Imidacloprid Monitoring in Urban Surface Waters of California, USA

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SETAC North America 39th Annual Meeting

Sacramento, California

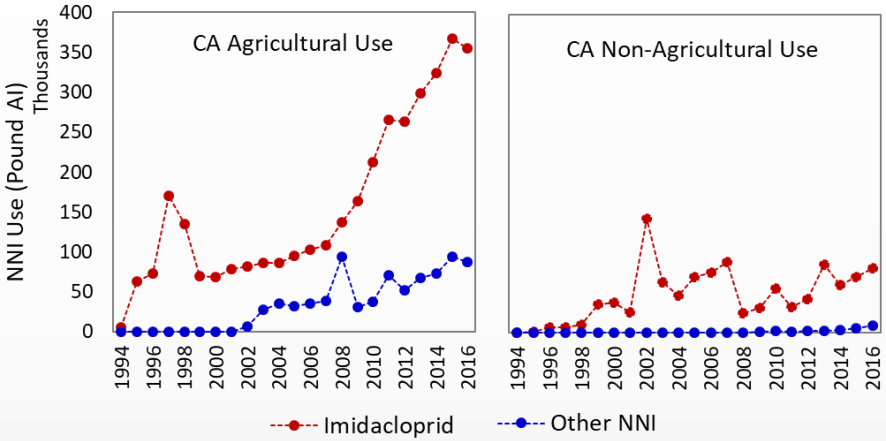
November 8, 2018

California Department of Pesticide Regulation

Imidacloprid Urban Monitoring - Introduction

- Neonicotinoid insecticides
  - High use in California
  - Suspect in CCD

    - DPR Reevaluation in 2009
    - Mitigation for high risk crops



- More recent, concerns in surface water
  - High transport potential to surface water
  - High potential for aquatic toxicity
    - Sublethal effects: immobilization, emergence, behavioral changes

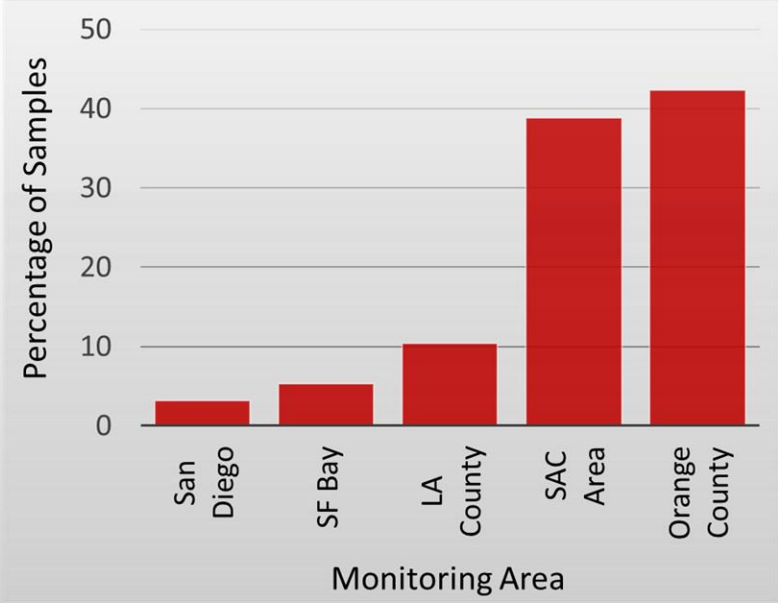
David Funk, Stroud Water Research Center

Imidacloprid - Urban Surface Water Program

- DPR initiated Imidacloprid urban monitoring in 2010
- Objectives:
  - Present in surface waters? Concentrations?
  - Spatial and temporal trends?
  - Ecological risk to aquatic organisms?
    - USEPA Benchmarks, Toxicity testing

Urban Surface Water Monitoring Areas

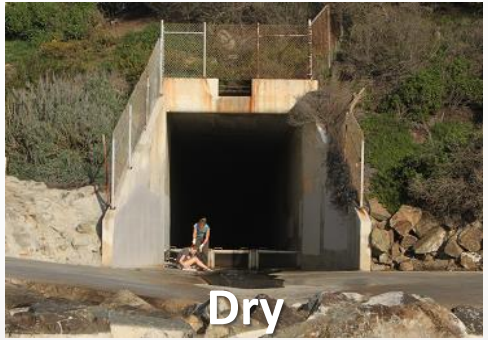
- 569 Samples
- 54 Sites
- 25 Watersheds



