

Benthic Algae as a Tool for Bioassessment & Nutrient Monitoring in California



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LIBERATOR OF O₂ WE BREATHE

ERECTOR OF INTRUSIVE & UNSIGHTLY SCUMS

Fixer of carbon (& nitrogen)

Emitter of emetogenic stenches

Food source (& cover) for bugs & fish

Concocter of repugnant flavors

Informant of water quality



EFFUSER OF TOXINS

Brief History of Algae in CA Bioassessment Programs

- Sampled via California Monitoring & Assessment Program (CMAP): 1999-2004

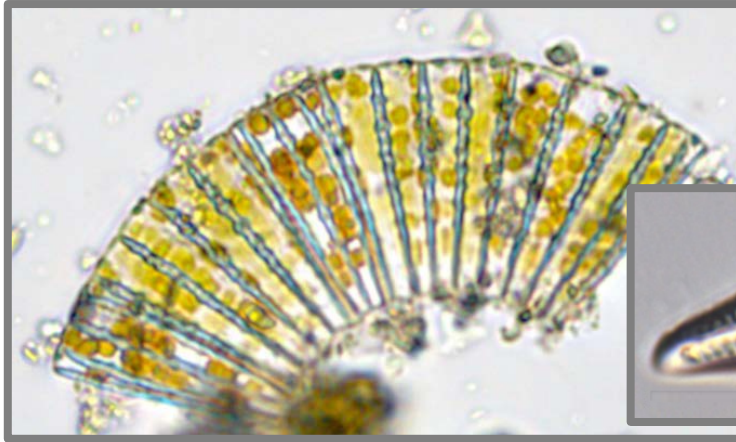
- Indices (IBIs) developed for:

- Region 6
- Region 3
- southern California

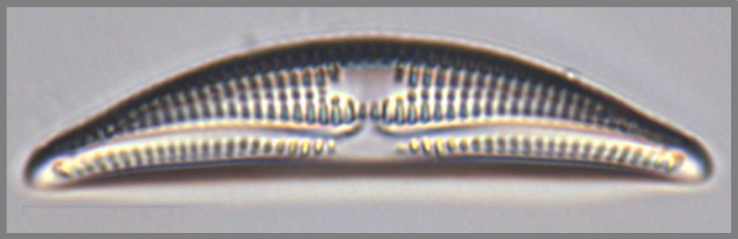


- Regularly Monitored by SWAMP statewide programs (PSA, RCMP) & regional (SMC, RMC, etc.)
- >1,500 sites' worth of data over past decade

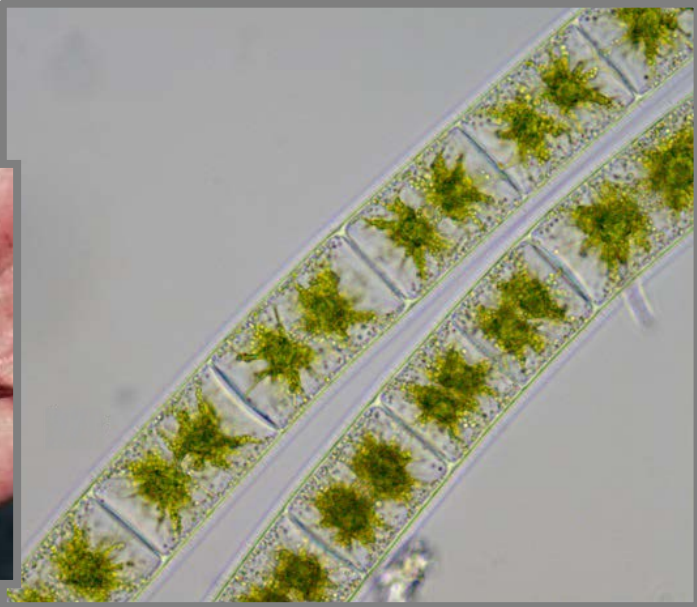
Types of Freshwater Algae Assessed in CA



diatoms

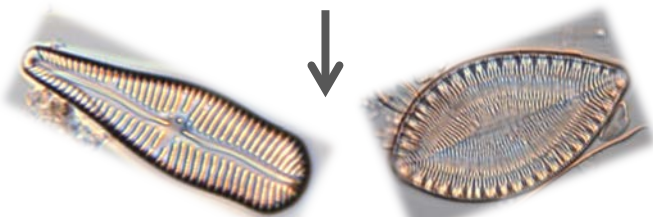
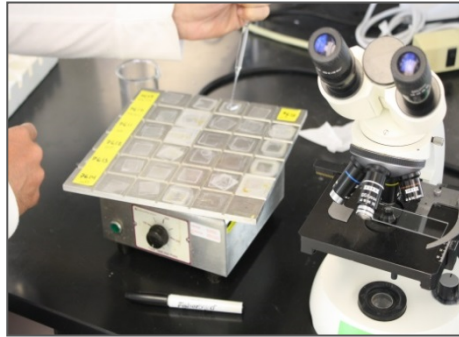


