California's Surface Water Ambient Monitoring Program

Pesticide Water Quality Story

Office of Information Management & Analysis

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California Water Boards

SWAMP Surface Water Ambient Monitoring Program

Contributors

- Stream Pollution Trends (SPoT) Monitoring Program
- CA Department of Pesticide Regulation (DPR)
- California Environmental Data Exchange Network (CEDEN)

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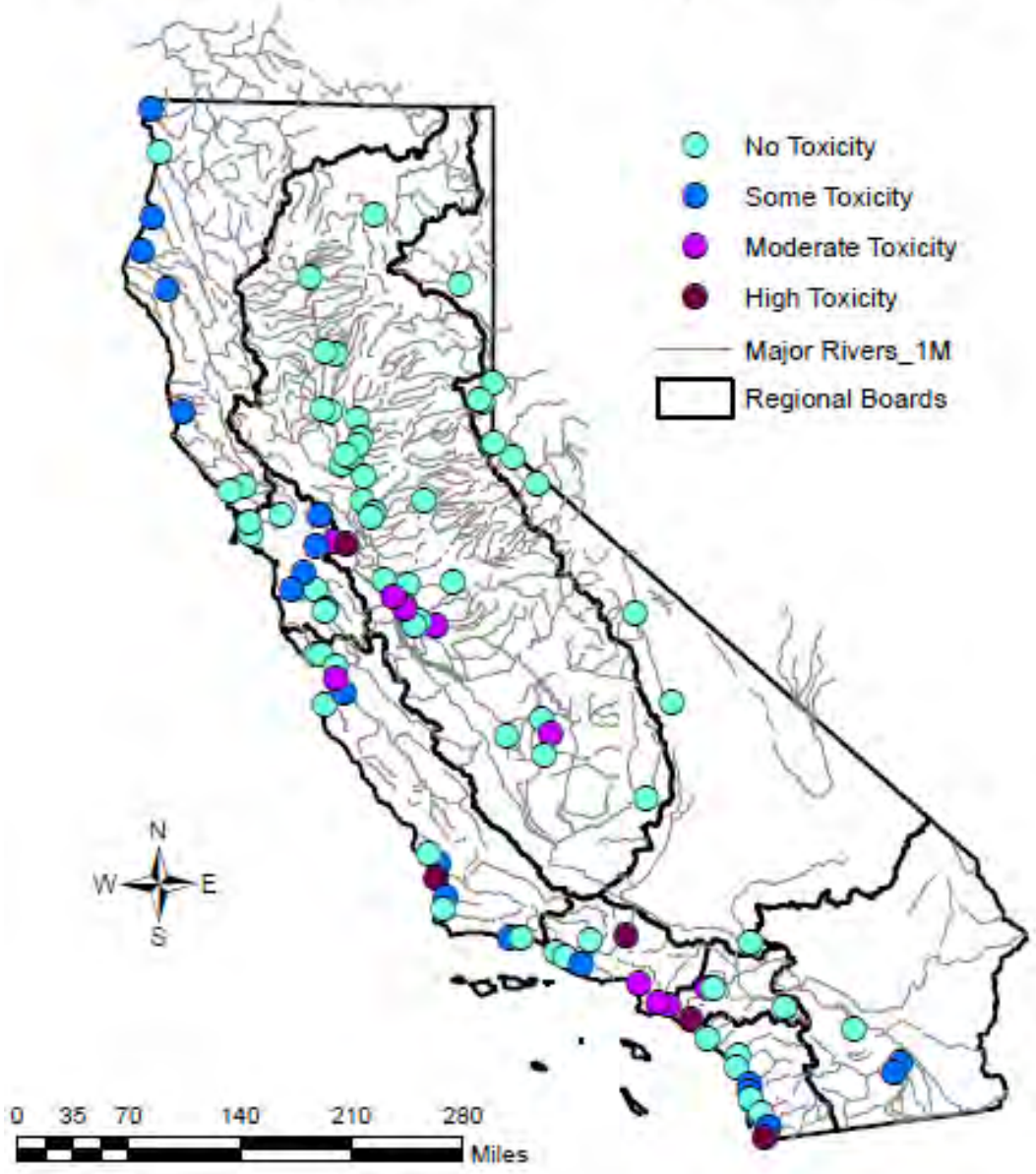
California Environmental Protection Agency
dpr Department of Pesticide Regulation