Urban Surface Water Monitoring Plan

Site Type

Event Type



Sample Type

cdfa

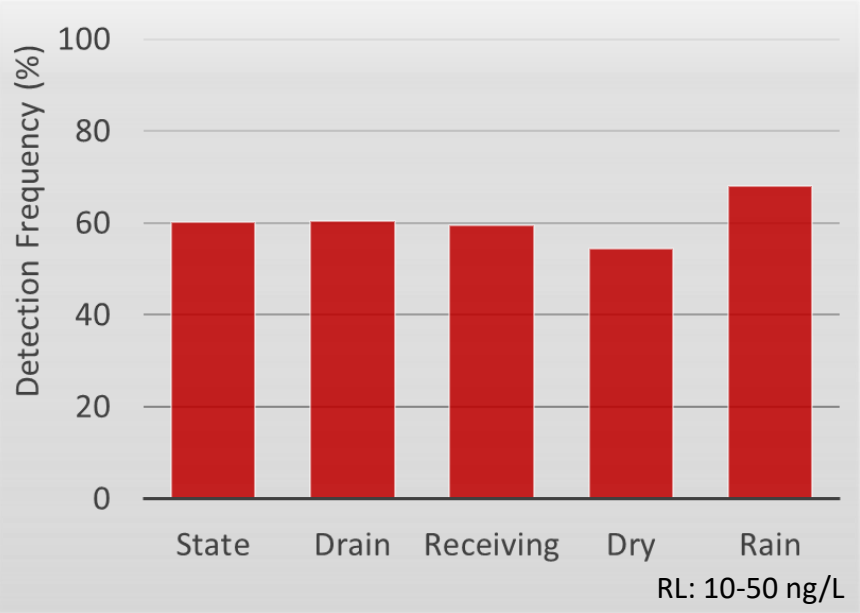
Center for Analytical Chemistry

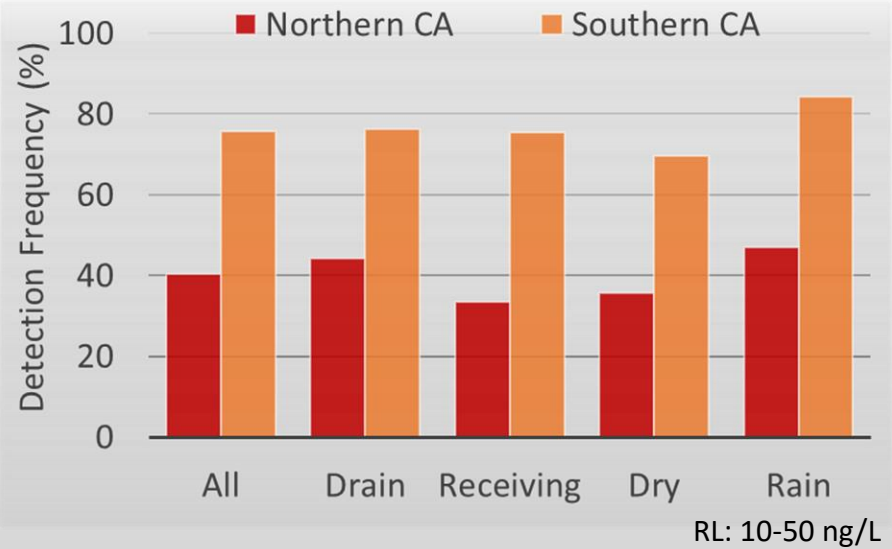
LC/MS/MS

dpr

Monitoring Results – Detection Frequency

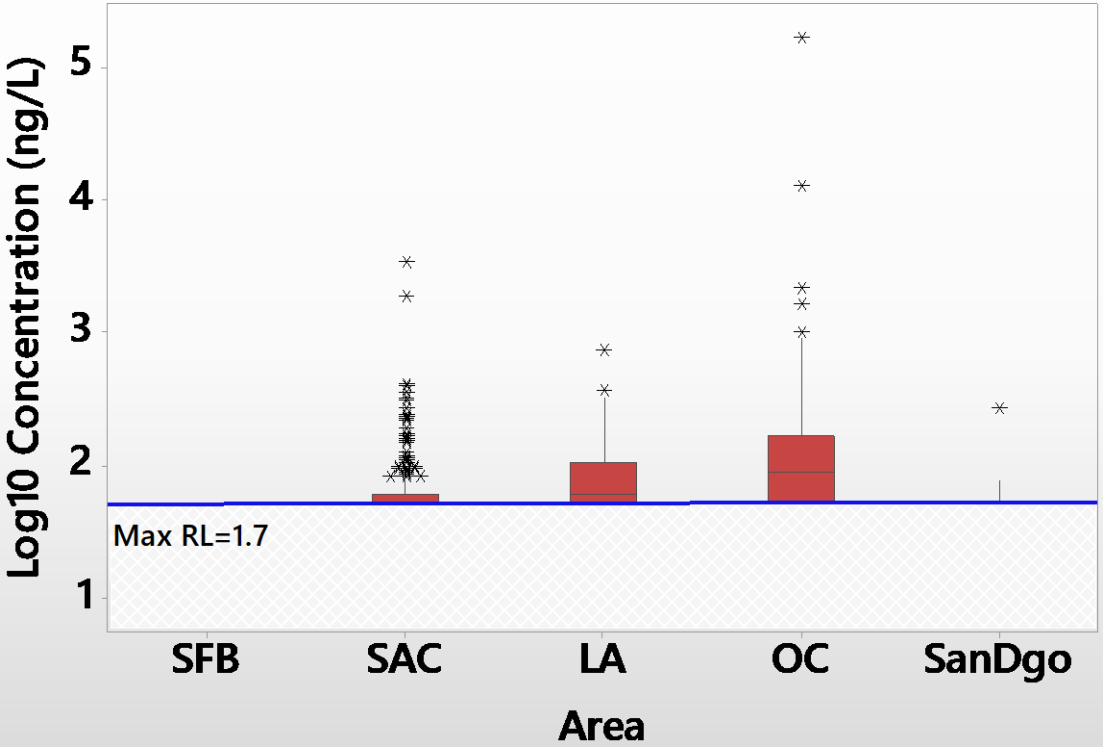
- High Detections Statewide, site type and event type





- Southern ~ 2X Northern California

Results – Imidacloprid Concentrations



Areas of the State:

- OC, LA > SFB, SAC, San Diego ($p<0.001$)

SFB, San Francisco Bay area; SAC, Sacramento area; LA, Los Angeles County; OC, Orange County; SanDgo, San Diego area

