UP3 Project

Sources of Pyrethroids in Urban Runoff

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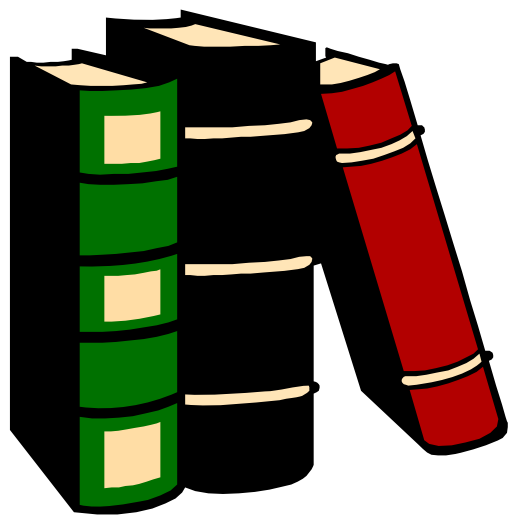
Acknowledgements

- Funding
  - State Water Resources Control Board Grant
- Project management
  - San Francisco Estuary Project
- UP3 Project report reviewers
  - U.S. EPA
  - California Dept. of Pesticide Regulation
  - SF Bay Regional Water Board
  - Tri-TAC (Wastewater agencies)
  - CASQA (Stormwater agencies)

Data Sources

- California pesticide databases
  - Pesticide use reports
  - Sales data
  - Product labels
- Scientific literature
- Government agency reports
- UP3 Project reports



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
  - Disinfectants & biocides
  - Keeping ants out of buildings

