

# Management Options for Reducing Pesticide Concentrations in Urban Runoff

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# Management Options

Physical



Constructed Wetlands



Vegetated Ditches



Bioreactors



Carbon Socks

Agricultural

Urban?

Regulatory

Regulations  
Label Changes  
Cancellation

# Locations & Timing



Storm



Receiving Water



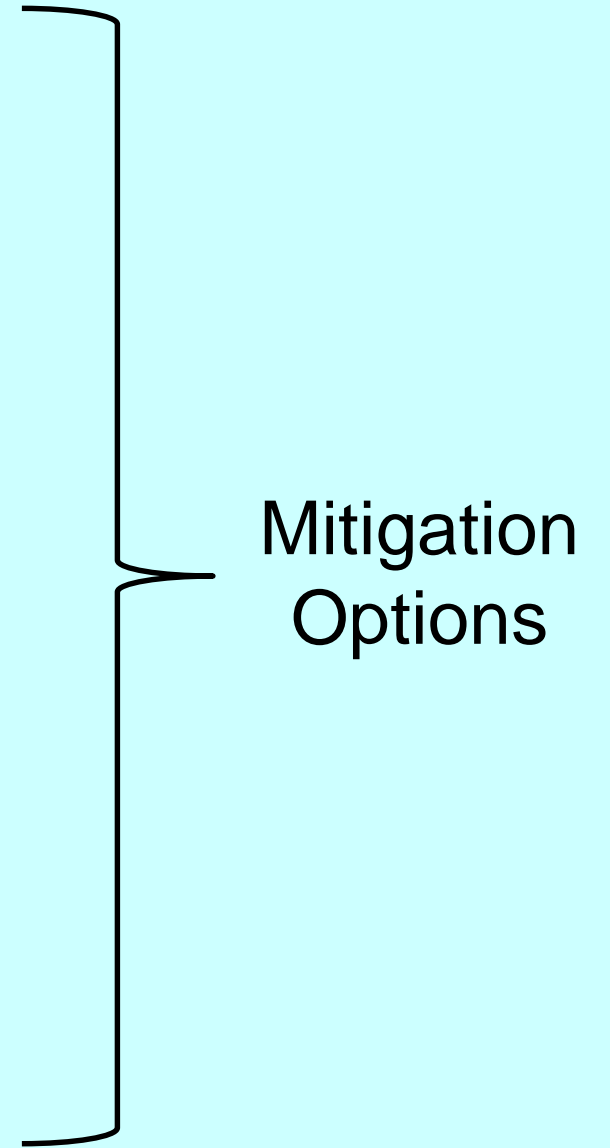
Regional Differences



Dry Season

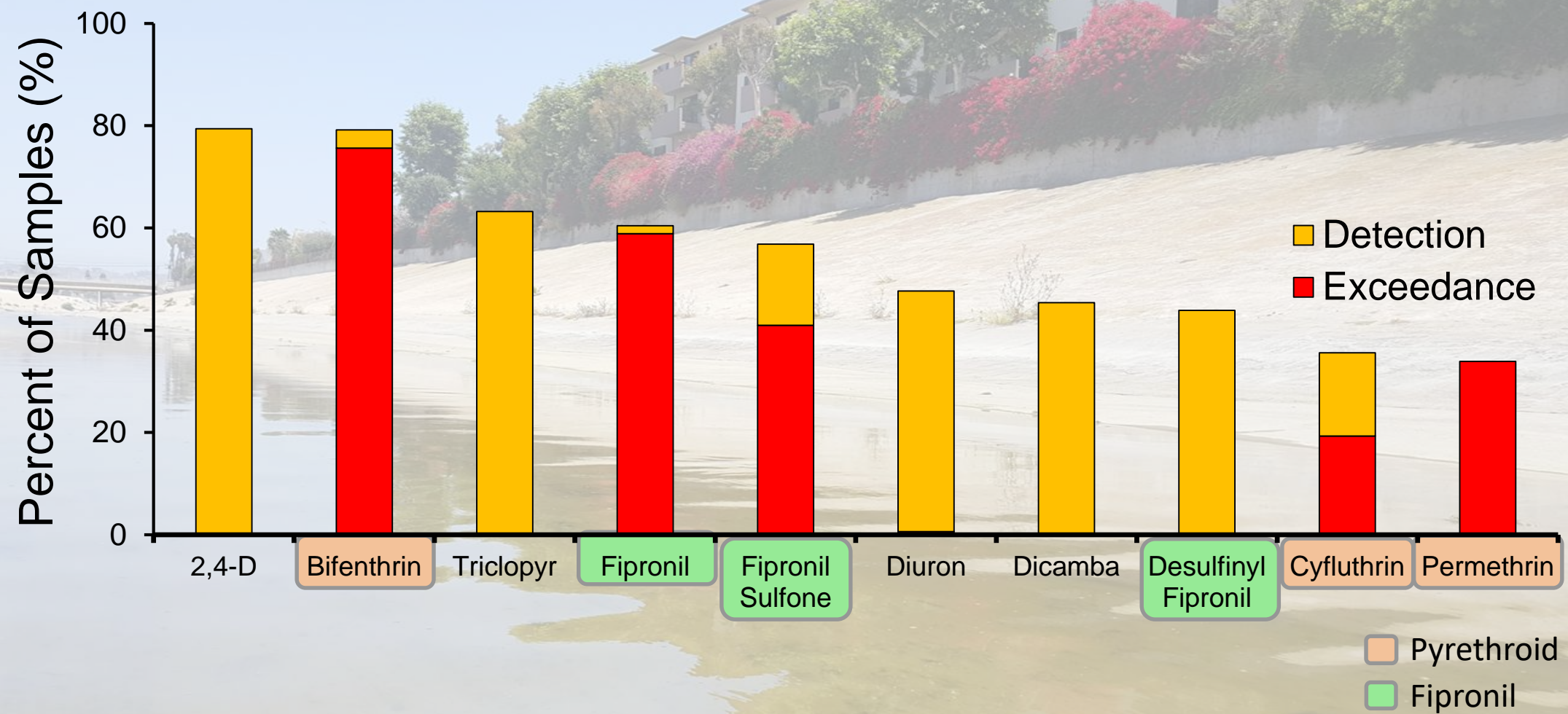


