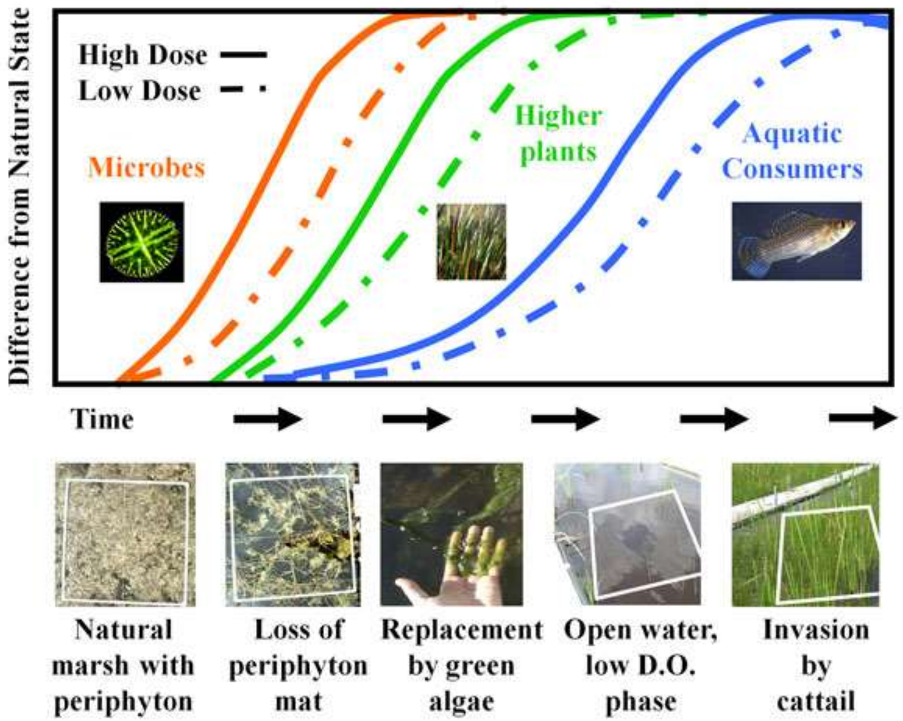
"~~Life~~ **Restoration should be lived so vividly and so intensely** that thoughts of another ~~life~~ restoration, or of a longer ~~life~~ restoration, are not necessary" (modified from *M. Stoneman-Douglas)*

Enjoy our session (and the Everglades!)

