

Development of Stream Algal Bioassessment Capacity: Progress in Southern California



Algal Bioindicators - Valuable Addition to Bugs

- 2nd bioindicator to provide “weight of evidence”
- Fast growth/colonization
 - Rapid response (days -weeks)
 - Applicable in short-lived streams
- Primary producers → nutrient TMDL development/assessment, biocriteria
- Ability to colonize virtually any stream substratum...

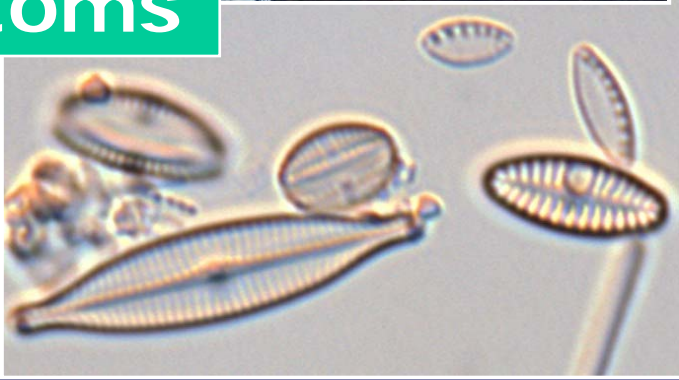
CA - Diversity of Substrate Types



What Are "Benthic Algae"?



diatoms



soft-bodied algae
(& cyanobacteria)



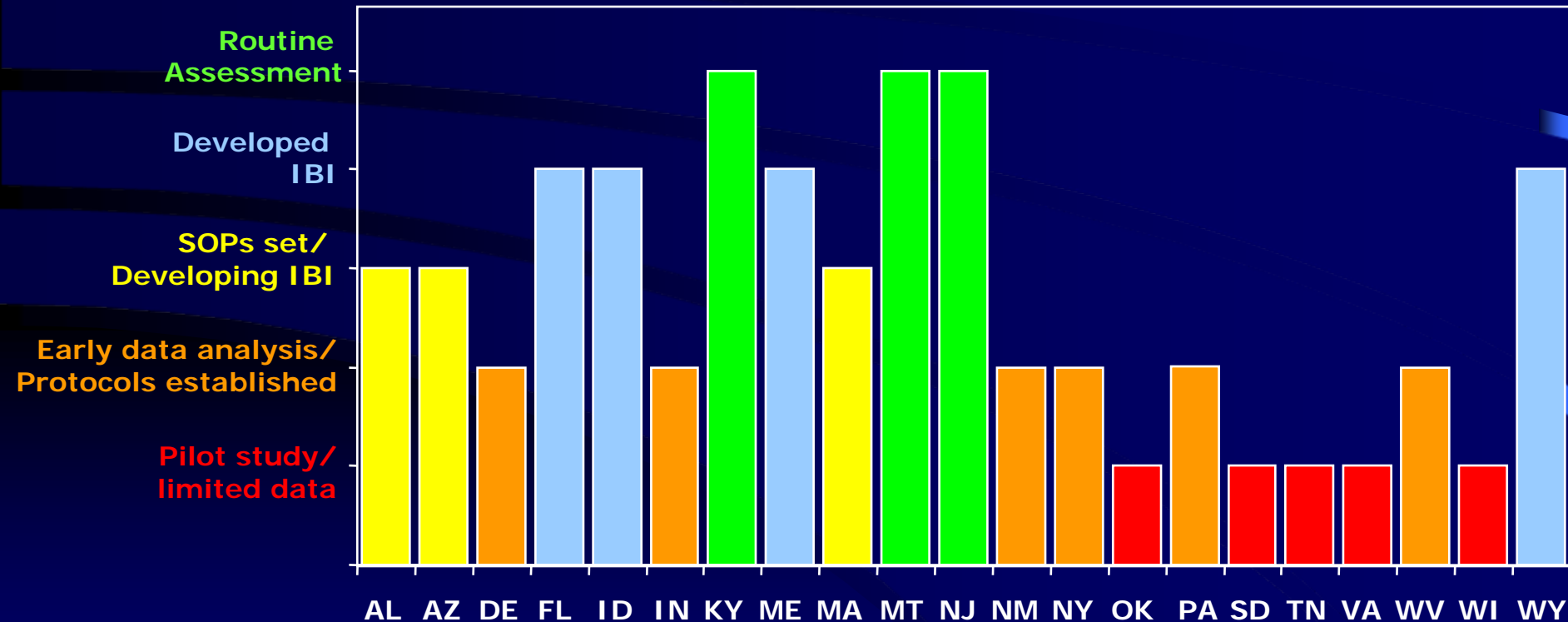
What Do We Measure?

- Biomass
 - chlorophyll a
 - ash-free dry mass
 - algal cover
- Assemblage(s): taxonomic composition
 - diatom
 - soft-bodied

What Can Algal Assemblages Tell Us?

- Habitat responses: light, temperature, low DO, siltation
- WQ responses: nutrients, organic enrichment, conductivity, metals, pH
- Presence of nuisance/toxic algal blooms

Progress of Other States: Developing Algal Indices



Status of Algae Bioassessment in California

- Herbst and Blinn (2008): prelim. IBI – Eastern Sierra Nevada
- National programs: EMAP, NAWQA
- State programs: CMAP, SWAMP regions, PSA
- TMDL studies (biomass)
- Watersheds: San Gabriel River, Big Bear (benthic algal assemblage)
- Recently initiated So Cal projects...

