UP3 Project

Overview of Stormwater-Related Scientific Issues and Resources

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UP3 Project

Urban Pesticide Pollution Prevention Project

- Manager: San Francisco Estuary Project
- Funding: State Water Board, Municipalities
- Goal: Prevent surface water toxicity from urban pesticide use
- Activities:
  - Science, regulatory, & other support for water quality agencies
  - Urban Pesticides Committee
  - E-mail listserver
  - Web site www.up3project.org

Acknowledgements

- Preparation
  - Armand Ruby, Armand Ruby Consulting
  - Laura Speare, UP3 Project Manager
- Assistance with Data
  - DPR (Larry Wilhoit, George Farnsworth)
  - Scotts Miracle-Gro

Overview Topics

- California Urban Pesticide Use Data Sources
- Urban Runoff Pollutant Transport Processes
- Urban Runoff Monitoring Challenges

Today – Brief overview only
Follow-up forum on urban runoff recommended by UP3 Project and CASQA

California Urban Pesticide Use Data Sources

- Pesticide Use Reporting – DPR (Cal-PIP)
- Pounds of Pesticides Sold Reports - DPR
- Residential surveys
  - Several high-quality surveys funded by DPR/conducted by UC IPM
- Shelf surveys - UP3 Project, UC IPM

Approach to Estimating Urban Pesticide Use with DPR Data

Urban Use	=	Reported Urban Use	+	Over-the-Counter (OTC) Sales

Assumption:

- *OTC Sales = Urban use that does not require reporting (i.e., residential) (overestimate)*

Statewide OTC Sales	=	Statewide Sales	–	Statewide Reported Use

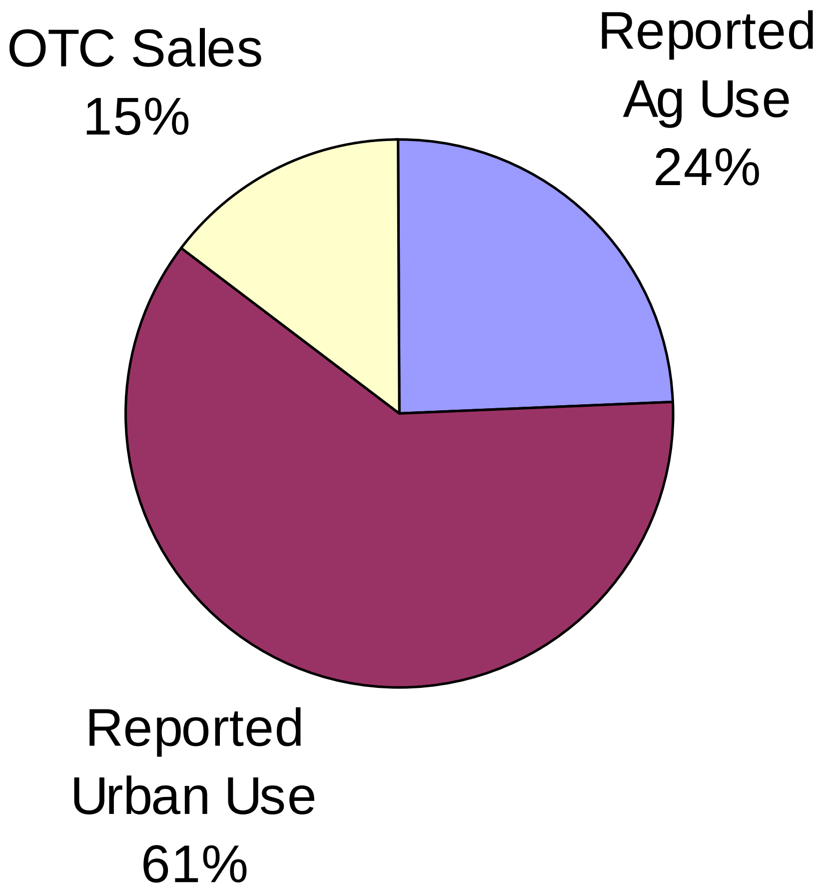
Reality check:

- *Estimated OTC sales of bifenthrin 2004/05 = 13,000 lb ai*
- *Scotts actual OTC sales of bifenthrin 04/05 = 11,000 lb ai*

