Effects of increased salinity and inundation on microbial processing of carbon and nutrients

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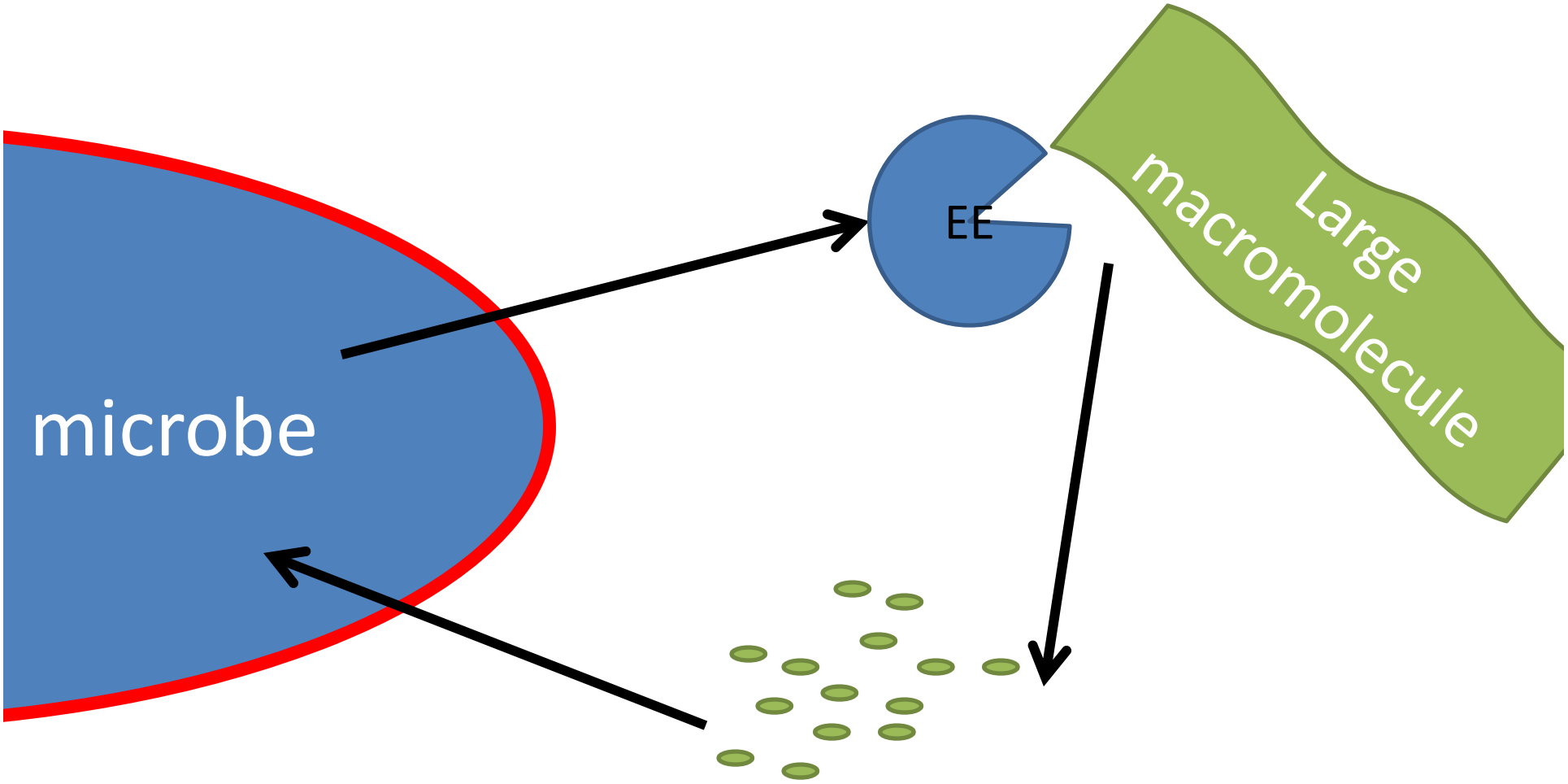
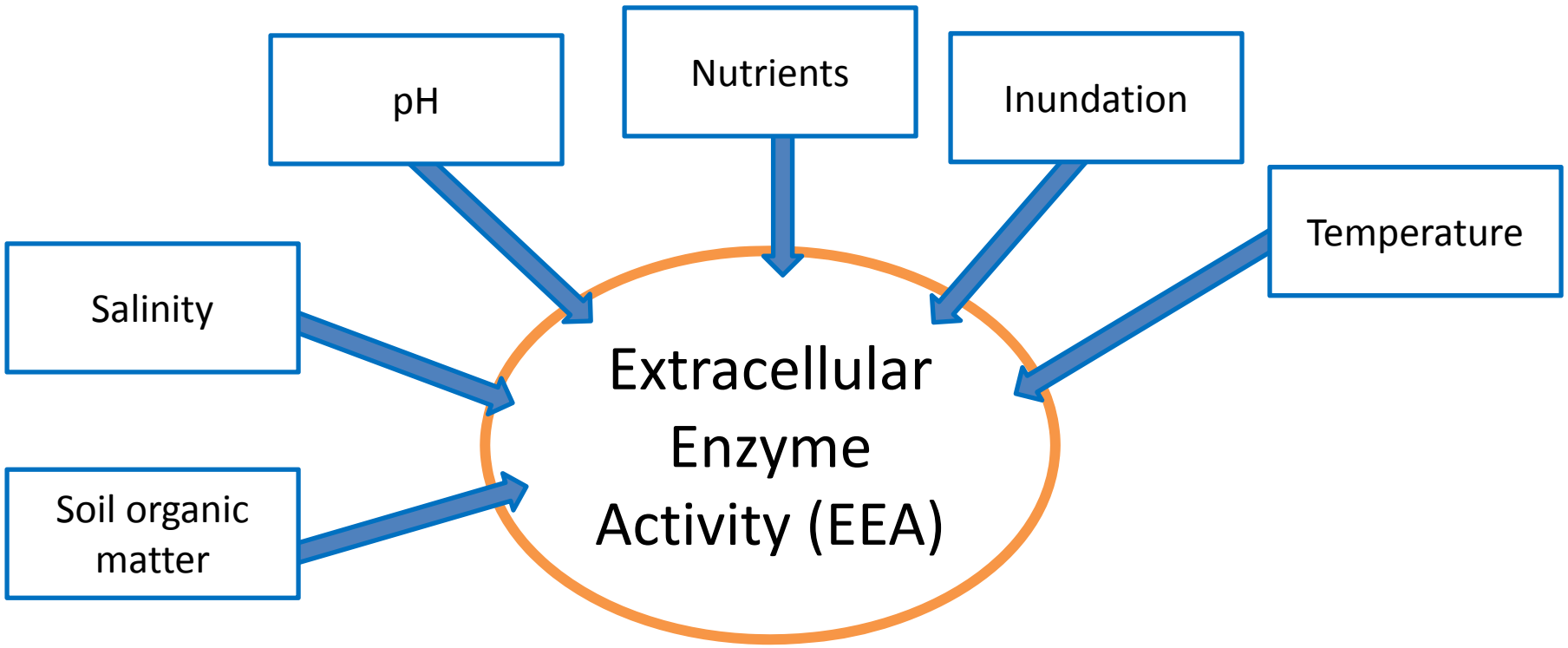
Understanding the mechanisms of peat collapse

