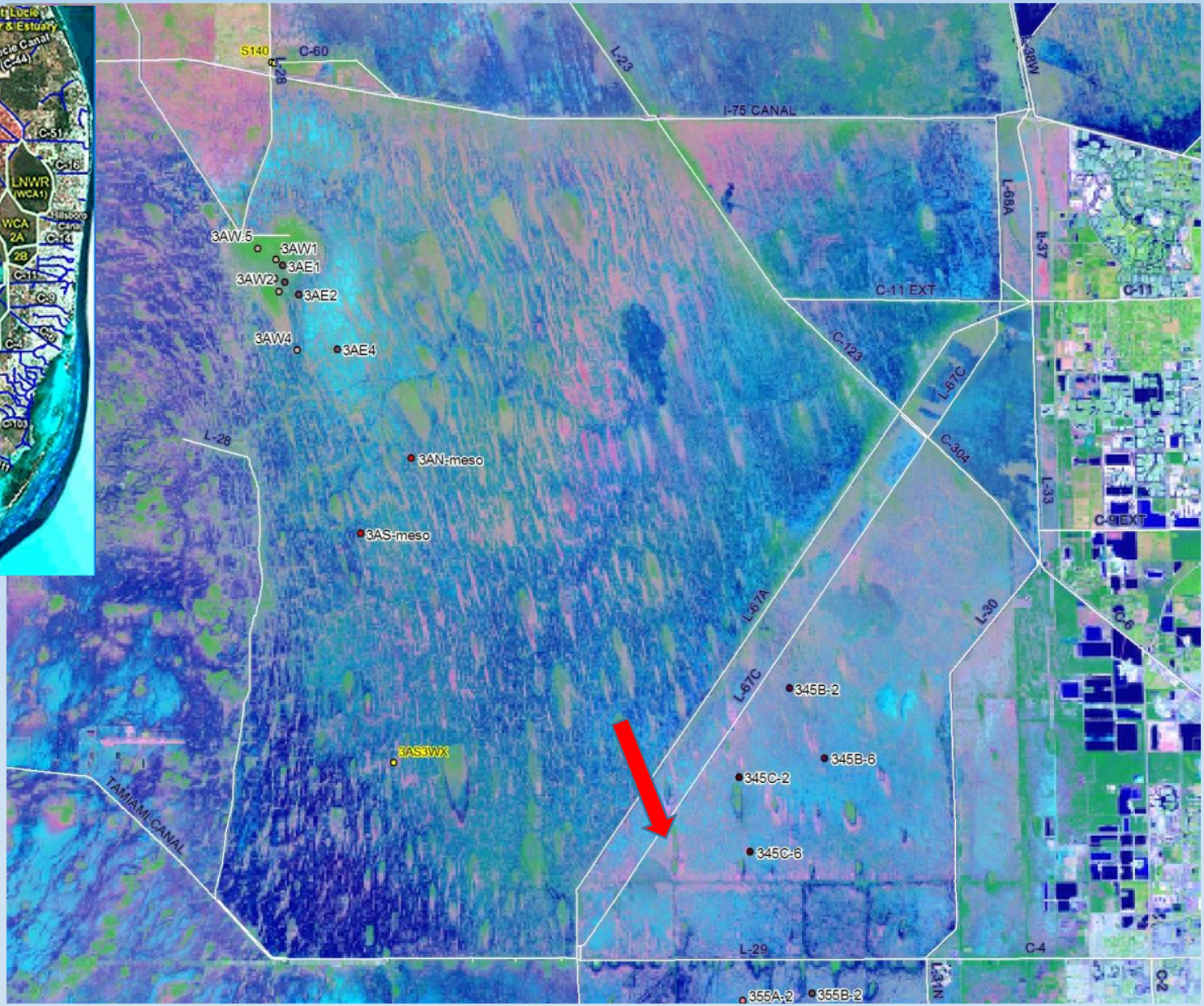
ALGAL INDICATORS OF ECOSYSTEM RESPONSE IN THE DECOMP PHYSICAL MODEL HIGH-FLOW EXPERIMENT

Barry H. Rosen[1], *Sue Newman*[2], *Colin Saunders*[2], *Joel Trexler*[3], *Judson Harvey*[4], Carlos Coronado-Molina[2], and *Eric Tate-Bolt*[2]

[1]United States Geological Survey, Orlando, FL, USA
[2]South Florida Water Management District, West Palm Beach, FL, USA
[3]Florida International University, North Miami, FL USA
[4]United States Geological Survey, Reston, VA USA

The Decomp Physical Model (DPM)



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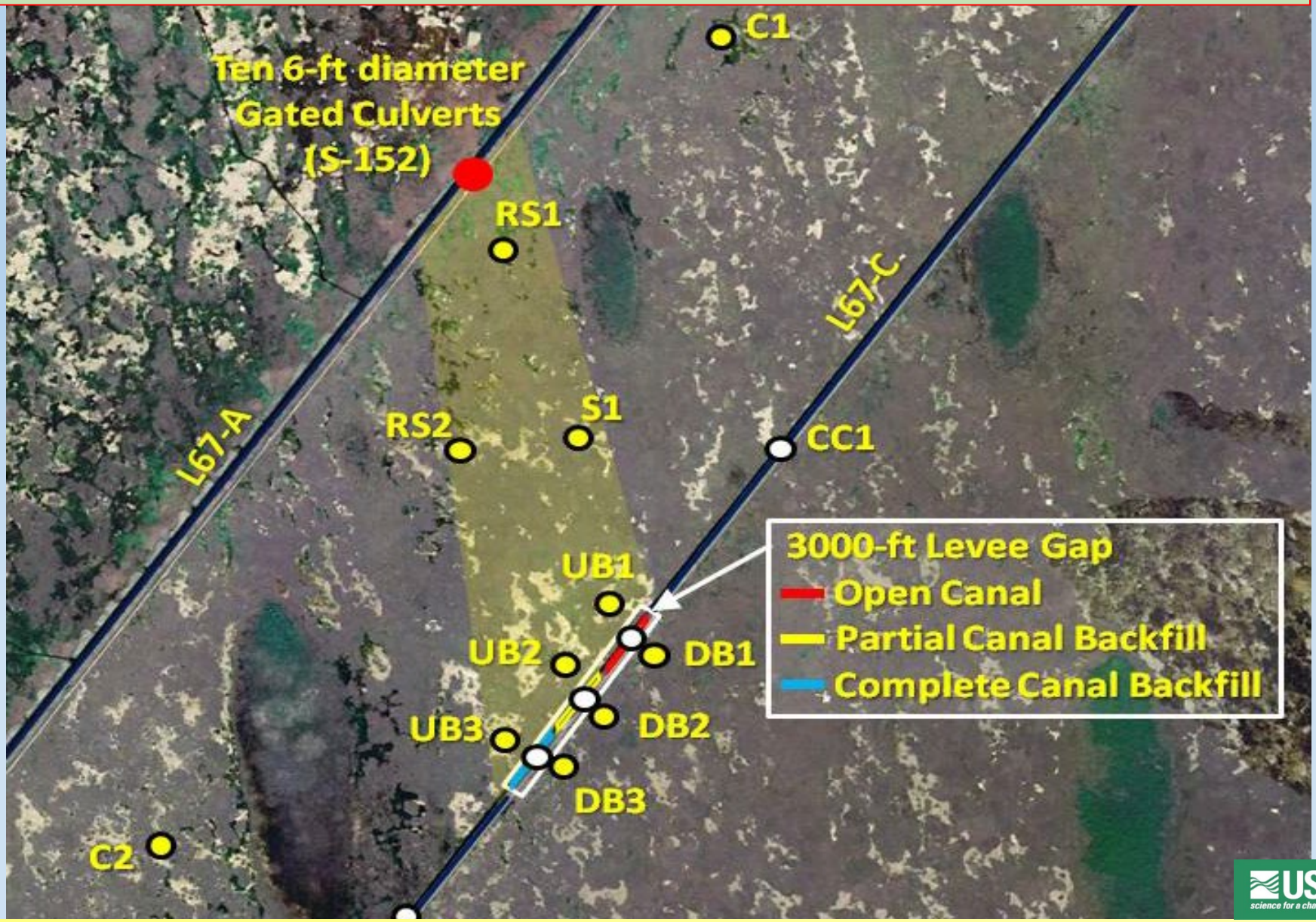
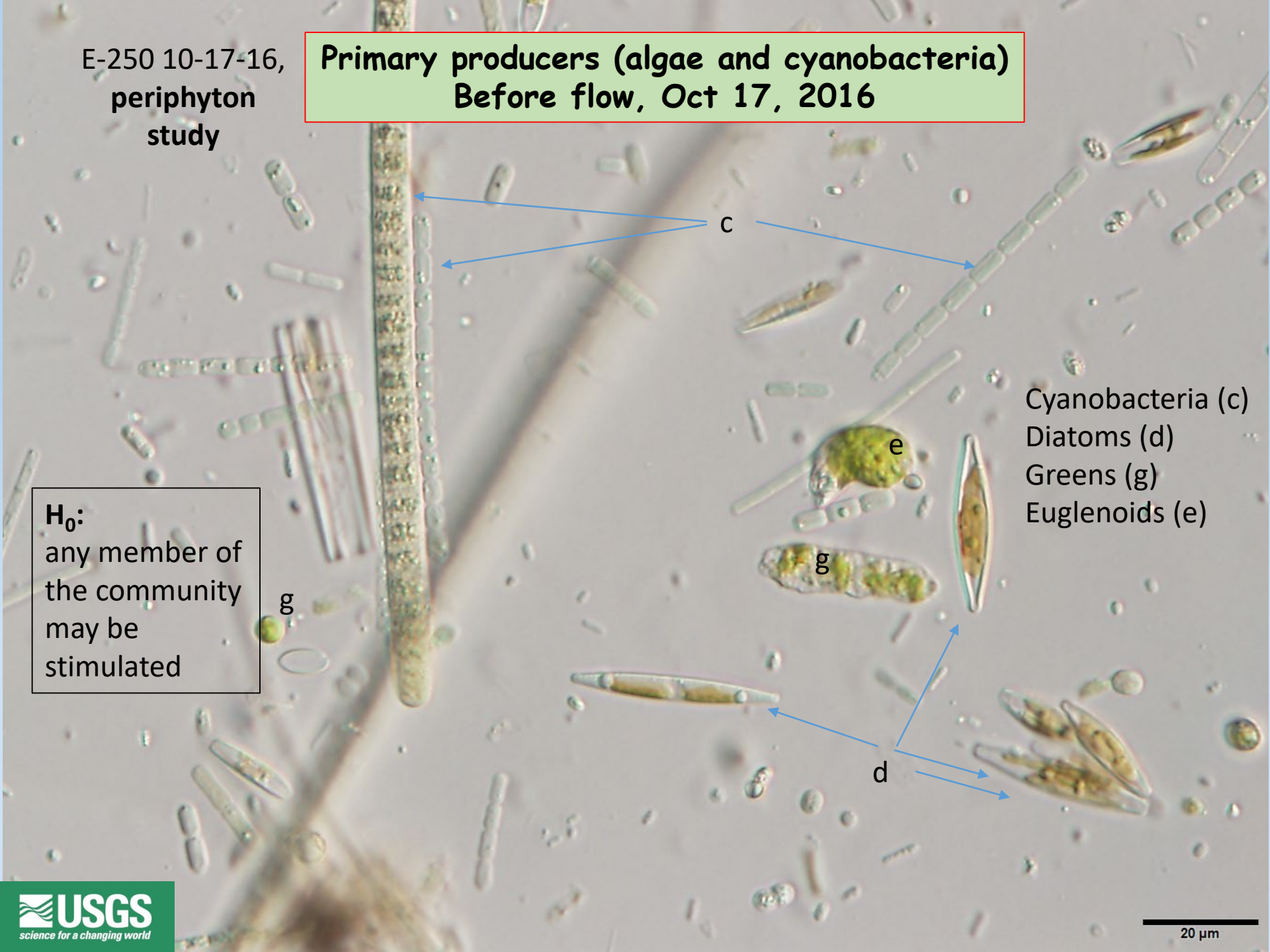
Samples of periphyton collected throughout the pocket: sediment traps, artificial substrates and natural collections