Bifenthrin Example Data Notes

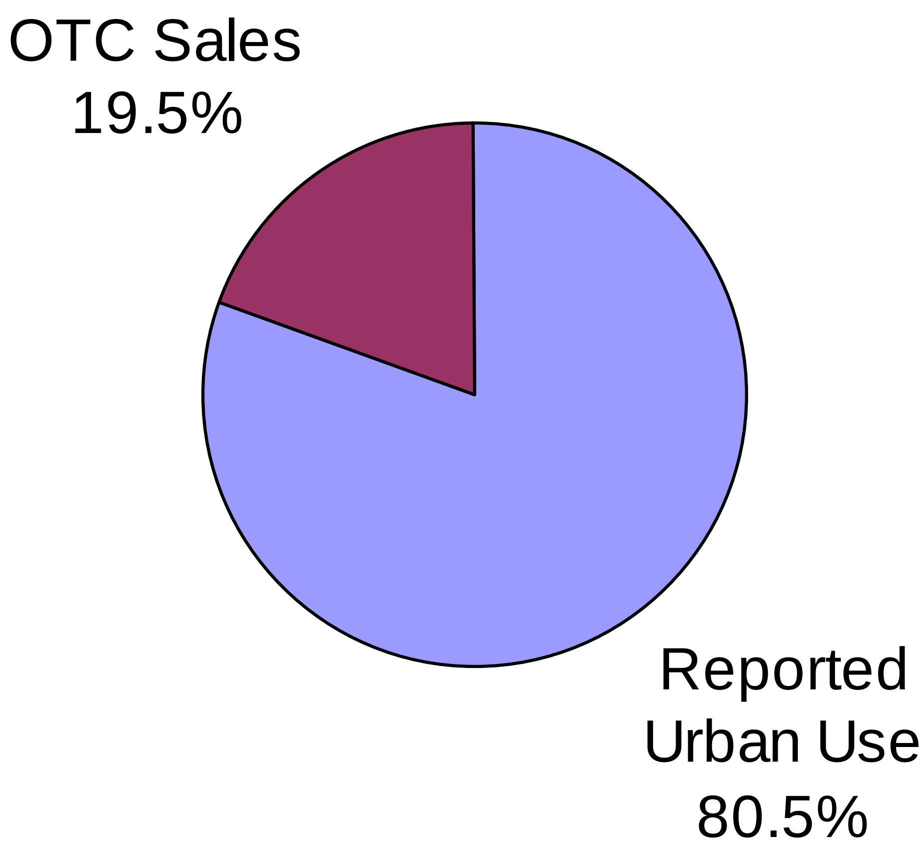
- Example based on 2-year averages for 2004/05
- DPR data have significant uncertainties
  - DPR PUR data include errors from non reporting (variable; estimated to average about 10%) and data handling (estimated <1-2%)
  - DPR Sales data include errors from non-reporting, incorrect reporting, data entry, and annual variations – uncertainty likely >10%
- Use of DPR and Scotts data does not constitute endorsement of this analysis

About 75% of 2004-2005 California Bifenthrin Use was in Urban Areas



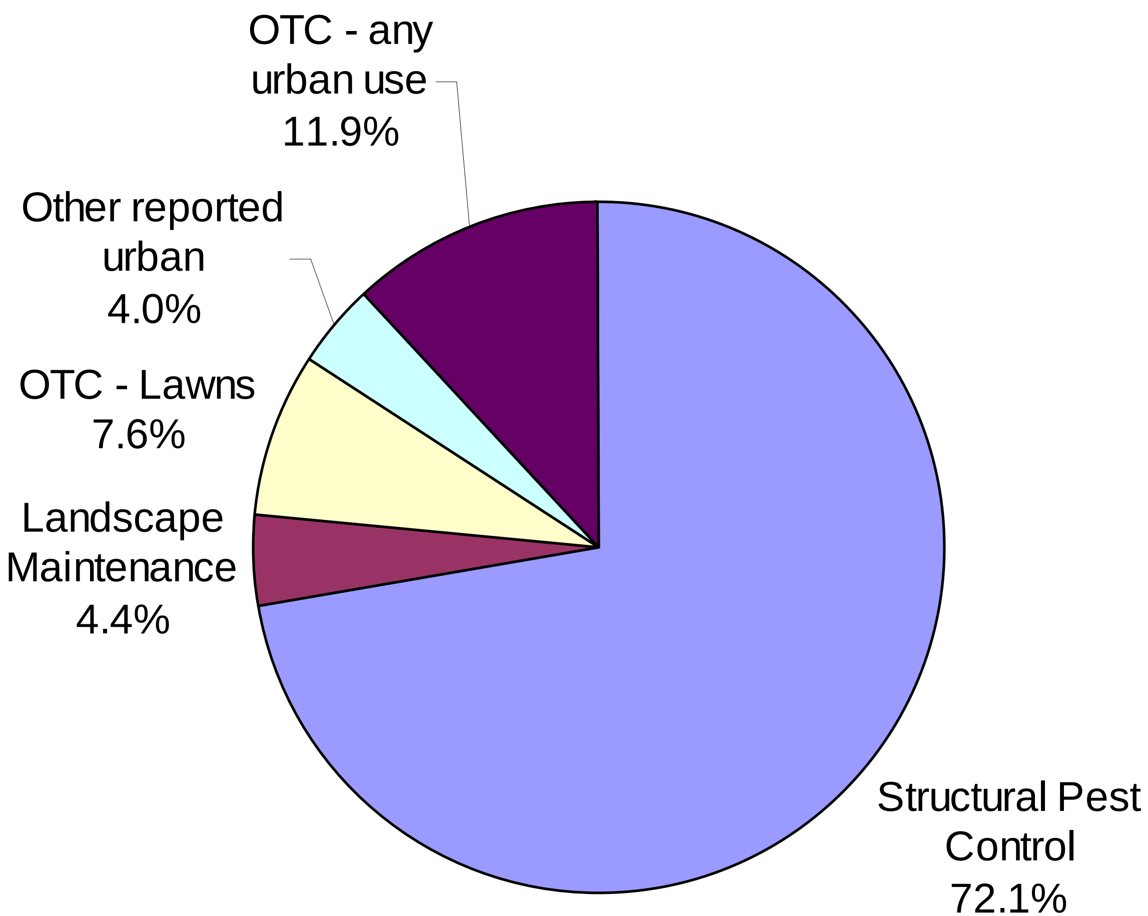
Source: California DPR Pesticide use reporting data & Scotts sales data.
Note: Data accuracy warrants only one significant figure. Additional digits provided to simplify category tracking.

Most 2004-2005 California Urban Bifenthrin Use Was by Professionals



Source: California DPR Pesticide use reporting data & Scotts sales data.
Note: Data accuracy warrants only one significant figure. Additional digits provided to simplify category tracking.

