WHY THE PRIMARY PRODUCERS (ALGAE AND CYANOBACTERIA) ARE THE KEY EARLY RESPONDERS TO NUTRIENT AND WATER FLOW CHANGES IN THE EVERGLADES

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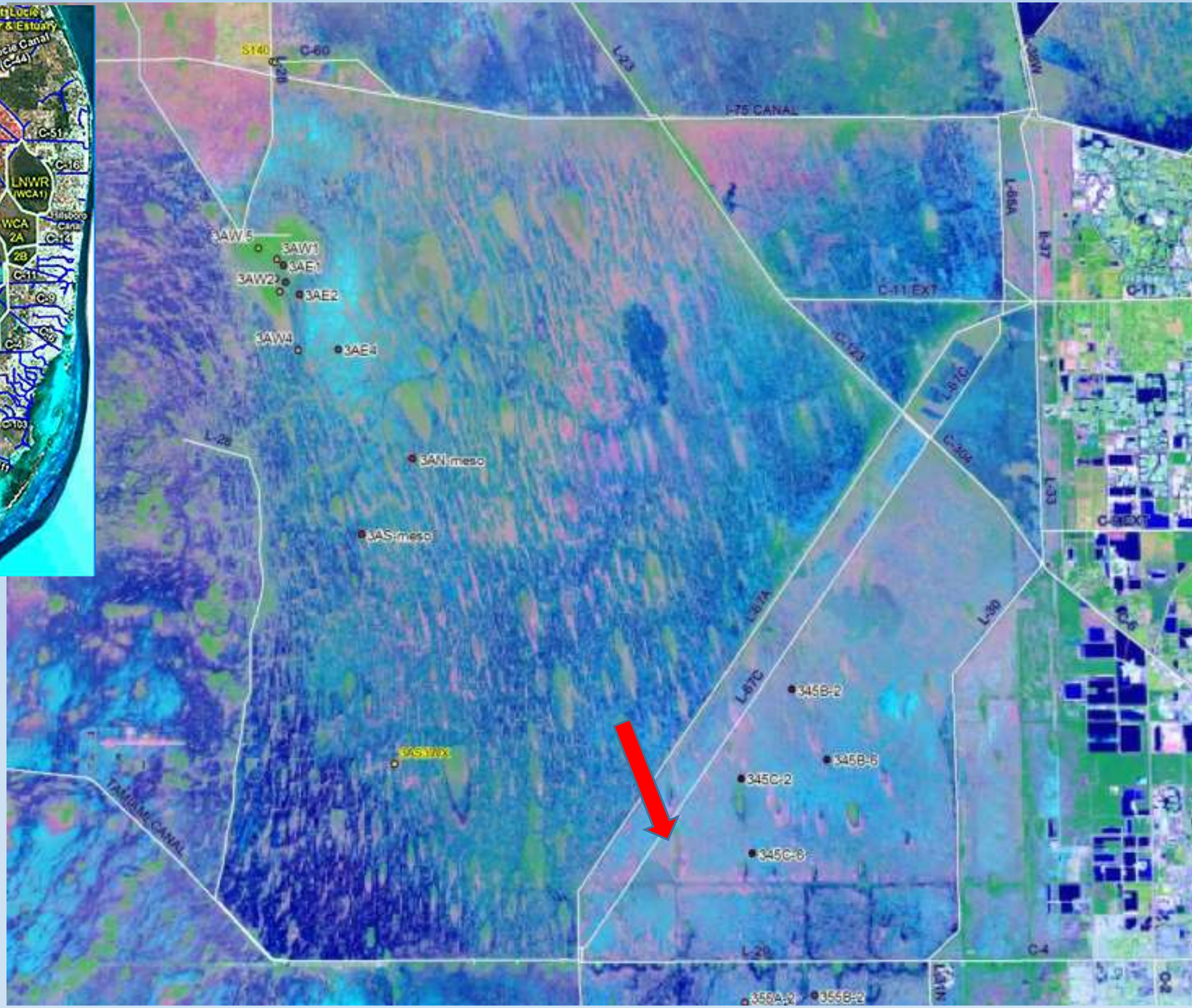
The Decomp Physical Model (DPM)



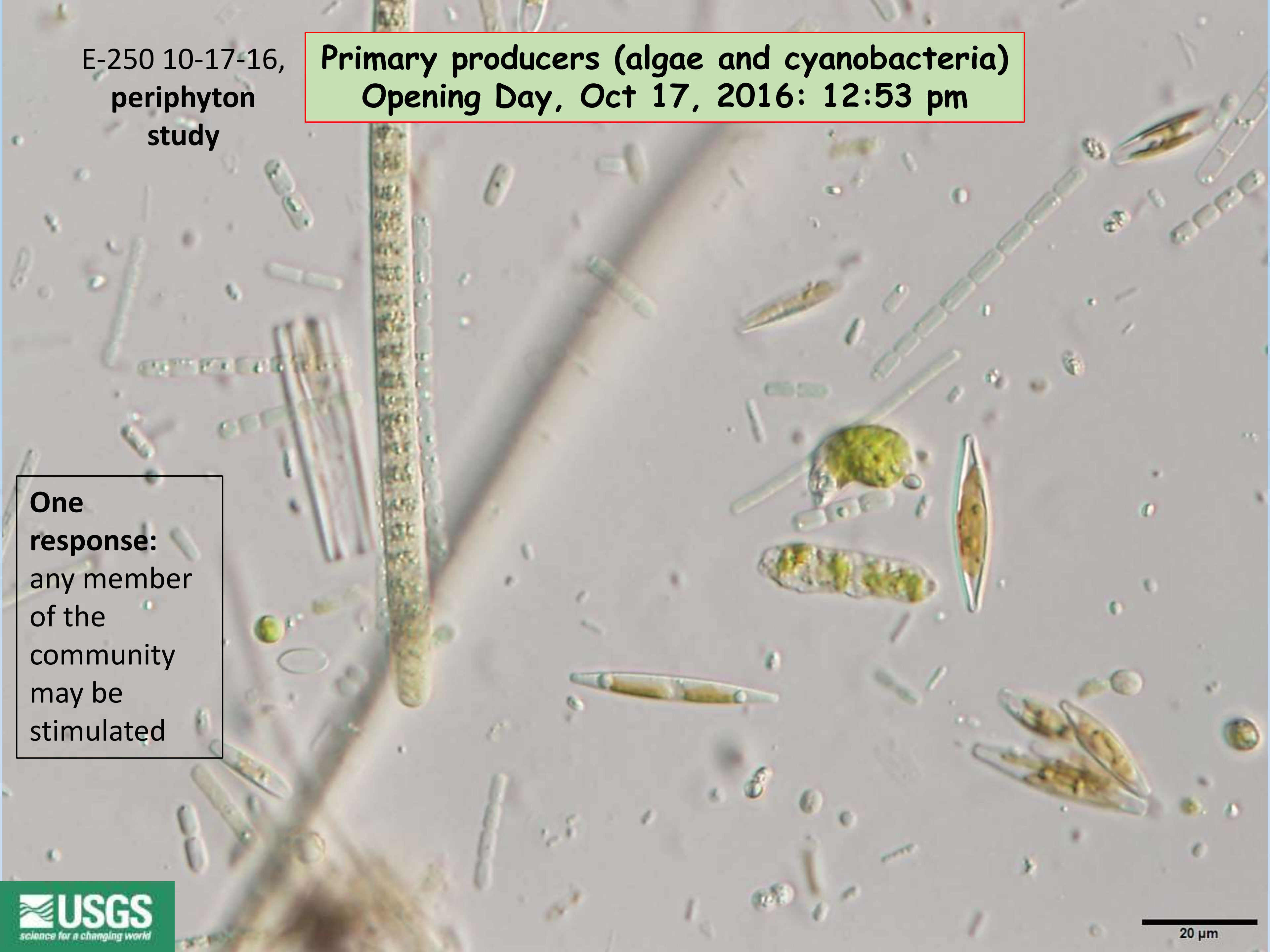
Samples of periphyton collected throughout the pocket: sediment traps, artificial substrates and natural collections

