

# Influence of Hydrologic Flow on Benthic Microbial Enzyme Activity in Everglades Stormwater Treatment Areas (STAs)

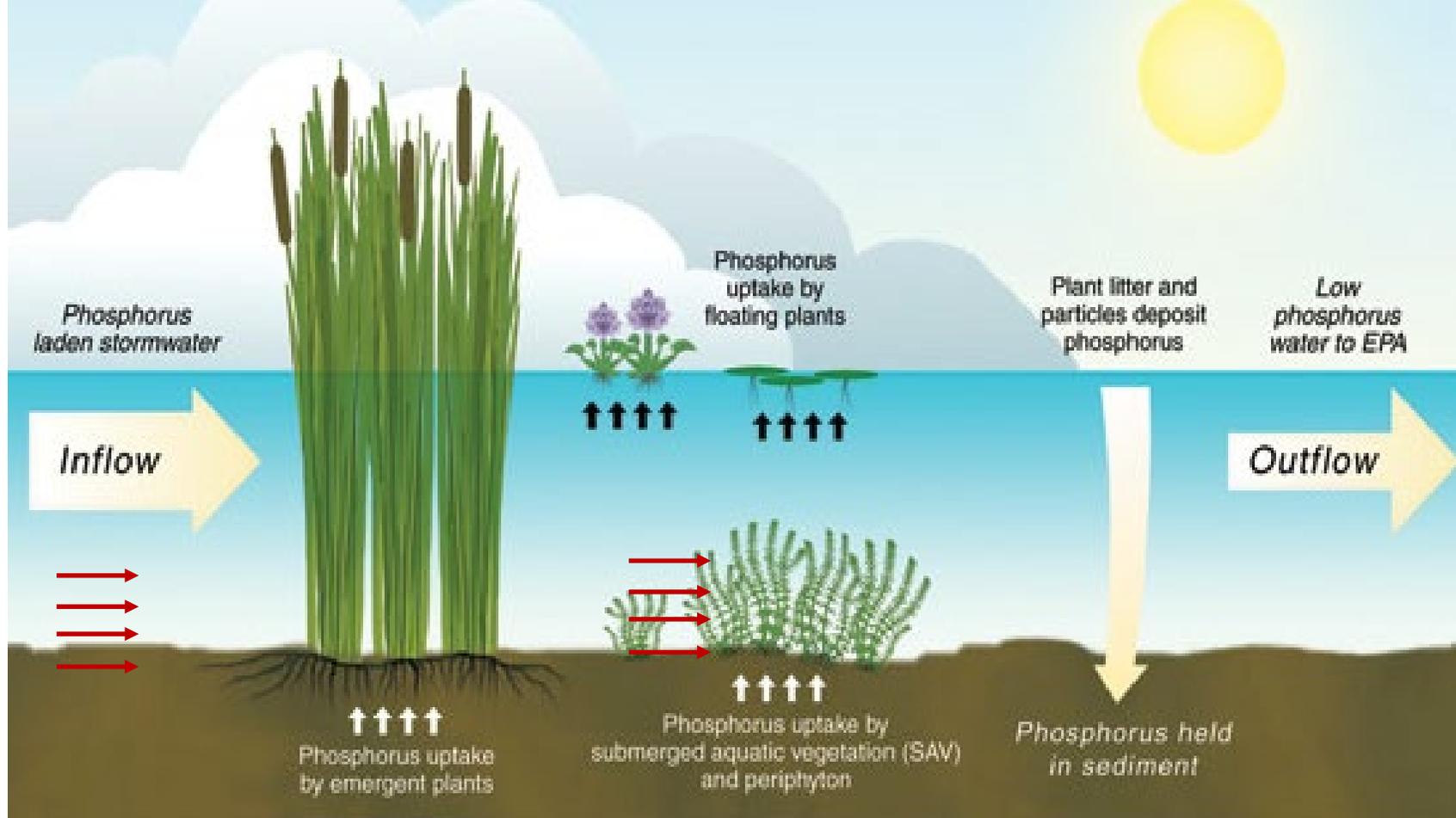


**UF | IFAS**  
UNIVERSITY of FLORIDA



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### Flowing condition (Flow or No Flow)

- Bring in sediment (change C, N and P availability)
- Create nutrient gradients along transect path (inflow and outflow)
- Change water column depth
- Physically perturb the system

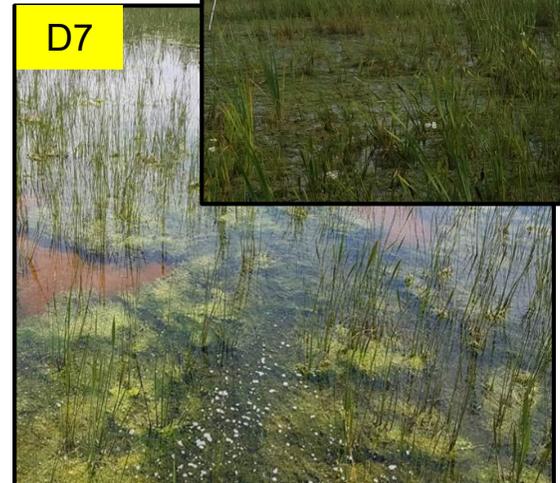
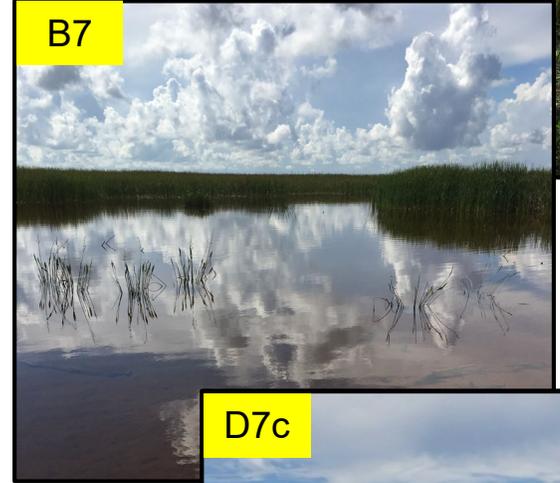
# Objectives

**Objective 1:** Assess the effect of hydrologic flow on microbial abundance and activities in detritus (floc) layer along transect sites (inflow and outflow) in SAV and EAV system.

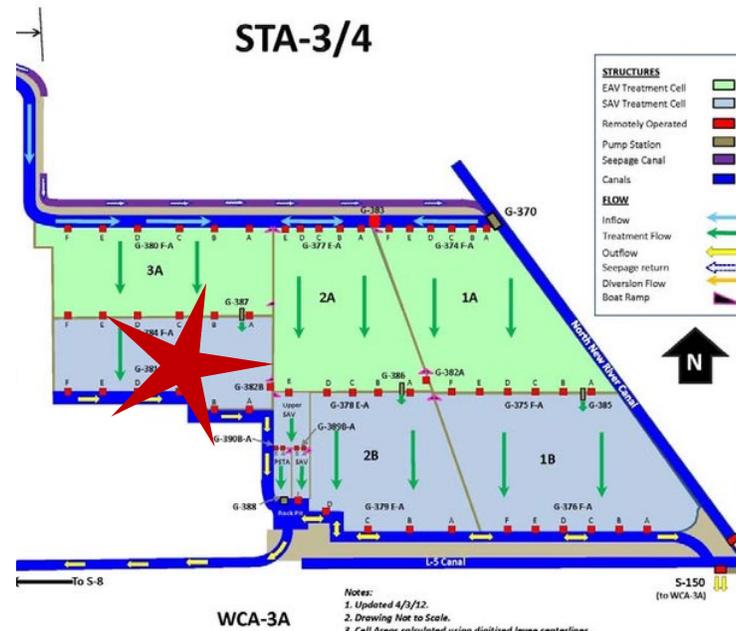
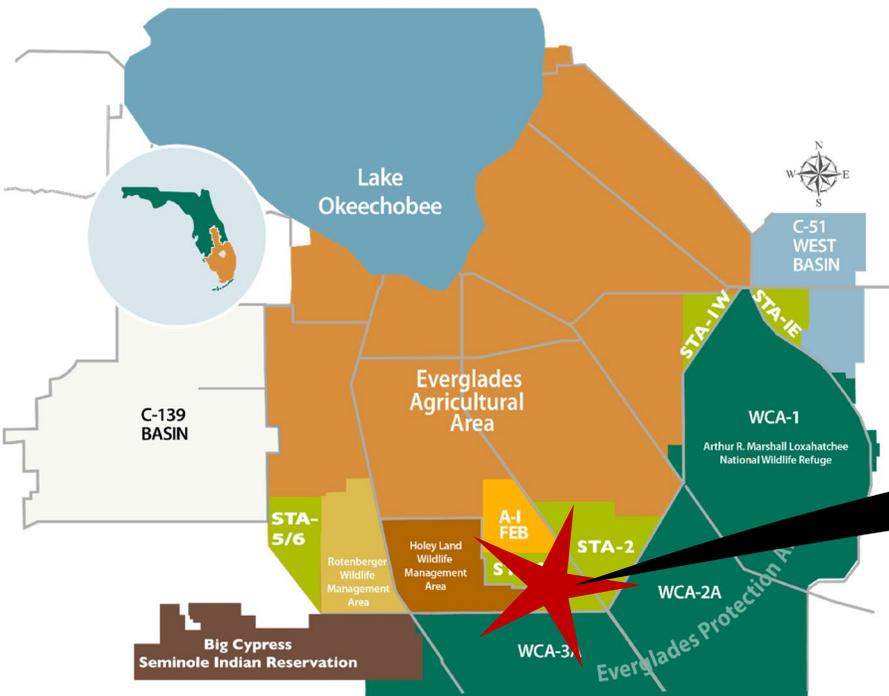
**Objective 2:** Investigate the relationship among microbial stoichiometries impacted by flow condition, transect sites and vegetation type