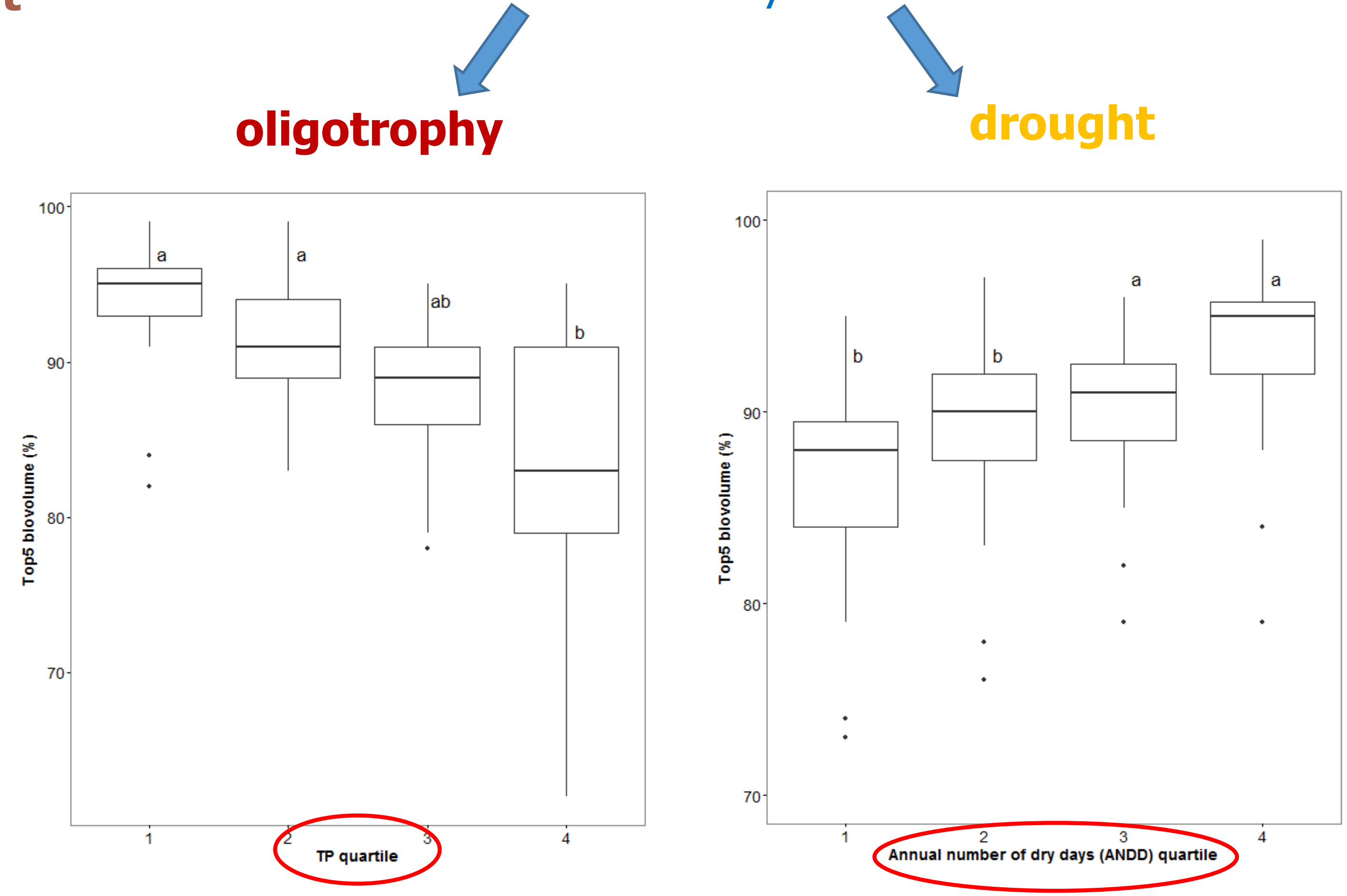
What we know about periphyton in relation to nutrients and hydroperiod

Community shifts and food web changes with effects of **long-term phosphorus enrichment** in Everglades wetlands



Source: **Gaiser, E., J. Trexler** and P. Wetzel 