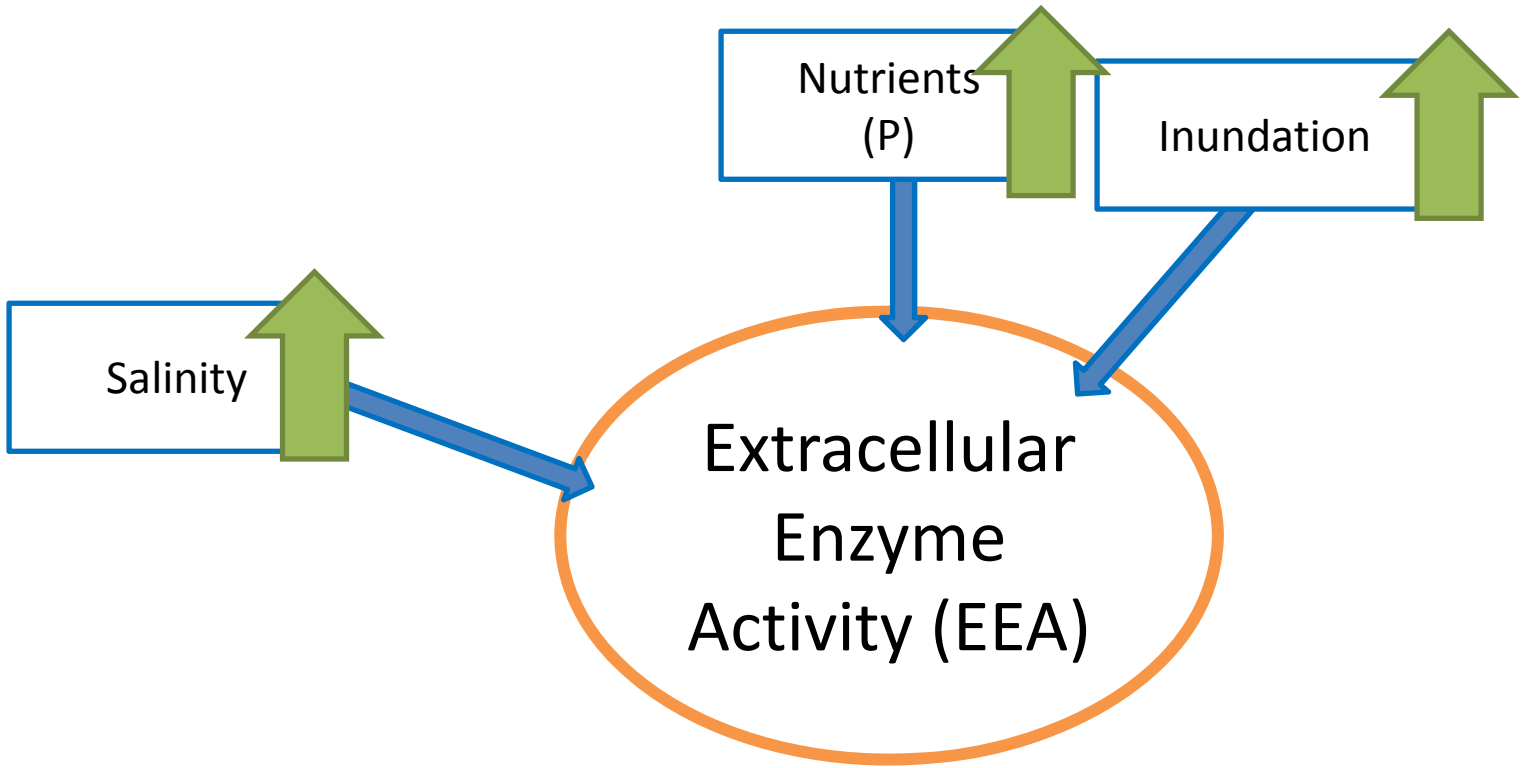
Extracellular enzymes help break down large macromolecules



