

# Benthic cyanotoxin production in California streams

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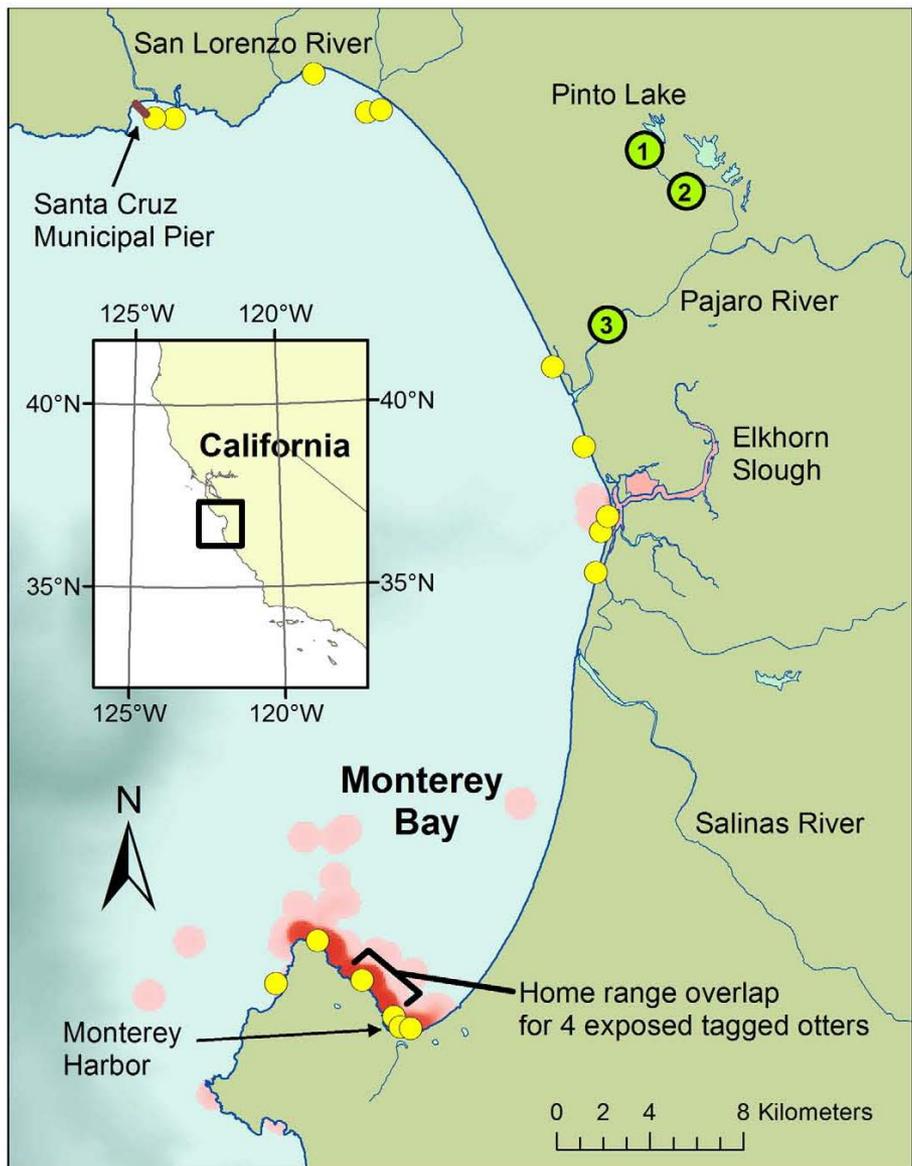
# Why care about cyanotoxins?

