An aerial photograph of a vast, flat landscape, likely a wetland or marsh. The terrain is a mix of dark green and brownish-green, suggesting water and vegetation. The horizon is flat and extends across the entire width of the image. The sky is a pale, overcast blue.

# **Microbial Dynamics in the Stormwater Treatment Areas**

**Kanika S. Inglett**

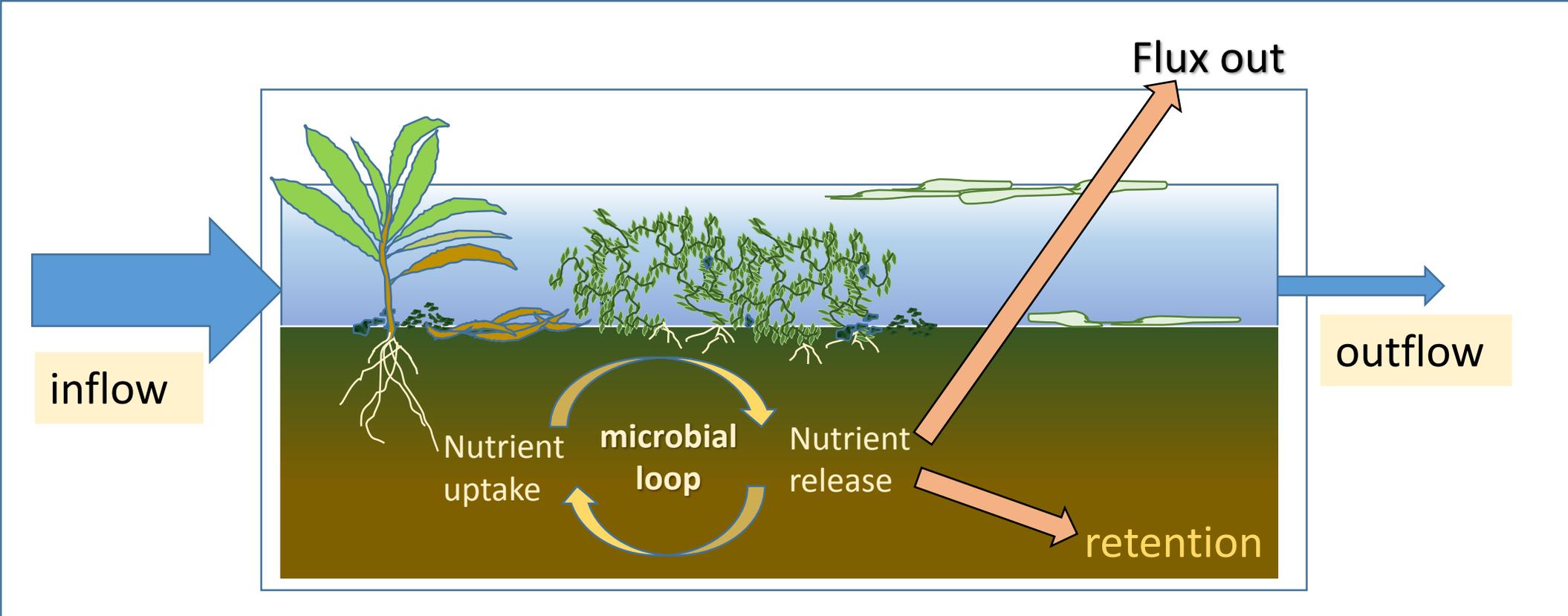
**Soil and Water Sciences Department**

**University of Florida, Gainesville FL**

# Black Box of the microbial dynamics



# Black Box of the microbial dynamics



Energy and nutrient flow is through the microbial loop

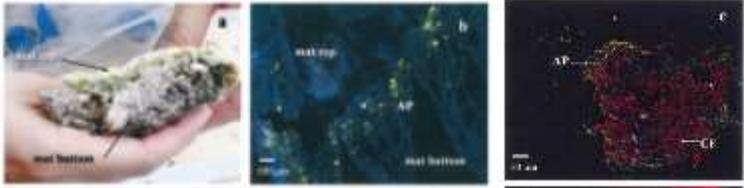
Organic Matter  
decomposition

Transformation  
of nutrients

# Zones of the microbial activities

algal, fungal, bacterial biomass, high available C, Vegetation dependent lignin to cellulosic ratio

aerobic to anaerobic algae and bacteria high C availability, higher biomass and activity