Enlarged view of the DECOMP Physical Model footprint indicating the locations of the walkways and monitoring stations. C = control; RS = ridge/slough, S = slough
UB = upstream backfill

DPM culverts: first opening day Nov. 5, 2013

Primary producers (algae and cyanobacteria)
Opening Day, Oct 17, 2016: 12:53 pm

E-250 10-17-16,
periphyton study



One response: any member of the community may be stimulated

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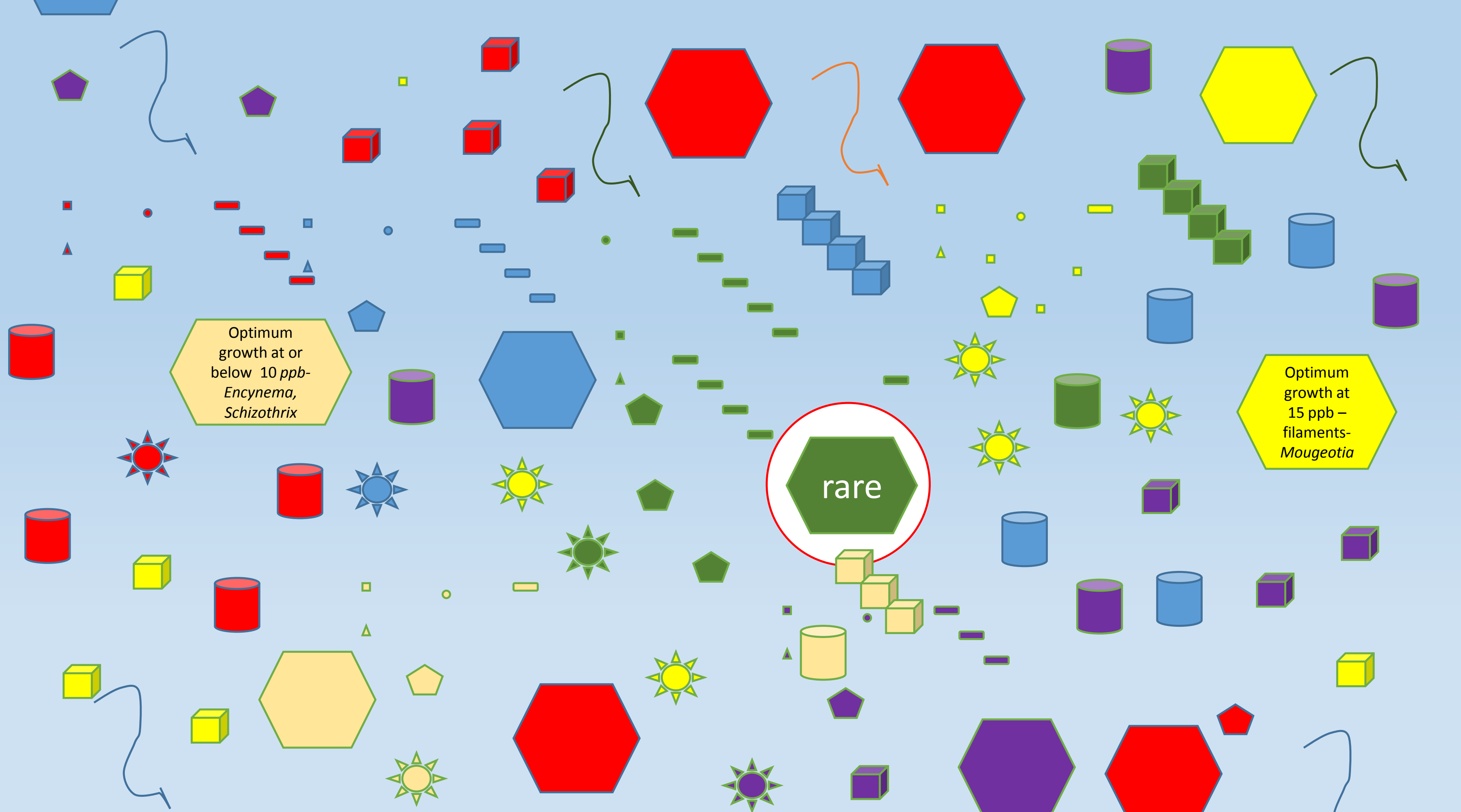
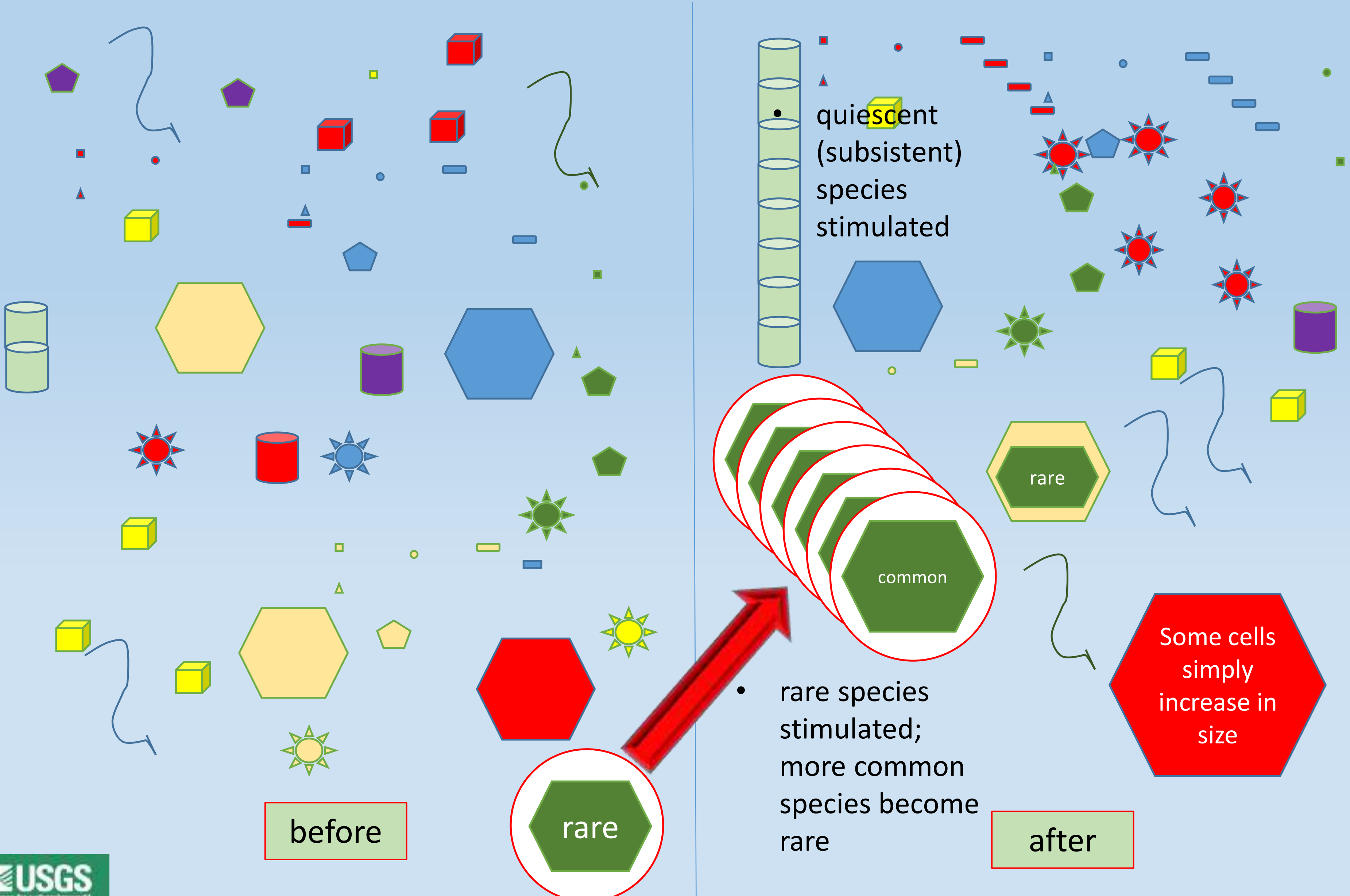
Depiction of the primary producers (algae and cyanobacteria)