Current Prop 50-Funded Projects

Southern California

- SCCWRP
- U of Colorado, Boulder
- CSU San Marcos

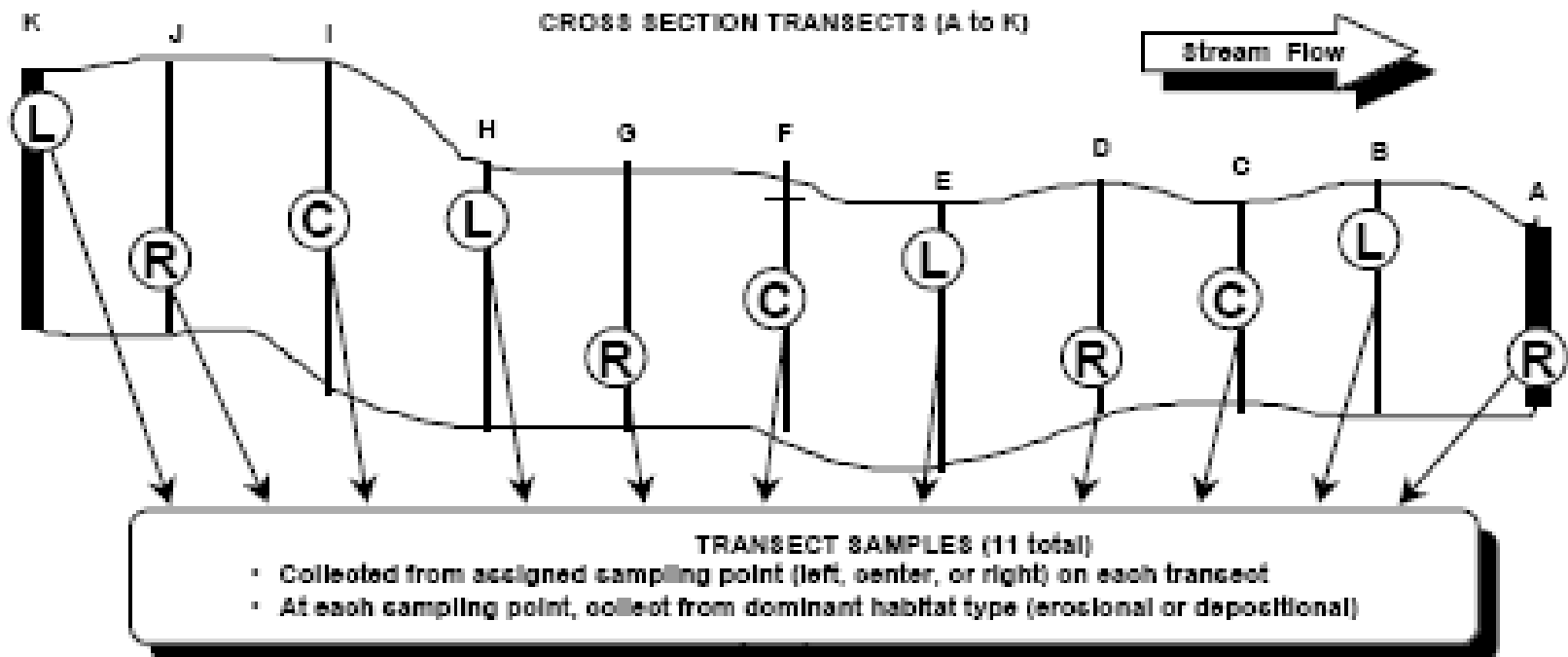
Central Coast

- CSU Monterey Bay
- UC Santa Cruz
- Portland State U.
- Michigan State U.

Major Goals - Joint Projects

- Assess responses of benthic stream algae to types of human disturbance in coastal So Cal
- Understand relationships between nutrients, environmental factors, & stream algae in our region
- Apply this information to the development and refinement of assessment tools

