



Certified Landscape Professional in Water Quality Protection

Darren L. Haver

Water Resources-Water Quality Advisor

January 28th, 2016

Sessions included in Certification

Today: Water Quality Issues in Urban Landscapes

February 10, 2016: IPM Approaches to Protect Water Quality

February 24, 2016: Managing Irrigation Runoff to Reduce Water Waste

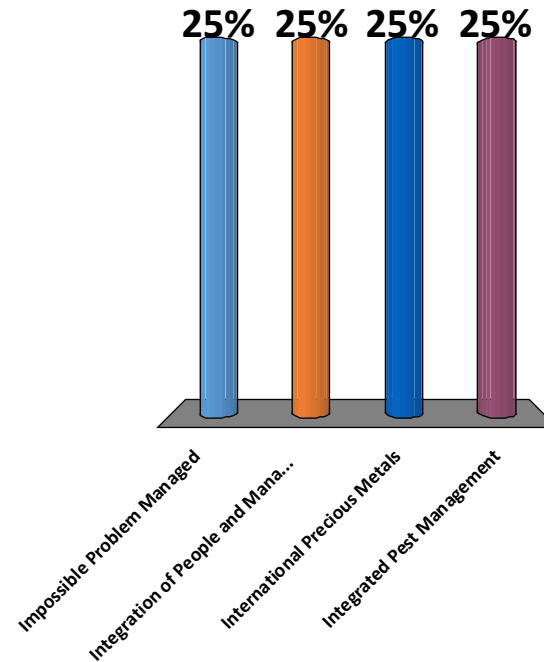
March 8, 2016: Management of High-use Sports Turfgrass Facilities

March 23, 2016: Selecting Locally-Adapted Plants for Municipal Landscapes

April 5, 2016: Soil Health and Protection

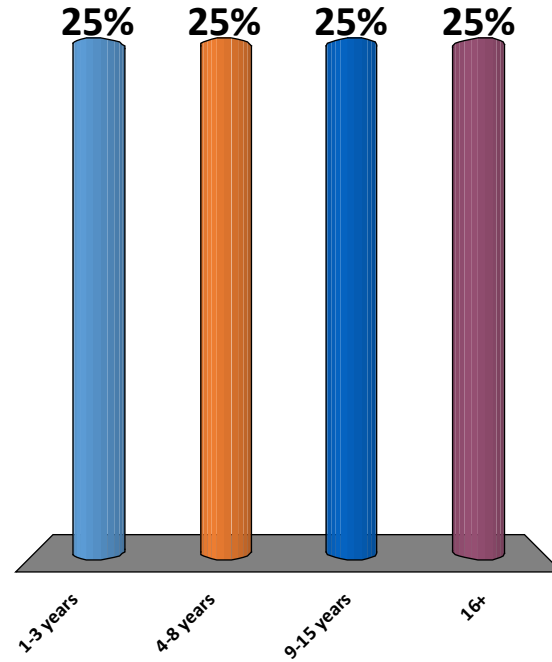
What is IPM?

- A. Impossible Problem Managed
- B. Integration of People and Managers
- C. International Precious Metals
- D. Integrated Pest Management



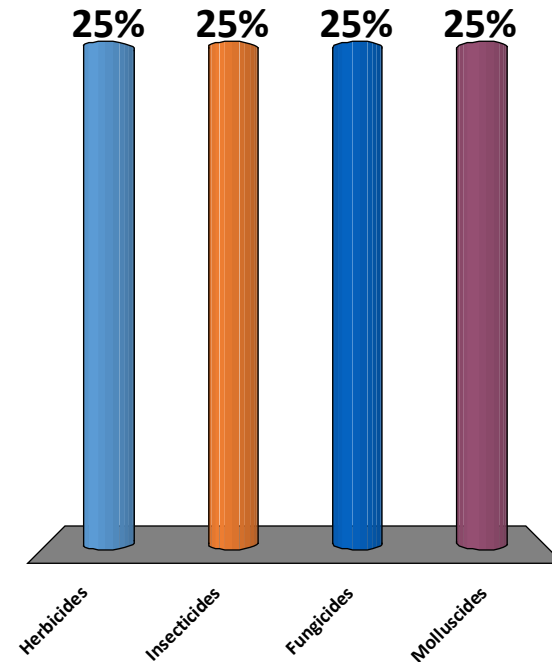
How many years do you have working in landscape maintenance?

- A. 1-3 years
- B. 4-8 years
- C. 9-15 years
- D. 16+



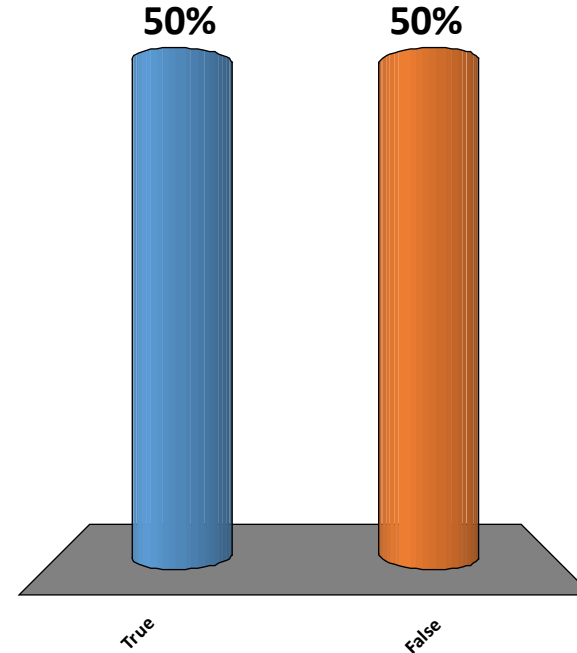
Which of these pesticides has the greatest impact on water quality?

- A. Herbicides
- B. Insecticides
- C. Fungicides
- D. Molluscides



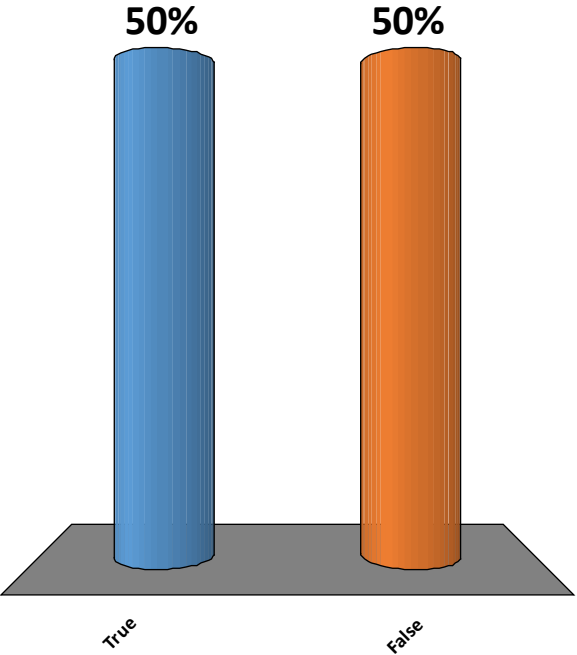
I hold a license from Department of Pesticide Regulation (DPR) to apply pesticides.

- A. True
- B. False



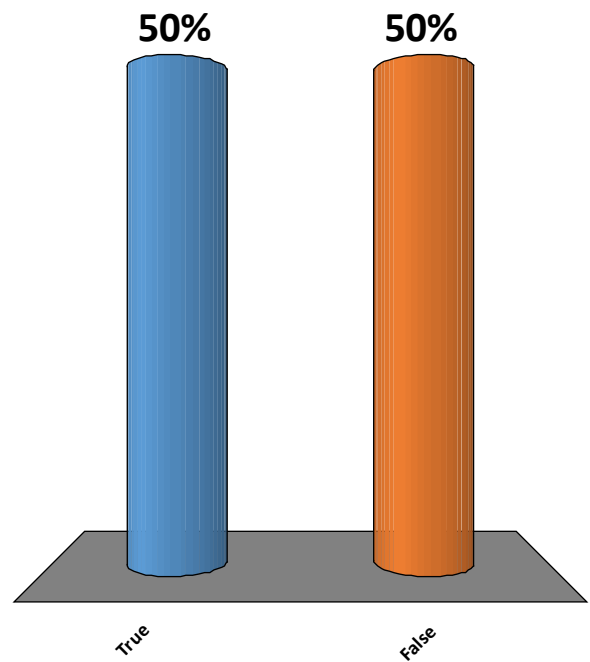
I have been told my city has an IPM Policy.