2012. The Everglades. In Batzer, D. and A. Baldwin (eds). Wetland habitats of North America: Ecology and Conservation Concerns. Berkeley: University of California Press.

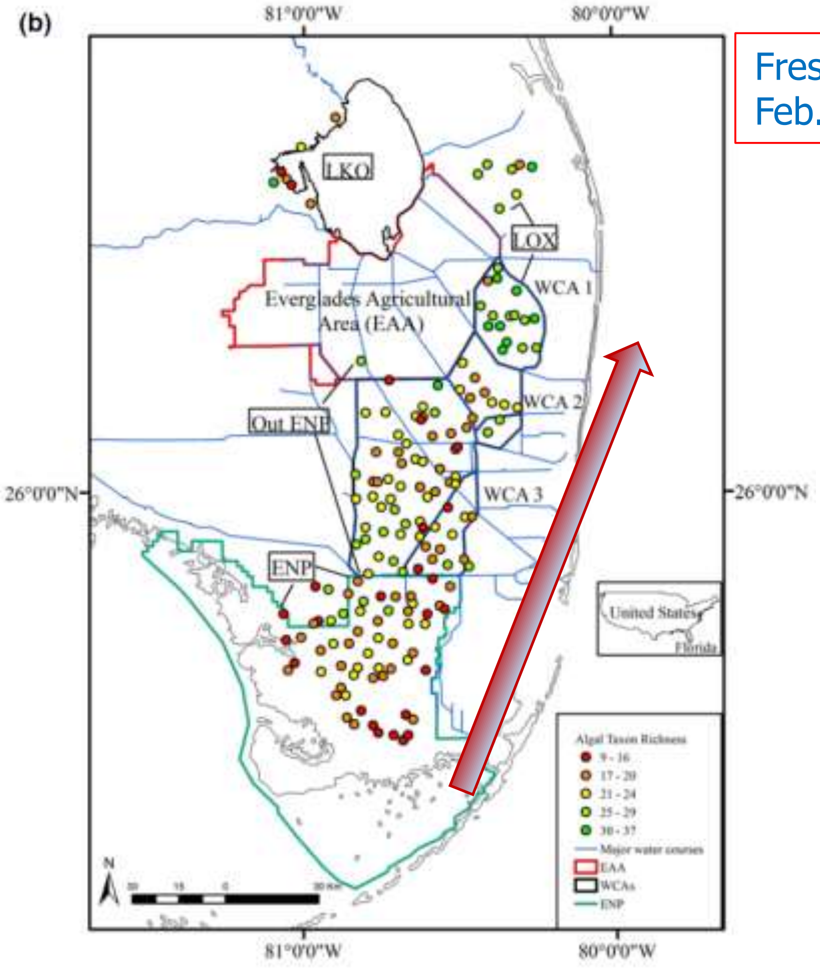
Dominance by a few species increases substantially with