Methodology: Reachwide (Multihabitat) Approach



Methodology: Algae Sampling *e.g.* from cobbles



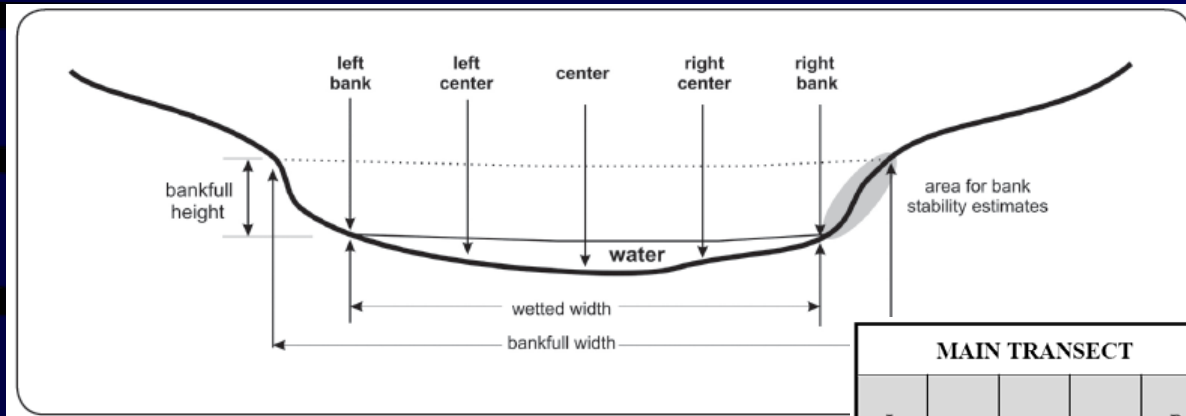
diatom + soft
taxonomic IDs

chlorophyll *a*

ash-free dry
mass

Assessing Algal Percent Cover

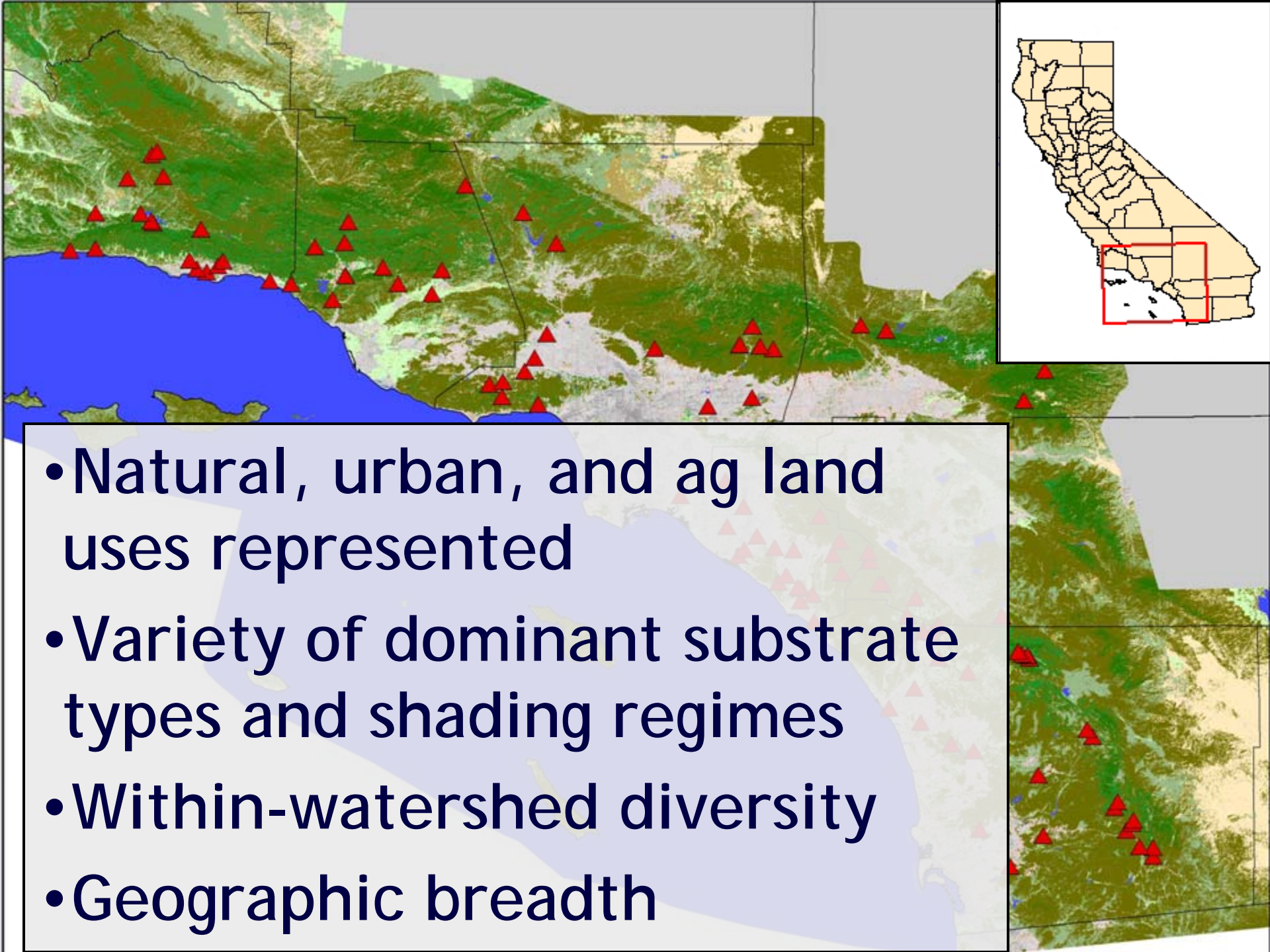
...adapted for SWAMP Bioassessment...



MAIN TRANSECT					PEBBLE COUNT, EMBEDDEDNESS, CPOM, PERIPHYTON COVER	INTER TRANSECT				
L Bank	L Ctr	Ctr	R Ctr	R Bank		L Bank	L Ctr	Ctr	R Ctr	R Bank
					Substrate size class					
					% Embedded (if a cobble)					
					Depth (cm)					
					CPOM (P/A)					
					Micro Algae (thickness code)					
					Macro-/Filament (length/units, A if absent)					
					Macro-/Floating (P/A)					
					Macrophytes (P/A)					

Status of Southern California Project

- Completed 2nd season of spring/summer sampling (total: 104 sites across 2 years)
- Resampled a subset each Fall
- Initiated a time-course sampling in non-perennial systems