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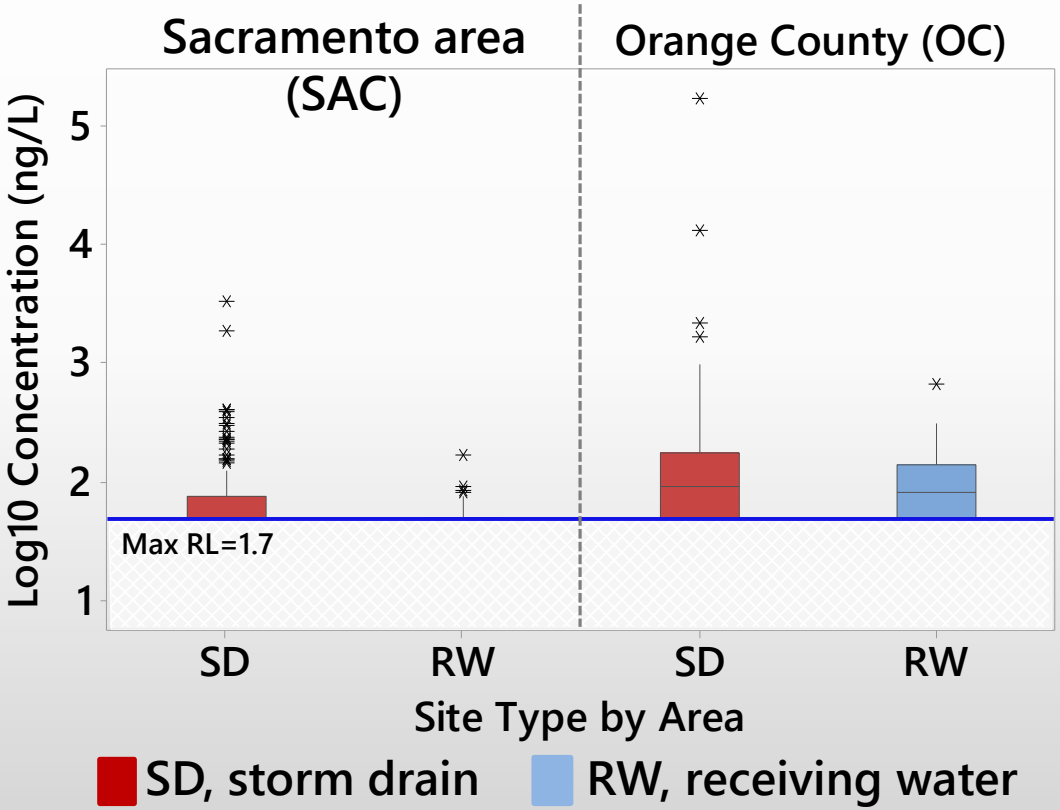
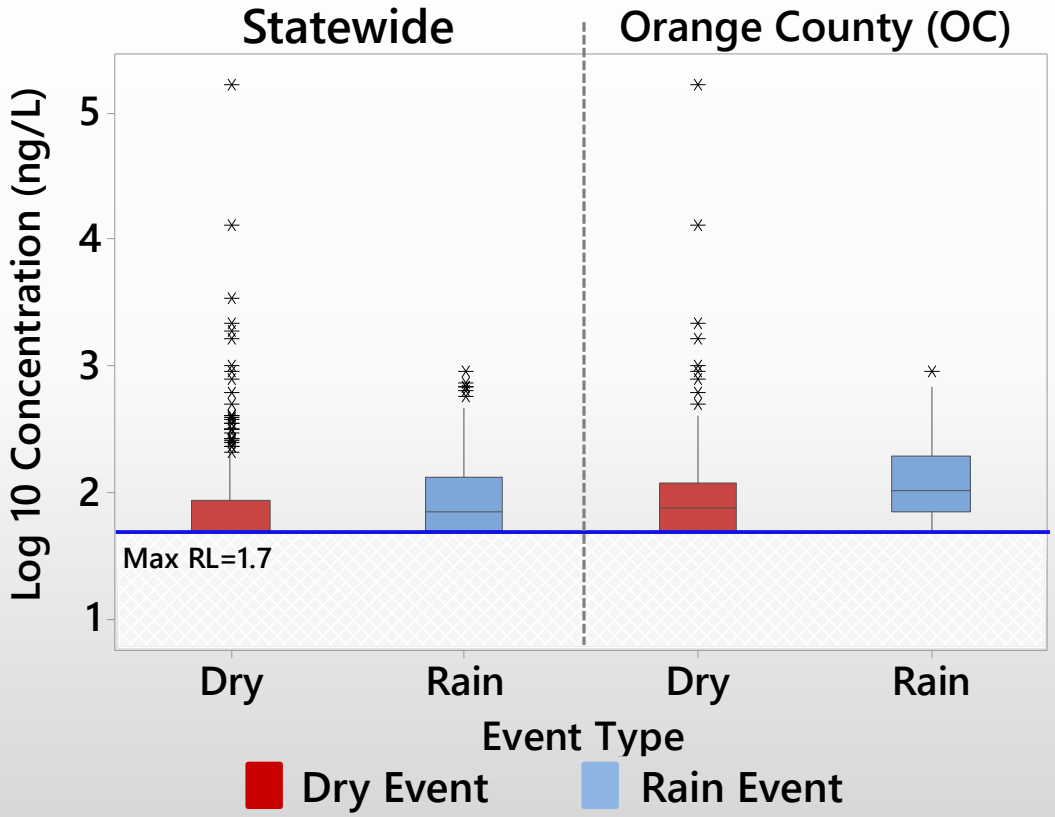
Results – Concentrations by Site Type