Urban Runoff Carries Pesticides to Creeks

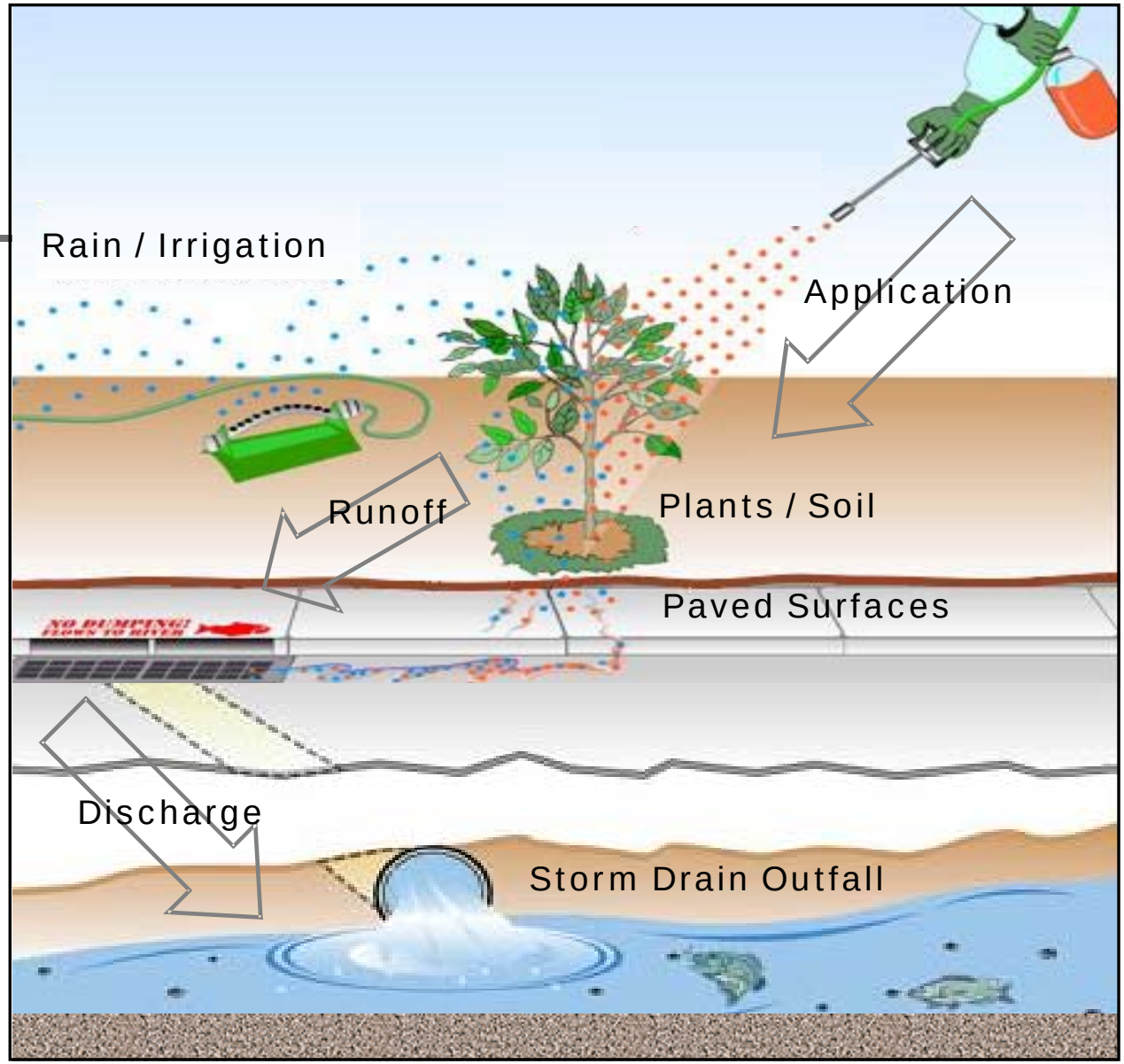