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


E-250 10-17-16, periphyton study
Primary producers (algae and cyanobacteria)
Before flow, Oct 17, 2016
c
e
g
g
d
H_0:
any member of the community may be stimulated
Cyanobacteria (c)
Diatoms (d)
Greens (g)
Euglenoids (e)
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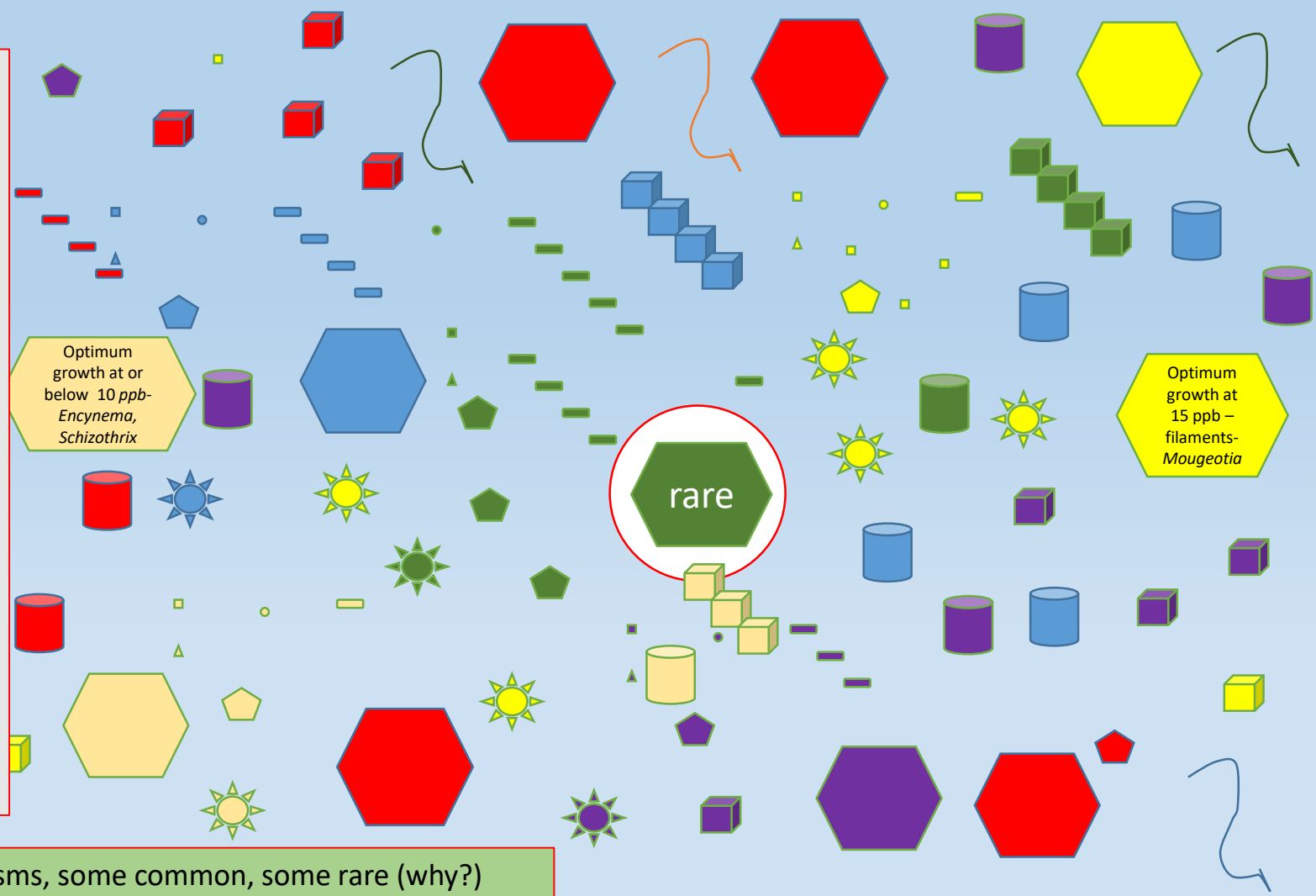
20 µm

Depiction of the primary producers (algae and cyanobacteria)