Regionally:

- SAC, SD > RW (p=0.04)
- OC, no differences (p=0.29)
- No storm drains monitored in other areas

Results – Concentrations by Event Type



Statewide:

- Rain > Dry (p=0.001)

Regionally:

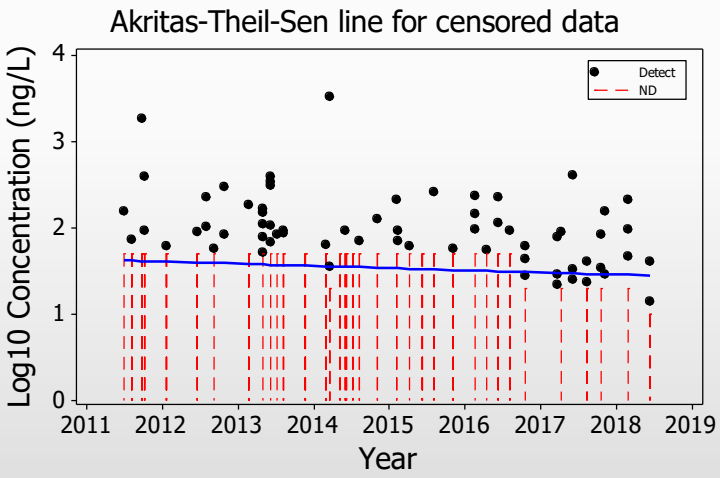
- OC rain > dry (p<0.001)
  - First flush rain event
- No difference: LA, SFB, SAC (p=0.8-1.0)