- Sickness in humans
- Mortality of domestic animals and wildlife
- Increasing problem  
(Paerl *et al.*, O'Neil *et al.*)
  - expanding distribution
  - more frequent
  - lasting longer



# Cyanotoxins: far-reaching effects

## *Mortality of sea otters due to microcystin intoxication*

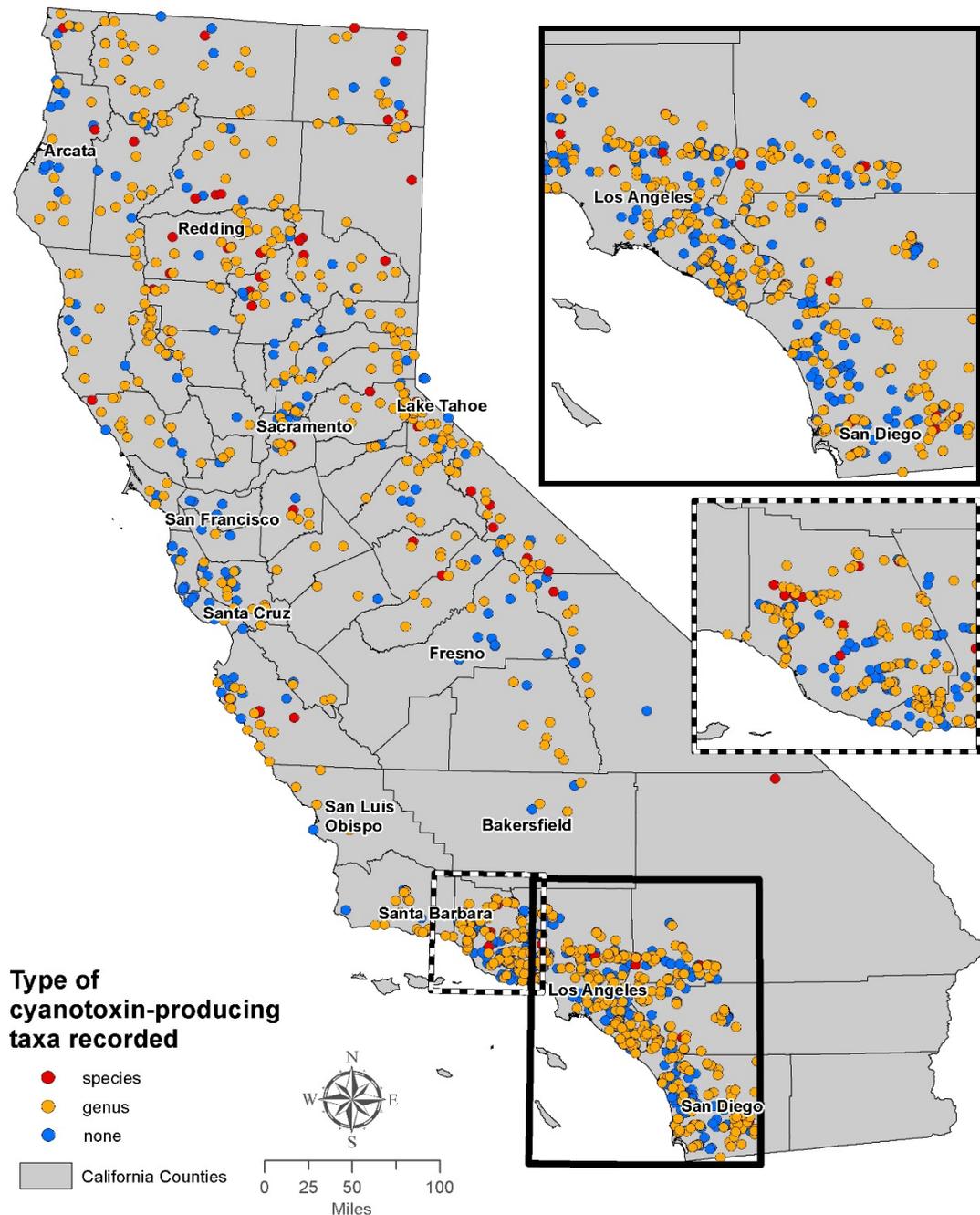


Miller et al., 2010



Distribution of  
cyanobacterial  
“toxic taxa”  
collected in CA  
wadeable streams  
2007 - 2013  
(1,280 sites,  
mostly 1-time sampling)