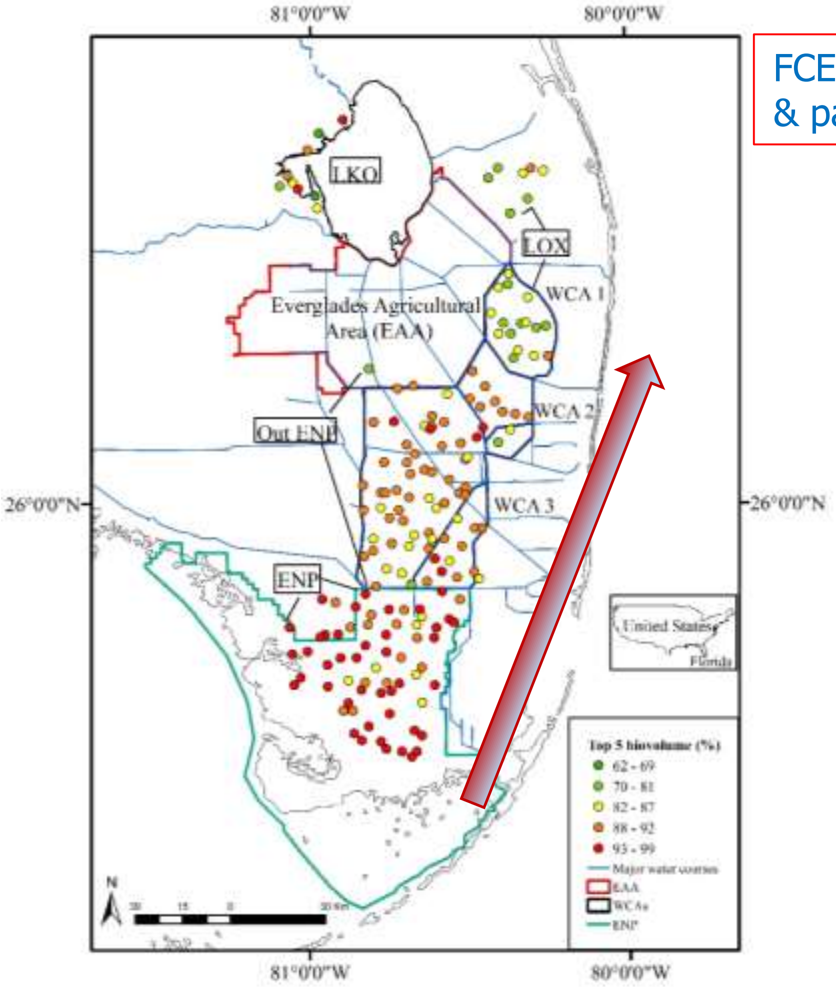
Source: **Marazzi L., Gaiser E.E., Tobias F.A.C.** (in review) Phosphorus scarcity and desiccation stress increase dominance in wetland benthic primary producer communities. Aquatic Ecology.