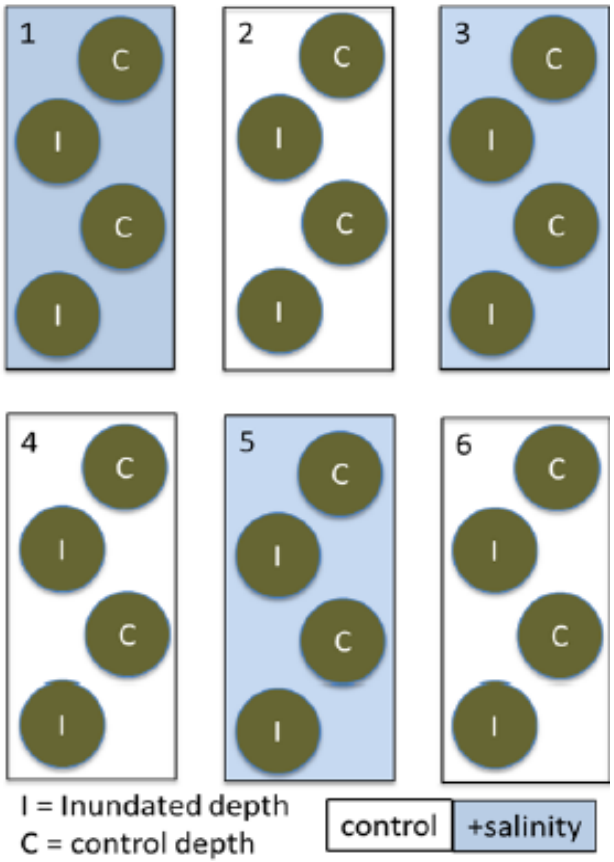
Carbon cycling is fundamentally linked to the metabolism of microbial communities

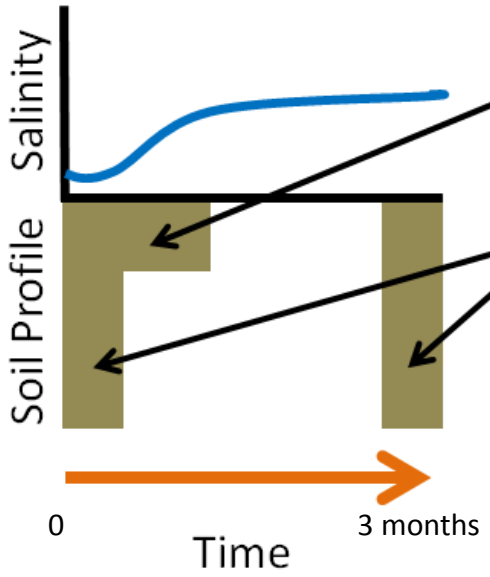


How will increased salinity and inundation affect microbial processing of carbon and nutrients?



Salinity x Inundation





High intensity sampling of soil surface during ramp up

Initial and final soil profile samples

ntifying changes in enzyme activities is a sensitive way to assess changes in microbial processes

