Pyrethroids (and other pesticides) in Agricultural and Urban Environments

Pyrethroid Monitoring and Priorities

Agricultural areas

- Monitoring results
- Monitoring priorities

Urban areas

- Monitoring results
- Monitoring priorities

Urban pyrethroid regulations

- Measuring success

Monitoring Sites, Ag

Old Salinas River, Salinas Valley

Alamo River, Imperial Valley

Tembladero Slough,
Salinas Valley

Solomon Canyon Creek,
Santa Maria Valley

Currently Monitored Ag Pesticides

- Pyrethroids
  Bifenthrin, Cyfluthrin, Cypermethrin, Esfenvalerate, λ-Cyhalothrin, Permethrin
- Organophosphates
  Chlorpyrifos, Diazinon, Malathion
- Imidacloprid
- Chlorothalonil
- Pendimethalin, Trifluralin, Oxyfluorfen
- Methomyl

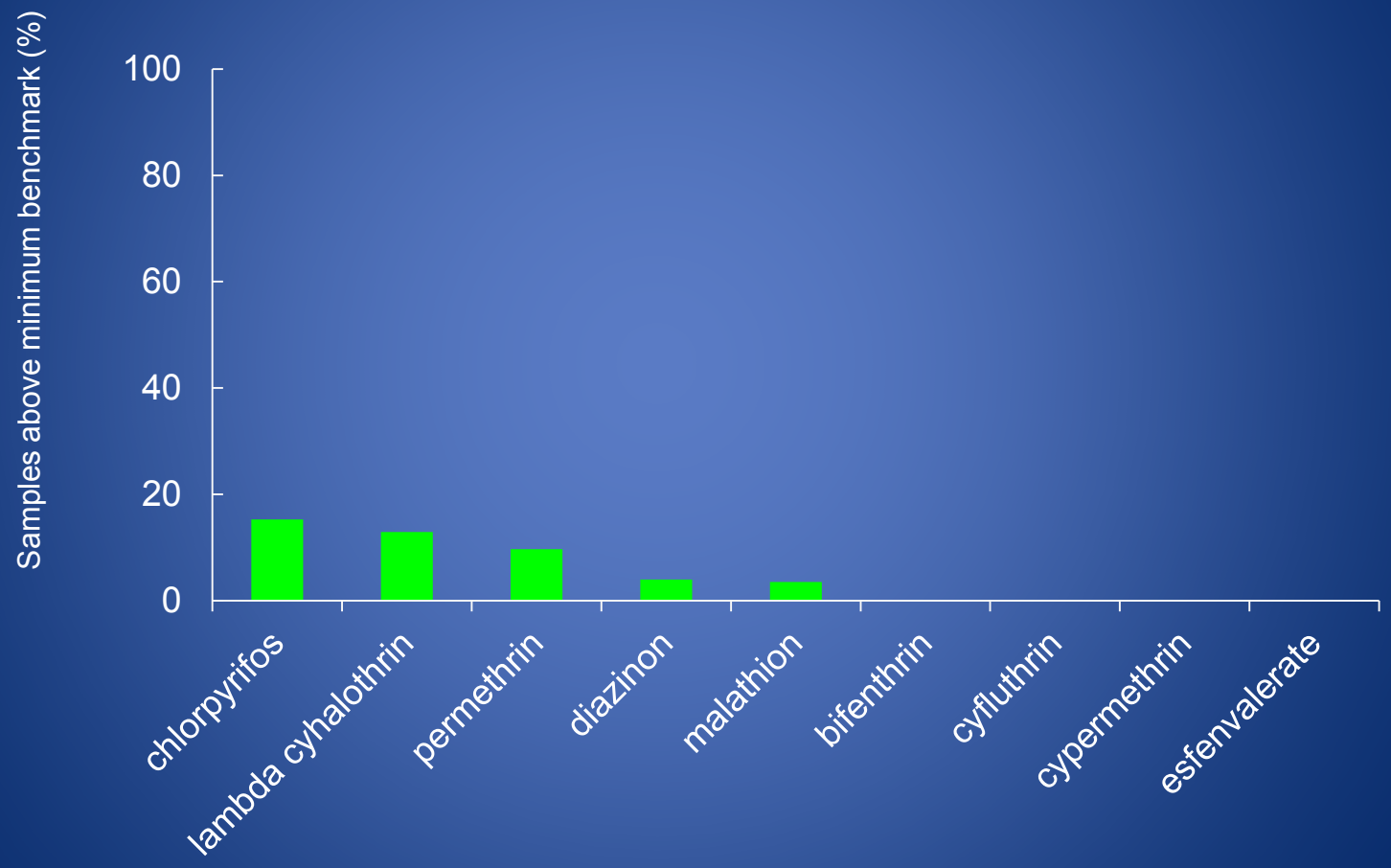
Prioritization Model for Ag

Active ingredient	Use Type	Ave Lbs Used	Use Score	Minimum Acute Aquatic Benchmark	Acute Score	Prioritization Score
Paraquat dichloride	herbicide	1,879,636	5	0.396	5	25
Chlorpyrifos	Insecticide	1,295,679	4	0.05	6	24
Permethrin	Insecticide	114,362	3	0.01	7	21
Pendimethalin	herbicide	1,835,108	5	5.2	4	20
Copper hydroxide	fungicide	1,644,087	5	8.5	4	20
