Effect of water table fluctuations on the decomposition of *Sphagnum*

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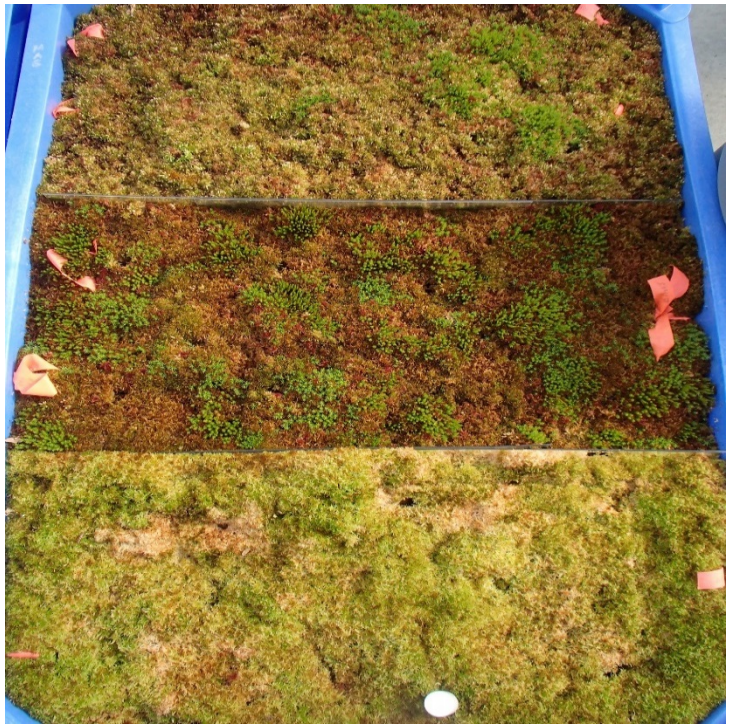
Outline

- Background
- Experimental design
- Methods
- Results

Background

- Sphagnum is of global significance in carbon cycling
- Stores a large % of wetland carbon
- Climate is becoming more variable
- We need to know how the consequent hydrological variability will impact on decomposition & C storage in these wetlands

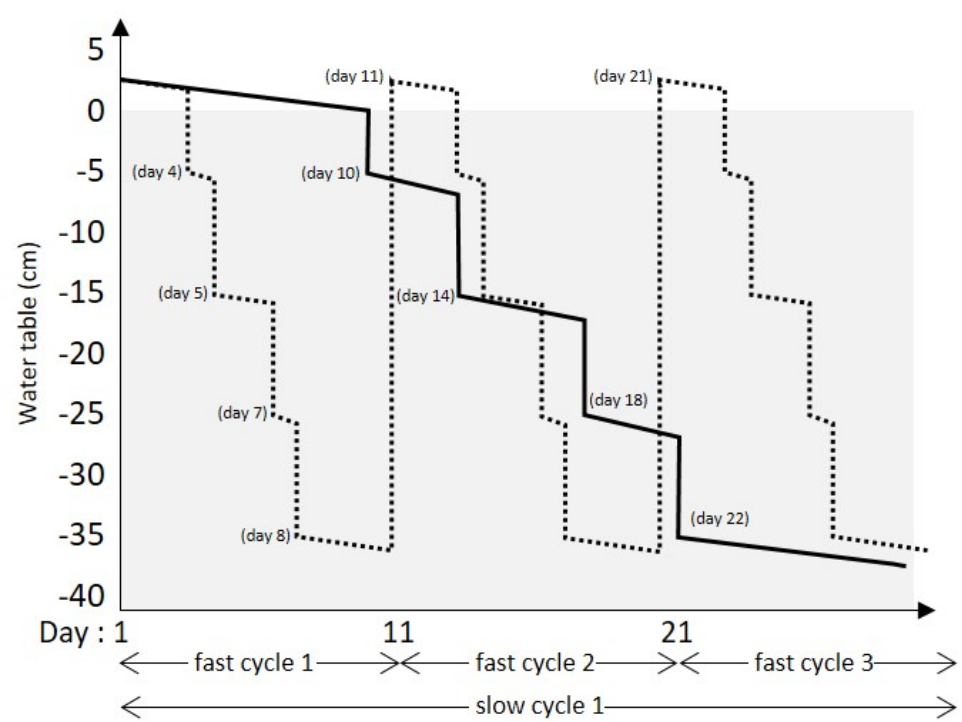
The focus of our study



- 12 mescosms: 3 treatments, 4 replicates

- *Sphagnum fallax*
- *Sphagnum fuscum*
- *Sphagnum magellanicum*

- Aim: Determine if the rapidity of the fluctuation affects the decomposition of Sphagnum mosses.