Periphyton

Vegetation

Phototrophic, heterotrophic, high C availability,

Water column

Detritus/floc

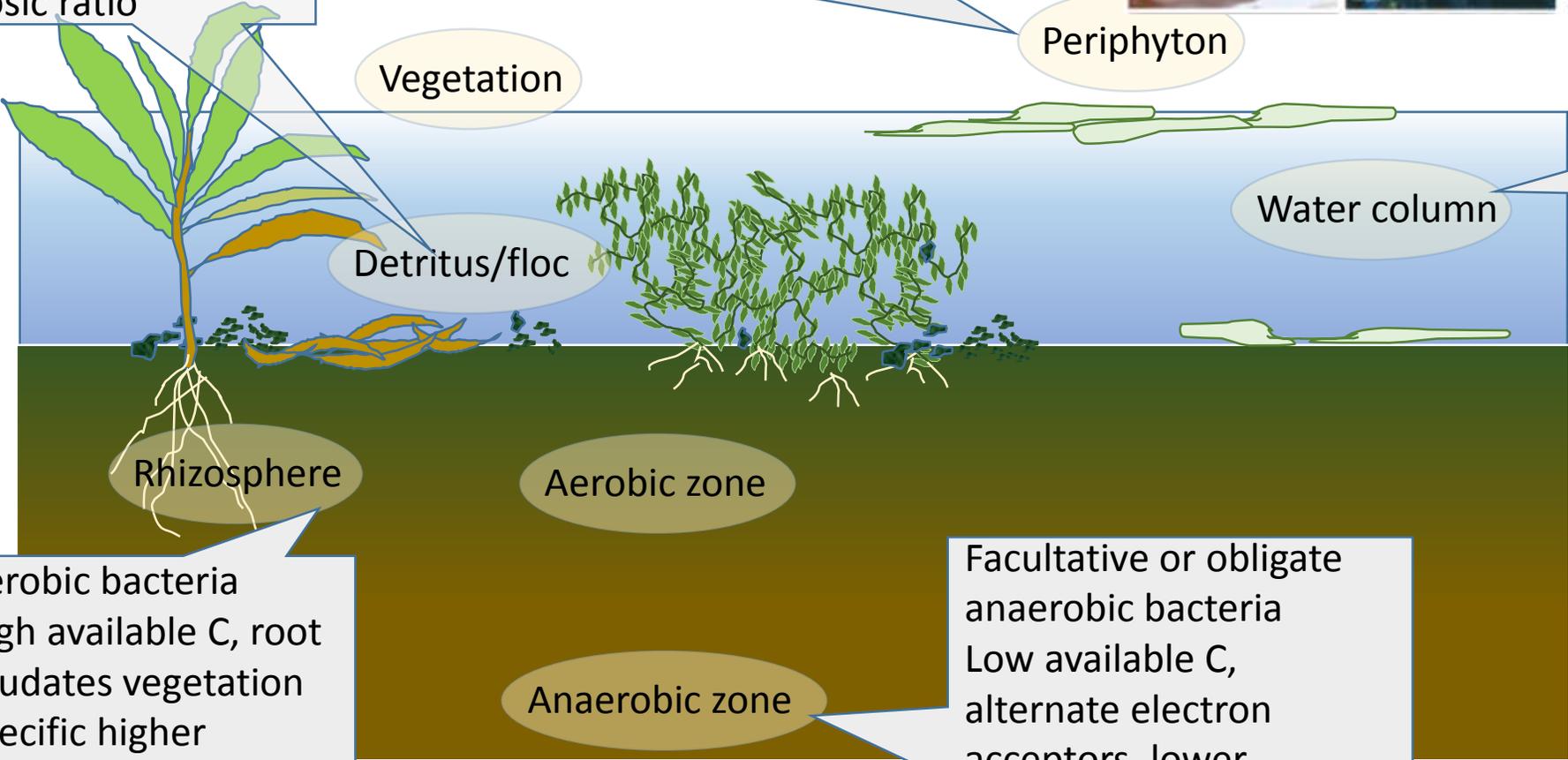
Rhizosphere

Aerobic zone

Aerobic bacteria High available C, root exudates vegetation specific higher biomass and activity