What we know about periphyton in relation to nutrients and hydroperiod

With higher hydroperiod and phosphorus, species richness increases (left) and dominance decreases (right), but opportunistic taxa replace 'native' algae



Freshwater Biology
Feb. 2017

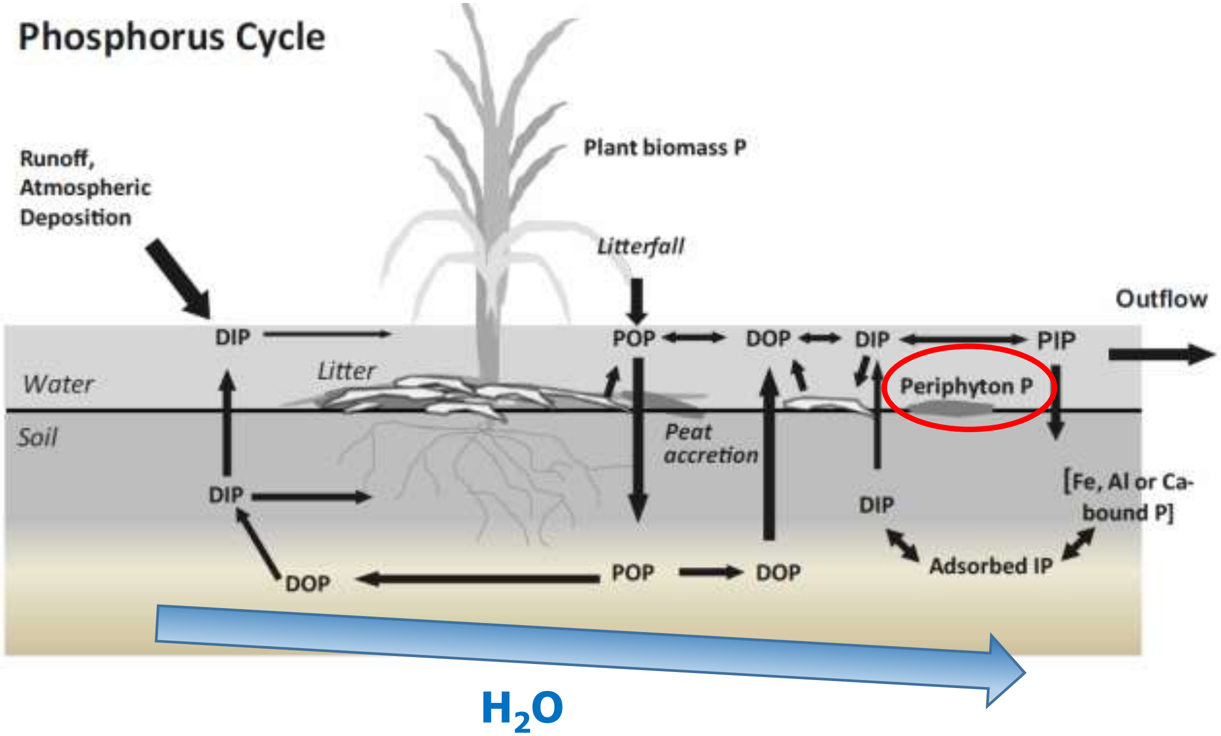


FCE ASM preview
& paper in review

Source: **Marazzi, L., E.E. Gaiser,** V.J. Jones, **F. Tobias**, A.W. Mackay. 2017. Algal richness and life-history strategies are influenced by hydrology and phosphorus in two major subtropical wetlands. Freshwater Biology 62: 274-290. DOI: 10.1111/fwb.12866

Source: **Marazzi, L., E.E. Gaiser, F. Tobias** 2017. Algal dominance increases with phosphorus scarcity and desiccation stress in the Everglades. FCE-LTER ASM poster.

But how does water flow impact P supply & periphyton-based food webs?