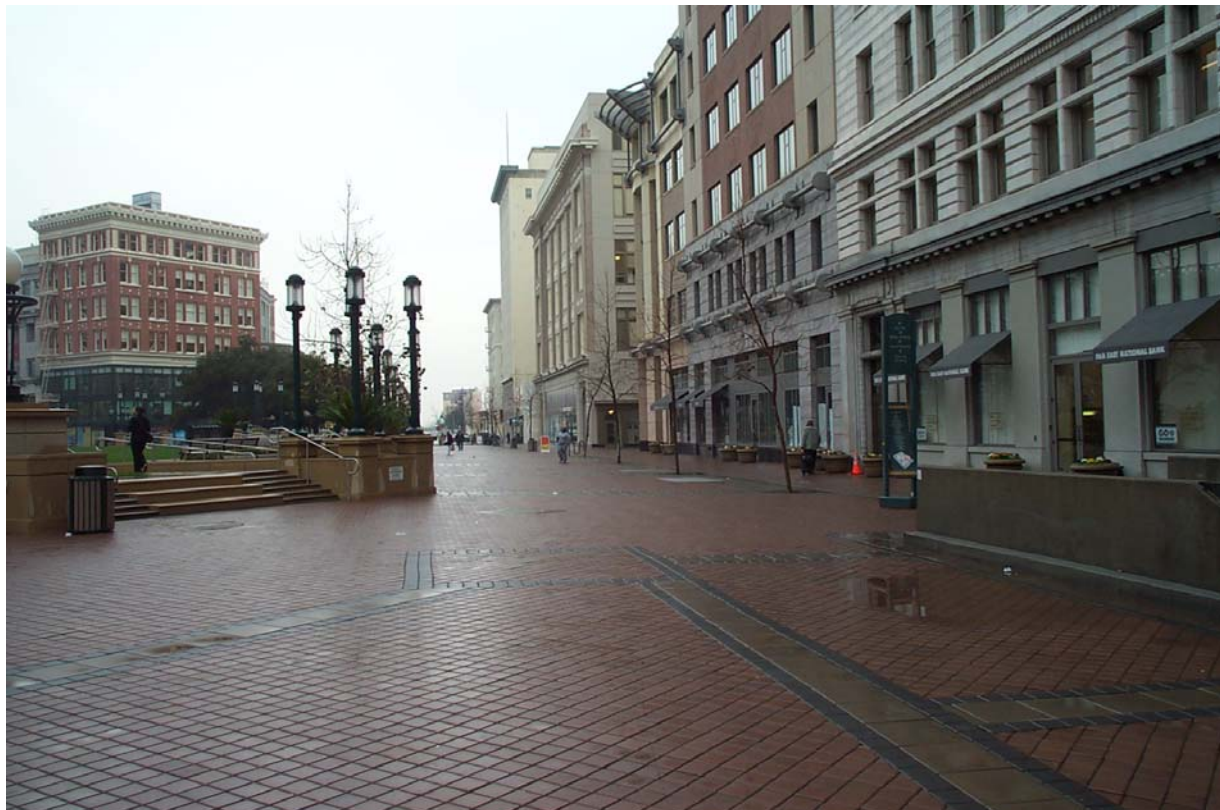
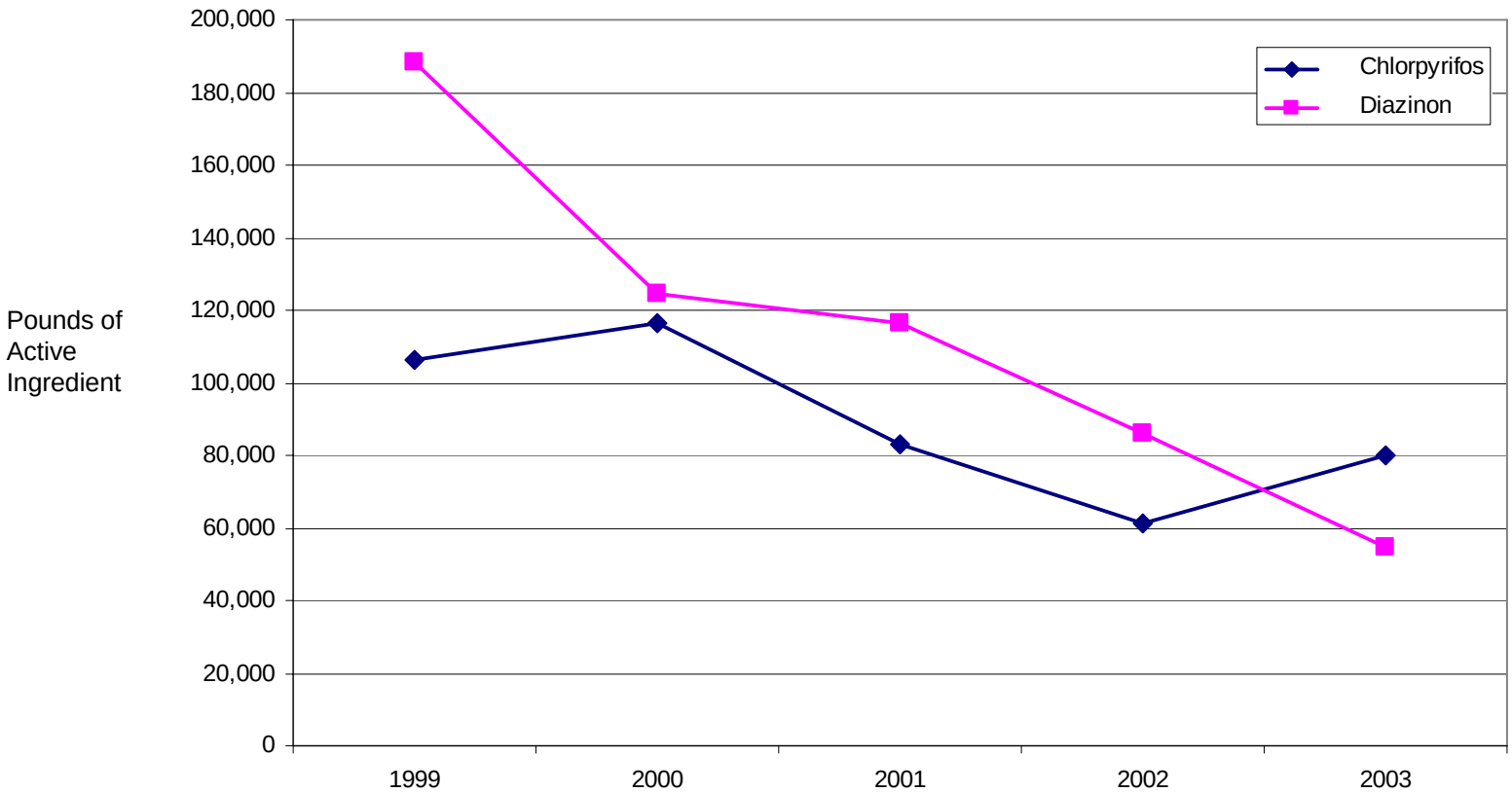


