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
One response: any member of the community may be stimulated
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)

Some cells simply increase in size

- quiescent (subsistent) species stimulated
- rare species stimulated; more common species become rare
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
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

**H₀**: There is a more subtle shift in the periphyton community structure

**Findings**: a) more of an individual species and, b) more species overall
Community response: cyanobacteria

E-250

E-250

E-400, E-500 and E-800
Second Response: cellular level, (what does flow do)?

Before:
- Nutrients are pulled from the surroundings.
- Diffusion across the boundary layer.
- Enzymatic flexibility of the organism (to some extent).

Boundary layer

Eroded boundary layer

After:
- More nutrients enter the cells: growth.
- Enzymatic response to nutrient availability.
- Certain species stimulated by the “new” nutrient regime.

Nutrient gradient
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

- **Design**: 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

- **Post-processing**
  - 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

- **Sampling frequency & design**
  - 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**

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**Mougeotia sp.**

**Fragilaria synegrotesca**

**Mastogloea sp.**

**Phacus sp.**

**Gomphospheria 16%**

**Geminocystis (Synechocystis) 2%**

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Species Richness: Greens as a proportion of total species richness

\[ y = 0.0032x^2 + 0.2094x - 0.1337 \]

\[ R^2 = 0.9379 \]
Species Richness: Diatoms as a proportion of total species richness

\[ y = -0.0004x^2 + 0.3579x + 1.4047 \]

\[ R^2 = 0.888 \]
Species Richness: Cyanobacteria as a proportion of total species richness

\[ y = -0.0017x^2 + 0.3201x - 0.8781 \]

\[ R^2 = 0.897 \]
Other interesting indicators: plankton

E-800 10-17-16
Other interesting finds: freshwater red alga, *Nemalion*
Ecological Strategies: complimentary pigments
Thank You!