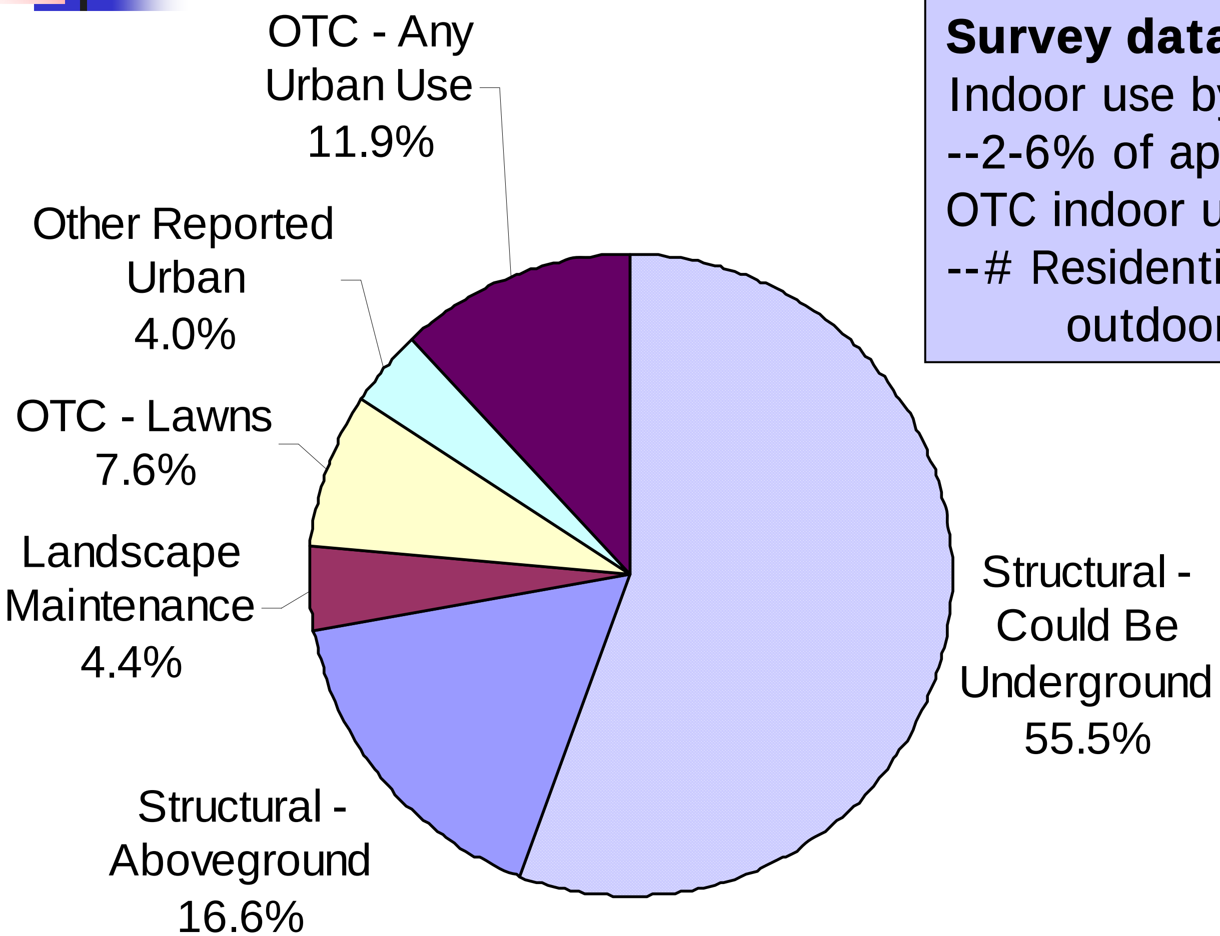
Most 2004-2005 California Urban Bifenthrin Use Was for Structural Pest Control



Source: California DPR Pesticide use reporting data & Scotts sales data.
Note: Data accuracy warrants only one significant figure. Additional digits provided to simplify category tracking.

Structural Pest Control Includes Some Underground & Indoor Applications

Survey data on indoor pesticide use:
Indoor use by professionals likely small
--2-6% of applications at residences
OTC indoor use may be meaningful
--# Residential indoor applications > outdoor



Source: California DPR Pesticide use reporting data, Scotts sales data, and analysis of product labels.
Note: Data accuracy warrants only one significant figure. Additional digits provided to simplify category tracking.