Rain Event



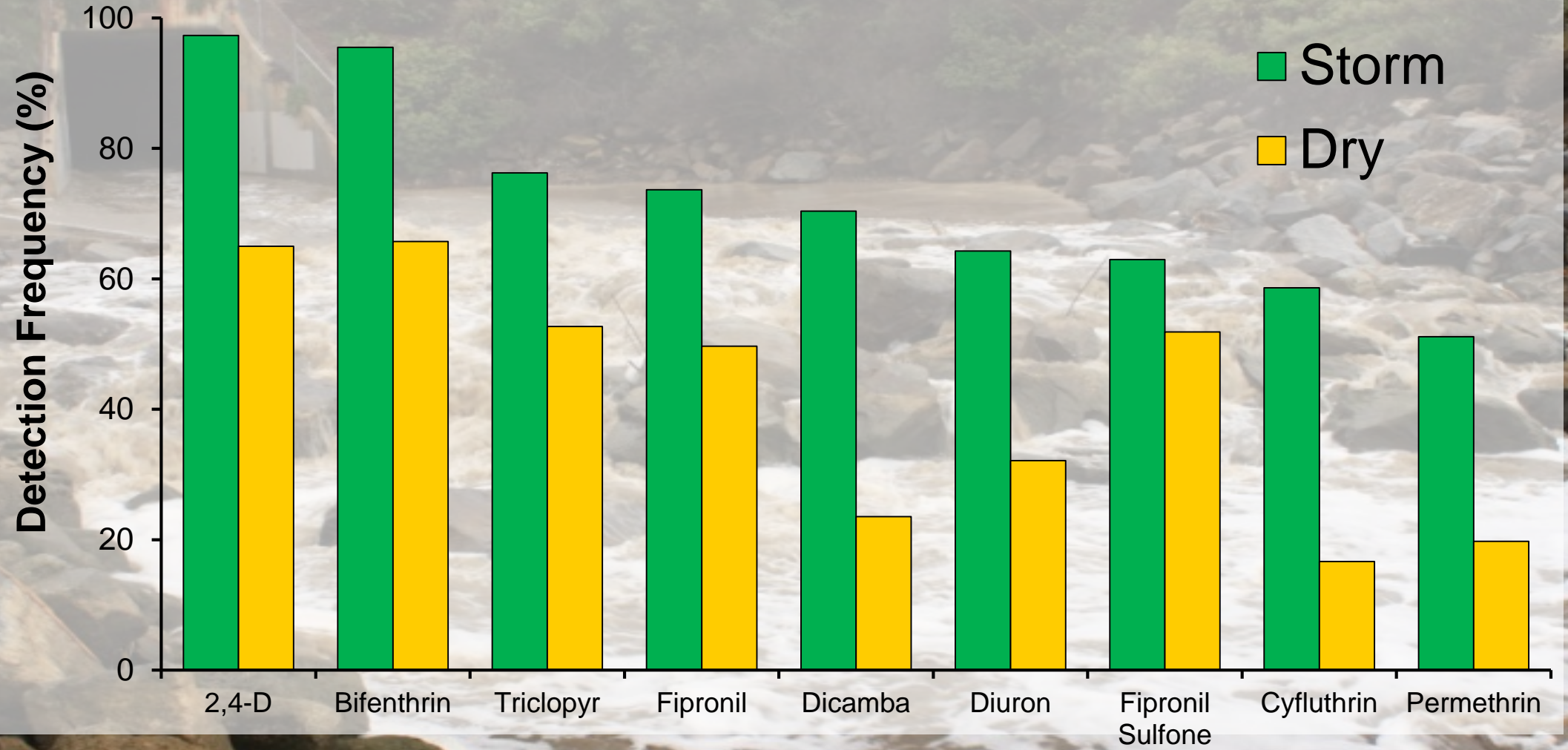
Mitigation Options

# Pesticides Detected In California Urban Waterways



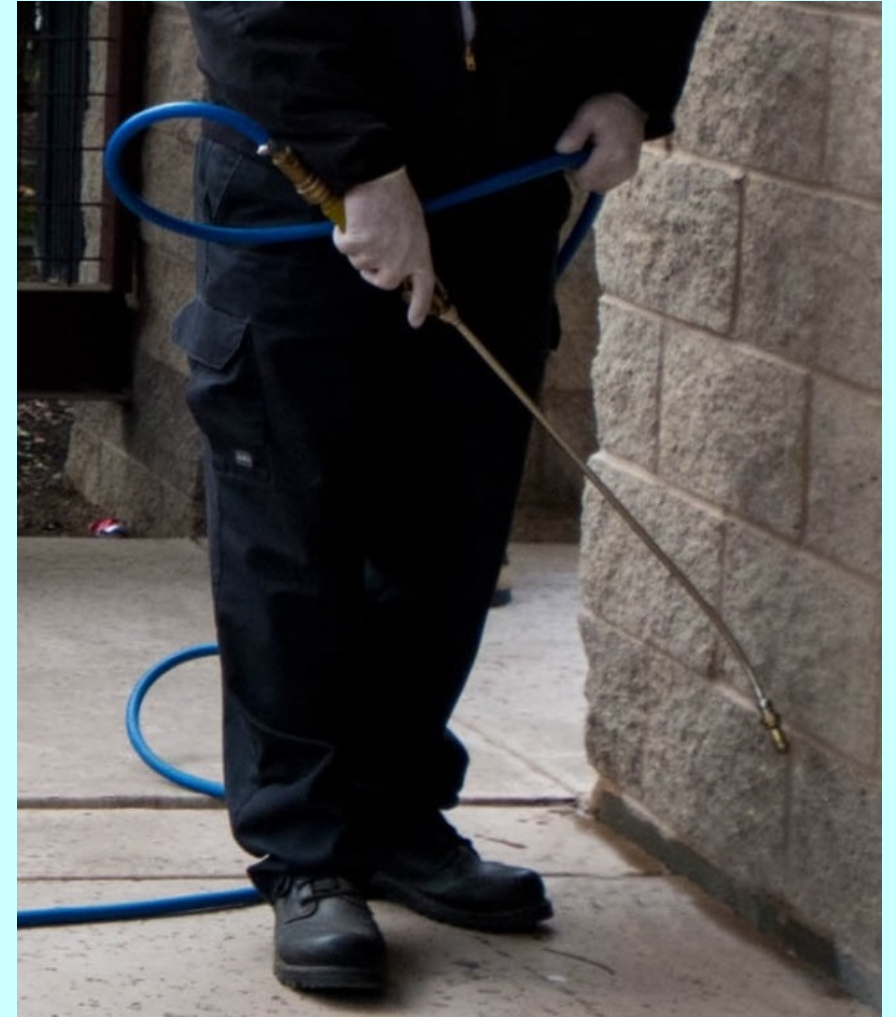
\*Concentration above lowest US EPA aquatic benchmark