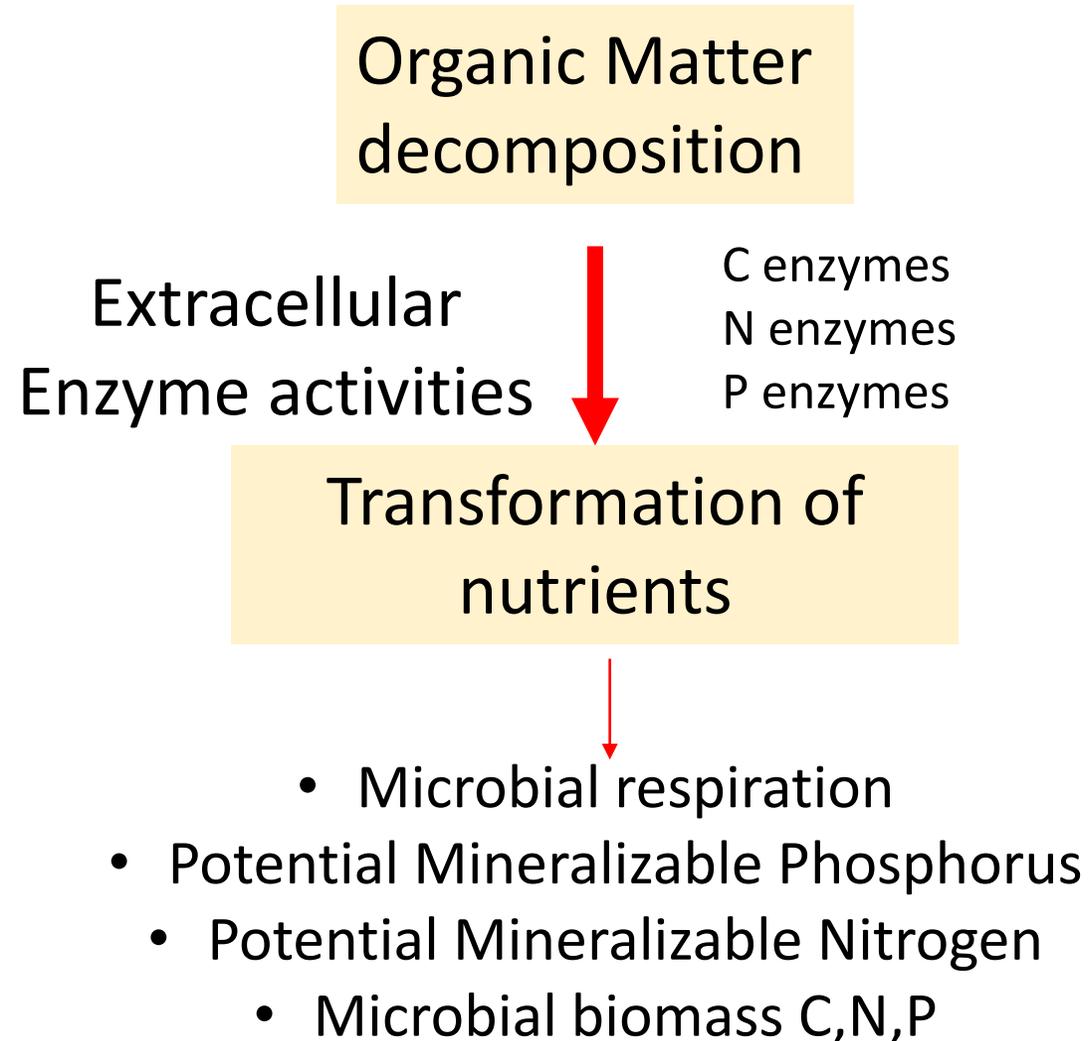
Anaerobic zone

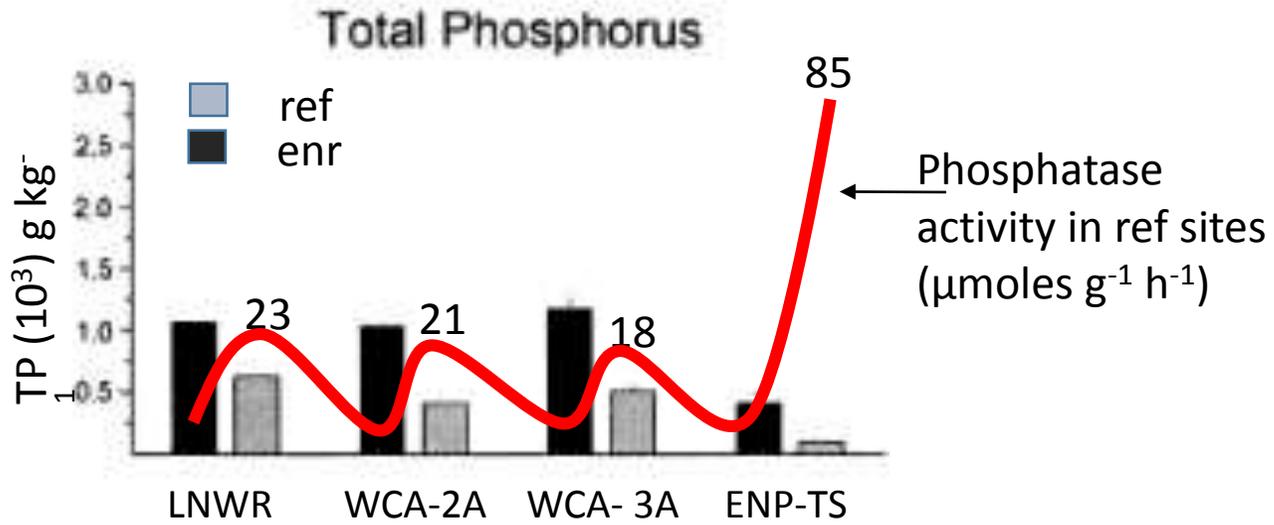
Facultative or obligate anaerobic bacteria Low available C, alternate electron acceptors, lower biomass and activity



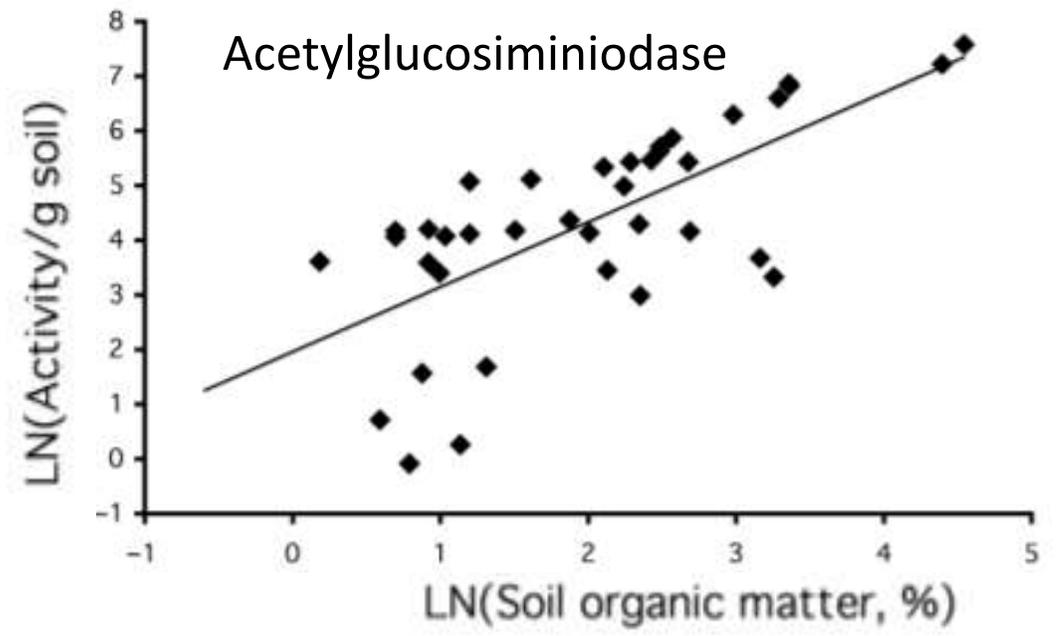
# Nutrient availability and enzyme activities

C:N:P	
3000:46:1	Plant litter
↓	
86:13:1	Soil organic matter
↓	
60:7:1	Microbial biomass

