Building a Statewide Wastewater Pesticide Monitoring Network

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Environmental Program Manager
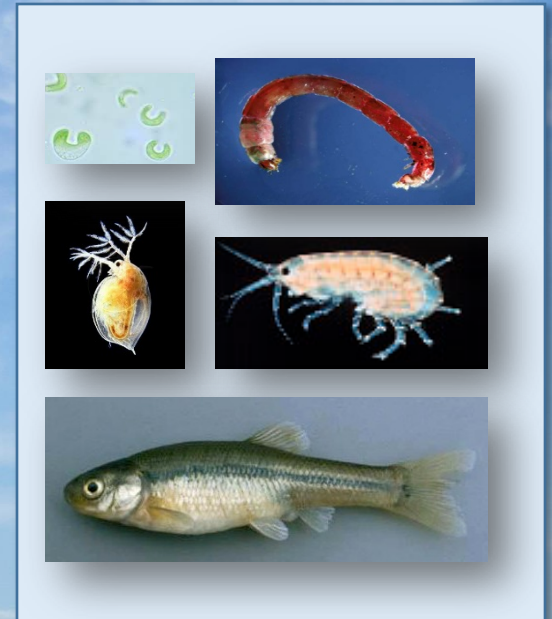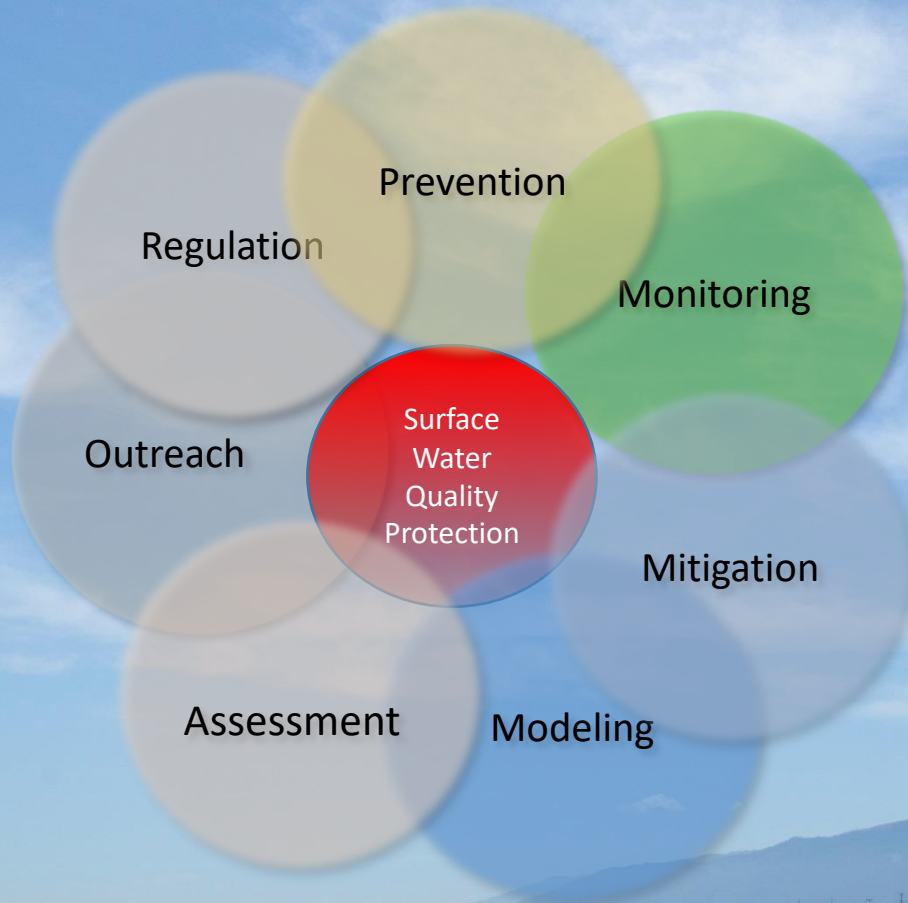
Surface Water Protection Program