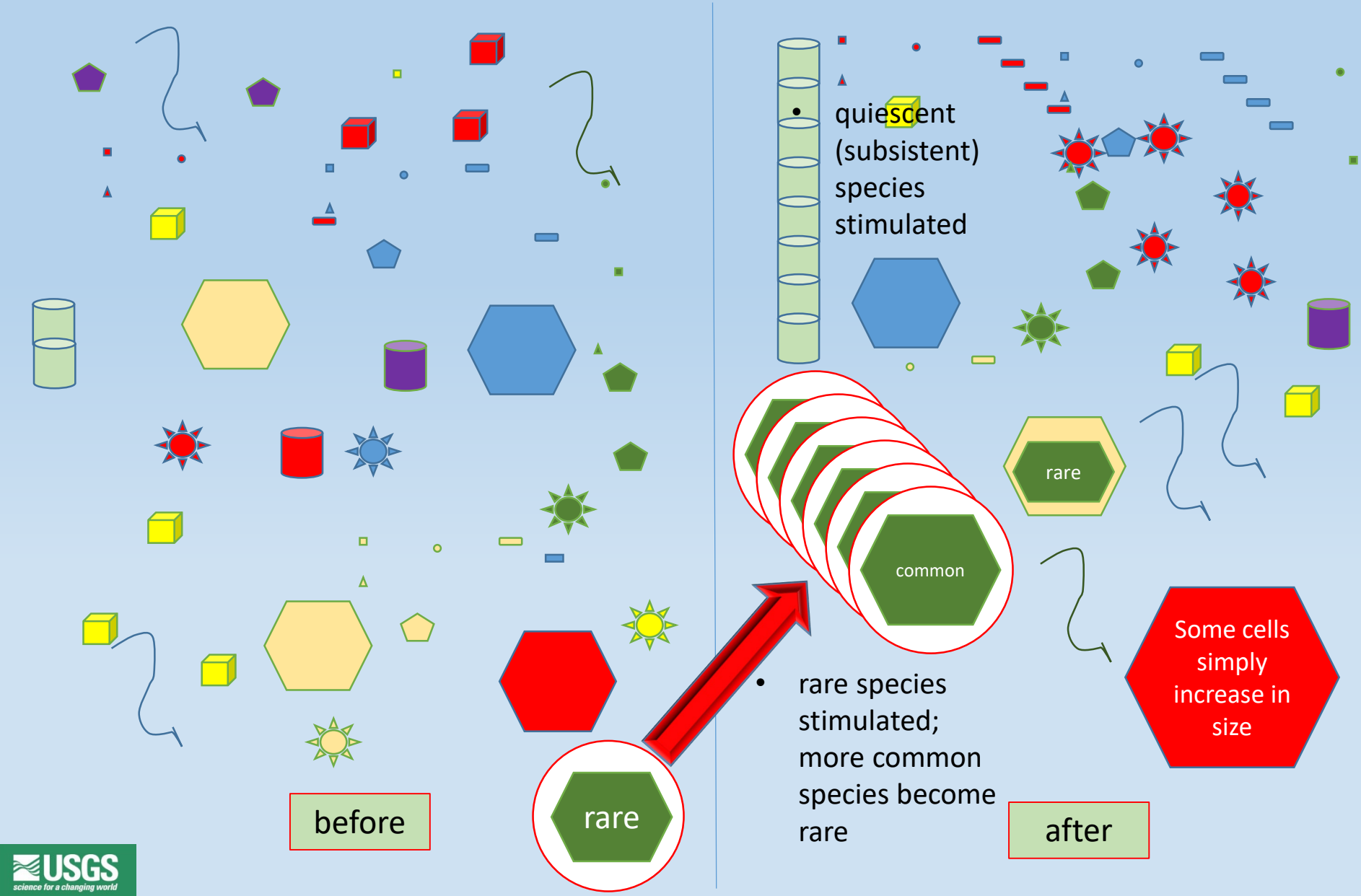
- Daily, weekly, monthly, seasonal forcing functions (temp., light quantity and quality, rainfall)
- Each organism has an optimum **rate** of nutrient uptake; and optima for all other factors
- Each organism has a **concentration** threshold efficiency to take up that nutrient



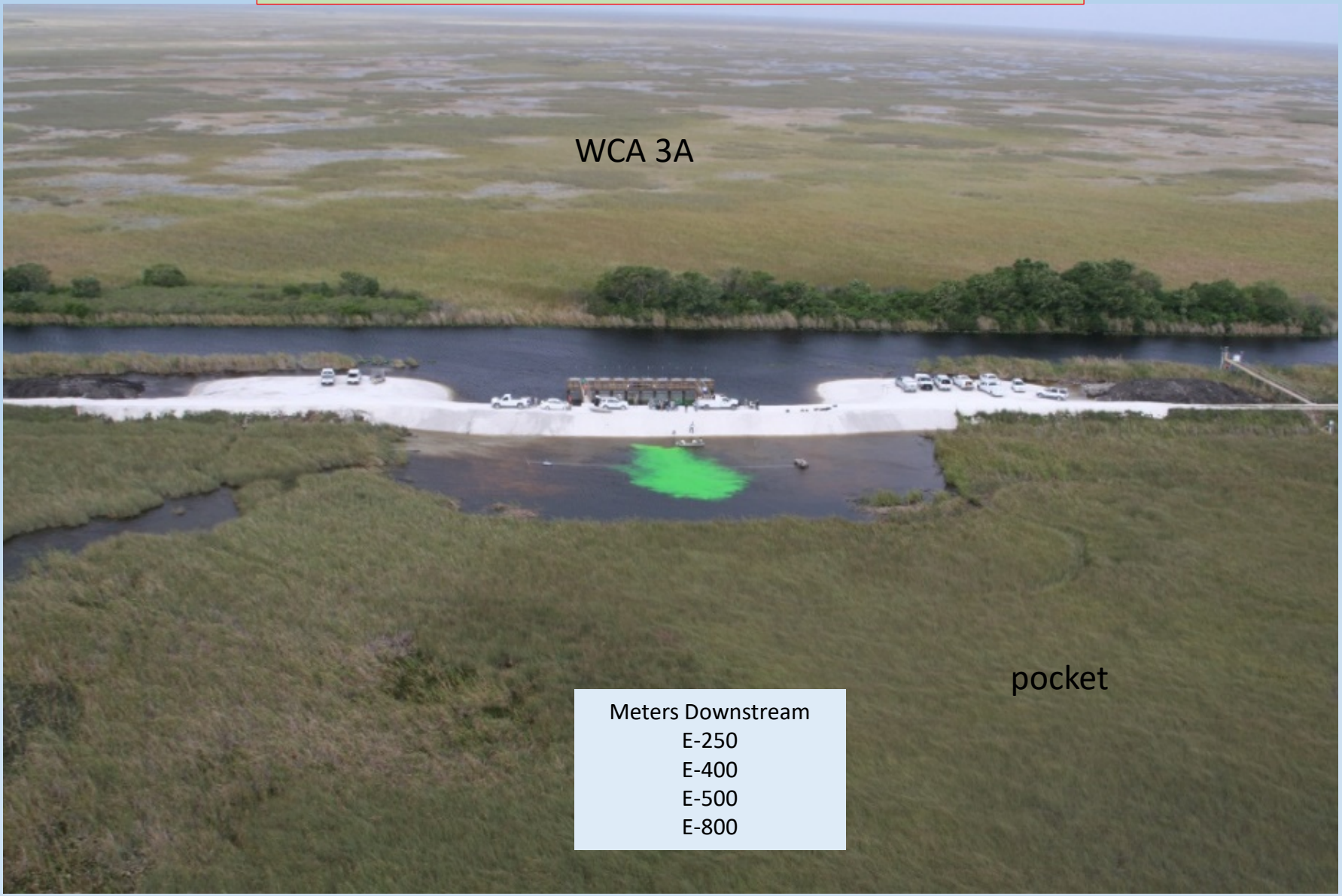
Variety of organisms, some common, some rare (why?) (how are some "holding on"?)
At any given time, they experience approximately the same nutrient environment (although microhabitats exist)

- Slow-growing nutrient specialist
- Fast-growing nutrient opportunist

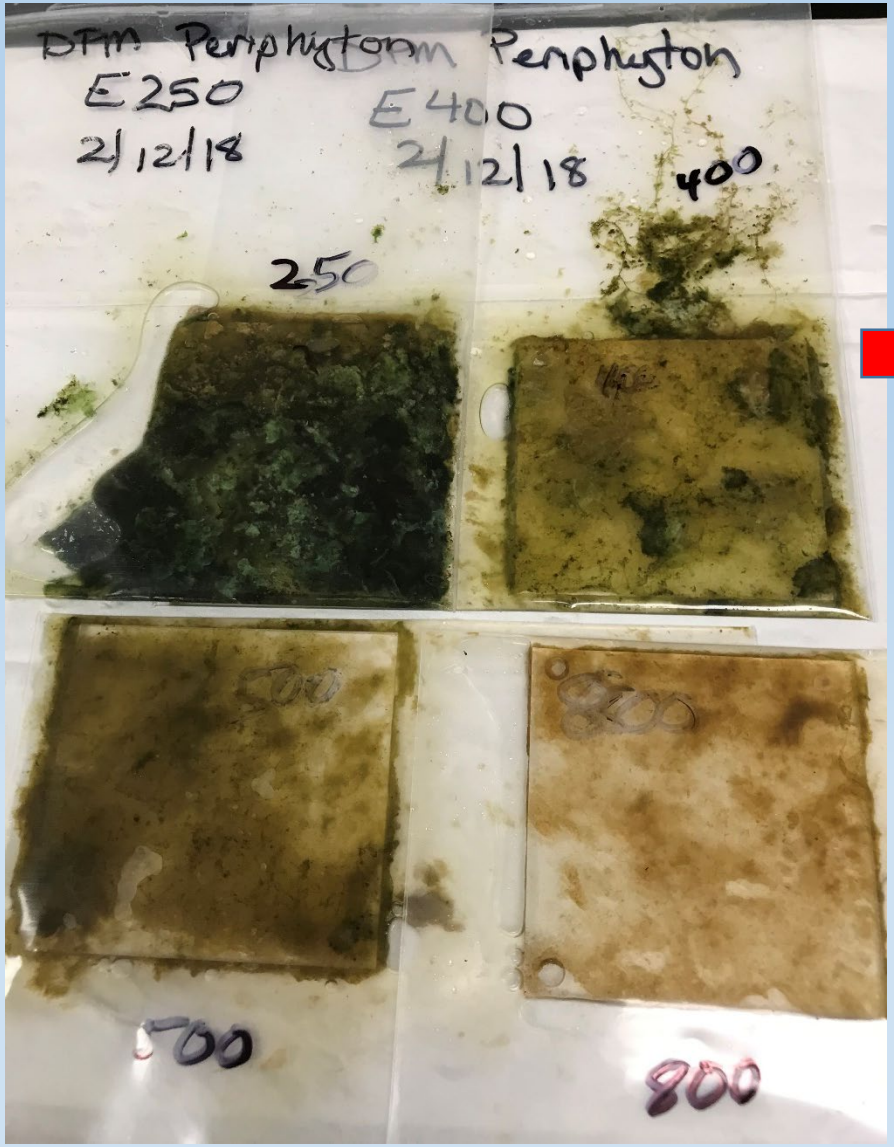
Add flow increase… (these are periphyton, so they stay in place for the most part)