**Ho:** There is no change in microbial abundance and activities with flow conditions.

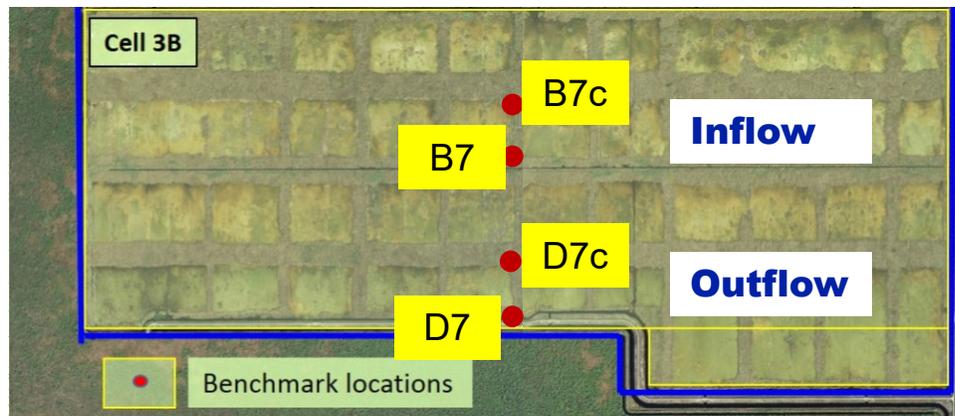
**Ho:** There is no effect of flow on microbial stoichiometries along the transect and vegetation.



# Study Area

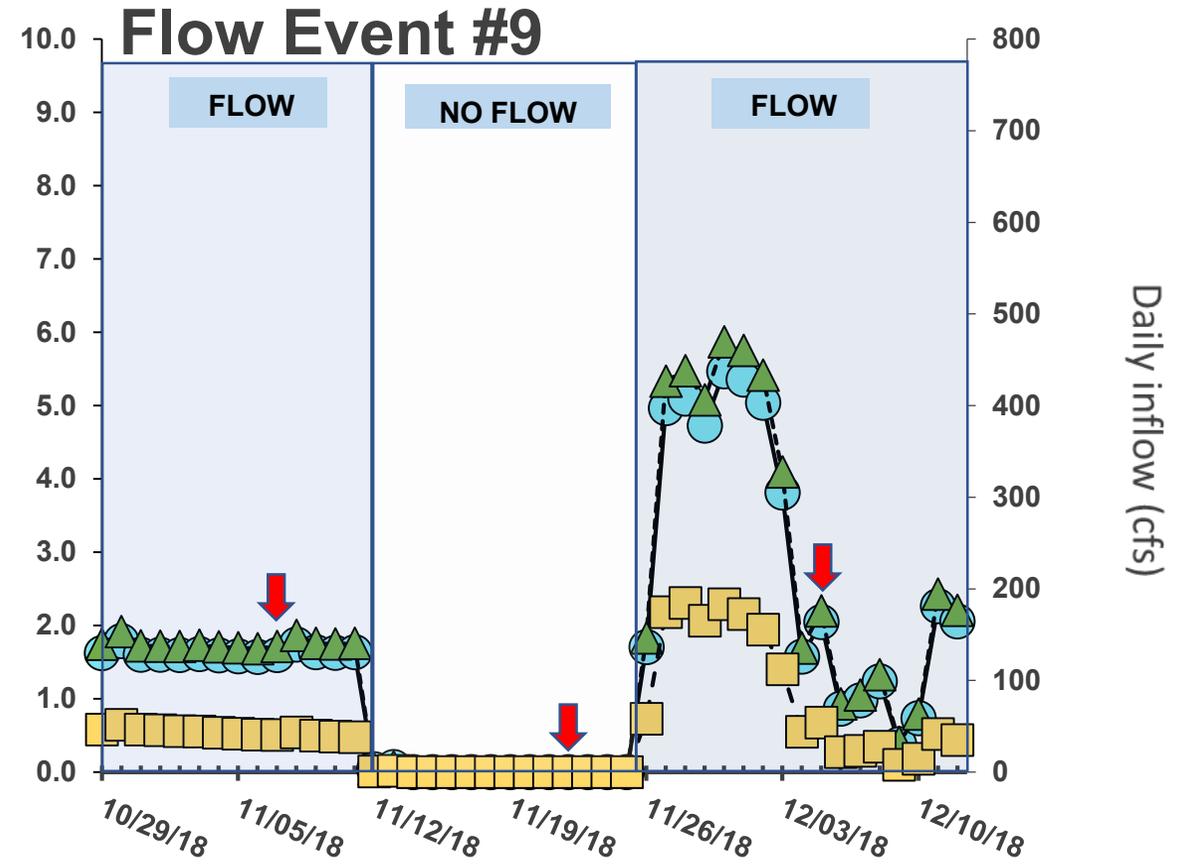
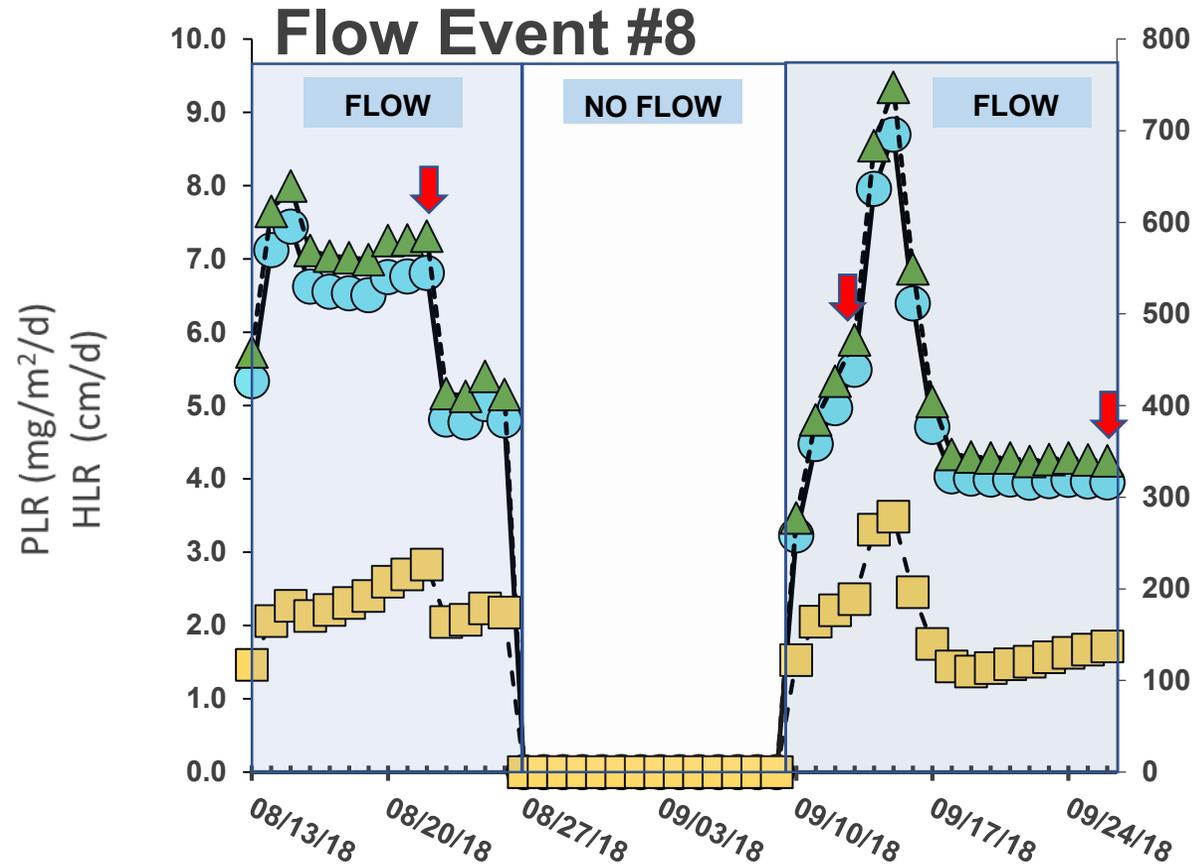