Urban Runoff Pollutant Transport Processes

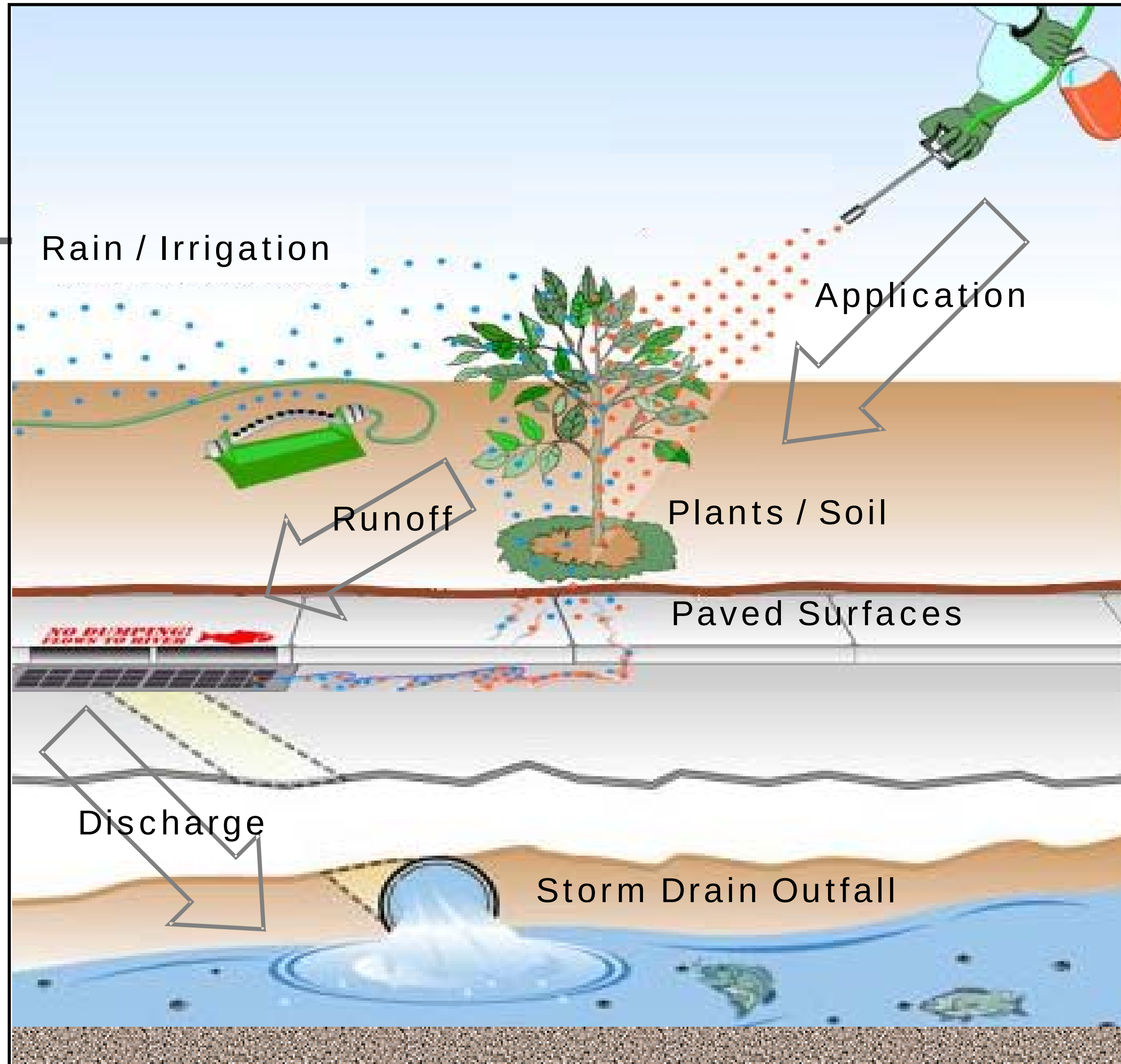


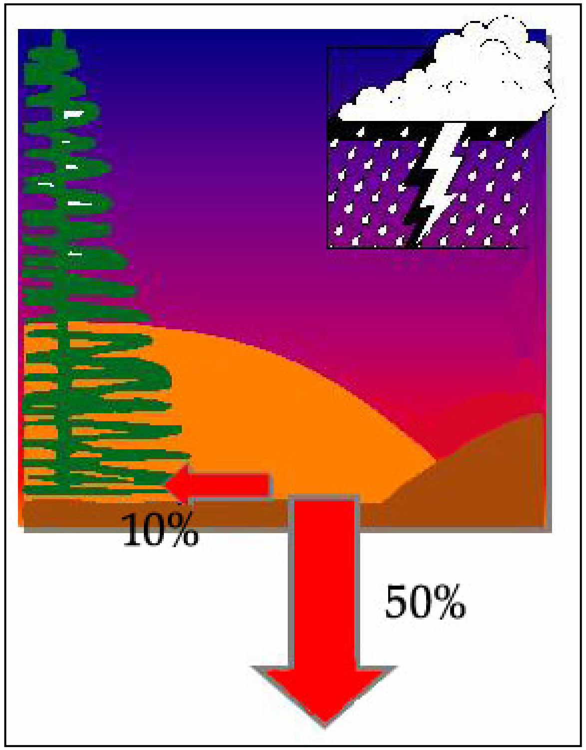
Figure courtesy SF Bay Regional Water Board, based on U.C. IPM Project drawing