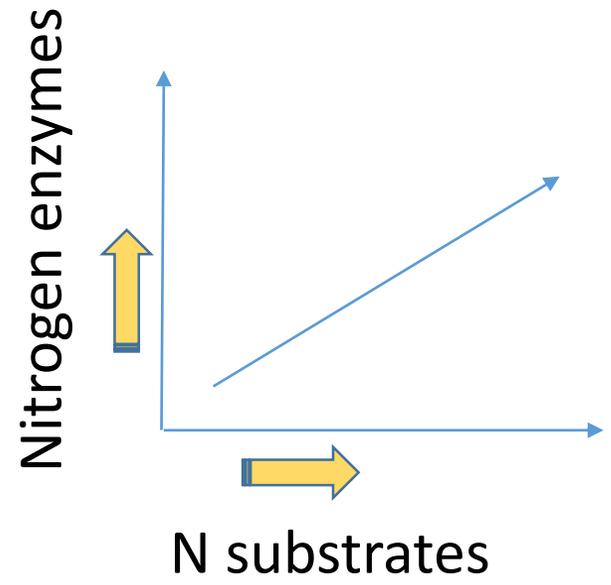
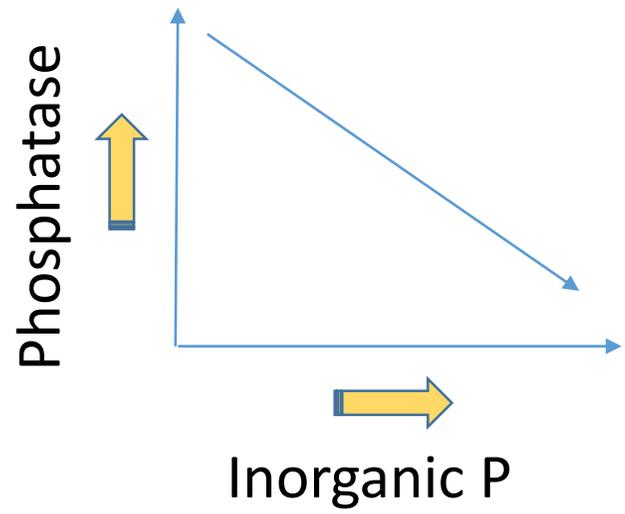




Modified from  
Penton and Newman, 2007 Biogeochem 84,83

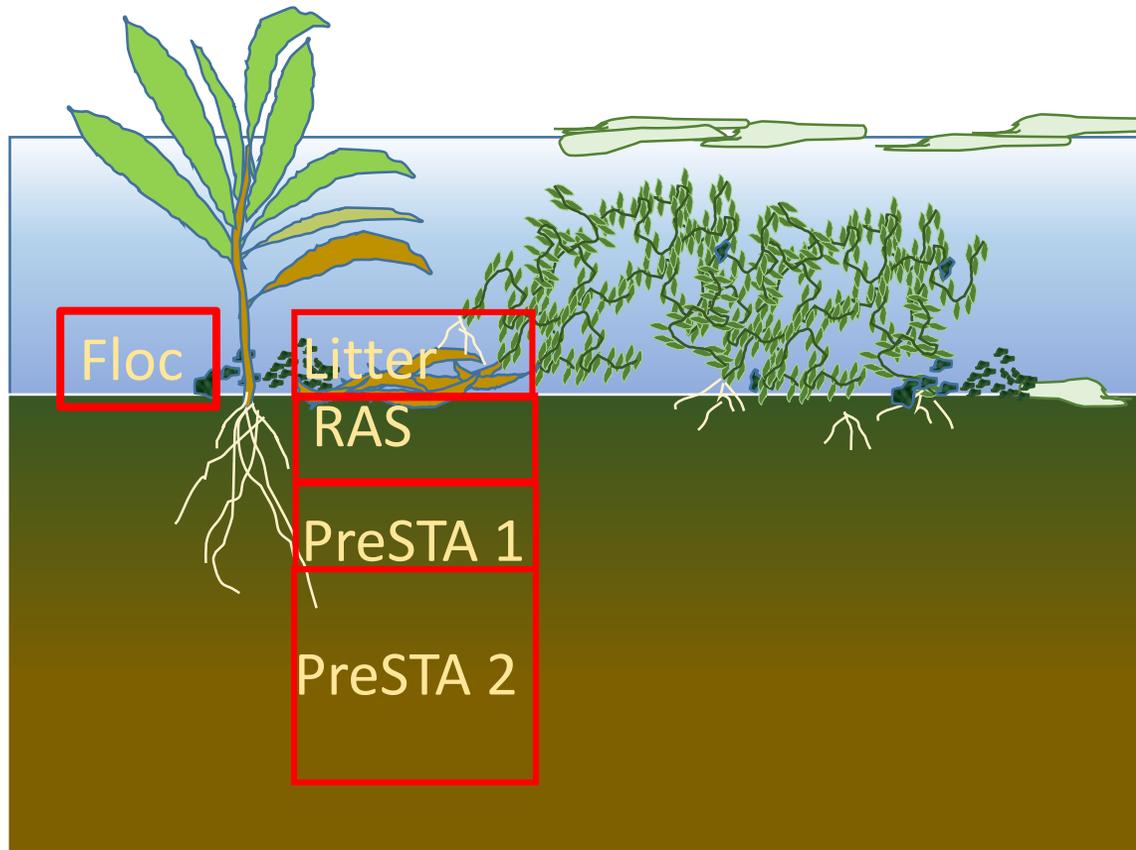


Sinsabaugh et al 2008 Ecol Lett



# Vegetation in the STAs

- Nutrient uptake- nutrient removal
- Source of C – litter, detritus, rhizosphere
- Allows microorganisms to colonize