- A. True
- B. False



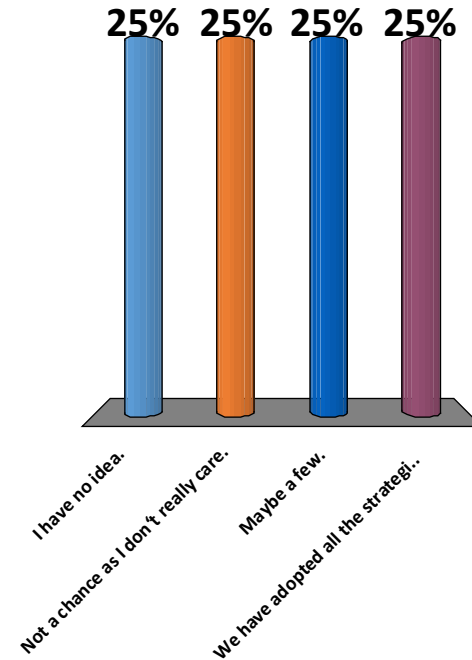
I have seen and read my city's IPM policy.

- A. True
- B. False



I have implemented IPM strategies outlined in my City's IPM Policy.

- A. I have no idea.
- B. Not a chance as I don't really care.
- C. Maybe a few.
- D. We have adopted all the strategies outlined in the policy.



Water Quality Protection Guiding Principles

- Maintain aesthetically pleasing landscapes.
- Use climate appropriate plants in new plantings or retrofits.
- Apply irrigation to support healthy plant growth while minimizing runoff.
- Apply fertilizers at the right frequency and right quantity.
- Promote healthy soils through the use of compost and mulch.
- Implement integrated pest management practices outline in IPM Policy.



Why do I need to worry about this?

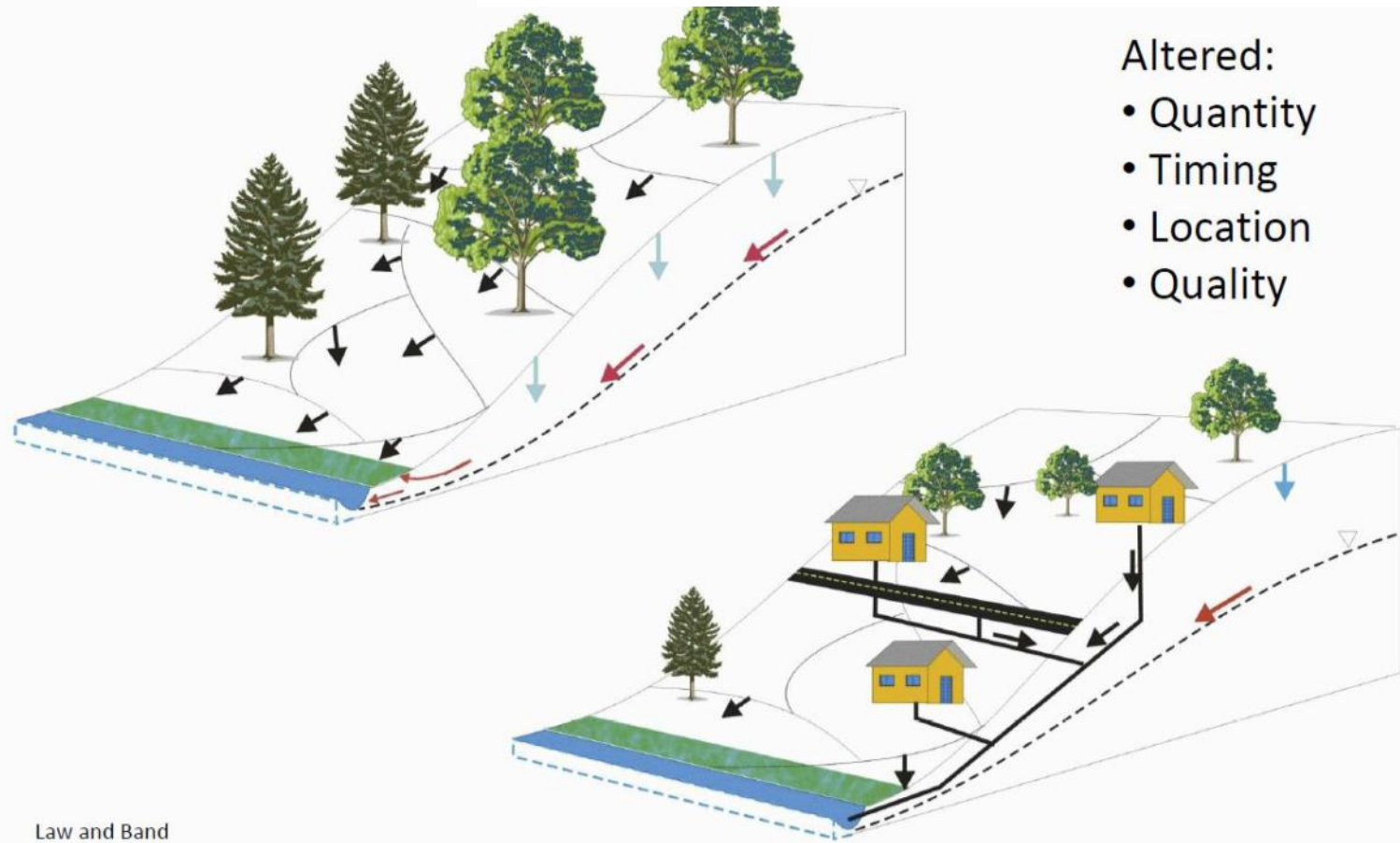


The Issue

Urbanization impacts stream quality



Flow modification



From M. Cadenasso

“Urban Drool”



Photos: D. Haver

Irrigation Management





Photo: D. Haver



Photo: L. Oki

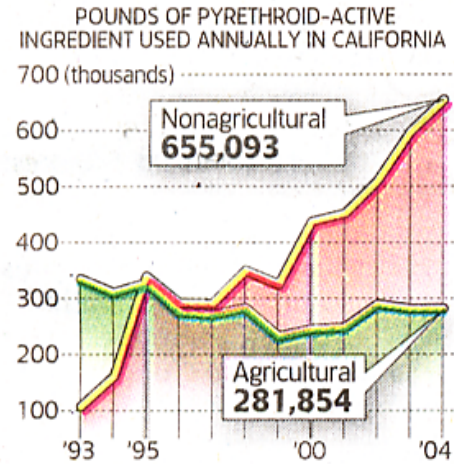


Photo: L. Oki



Pyrethroid use in California

Commercial use of pyrethroid pesticides in California has been increasing dramatically, mainly because of urban use. The data below do not include usage of retail products by homeowners, which does not have to be reported to regulators and is suspected to be much greater.



Sources: Prof. Donald Weston, UC Berkeley
Sacramento Bee/Nam Nguyen

Sacramento Bee
July 14, 2006

State toughens rules on a household pesticide

Low levels of pyrethroid products kill aquatic life

By Matt Weiser
BEE STAFF WRITER

California next month will begin to regulate a broad class of pesticide that has become the dominant home and garden bug-killer.

The state Department of Pesticide Regulation in August will notify manufacturers of pyrethroid insecticides that they must share data on their products or those products will be banned from sale in California. The data will drive a regulatory review that could result in use restrictions or a ban on specific products.