Impervious Surfaces Change Pollutant Transport Processes

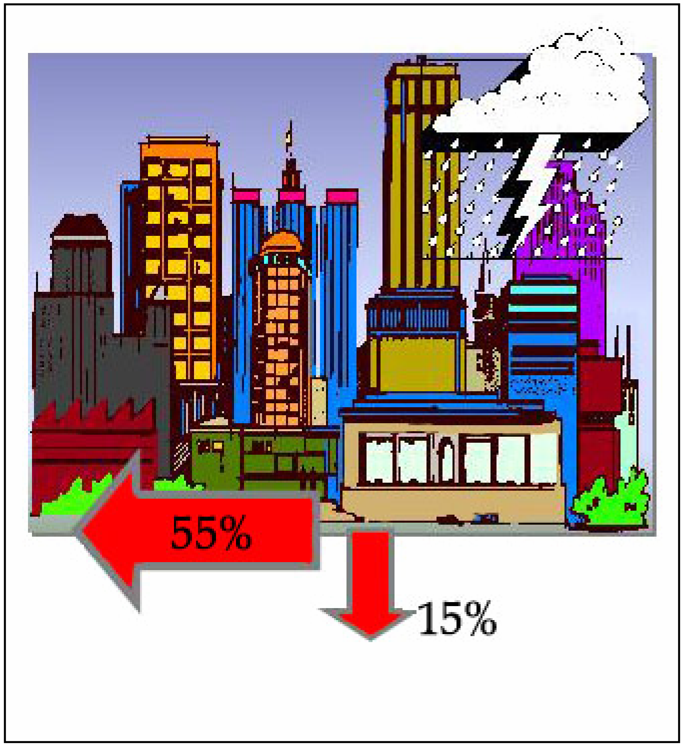
- Pollutant transport in urban runoff depends on:
  - Physical characteristics of watershed/runoff conveyances
  - Chemical properties of pollutants
- Pollutant transport related to many factors, including:
  - Runoff intensity (larger flow/larger particles transported)
  - Rainfall/Runoff volumes
  - Surface characteristics
  - Pollutant chemical properties (fate, solubility)
  - Pollutant release patterns
- Topic of engineering research since early 1980s

Impervious Surfaces Increase Runoff Quantities

Pre-Development



Post-Development



Diagrams courtesy NEMO (Nonpoint Education for Municipal Officials) and the Lower Columbia River Estuary Partnership.