**SAV  
(B7 & D7)**



**EAV  
(B7c & D7c)**

# Flow Events



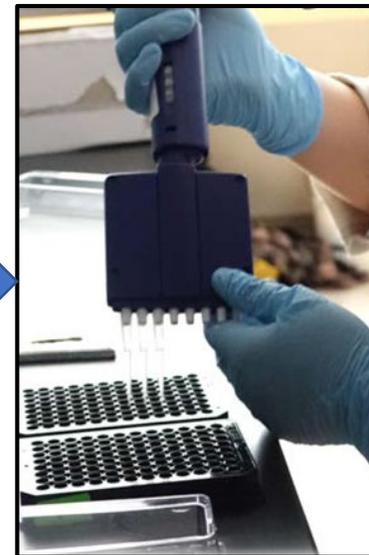
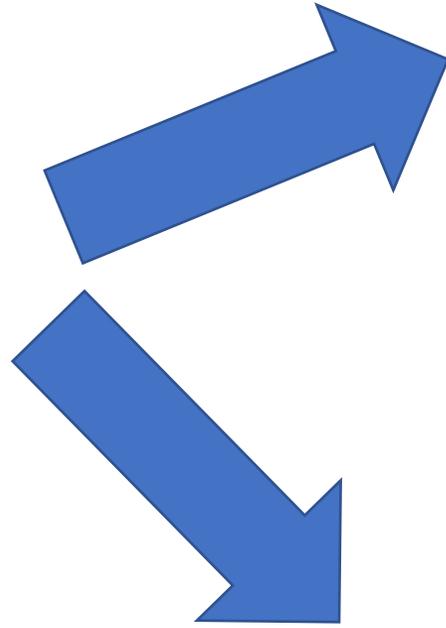
Sampling dates 

 Daily Inflow    HLR    PLR

# Methods



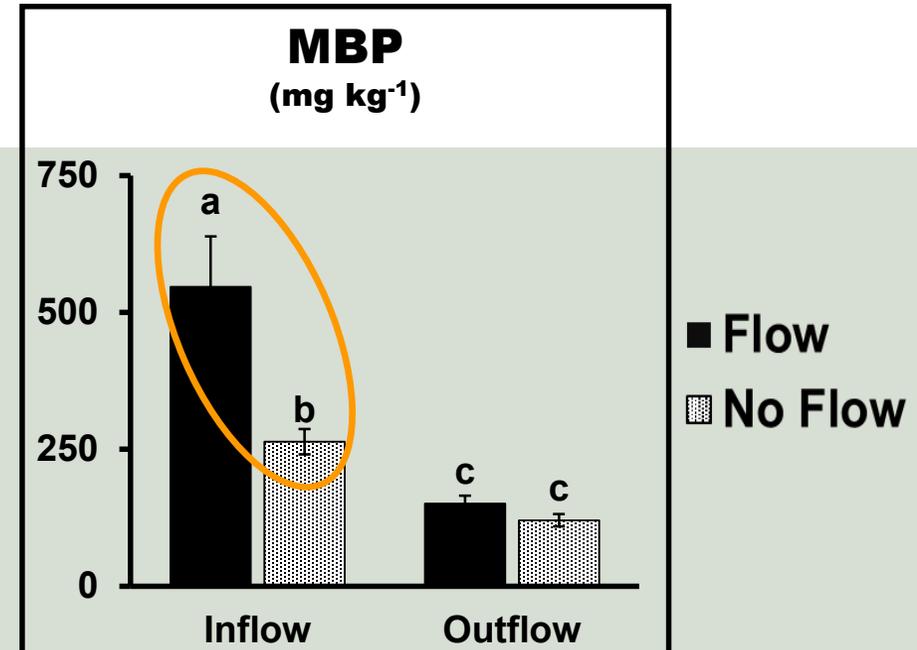
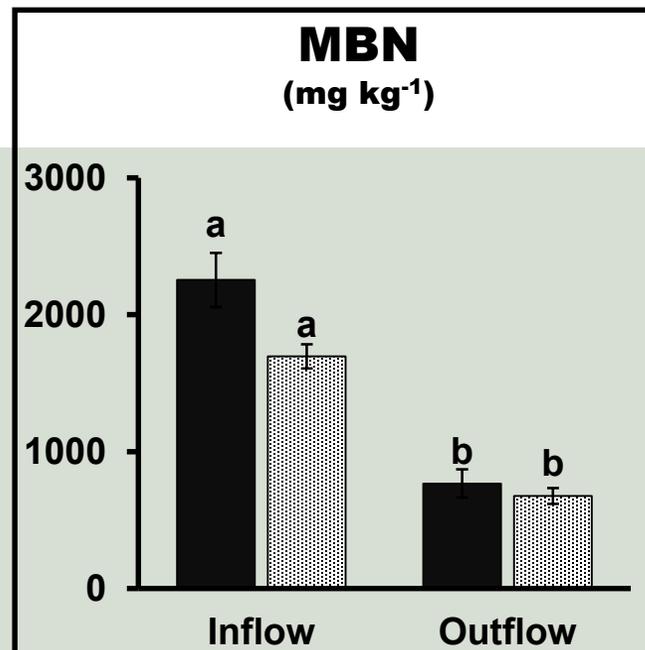
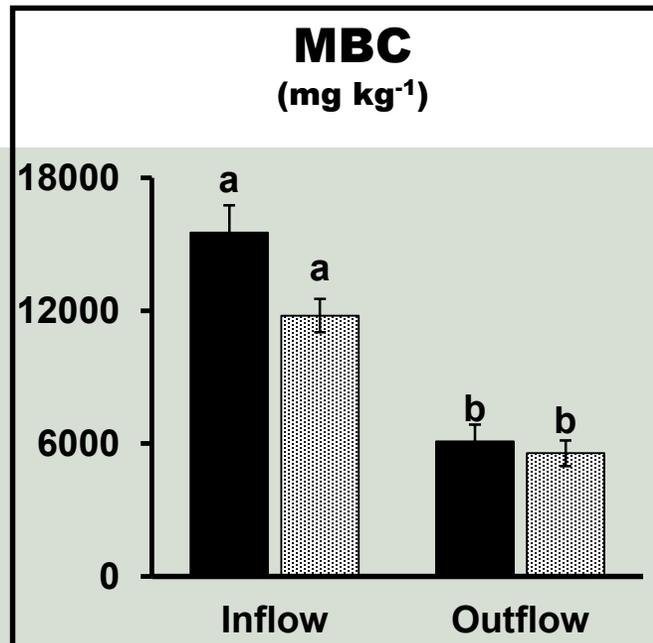
**MBC/N/P**  
Chloroform  
fumigation/Extraction



**Enzymes**  
**C\_Enz:**  $\beta$ -glucosidase  
**N\_Enz:** Leucine aminopeptidase/  
N-acetyl-glucosaminidase  
**P\_Enz:** Alkaline phosphatase/  
Diesterase

