



Preventing Problems from Pesticides – The Research and the Regulations

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Central Contra Costa Sanitary District
NACWA P3 Workshop 2014

Alphabet Soup



- CASA = CA Association of Sanitation Agencies
- DPR = CA Department of Pesticide Regulation
- Tri-TAC = Technical Advisory Committee for CASA, the League of California Cities and California Water Environment
- UP3 = Urban Pesticides Pollution Prevention Project (staffed by Dr. Kelly Moran)

Pesticide Registration

- EPA Office of Pesticide Programs registers pesticides for use in the US.
- EPA pesticide registrations are reviewed once every 15 years.
- DPR registers pesticides for use in California.
- DPR can place pesticides in reevaluation should human health or environmental monitoring reveal concerning data.

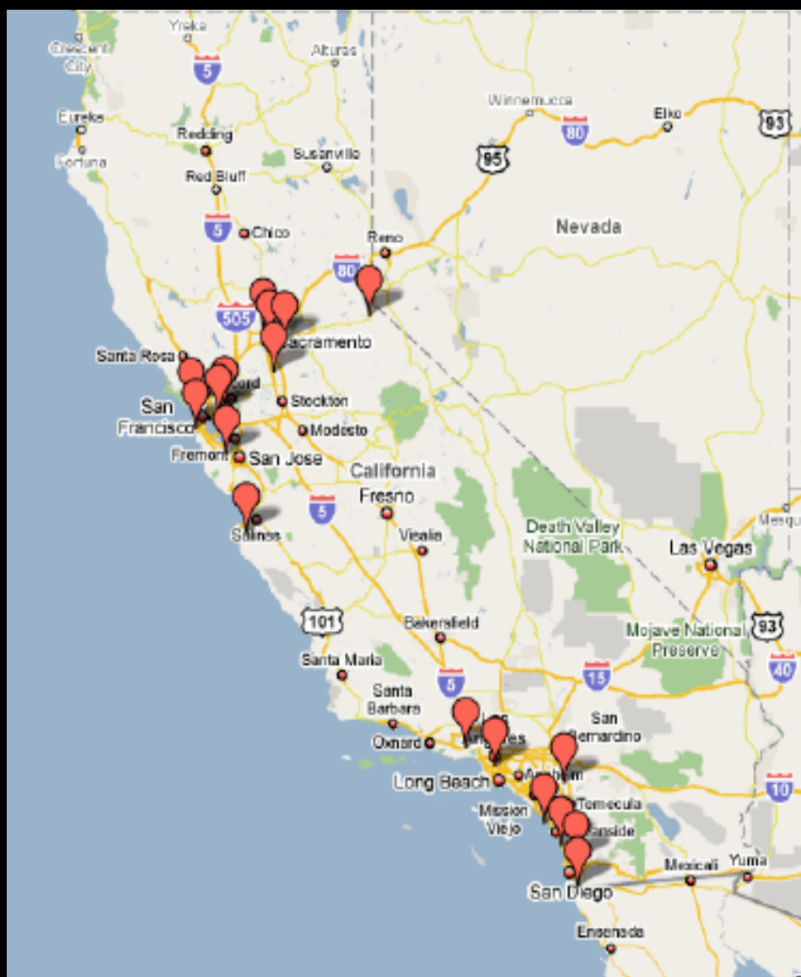
Where Are More Pesticides Used?



Photo: USGS



Pyrethroids and Associated Toxicity Widespread in CA Urban Watersheds



Note: Not comprehensive

Data from: Armand Ruby Consulting (2013). Review of Pyrethroid, Fipronil and Toxicity Monitoring Data from California Urban Watersheds. Prepared for CASQA.

Pyrethroid Pesticides

- Replacement for Organophosphates
 - Diazinon & Chlorpyrifos
- Developed from the naturally-occurring pyrethrin that comes from chrysanthemums
- Not toxic to people and pets
- Highly toxic to aquatic life
- Resulting water quality problems caused primarily by ant control efforts

Really???