Impervious Surfaces Increase Runoff Intensity

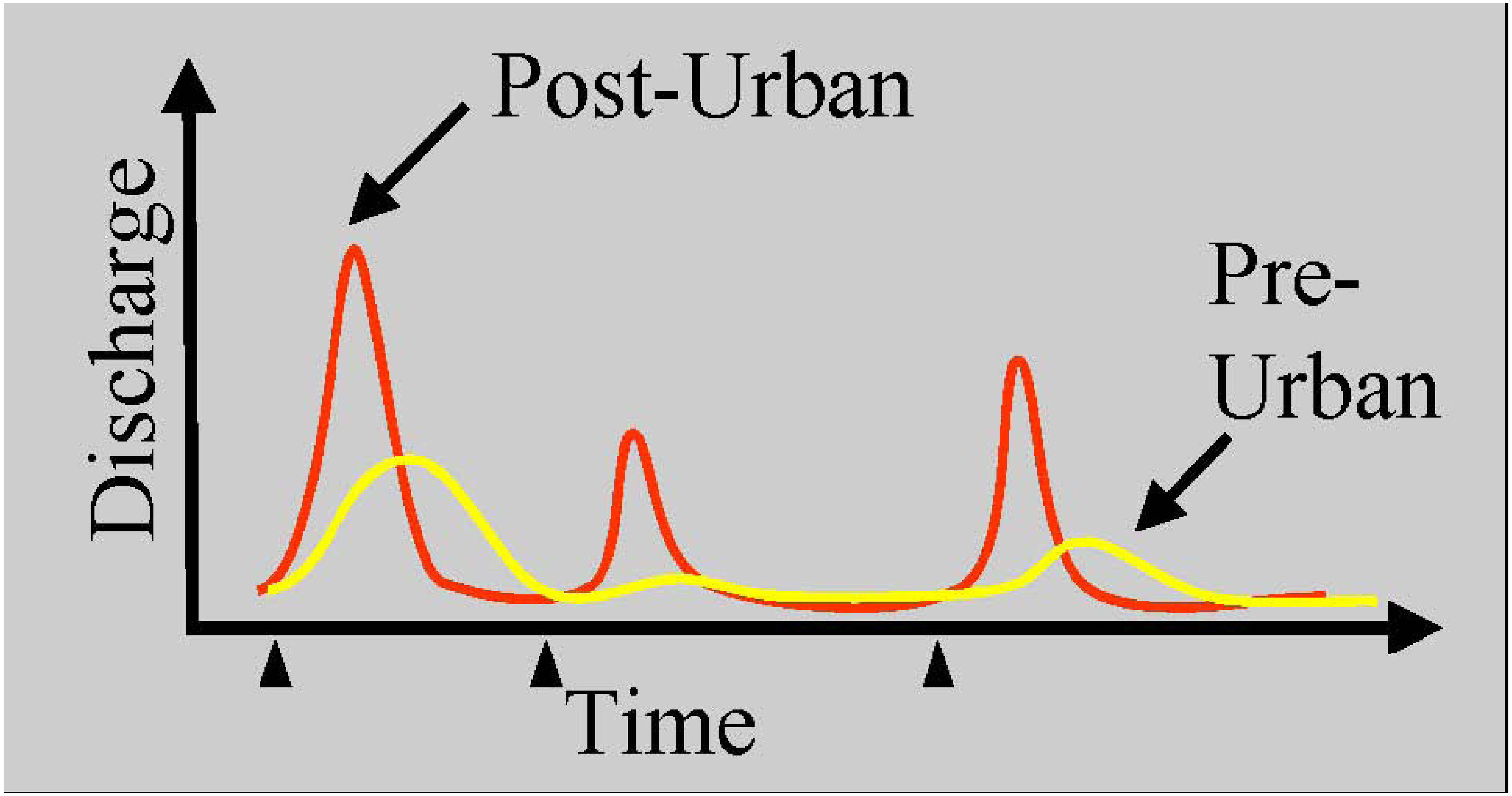


Diagram of example courtesy NEMO-California Partnership

Pollutant Washoff Differs Between Impervious & Pervious Surfaces

Typical California urban stormwater conveyance system – Street gutter

Water & pollutants efficiently moved to creeks

Alternative stormwater conveyance system example – Vegetated swale

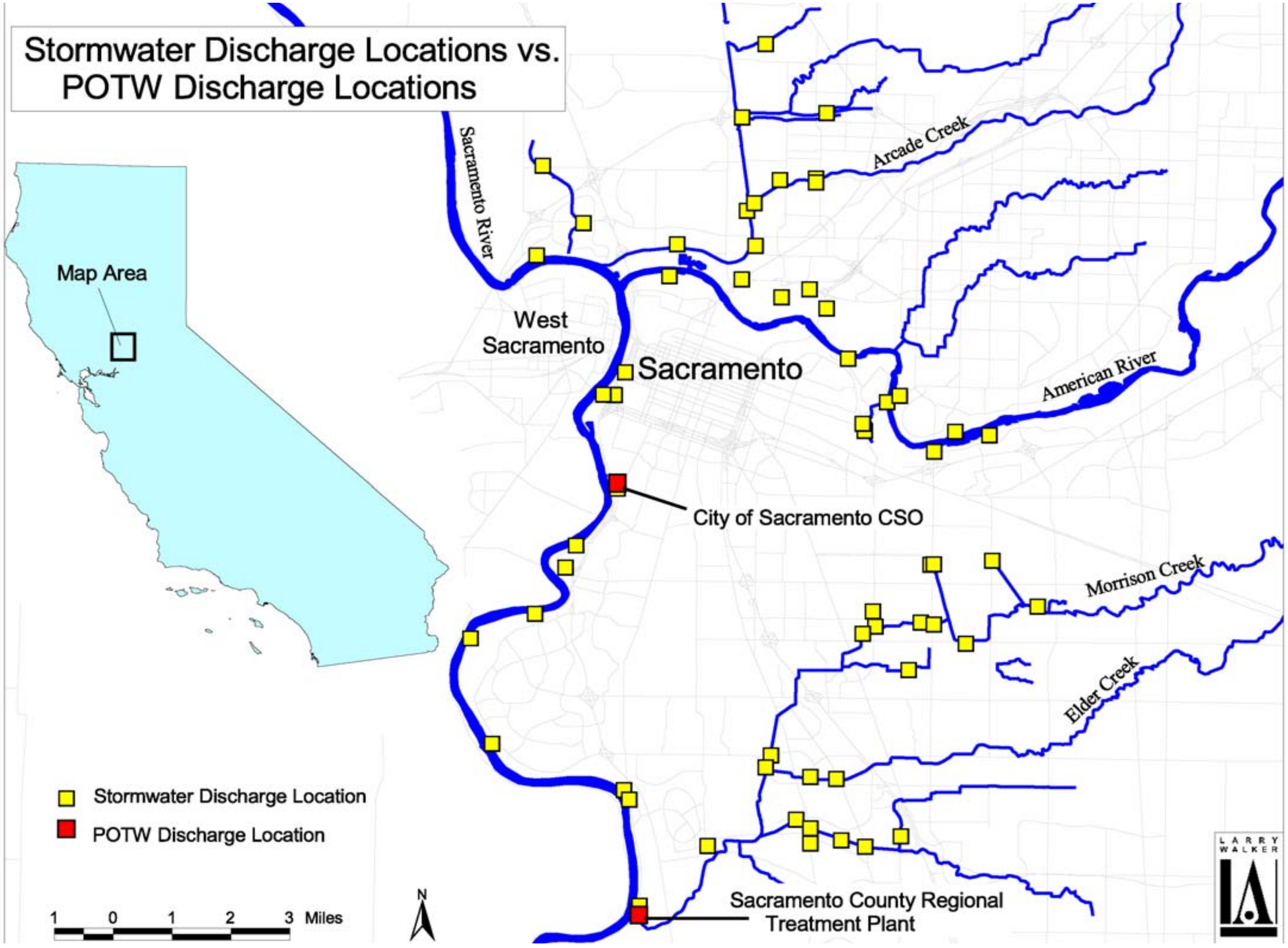
Slower flow & infiltration reduces pollutant discharge (e.g., TSS removal about 80%)

TSS Data Source: Compilation of TSS removal data in CASQA (2003). *California Stormwater BMP Handbook New Development and Redevelopment*. January.