In doing so, California steps out ahead of the federal government and other states in regulating pyrethroids, found to be deadly to aquatic life at very low concentrations.

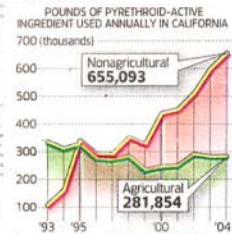
Mary-Ann Warmerdam, director of the Department of Pesticide Regulation, said it will be the biggest pesticide regulation effort in state history, involving 600 consumer products sold in hardware stores, garden centers and pet stores.

"We know we have enough caution flags, and that requires a

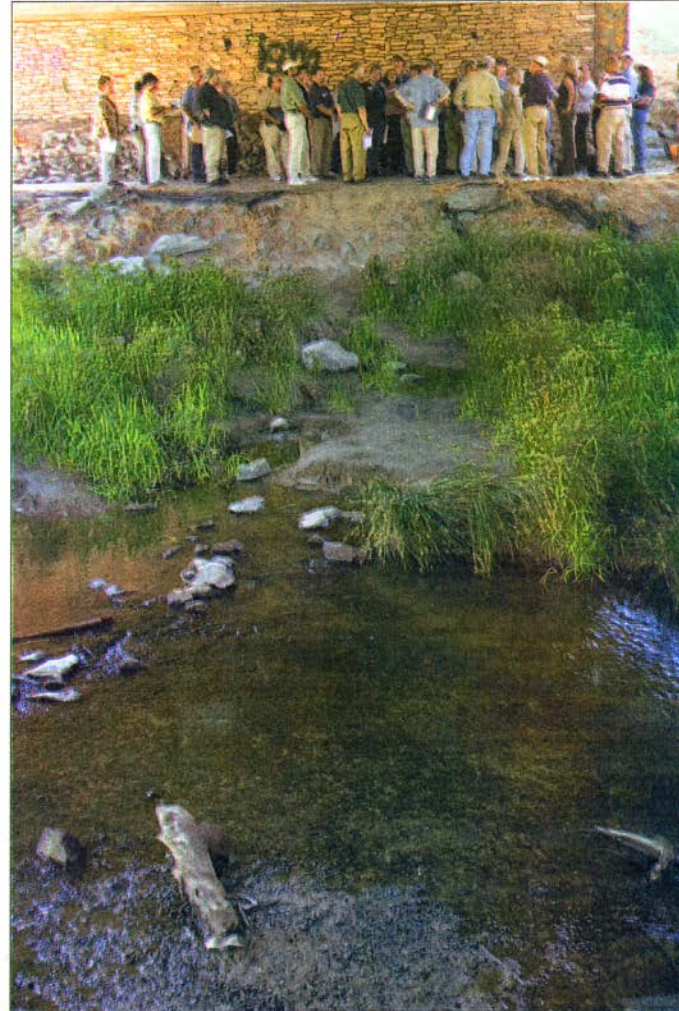
► PESTICIDE, Page A4

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Sources: Prof. Donald Weston, UC Berkeley
Sacramento Bee/Nam Nguyen



Sacramento Bee/Jay Mather
Researchers address people from government agencies Thursday at Roseville's Pleasant Grove Creek. The pyrethroid class of pesticide has been found in stream sediment at levels toxic to tiny crustaceans.