60% of sites support  
“toxic genera”;  
of those,  
10% support known  
“toxic species”



# Are benthic cyanobacteria producing toxins? Should we be concerned?

- Potential loading source (local, remote impacts)
- Toxin production possibly exacerbated by :
  - Loss of riparian habitat/shading
  - Hydromodification; stagnation
  - “Perennialization” of intermittent streams by nuisance flows

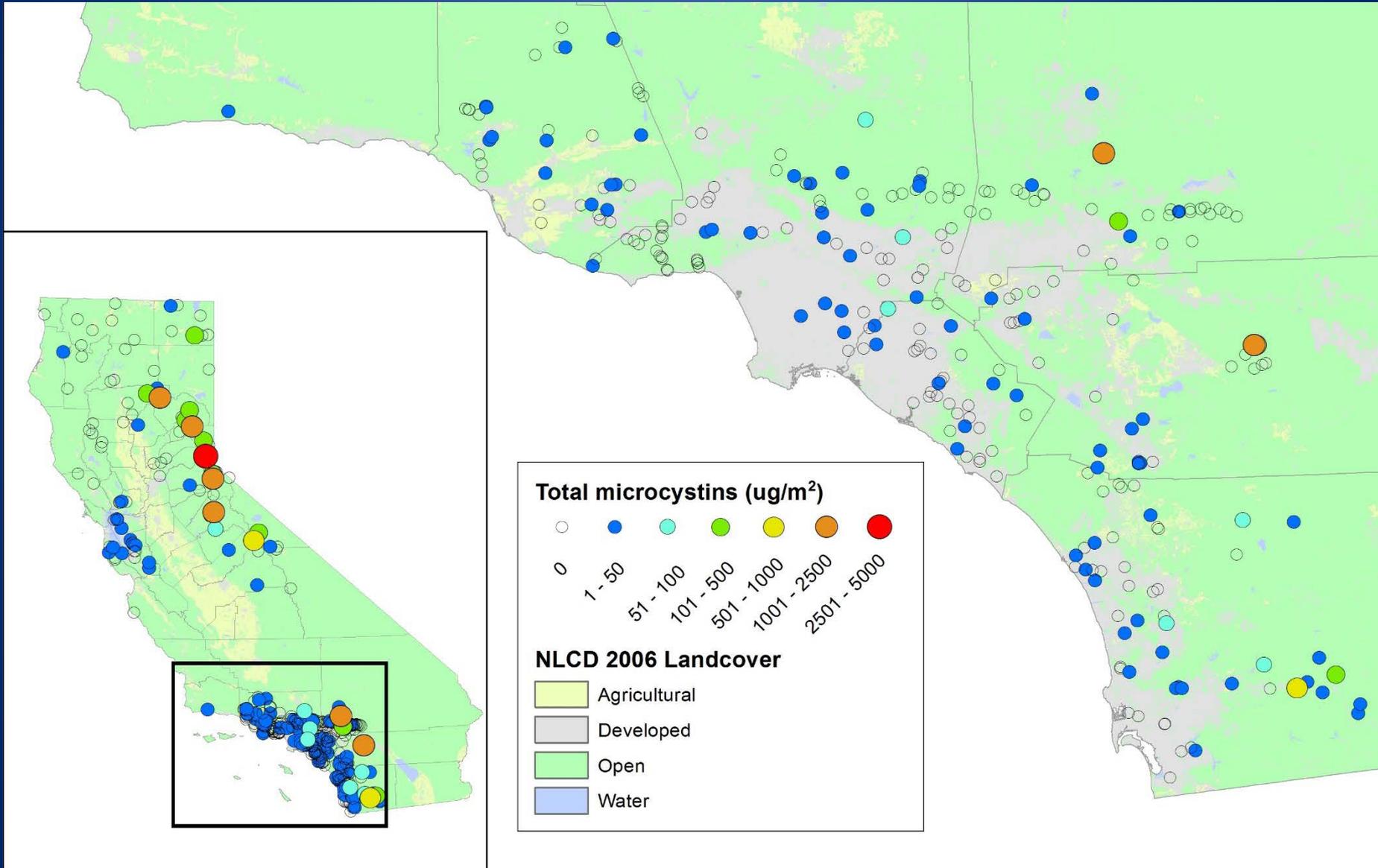


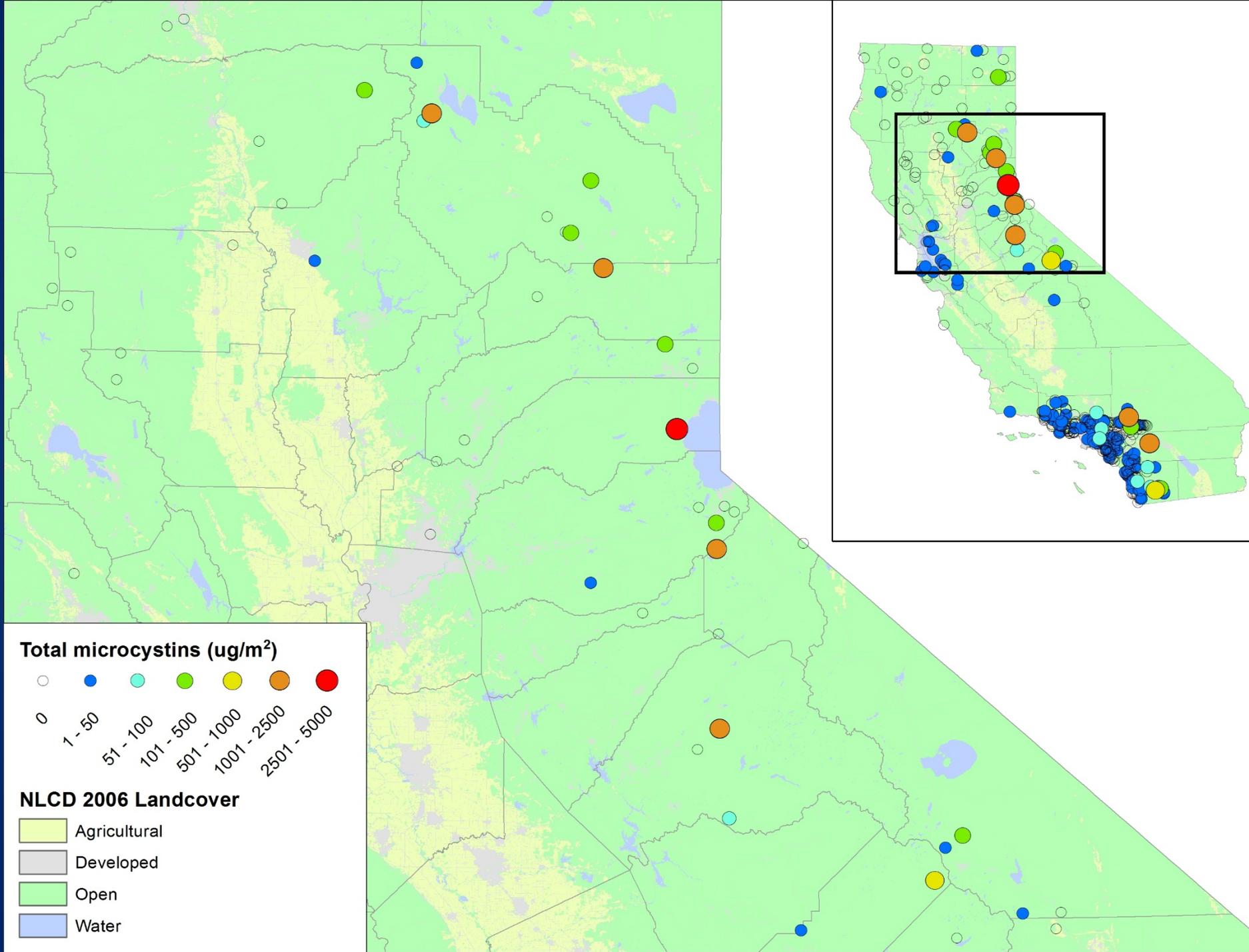
# Benthic cyanotoxin detection rates in CA streams (2011-2013)