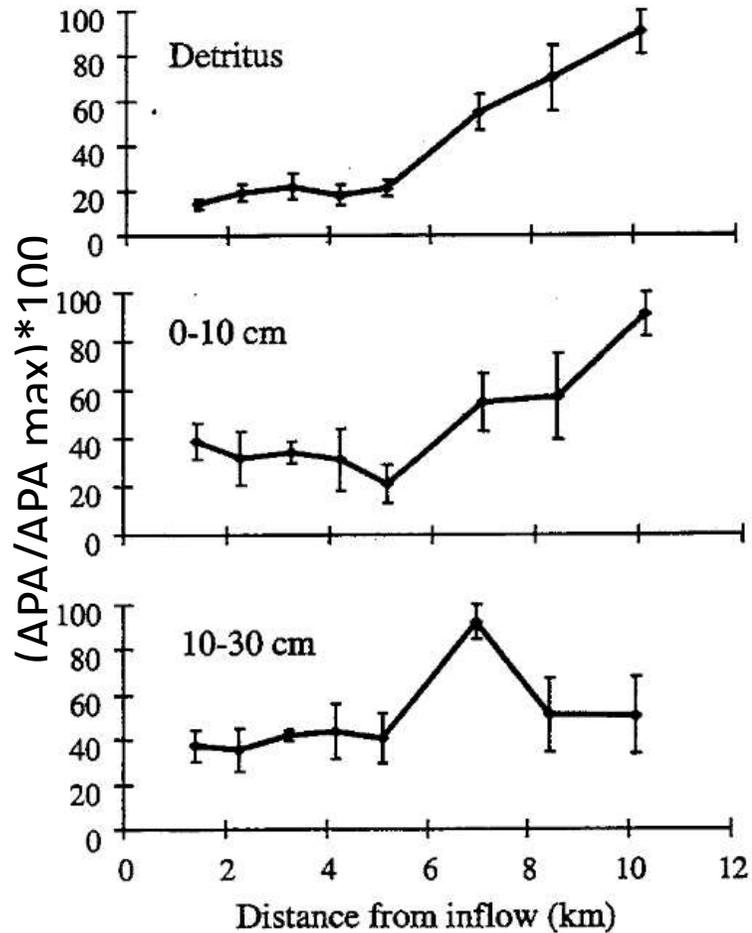
Emergent aquatic vegetation



Submerged aquatic vegetation

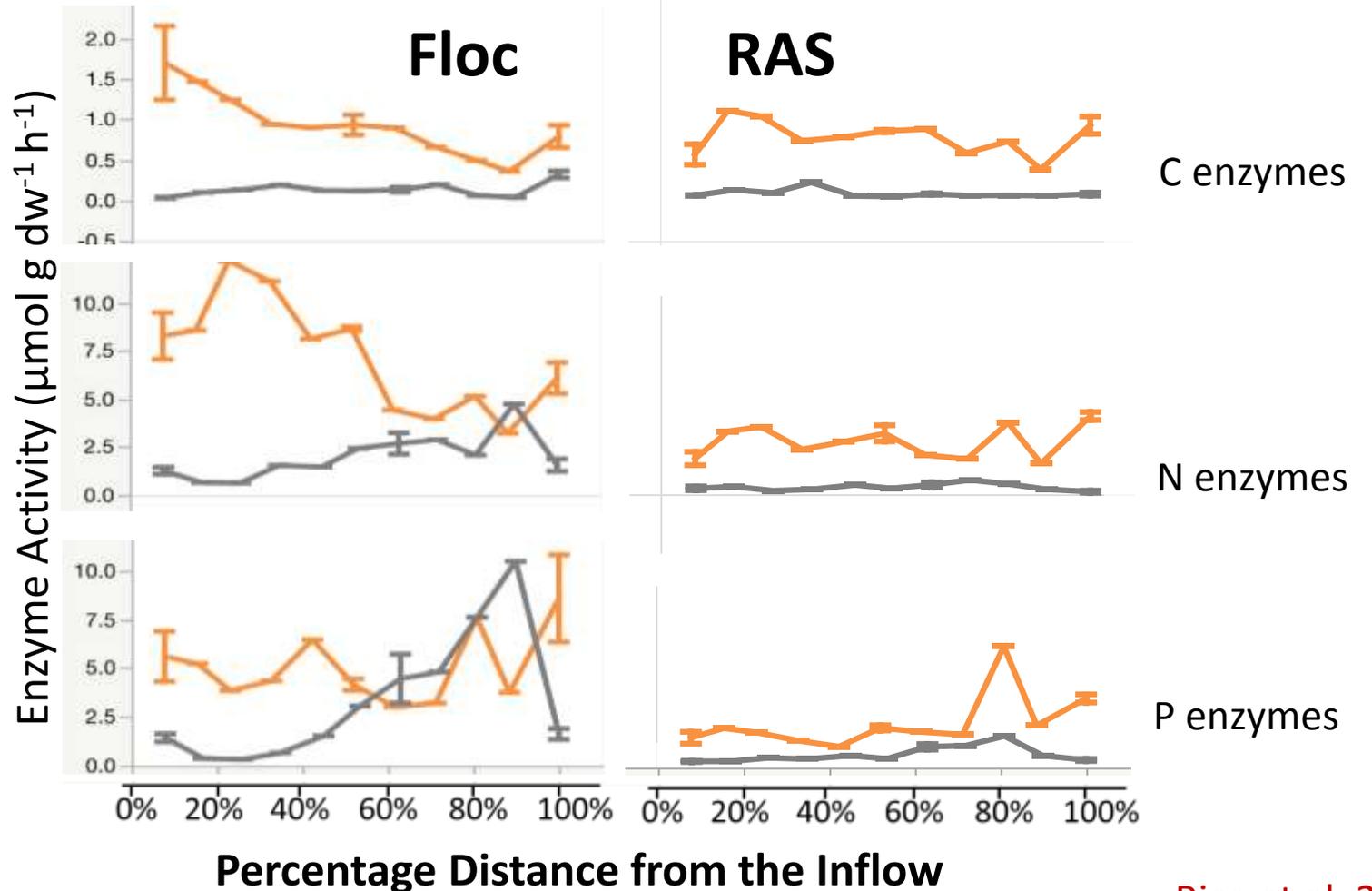
# Effects on enzyme activities

Soil depth



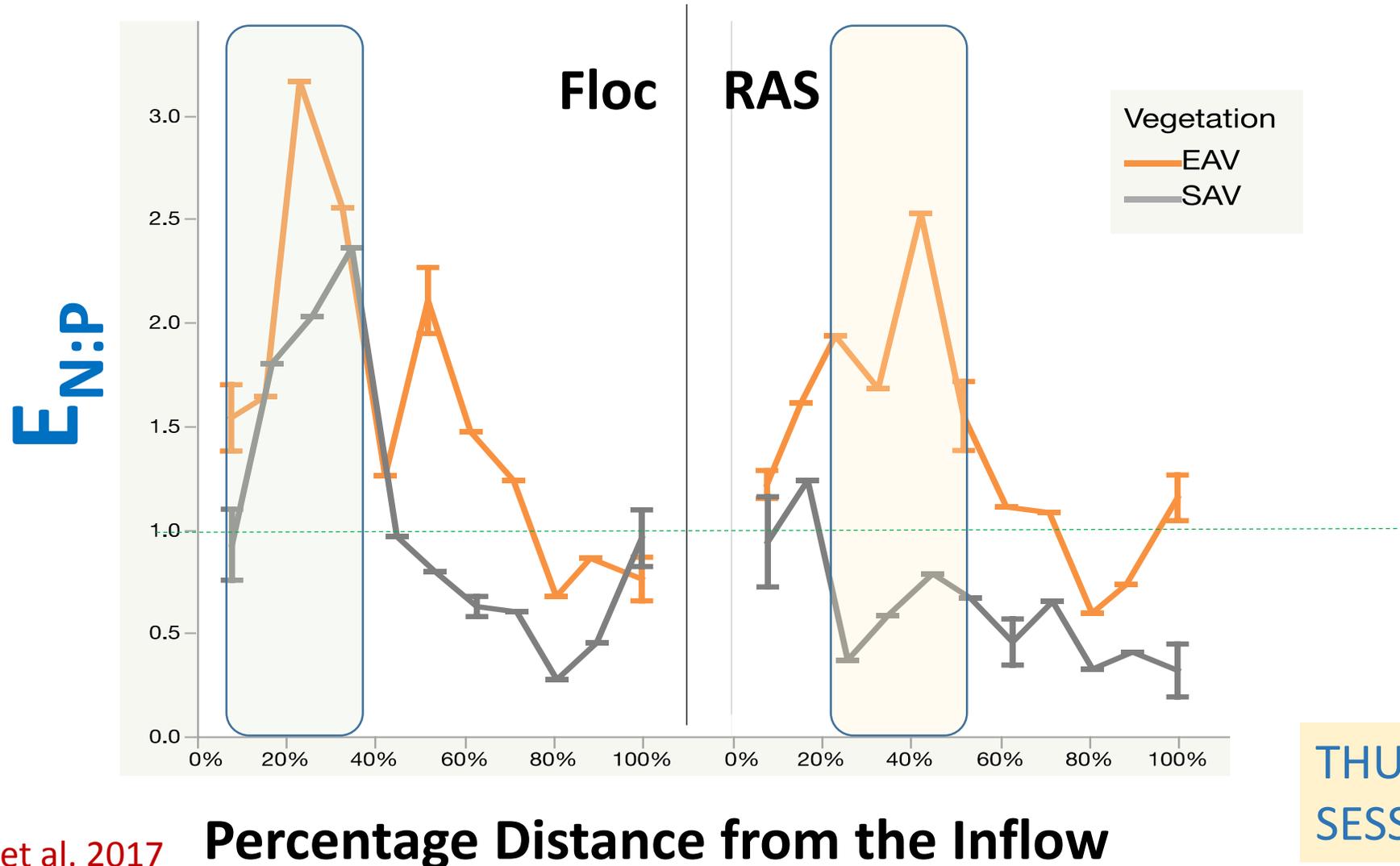