Figure courtesy SF Bay Regional Water Board, based on U.C. IPM Project drawing

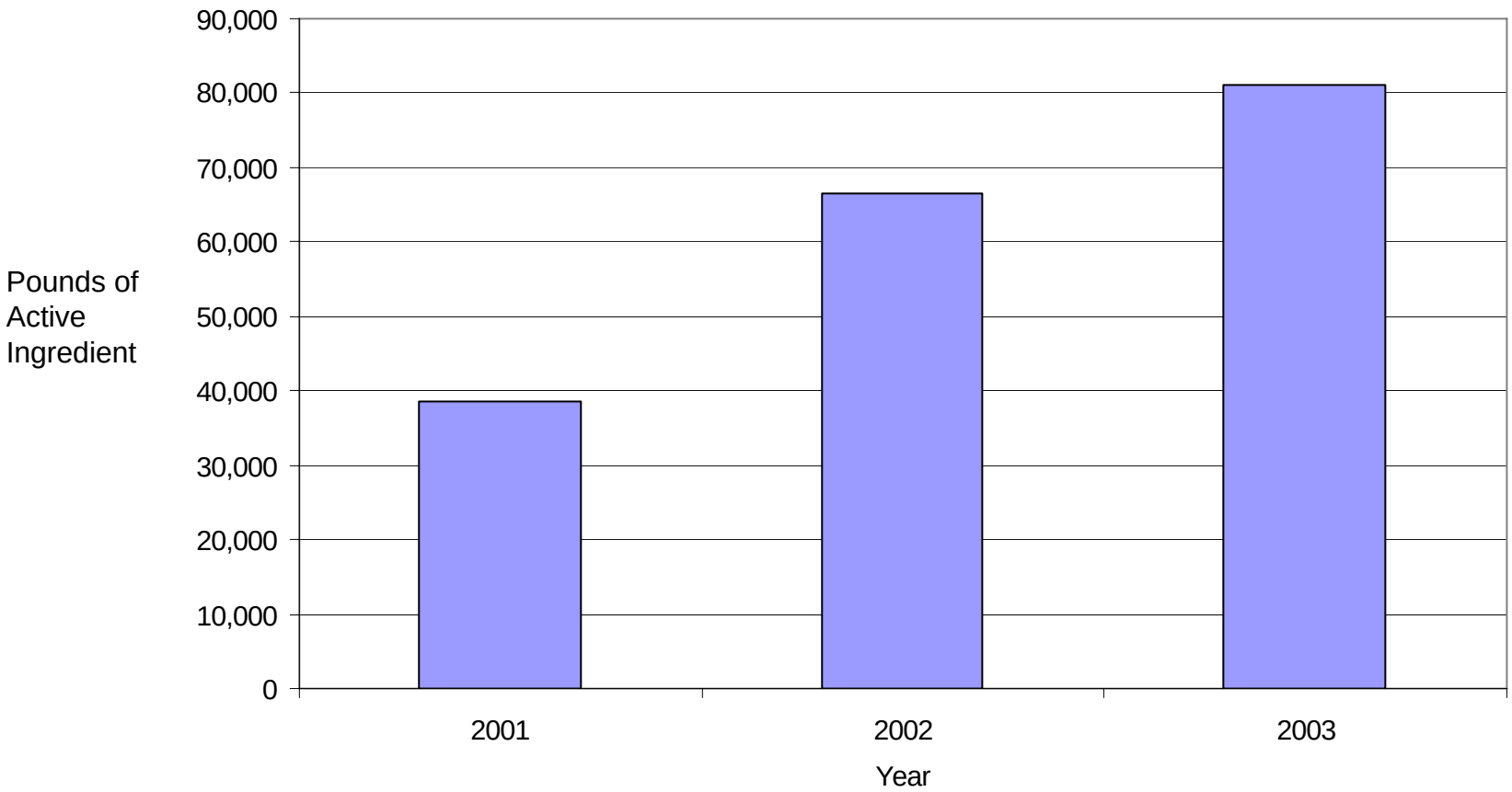
Which Pesticide Uses Are Most Important for Water Quality?



Bay Area Diazinon & Chlorpyrifos Use Decreased from 1999-2003



Bay Area Pyrethroid Use Doubled Between 2001 and 2003



Pyrethroids Have Many Uses

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





Priority Pyrethroids for Water Quality (Based on Use Patterns)

- Bifenthrin
- Cyfluthrin and Beta-Cyfluthrin
- Cypermethrin
- Deltamethrin
- Esfenvalerate
- Lambda-Cyhalothrin
- Permethrin
- Tralomethrin