Pesticides Water Pollution in California

- Discharge toxicity testing
- TMDL lawsuits
- EPA water regulator pressure
- Nation's first Pyrethroids TMDLs
 - EPA adopted Bifenthrin TMDL for Oxnard Drain
 - Central Coast Santa Maria River Pyrethroids TMDL
 - Both have targets < 1 ng/L AND no chronic toxicity
- Dozens of 303(d) listings coming

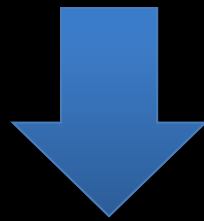
Why We Care about Urban Pesticides Water Pollution

- Compliance
- Environmental & health protection
- Contaminants of emerging concern
 - Growing interest by the public AND water regulators
- Impacts to beneficial reuse
 - We may soon be drinking our urban discharges



Water quality and pesticide regulation
not fully coordinated

Pesticide registrations rarely consider
sewer discharges or urban runoff



**Pesticides are approved for uses that
cause Clean Water Act violations**

FAIL

Example: Bifenthrin

1,100 California Urban Creek samples
Collected 2003-2012

Detected - 64% Water / 69% Sediment

Average water concentration = 26 ng/L

H. Azteca LC 50 = 7 ng/L EC50 = 3 ng/L

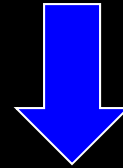
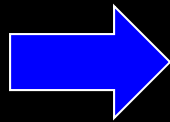
EPA TMDL Target = 0.6 ng/L

< 10 ppt of
Pyrethroids
Kills
Hyalella azteca



Standard aquatic toxicity test organism; native in many of nation's streams

Pyrethroids are Discharged to POTWs



Many Discharge Pathways



Cleaning

Inevitable
Discharges

Applications
into Sewer?

Do POTW Pyrethroids Discharges Matter?

2006: DPR starts Pyrethroids Reevaluation

- UP3/Tri-TAC approached DPR
- DPR required manufacturers to do survey (effluent permethrin only)

2007-11: Manufacturers & Tri-TAC disagree

- Quality of study
- Include influent, effluent, biosolids & 8 pyrethroids

2011: DPR requirement updated

2012: Study plans, analytical method, volunteers

2013: Survey completed

Pyrethroid pesticides in municipal wastewater: A baseline survey of publicly owned treatment works facilities in California in 2013

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Coalition for Urban/Rural Environmental Stewardship
www.curesworks.org

PYRETHROID
WORKING GROUP



Project sponsored by the Pyrethroid Working Group

POTW Pyrethroid Survey

- Validated analytical method
- Developed Quality Assurance Project Plan (QAPP)
- 32 diverse volunteer POTWs (anonymous)
 - Size, location, treatment type, etc.
- Influent, effluent & biosolids (grabs)
- Extensive QA
- Measured: 8 pyrethroids, TSS, TOC (water); Total Solids (biosolids)

POTW Pyrethroid Survey

- Not Measured:
 - Toxicity
 - 10 indoor and/or less used pyrethroids
- Pyrethroids manufacturers funded the analytical work. (DPR requirement)
- Tri-TAC solicited volunteers and managed the study on behalf of the POTWs.

Results

- Pyrethroids are likely to be found in influents, effluents and biosolids from California POTWs
- Effluent – 90% detections
 - <RL – 190 ng/L
- Influent – 100% detections
 - 42 – 3,800 ng/L
- Biosolids 100% detections
 - 130 to 13,000 ng/g (dry)

Results

Effluent Pyrethroids Concentrations – 62 Grab Samples from 31 CA POTWs (Nanograms per Liter)