LA, Los Angeles County; SFB, San Francisco Bay area; SAC, Sacramento area

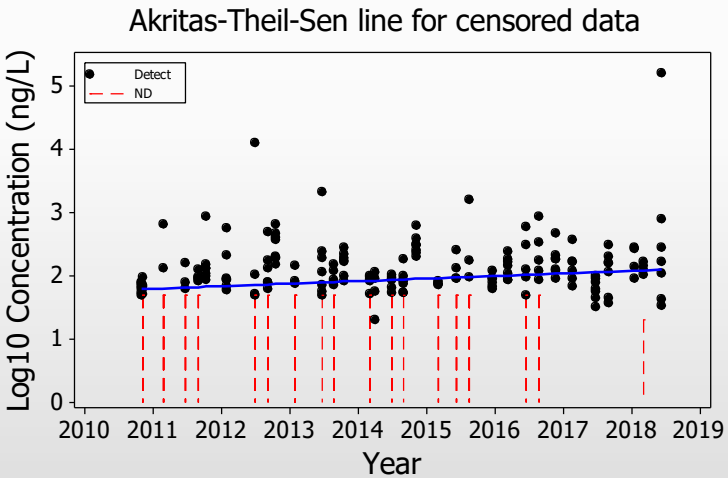
Imidacloprid Trends

Imidacloprid trends at long-term monitoring sites

- Storm drain sites in Orange, Sacramento, and Placer counties



Northern California
no significant trend, p=0.44

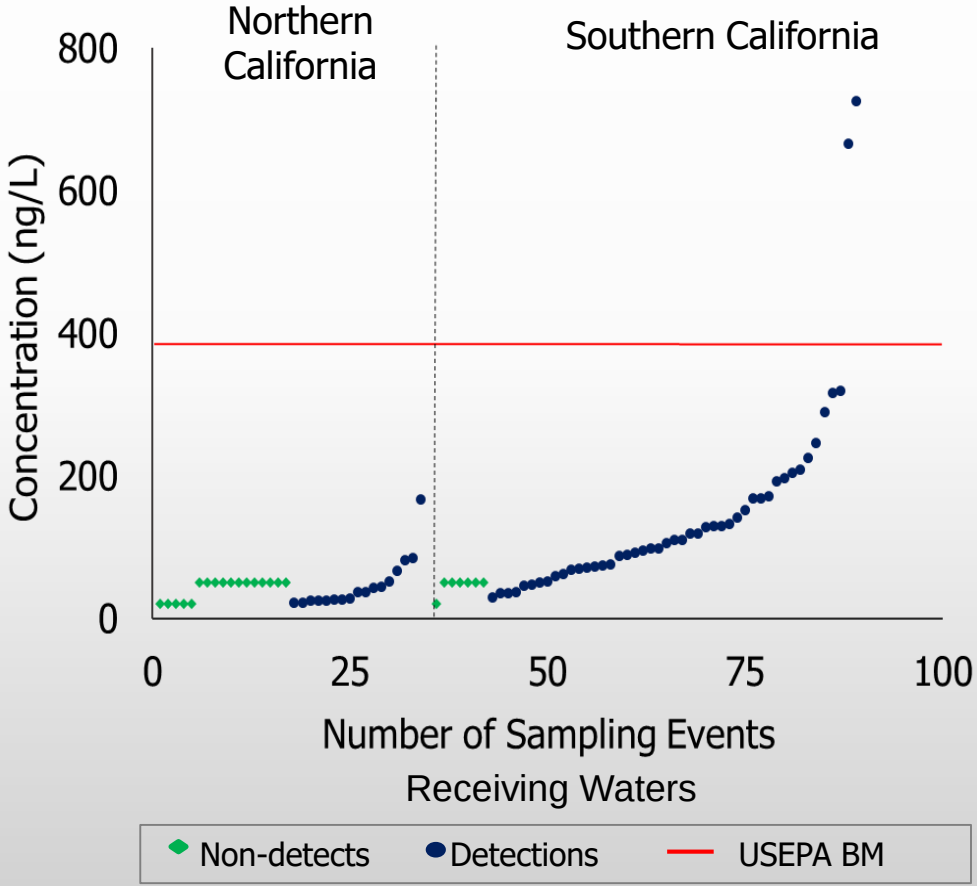