California Department of Pesticide Regulation

BACWA BAPPG

June 2, 2021

CDPR Surface Water Protection Program

Prevention

Regulation

Monitoring

Outreach

Surface Water Quality Protection

Mitigation

Assessment

Modeling

Prevention: Pesticide Registration

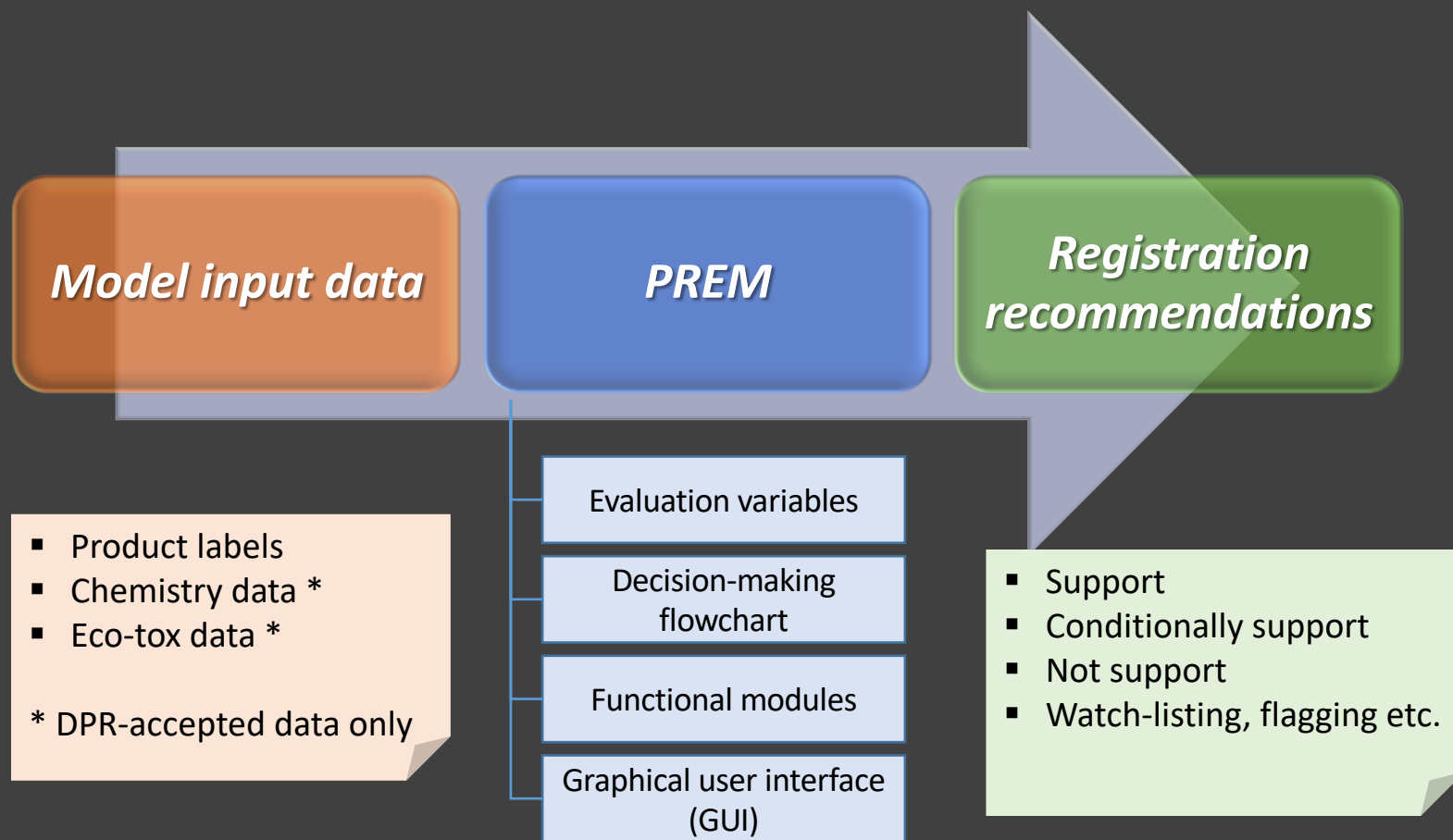Products 1st registered with US EPA

The Surface Water Protection Program routinely evaluates products with potential impact to surface water using a Pesticide Registration Evaluation Model (PREM) wherever possible and expert judgement.

*Examples ONLY - DPR does not endorse any product

Burden of proof for safe use lies with registrants prior to registration

Overview of Pesticide Registration Evaluation Model

Model input data → **PREM** → **Registration recommendations**

- Product labels
- Chemistry data *
- Eco-tox data *

* DPR-accepted data only

Evaluation variables

Decision-making flowchart

Functional modules

Graphical user interface (GUI)

- Support
- Conditionally support
- Not support
- Watch-listing, flagging etc.

Prevention: Pesticide Registration

- PREM expanded to include Down-the-Drain Capabilities.
  - Product Types:
    - Pet Products
    - Washable impregnated materials
    - Applied to sewer lines
    - Applied to floor drains
  - Additional Information:
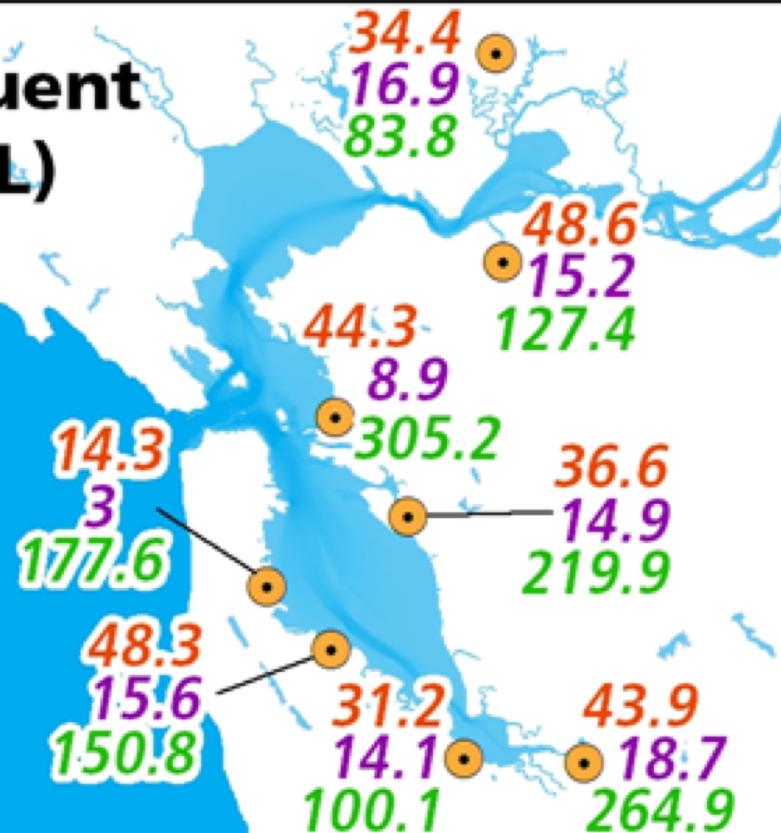   - Removal rates
    - Use patterns
    - Wash-off fraction

Final Wastewater Effluent Concentrations (ng/L)

Fipronil and imidacloprid concentrations in effluent exceeded U.S. EPA aquatic benchmarks that are used as a screening tool.

Sadaria, et al., 2017. *Environmental Toxicology & Chemistry. 36 (6): 1473-1482.*

What Pesticide Data is Available?