“soft” algae
(+ cyanobacteria)



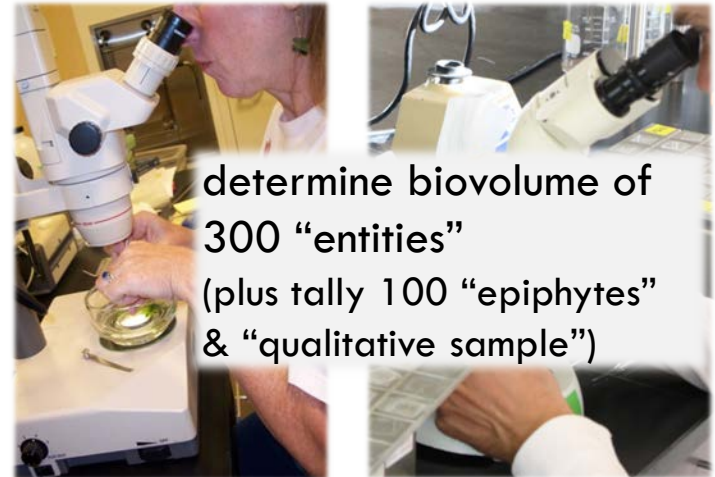
How are Algae Data Generated?

D
I
A
T
O
M
S



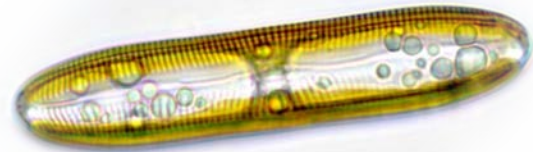
“valve” counts: $N = 600$

S
O
F
T
A
L
G
A
E



What's Algae's "Niche" in Water Resources Management?

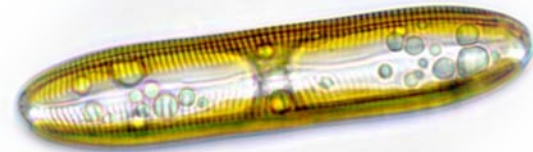
- Complement bugs in bioassessment:
 - community composition can shift quickly
 - highly responsive to water quality
 - relatively unconstrained by microhabitats
- *Beyond* traditional bioassessment:
 - stream cyanobacteria = sources of natural toxins
 - CA Nutrient Policy implementation