All Pyrethroids Are Not Equal

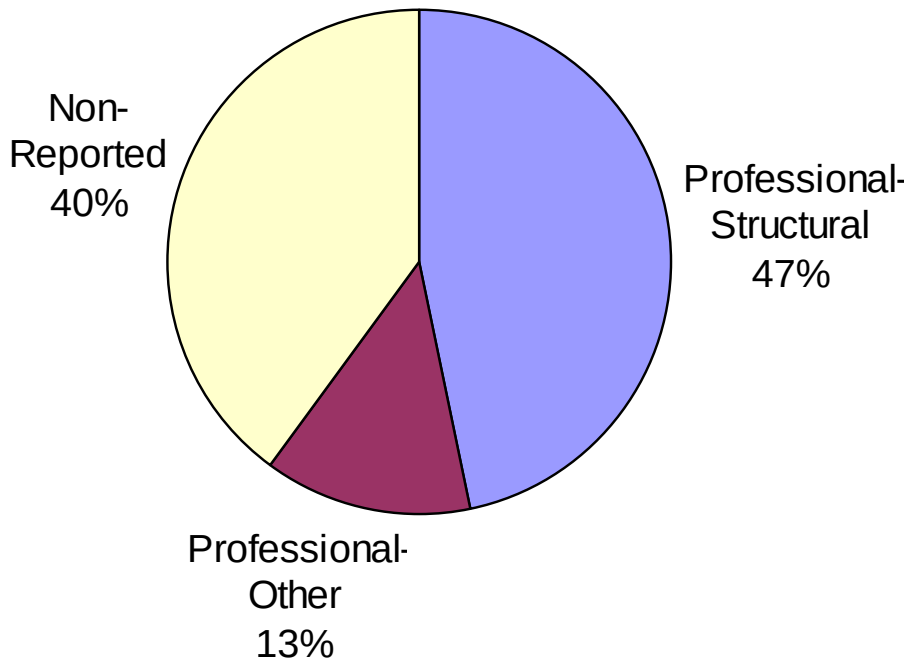
Pyrethroid Toxicity to *Hyalella azteca*

Pyrethroid	**Number of Times More Toxic than Permethrin**
Bifenthrin	21
Cyfluthrin	10
Beta-Cyfluthrin	10
Cypermethrin	29
Deltamethrin	14
Esfenvalerate	7
Lambda-Cyhalothrin	24
Permethrin	1
Tralomethrin	Assume ~1

Source: Ratio of each compound's 10-Day LC50 (µg/g organic carbon) for sediment toxicity to *Hyalella azteca* to permethrin's LC50 (Amweg et al. 2005; Maund et al. 2002)

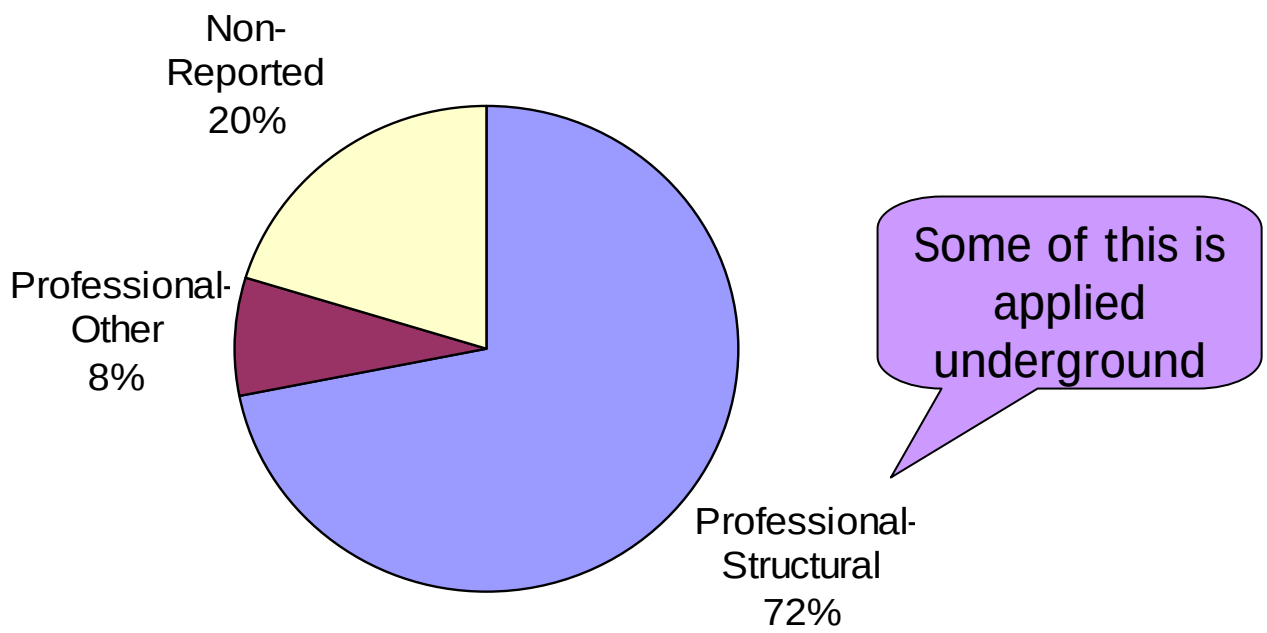
Most Urban Pyrethroid Use Is by Professionals