Oxyfluorfen	Herbicide	619,879	4	0.29	5	20
Malathion	Insecticide	492,296	4	0.3	5	20
Chlororthalonil	fungicide	819,484	4	1.8	4	16
Ziram	Fungicide	740,610	4	9.7	4	16
Trifluralin	Herbicide	494,499	4	7.52	4	16
Diuron	Herbicide	349,605	4	2.4	4	16
Propanil	Herbicide	2,128,121	5	16	3	15
Diazinon	Insecticide	117,158	3	0.11	5	15
Phosmet	insecticide	115,414	3	1	5	15
Carbaryl	Insecticide	101,063	3	0.85	5	15
Lambda-cyhalothrin	Insecticide	43,882	2	0.0035	7	14
Diflubenzuron	insecticide	37,005	2	0.0014	7	14
Bifenthrin	insecticide	86,105	2	0.075	6	12
Esfenvalerate	insecticide	39,006	2	0.025	6	12
Simazine	Herbicide	399,845	4	36	3	12
Methomyl	insecticide	225,684	3	2.5	4	12
Pyraclastrobin	Fungicide	122,132	3	1.5	4	12
s-metolachlor	herbicide	280,860	3	8	4	12

Yellow = currently monitored, Green = previously monitored

Benchmark Evaluation

2012 Ag Monitoring Central Coast & Imperial



Concentrations compared to minimum EPA acute aquatic benchmark value:

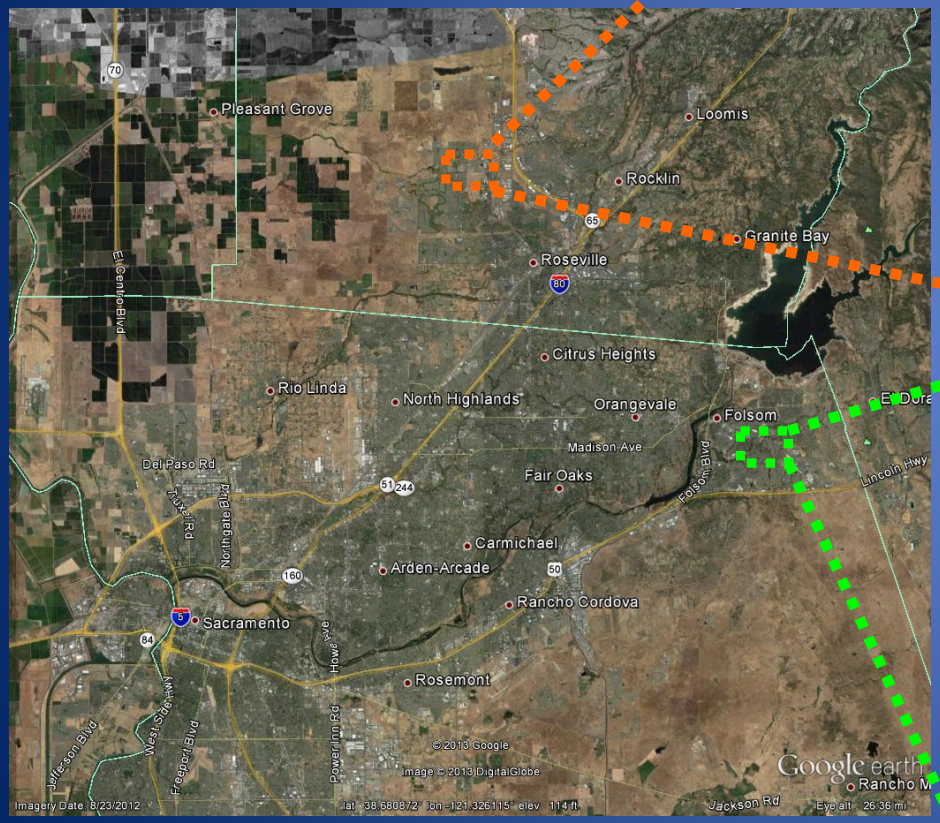
http://www.epa.gov/oppefed1/ecorisk_ders/aquatic_life_benchmark.htm#benchmarks

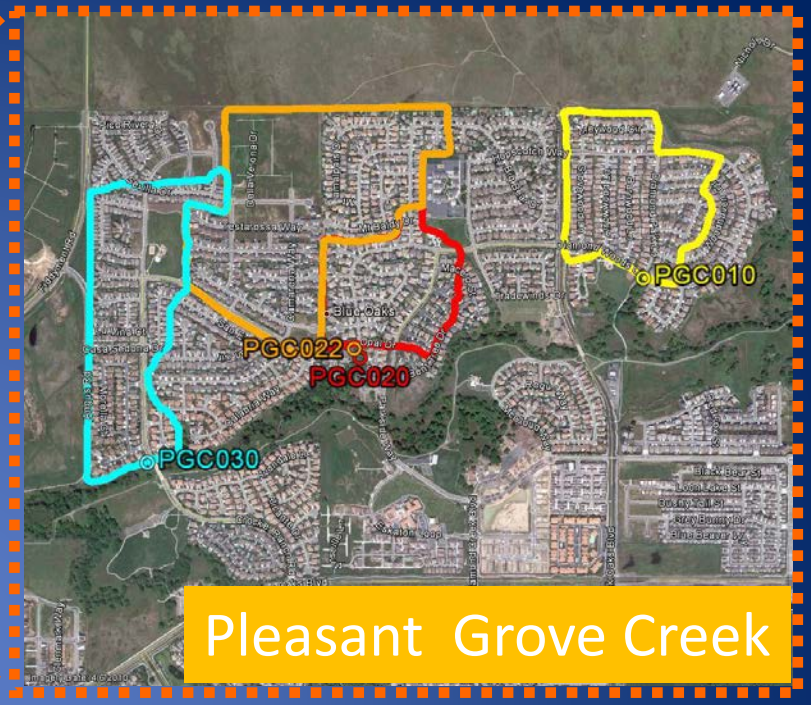
Monitoring for Pesticides in Urban Runoff in California