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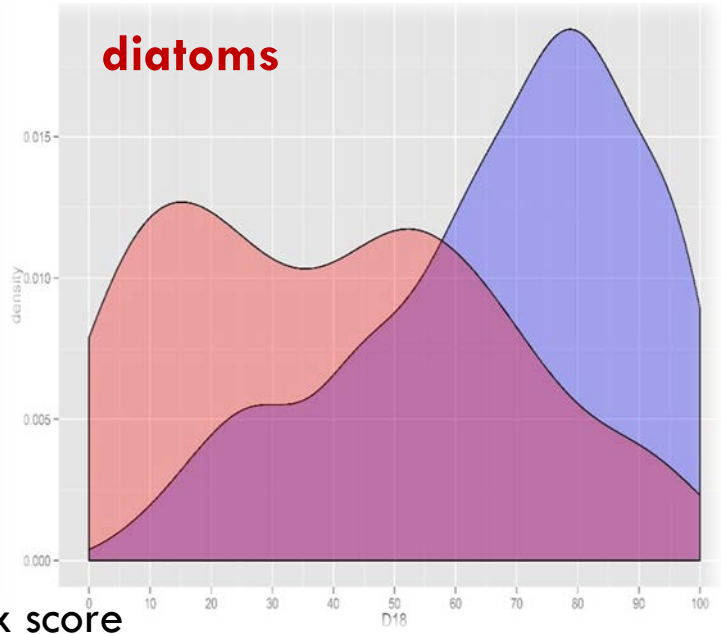
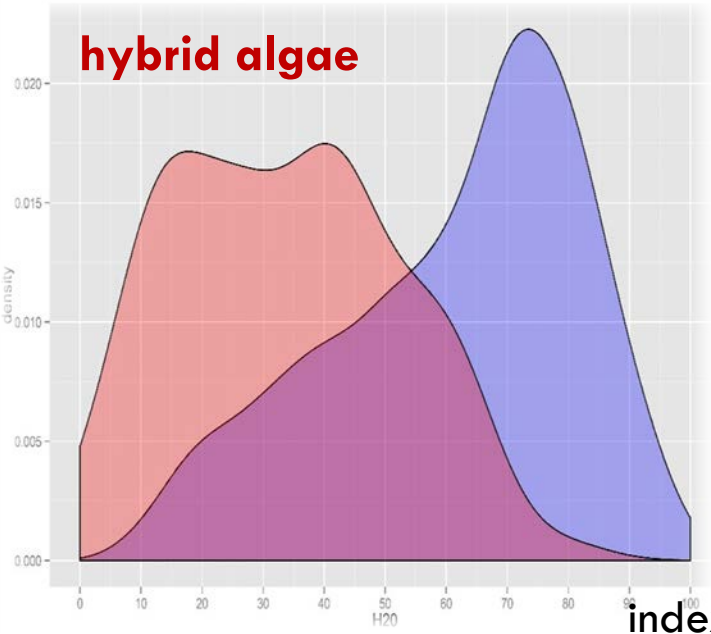
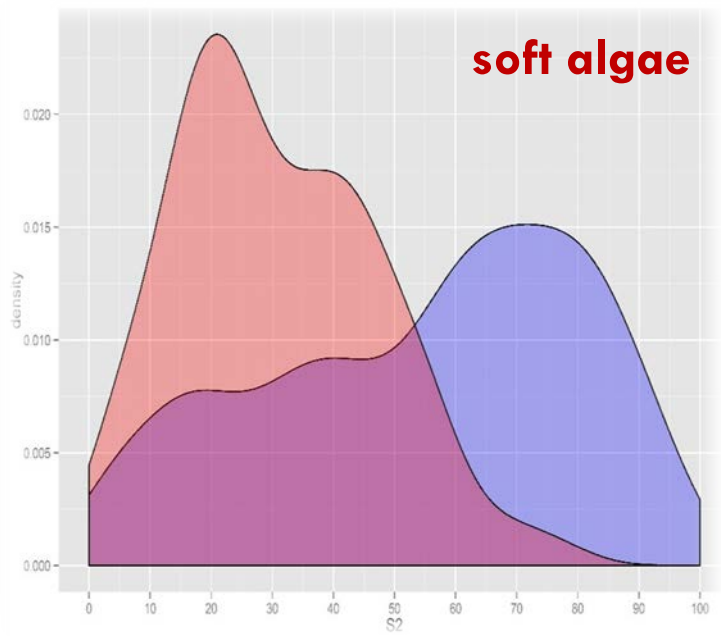
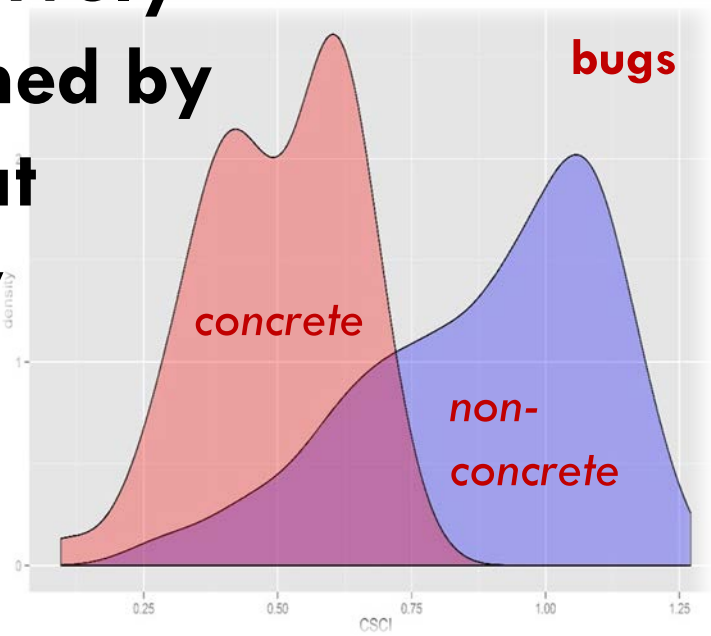


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Algae Relatively Unconstrained by Microhabitat Availability