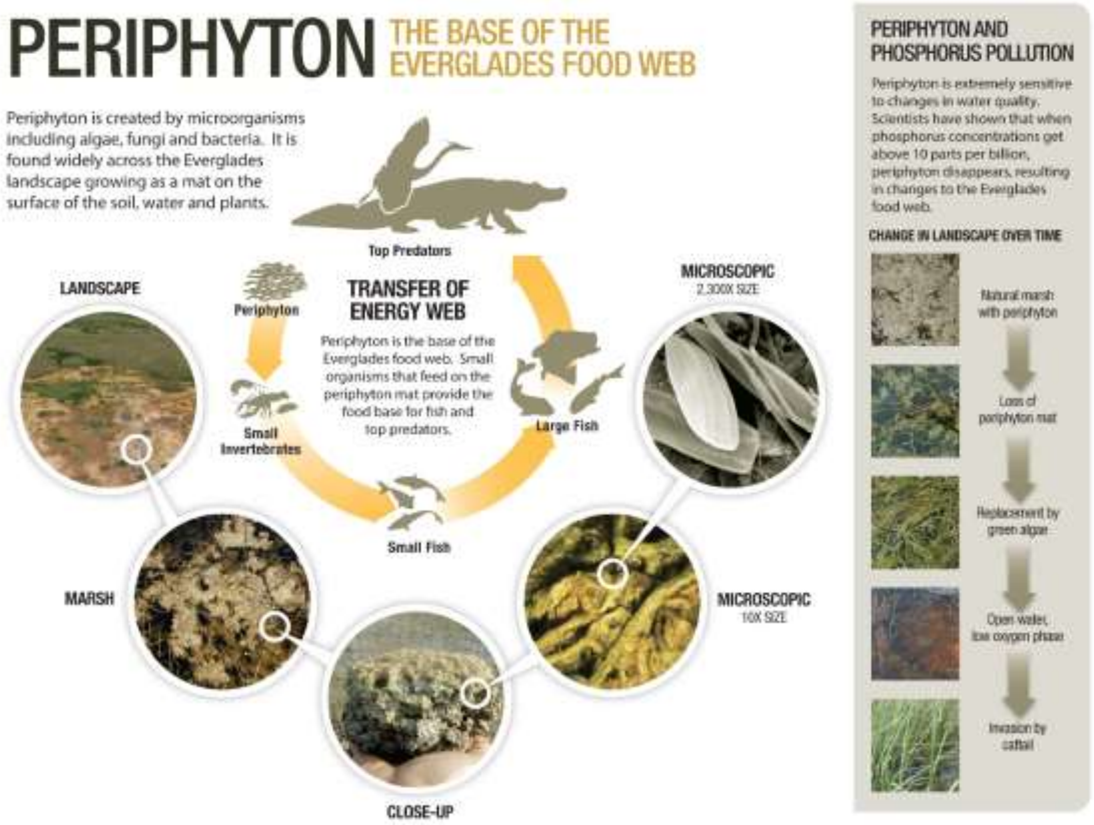


Source: Orem, W., **Newman, S.**, Osborne, T.Z. and Reddy, K.R., 2015. Projecting changes in Everglades soil biogeochemistry for carbon and other key elements, to possible **2060 climate and hydrologic scenarios**. *Environmental management*, *55*: 776-798.

Phosphorus increases cause mats to break down

Source: Sklar, F.H., Chimney, M.J., Newman, S., McCormick, P., Gawlik, D., Miao, S., McVoy, C., Said, W., Newman, J., Coronado, C. and Crozier, G., 2005. The ecological–societal underpinnings of Everglades restoration. *Frontiers in Ecology and the Environment*, *3:* 161-169.

Challenge: **scaling up from microscopic communities to landscape-**scale periphyton cover & community changes



Source: Synthesis of Everglades Research and Ecosystem Services (SERES) project

Everglades Periphyton: open questions and challenges

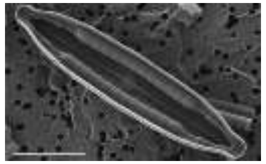
1. How can we improve our understanding of periphyton ecology and dynamics to enhance our **predictions** of periphyton under potential climate / restoration scenarios?

   a) devise **mechanistic functions** in periphyton / ecological models and linking these with biogeochemical models;
   b) better simulate **top-down controls, food web responses**, and **spatio-temporal dynamics**

2. What do we still need to discover about these ***enigmatic carpets of algae*** ?

3. How can **we better apply new & old knowledge** on the role of periphyton for Everglades **restoration**? And how do we communicate it to / with people, including decision-makers?