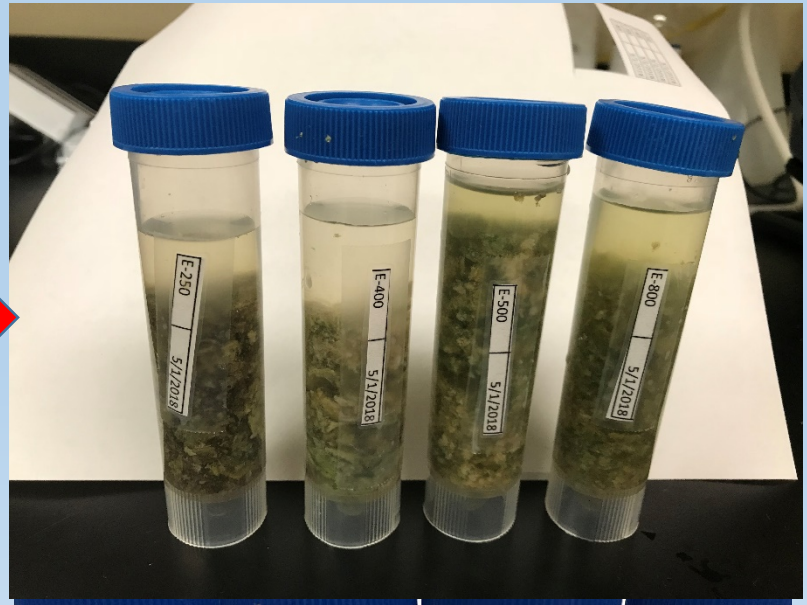


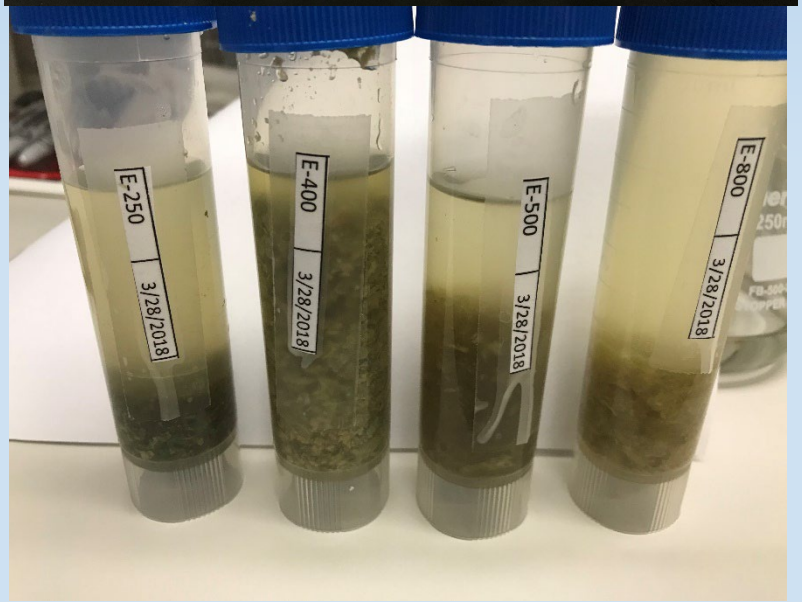
Periphytometers downstream of culverts



Growth on periphytometers downstream of culverts







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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

20 µm

before

20 µm

after

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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

20 µm

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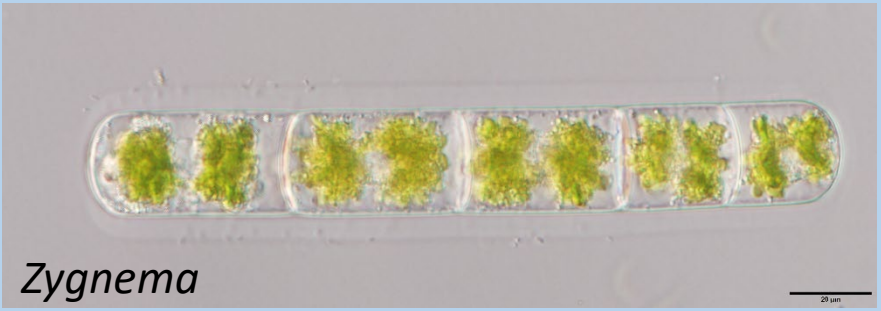
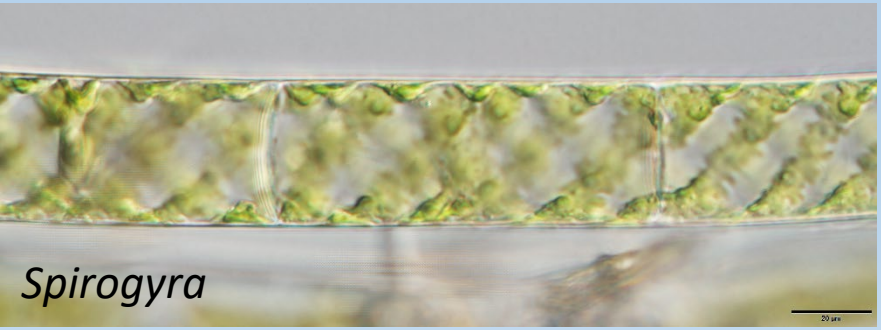
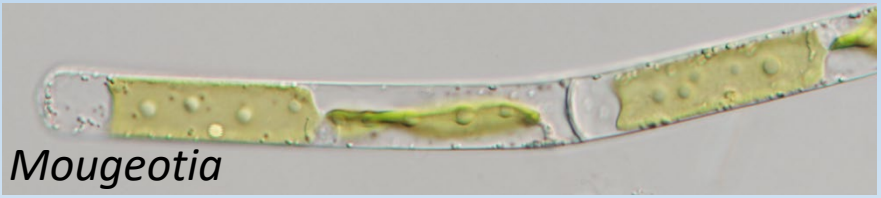
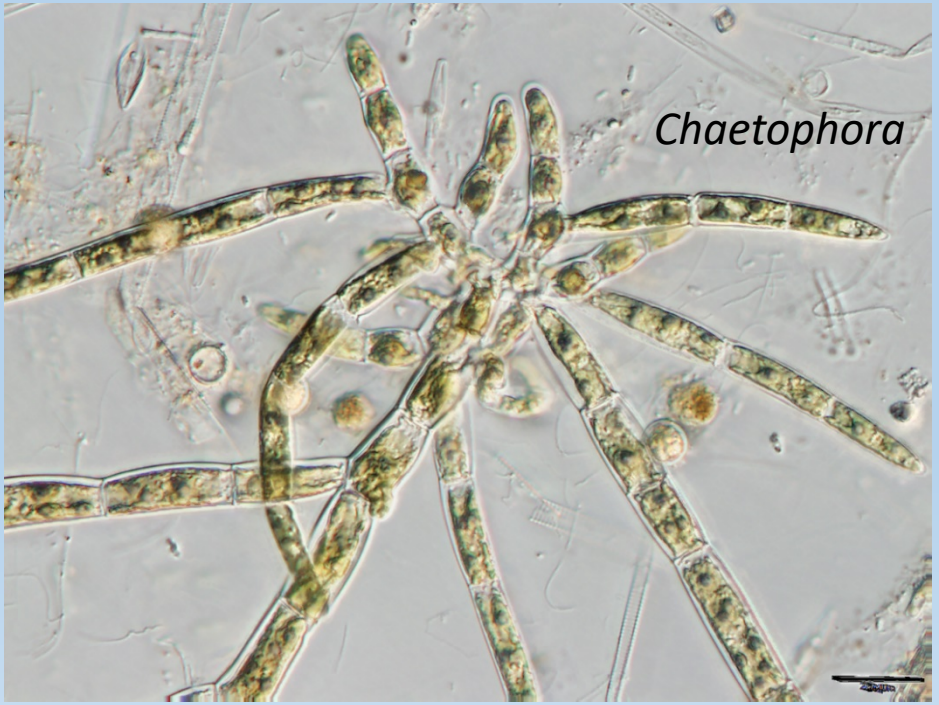
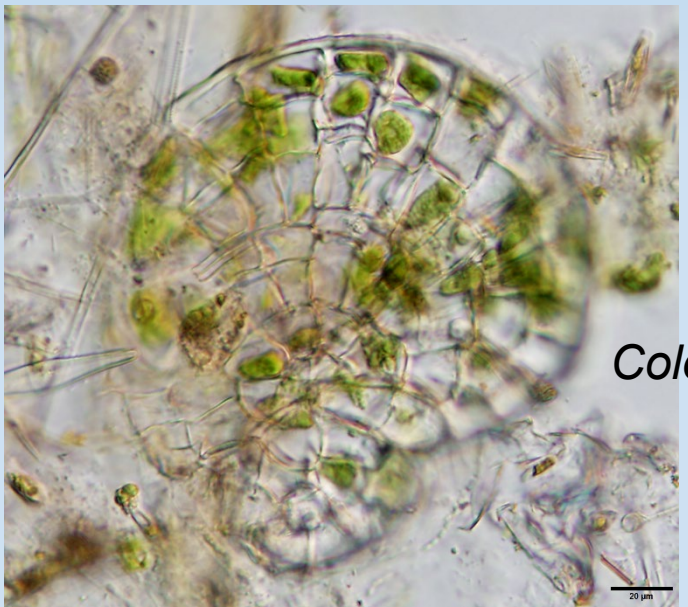
Not just one type of filamentous green is responsive