Vegetation type

Vegetation  
 — EAV  
 — SAV



# Vegetation Effects on Microbial Enzyme Activities in Soils of the Stormwater Treatment Areas (STAs)

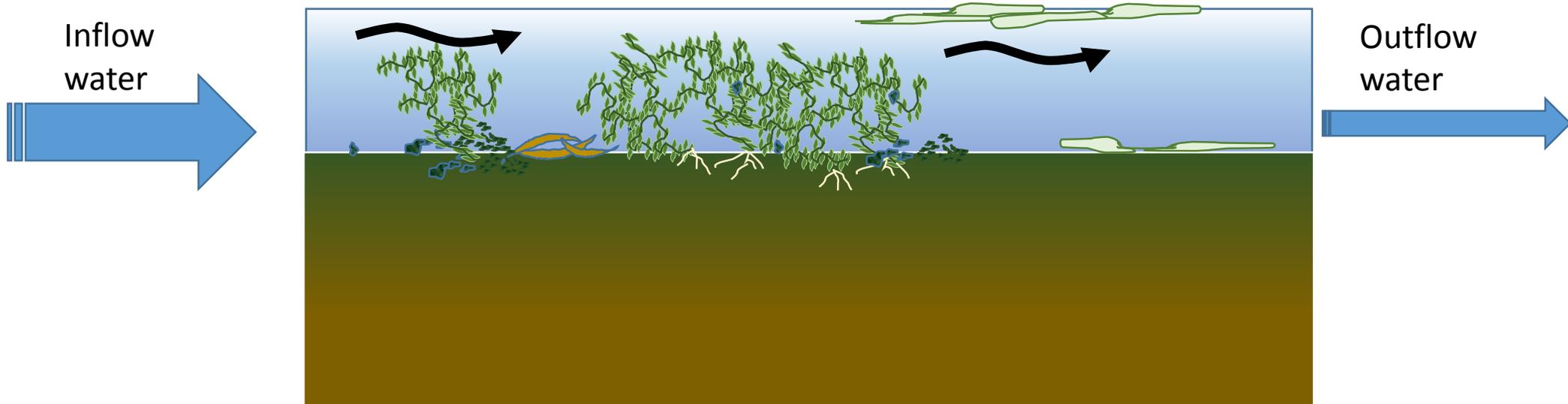
Rice et al.