CEDEN
CALIFORNIA ENVIRONMENTAL DATA EXCHANGE NETWORK

Water Boards Storm Water Multiple Application & Report Tracking System

Mean Magnitude of Toxicity 2008 - 2012



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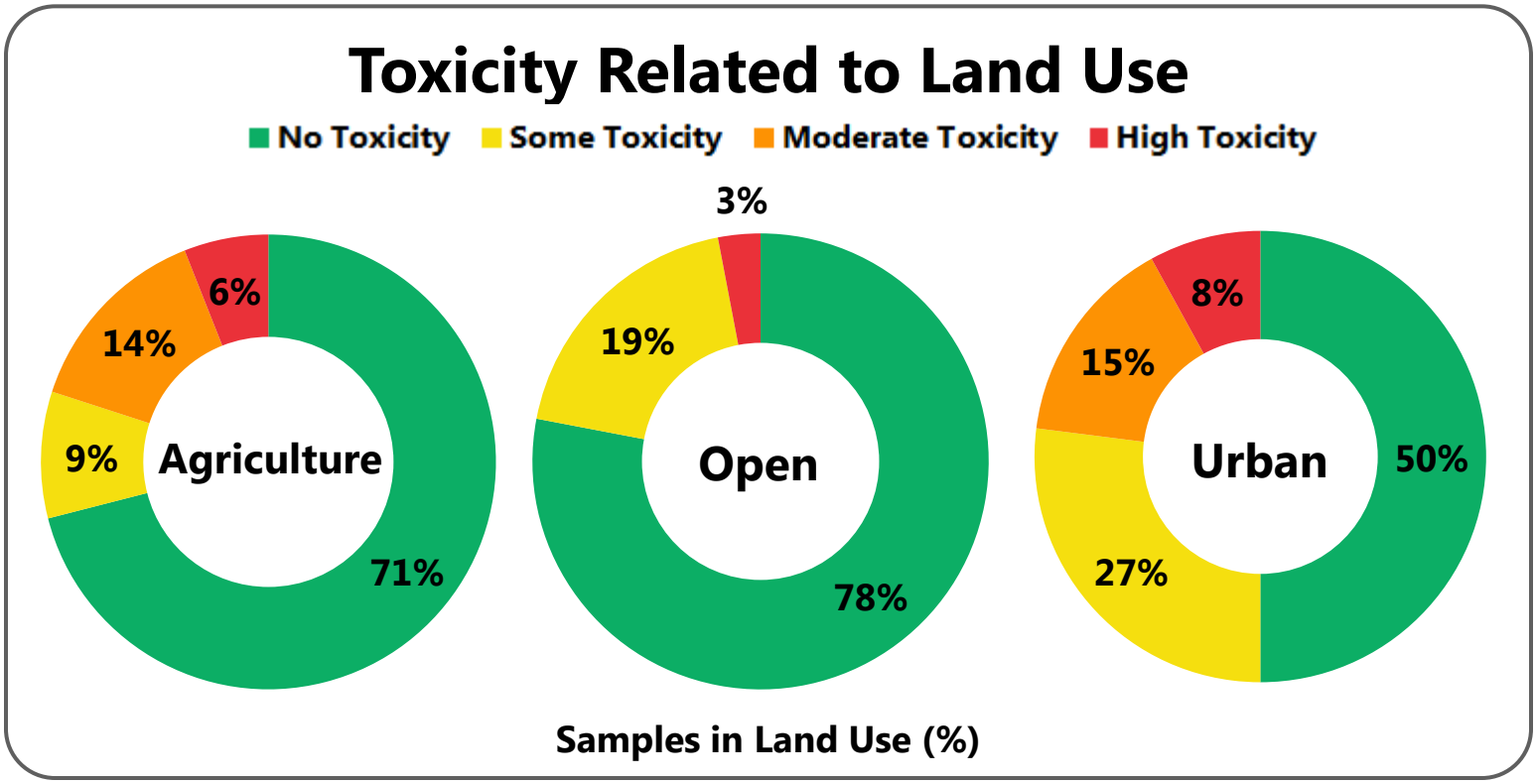
How toxic are California's waters?