- 100s of registered pesticides

- Data reported for 81 pesticides in the United States

- 41 pesticides detected

Pesticides & Degradates	Inf./Eff.	Range (ng/L)	Median (ng/L)	DF (%)	No. of Samples	No. of Facilities
2,4-D	Eff.	<100-1,890	<100	3	102	52
Acetamiprid	Inf.	3-4.7	3.2	100	5	1
	Eff.		1.3-1.7	76	17	13
Atrazine	Inf.	2-18.4	100		19	4
	Eff.		<7-29	82	67	16
Bifenthrin	Inf.	7.7-20.3	96		80	32
	Eff.	<0.1-14.1	<1-10.3	71	92	34
Carbaryl	Eff.	<0.49-663	<41	9	140	55
Chlorpyrifos	Inf.	<1-81.3			13	1
	Eff.	<1-24.1			30	5
Clothianidin	Inf.	<0.9-660			5	1
	Eff.	<0.9-341			17	13
Diuron	Eff.	<4–775			102	52
Fipronil	Inf.	<20-146			41	33
	Eff.	<0.5-340			57	40
	Eff.	<7.7-27	<7.7	1	102	52
	Inf.	30-306	51.4-161	100	21	17
	Eff.	18.5-305	48.3-164	100	25	21
Permethrin	Inf.	30-3,800	180-315	100	80	32
	Eff.	<1-170	<1-21.4	64	90	34
Thiabendazole	Eff.	24-27	25.5	100	2	2

Variable detection limits

Limited spatial and temporal

Treatment type

Effluent only data

Sutton, Xie, Moran, Teerlink. Occurrence and Sources of Pesticides to Urban Wastewater and the Environment Chapter 5 in Pesticides in Surface Water: Monitoring, Modeling, Risk Assessment, and Management. ACS Symposium Series, vol. 1308; American Chemical Society: Washington, DC.19.

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Budget Change Proposal to Establish Permanent Wastewater Program

- Awarded July 1, 2019

- Contract and Analytical Support

- Key arguments:
  - Existing monitoring data (in part generated in part by RMP)
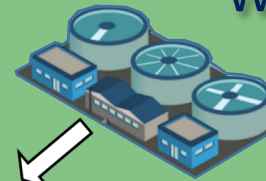 - Source control vs. treatment
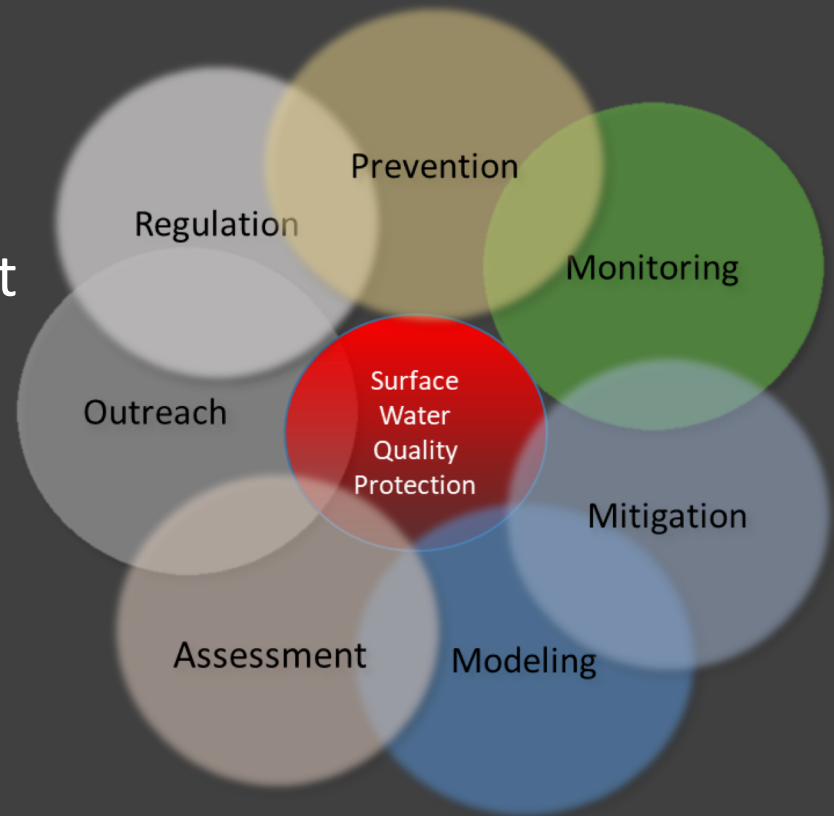
~1990
Agriculture Runoff

Wastewater Effluent

2019

Urban Stormwater & Irrigation Runoff

2008

1st Long-term wastewater monitoring program

California Department of Pesticide Regulation
Surface Water Protection Program Monitoring Efforts

Monitoring Goals

- Spatial trends

- Temporal trends

- Consistent analytical

2019-2020 Study

- 25+ Plants currently participating

- Predominantly in urban centers

- 4 influent/effluent events (time-weighted composites)