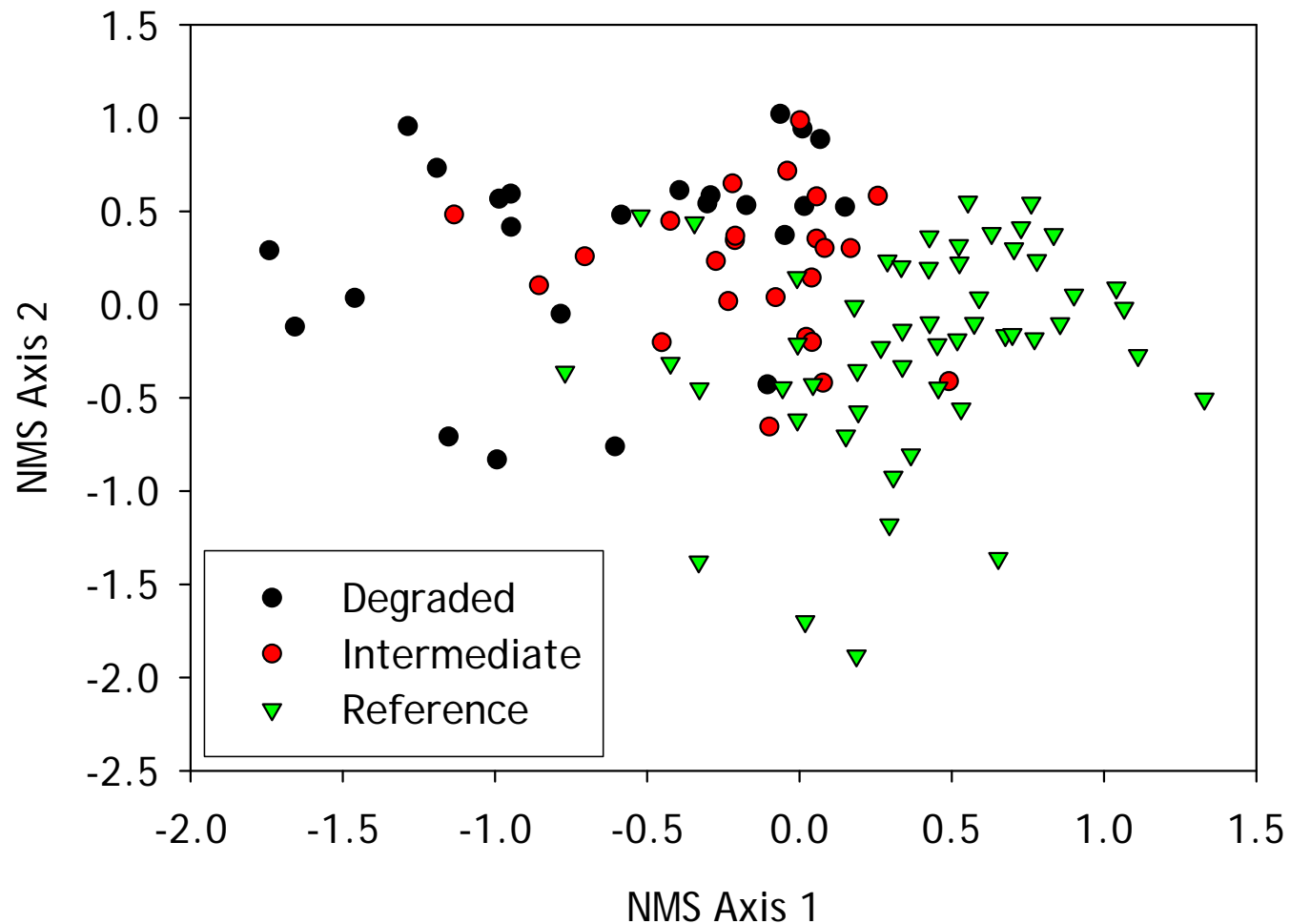


- Natural, urban, and ag land uses represented
- Variety of dominant substrate types and shading regimes
- Within-watershed diversity
- Geographic breadth