Understanding Impervious Surfaces Is Usually Key to Loads

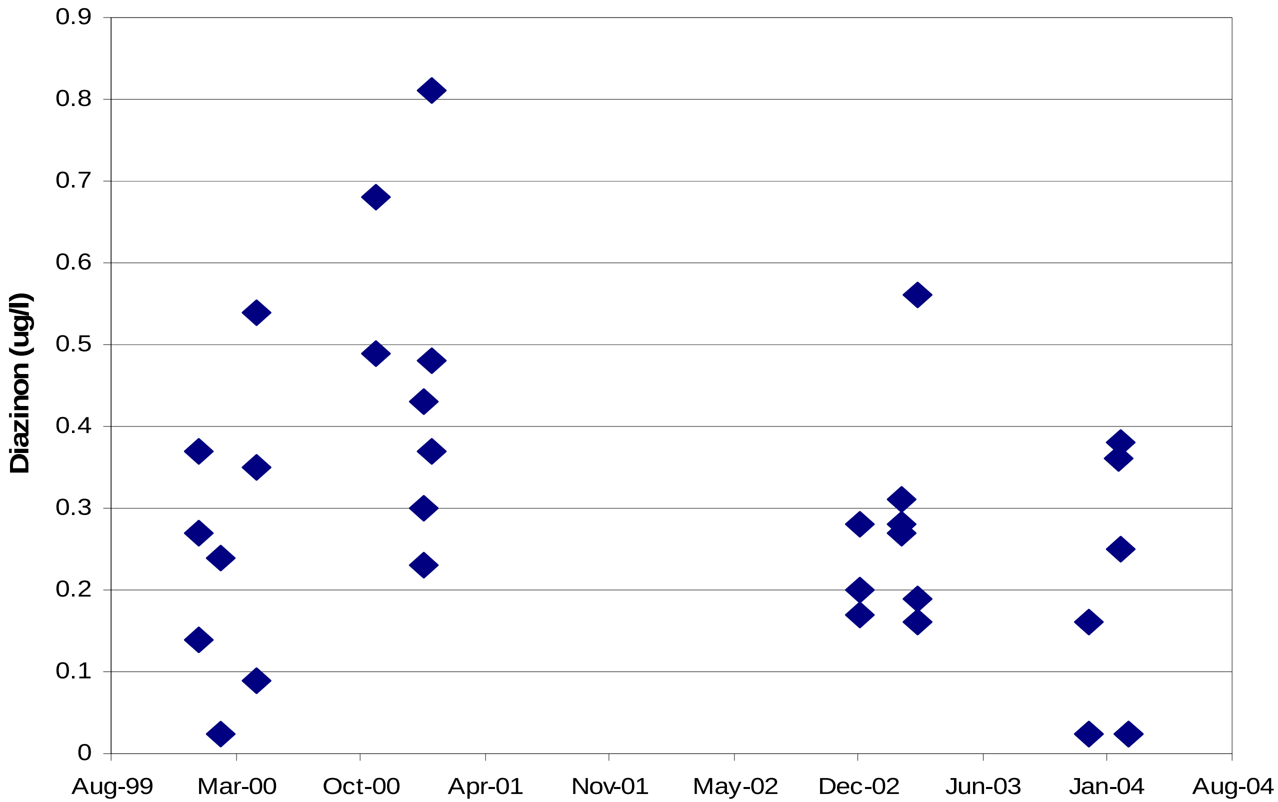
For most pollutants, loads are dominated by runoff from impervious surfaces

Urban Runoff Monitoring Challenges: Many Discharge Points



Urban Runoff Monitoring Challenges: Data Variability

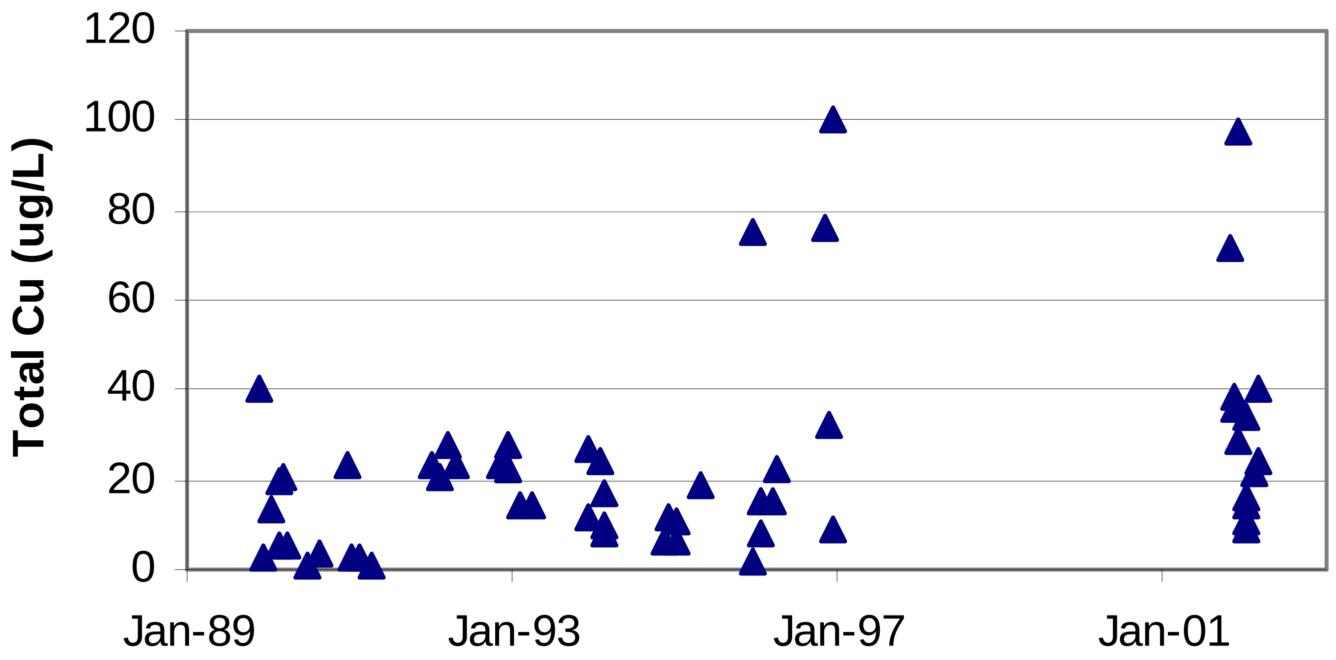
Event Mean Diazinon Concentrations, Sacramento CA



Source: Ruby, A. (2005). Sacramento Urban Runoff Discharge Characterization 2005. Prepared for Sacramento Stormwater Quality Partnership. August.