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



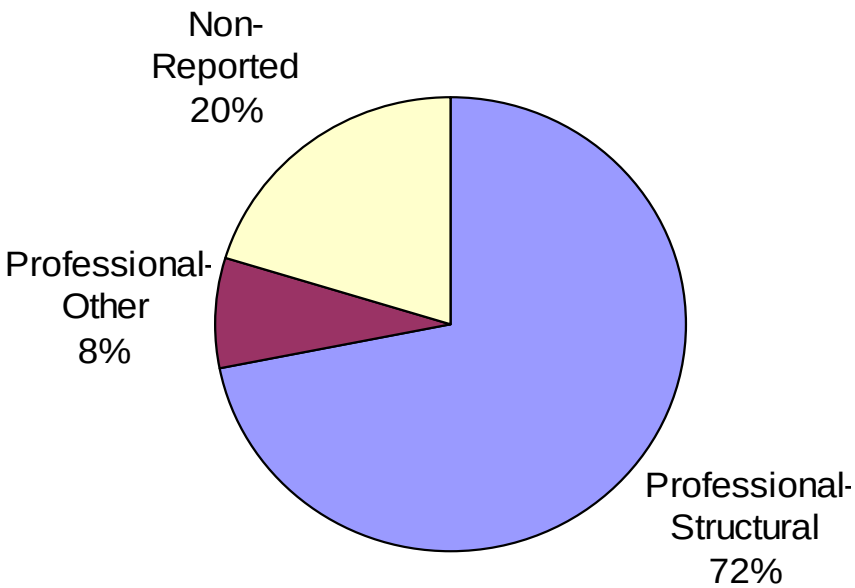
Most Urban Pyrethroid Toxicity Is Applied by Professionals for Structural Pest Control

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

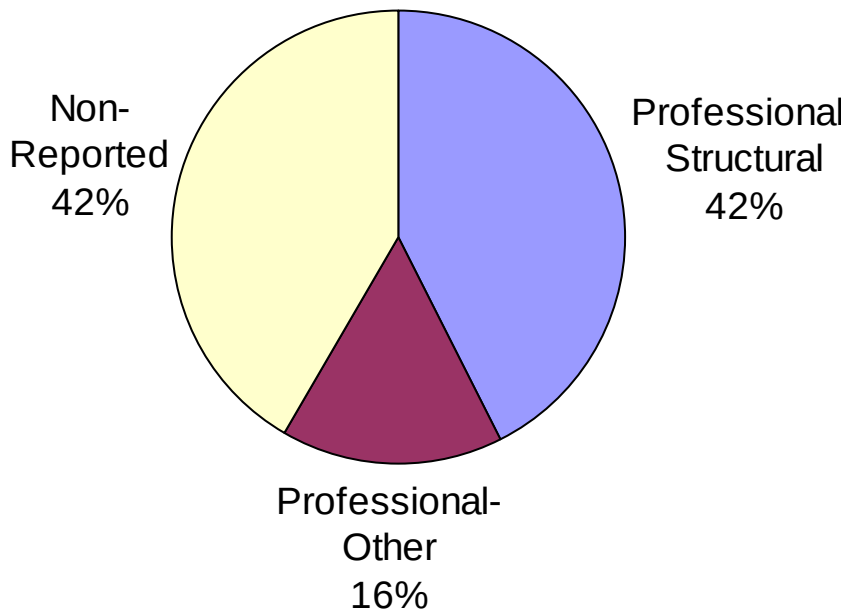


What If We Excluded All Structural Applications of Products Labeled for Underground Injection?

All Applications



Excluding Structural Applications of Products Labeled for Underground Injection

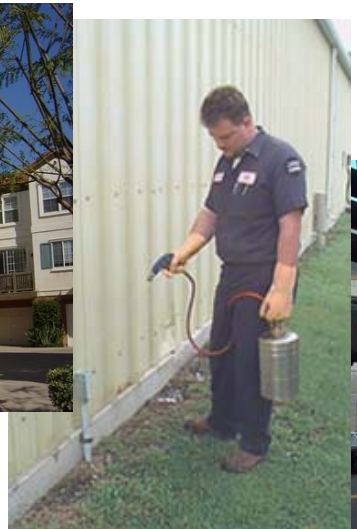


Does not account for indoor use.