- 1 biosolids event

● = Treatment plant with a daily capacity of 1 million gallons or greater

Analytical Support with UC Davis Dr. Tom Young's Lab

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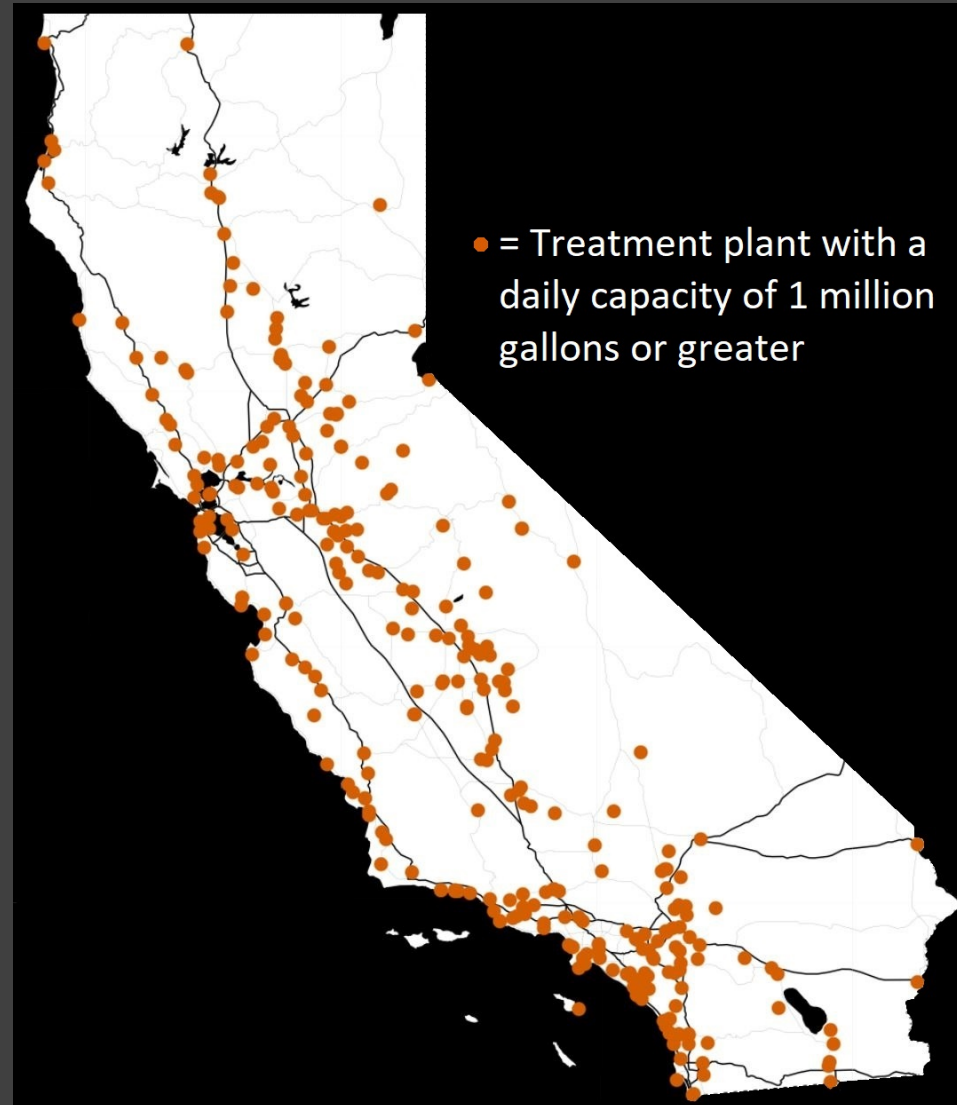
Wastewater

Influent

Effluent

Biosolids

What do we see?
- Fipronil & most degradates
- Some pyrethroids
- Imidacloprid*

What don't we see?
- Carbamates
- Fungicides
- Insect Growth Regulators
- A subset of pyrethroids

Detection (%)

Site Influent Effluent

Observations <LOQ were considered non-detects. 88 observations for both Influent and Effluent
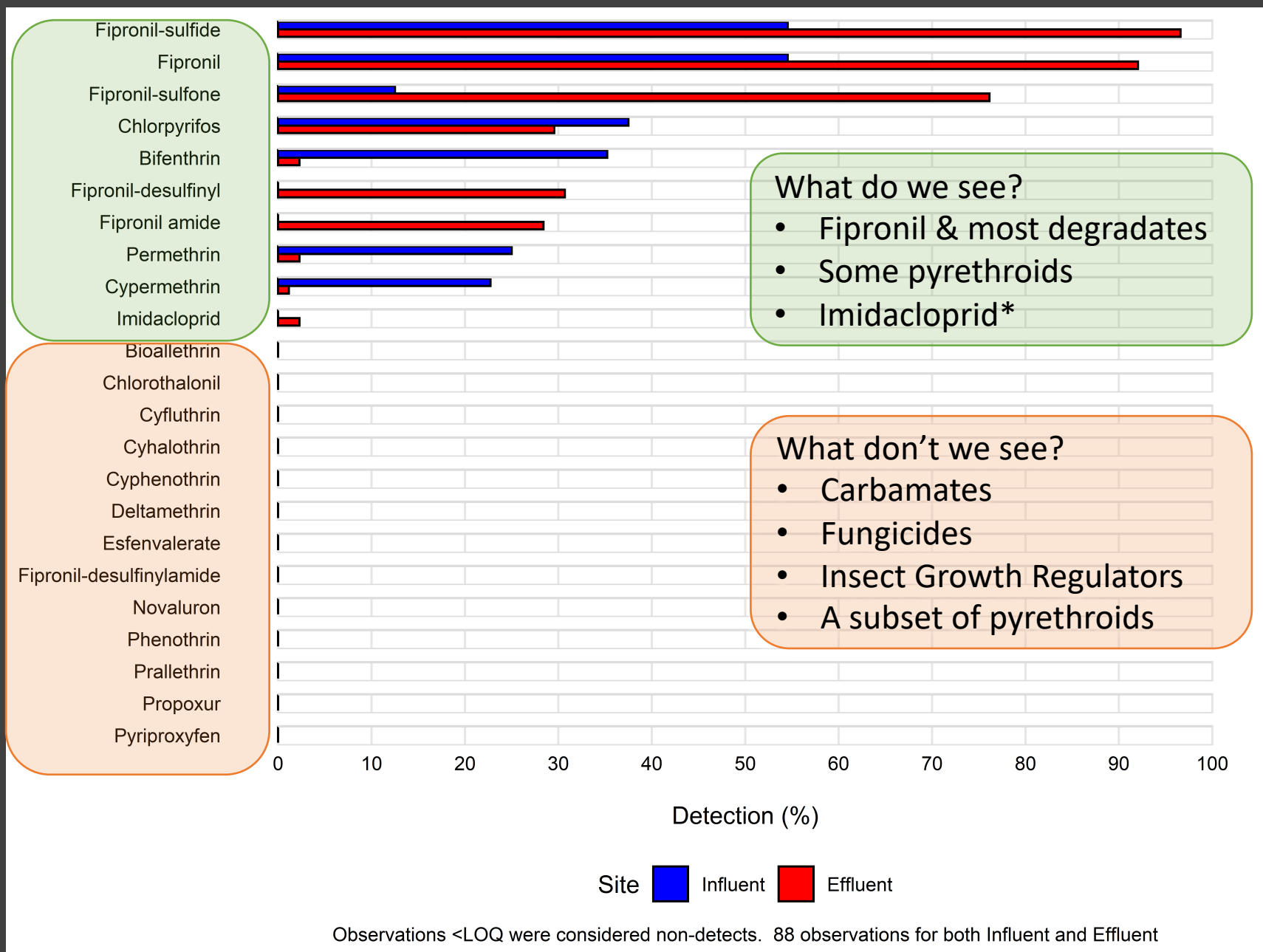
*Intending to lower analytical reporting limit, so detection frequency may increase