Urban Runoff Monitoring Challenges: Data Variability

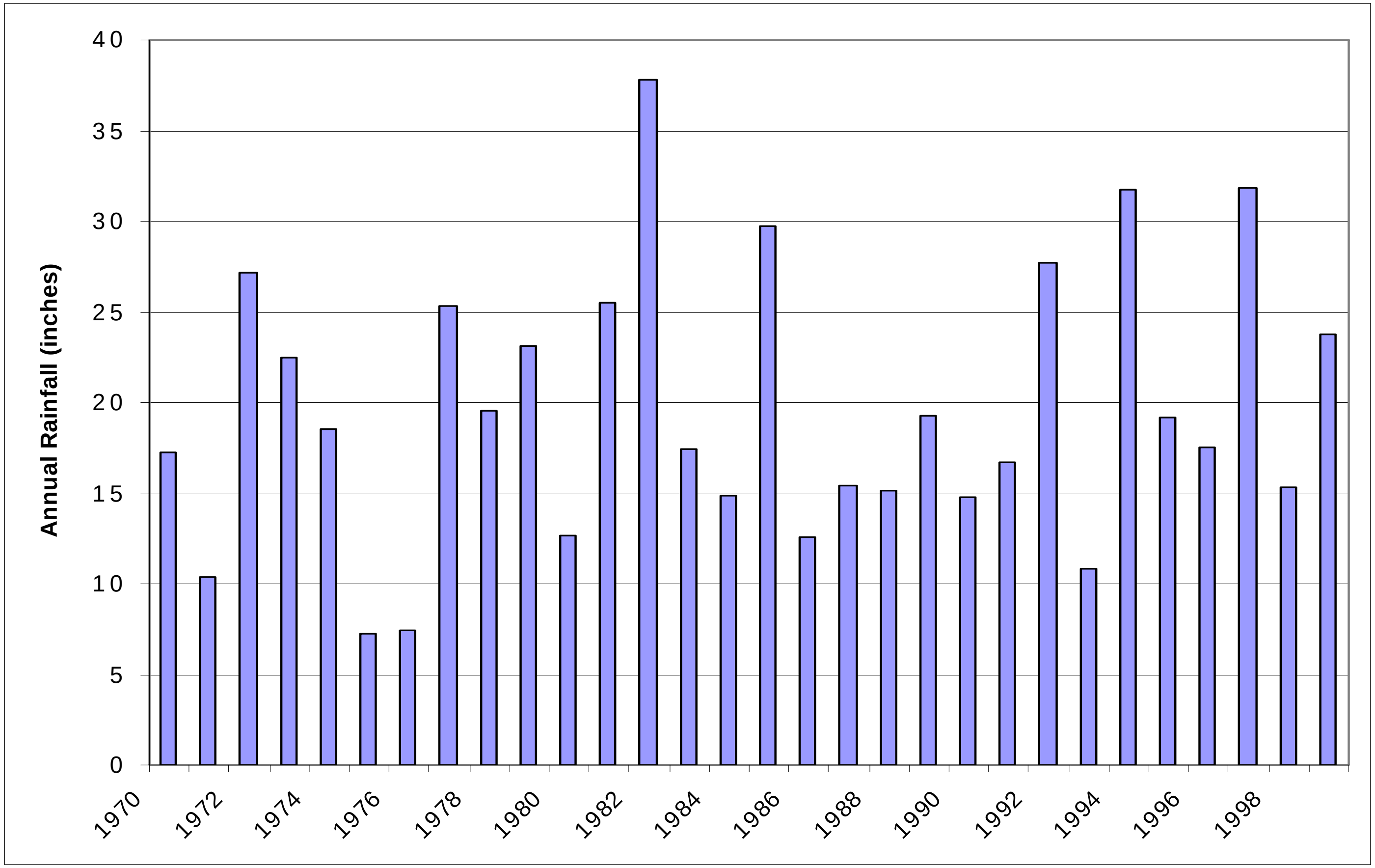
Event Mean Copper Concentrations, Castro Valley CA



Source: Alameda Countywide Clean Water Program.

Urban Runoff Monitoring Challenges: Weather

Annual Rainfall Sacramento California 1970-1999



Source: Ruby, A. (2005). Sacramento Urban Runoff Discharge Characterization 2005. Prepared for Sacramento Stormwater Quality Partnership. August.

Urban Runoff Monitoring Challenges: Need Large # Samples for Conclusions

- **EXAMPLE: Long-Term Effectiveness, Sacramento County Stormwater Program**
  - If the actual quality of stormwater runoff were improved by 30%, to demonstrate that change via traditional monitoring would require approx. 6 samples per year over 20 years
- **EXAMPLE: Before and After Studies, Copper in Urban Runoff**
  - Based on the known variability of copper urban runoff data in the San Francisco Bay Area, the # samples required to show a statistically significant difference:
    - 25% change – 40 samples "before" + 40 samples "after"
    - 50% change – 10 samples "before" + 10 samples "after"

Before and after studies of pollutants in urban runoff are rarely successful.

Note: "Statistically significant" is defined as 80% statistical power, with 95% confidence. Sources: LWA (1996). Technical Memorandum: An Evaluation of Methods for the Assessment of Long Term Effectiveness of the Sacramento CSWMP. Nov. URS (1999). Feasibility of Detecting Changes in Environmental Copper Concentrations as a Result of Changes in Automotive Brake Pad Composition. Memorandum to the City of Palo Alto. May.

Next Steps

UP3 Project and CASQA would like to work with DPR to set up a follow-up forum specifically on urban runoff