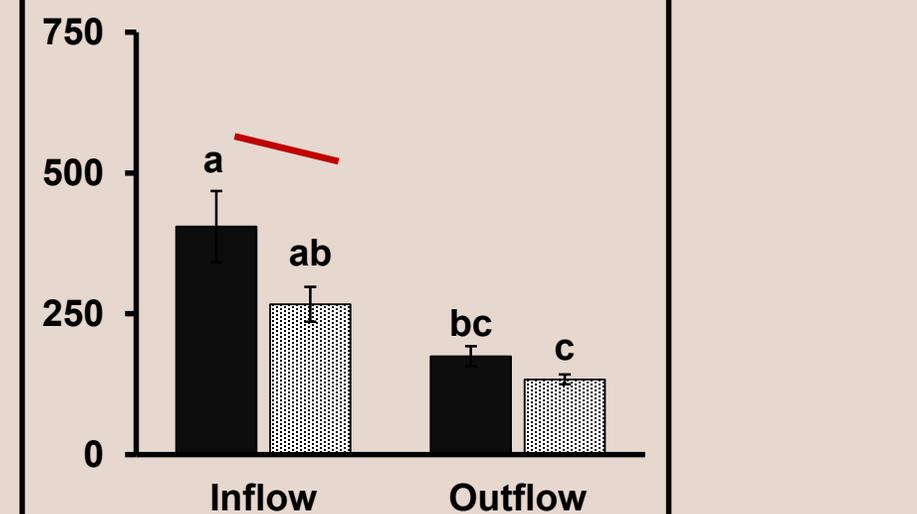
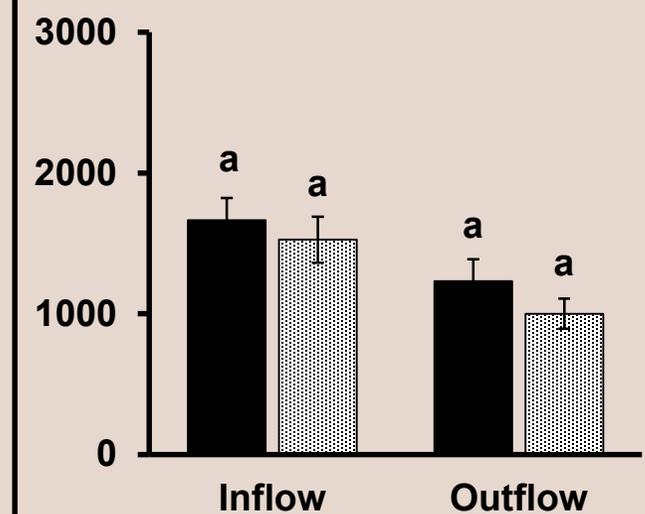
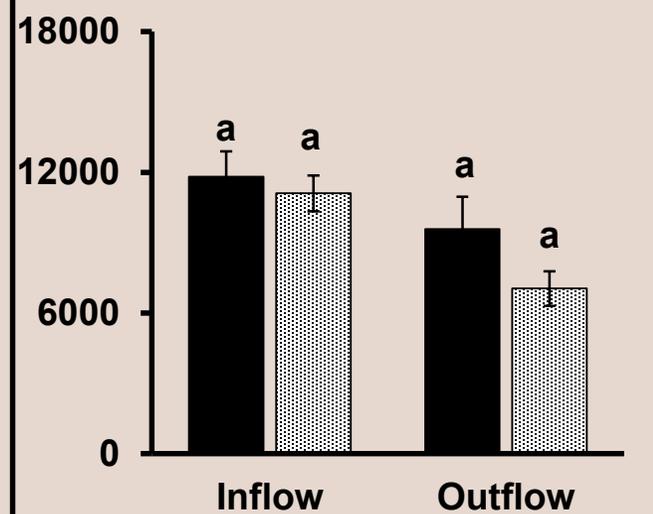
# Microbial Biomass Nutrient

EAV



■ Flow  
▨ No Flow

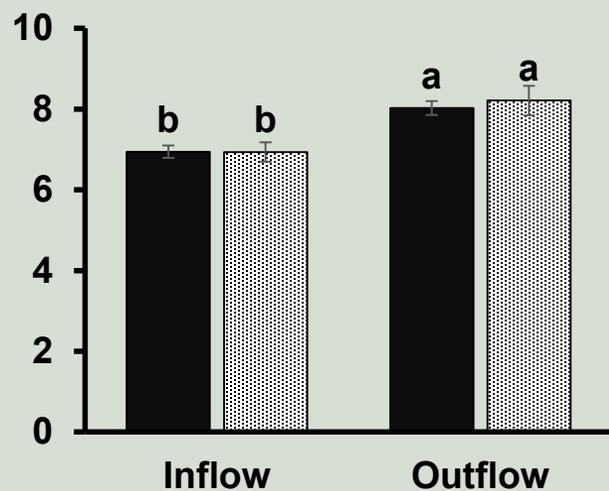
SAV



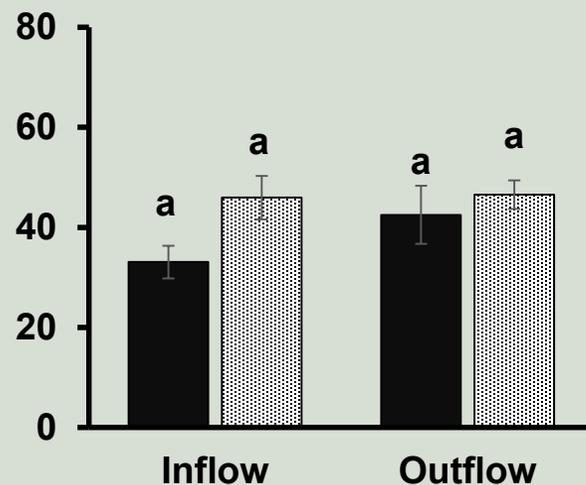
# Microbial Biomass Stoichiometry

EAV

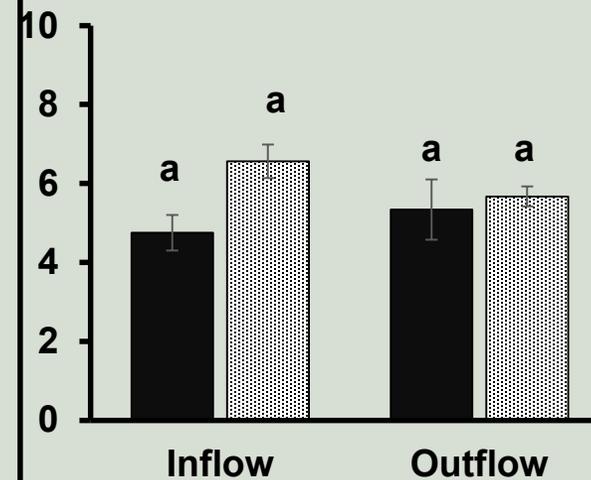
### MBC:MBN



### MBC:MBP

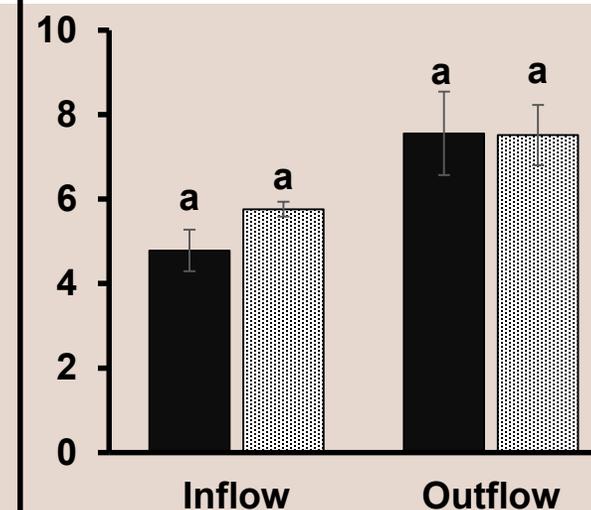
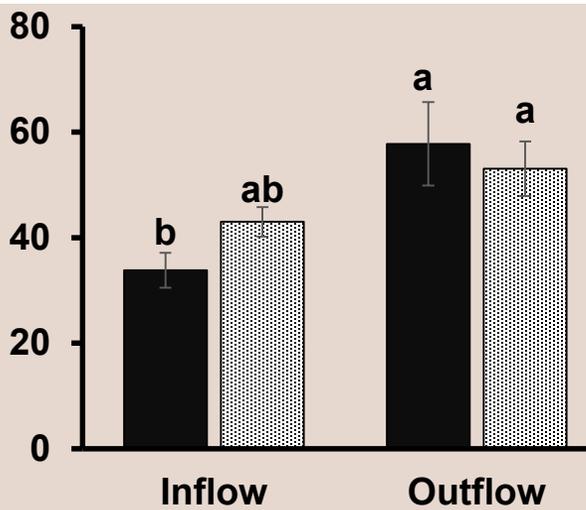
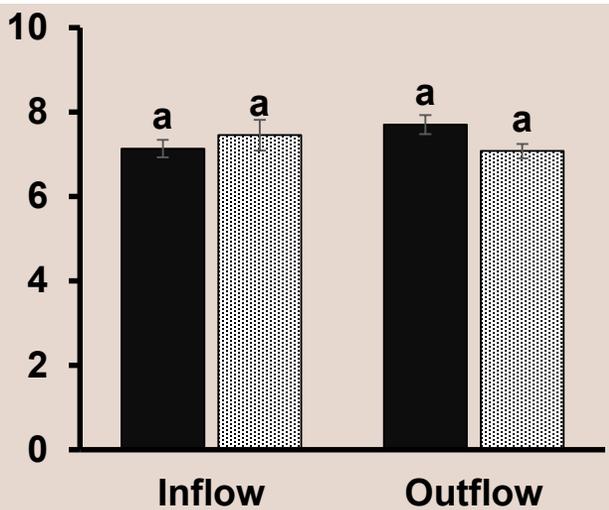