2019 and 2020 Influent Seasonality
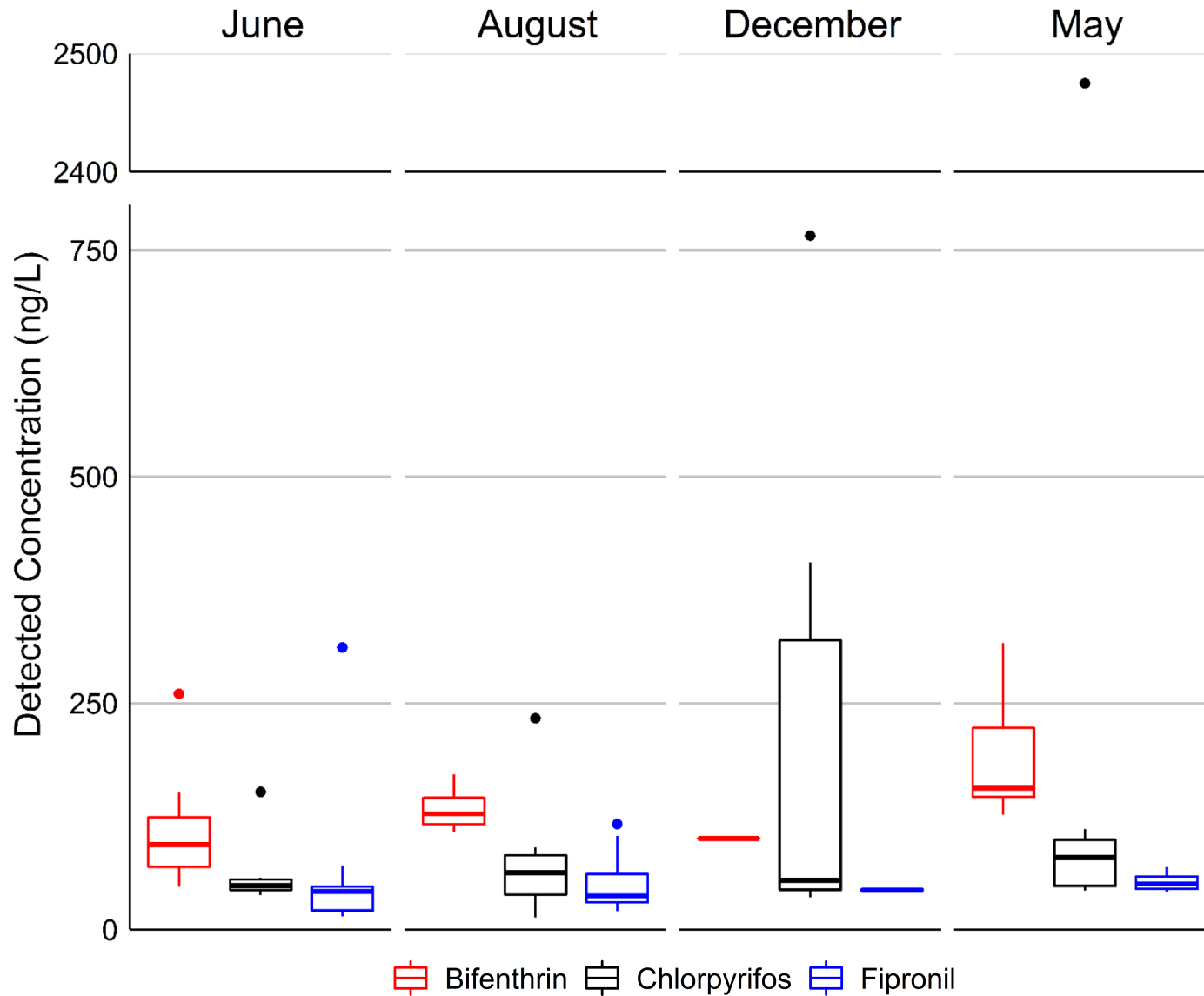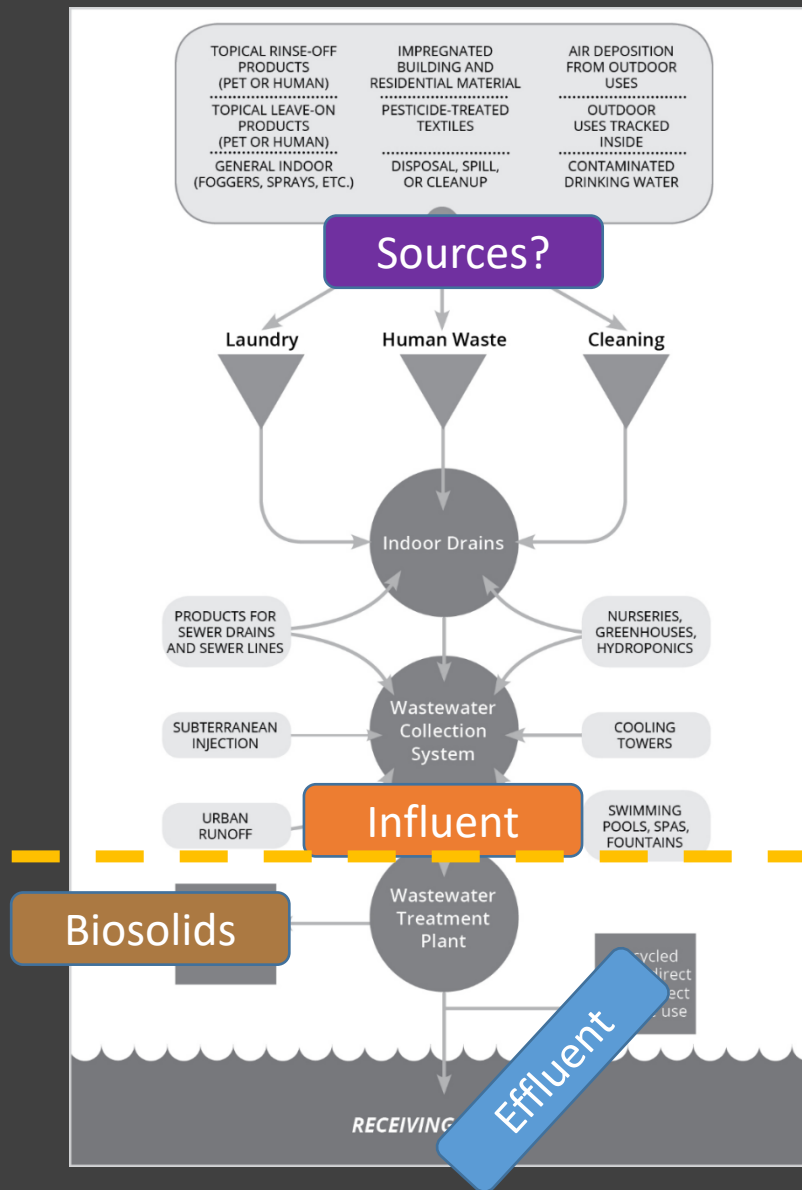
Sutton, Xie, Moran, Teerlink. Occurrence and Sources of Pesticides to Urban Wastewater and the Environment *Chapter 5 in Pesticides in Surface Water: Monitoring, Modeling, Risk Assessment, and Management. ACS Symposium Series, vol. 1308; American Chemical Society: Washington, DC.19.*