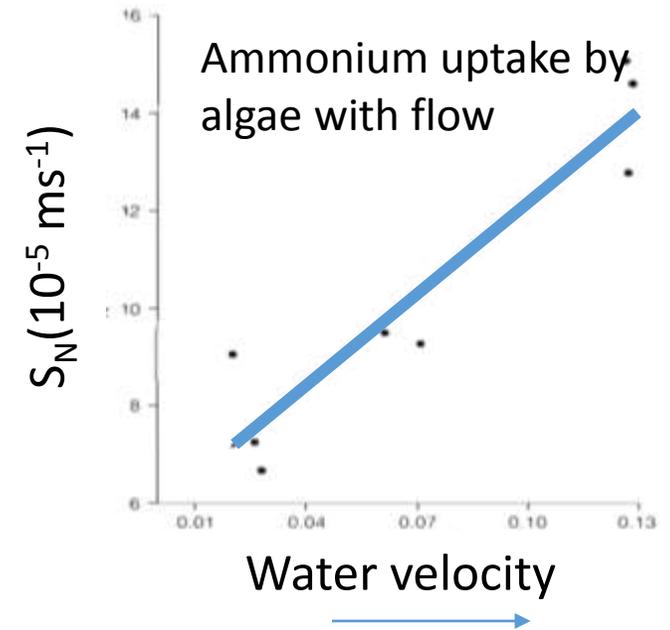
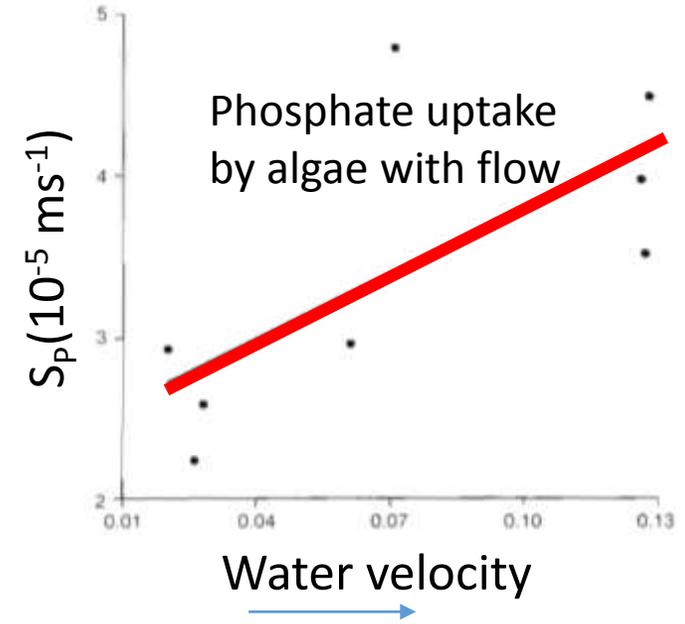
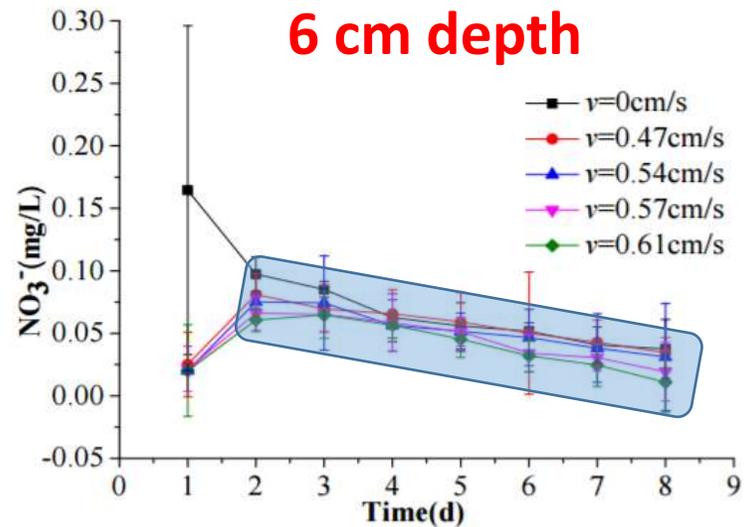
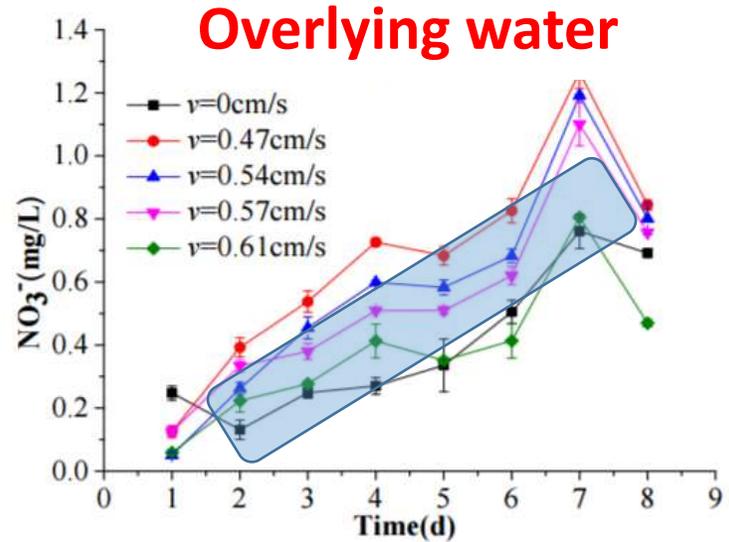
THURSDAY 8:00am–10:15am  
SESSION 2 POSTER # 66

