Summary of Toxicity in California Waters 2001-2009

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Item #7

Karen Larsen
Director, OIMA

John Hunt, Brian Anderson, Dan Markiewicz
University of California Davis

Mark Pranger
Moss Landing Marine Laboratory

California Water Boards

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Introduction

- 1st Statewide Assessment of Toxicity Test Data in over 10 years
- Purpose
  - Present a summary assessment of toxicity in California's watersheds and coastal waters
  - Provide data to put Toxicity Policy recommendations into context
  - Provide recommendations for future statewide toxicity monitoring

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Assessment Questions

- Where has toxicity been observed in California waters?
- What is the magnitude of observed toxicity?
- How does toxicity compare among waters draining different land cover areas?
- Which chemicals have been implicated as causing toxicity?
- What are the ecological implications of aquatic toxicity?
- Do the results change depending on statistical method applied?

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Caveats

- Targeted sampling only characterize sampled sites, not unmonitored areas
- Results cannot be extrapolated to human health
- Grab samples may underestimate toxicity
- Acute toxicity tests may also underestimate chronic toxicity
- Laboratory toxicity test organisms do not represent the full range of sensitivity of resident community

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Methods Overview

- Time Period for Data Analyzed: *8/7/2001 - 3/31/2010*
- 1047 sites • 3227 water samples • 1302 sediment samples
  Total tests = 8,542
- Data Sources: SWAMP (CEDEN) and partner programs – 9 Regions with different programs
- Toxicity Determinations
  - Water –freshwater tests (fathead minnow, water flea, and algae) and some salt water tests
  - Sediment – freshwater tests primarily (*Hyalella*) and marine tests
  - Lethal endpoint for fish and invertebrates, growth for algae

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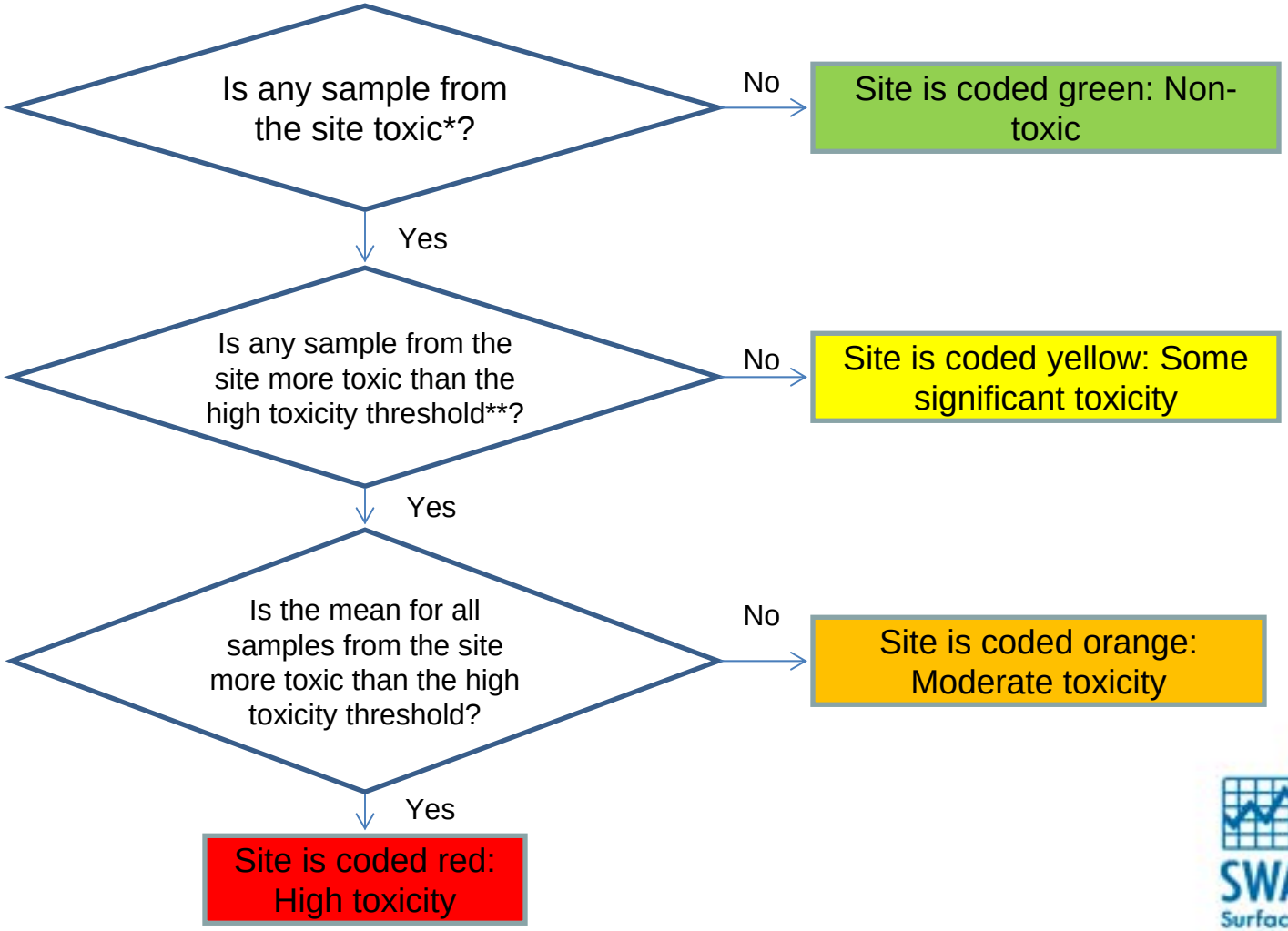
Site Characterization