- Daily, weekly, monthly, seasonal forcing functions (temp., light quantity and quality, rainfall)
- Each organism has an optimum **rate** of nutrient uptake; and optima for all other factors
- Each organism has a **concentration** threshold efficiency to take up that nutrient

Add flow increase… (these are periphyton, so they stay in place for the most part)



Add flow increase… potential dramatic shift (these are periphyton, so they stay in place, for the most part)

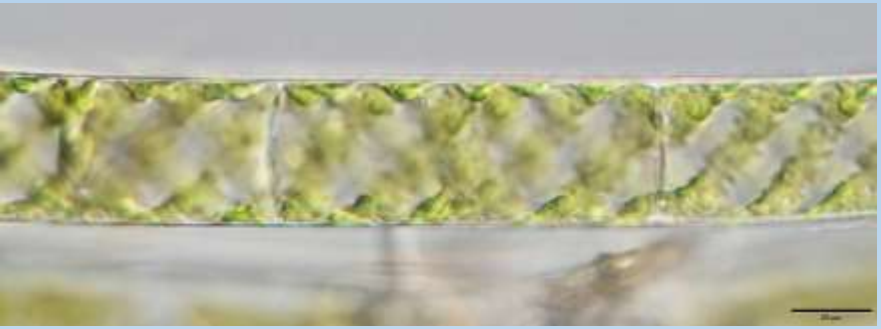
H_o: There is a dramatic shift in the periphyton community structure