t enzymes, abbreviations, and description of enzyme function

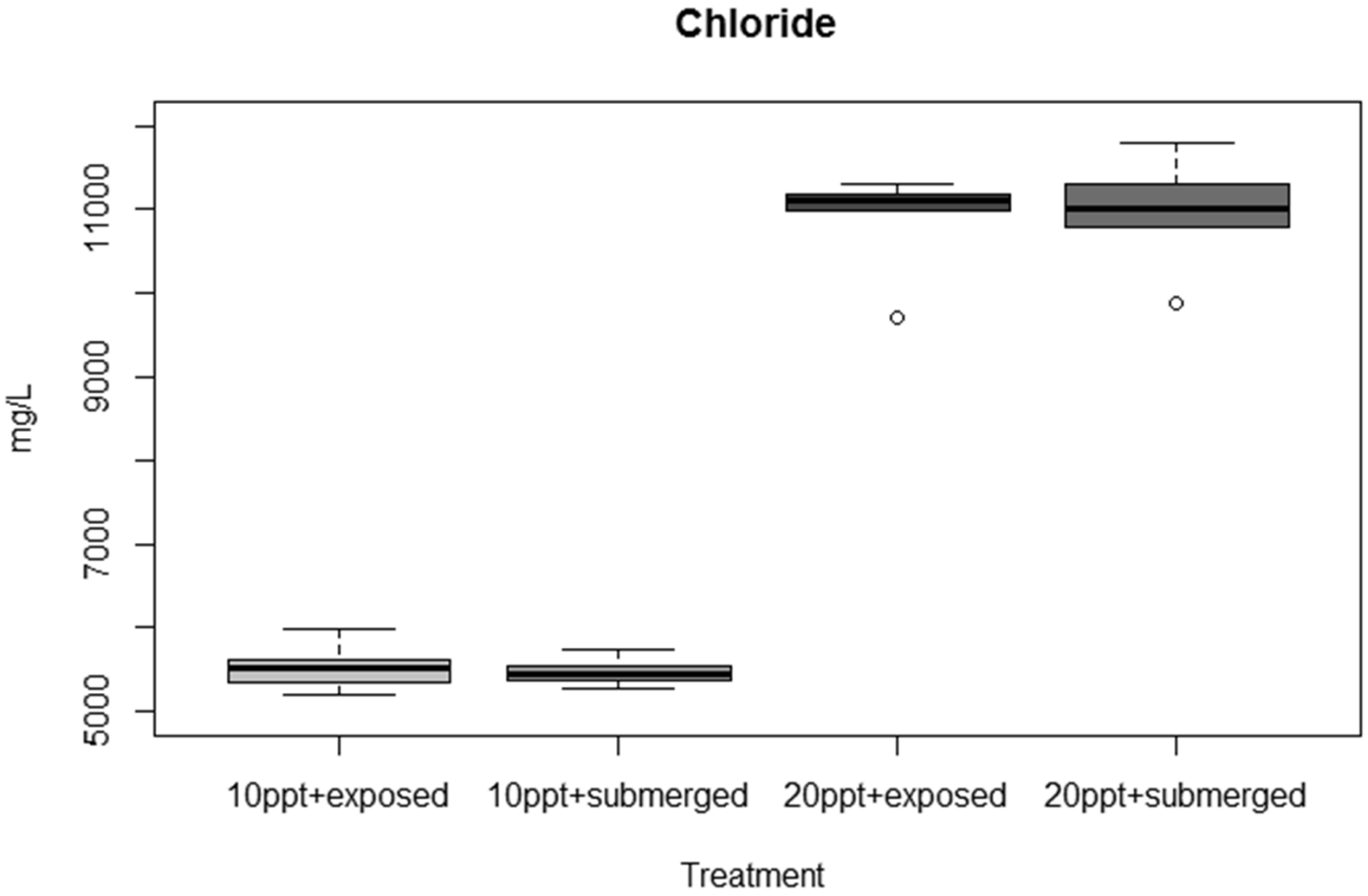
me	EC	Enzyme function	
Phosphatase (AP)	3.1.3.2	P liberation	P
ine Phosphatase (AKP)	3.1.3.1	P liberation	
ulfatase (ARS)	3.1.6.1	Hydrolyze sulfur bonds	S
-Glucosidase (BG)	3.2.1.21	Hydrolyzes glucose	C
- Cellobiosidase (CEL)	3.2.1.91	Produce more labile C	