Urban Monitoring Objectives

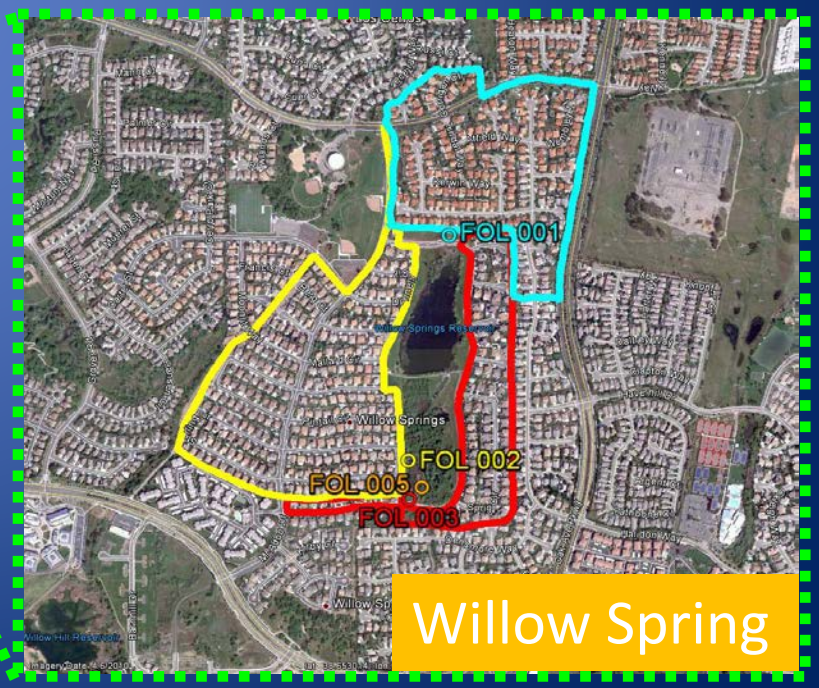
1. Determine presence of high use pesticides in urban runoff
2. Compare concentrations to aquatic benchmarks or water quality criteria
3. Determine differences in concentrations during base flow versus storm events
4. Observe efficacy of local mitigation measures aimed to reduce pesticide concentrations in receiving waters
5. Evaluate efficiency of recently adapted surface water regulations at reducing pyrethroid concentrations