- Surface water toxicity pervasive in California
  - 50% water and sediment samples statewide toxic 2001-2010
  - Most toxicity observed in urban areas



50%

of sites sampled for toxicity had at least one toxic sample

Source: SWAMP 10-Year Toxicity Report, Anderson et al. 2011

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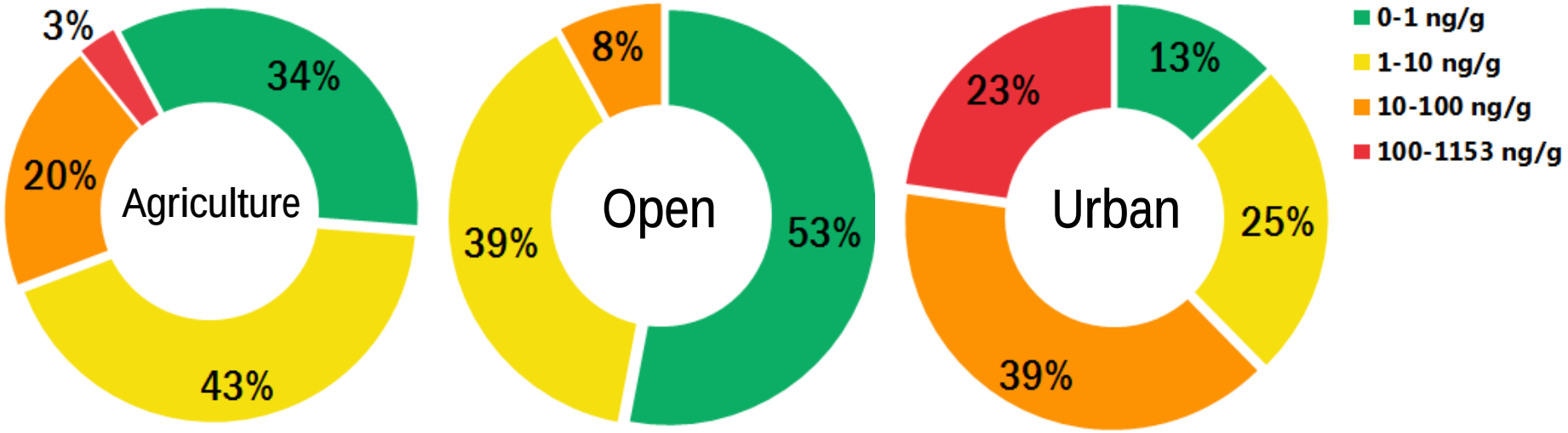
Source: SPoT Program Third Report – Five-Year Trends 2008-2012 (2014)

Pyrethroid Concentrations by Land Use



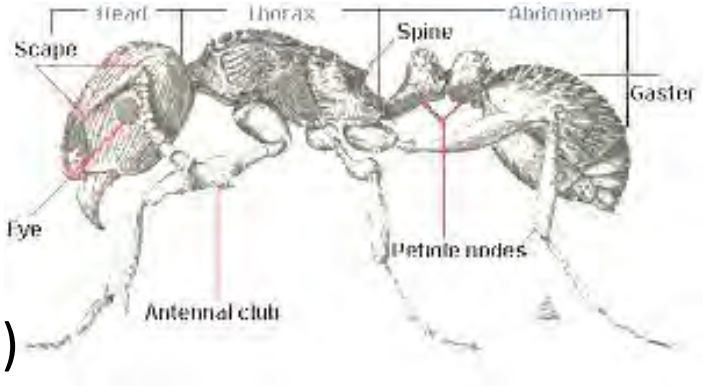
Source: SPoT Program Third Report – Five-Year Trends 2008-2012 (2014)