Concentrated Sources of Pesticides to Wastewater

Impacted due to COVID19

Pest Control Operators

Laundromat/ Professional Laundry

Pet Grooming/Boarding

Nurseries

Ubiquitous versus concentrated sources

Monitoring Program Next Steps

- Establish analytical methods with Department of Toxic Substances Control as a partner with a focus on lowered reporting limits.

- Select wastewater treatment plants for future monitoring.
  - Plants that serve agricultural regions
  - Smaller wastewater treatment plants
  - Diverse treatment technologies

- Establish long-term sites.

- Craft special studies to target specific questions.

Collaborative Work

- #18-C0019. Indoor Depositional Patterns of Pesticides from Fogger Products to estimate wash-off fraction for down-the-drain modeling. Dr. Choe UC Riverside.
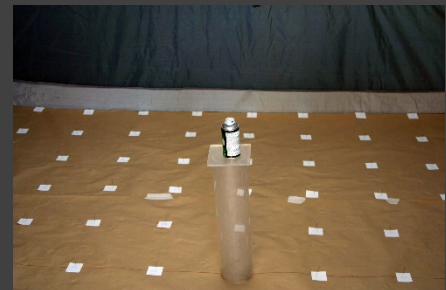
#19-C0031. Quantifying California Municipal Wastewater Discharge Contributions to Streams for Pesticide Source Modeling. Dr. Jacelyn Rice, University of North Carolina at Charlotte.

- Quantify dilution factors for WWTPs discharging to surface water.

- Evaluate impact of climate change

- Better understand relative contribution of pesticide use patterns
  - Agricultural
  - Outdoor urban
  - Wastewater Effluent

● = Treatment plant with a daily capacity of 1 million gallons or greater

Intersections with RMP's ECWG

- Adjuvants/Inerts
  - PFAS

- Antimicrobials

HIGH CONCERN	Moderate or High Impact	None
MODERATE CONCERN	Low Impact	PFOS, PFOA, Long-Chain Carboxylates Fipronil, Imidacloprid Alkylphenols, Alkylphenol Ethoxylates Bisphenols, Organophosphate Esters Microplastics
LOW CONCERN	Limited Impact	PBDEs and HBCD Pyrethroids* Pharmaceuticals Personal Care & Cleaning Products PBDDs / PBDFs
POSSIBLE CONCERN	Uncertainty as to Impact	Alternative Flame Retardants Other PFAS (Fluorinated Chemicals) Pesticides, Plastic Additives Siloxanes, SDPAs, UV-BZTs, others

* Pyrethroids are of low concern in the Bay, but high concern in Bay Area urban creeks

Thank you
Jennifer.Teerlink@cdpr.ca.gov

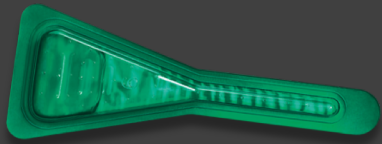# Pesticide Registration Evaluation Model