Northern California Sampling Locations



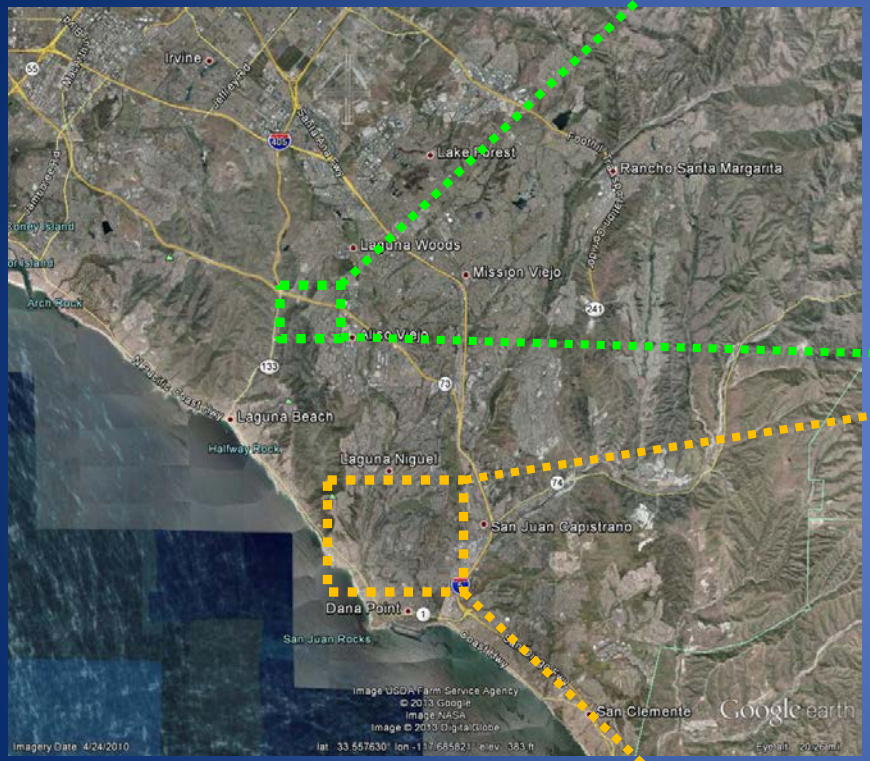


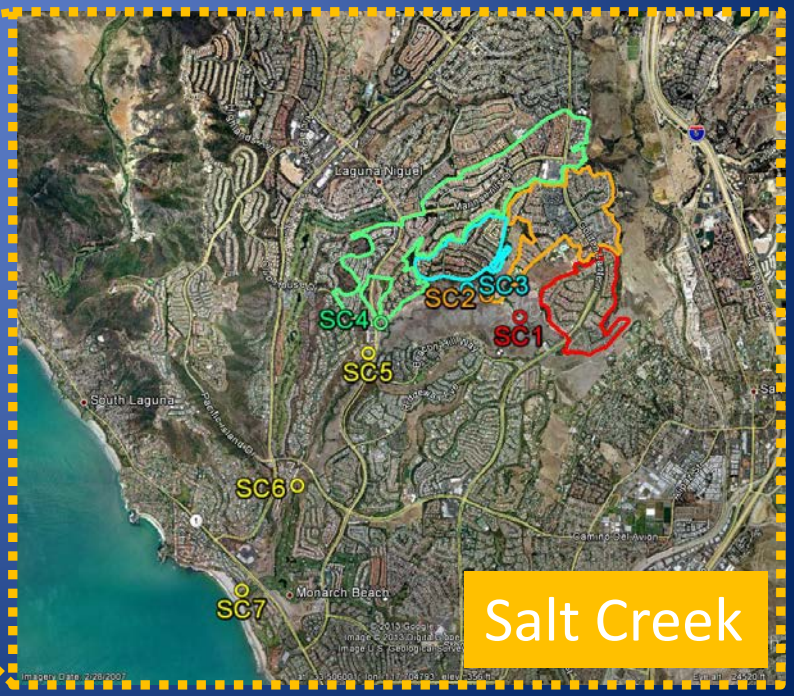
Pleasant Grove Creek



Willow Spring

Southern California Sampling Locations





Sample Collection

Grab Sampling

Automated Samplers

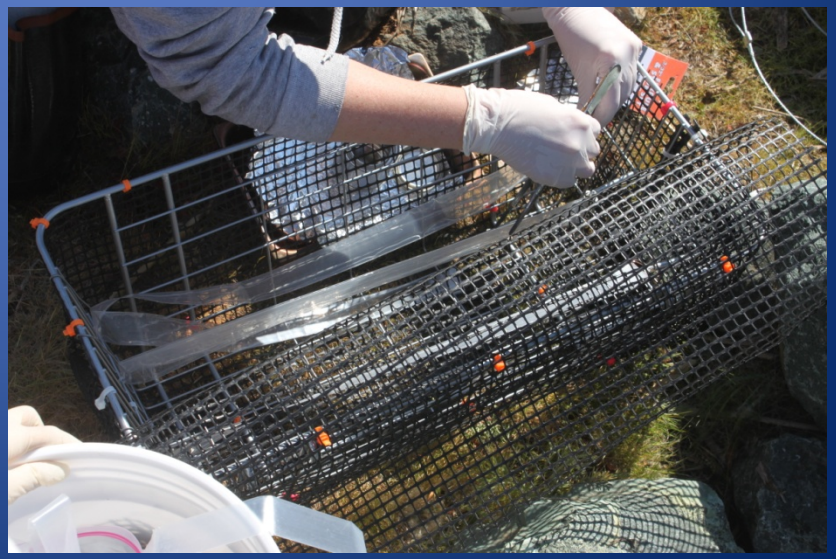
Water Quality

Flow

Passive Samplers

Polar Organic Chemical Integrative Sampler (POCIS)

Semipermeable Membrane Device (SPMD)



Currently Monitored Pesticides

- Pyrethroids
  - Bifenthrin, Cyfluthrin, Cypermethrin, Esfenvalerate, λ-Cyhalothrin, Permethrin
- Fipronil + Metabolites
- Malathion
- Photosynthetic Inhibitor Herbicides
  - Bromacil, Diuron, Hexazinone, Simazine
- Auxin Herbicides
  - 2,4-D, Dicamba, MCPA, Triclopyr
- Chlorothalonil
- Imidacloprid
- Pendimethalin