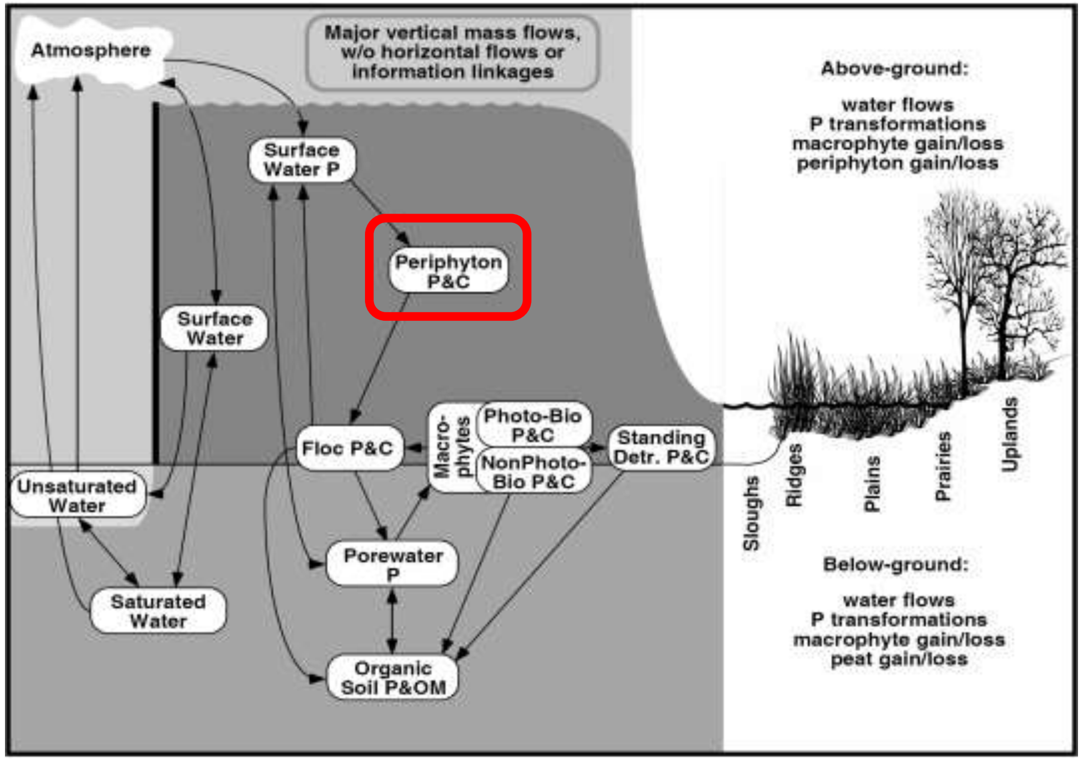


To conserve fish, wading birds, alligators, we need to protect microorganisms

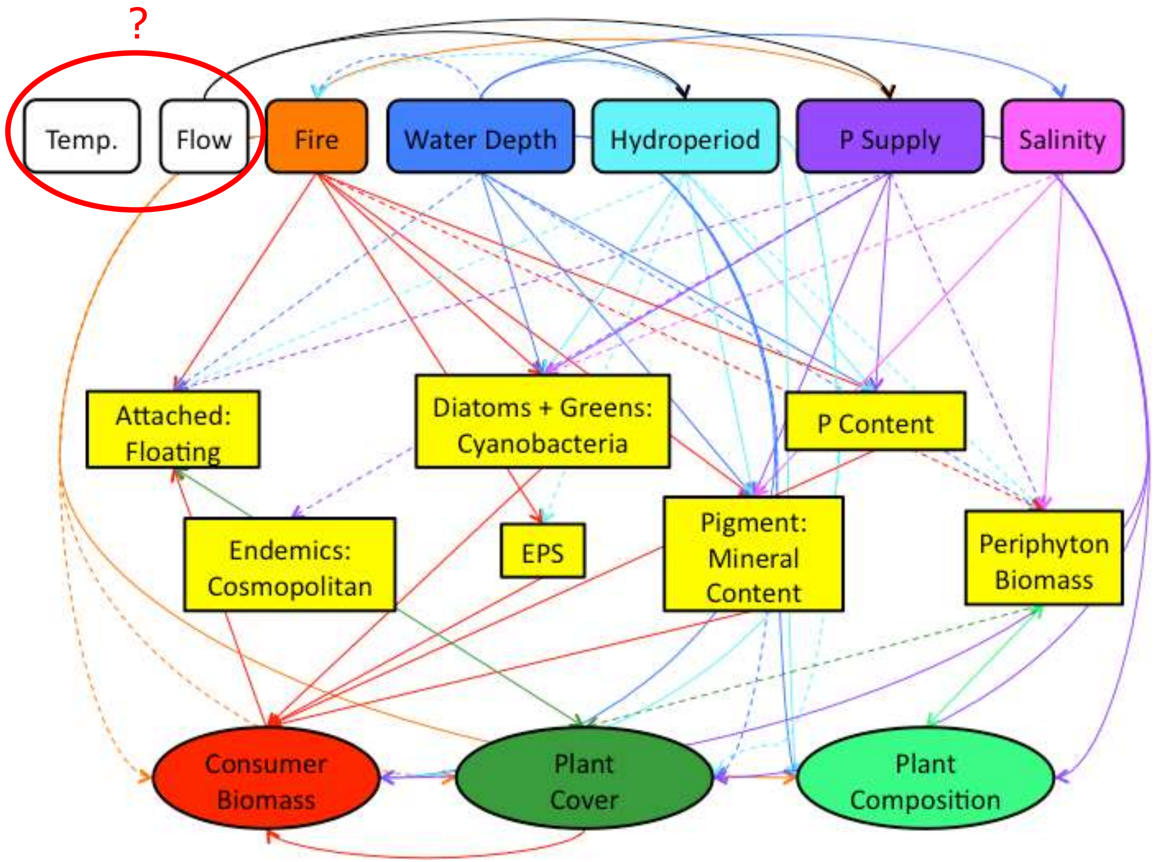
What do we still need to discover about these *enigmatic carpets of algae*?

