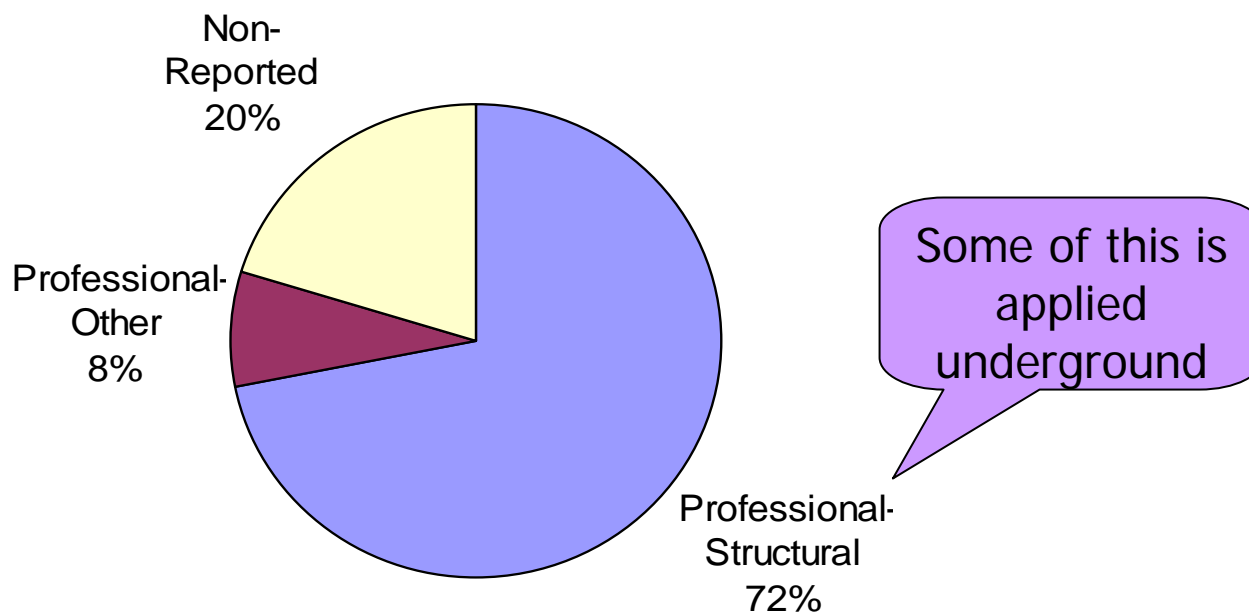
# Most Urban Pyrethroid Use Is by Professionals

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



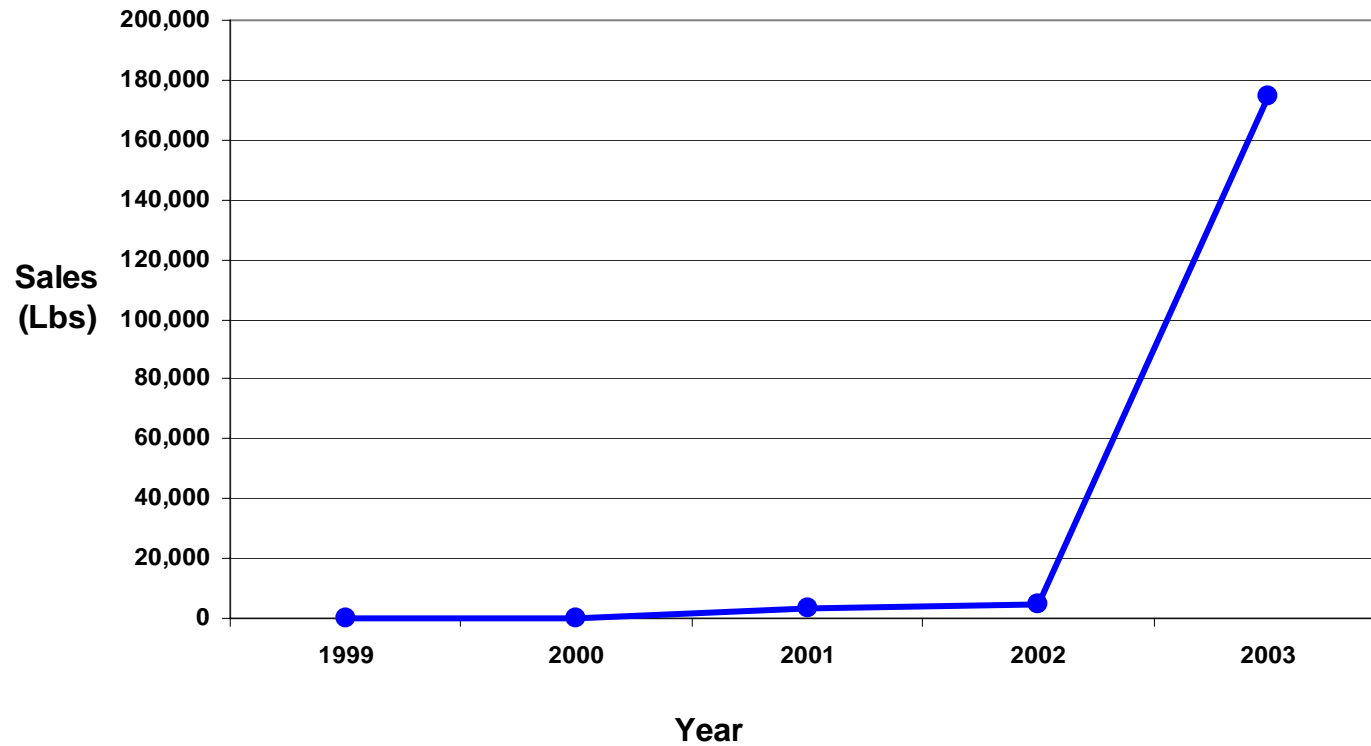
# Most Urban Pyrethroid Toxicity Is Applied by Professionals for Structural Pest Control

## 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





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## Part 2: Recommendations to Improve Urban Pesticide Toxicity Reduction Activities



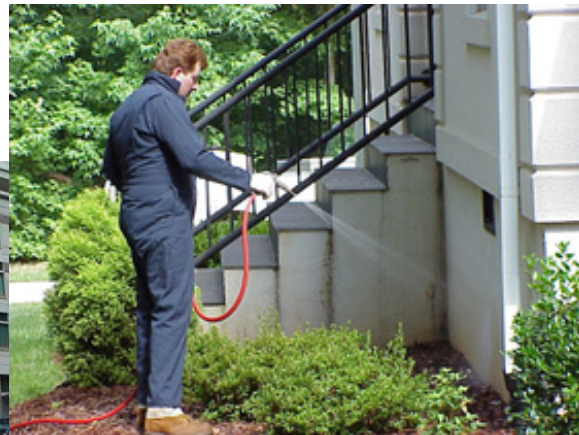
# General Approach

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- 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

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- 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

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- 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

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



# Recommendations—

## Funding

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- 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



For more information:

[www.UP3Project.org](http://www.UP3Project.org)