Prioritization Model for Urban

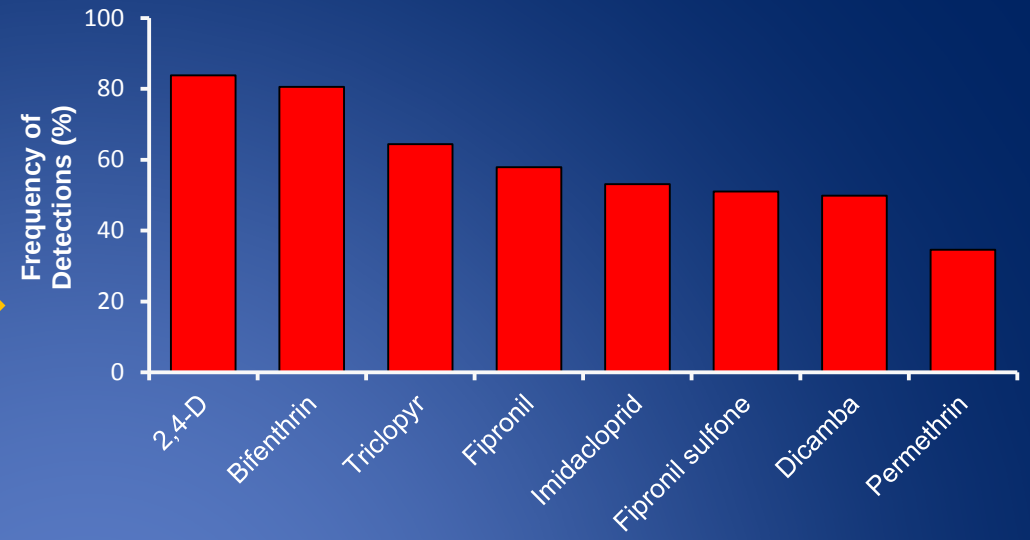
Active ingredient	Use Type	Ave Lbs Used	Use Score	Minimum Acute Aquatic Benchmark	Acute Score	Prioritization Score
Permethrin	Insecticide	167,704	5	0.01	7	35
Bifenthrin	Insecticide	85,852	5	0.075	6	30
Oxyfluorfen	Herbicide	131,911	5	0.29	5	25
Cyhalothrin (lambda)	Insecticide	8,173	3	0.0035	7	21
Copper	Fungicide, Algaecide	530,418	5	2.05	4	20
Diuron	Herbicide	274,649	5	2.4	4	20
Acrolein	Algaecide, Fumigant	120,384	5	7	4	20
Cypermethrin	Insecticide	58,543	4	0.195	5	20
Fipronil	Insecticide	43,480	4	0.11	5	20
Diquat dibromide	Herbicide	41,778	4	0.75	5	20
Cyfluthrin	Insecticide	24,437	3	0.0125	6	18
Cyfluthrin (beta)	Insecticide	7,749	3	0.034	6	18
Deltamethrin	Insecticide	6,937	3	0.055	6	18
Chlorothalonil	Fungicide	85,807	4	1.8	4	16
Pendimethalin	Herbicide	58,863	4	5.2	4	16
Bromacil	Herbicide	38,799	4	6.8	4	16
Prodiamine	Herbicide	26,377	4	3	4	16
Sulfometuron-methyl	Herbicide	11,857	3	0.48	5	15
Flumioxazin	Herbicide	10,523	3	0.852	5	15
Malathion	Insecticide	9,600	3	0.3	5	15
Oryzalin	Herbicide	74,409	4	15.4	3	12
Triclopyr, butoxyethyl ester	Herbicide	48,385	4	70	3	12
Imidacloprid	Insecticide	40,314	4	35	3	12

Yellow = currently monitored, Green = previously monitored

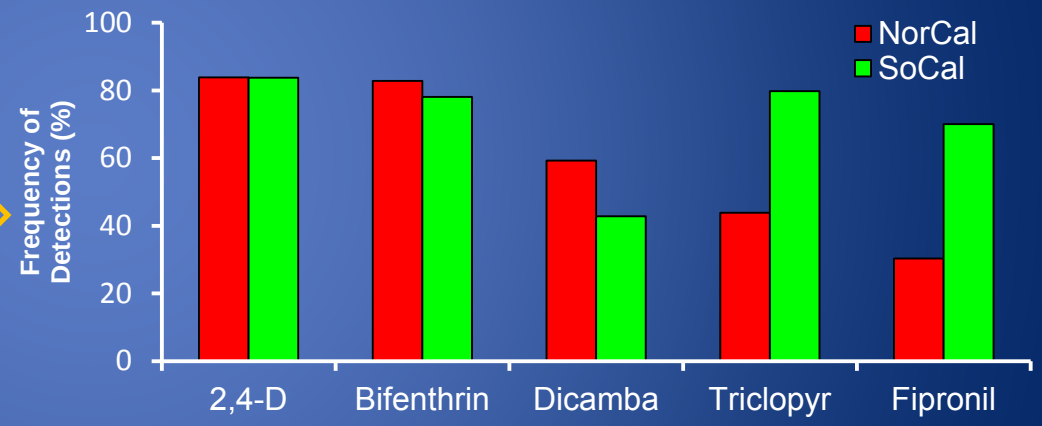
Data Usage

Region	Sample Date	SiteID	Analyte Name	Result (ug/L)
NorCal	5 /27/2008	PGC010	2,4-D	11.5
NorCal	5 /27/2008	PGC020	2,4-D	8.2
NorCal	8 /1 /2011	PGC010	2,4-D	3.5
NorCal	8 /2 /2011	FOL001	2,4-D	4.1
NorCal	6 /19/2012	PGC022	2,4-D	5.2
NorCal	10/13/2009	PGC010	2,4-D	ND
NorCal	10/13/2009	PGC040	2,4-D	ND
NorCal	10/5 /2011	FOL001	2,4-D	5.7
NorCal	2 /19/2013	FOL005	2,4-D	6.4
NorCal	4 /13/2009	PGC040	Bifenthrin	ND
NorCal	8 /28/2009	PGC040	Bifenthrin	ND
NorCal	8 /28/2009	NAT001	Bifenthrin	ND
NorCal	6 /27/2011	SBP100	Bifenthrin	ND
NorCal	10/5 /2011	PGC021	Bifenthrin	131.0
NorCal	10/5 /2011	PGC022	Bifenthrin	67.5
NorCal	10/5 /2011	PGC010	Bifenthrin	54.1
NorCal	10/5 /2011	PGC025	Bifenthrin	50.8
NorCal	1 /20/2012	PGC010	Bifenthrin	52.5
NorCal	2 /19/2013	FOL002	Bifenthrin	59.8
NorCal	2 /19/2013	PGC010	Bifenthrin	141.0
NorCal	2 /19/2013	PGC022	Bifenthrin	49.9
SoCal	4 /8 /2008	SC5	Fipronil	0.1
SoCal	4 /8 /2008	SC1	Fipronil	ND
SoCal	4 /8 /2008	SC3	Fipronil	ND