Southern California
significant upward trend, p=0.013

Imidacloprid Exceedance USEPA Benchmark

Rain events compared to acute benchmark (385 ng/L)

- Receiving waters
- Two exceedances



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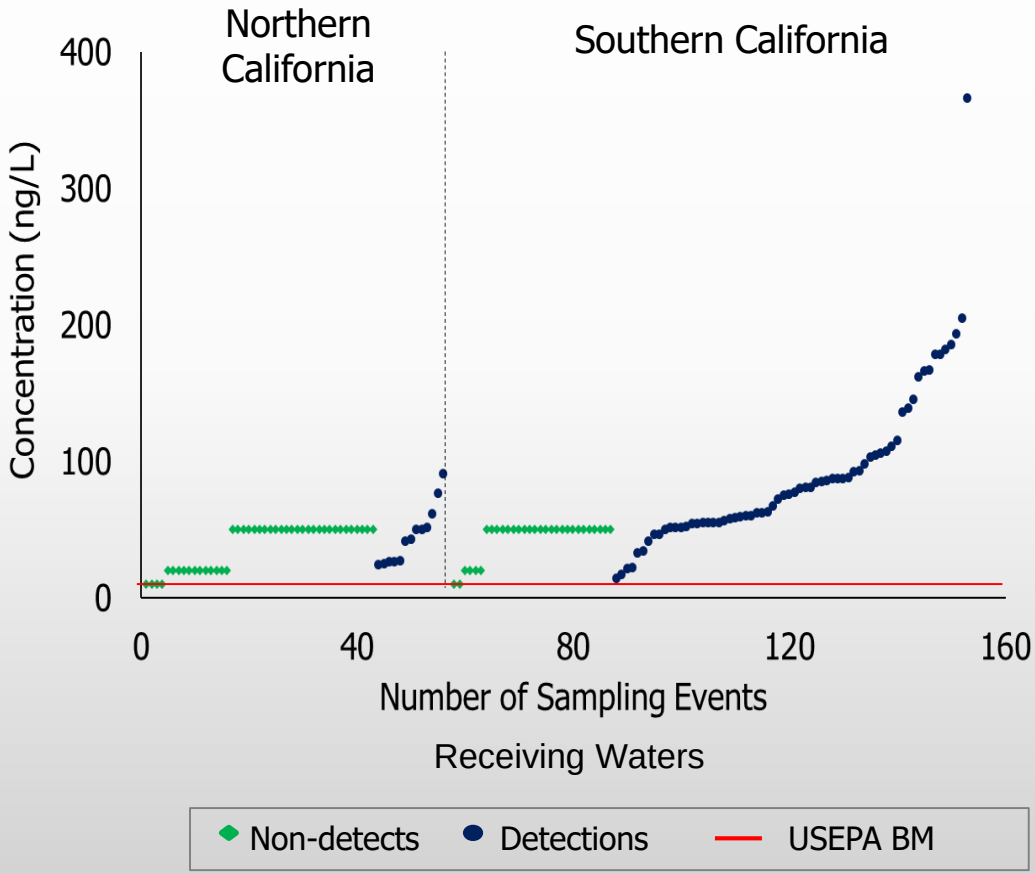
Imidacloprid Exceedance USEPA Benchmark