Pesticide Application





Urban Residential Runoff Research

Landscape Demonstration Sites

South Coast Research & Extension Center



Typical

Landscape Demonstration Sites

South Coast Research & Extension Center



LID 1

Landscape Demonstration Sites

South Coast Research & Extension Center



LID 2

Designed for Data Collection

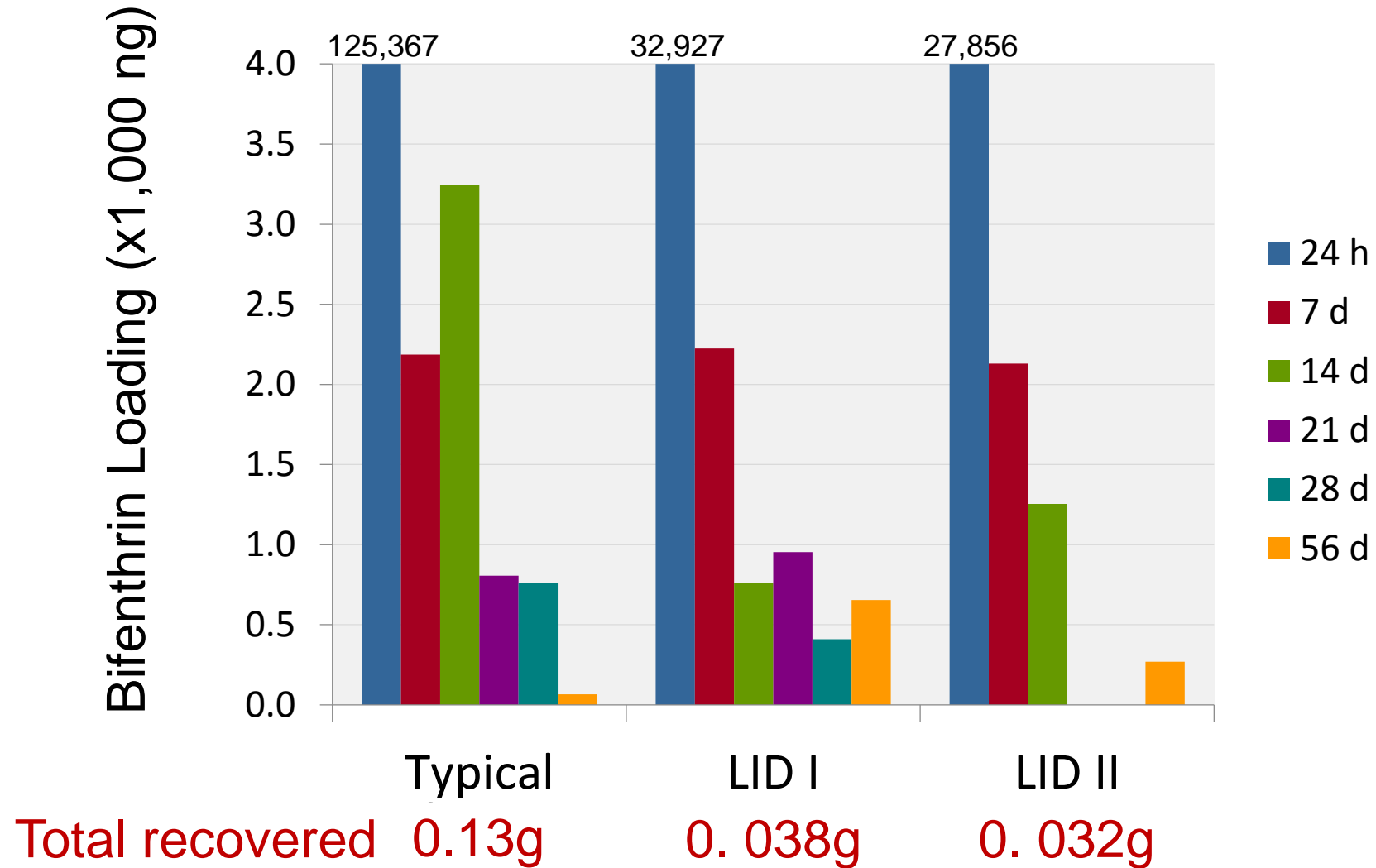


Pesticide Treatments

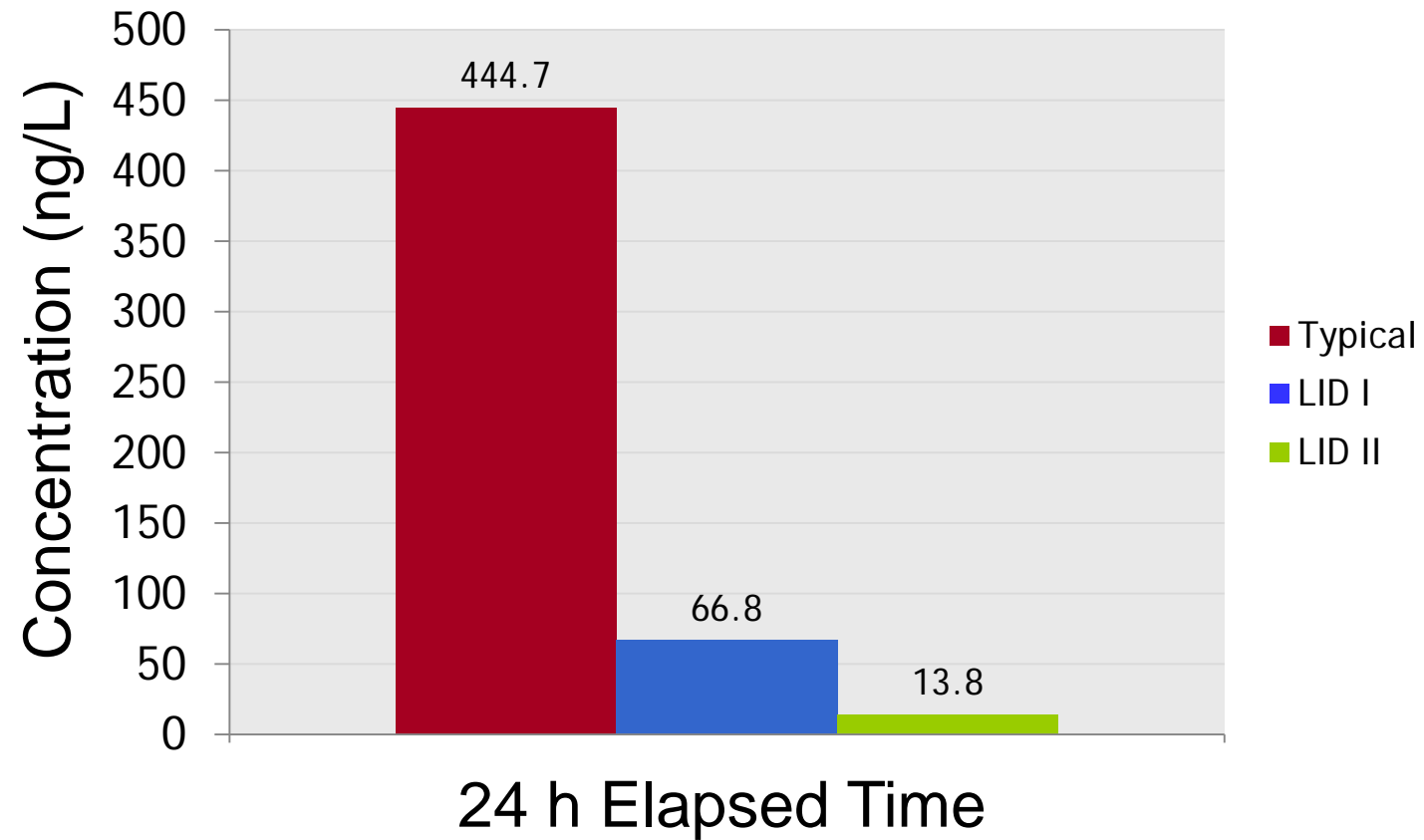
- **Pre-Treatment Wash**
Background levels of pesticides (previous studies)
- **Lawn and Garden Treatment**
0.3% bifenthrin \approx 0.9449 g a.i. to each landscape
RTU hose-end product
- **Perimeter Pesticide Treatment**
Fipronil at 0.06% \approx 0.9654 g a.i. to each landscape
1 foot out, 1 foot up fan spray around perimeter
- Hardscapes washed at defined intervals

Bifenthrin Loading

Hardscape Washing



Fipronil In Wash Water



Pollutants in Residential Runoff

Large-scale Residential Landscape Studies



Pollutants in Residential Runoff

Study Site Selection

- 8 sites
 - 4 each in Sacramento (N. Cal) and Orange (S. Cal) Counties
- Criteria
 - Single family homes
 - 4-20 years old
 - Lot size
 - Demographics



Pollutants in Residential Runoff

Study Site Selection

- Storm drain maps
 - Locate outfalls
 - Delineate drainsheds
 - Identify lots
 - Verify land use
- Visit outfalls
 - Safe access



Water Sample Collection

Sampling Schedule

	Q1	Q2	Q3	Q4
2006			Weekly*	Weekly
2007	Biweekly	Weekly	Weekly	Weekly
2008	Biweekly	Biweekly	Biweekly	Weekly
2009	Monthly	Monthly*	None	None
2010	None	Monthly	Monthly	Monthly

- Up to 5 early storms of each season

Water Sample Collection



Water Sample Analyses

Nutrients

Nitrate, TKN,
Phosphate, Total P

Pesticides

diazinon, chlorpyrifos,
pyrethroids (9), fipronil

Drinking Water COCs

TOC, DOC, Br⁻, Cl⁻,
TDS, TSS, turbidity

Pathogen indicators

E. coli

Total coliforms

Somatic coliphages

Male-specific coliphages

Enterococci

Clostridium perfringens

Pathogens

Giardia

Cryptosporidium

Arden Creek Area Survey

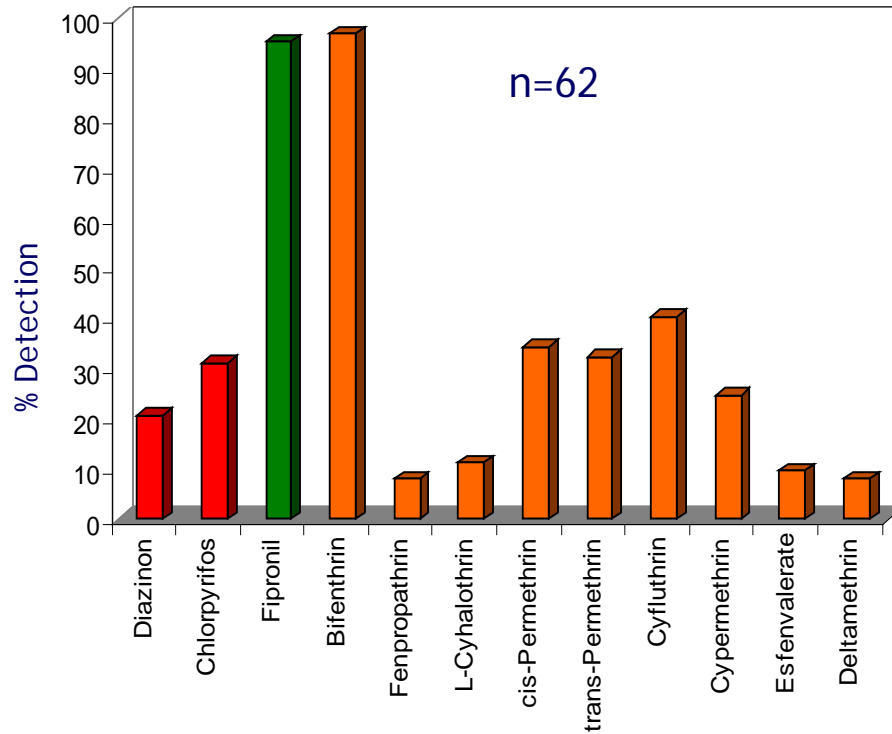
Use of pest control products

	Frequency	Percent
Ants	162	47.9%
Snails or Slugs	31	9.1%
Weeds	28	8.2%
Spiders	22	6.5%
Hornets/Wasps	16	4.7%
Insects- unspecified	15	4.4%
Rodents	14	4.4%