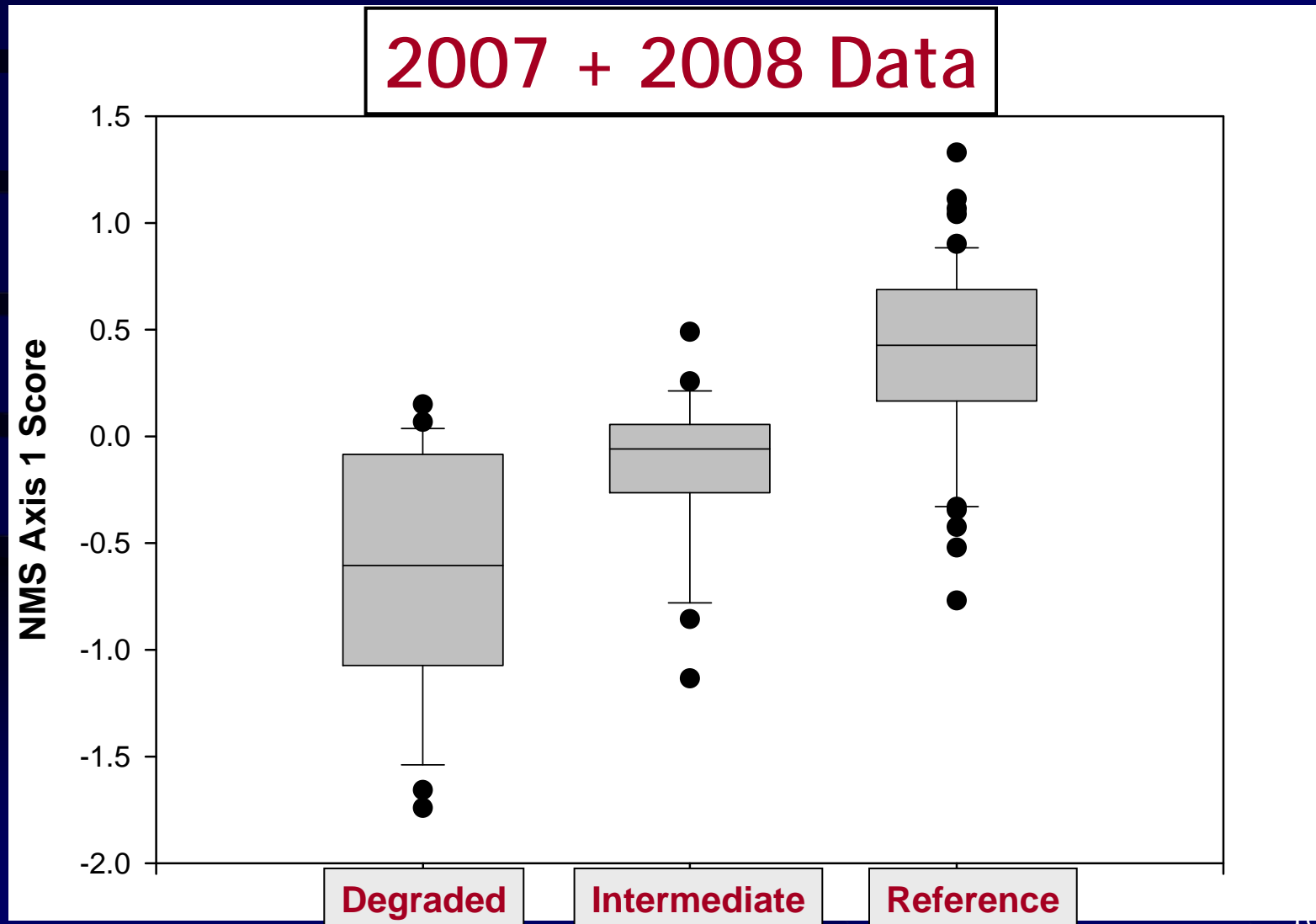
Preliminary Results

- Broad taxonomic diversity
 - Diatoms: > 450 taxa
 - Soft-bodied: > 150 taxa
- Benthic algal assemblages show relationships to anthropogenic factors (*e.g.*, surrounding land use, water chemistry parameters)
- Indicator taxa candidates emerging (*e.g.*, nitrogen-fixing taxa)

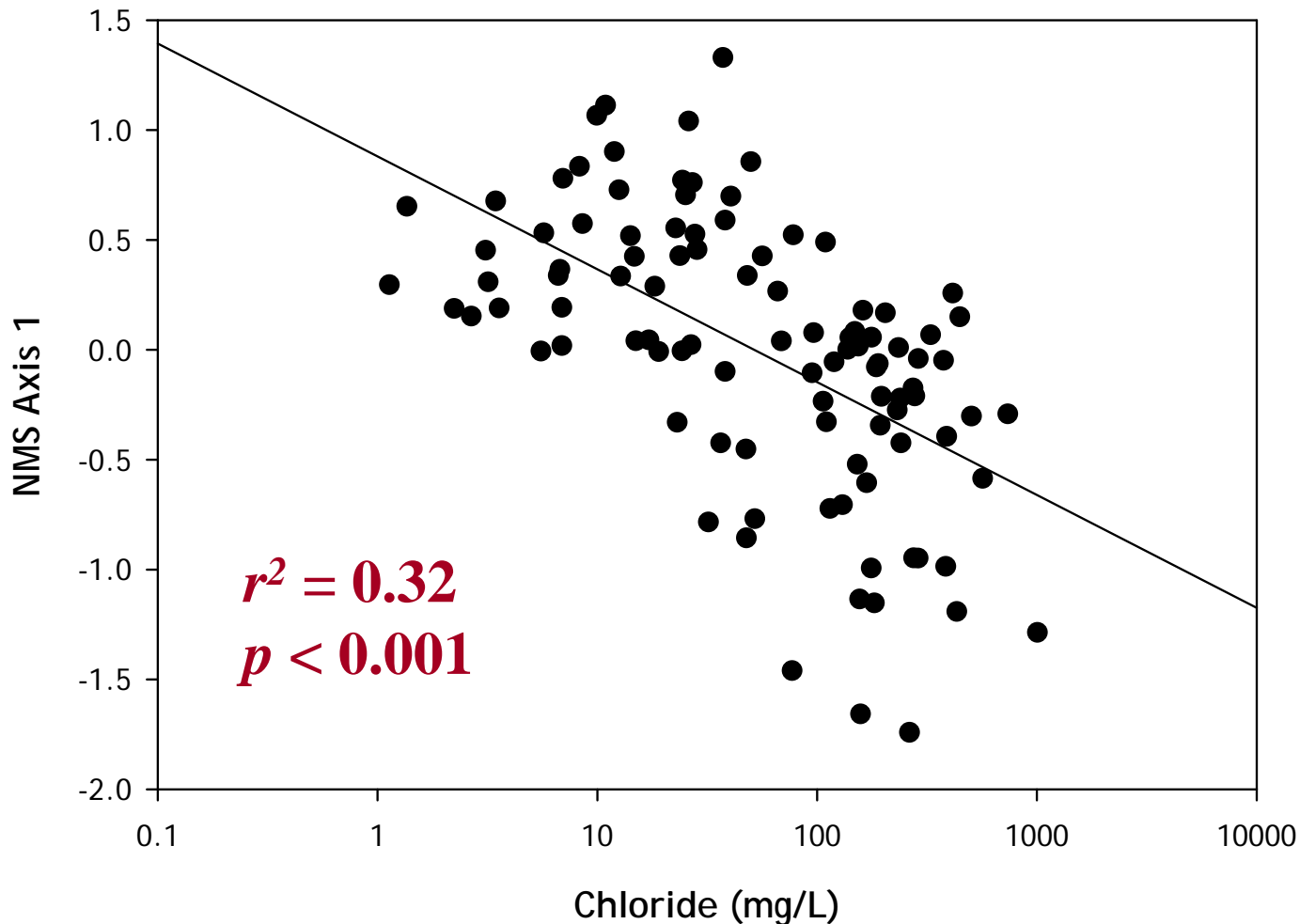
NMS Ordination of Diatom Data 2007 + 2008