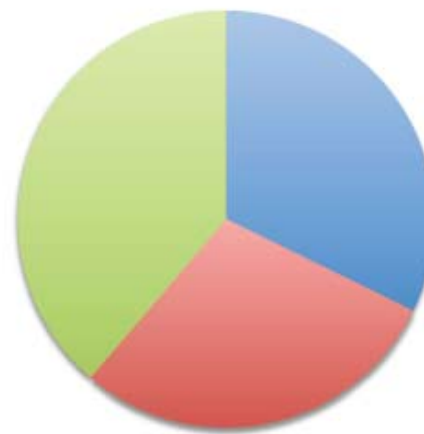
	Bifenthrin	Cyfluthrin	Lambda-Cyhalothrin	Cypermethrin	Deltamethrin	Esfenvalerate	Fenpropathrin	Permethrin
% Detected	82%	60%	48%	81%	16%	32%	3%	65%
Maximum	3.9	4	1.6	13	1.2	0.6	0.8	170
Median (includes NDs)	0.6	0.3	0.2	1.3	0.3	0.2		9.4
<i>H. azteca</i> Acute (LC50)	7.5	2.4	Not available	2.5	Not available	8	Not available	21.1
<i>H. azteca</i> Chronic (EC50)	3.3	1.9	2.3	1.7	Not available	Not available	Not available	Not available
<i>A. bahia</i> Chronic (EC50)	4	2.4	Not available	5	1.7	38	21 (LC50)	20
% \geq lowest of three above number	5%	6%	0%	40%	0%	0%	0%	23%
UCD "Criterion" CMC	4	0.3	1	1	Not calculated	Not calculated	Not calculated	10
UCD "Criterion" CCC	0.6	0.05	0.5	0.2	Not calculated	Not calculated	Not calculated	2
% \geq UCD CCC	52%	61%	10%	77%	--	--	--	66%

Results

**Biosolids Pyrethroids Concentrations – 52 Grab Samples from 26 CA POTWs
(Nanograms per Gram, Dry Weight)**

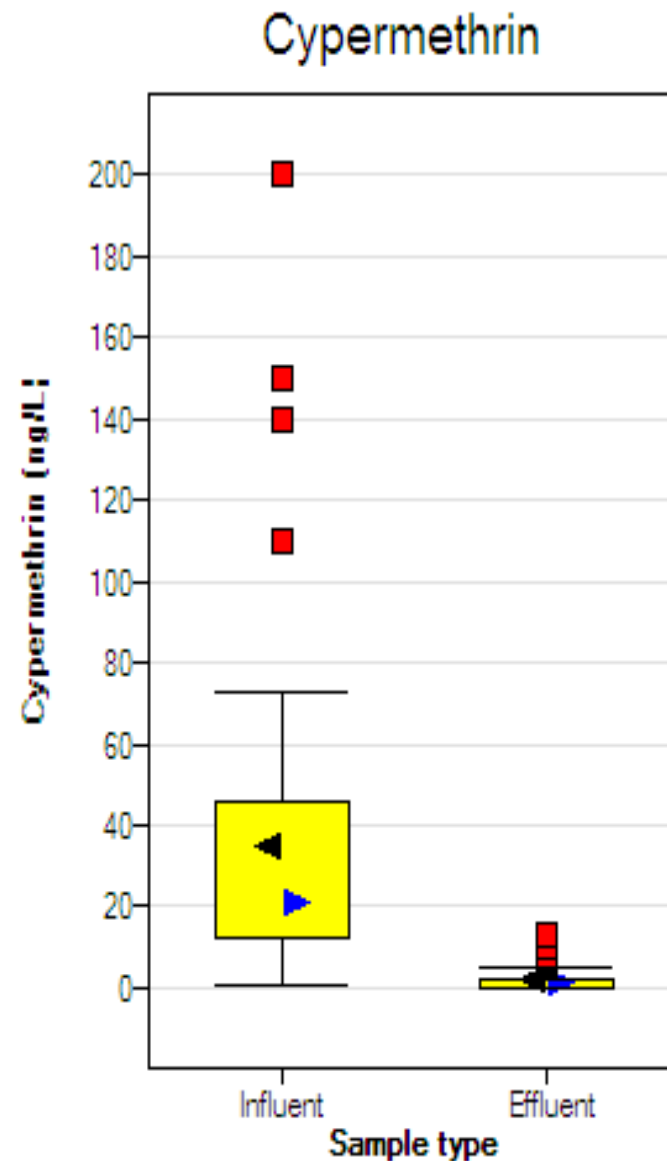
	Bifenthrin	Cyfluthrin	Lambda-Cyhalothrin	Cypermethrin	Deltamethrin	Esfenvalerate	Fenpropathrin	Permethrin
% Detected	96%	87%	52%	90%	31%	31%	6%	92%
Maximum	1,100	190	200	1,000	78	42	71	11,000
Median (includes NDs)	120	29	28	79	24	14		1,200