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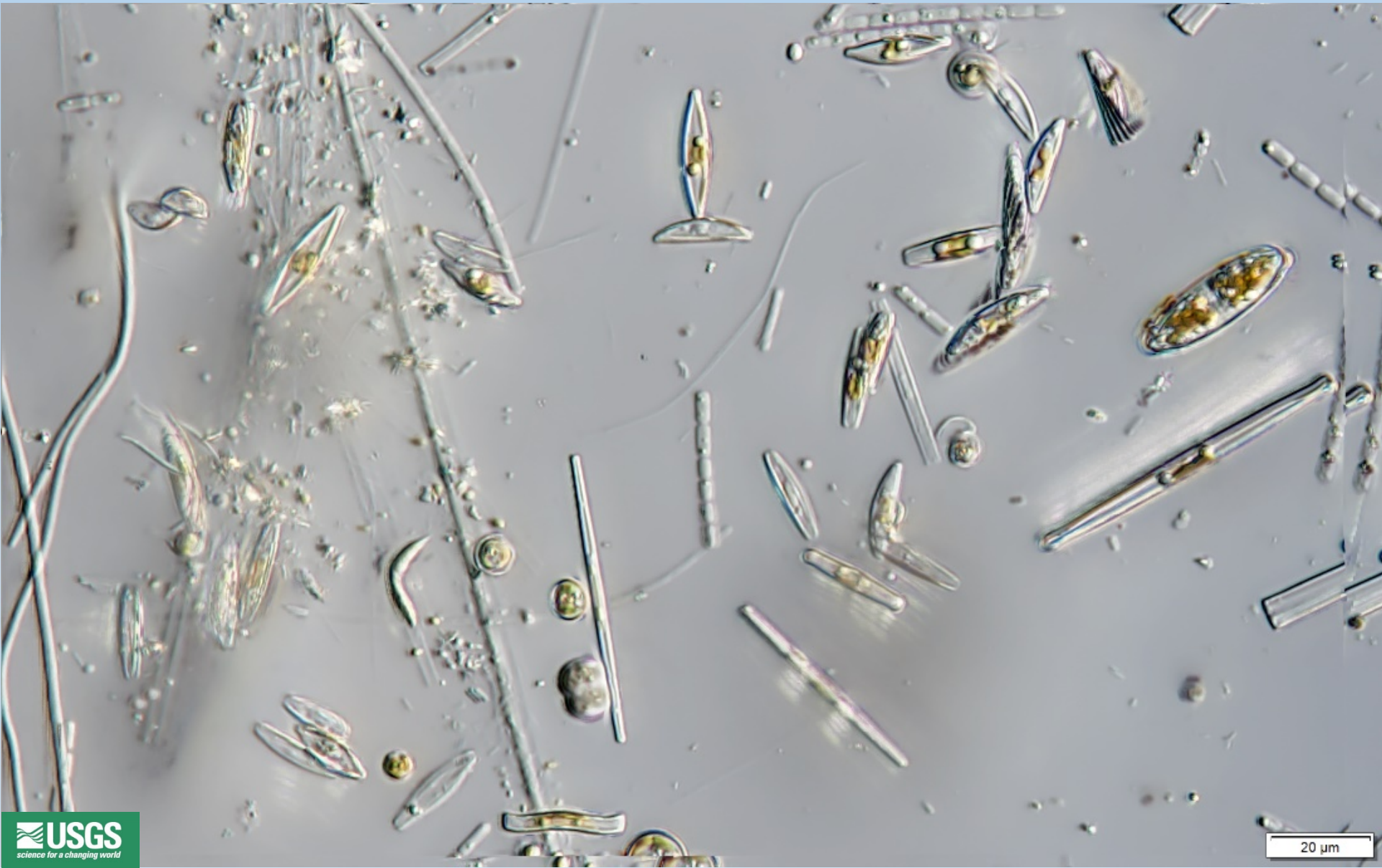
Diatoms and cyanobacteria at E-500 and E-800

E-500 and E-800



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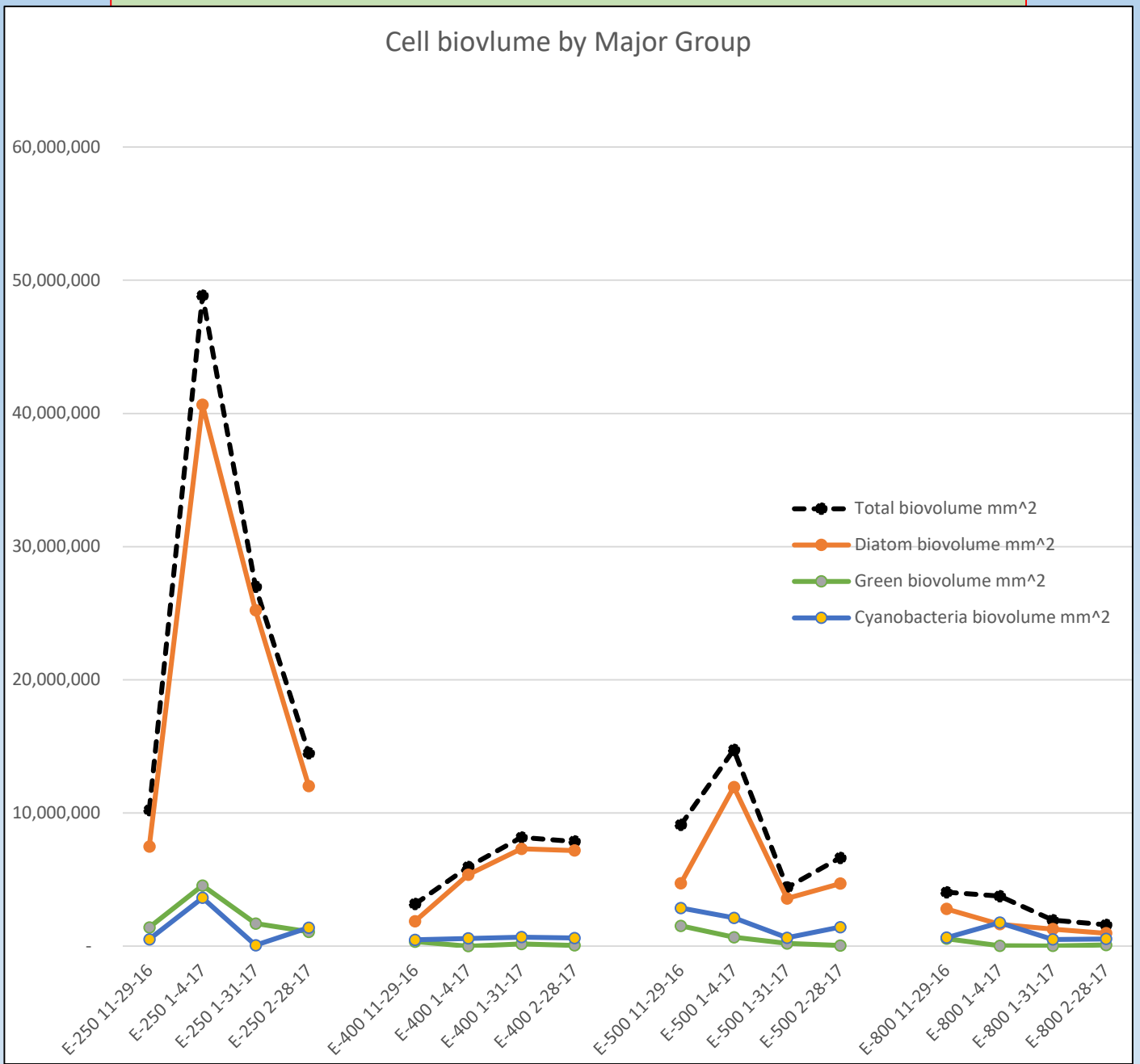
Cyanobacteria: Dominance of calcium carbonate (marl) producers downstream