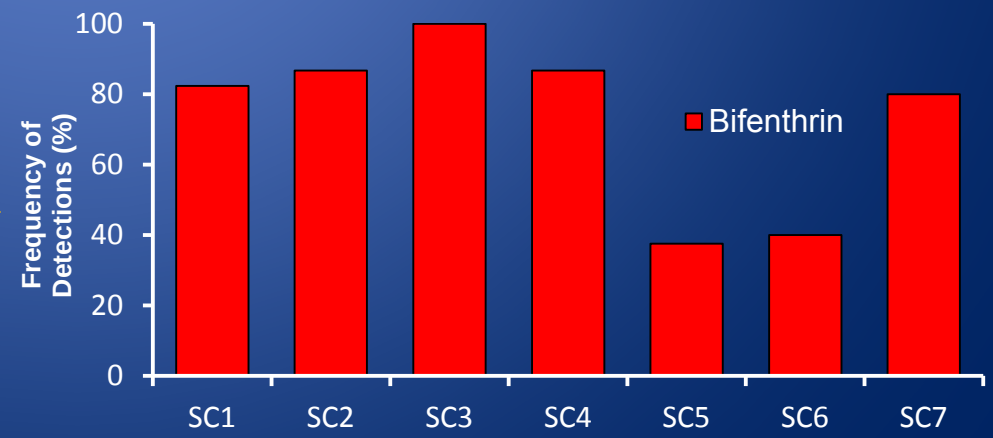
State



Region

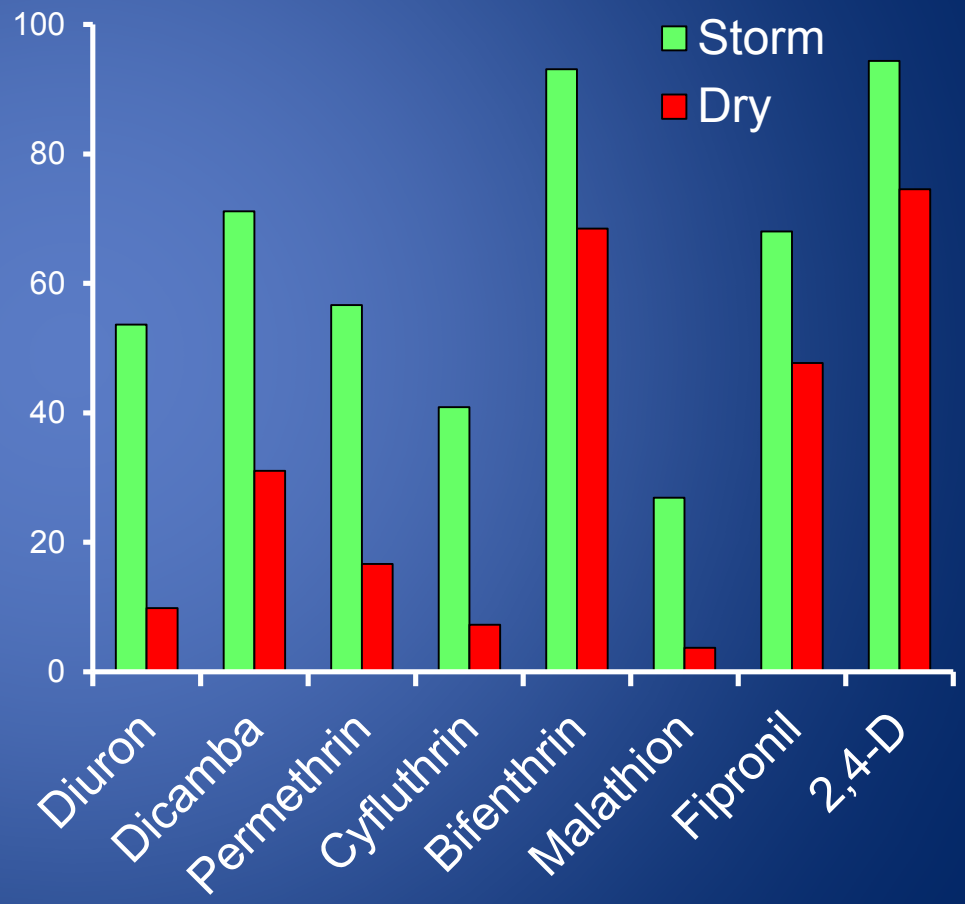


Local

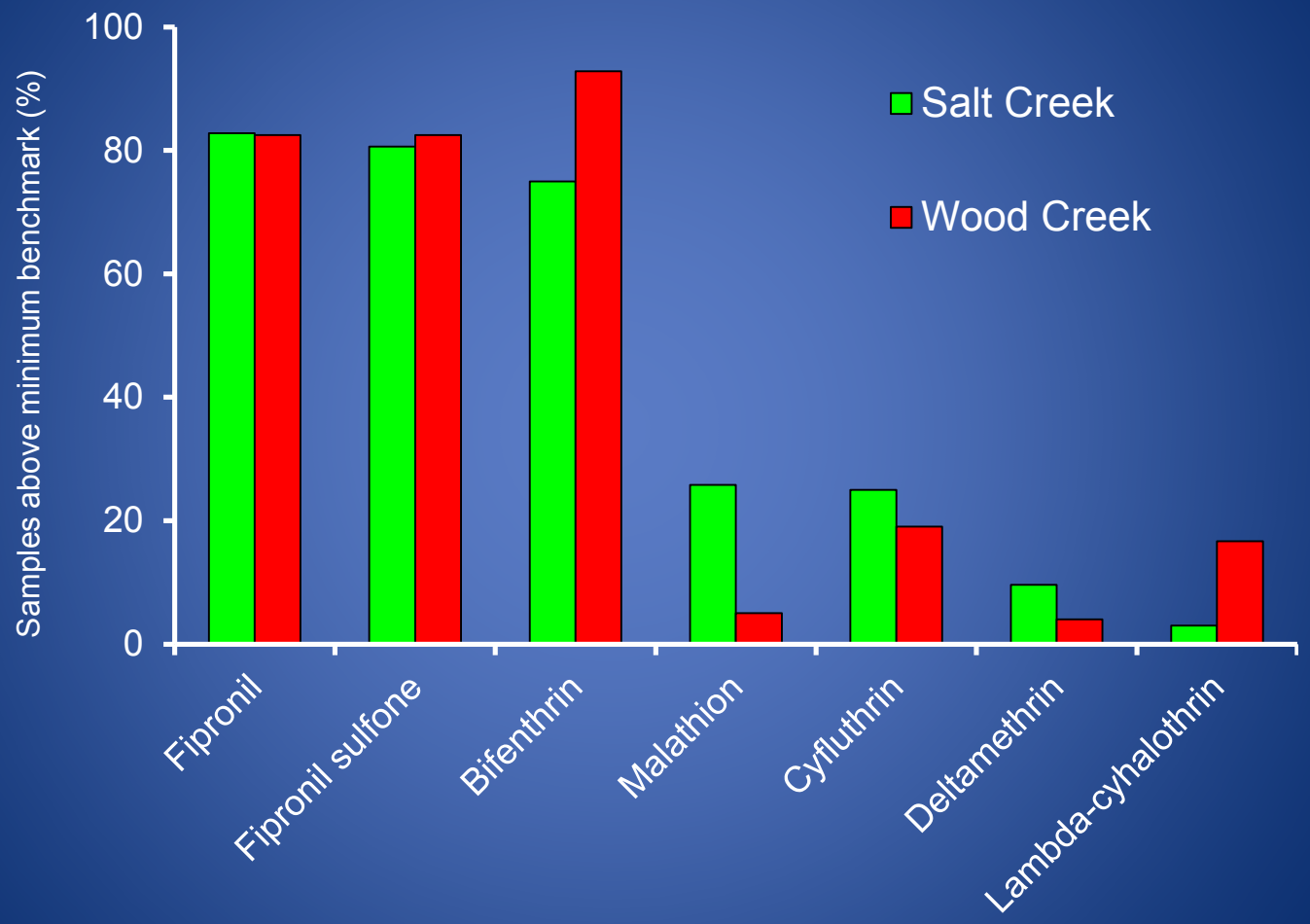


Database queried for 2008-2013