### MBN:MBP



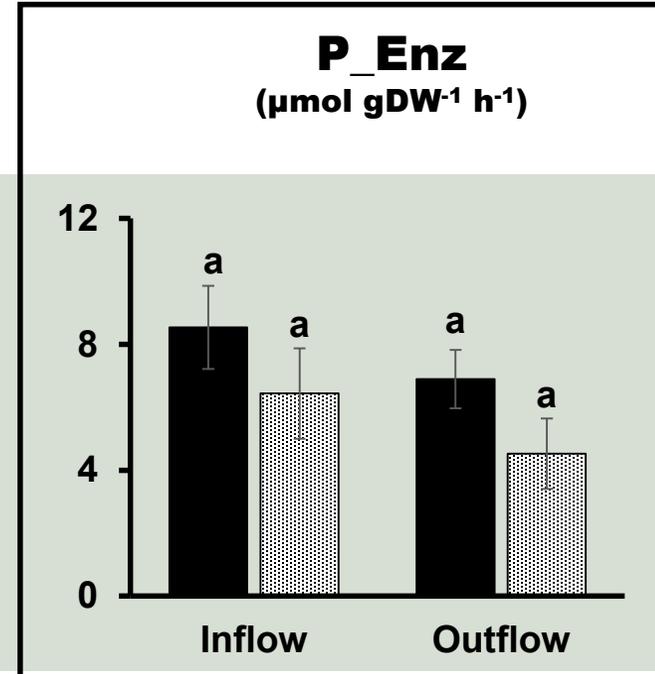
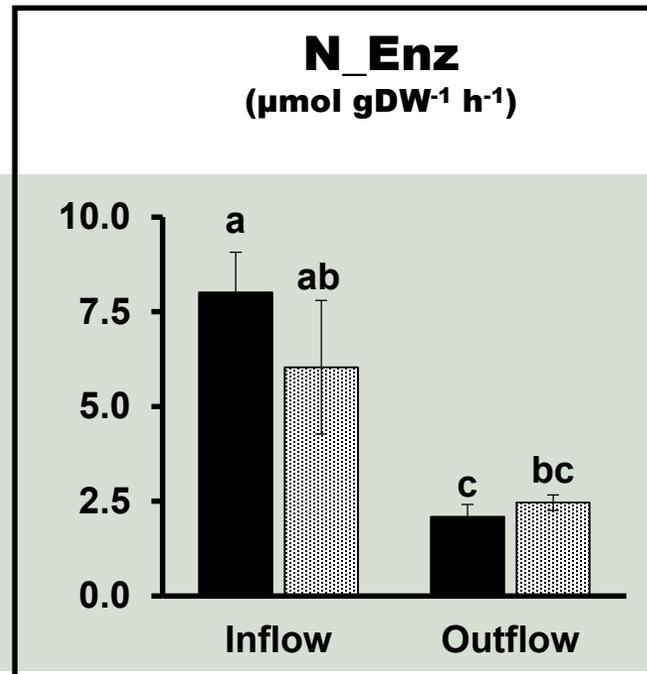
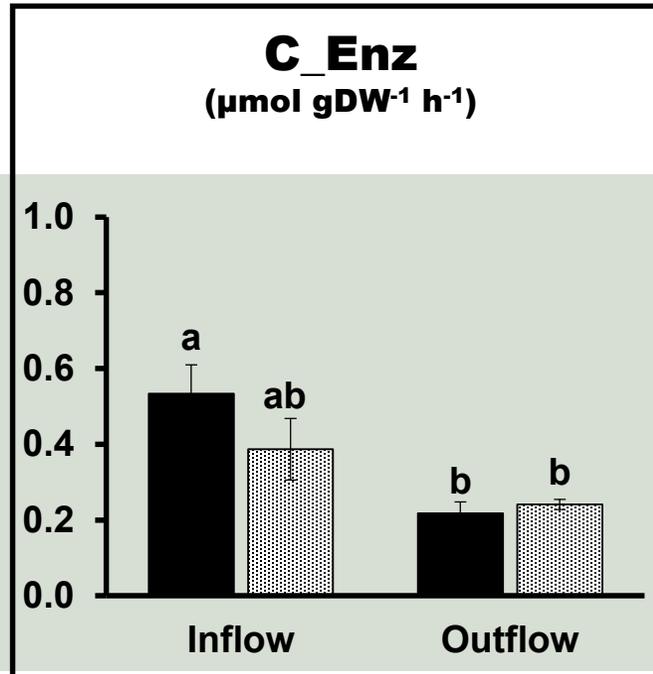
■ Flow  
▨ No Flow

SAV



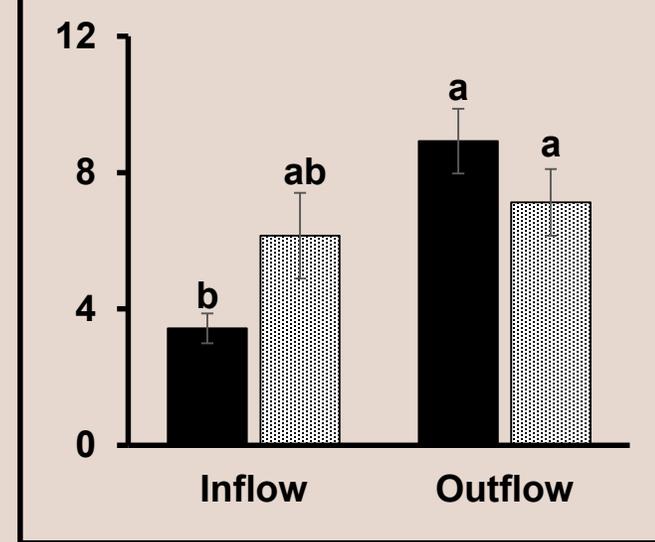
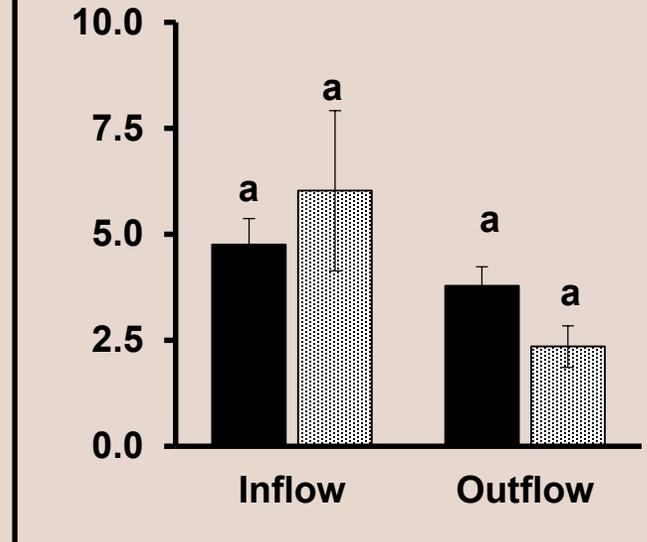
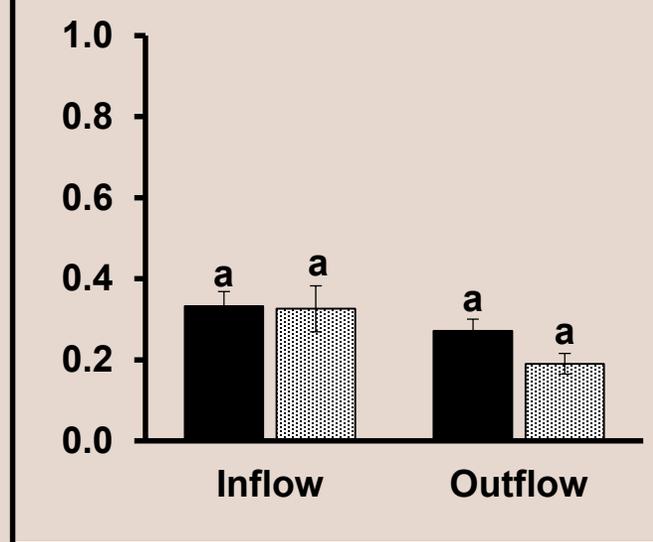
# Microbial Enzyme Activities