# Event Type



# Example 1: Regulations

- Surface Water Pyrethroid Regulations went into effect 2012
- Professional applicators applying pyrethroid-containing products
- Reduce amount of pyrethroids in runoff




# Early Understanding

- High detection frequency
- Concentrations found at potentially toxic levels to aquatic organisms
- Impervious surfaces primary conduit for offsite transport
- Applications to driveways serve as source for long periods after applications
  - Jiang, W. et al. 2012. **Runoff of pyrethroid insecticides from concrete surfaces following simulated and natural rainfalls.** Water Research, 46(3):645-652.
  - Hanzas, J. et al. 2011. **Runoff transport of pyrethroids from a residential lawn in Central California.** Journal of Environmental Quality, 40(2): 587-597.
  - Jorgenson, B., and T. Young. 2010. **Formulation effects and the off-target transport of pyrethroid insecticides from urban hard surfaces.** Environmental Science and Technology, 44(13):4951-4957.




# SURFACE WATER REGULATIONS

1"   
PIN STREAM  
1" OR LESS is permitted

  
2'  
2'  
SPOT SPRAY

Cracks  Crevice   
CRACKS & CREVICES  
Spray MUST stay in cracks & crevices

2' up   
STRUCTURE BASE

Driveway or Hard Surface

- CRACKS & CREVICES  
Spray MUST stay in cracks & crevices
- PIN STREAM  
1" OR LESS
- SPOT SPRAY

Driveway or Hard Surface

2' ↓  
HORIZONTAL SURFACES

  
DRAINS  
Do NOT allow the pyrethroids to enter drains



# DPR Monitoring Trends 2008-2018

- All data at long-term monitoring sites from 2008-2018
- Mann-Whitney and Kendall's tau non-parametric tests
- Highlighted if either test significant ( $\alpha = 0.05$ )
- No trends observed for Esfenvalerate, Lambda-cyhalothrin, Permethrin

Region	Test	Bifenthrin	Cyfluthrin	Cypermethrin	Deltamethrin
State	All				
Northern	All Data				
	Stormdrain				
	Receiving Water				
	Storms				
	Dry				
Southern	All				
	Stormdrain				
	Receiving Water				
	Storms				
	Dry				



= Downward Trend



= Upward Trend



= No Trend

# Example 2: Label Changes

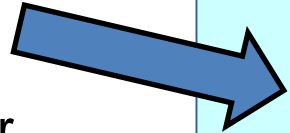
- Products with new labels began circulating in California in January, 2018
- Reduce fipronil concentrations in runoff
- Maintain practical, effective pest control
- Involve all stakeholders
- Evaluate efficacy under real world conditions



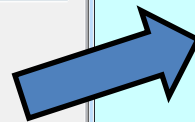
# DPR PREM Model Estimations

## Model Parameters

- Product dilution
- Applications to driveway
- Bandwidth
- Volume
- Applications per year



Product Dilution	Application to garage door/ driveway interface		Application around house		Applications per year	Predicted reduction from baseline	
	Swath @ volume	Rate	Swath @ volume	Baseline Rate		Applied mass	Estimated environmental concentration
0.06%	1 ft @ 2 qt	1x	1 ft @ 2 qt	1x	2		Baseline
0.06%			1 ft @ 2 qt	1x	1	55%	<b>31%</b>
0.06%	≤1 in @ 1 qt	6x	≤1 in @ 1 qt	6x	1	75%	<b>54%</b>
0.06%	≤1 in @ 2 qt	12x	≤1 in @ 2 qt	12x	1	50%	<b>8%</b>
0.06%			≤1 in @ 2 qt	12x	2	10%	<b>24%</b>
0.06%			≤1 in @ 1 qt	6x	2	55%	<b>62%</b>
0.03%			1 ft @ 2 qt	1/2x	2	55%	<b>62%</b>
0.03%			6 in @ 1 qt	1/2x	4	55%	<b>83%</b>
0.03%			6 in @ 1 qt	1/2x	4	55%	<b>89%</b>



Advanced options for residential uses

Primary method | Additional method

Pervious surfaces:  
set buffer (ft) away from impervious surfaces: [ ]

Impervious surfaces, horizontal

Backyard: Perimeter [ ] width (ft) [ ]

Walkway (frontyard): Crack & crevice [ ] width (ft) [ ]

Garage door-driveway interface: Not treated [ ] width (ft) [ ]

Driveway: [ ] width (ft) [ ]

Sidewalk: Not treated [ ] width (ft) [ ]

Impervious surfaces, vertical

Wall (backyard): [ ] width (ft) [ ]

Wall (frontyard): [ ] width (ft) [ ]

Garage door: [ ] width (ft) [ ]

Example scenarios

Select a scenario for description...