Findings : nearest to inflow site, a big increase in filamentous greens

before

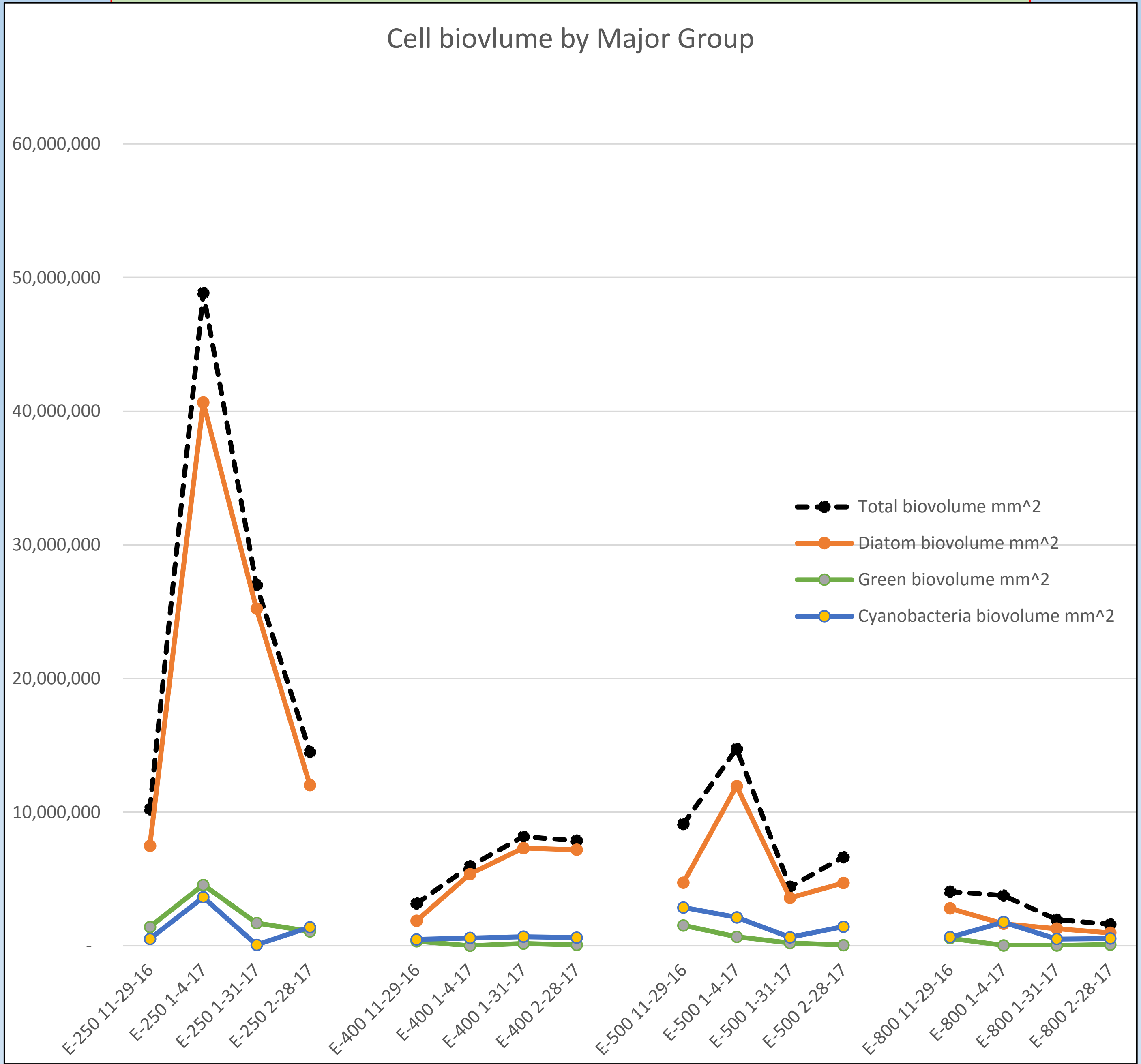
after

Community response: E-250 greens

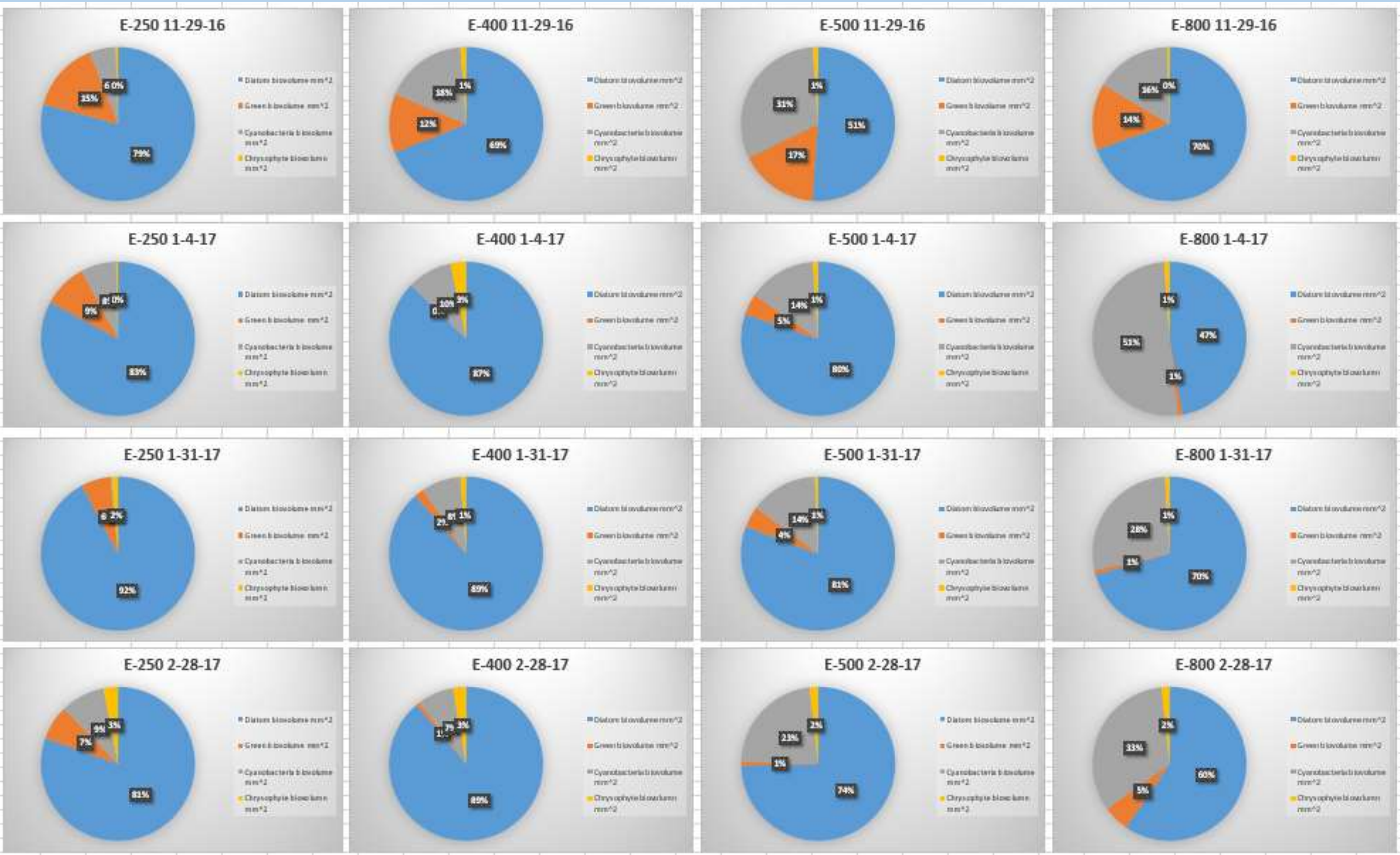


Community response: across distance and time

1st responders easy to document: the community



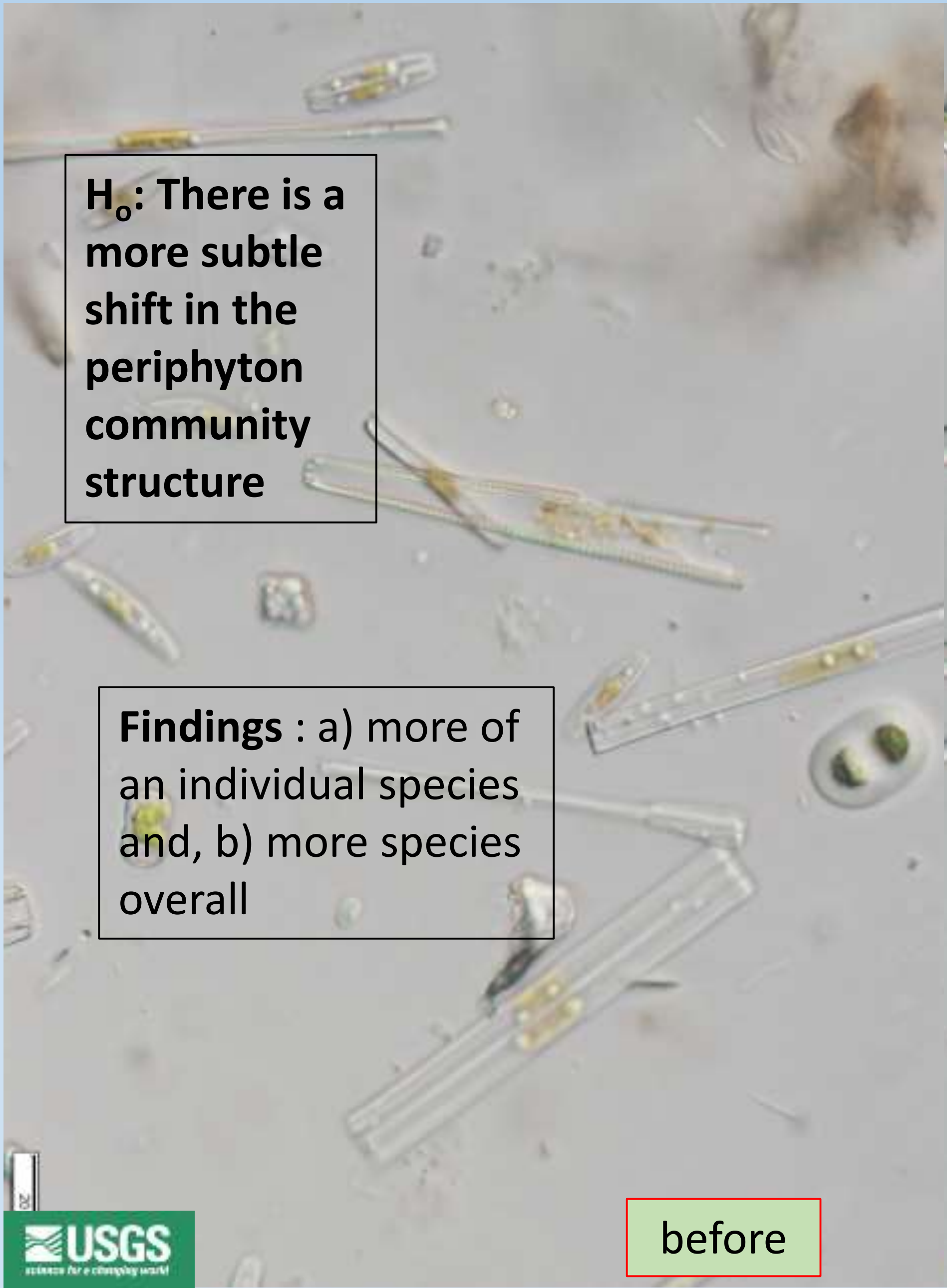
Community response: across distance and time



Diatoms response

H_o: There is a more subtle shift in the periphyton community structure

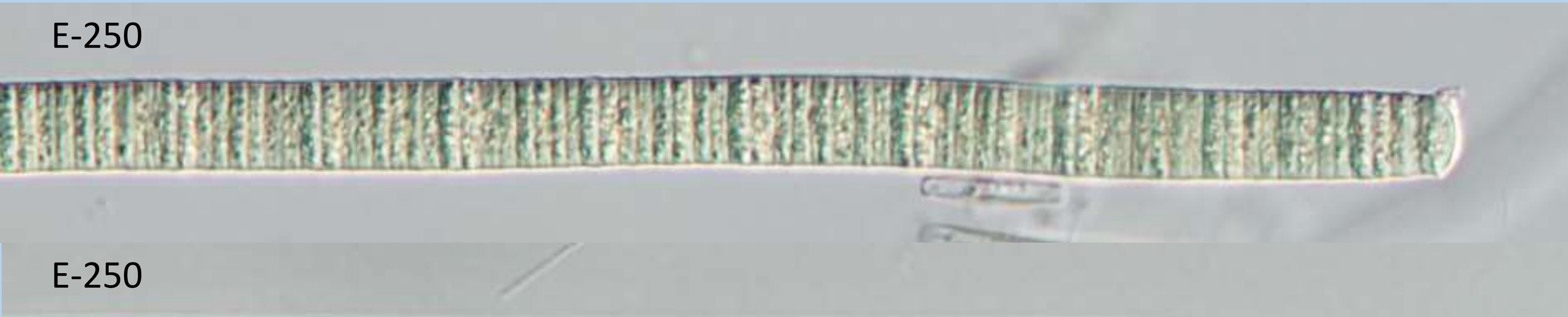
Findings : a) more of an individual species and, b) more species overall



before

after

Community response: cyanobacteria



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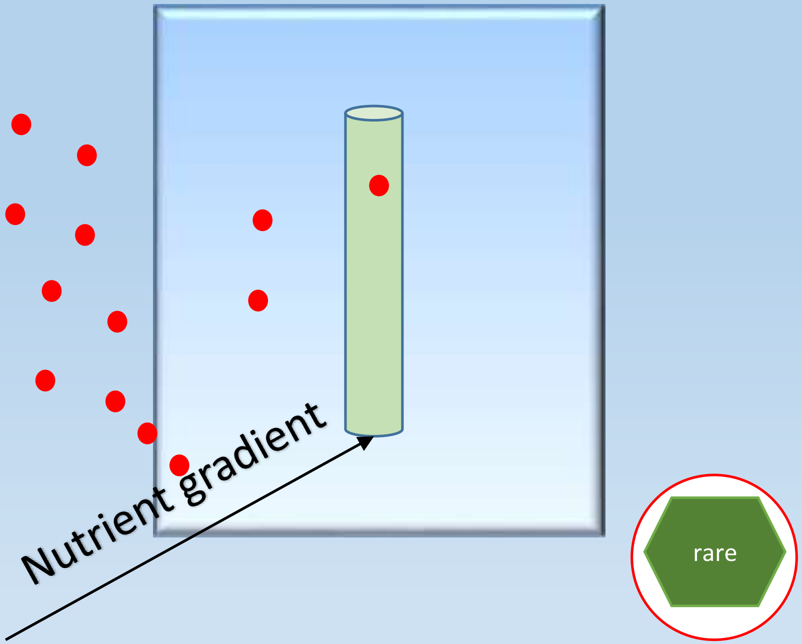
Second Response: cellular level, (what does flow do)?