**Implications of Pyrethroids' Additive Toxicity (Values Approximate)
(Does not account for effluent dilution nor for any bioavailability reduction from TSS/TOC)**



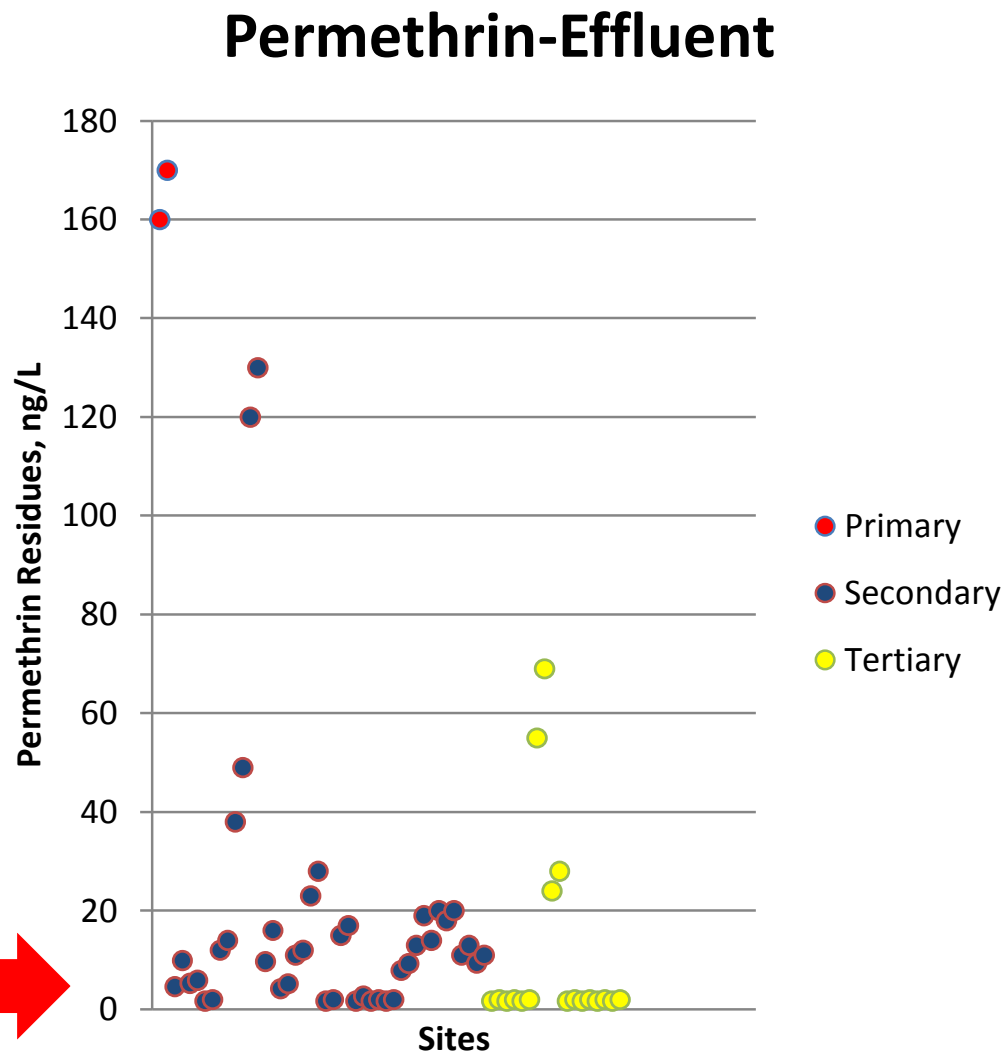
- Individual concentration of at least one pyrethroid exceeded the H. azteca LC50
- Summed pyrethroids concentrations ("toxic units") together exceeded H. azteca LC50
- Below H. azteca LC50