EAV



■ Flow  
▨ No Flow

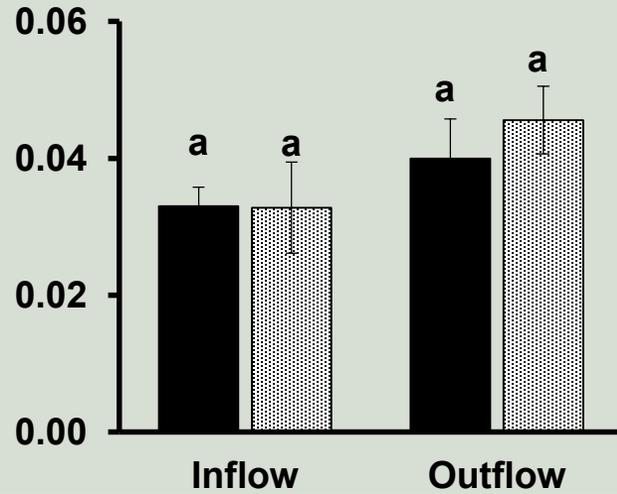
SAV



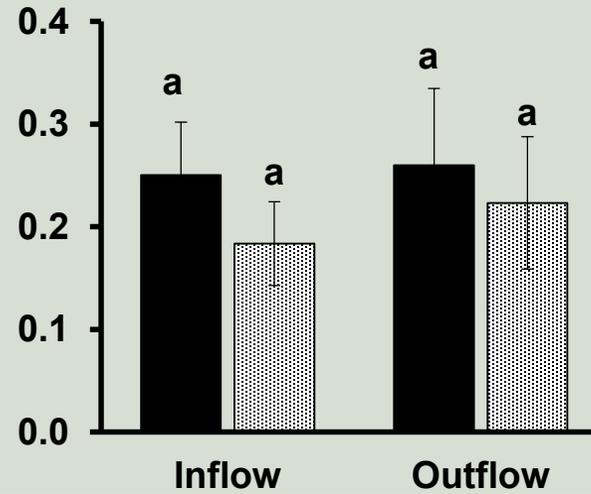
# Specific Enzyme Activities

EAV

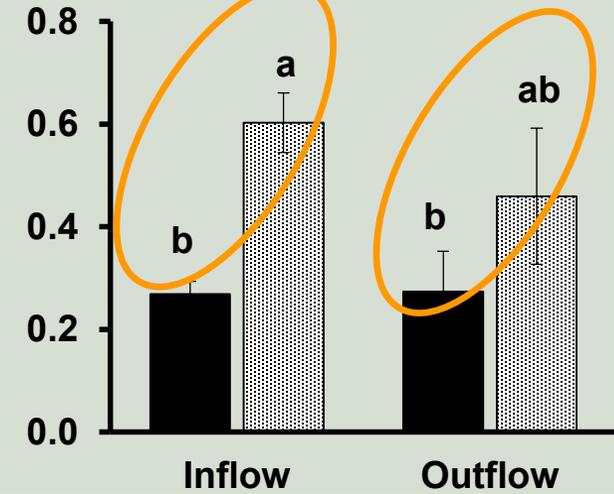
**Sp. C\_Enz**  
(mmol g MBC<sup>-1</sup> h<sup>-1</sup>)



**Sp. N\_Enz**  
(mmol g MBC<sup>-1</sup> h<sup>-1</sup>)

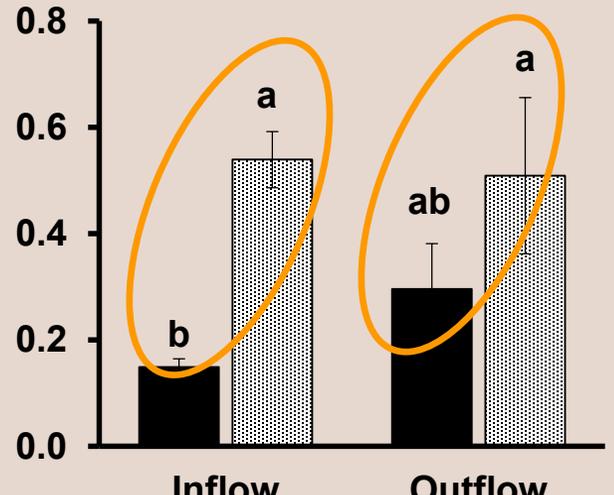
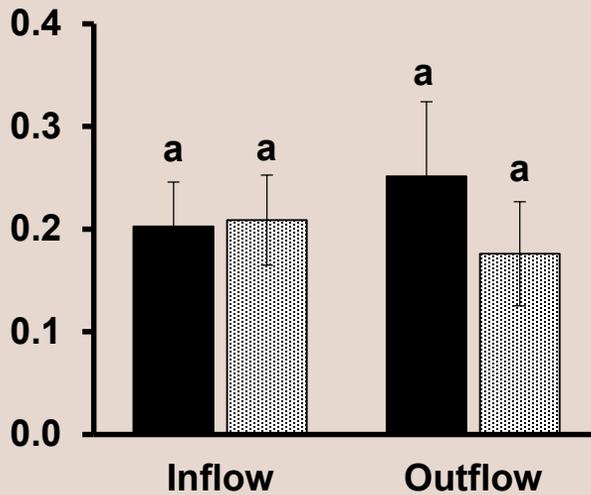
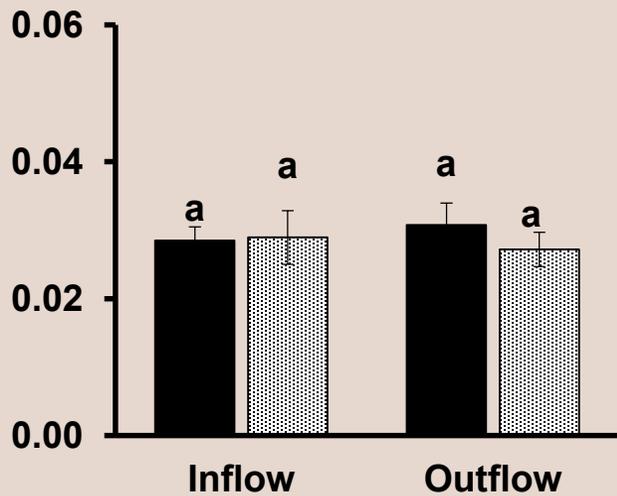