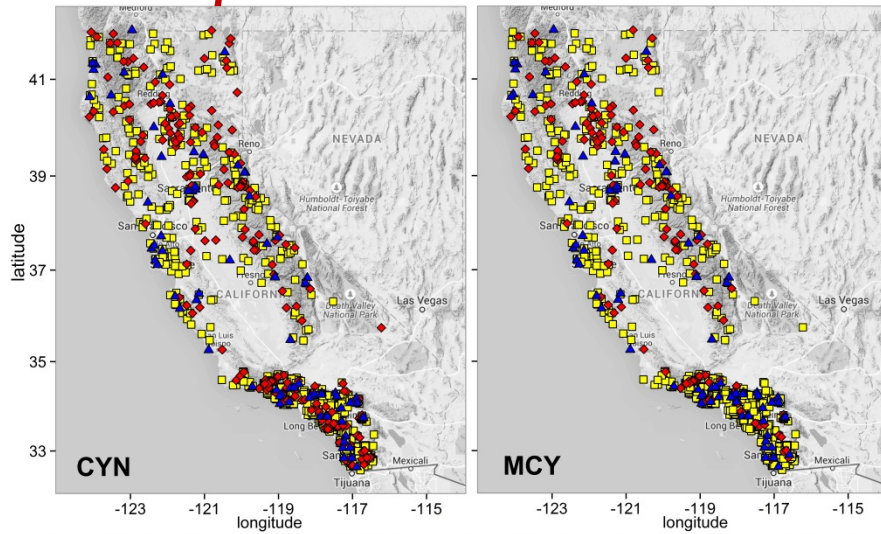


index score

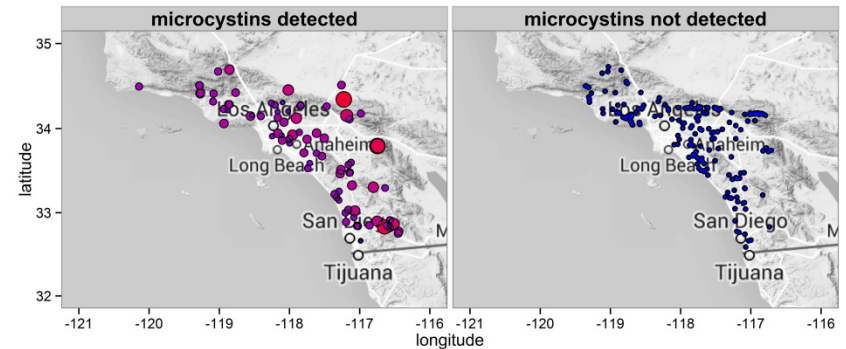
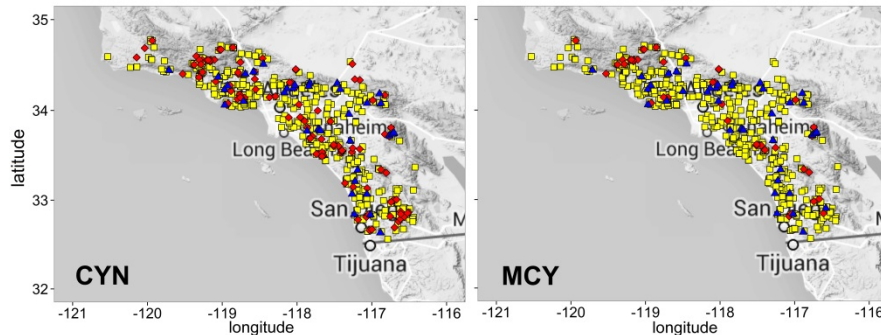
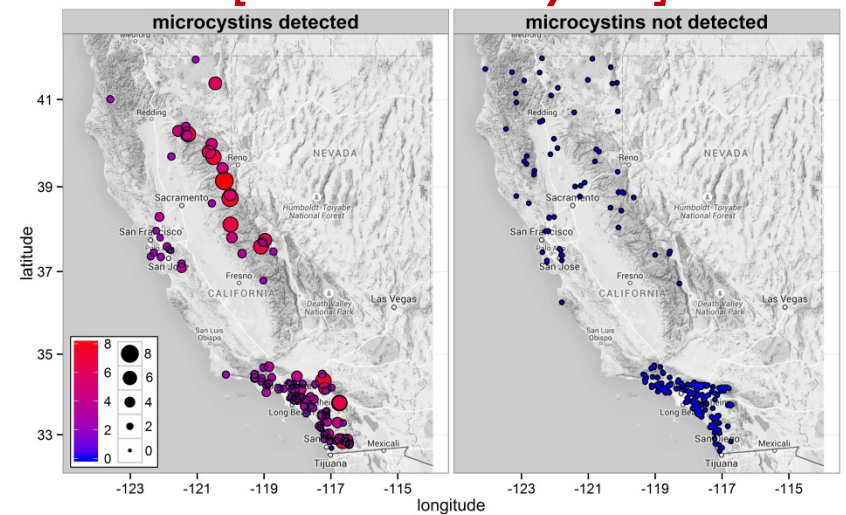
Stream Benthic Cyanobacteria: Sources of Natural Toxins



presence of "toxic taxa"