	Total Microcystins	Lyngbyatoxin	Saxitoxin	Anatoxin	Cylindrospermopsin	Nodularin
% detects	33	21	5	3	0	0
# sites analyzed	368	14	101	33	14	14



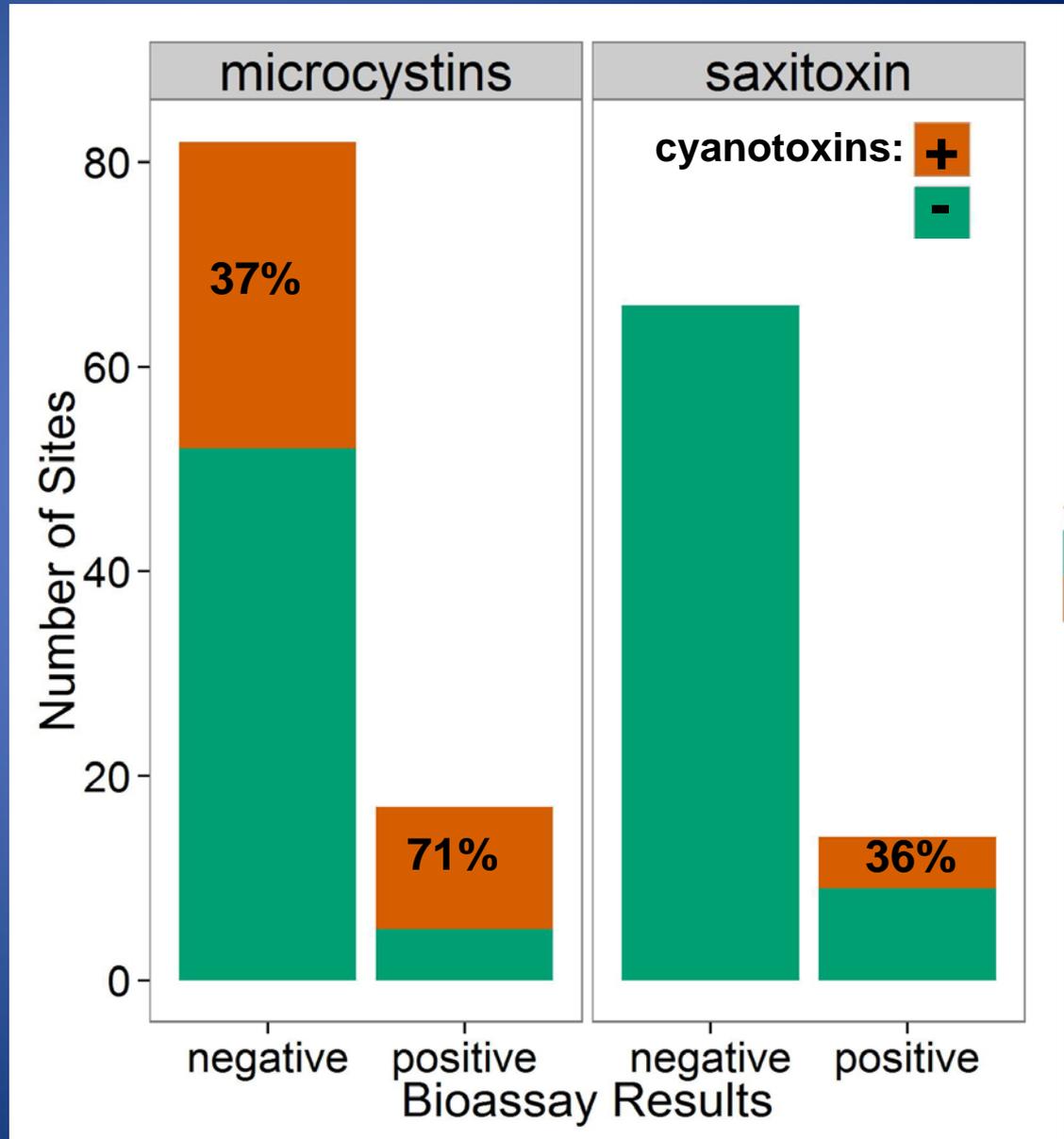
# Distribution of [total microcystins] in California wadeable streams (2011-2013)