**Sp. P\_Enz**  
(mmol g MBC<sup>-1</sup> h<sup>-1</sup>)



■ Flow  
▨ No Flow

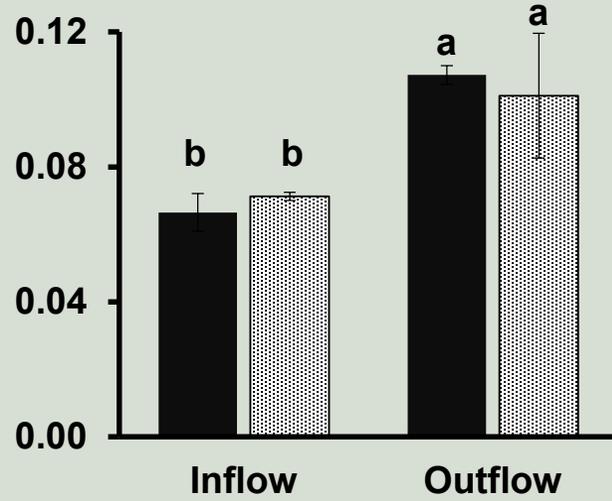
SAV



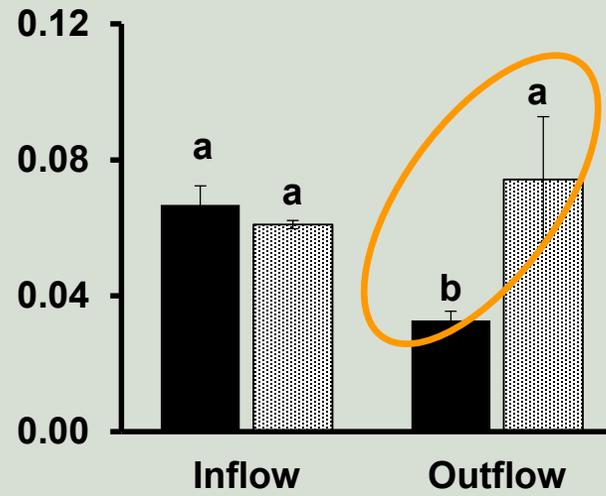
# Enzyme Activity Stoichiometry

EAV

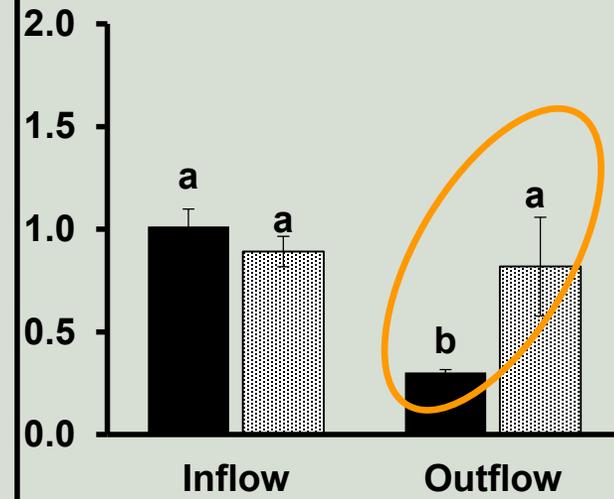
### C:N\_Enz



### C:P\_Enz

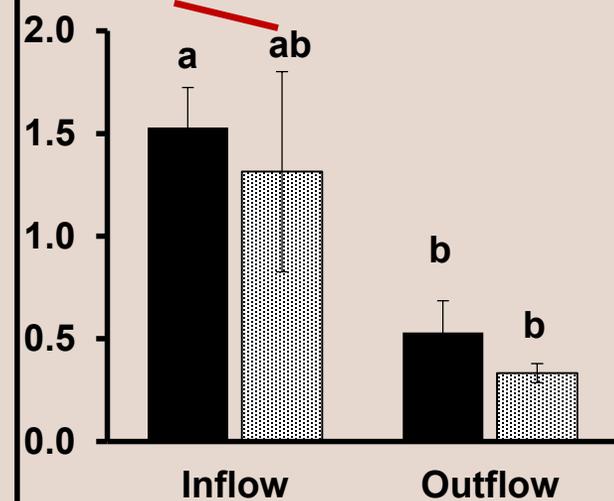
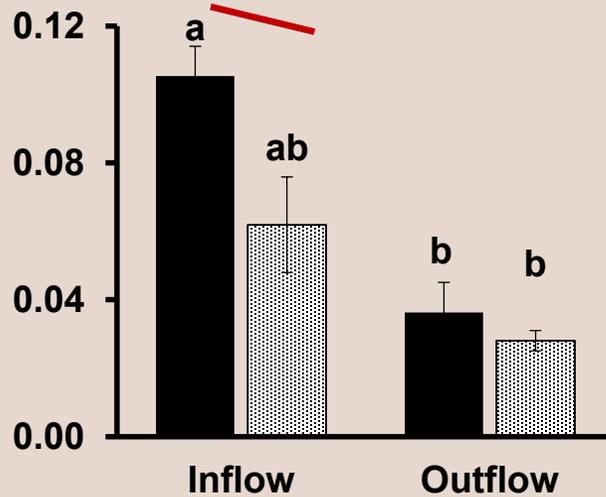
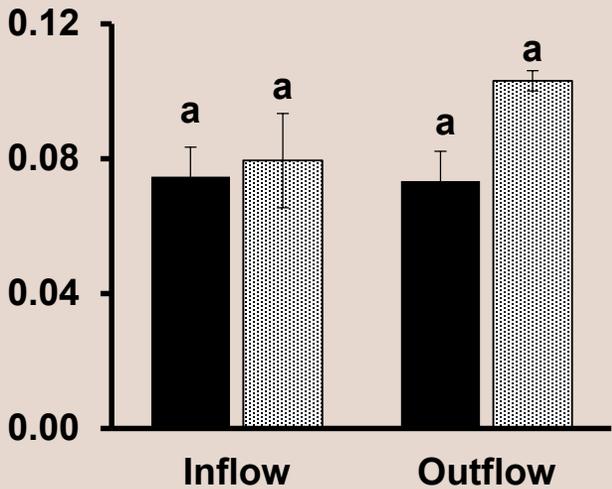