Non- detectable

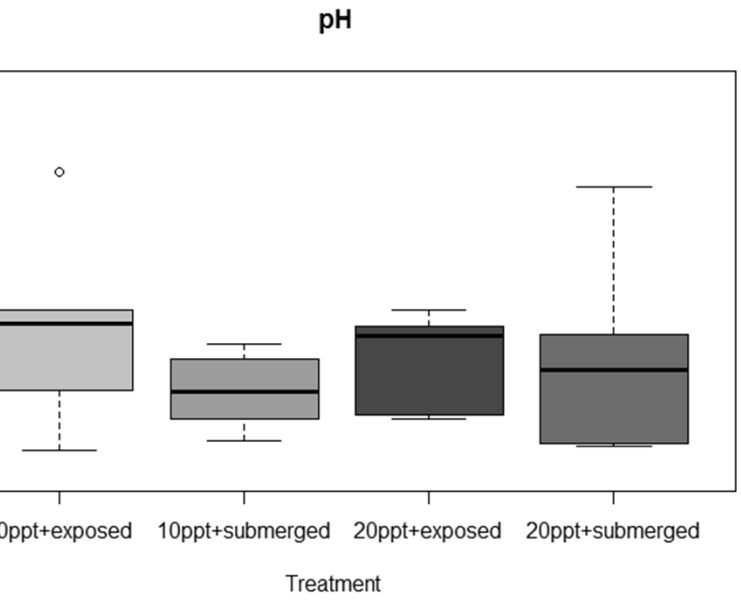
Short-term response is enzyme dependent

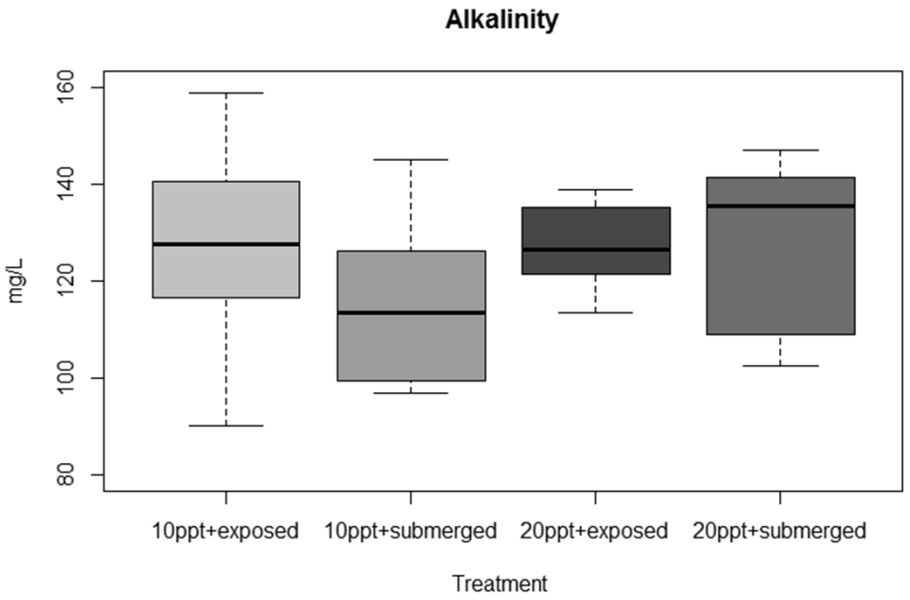
Enzyme	Trend with increased salinity	Log response ratio
AP	↓	-0.30
AKP	↑	0.56
ARS	↑	0.28
BG	No trend	0.03
CEL	↓	-0.20
LAP	Non-detectable	NA

Final porewater

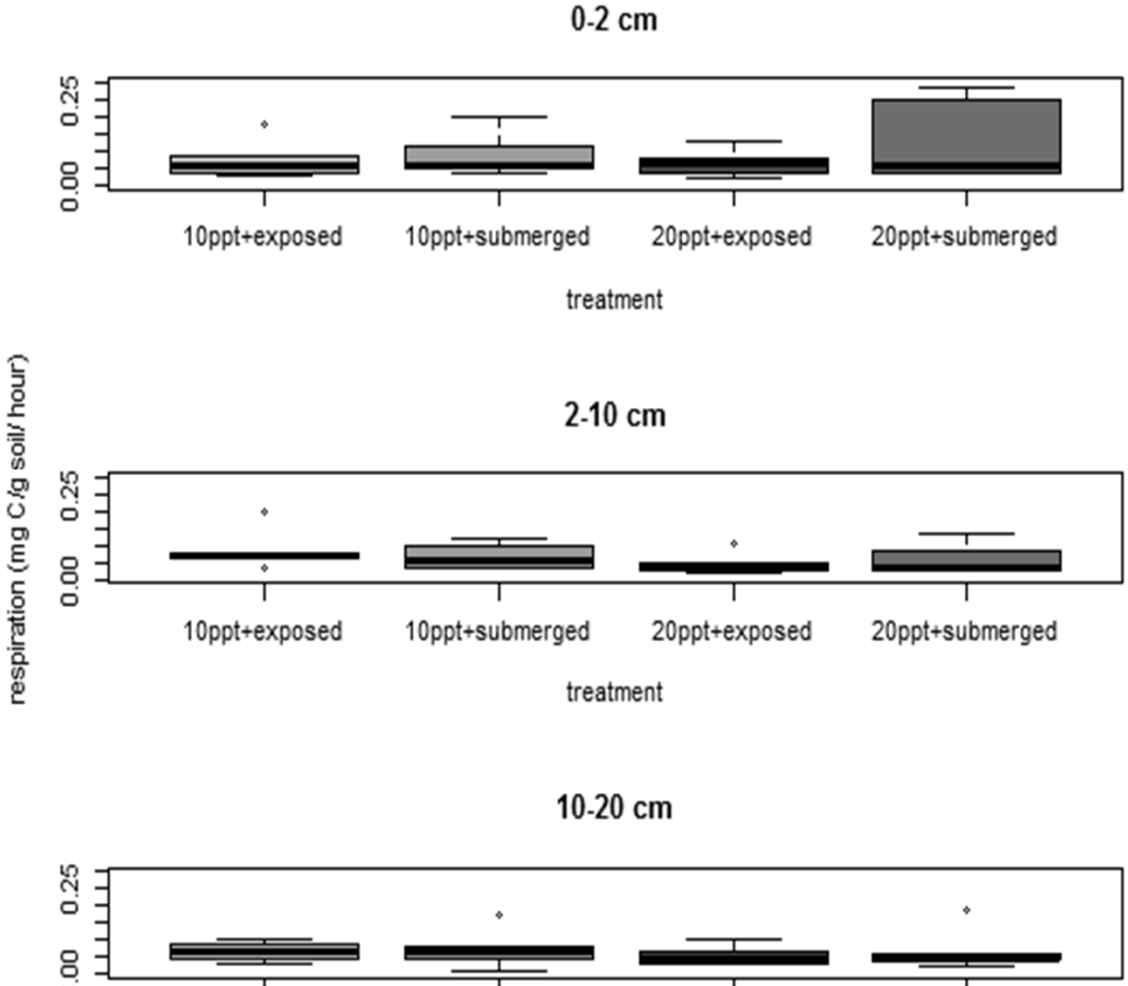


Porewater pH and alkalinity are not the drivers of observed differences in enzyme activity