# Does flow affect the microbial nutrient availability?

- Flow can alter advective processes
- Enhance exchanges between reactive zones
- Upstream affects the downstream
- River continuum concept

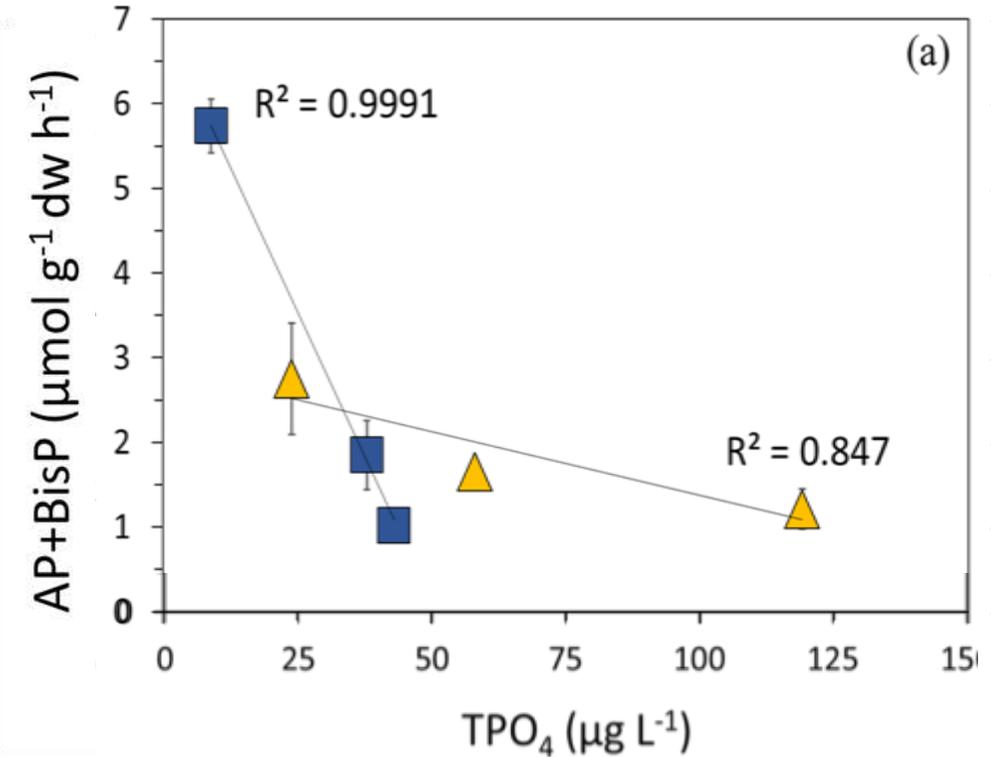
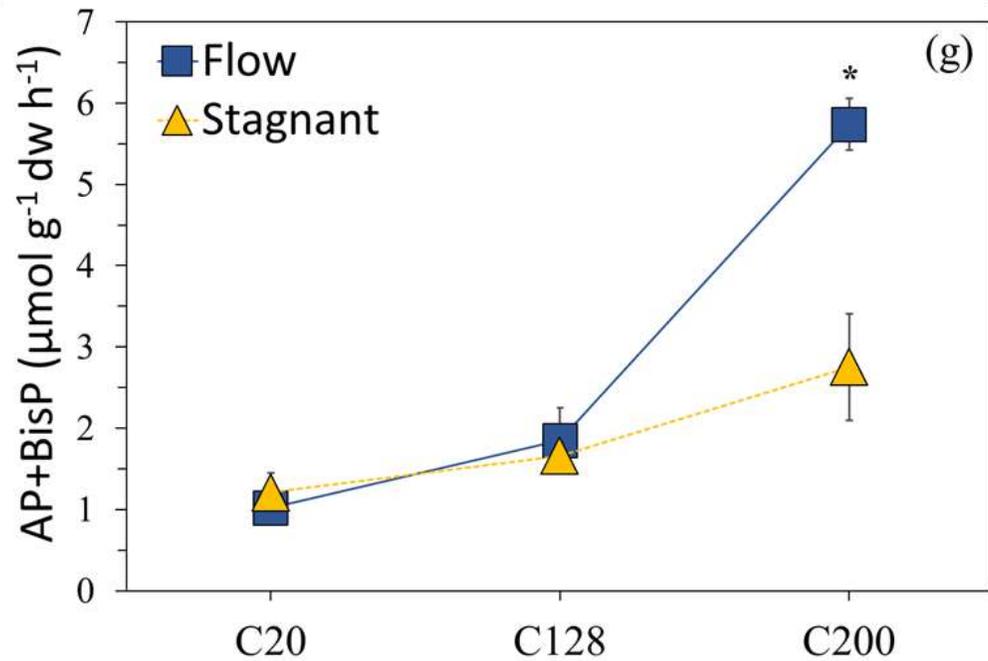


# Flow effects



# Effects of Flow on Enzyme Activity in the Everglades Stormwater Treatment Areas (STAs)

Baker et al.



# Future Directions

- Other components (periphyton, mats)
- Diel variations in activity (day/light, dark)
- Coupling with inorganic nutrients (e.g., P fractionation)
- Greenhouse gas emissions

# Acknowledgement and Collaboration

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## **South Florida Water Management District**

Odi Villapando, Jill King, Kathy Pietro