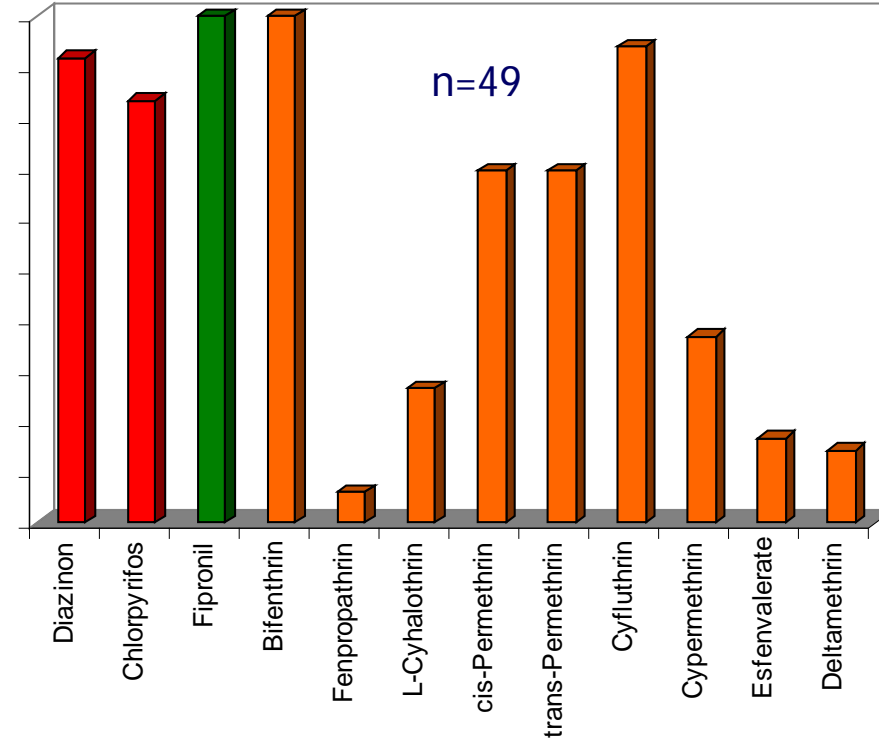
From: Residential pesticide use in California, M.L. Flint, UC Statewide IPM Program, CA DPR contract 01-0219C, March 15, 2003