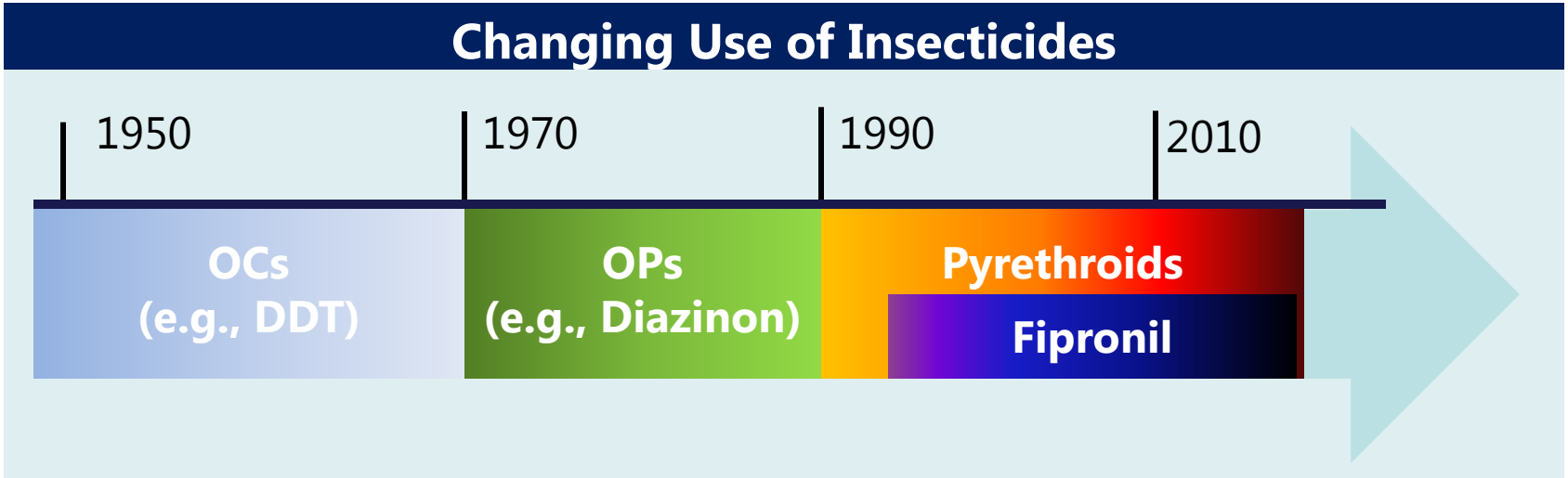
Pyrethroids

- Significant increase in pyrethroid pesticides
  - Driven by increased urban use (likely professional and residential applications)
  - Statewide trend
- CA Department of Pesticide Regulation (DPR) has implemented restrictions to limit urban professional application of pyrethroids
  - Monitoring with SPoT to evaluate effectiveness of regulations

Urban: Increased Toxicity, Changing Actor(s)

- Changing use of insecticides
  - Organochlorines (OCs) & organophosphates (OPs)
  - Pyrethroids
    - Pyrethroid regulations → professional application use requirements
  - Fipronil and neonicatinoids (imidacloprid)





Are you using the right test organism?

- Toxicity: pyrethroids vs. neonicotinoids
- Different results based on species sensitivity
  - Region 3 *Hyalella* vs. *Chironomus* neonicotinoid samples