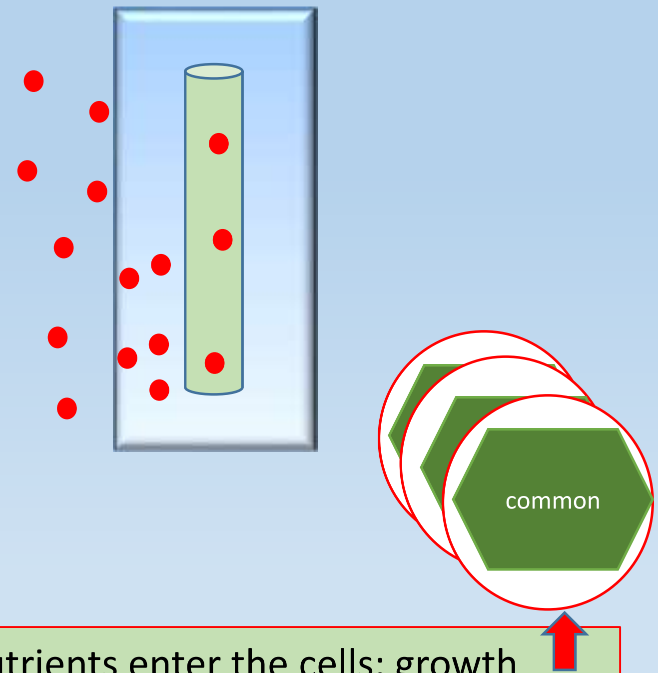
boundary layer



- nutrients are pulled from the surrounds
- diffusion across the boundary layer
- enzymatic flexibility of the organism (to some extent

before

eroded boundary layer



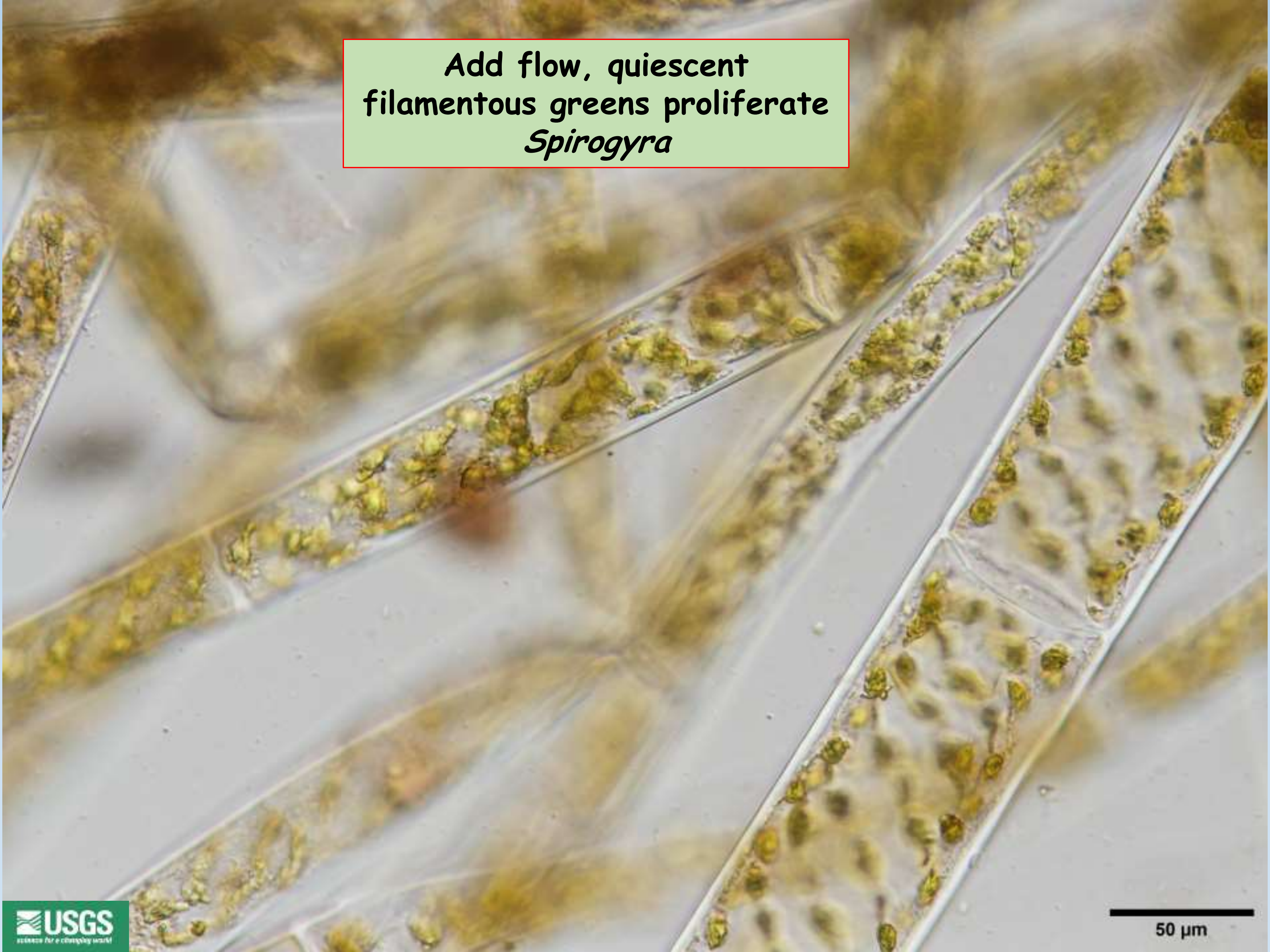
- more nutrients enter the cells: growth
- enzymatic response to nutrient availability
- certain species stimulated by the “new” nutrient regime

after

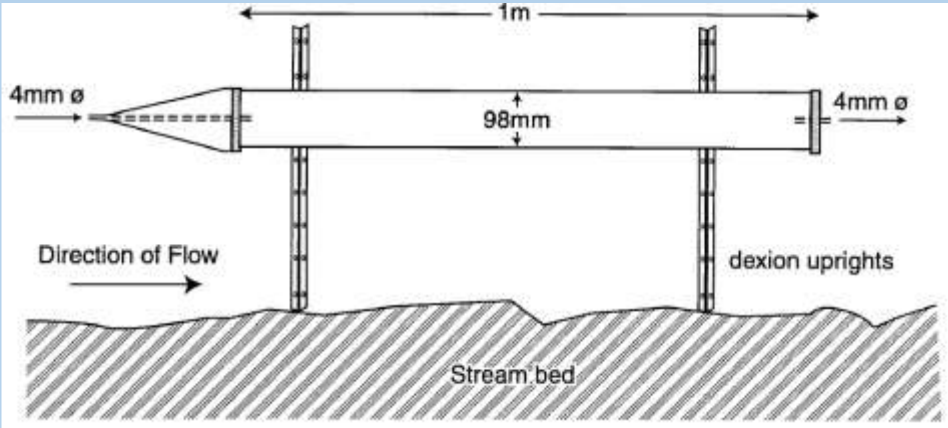
Life at ultra low nutrients: greens

Add flow, quiescent filamentous greens proliferate *Mougeotia*

Add flow, quiescent filamentous greens proliferate *Spirogyra*



Collection device for horizontal transport



Phillips et al., 2000 *Hydrol. Procs* 14: 2589-2602

- <u>Design</u>: Phillips et al., 2000
- 10.16 mm dia. x 1-m acrylic tube
- inlet/outlet diam. 4-mm, 7-mm or 10-mm
- Set @ mid-water column, above floc layer