E-500 and E-800

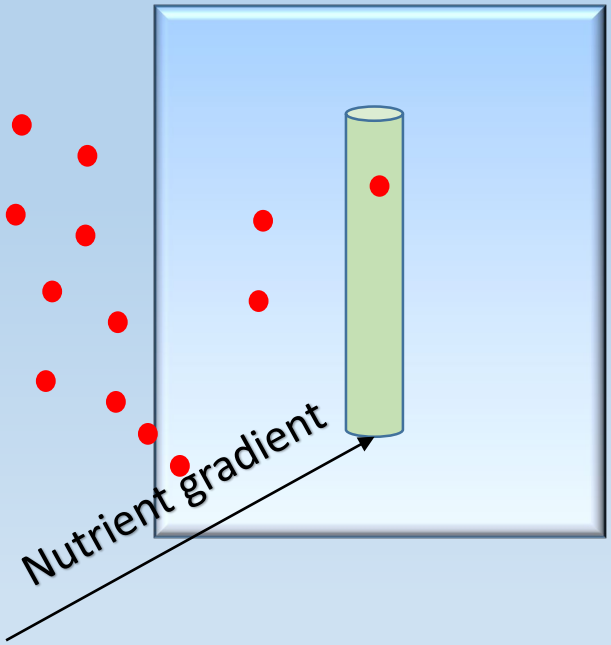
Community response: across distance and time

1st responders easy to document: the community



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

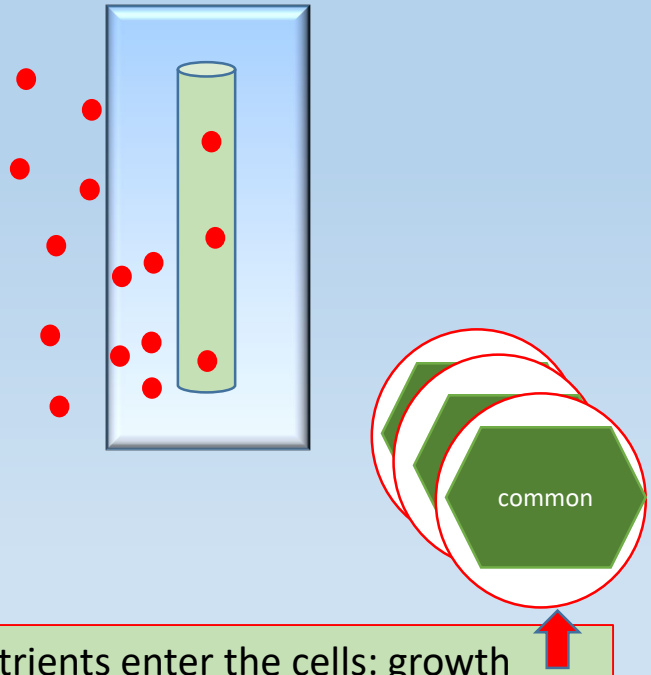
boundary layer



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

before

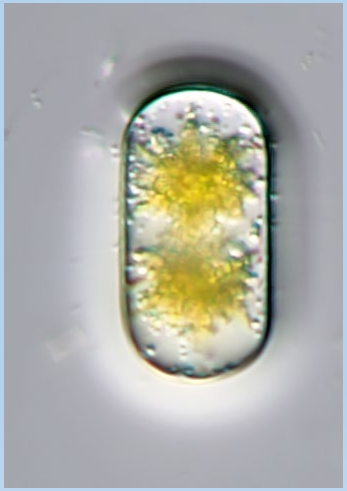
eroded boundary layer

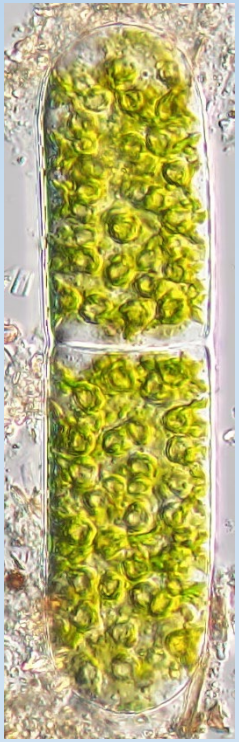


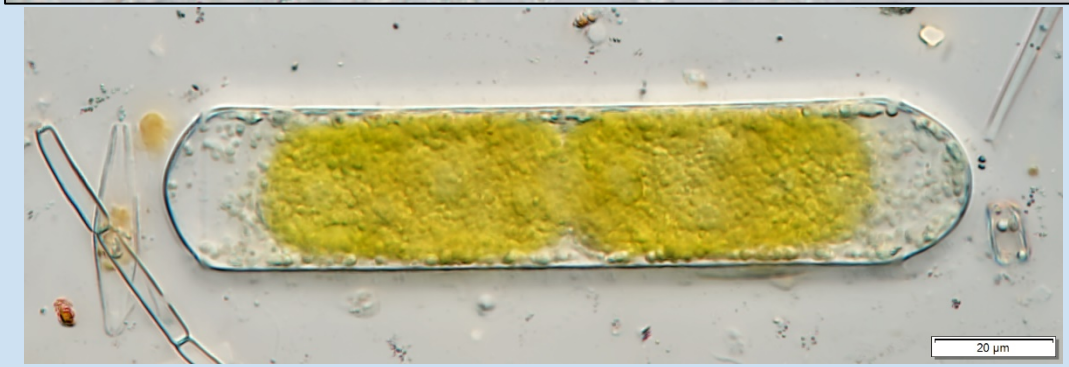
- more nutrients enter the cells: growth
- enzymatic response to nutrient availability
- certain species stimulated by the “new” nutrient regime