Diatom Assemblage NMS Axis Scores Breakdown by Reference Status

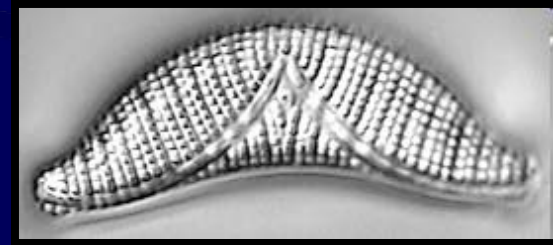
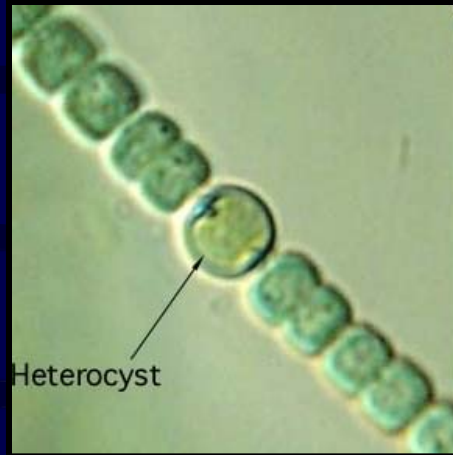


Chloride Relationship with Diatom Assemblage



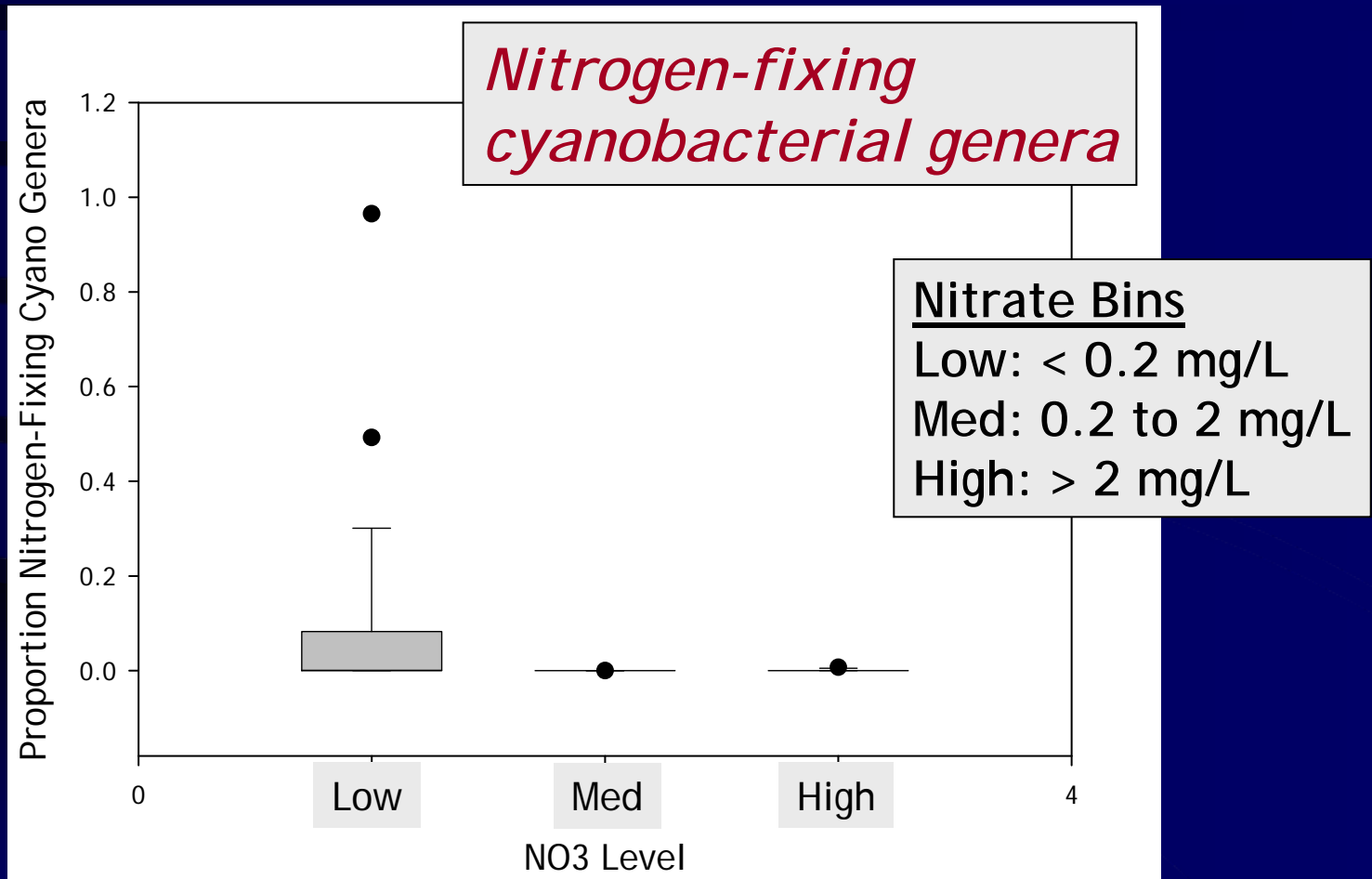
So Cal Flora: Genera with Nitrogen-Fixing Capability...

- *Anabaena*
- *Calothrix*
- *Chamaesiphon*
- *Cylindrospermum*
- *Nodularia*
- *Nostoc*
- *Nostochopsis*