Removal Generally High – But Not Always



Advanced Treatment May Not Be Enough

Proposed
TMDL
Target
2 ng/L



What Do the Results Mean?

- Benchmarks often exceeded in undiluted effluent
 - Cypermethrin:
 - 26% effluents > H. azteca EC50
 - 77% effluents > TMDL Target (Region 3 Water Board)
 - Bifenthrin:
 - 5% effluents > H. azteca EC50
 - 52% effluents > TMDL Target (EPA, Region 3 Water Board)
- Bioavailability not examined
- Biosolids implications unknown

Effluent unlikely to meet upcoming TMDL targets

Pyrethroids in Effluent Could Be Costly

- POTWs likely unable to meet TMDL targets
 - Central Valley Pyrethroid TMDL coming in 2015
- Water Boards evaluating new pesticide requirements, which could include:
 - Additional monitoring & toxicity testing
 - Toxicity identification evaluations
 - Toxicity reduction evaluations
 - Actions toward reducing pyrethroids



Unfortunately...it's not just
Pyrethroid pesticides.

Wastewater Effluent Fipronil Concentrations Often Exceed Benchmarks

Fipronil Passes Through Treatment Processes

	Fipronil
Detection (19 effluents)	>90%
Mean Detected Concentration	34 ng/L
Range of Detected Concentrations	ND – 130 ng/L
Mean Reduction from Influent Concentration (9 sites)	<20%
EPA Benchmark*	11 ng/L
Lowest published toxicity data	<i>C. tentans</i> EC50 – 30-35 ng/L <i>A. bahia</i> LOEC – 5 ng/L

Sources: Jackson 2013; Morace 2012; Heidler and Halden 2009; Weston & Lydy 2014; U.S. EPA OPP 2011

*Chronic aquatic invertebrates

CA Registered Fipronil Products

Product Type	% A.I.
Bait or Gel	0.00045 – 0.05
Pet Squeeze-On	6 - 10
Pet Spray	0.29
Turf/Ornamentals (fire ants, Coachella Valley only)	0.01 – 0.1
Dust RTU (voids)	0.5
Structural Concentrate	9.1

California municipalities are
pre-empted by State law
from regulating pesticide use.

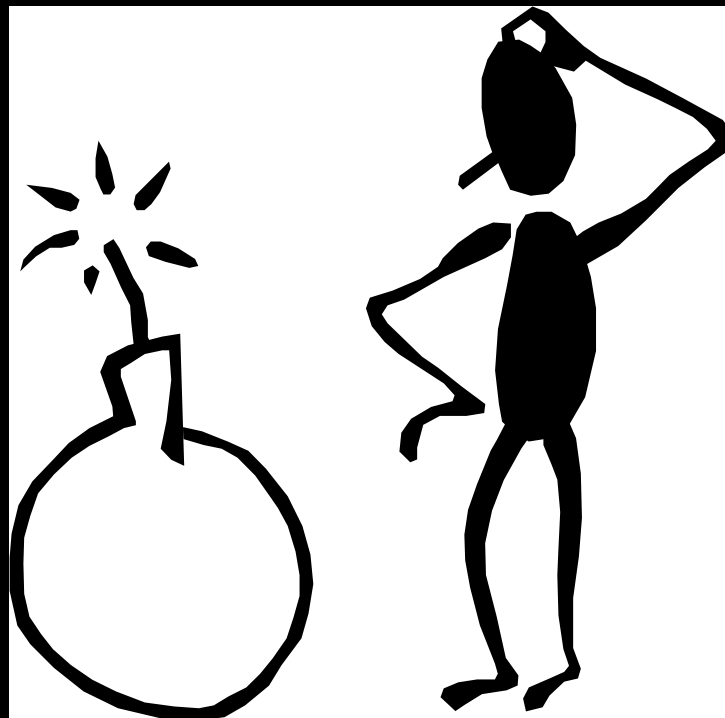
Municipalities Have Little Control Over Pesticides