- <u>Post-processing</u>
- Siphon off water; sieved 1-mm
- Mass loading rate
  - Per ground area (g m^{-2} d^{-1})
  - Or per frontal area (g cm^{-2} d^{-1})
  - CNP, LOI, molecular biomarkers

- <u>Sampling frequency & design</u>
- 3-6 week deployment intervals
- 2-4 traps deployed along a ridge-slough transect
- oriented parallel to dominant flow vector

Keeping records: Species richness from live samples and cleaned diatoms

Mougeotia
sp.
24%

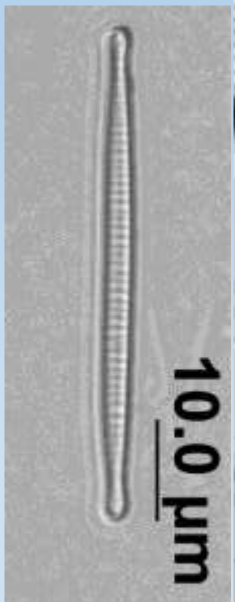
Mastogloea
sp.
74%

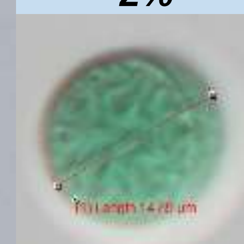
Fragilaria
synegrotesca
80%

Phacus
sp.
5%

Gomphospheria
16%

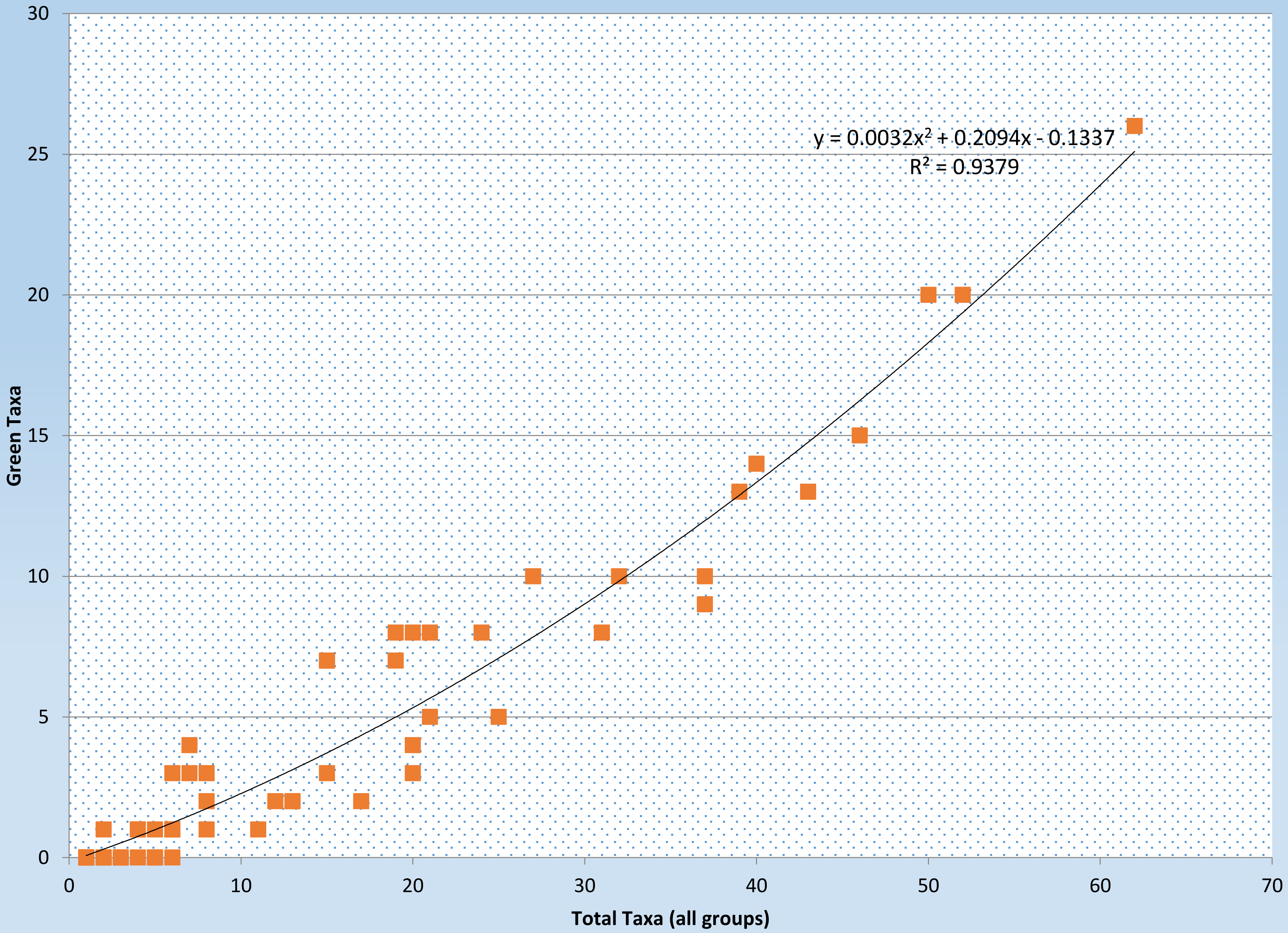
Geminocystis
(Synechocystis)
2%



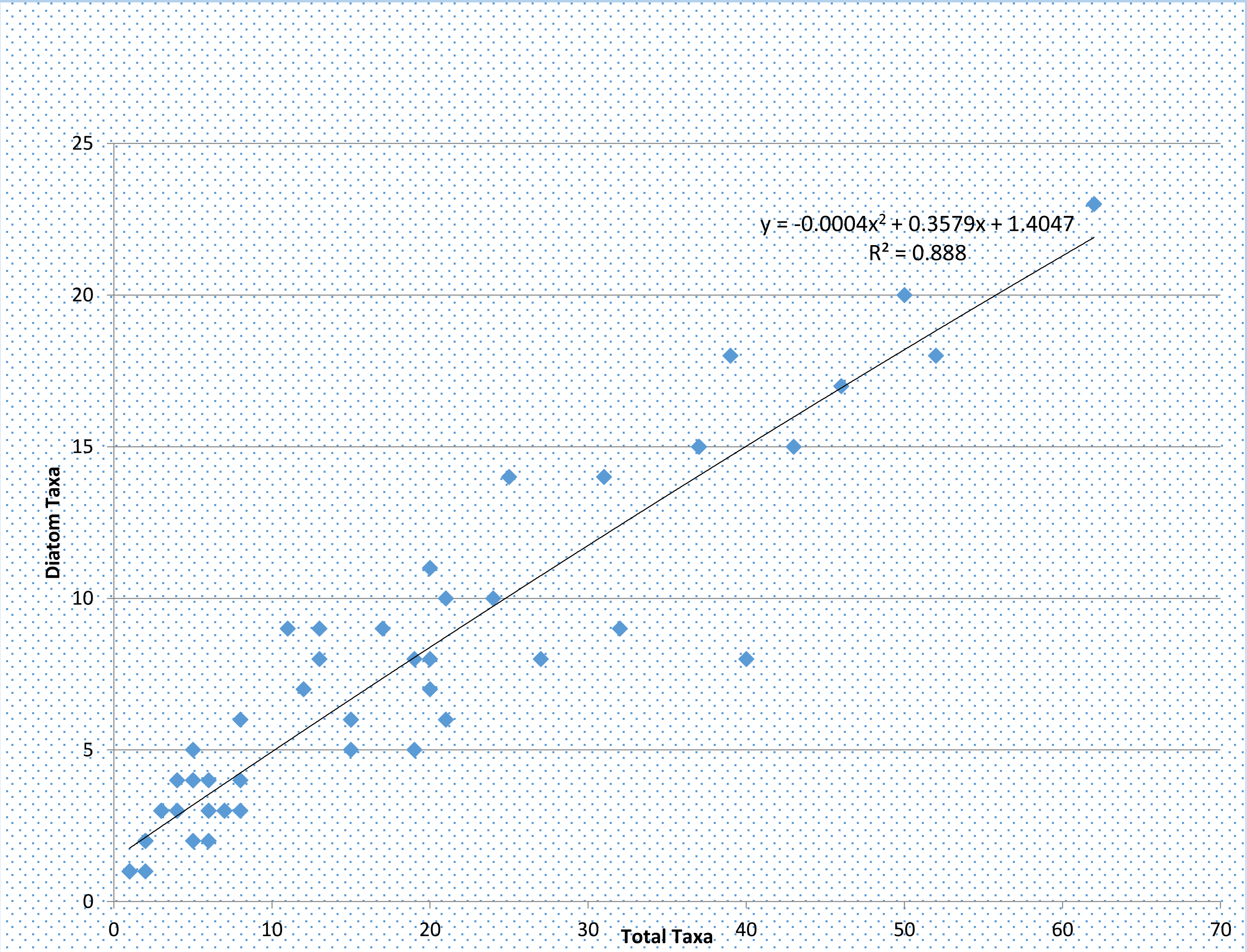


Sample ID												
RS1-ST1-130122	1		1									
RS2-RS1-130122								1				
RS1-ST2-130122						1		1				

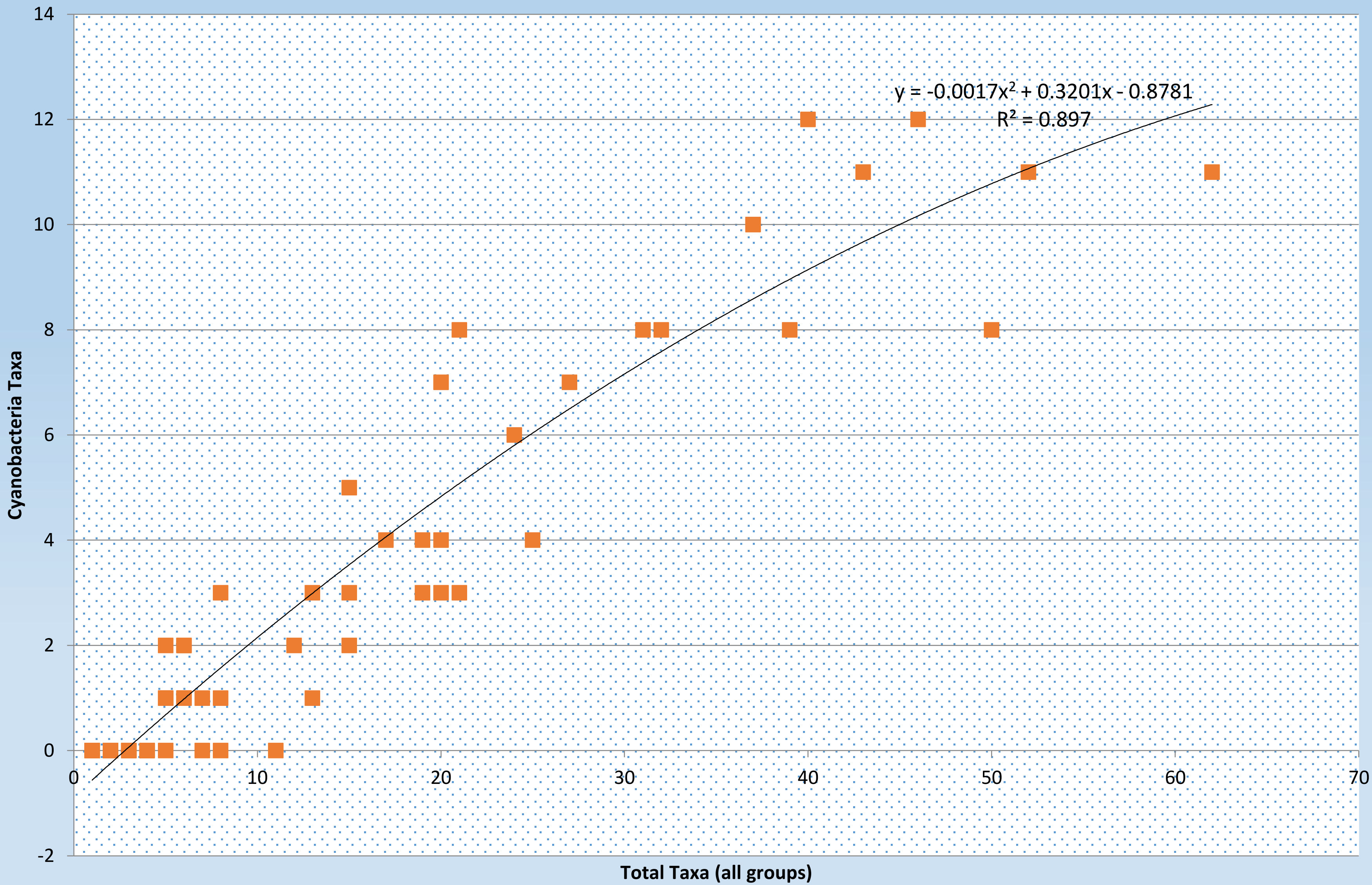
Species Richness: Greens as a proportion of total species richness



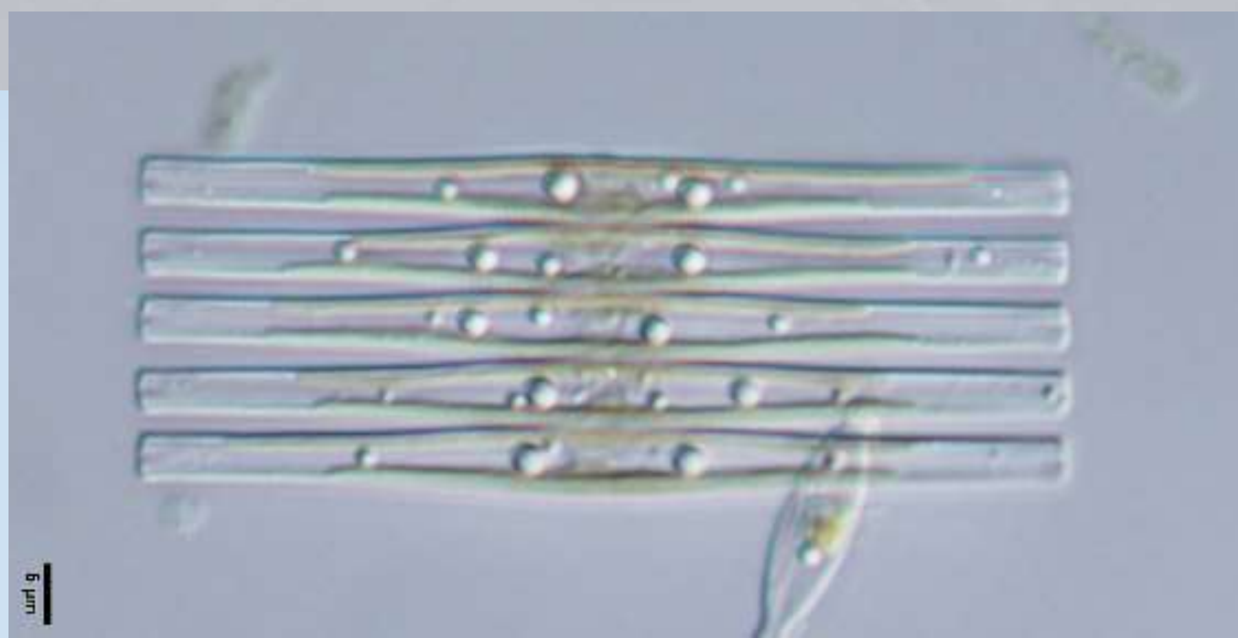
Species Richness: Diatoms as a proportion of total species richness