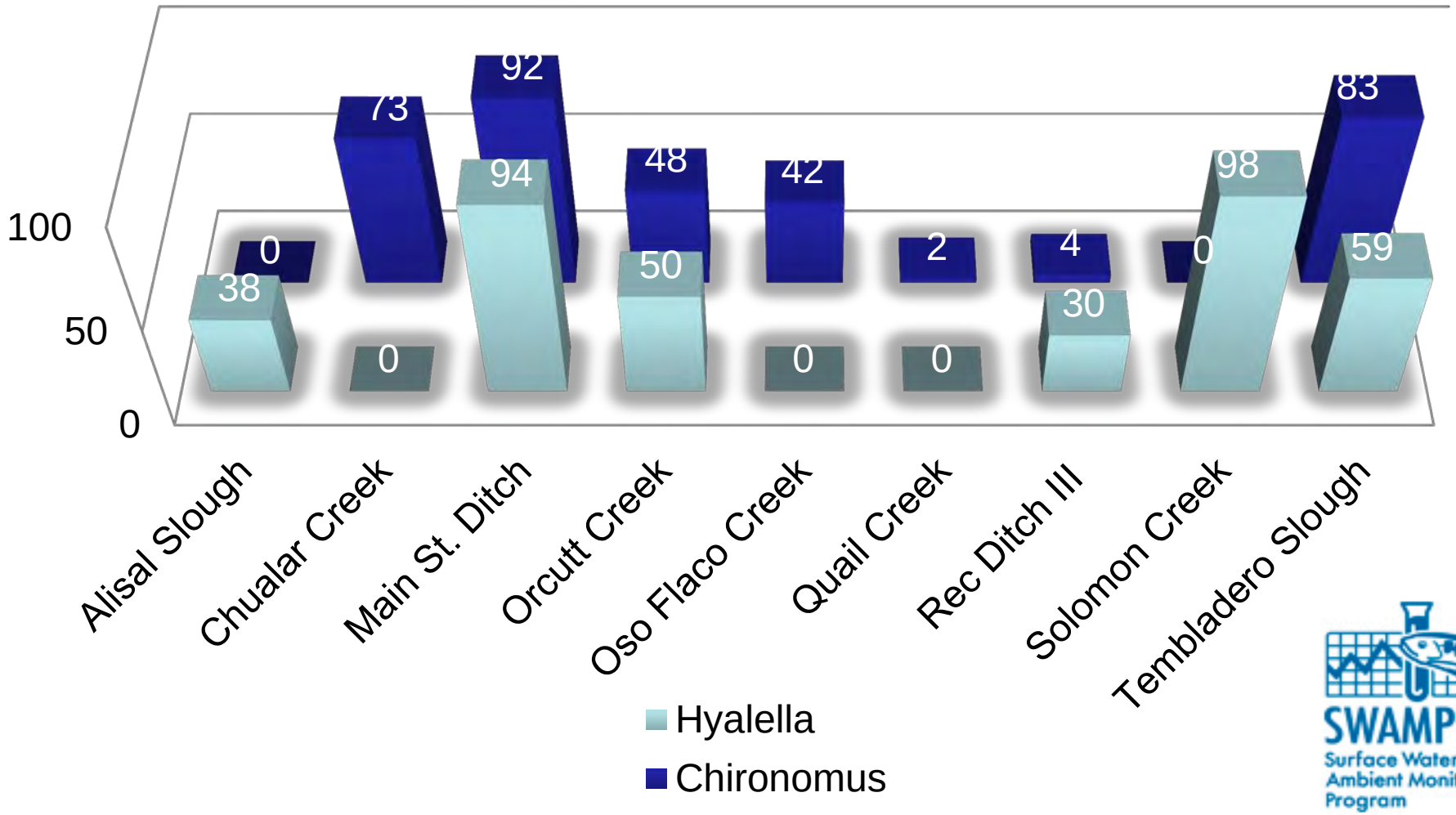
	% survival	
	Hyalella	*Chironomus*
Sample	**Mean**	**Mean**
Alisal Slough	**38**	**0**
Chualar Creek	**0**	**73**
Main St. Ditch	94	92
Orcutt Creek	50	48
Oso Flaco Creek	**0**	**42**
Quail Creek	0	2
Rec Ditch III	30	4
Solomon Creek	**98**	**0**
Tembladero Slough	59	83

Source: SPoT 2013

Multiple test organisms needed to tell the whole story

Fipronil follows neonicotinoid story

Pecent Survival at Nine Central Coast Agricultural Sample Locations (2013 SPoT data)