$$RQ = \frac{EEC}{TOX}$$

- "Estimated Environmental Concentration"
  - USEPA models (PRZM, VVWM, PFAM)
  - USEPA modeling scenarios for agricultural pesticide uses
  - SWPP development for
    - Urban outdoor uses
    - Pesticide degradates
    - California receiving water
    - Wastewater Effluent
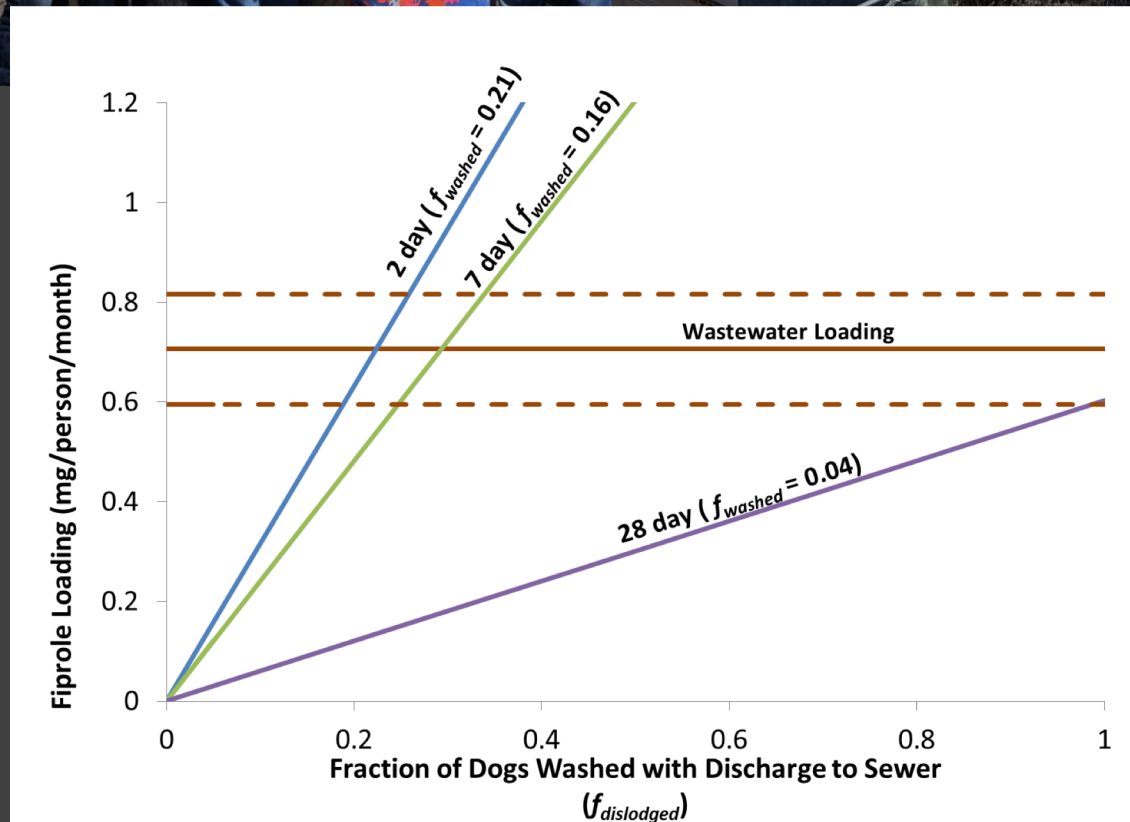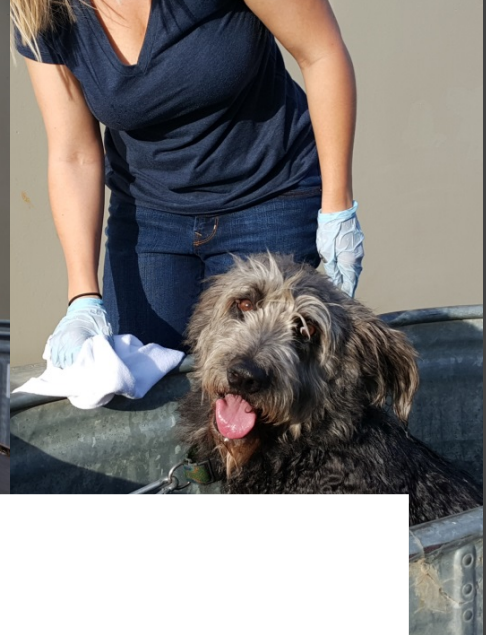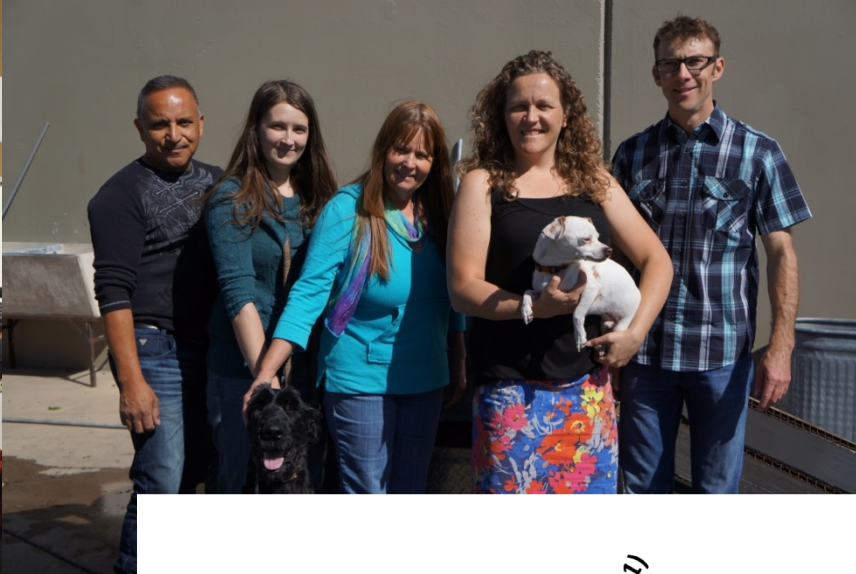
- "TOX" determination
  - Generally, =min(all available acute data)

Spot-on Products

- 9.1% Fipronil
- Recommended frequency of application 30 days
- Products "waterproof" once dry

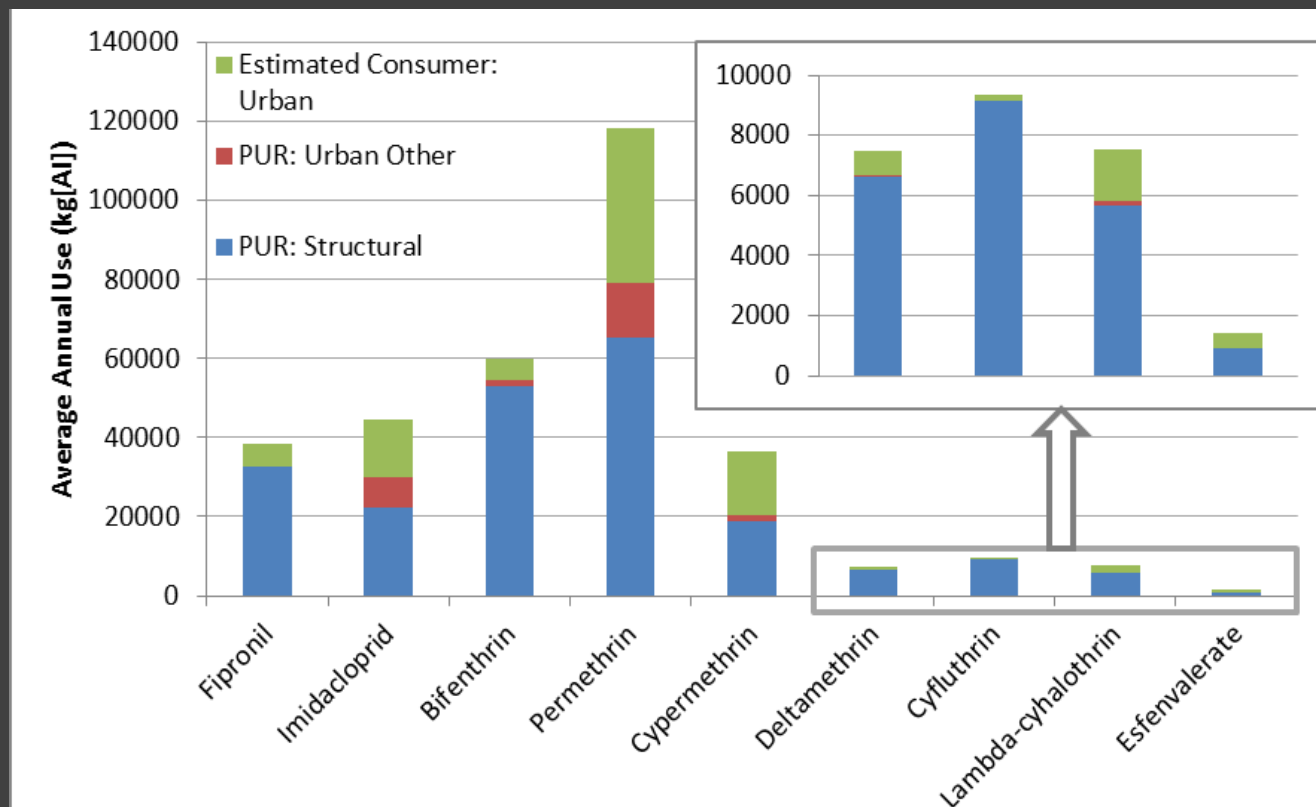- Wash volunteer dogs 2, 7, or 28 days post application.