Pesticide Detection Rates

Sacramento County

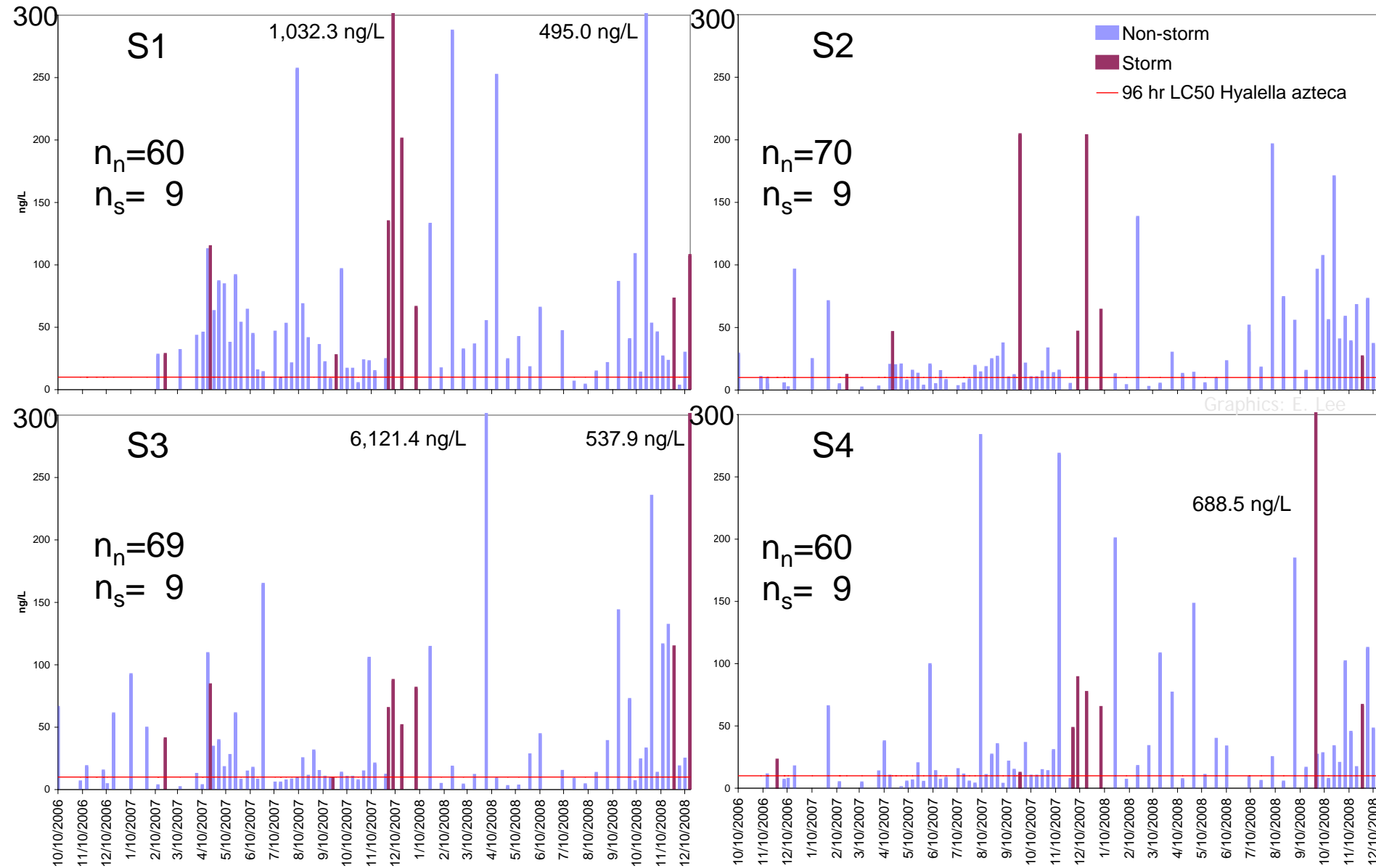


Orange County

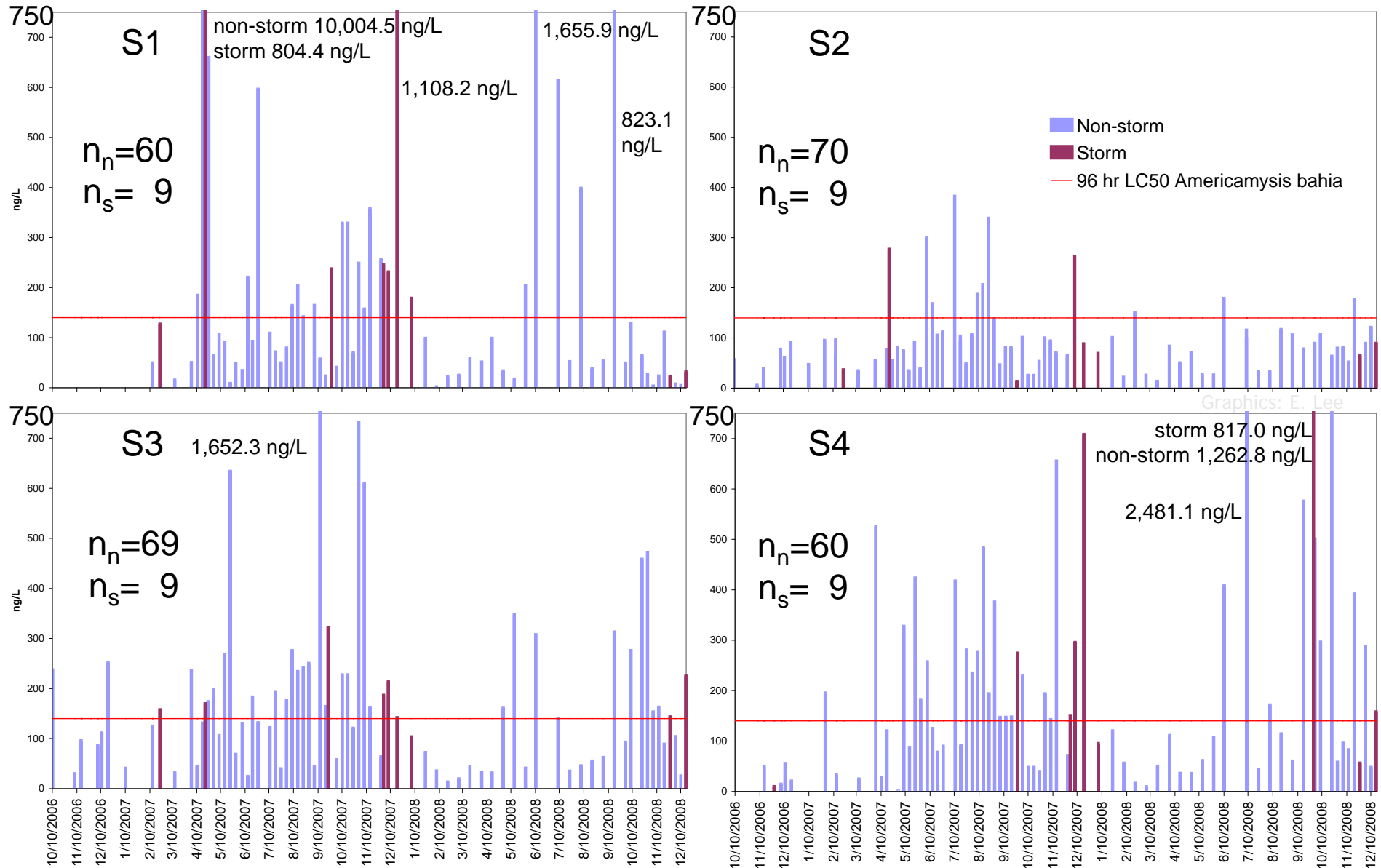


Graphics: S. Bondarenko

Bifenthrin Concentration- S Cal



Fipronil Concentration- S Cal





Fipronil Toxicity

Aquatic	LC50
Rainbow trout	248 ppb
Bluegill	85 ppb
Sheepshead minnow	130 ppb
Grass shrimp	0.32 ppb
Mysid shrimp	0.14 ppb
Daphnid	190 ppb

Degradate	Relative Toxicity	Approx ½ life (d)
Fipronil sulfone	~6x	500-600
Fipronil sulfide	~2x	200-350
Desthiofipronil	~8x	200-500

Pesticides in Residential Runoff

Dry Weather Sampling

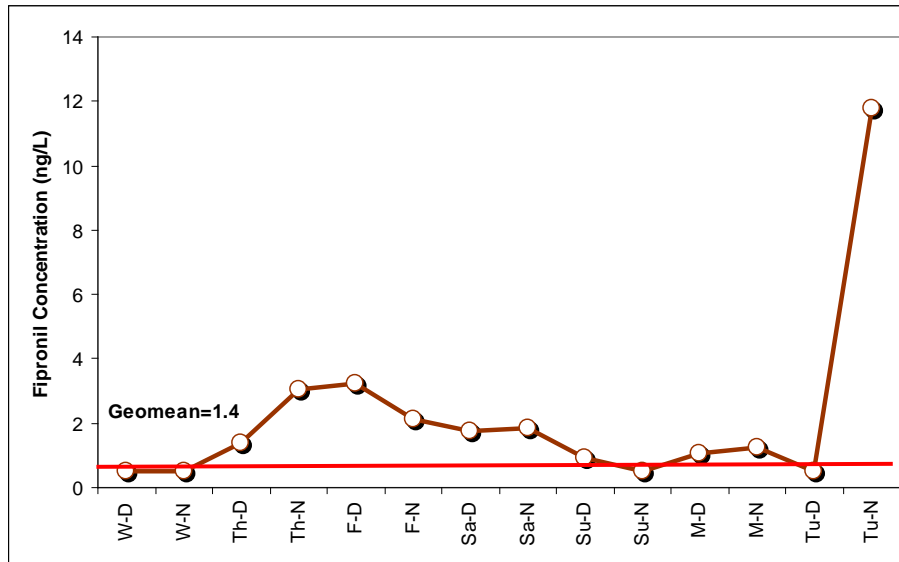
Intensive dry weather grab sampling

- Hourly sampling for 7 days
- S. California Site
 - June 16– 23, 2008
 - Aug 9-15, 2010
- N. California Site
 - July 23-30, 2008
 - Aug 24-31, 2010