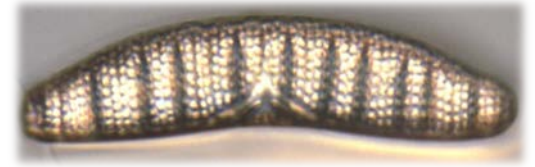


[benthic microcystins]

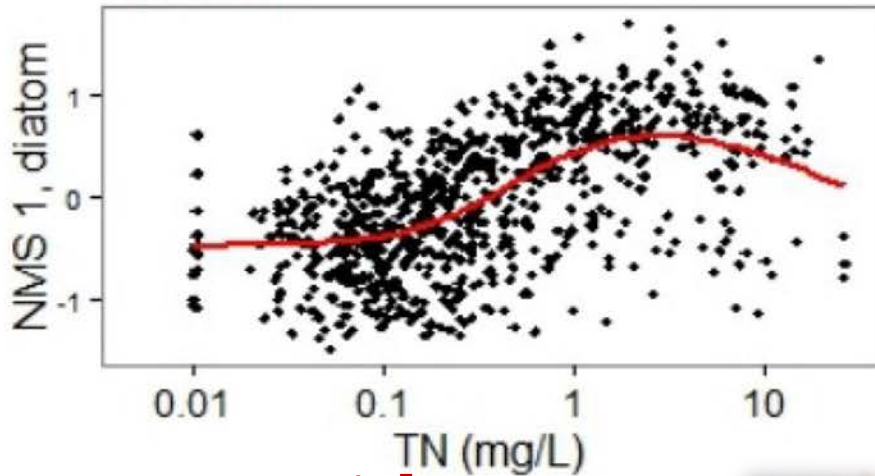


Nutrient Policy Implementation

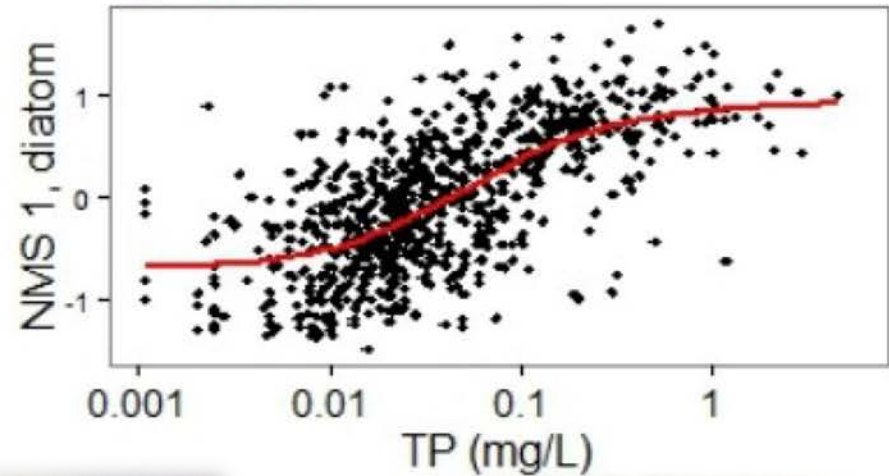
Algal communities respond strongly to many water-quality parameters, including (especially?) nutrients



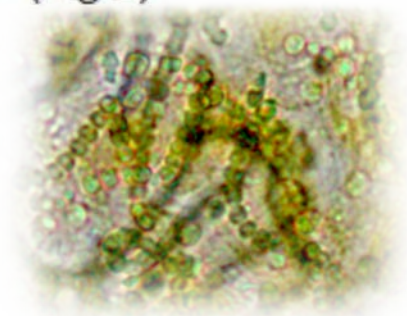
$r = 0.54$



$r = 0.63$



nitrogenase gene expression
(Stancheva *et al.* 2013)



Ongoing Algae Initiatives (SCCWRP *et al.*)

- Statewide nutrient policy considering use of information about algal community (Biological Condition Gradient; TetraTech)
- Index to be developed for use statewide (CSCI analog); Standard Taxonomic Effort (CSUSM)
- Exploration of molecular tools for inferring algae community composition



Questions:

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