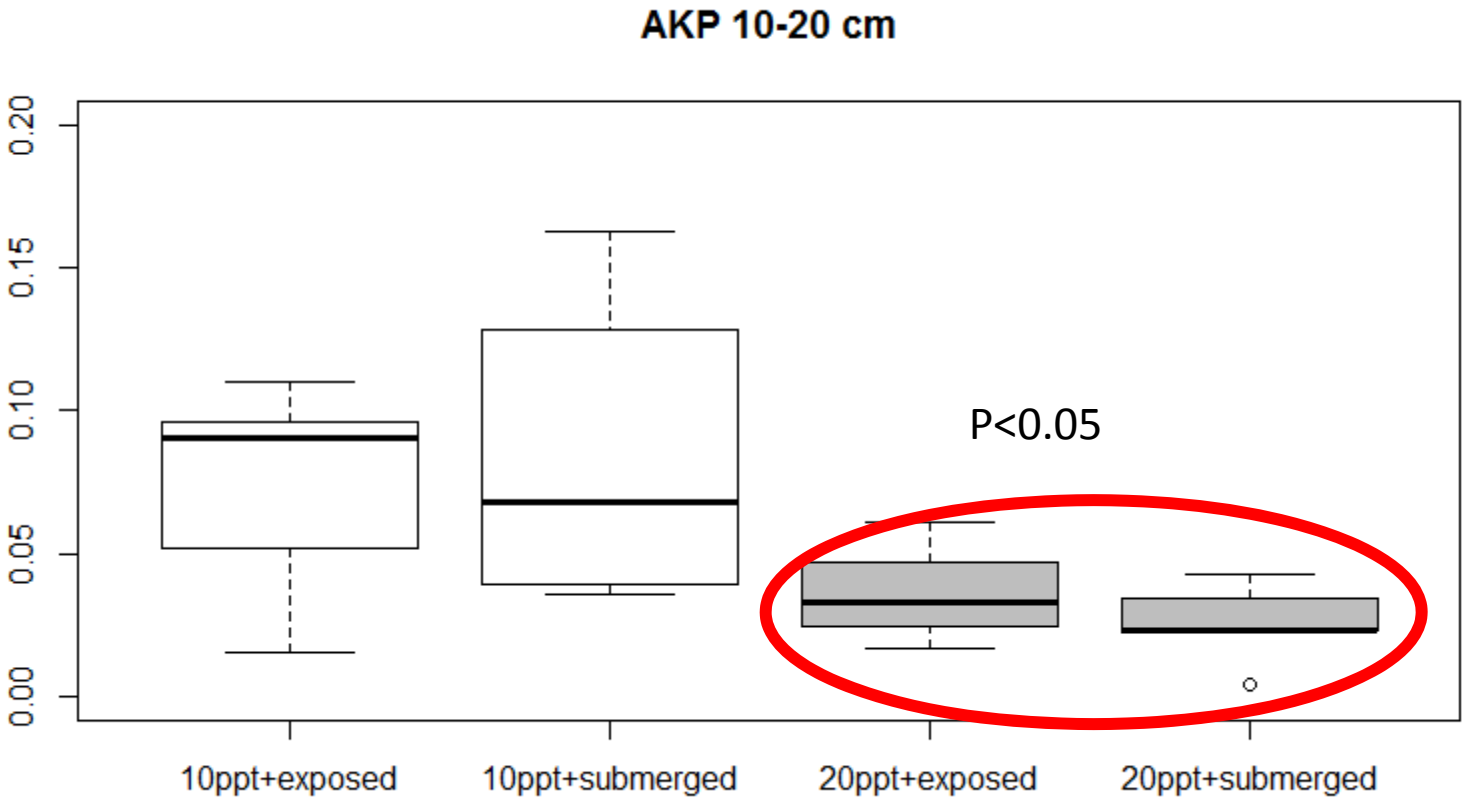




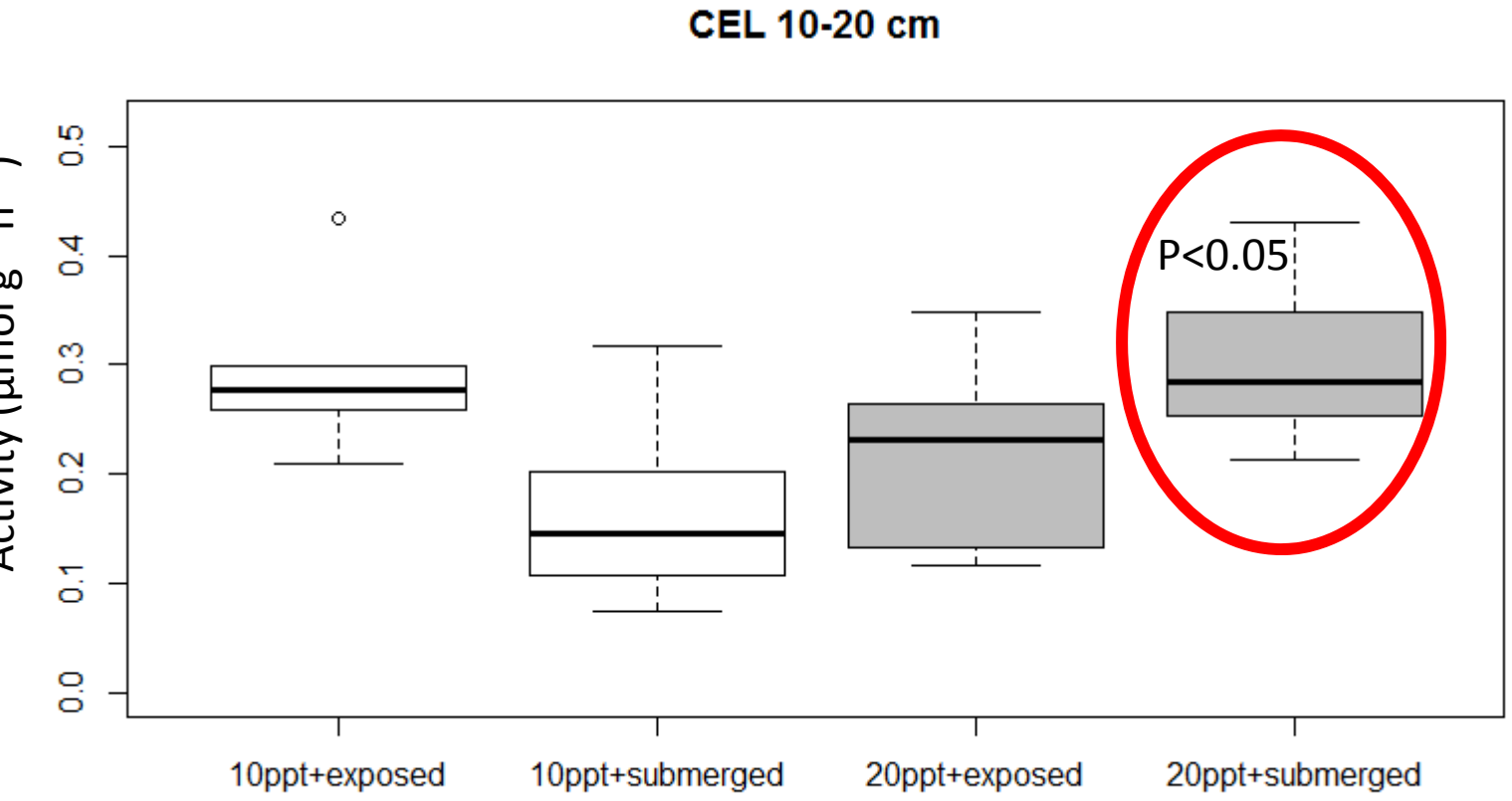
No difference in microbial respiration rate



Alkaline phosphatase (AKP) activities decreased with elevated salinity



3-1,4- cellubiosidase (CEL) activities increased with elevated salinity and inundation