Dry Season vs. Storm Runoff



Benchmark Evaluation



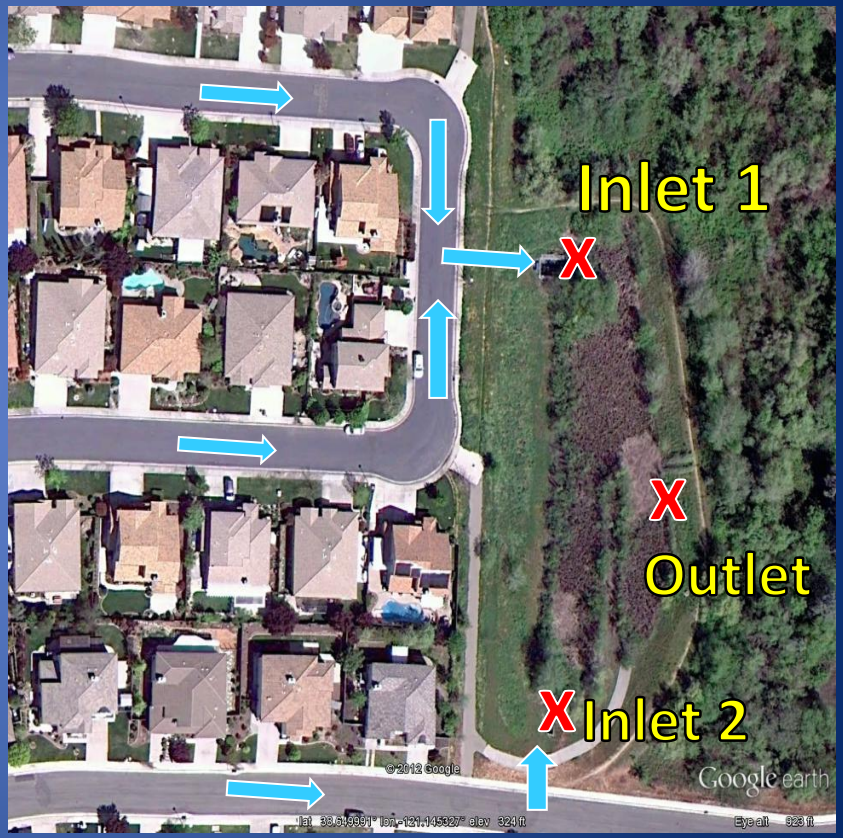
Concentrations compared to minimum EPA acute aquatic benchmark value:

http://www.epa.gov/oppefed1/ecorisk_ders/aquatic_life_benchmark.htm#benchmarks

MITIGATION

Water Quality Ponds

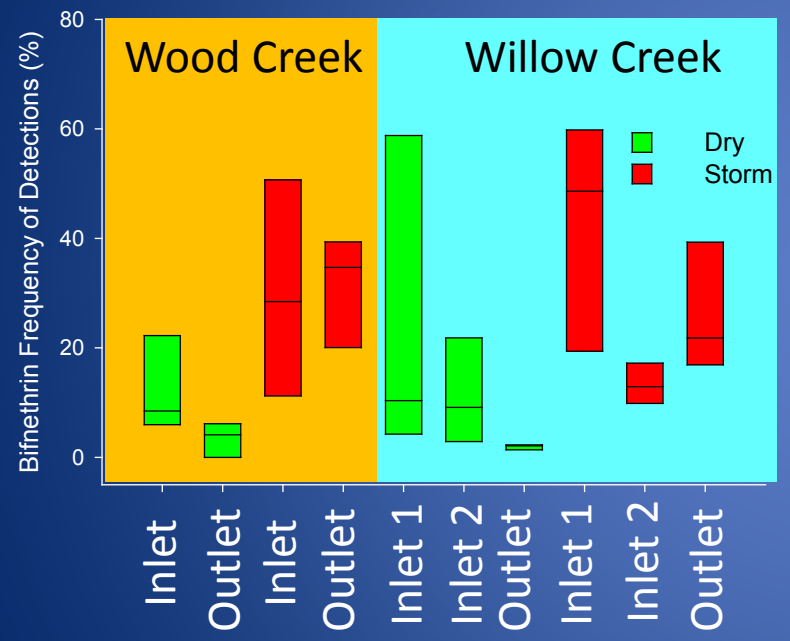
Wood Creek WQP



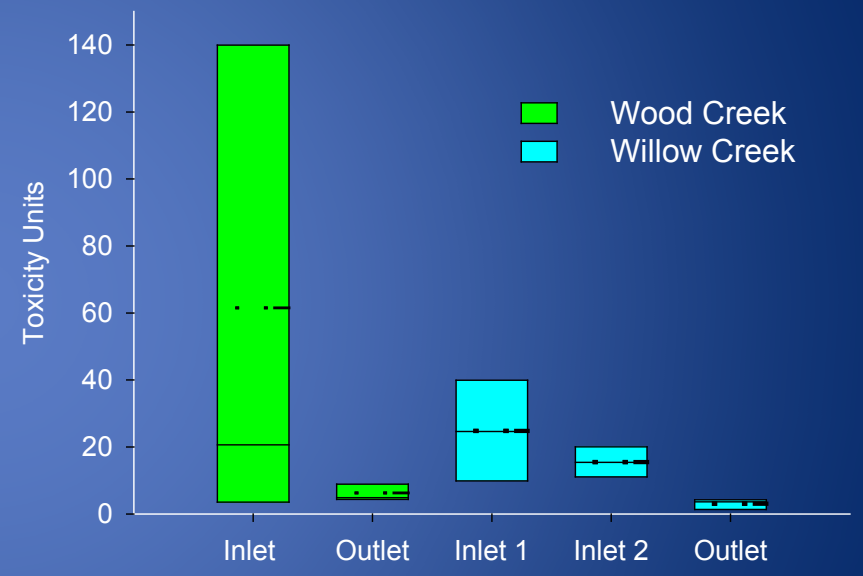
Folsom WQP

Water Quality Ponds

Bifenthrin



All pyrethroids



Urban Pyrethroid Regulations

Regulate the

- outdoor
- nonagricultural use of
- specified pyrethroid pesticides applied by
  - pest control businesses to
  - protect surface water

Horizontal/vertical impervious surfaces

Limited to:

- Spot
- Crack and crevice
- Pin stream of 1 inch or less
- Perimeter band treatment up to a max. of 2 feet above grade level

Applications allowed to the soil surface, mulch, gravel, lawn, turf, or groundcover

Limited to:

- Spot treatments, or
- Pin stream treatments of 1” wide or less
- Perimeter band treatments of 3 feet or less from the base of a building
- Broadcast treatments but not within 2 feet of horizontal impervious surfaces

Prohibited applications

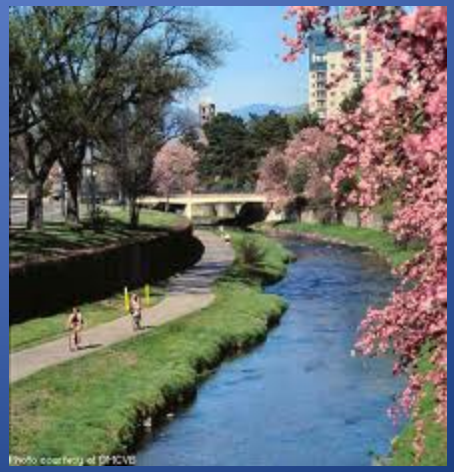
- No applications to sewer or storm drains or curbside gutters

Prohibited applications

- No applications to constructed drainage systems that drain to a sewer or storm drain, curbside gutter or aquatic habitat

Prohibited applications

- No applications to <u>any</u> horizontal surface (soil, turf, etc., or impervious or preconstruction) within 25 feet of aquatic habitat located downgradient from the application



Urban Pyrethroid Regs
Measuring Success

- Continued monitoring established urban watersheds in NorCal and SoCal
- Evaluate levels over time expecting reductions
- Plan to contract for water sampling at SPOT locations in State located in urban watersheds

Questions?