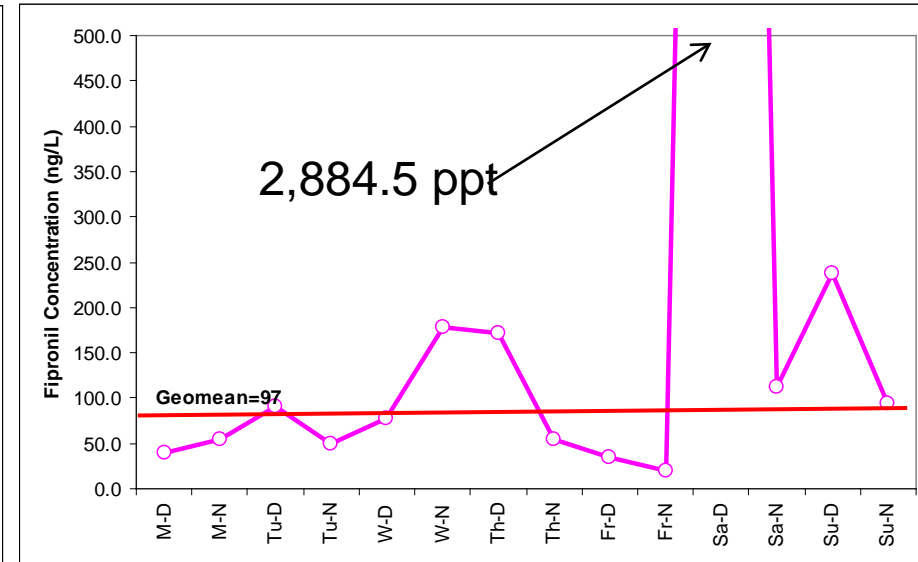
Fipronil

Intensive Dry Weather Sampling

Northern California Neighborhood Site



Southern California Neighborhood Site

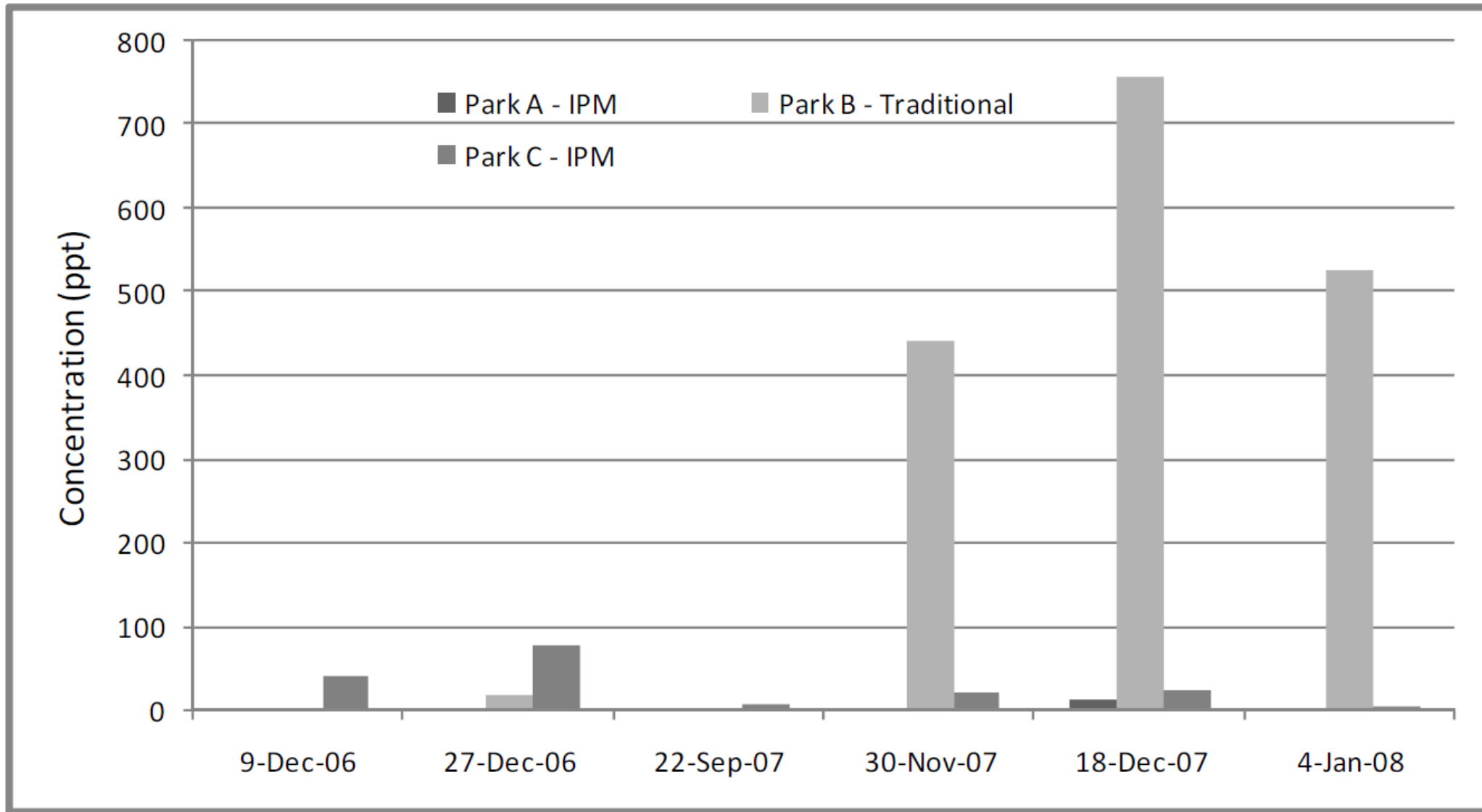


Pesticides in Residential Runoff

Runoff Flow Patterns

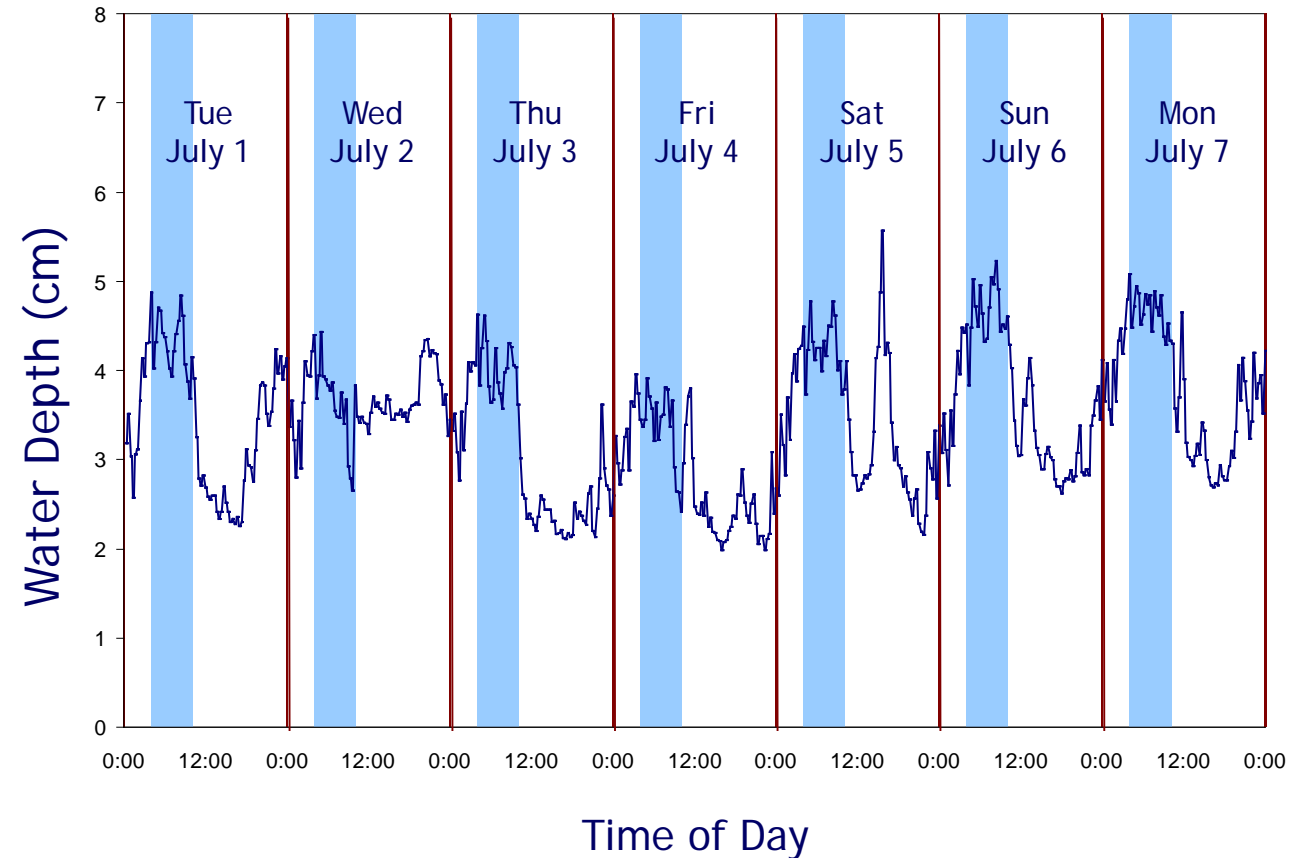


Figure 6-1: Fipronil concentrations in stormwater runoff from two city parks controlling ants utilizing bait stations compared to traditional broad spray applications.



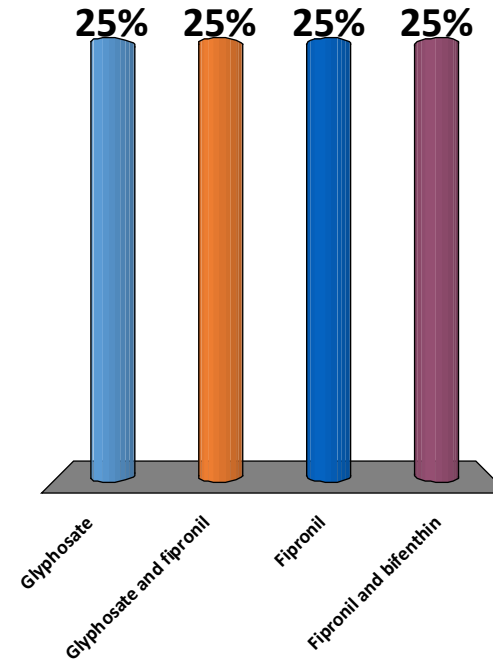
Dry season runoff patterns

Daily Periodicity



What insecticide(s) is (are) detected in runoff water with the highest frequency?