# Could cyanotoxins help explain toxicity in undeveloped catchments?

*Higher frequency of cyanotoxin detection among sites positive for toxicity based on bioassay*



# Burning Questions

- Do cyanotoxins (or cyanobacterial extracts) influence bioassay results?
- How do cyanotoxins affect stream food webs, aquatic life?
  - Study (Aboal et al.) found evidence for cyanotoxin impacts to benthic macroinvertebrates
  - Influence IBI interpretation
- What is significance of stream cyanotoxin loading to receiving waters?
- Do anthropogenic factors influence cyanotoxin production in streams?



# Acknowledgements

- Samples: Raphael Mazor, Regional Board 2, Aquatic Bioassay & Consulting Labs., AMEC, Weston Solutions, CSU Long Beach, California DFW
- Data: So Cal Stormwater Monitoring Coalition, SWAMP (PSA, RCMP)
- Funding: Regional Boards 4,8, & 9; SCCWRP; Sea Grant
- Analyses: David Tsukada, Kendra Negrey, Becky Schaffner, Abel Santana

# Public Service Announcement: online algae IBIs calculator now available

... for non-  
SWAMP  
users ...

The screenshot shows the web interface for the algaeMetrics Calculator. At the top, there is a header for the Southern California Coastal Water Research Project (SCCWRP) with a map of the region. Below the header is a navigation menu with options: Home, About SCCWRP, Meetings, Research Areas, Documents, Data (selected), and Contact Us. A search bar is also present. The main content area features the title 'algaeMetrics Calculator' in orange. A notice states that a user account is required for use. The 'Description' section explains the tool's purpose and provides links for data submission templates and more information. On the right side, there is a form with an email input field (circled in red), a file selection button, and a submit button.

SOUTHERN CALIFORNIA COASTAL  
WATER RESEARCH PROJECT  
*A Public Agency for Environmental Research*

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Search and Map Data Data Submission File Exchange Data Tools

algaeMetrics Calculator

You need to have a user account to use this tool. If you cannot login, you may not have a user account. You may get an account by contacting [bettyf@sccwrp.org](mailto:bettyf@sccwrp.org) or calling 714-755-3237.

**Description**

This tool calculates the three main benthic algal indices of biotic integrity (IBIs) that have been developed for bioassessment applications in southern California wadeable streams (Fetscher et al. 2014) by SCCWRP and collaborators at California State University San Marcos, the University of Colorado Boulder, the San Diego Regional Water Quality Control Board, and the California Department of Fish and Wildlife. At this time, validation of the IBIs for use in streams outside of southern California has not been conducted rigorously, but preliminary analyses (Fetscher et al. 2013) suggest that the IBIs may also have applicability in other parts of the state.

A template for data submission may be downloaded [here](#)

More information about this tool be obtained [here](#)

Enter your email address to indicate that you have read and agree to the terms and conditions of this scoring tool

Select input file

No file selected.

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# Stream benthic cyanotoxin sampling



- Quantitatively scrape/brush biofilms from substrata & take cuttings from algal mats
- Homogenize into slurry
- Filter measured amount on glass-fiber filter; store frozen
- ELISA (LC-MS)