Species Richness: Cyanobacteria as a proportion of total species richness

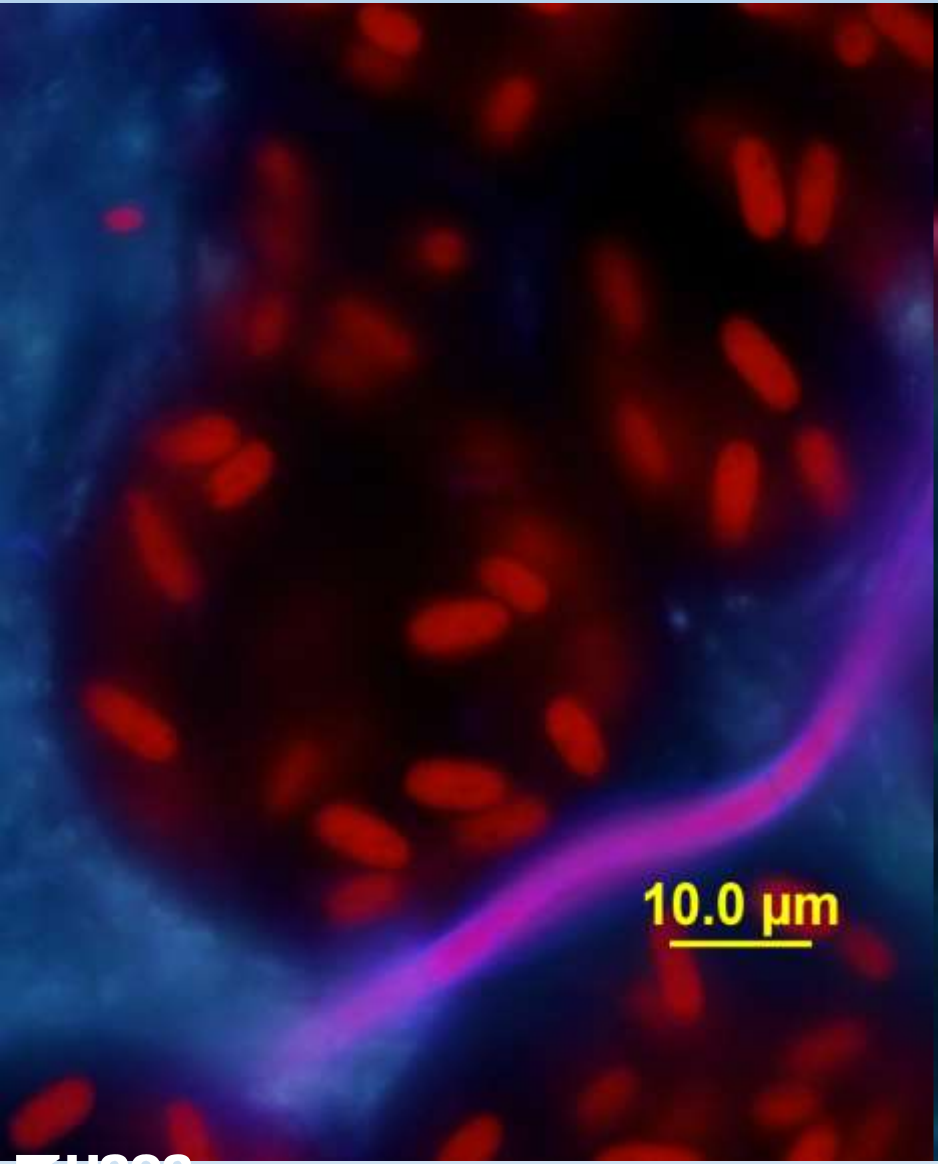


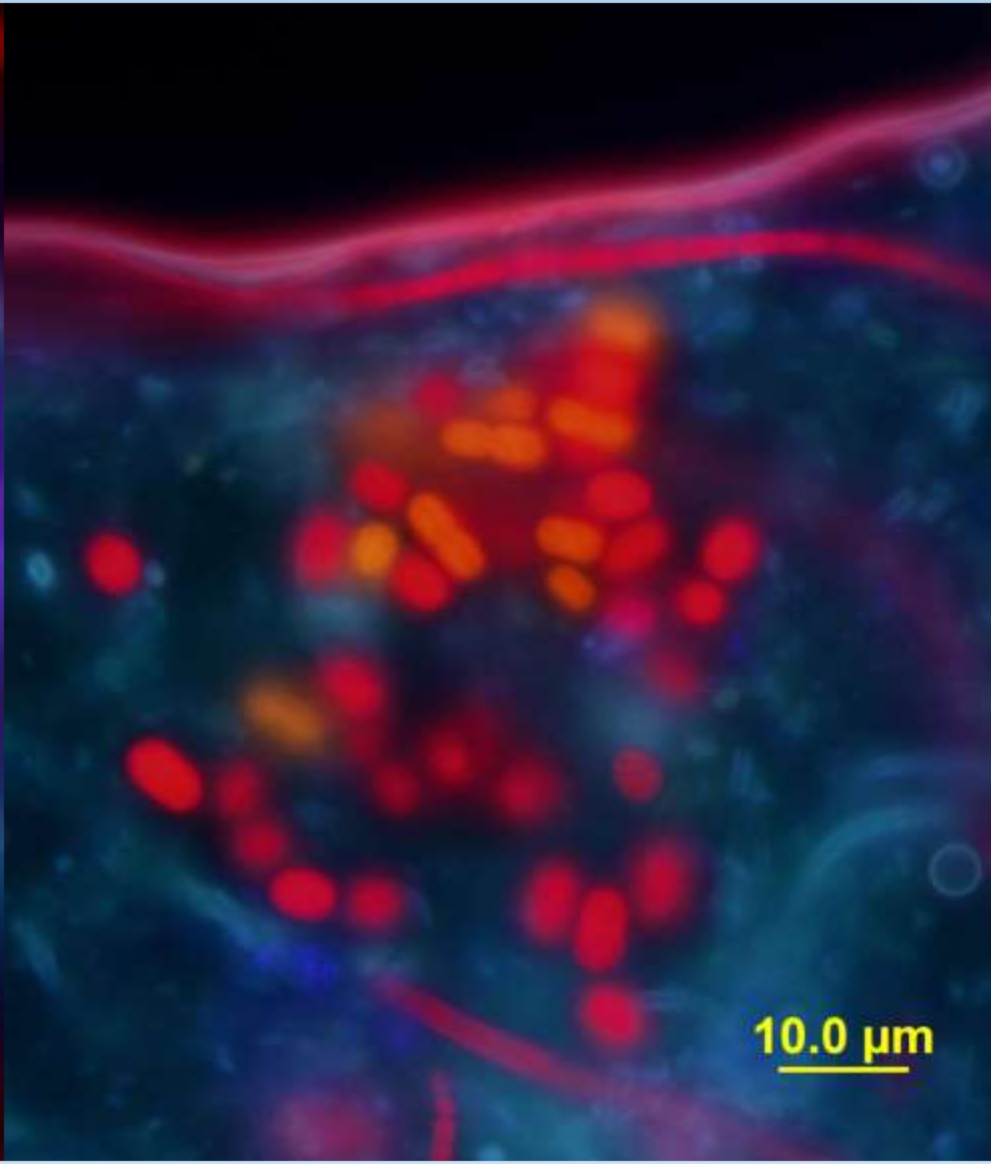
Other interesting indicators: plankton



Other interesting finds: freshwater red alga, *Nemalion*

Ecological Strategies: complimentary pigments





Thank You!

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