- A. Glyphosate
- B. Glyphosate and fipronil
- C. Fipronil
- D. Fipronil and bifenthrin

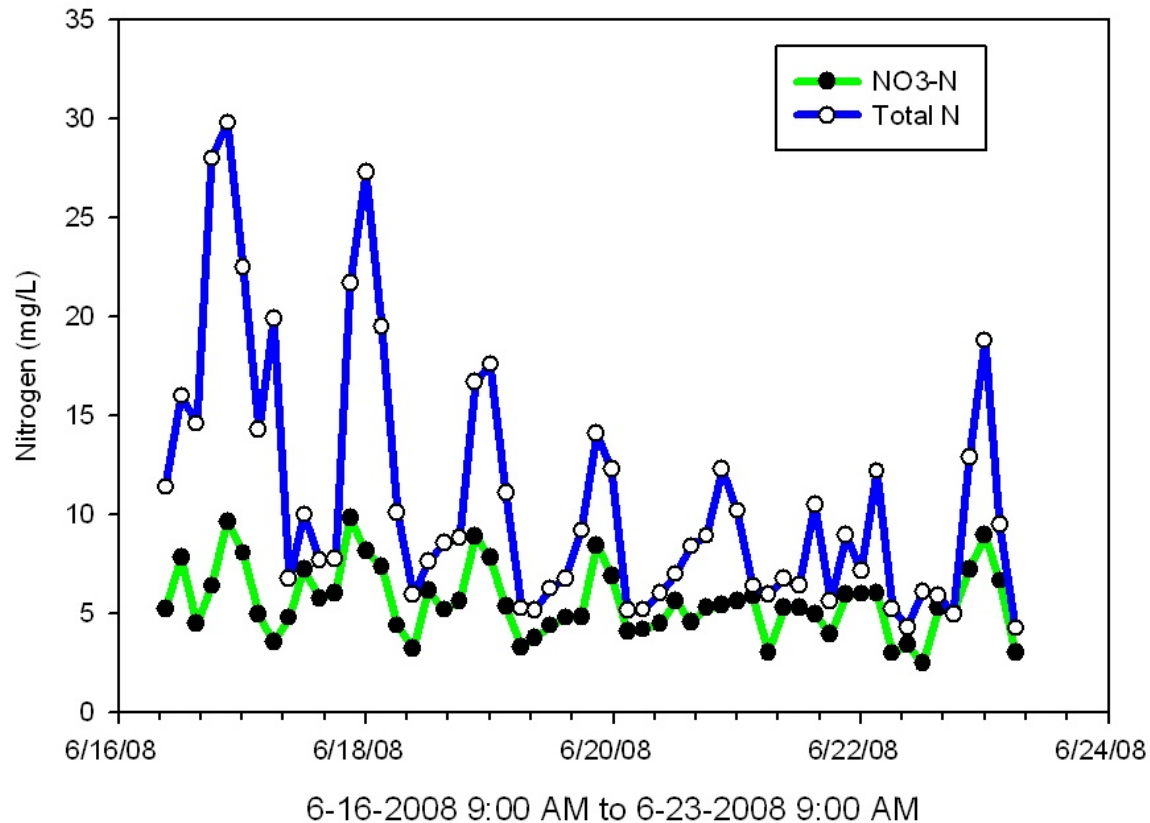


Nutrients in Urban Runoff



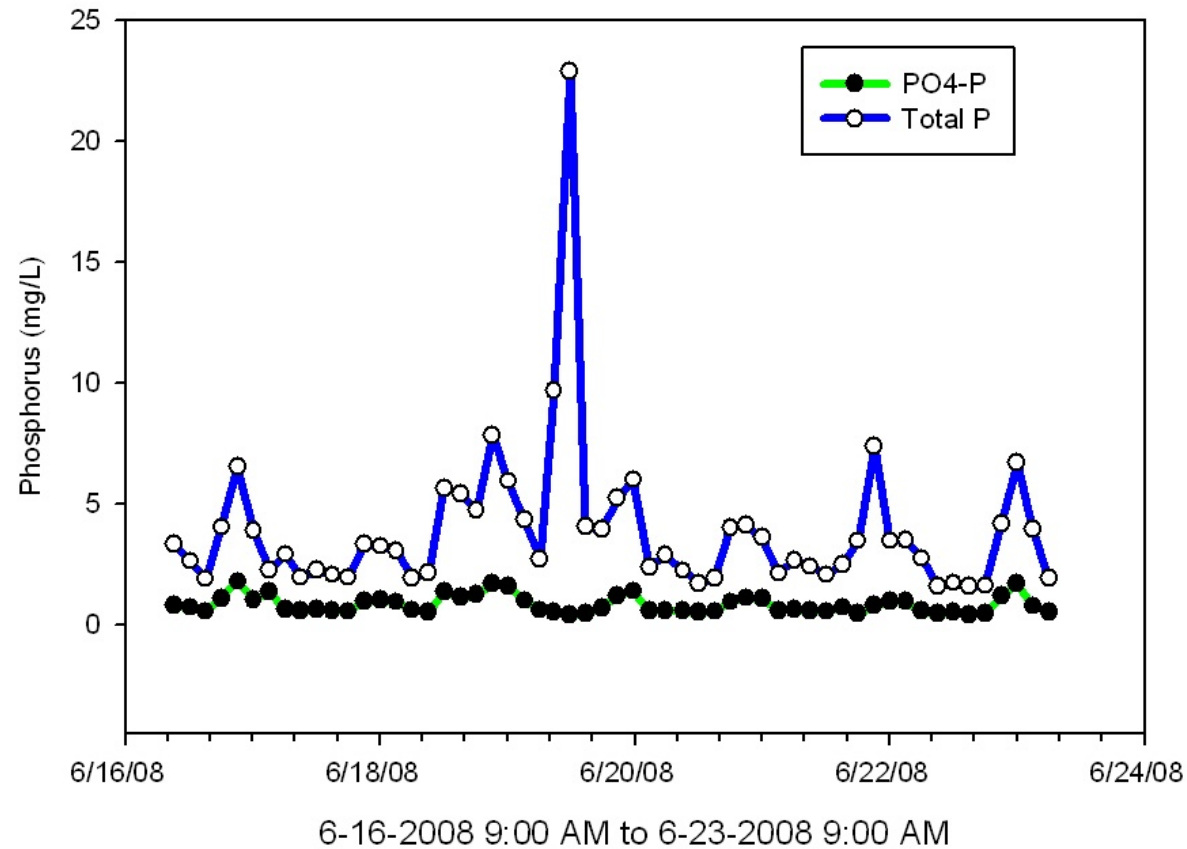
Nitrogen in Landscape Runoff Orange County

Nitrate (NO₃-N) and Total Nitrogen (N)



Phosphorus in Landscape Runoff Orange County

Phosphate ($\text{PO}_4\text{-P}$) and Total Phosphorus (P)



Natural $\approx 0.005 - 0.020$ mg/L $\text{PO}_4\text{-P}$
Possible pollution > 0.1 mg/L $\text{PO}_4\text{-P}$

Sources of N Contributing to Water Quality Issues



- **Off-target application**
 - Poor equipment
 - Poor technique
- **Improper timing**
 - Leaching/Runoff
- **Excess application**
 - Leaching/Runoff
 - Poor equipment calibration
- **Atmospheric Deposition**
 - Air pollution (combustion)
 - Volatilization of N

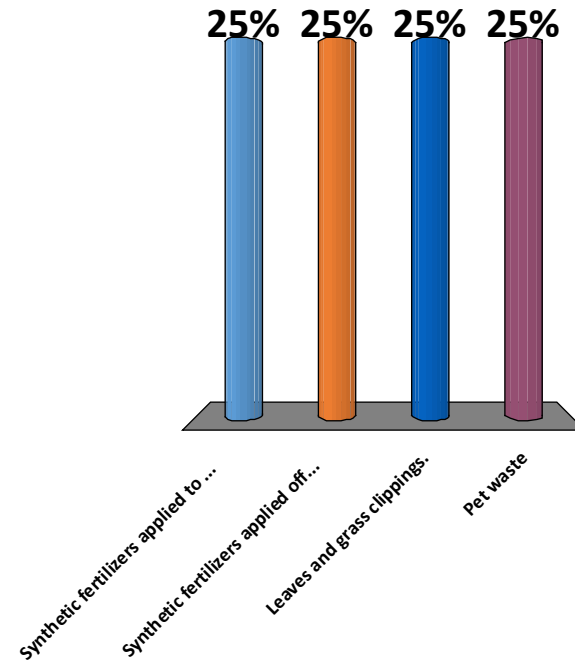






What is the most likely source of nitrogen found in urban surface runoff?

- A. Synthetic fertilizers applied to lawns.
- B. Synthetic fertilizers applied off-target.
- C. Leaves and grass clippings.
- D. Pet waste







Thank you
dlhaver@ucanr.edu