Does not account for runoff fraction.

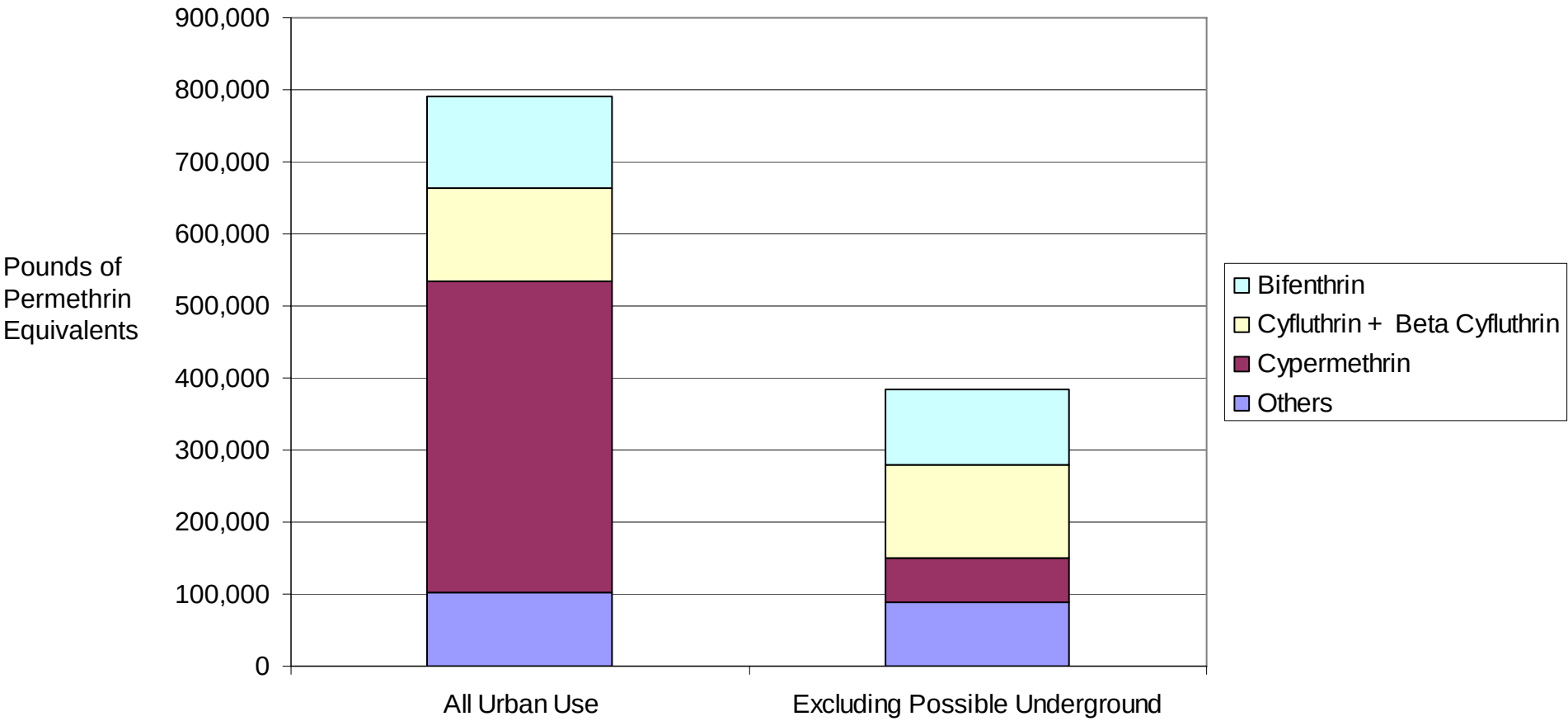
Structural Pest Control Has Higher Pesticide Runoff Fraction

- Impervious surfaces pesticide washoff >> lawn/garden washoff
- Structural pest control applications include impervious surfaces
  - Particularly multifamily & commercial buildings