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Assessment Questions 1 & 2

- Where has toxicity been observed in California waters?
- What is the magnitude of observed toxicity?

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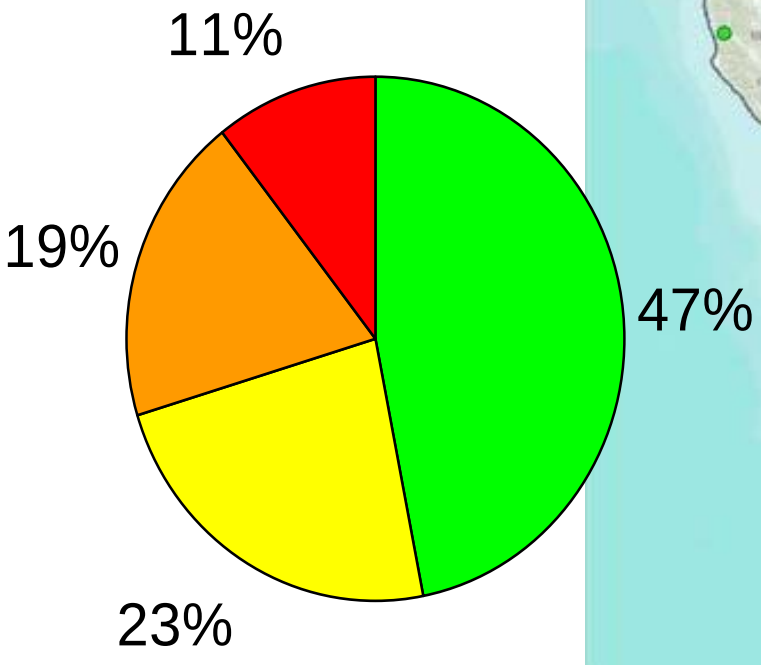