### N:P\_Enz



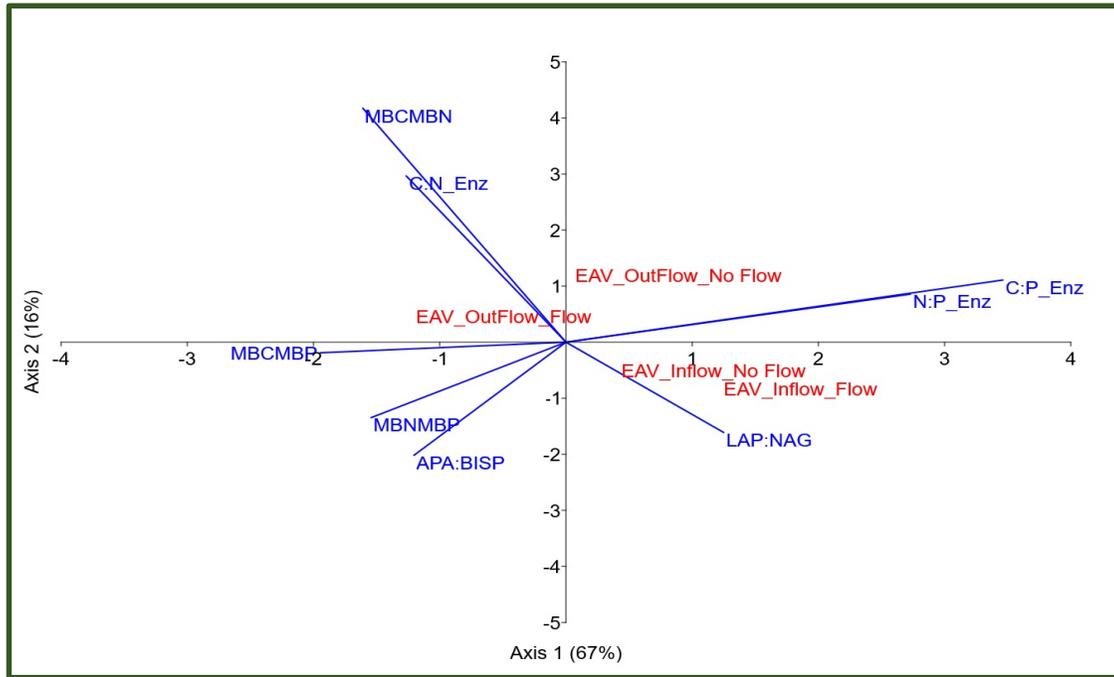
■ Flow  
▨ No Flow

SAV

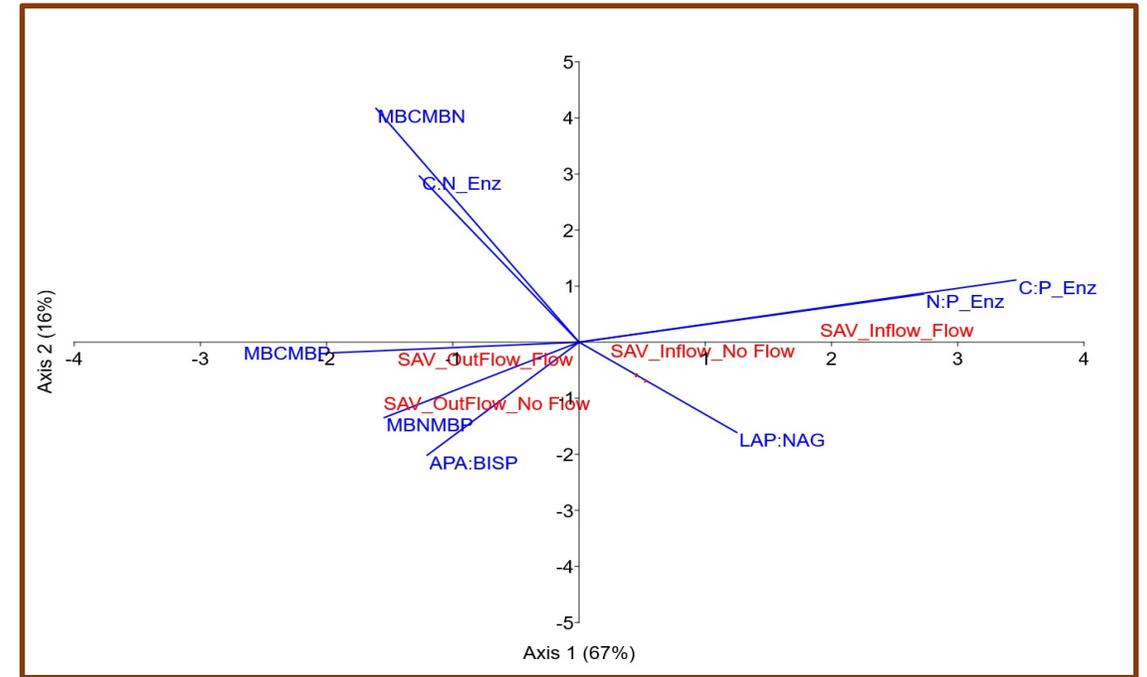


# Discriminate Analysis of Stoichiometric Relationships

## EAV

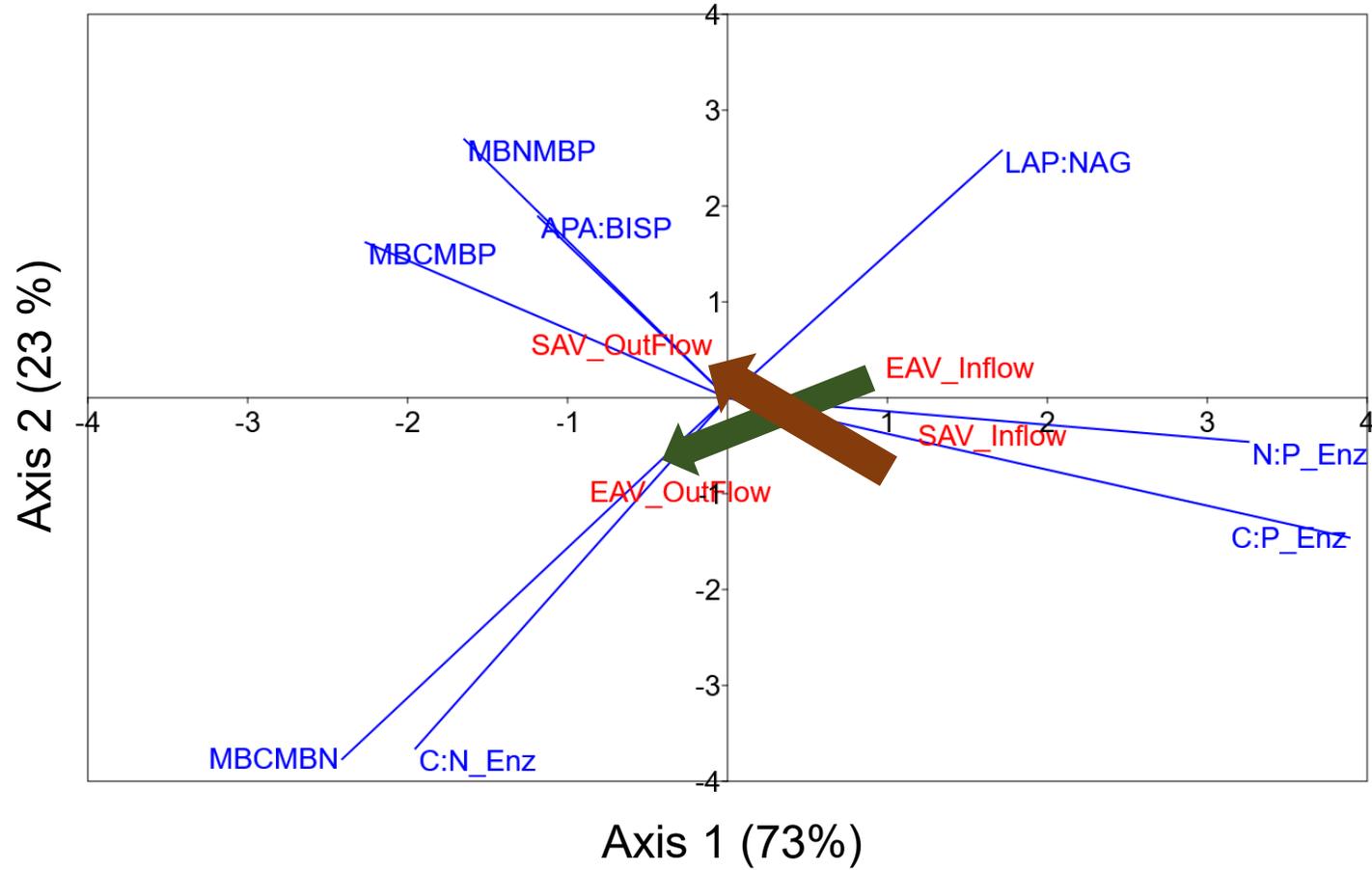


## SAV

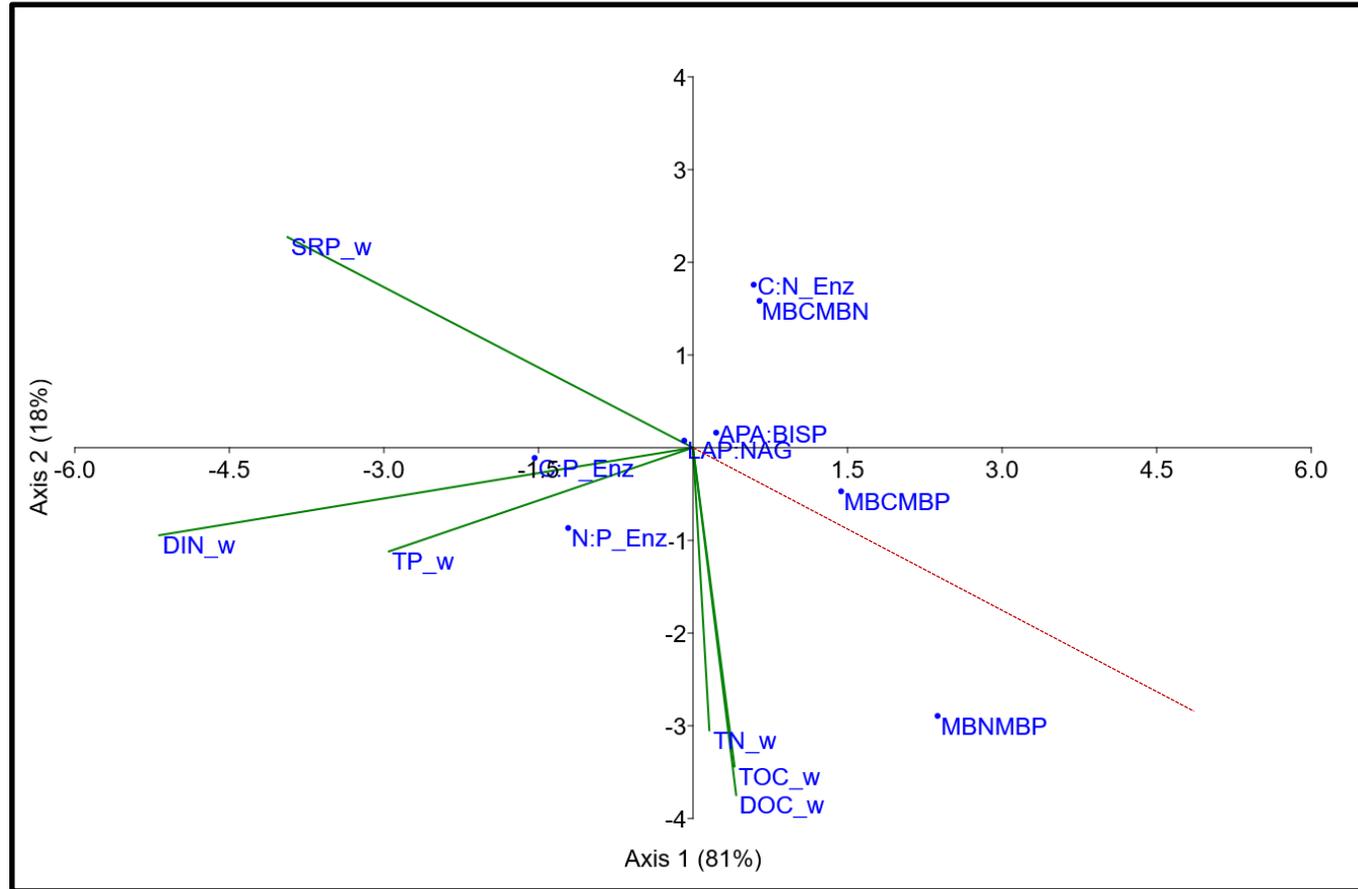


**Flowing conditions (Flow or No Flow) impacted microbial stoichiometries in EAV and SAV differently**

# Discriminate Analysis of Stoichiometric Relationships



# Water Chemistry & Microbial Stoichiometric Relationship

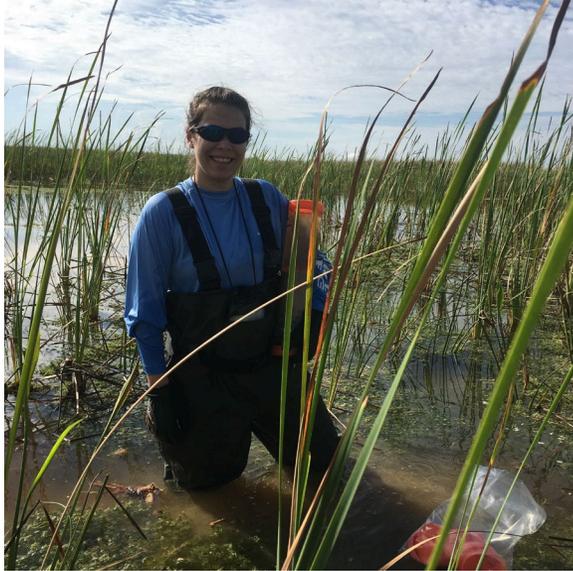


Axis	Eigen value	Variation explained (%)	<i>P</i>
1	0.002	81	0.001
2	0.0004	18	0.002

# Summary

- Flow appears to stimulate only microbial biomass P and specific P enzyme activity specially at inflow**
- Transect position having influence on microbial biomass and enzyme activities indicating P limitation at outflow**
- Discriminate analysis also indicated lower C/P or N/P enzyme activity at outflow position indicating greater P demand**
- Soluble reactive P in flow water dictates the microbial and enzyme stoichiometries related to N and P**

# Acknowledgement



## **UF Wetland Biogeochemistry Laboratory**

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