Applicator photos courtesy North Carolina Cooperative Extension

Three Pyrethroids Account for Most of the Urban Toxic Equivalents Applied



Based on 2003 San Francisco Bay Area use estimates

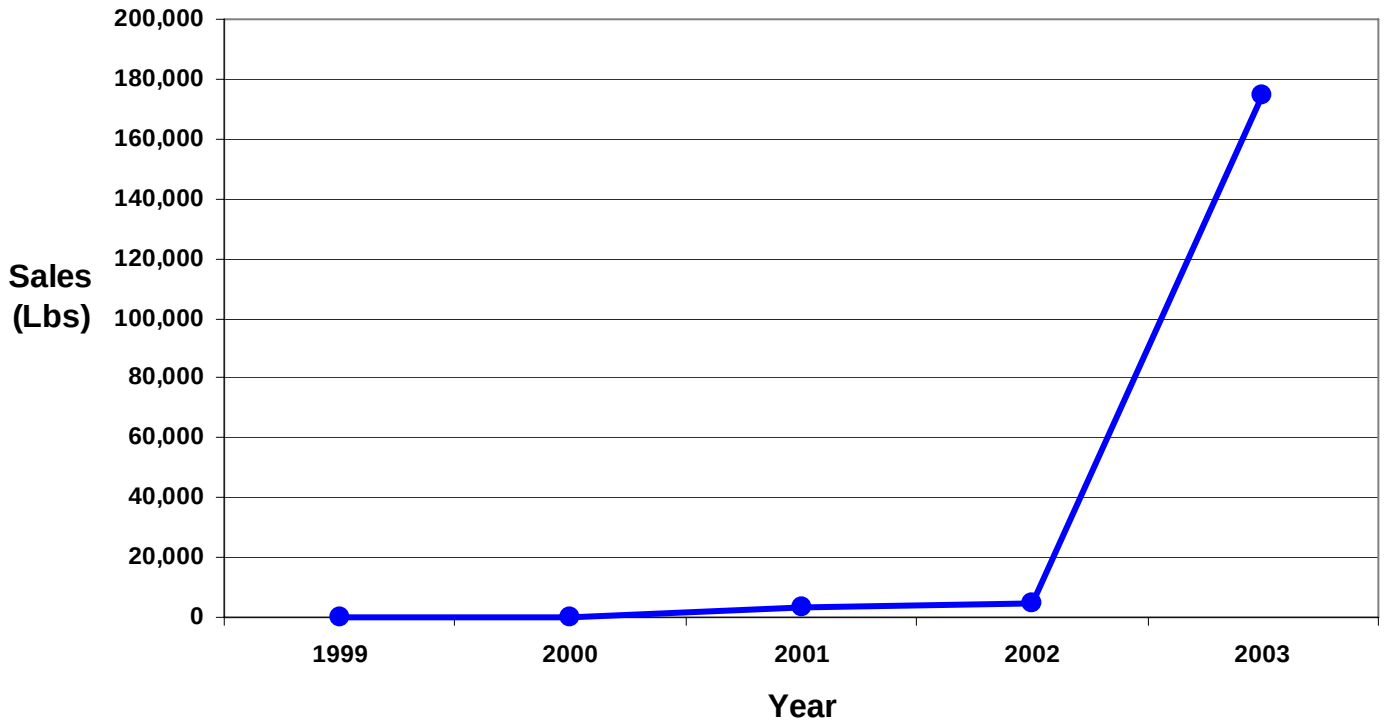
Could Switching Pyrethroids Help? Maybe—But Which Ones?

Outdoor Application Rates

Pyrethroid	**Quantity Applied per 1000 sq. ft. (grams of Permethrin Equivalents)**
Bifenthrin	46 to 91
Beta-Cyfluthrin	10 to 20
Cyfluthrin	1 to 13
Cypermethrin	266 to 532
Deltamethrin	12 to 18
Esfenvalerate	2 to 14
Permethrin	4 to 74

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

What's Next? Fipronil



Highly toxic to aquatic organisms

TERMIDOR®

Recently approved for keeping ants out of buildings

Toxicity Reduction Recommendations

- Target outdoor use of pyrethroids
  - Structural applications are the priority
  - Both business & residential (ants)
  - Lawn & garden a lower priority
- Promote new pest control approaches
  - Simply banning pyrethroids is not the answer
  - Promote IPM: baits, pest prevention & pest exclusion

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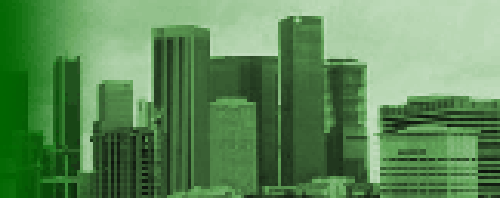

For more information:

www.UP3Project.org

Approach to Estimating Bay Area Urban Pesticide Use

Statewide Unreported Use = Statewide Sales – Statewide Reported Use

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

Urban Use in a County = Reported Urban Use + County Unreported Use

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