after

Life at ultra low nutrients: greens







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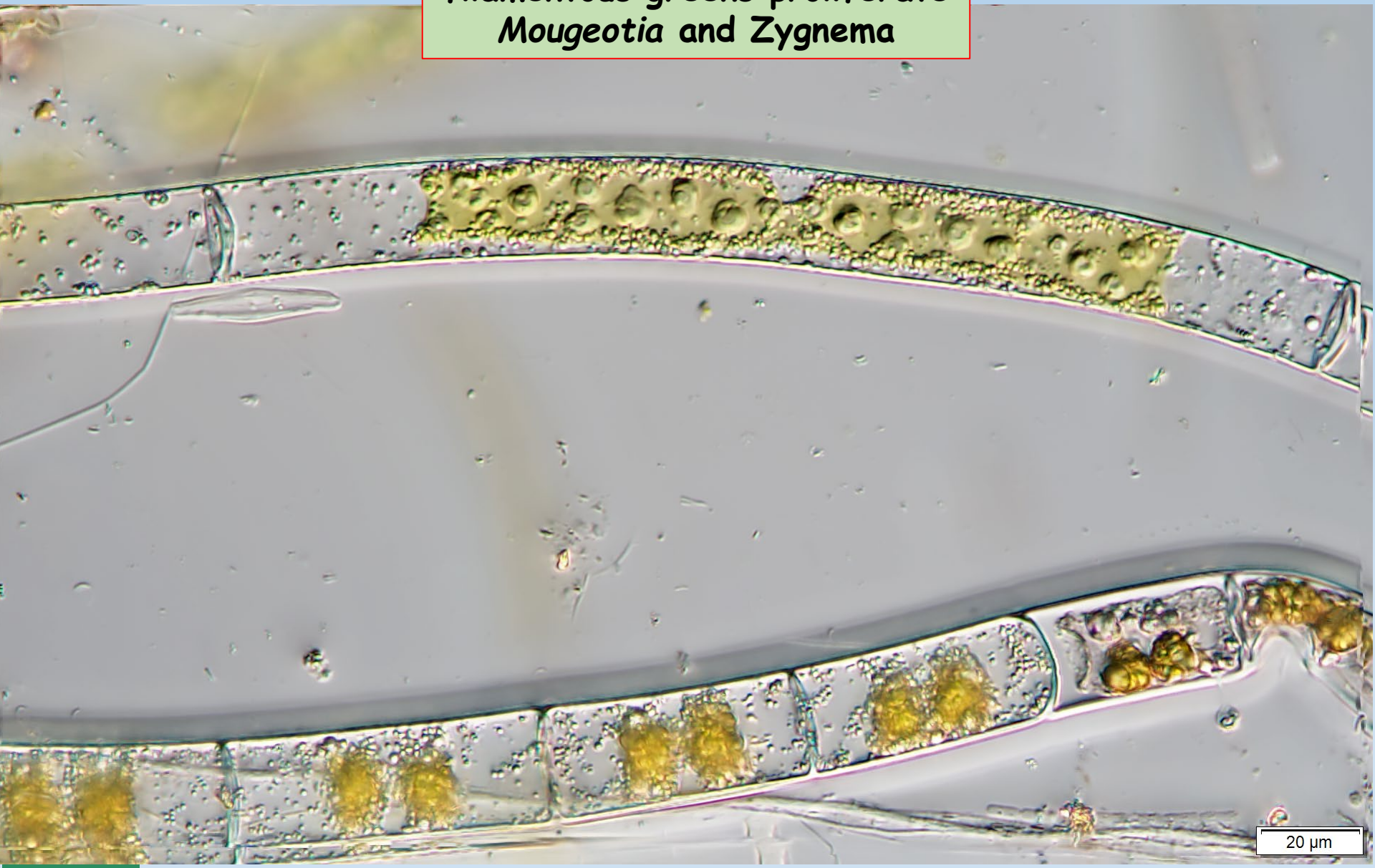
Add flow, quiescent filamentous greens proliferate *Mougeotia* and Zygnema



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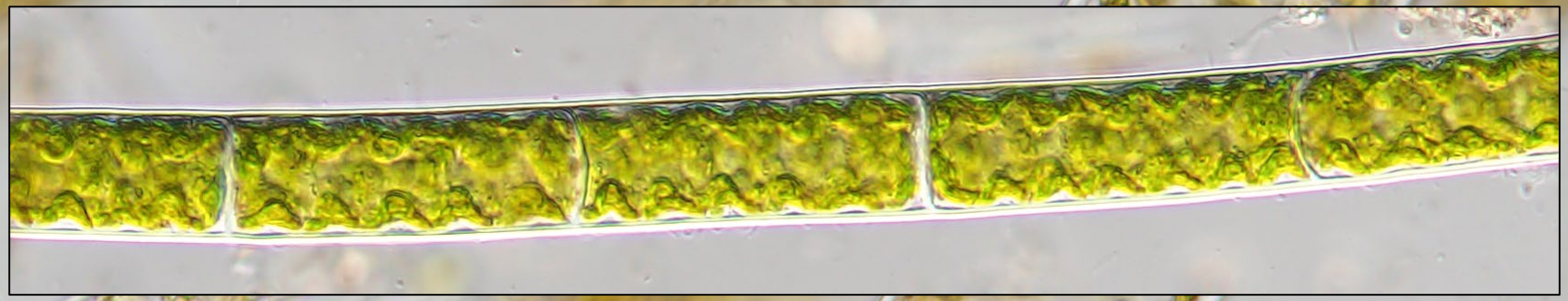
Add flow, quiescent filamentous greens proliferate *Spirogyra*



50 µm

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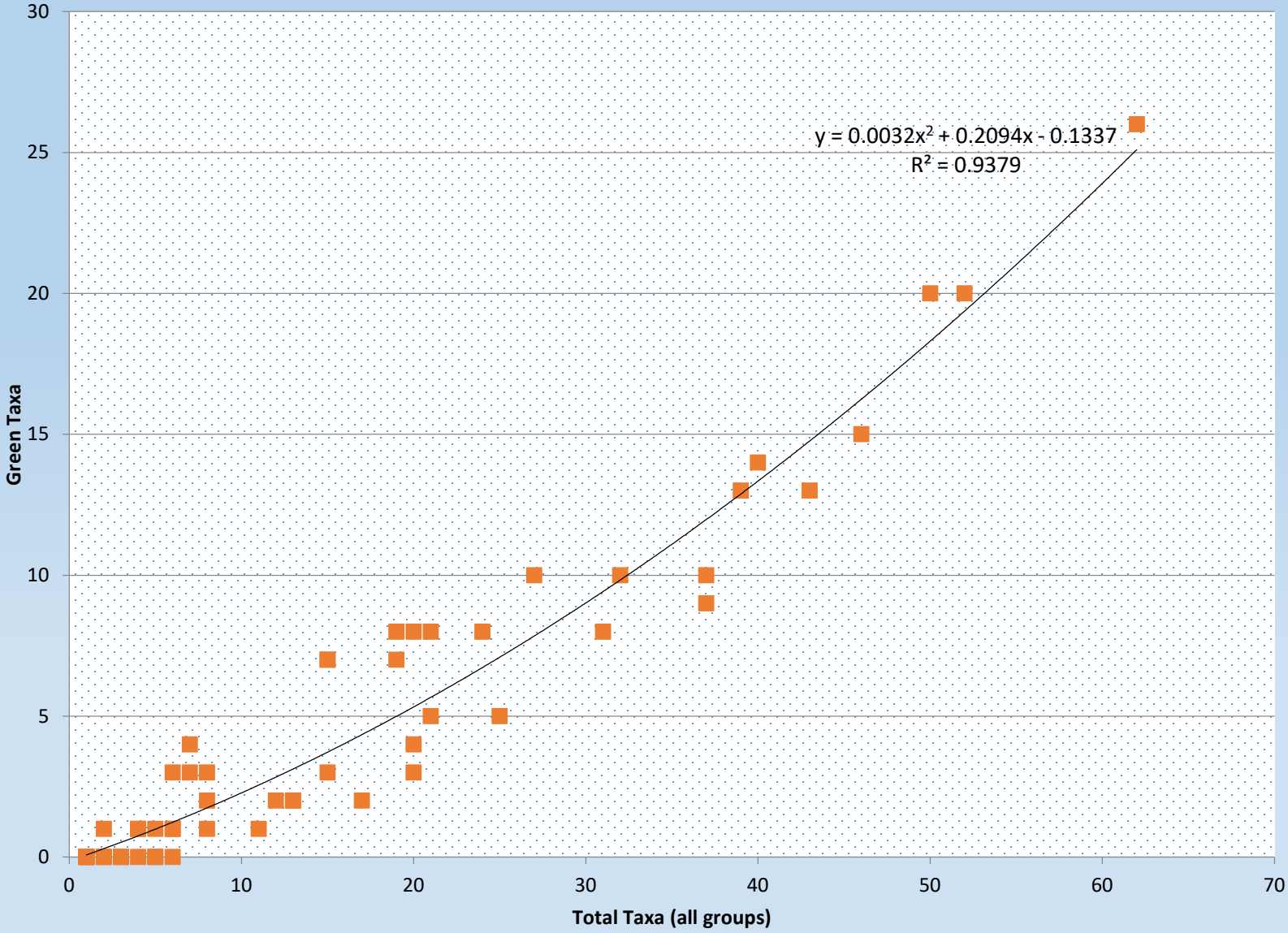
Species Richness: Greens as a proportion of total species richness