The conceptual model of the **Everglades Landscape Model (ELM)**. State variables are in oval boxes, linked by the major flow pathways among those variables. Abbreviations: **P = Phosphorus**; C = Carbon; OM = Organic Matter; **Photo-Bio = Photosynthetic Biomass of macrophytes**; NonPhoto-Bio = NonPhotosynthetic Biomass of macrophytes; Standing Detr. = Standing dead Detritus; Floc = Flocculent layer on/above soil.



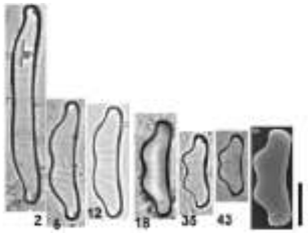
[Figure 2]. Fitz, C., Sklar, F., Waring, T., Voinov, A., Costanza, R. and Maxwell, T., 2004. Development and application of the Everglades Landscape Model. In *Landscape Simulation Modeling* (pp. 143-171). Springer New York.

Proposed conceptual ecological model for freshwater Everglades **periphyton**.

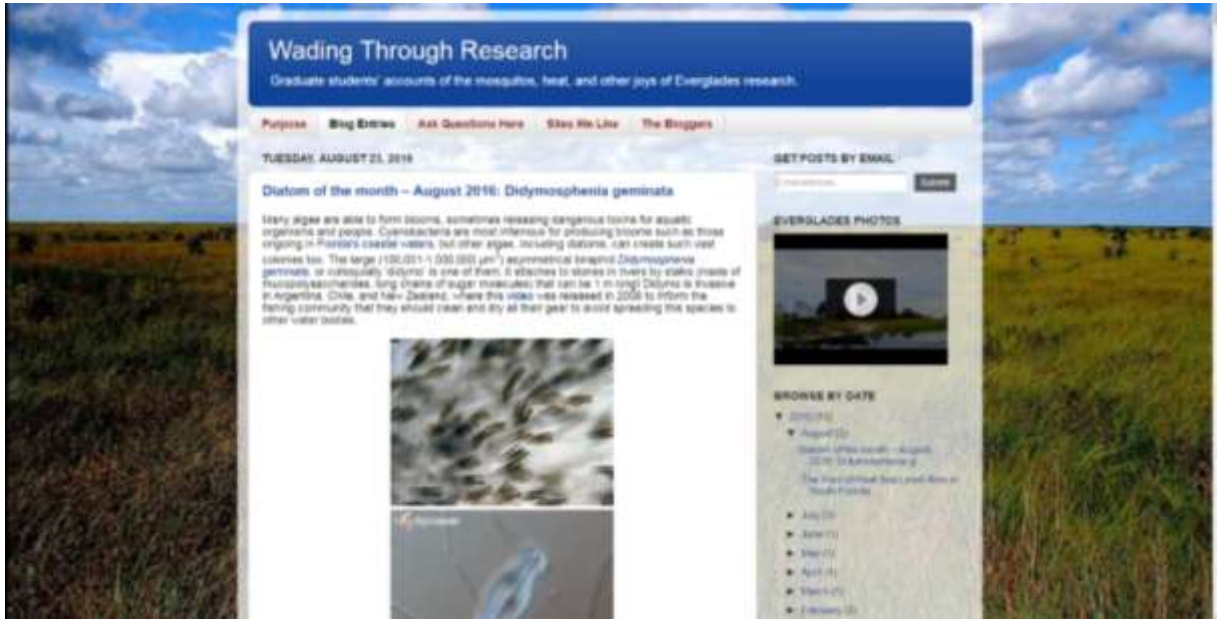


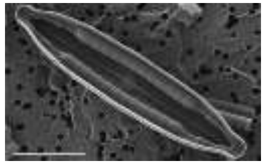
[pg. 91] Gaiser E.E., Wachnicka A., Lee S., Sah J. and Minchin P. (2011) "Developing periphyton-based hydrologic indicators for the Everglades **marl prairie**". Final Report to Everglades National Park, Cooperative Agreement # J5284-080991, January 31, 2011.

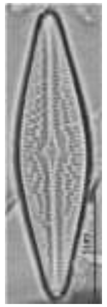
Communication starts with awareness – “Diatom of the month” series

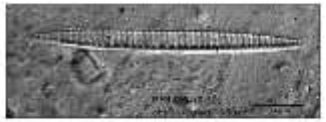


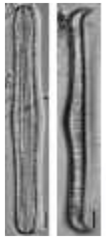
http://floridacoastaleverglades.blogspot.com

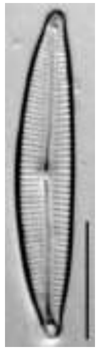


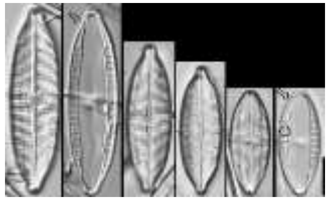


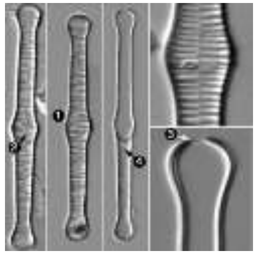


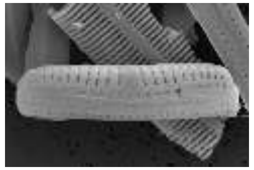












17 monthly posts by 7 authors: > **2,300 people reached** on **Facebook** + > **14,300 impressions** on **Twitter** = **Some impact on ? 8,000-16,600 people?**

“Periphyton Responses to Water Flow and Nutrient Loading and Implications for Everglades Restoration” (Session 21)

0) Luca Marazzi (FIU), Ph.D. - Introduction: “**Periphyton: Complex Ecological Indicators of Regional and Global Environmental Changes in a Subtropical Wetland under Restoration**” (10 min.)

1) Barry H. Rosen, Ph.D. (USGS)
Why the Primary Producers (**Algae and Cyanobacteria**) are the Key **Early Responders** to Nutrient and Water Flow Changes in the Everglades (15 min.)

2) Sue Newman, Ph.D. (SFWMD)
Effects of Increased **Flow** and Associated **Phosphorus** Loads on Microbial Responses (15 min.)

3) Evelyn Gaiser, Ph.D. (FIU)
Landscape-Scale Changes in Periphyton Under Contrasting **Water Management** and **Climate Change** Scenarios (15 min.)

4) Erik Tate-Boldt, MSc (SFWMD)
The Influence of Altered Flow Regimes on **Aquatic Ecosystem Metabolism** in an Everglades Marsh (15 min.)

5) Sarah Bornhoeft, MSc (FIU)
Influence of an Experimental Sheet Flow Regime on **Aquatic Food Webs** of the Central Everglades (15 min.)

Q&A – Discussion (15 min.)

Let’s make the most of our next 90 minutes in Great Cypress room!