Increased phosphorus availability drives increased cellubiosidase activity

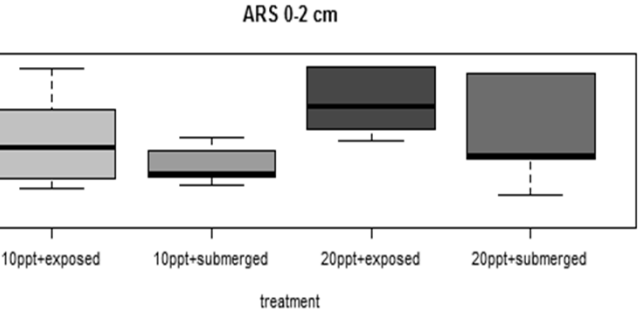
Marine osure (P dition)

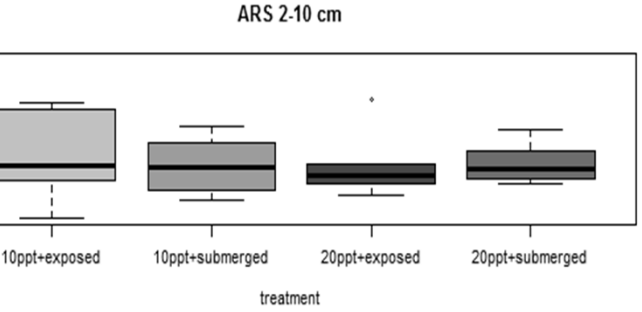
Decreased investment in P acquiring enzymes (AKP)