- Can regulate discharge
 - But is this practical?
- Can use voluntary programs
 - BUT studies show outreach can achieve 10-20% behavior change *at most* *



*Larry Walker Associates, *Tools to Measure Source Control Program Effectiveness*, prepared for the Water Environment Research Foundation, Project #98-WSM-2, 1999. <http://tinyurl.com/5ambooo>

What Do We Do Now???





Build More
Advanced (\$) Treatment?



California DPR–Water Boards Management Agency Agreement

DPR will respond to pesticide
water pollution

But...

Water Boards maintain authorities to
regulate pesticides if DPR action
insufficient

Water Regulators & Dischargers Asking Pesticide Regulators to Act If Necessary to Protect Water Quality



© Courtesy Joe Gratz



Regulatory Response to Urban Runoff Toxicity

- Urban Runoff Protection Regulations for pyrethroids (July 2012)
- Special restrictions for bifenthrin

Estimated 80-90% toxicity reduction



Regulatory Response to POTW Pyrethroids

- *To be determined*

POTW and Water Board input are Key!

Tri-TAC's* Pyrethroids Strategy

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graph TD; A[Tri-TAC's* Pyrethroids Strategy] --> B[Reduce pyrethroid discharges at their source]; A --> C[Implement a feasible regulatory framework];
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Reduce pyrethroid
discharges at their source

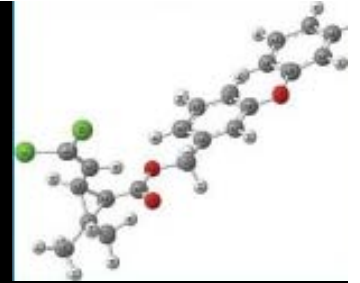
Implement a feasible
regulatory framework

* Now, the CASA Regulatory Workgroup

Implement a Feasible Regulatory Framework

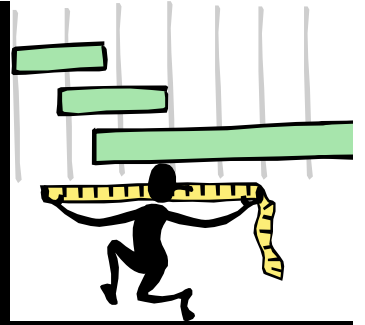
- Avoid unattainable water quality requirements being established and incorporated into permits, Basin Plans and TMDLs
 - Promote regulation of pyrethroids by pesticide regulatory authorities (EPA, DPR)
 - Coordinate regulatory response among water and pesticide regulatory agencies
 - Avoid application of current UC Davis criteria values

Reduce Pyrethroid Discharges



- Identify major sources of pyrethroids in effluent
- Work toward timely, effective implementation of discharge reduction measures targeting these major sources
 - Request that DPR ask/require additional studies by manufacturers
 - In partnership with DPR and PWG, investigate potential targeted discharge reduction opportunities

Progress So Far...



- Oxnard Drain & Santa Maria River Watershed TMDLs
 - Don't include any POTWs
 - Use UC Davis criteria
- Met with Central Valley Water Board staff on their upcoming Pyrethroid TMDL
 - They understand our predicament, but are being pressured by the EPA to include numeric targets.
- CASA is working to schedule a meeting with the DPR in June.

Acknowledgements

- Dr. Kelly Moran, TDC Environmental, UP3
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- Tom Meregillano, Orange County Sanitation District (Southern California Alliance of POTWs)
- Huy Do and Phil Markle, Sanitation Districts of Los Angeles County

Questions or Comments?



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