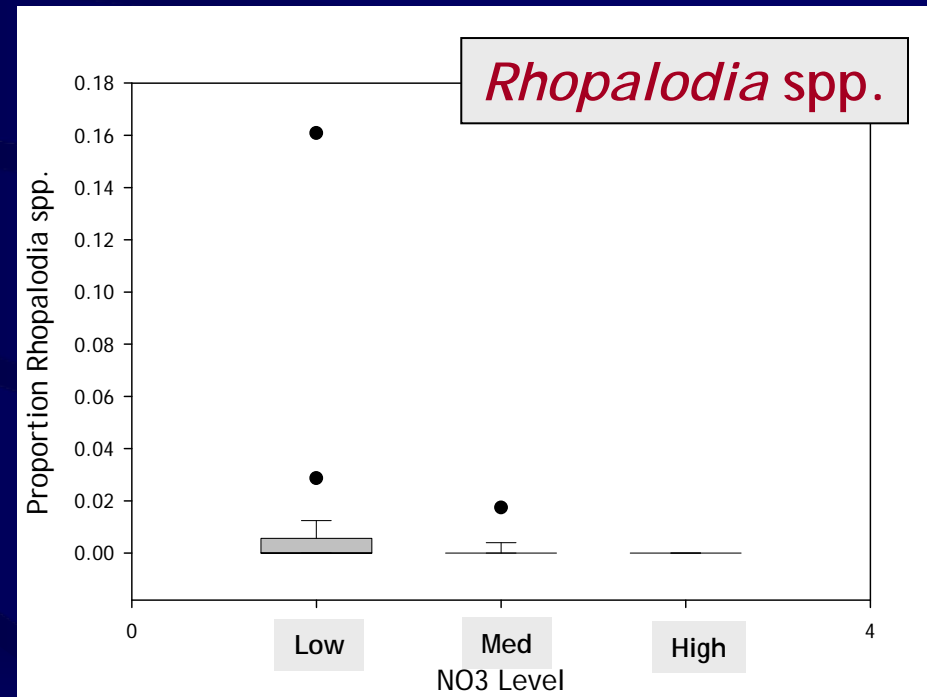
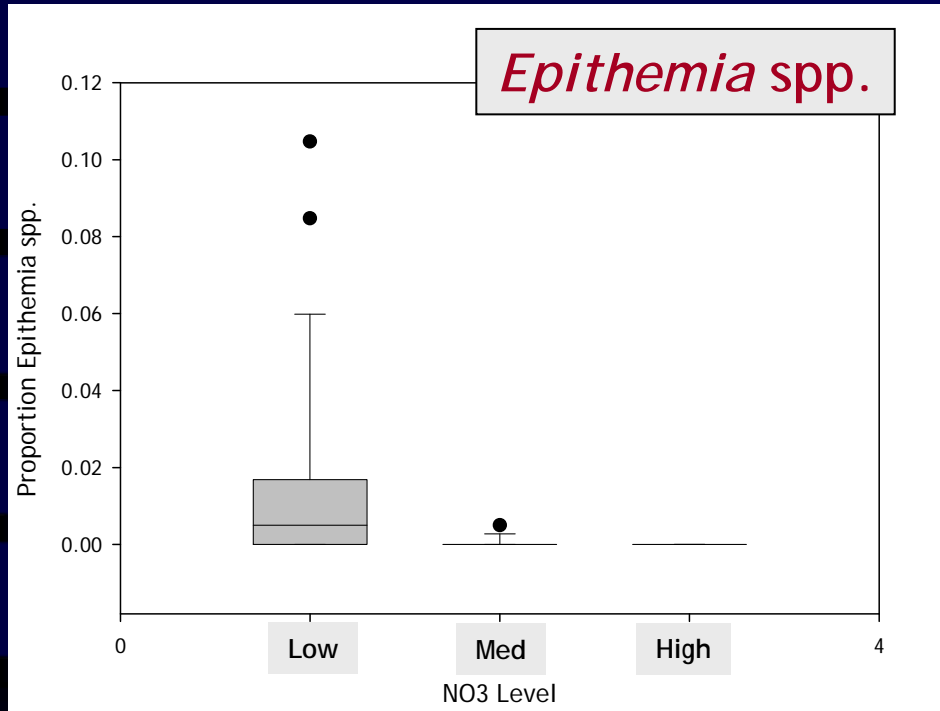


- *Epithemia*
- *Rhopalodia*

...Soft Assemblage Associated with Low Nitrogen



Diatom Responses to Low Nitrogen



California's "Algae Plan" completed this year

Incorporating Bioassessment Using Freshwater Algae into California's Surface Water Ambient Monitoring Program (SWAMP)

March 2008



Draft Technical Report

2008

**Incorporating Bioassessment Using Freshwater Algae
into California's Surface Water Ambient Monitoring
Program (SWAMP)**

March 2008

project was funded by SWAMP.



www.waterboards.ca.gov/swamp

Near-Term Recommendation from Algae Plan

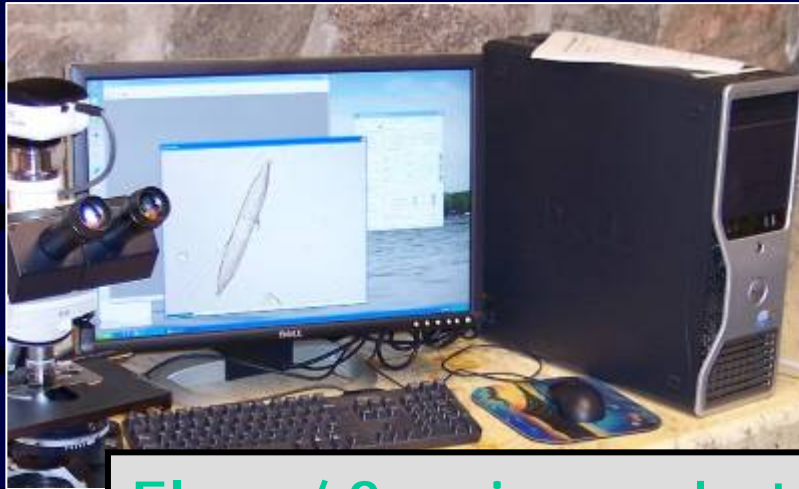
*Sample algae in conjunction with SWAMP/
Perennial Stream Assessment monitoring*