Dry events compared to chronic benchmark (10 ng/L)

- Receiving waters
- Numerous exceedances: Southern California (LA and Orange counties)



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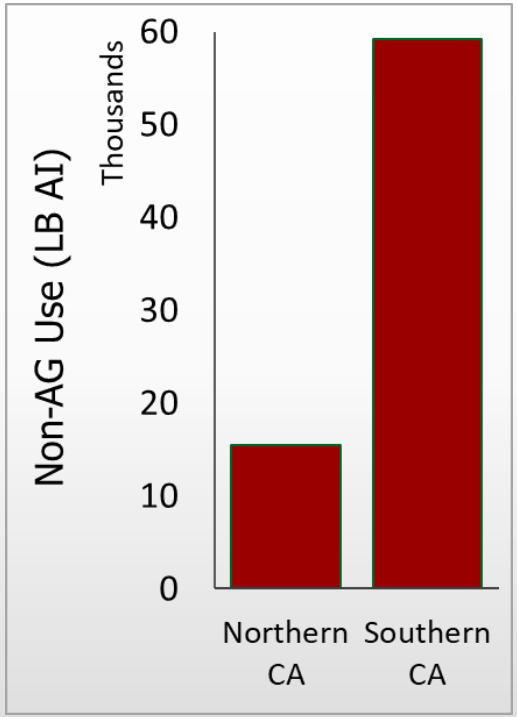
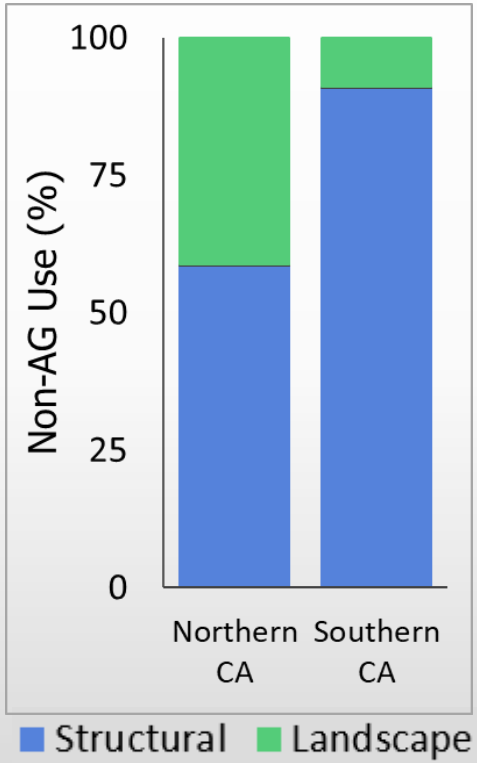
Imidacloprid Non-Agricultural Use

Why Southern California?

- Higher overall use
- High structural use

Increased detections?





Only professional non-agricultural applications; PUR, 2014–2016 (3-year total)
Northern CA, Placer and Sacramento counties; Southern CA, Los Angeles and Orange counties

Imidacloprid Urban Monitoring - Conclusions

Imidacloprid is frequently detected, notably:

1. Southern California >> Northern California
2. Potential concern to sensitive aquatic invertebrate organisms in Los Angeles and Orange county creeks and rivers
3. High structural use likely contributes to imidacloprid in surface waters

Questions?

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