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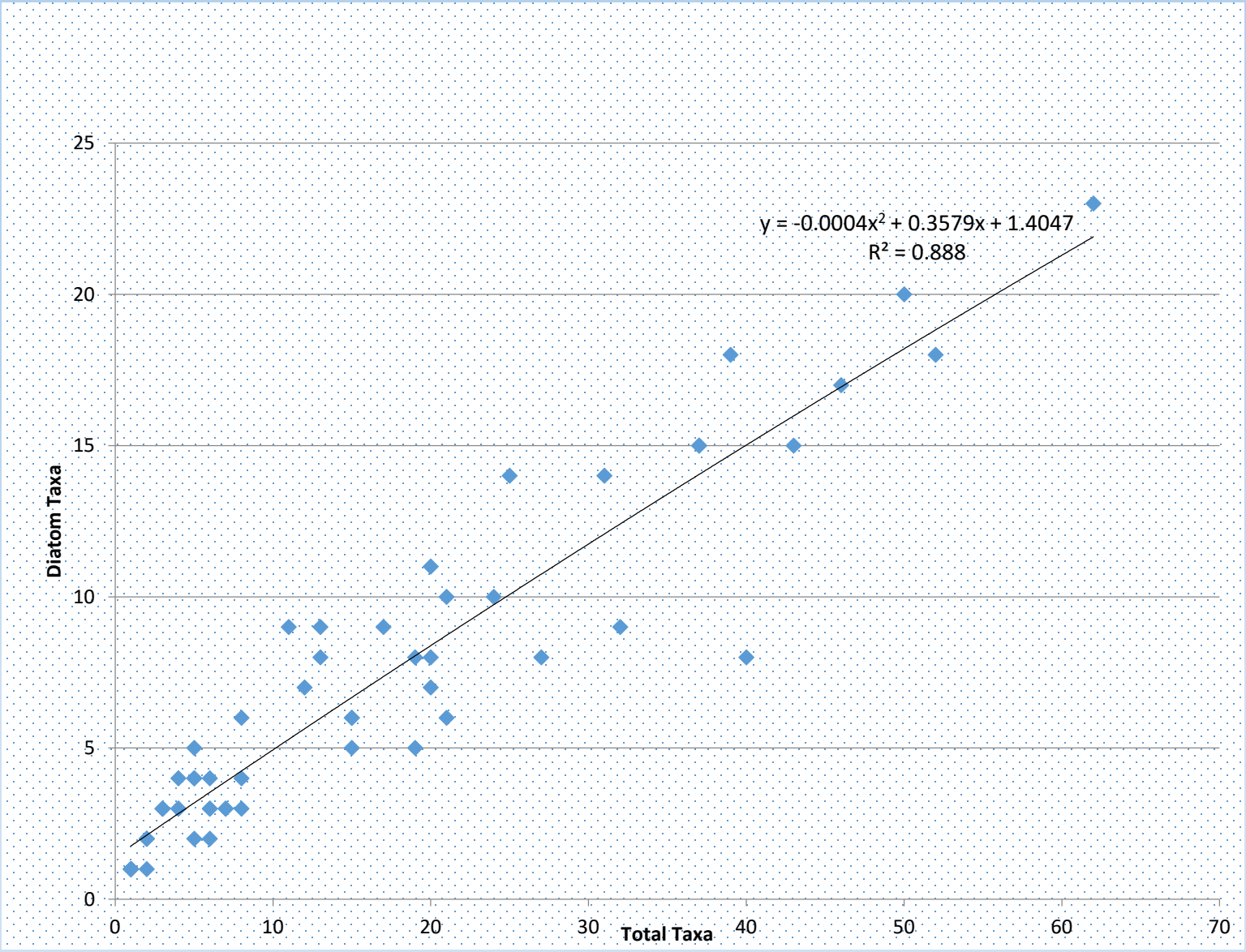
Species Richness: Diatoms as a proportion of total species richness



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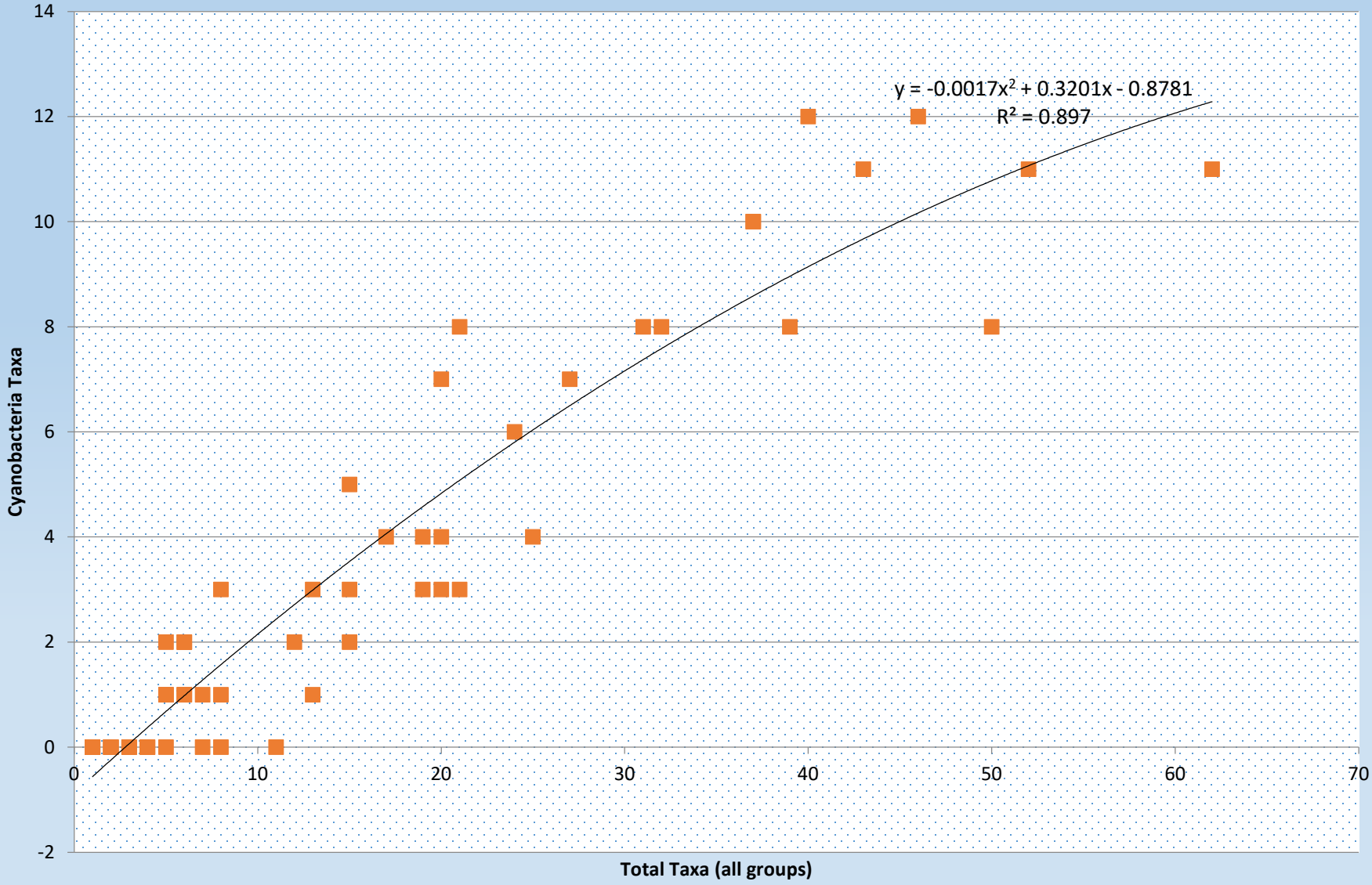
Species Richness: Cyanobacteria as a proportion of total species richness



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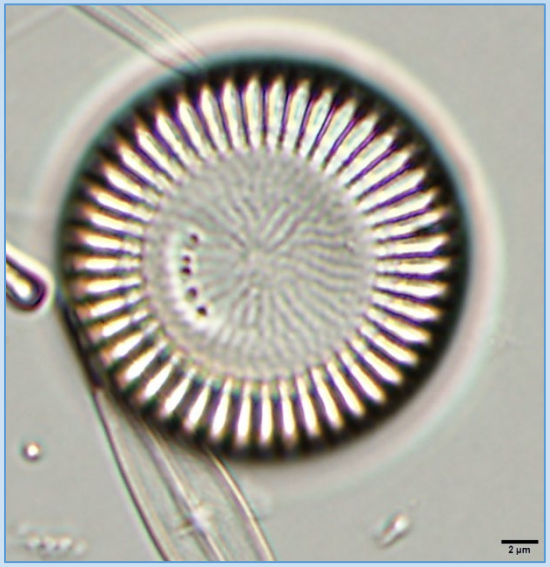
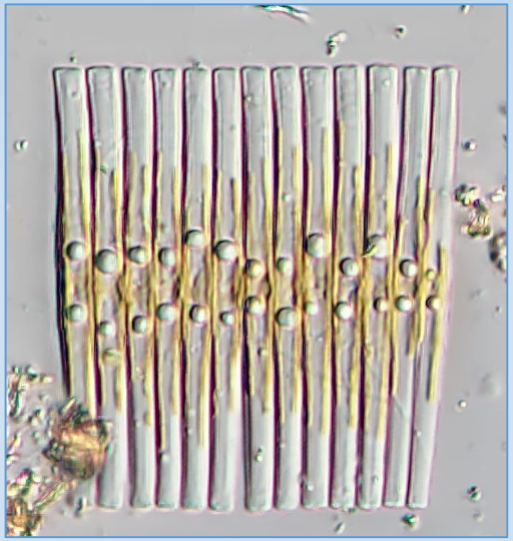
Other Indicators of flow: plankton





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Thank You!

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