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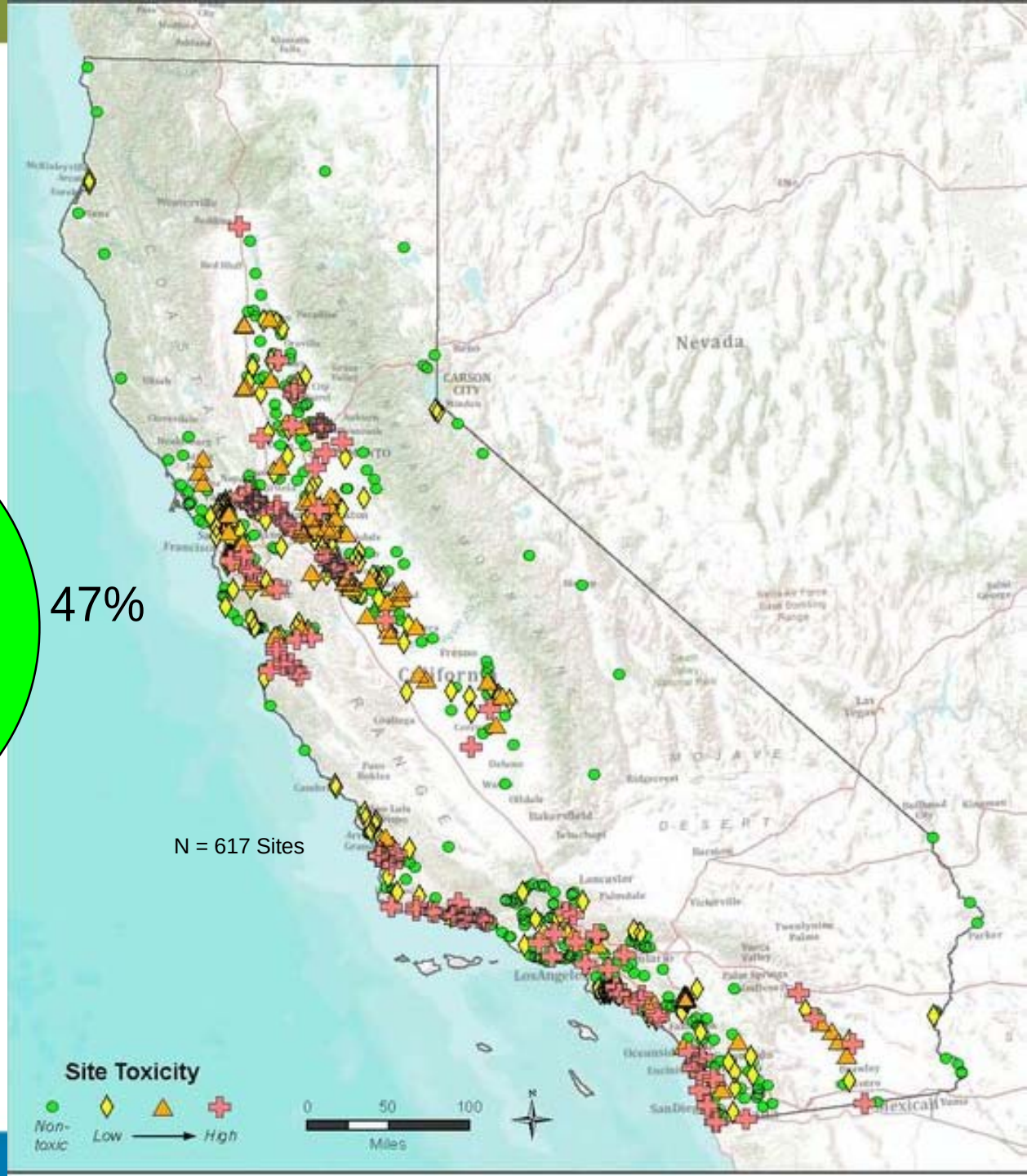
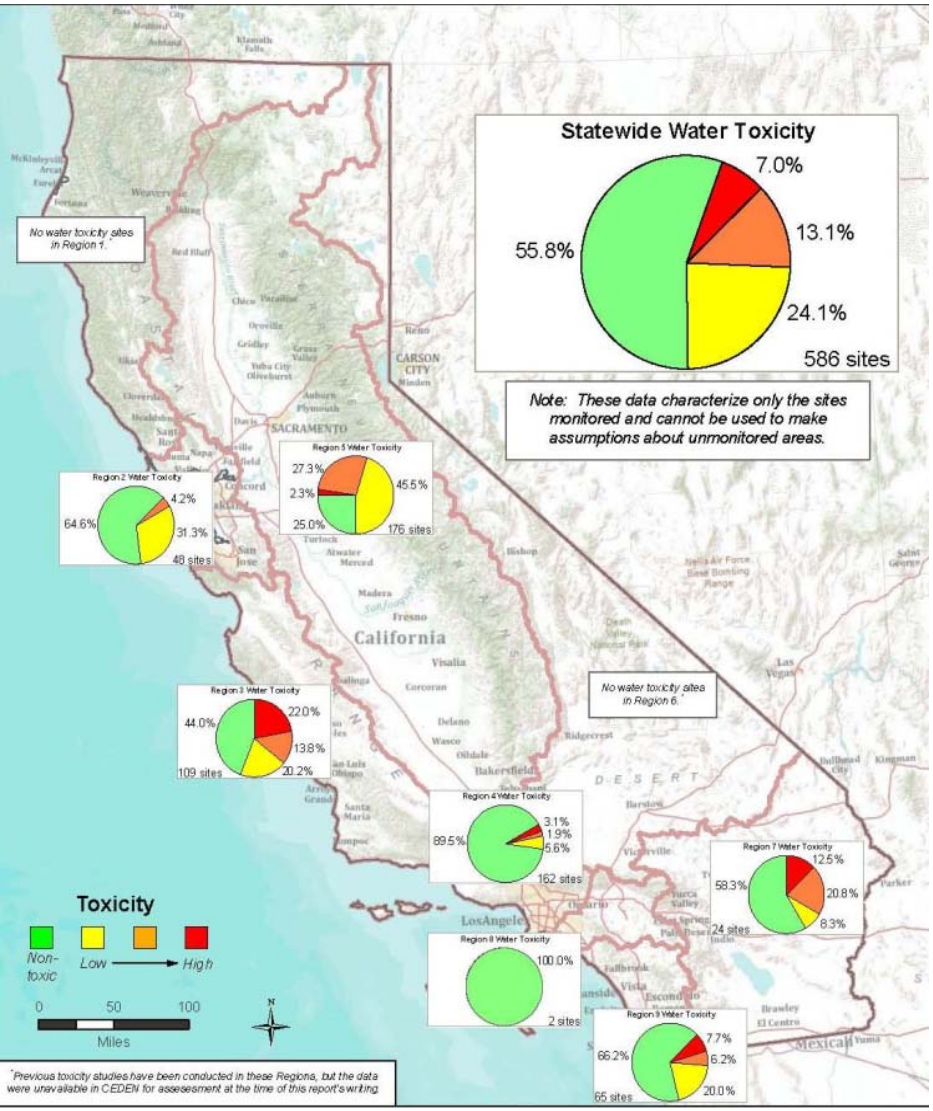
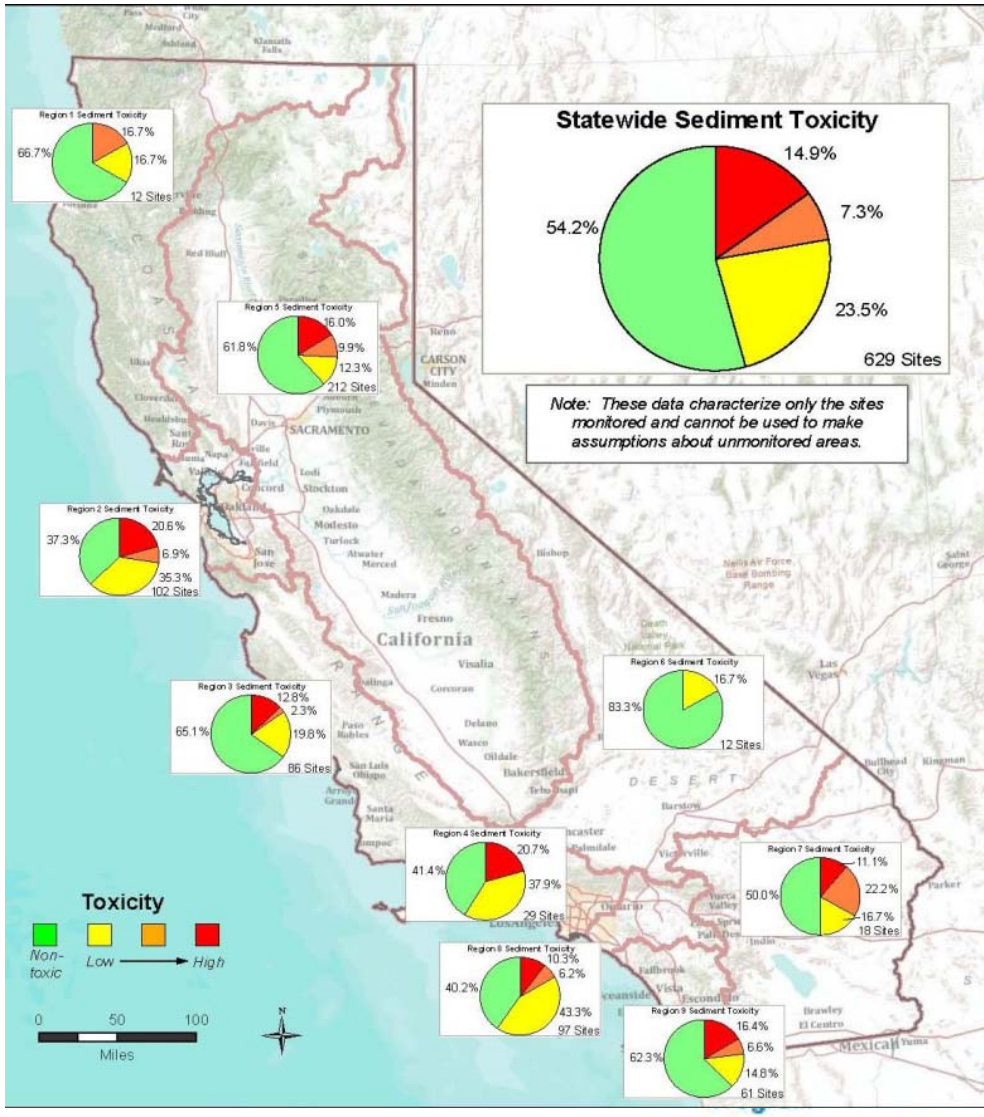