Teerlink, et al., 2017. *Science of Total Environment. 599-900: 960-966.*

Average annual pesticide use and estimated urban consumer use 2011-2015
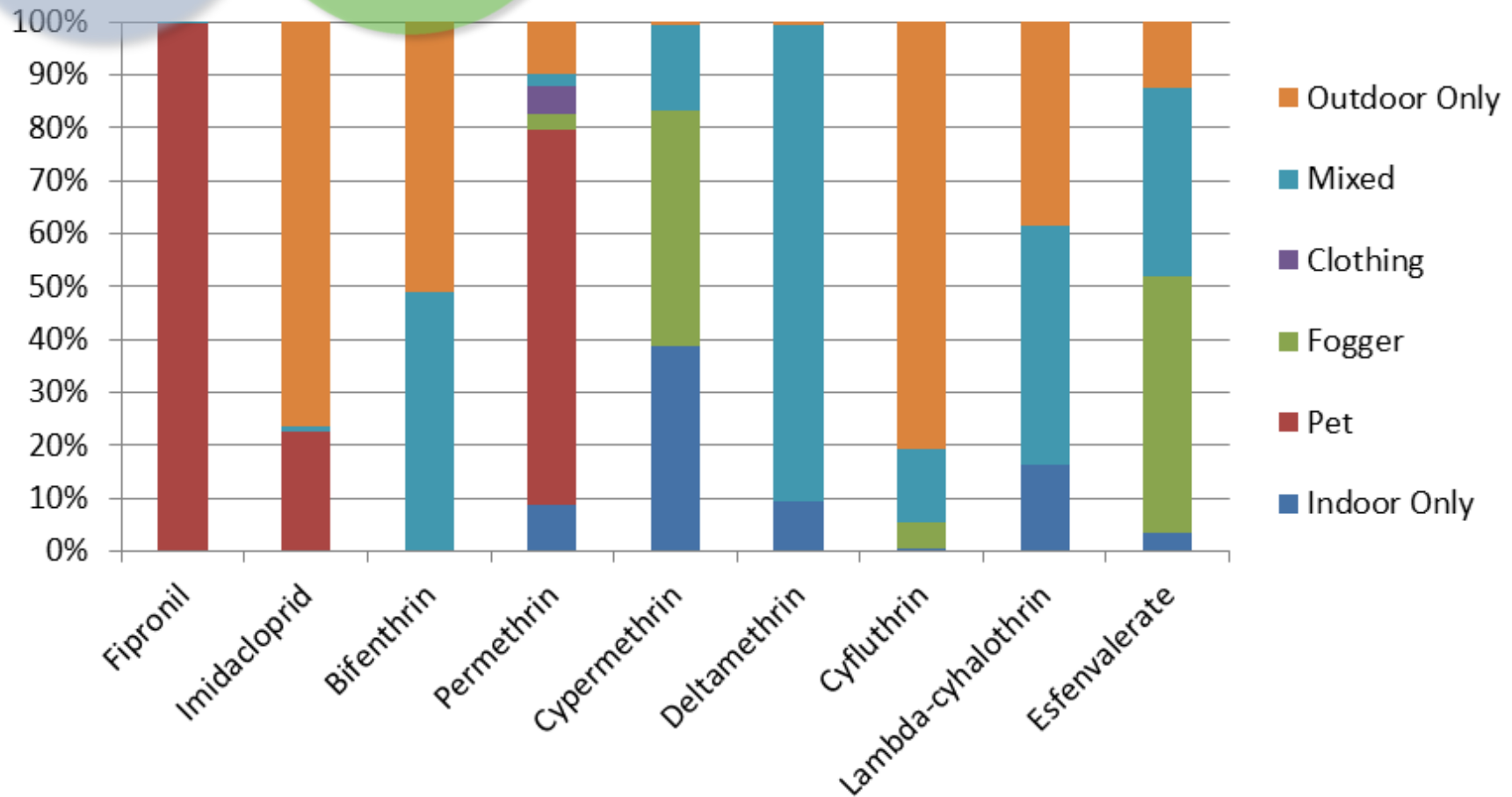
- Pesticide Use Reporting of Professional Applications

- Estimated Consumer:
  - Outdoor Only
  - Mixed
  - Clothing
  - Pets
  - Indoor Only

Xie, Budd, Teerlink, Luo, Singhasemanon. 2019. Assessing Pesticide Uses with Potentials for Down-the-Drain Transport to Wastewater in California. In Prep

Xie, Budd, Teerlink, Luo, Singhasemanon. 2019. Assessing Pesticide Uses with Potentials for Down-the-Drain Transport to Wastewater in California. In Prep