- Diatoms & soft-bodied algal assemblages
 - Biomass (chlorophyll *a* & ash-free dry mass)
- Evaluate continuation of various indicators based on early data

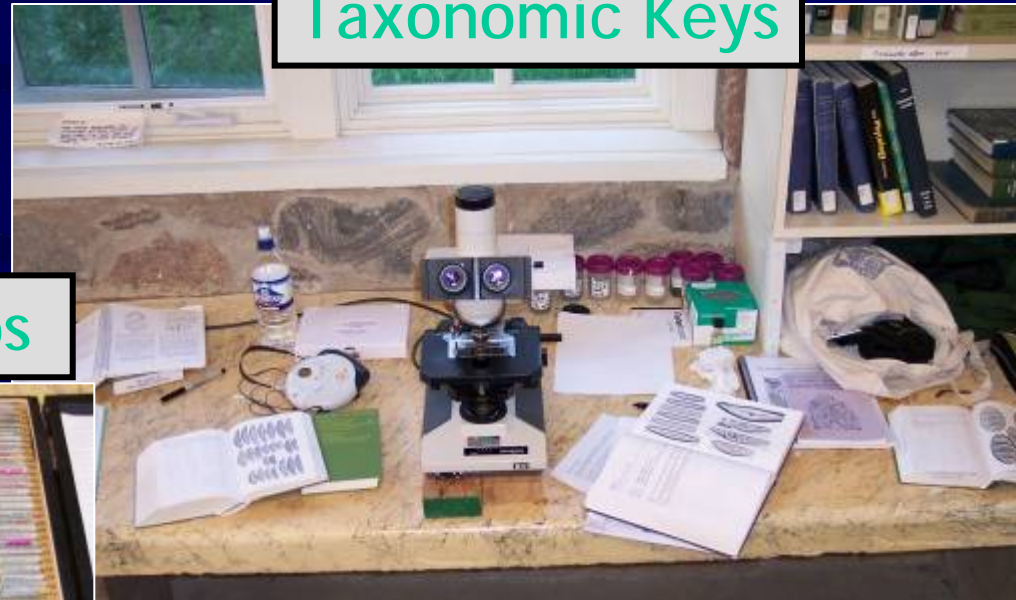
Progress on Algae Plan Recommendations

- Sampling conducted this past year through many State efforts (PSA, various Regions)
- *Draft* standard algae collection SOP completed
 - *Meeting TODAY!!*
- Establishing a taxonomy workgroup like SAFIT
 - *1st workshop being planned (Prop 50)*
- Add algae to SWAMP db & field forms
- Conduct methods calibration study (pilot study through Prop 50 ~ comprehensive study proposed)
- Conduct studies on algal index period (pilot study through Prop 50)

Support Resources Under Development



Flora / Specimen photos



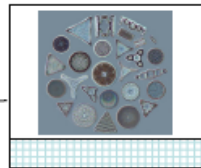
Taxonomic Keys



Archived vouchers

Identification Resource

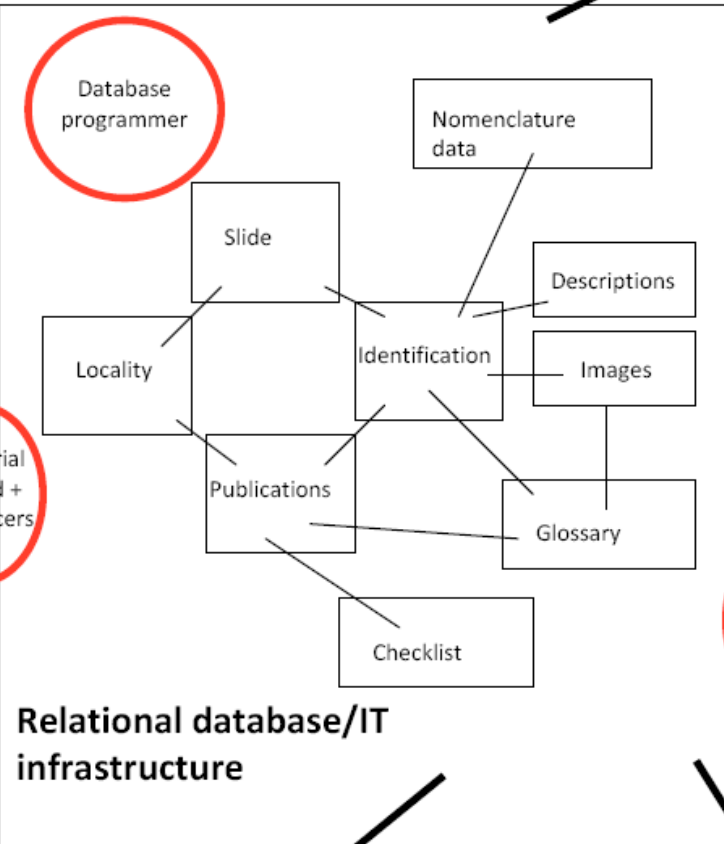
GBIF



Editorial Board + Producers

Basecamp

Individual Collaborators



About	Identification System	Resources
<ul style="list-style-type: none"> *Project description *Publications & Abstracts *DIATOM FLORA *Introduction to Diatoms *Acknowledgements 	<ul style="list-style-type: none"> *Organization & Introduction to the Flora *Keys to the Major Groups of Diatoms *Search by GENUS <input type="text"/> SPECIES <input type="text"/> *Cumulative list of Taxa *Glossary 	<ul style="list-style-type: none"> *Checklist of the diatom of the USA Bibliography *Listing of USA diatom Types

Website Developer

Cyclotella ocellata

Nomenclature

Description:

Literature:

Distribution

MorphBank

Individual Users, EOL

Key Contributors - Algal IBI Project

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