Nevada
CARSON CITY
N = 617 Sites
Site Toxicity
Non-toxic
Low
High
0
50
100
Miles

Magnitude of toxicity in water



Magnitude of toxicity in sediment



Relative Toxicity by Test Species

Test Species	No. Sites	Maximum Toxicity Observed (%)			
		Non-toxic	Some Toxicity	Moderate Toxicity	High Toxicity
Water Flea	545	71	6	16	7
Fathead Minnow	455	64	31	4	1
Algae	326	58	23	14	5

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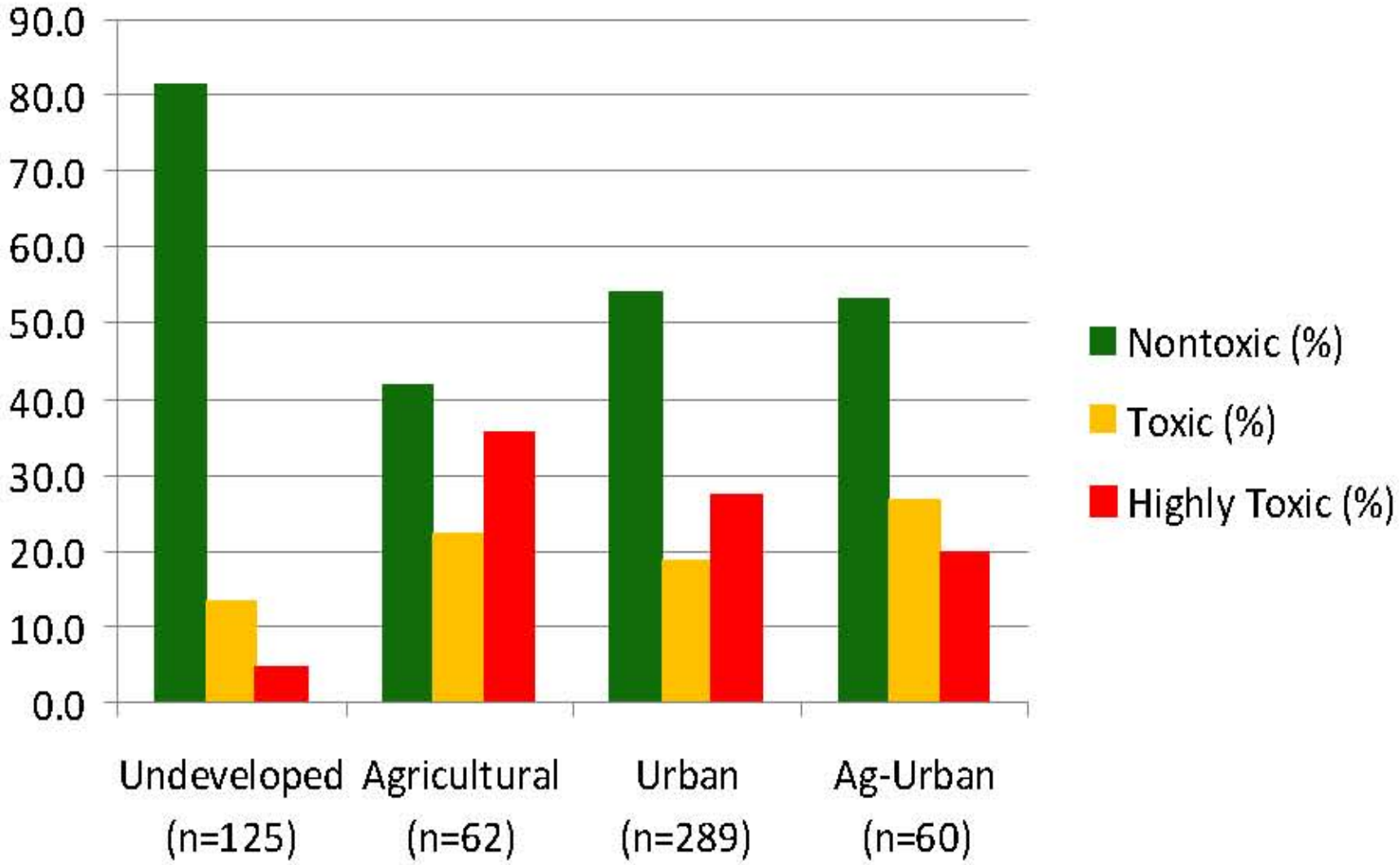
Assessment Question 3

How does toxicity compare among waters draining different land cover areas?



Assessment Question 4 - Which chemicals have been implicated as causing water toxicity?

Class	Compound	Water	Sediment
Ammonia	Ammonia	1	-
Carbamate Pesticides	Carbofuran	4	-
Organophosphate Pesticides	Chlorpyrifos	11	4
	Diazinon	13	-
	Ethyl Parathion	1	-
	Malathion	3	-
	Methyl Parathion	3	-
Pyrethroid Pesticides	Bifenthrin	4	8
	Cyfluthrin	3	3
	Cyhalothrin	2	7
	Cypermethrin	-	8
	Esfenvalerate	1	-
	Permethrin	-	1

Assessment Question 5
What are the ecological implications of toxicity?

- Declines in aquatic invertebrate population densities coincide with toxicity in the Salinas and Santa Maria Rivers
- Declines in marine communities coincide with sediment toxicity in San Diego Bay, Newport Bay, and the Ballona Creek estuary
- Declines in amphipod abundance coincide with sediment toxicity in Delta and Central Valley waterways

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Assessment Question 6 – Do the results change depending statistical method applied?

		USEPA Test of Significant Toxicity (TST)	
		Toxic	Non-Toxic
Traditional (t-test)	Toxic	20%	2%
	Non-Toxic	6%	72%

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Conclusions

- Toxicity in California surface waters is widespread
- Toxicity is prevalent in areas draining urban and agricultural land uses
- Evidence suggests much of the toxicity can be attributed to pesticides
- New statistics improve data quality, enhance consistency, and reduce costs

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Recommendations

- Toxicity testing is an important tool for assessing water quality in agricultural and urban landscapes
- More TIEs with fish and algae would help explain toxicity to these indicators
- Enhance linkage with bioassessment program to strengthen connection between toxicity and ecological effects

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Questions?

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