Update

Components for horizontal impervious surfaces  
(for illustration only, not reflect actual dimension and size)

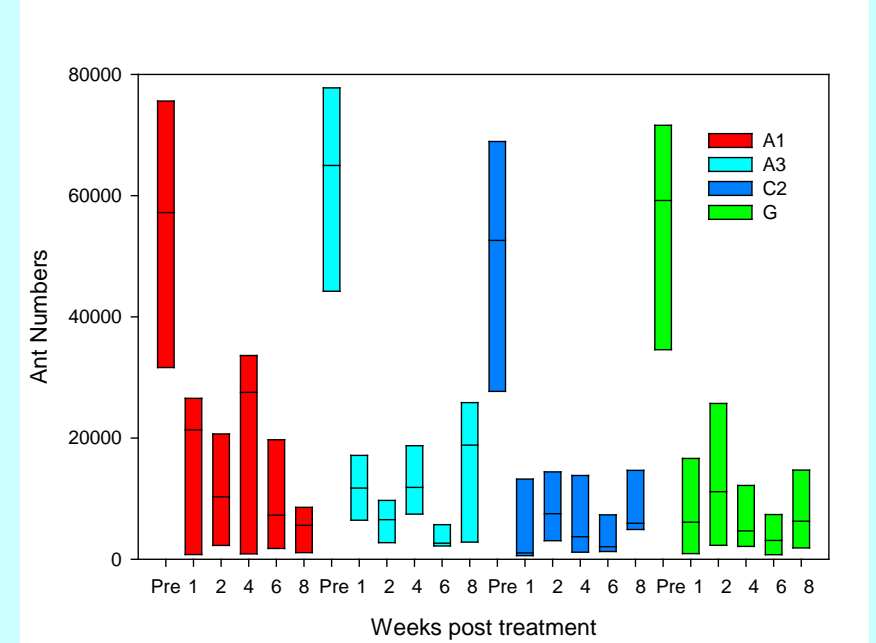
Legend

- Untreated
- Perimeter
- Crack and crevice

# University of California

## Washoff studies

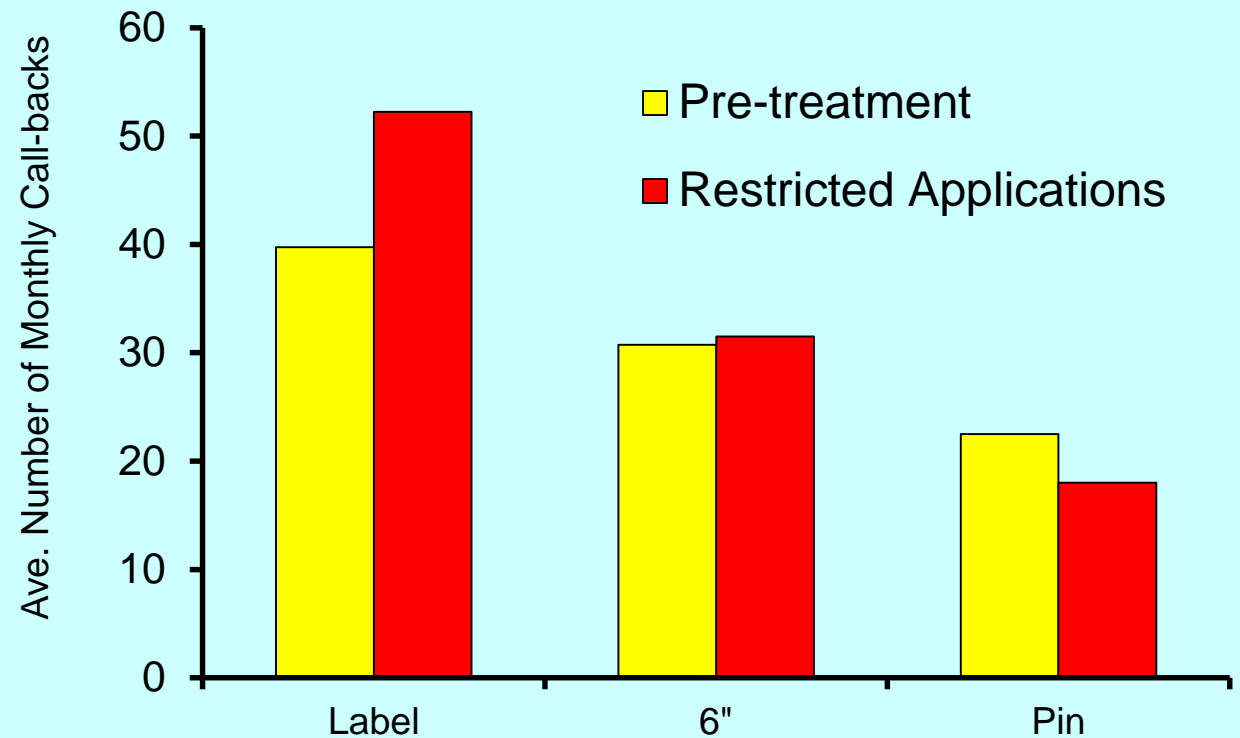
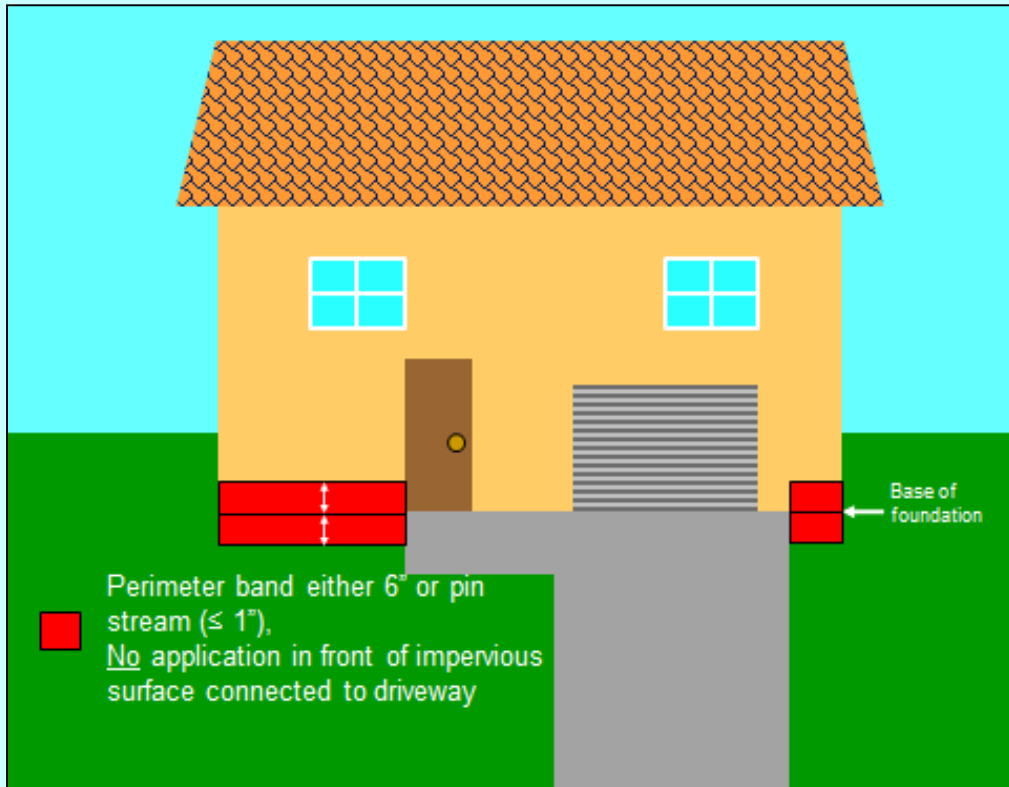
- Runoff study under restricted application scenarios
- Observed ant populations (efficacy)
- Measured runoff concentrations
- No differences in efficacy between trials



# Pest Control Operators

## Field Trials

- Restricted applications on regularly scheduled routes
- Large number of homes (**2000+**)
- No change in number of call-backs



# NEW CALIFORNIA FIPRONIL LABELS

\*DOES NOT AFFECT TRAPS OR BAIT PRODUCTS

Only apply  
0.03%  
finished dilution

Do not apply to  
garage door or  
driveway

6" up  
6" out  
Only apply bandwidth  
6 inches up and out  
from foundation



# Outreach and Education



Professional Applicators



Public

**Regulations Not As Effective If No One Knows About Them!**

**Challenge – Human Behavior Affects Outcome**



Questions?