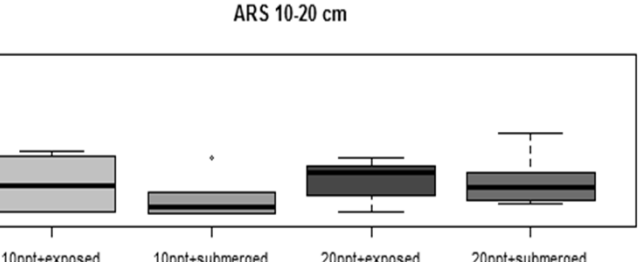
Increased CEL activity

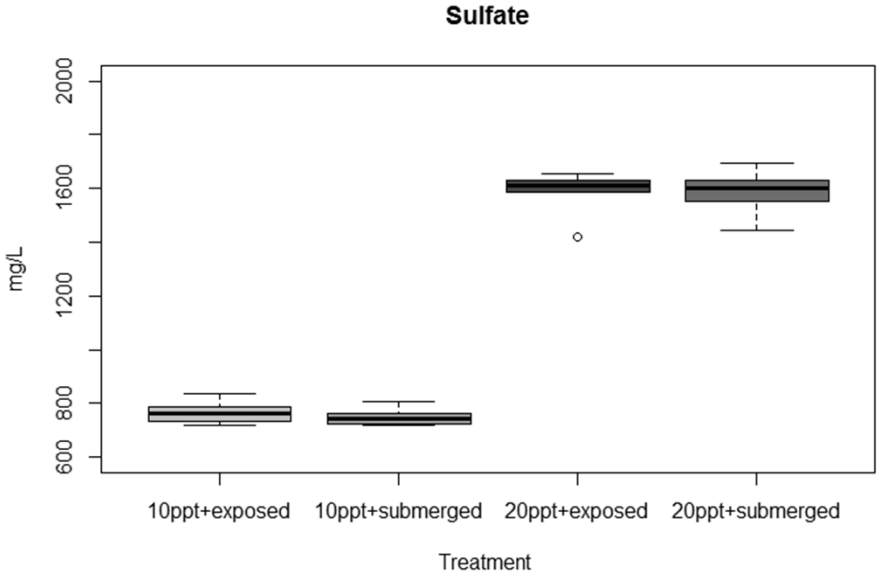
Breakdown of more recalcitrant C

Arylsulfatase activity did not differ at any depth despite increases in sulfate concentration with elevated salinity



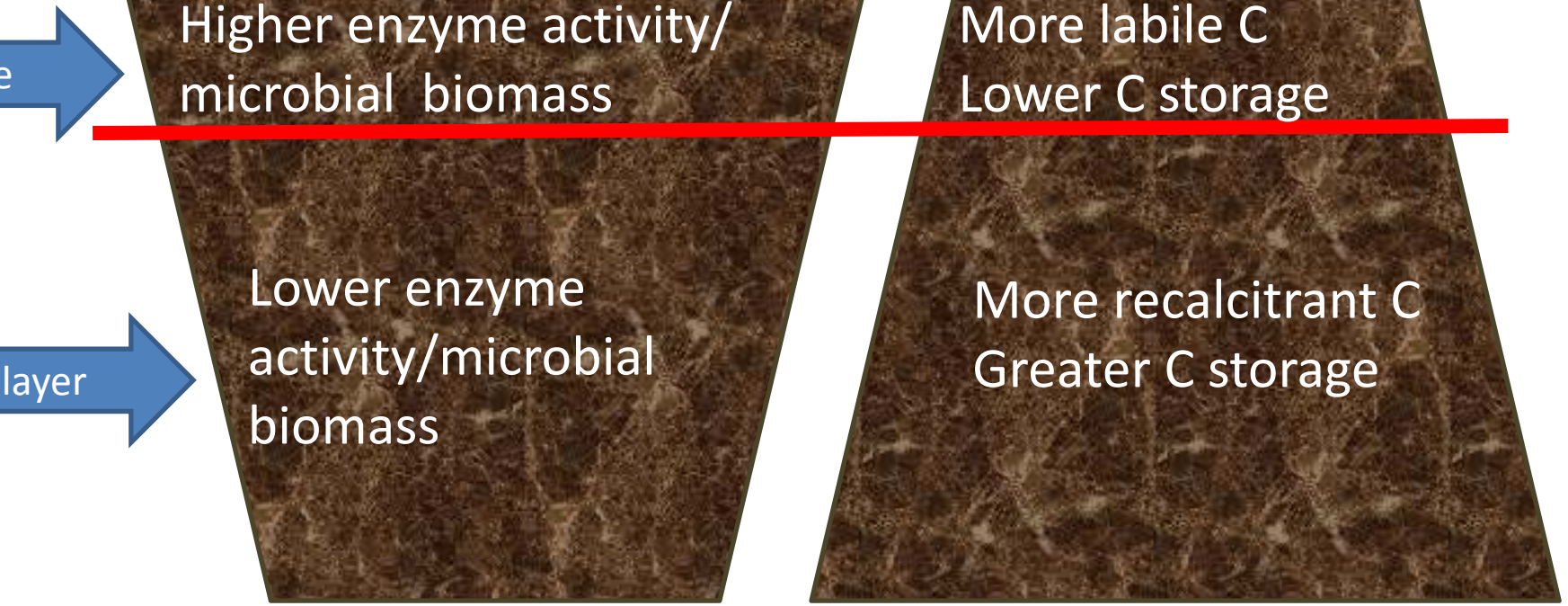






Nearly 2x increase in sulfate

Waking the sleeping giant



Elevated salinity may accelerate microbial ogeochemical processes that ultimately stimulate soil C loss.

eterogeneous response to marine exposure:

- Not all enzymes respond similarly
- Depth matters
- Length of exposure matters

e need more information:

- Are changes a result of shifts in microbial community, changes in microbial biomass, or changes in extracellular enzyme degradation?
- Possible changes in phosphorus availability with increased salinity (waiting on these data)

e these changes in enzyme production a possible mechanism for peat llapse???

What is next?

nity*Inundation
cluding plants)

Salinity*Phosphorus

Longer long-term
field manipulations

questions

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