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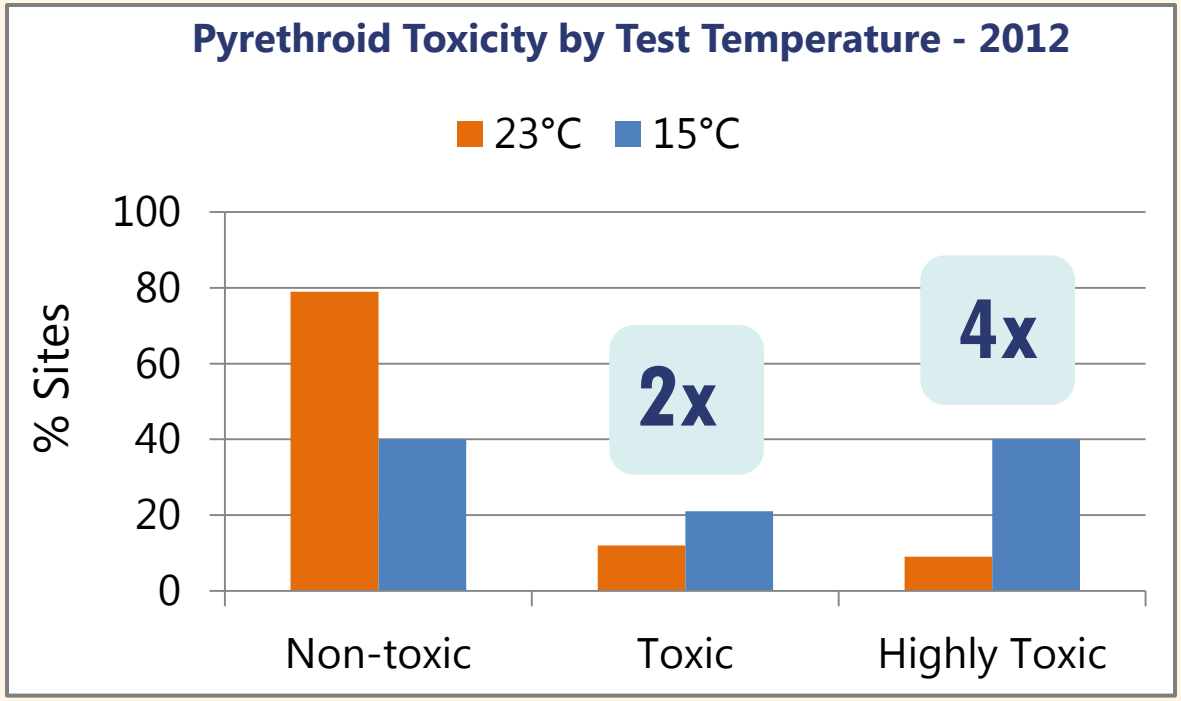
Do standard toxicity tests underestimate ambient toxicity?

- Pyrethroids more toxic at colder temperatures
- Standard US EPA method test temperature 23°C
  - Ambient CA stream temperature 15°C
- Results show higher pyrethroid toxicity at 15°C



Standard test methods at 23°C **underestimate** pyrethroid toxicity in California watersheds

Source: SPoT Program Third Report – Five-Year Trends 2008-2012 (2014)

Research: does infiltration reduce toxicity?

URBAN

- Management practices urban: e.g., LID- bioswales
  - 90% reduction of pyrethroids and associated toxicity to *H. azteca* and *C. dilutus* (Anderson et al., in prep)
  - Reductions of fipronil and degradates variable
  - (funding by Prop 84, DPR)

AGRICULTURE

- Integrated vegetated treatment systems
  - 100% reduction of pyrethroids (Anderson et al. 2011)
  - 96% reduction of chlorpyrifos (Phillips et al. 2015)
  - (funding by USDA, Region 3, DPR)
- Treatment of neonicotinoids unknown
  - Prop 1 and future collaborative projects with DPR, etc.

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Water Boards regulatory message(s)

- SPoT is producing data and knowledge that should feed to Water Board regulatory programs
  - Toxicity analyses involving insecticides is species and temperature specific:
    - Use appropriate organism (or multiple organisms)
    - Consider method effect of temperature
  - Infiltration BMPs can significantly reduce toxicity of urban and ag runoff
- New insecticide licensing / registration efforts should emphasize toxicity method development burden be placed on manufacturers

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