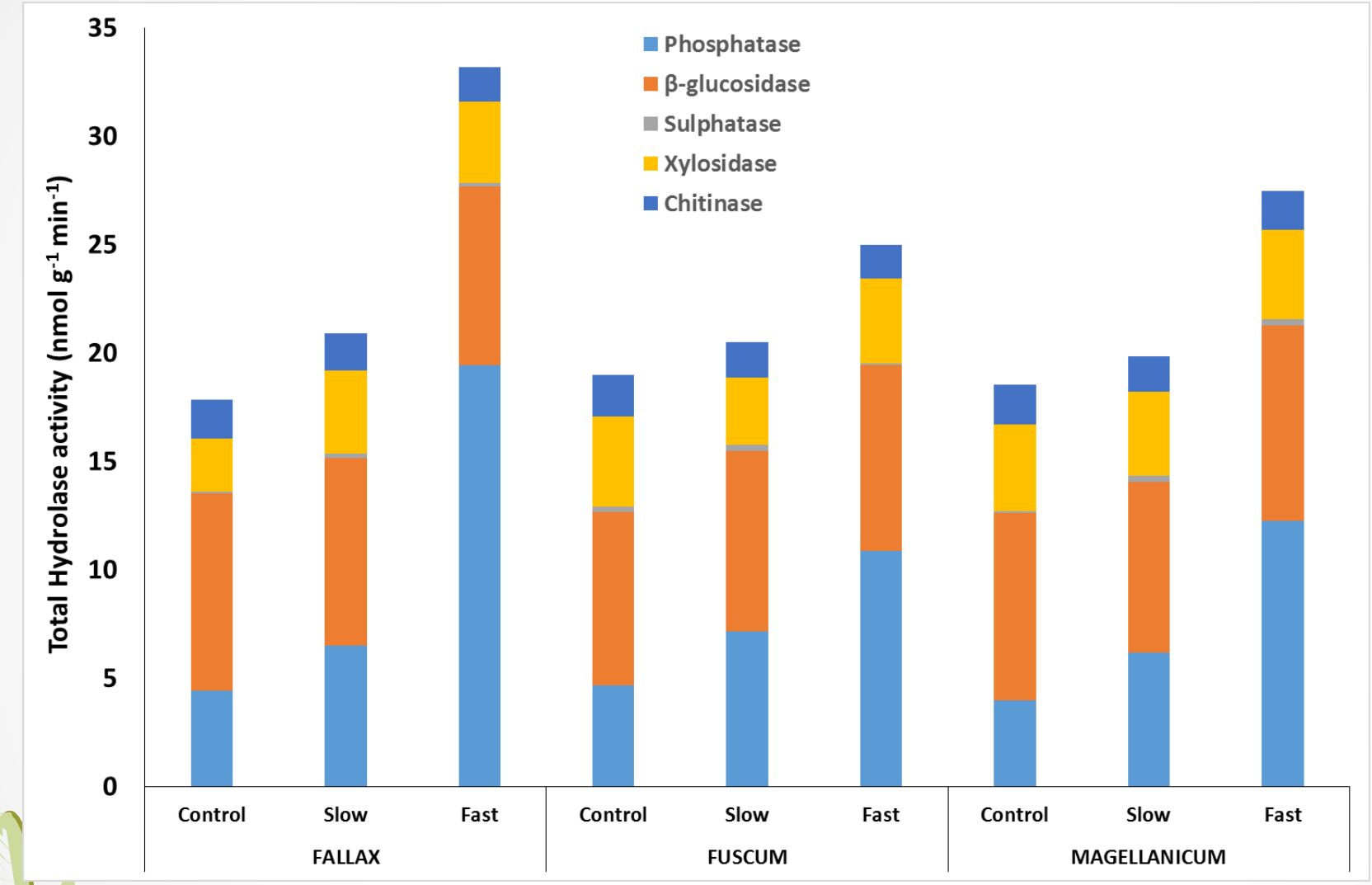
Treatments:

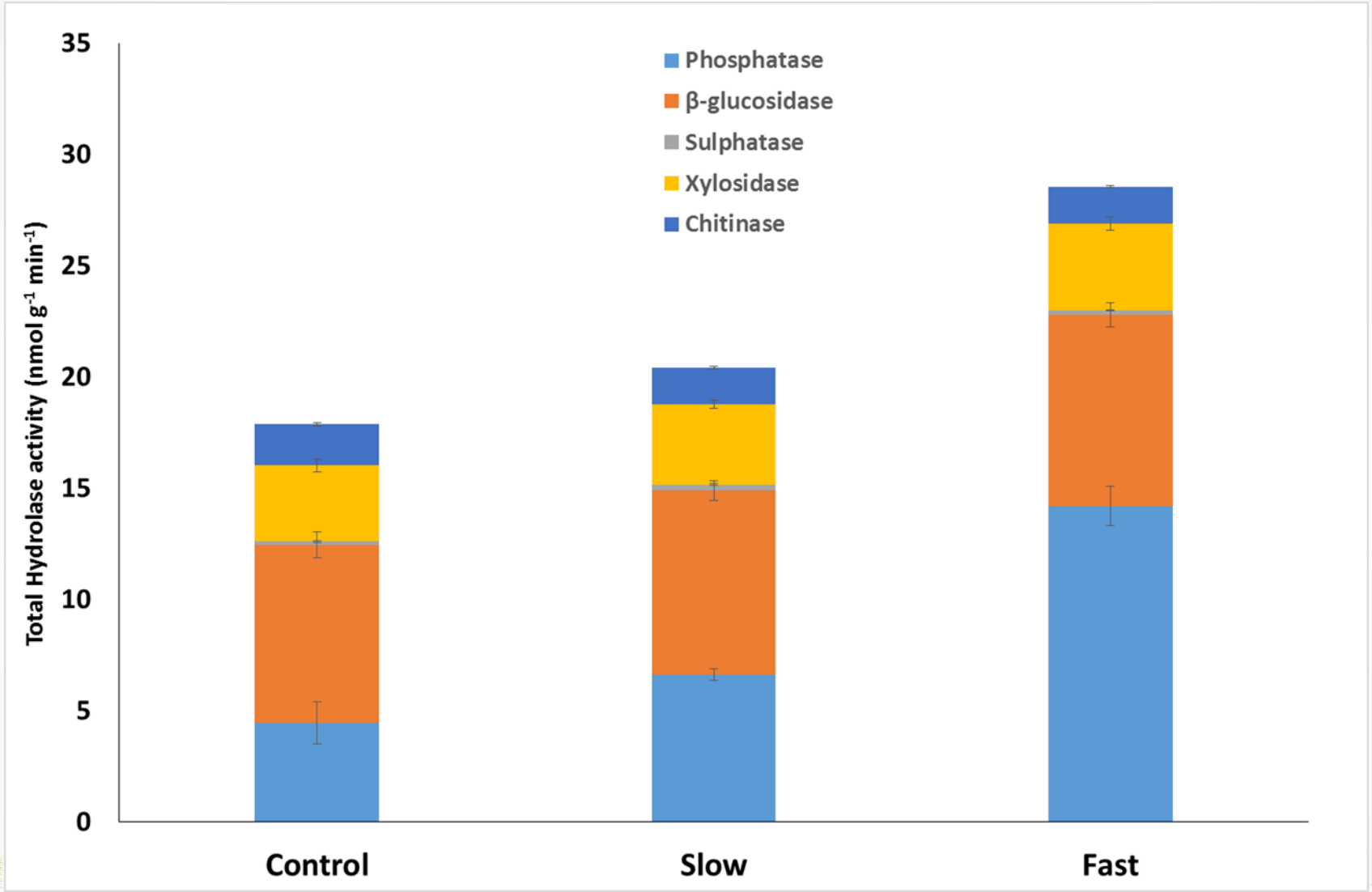
- Control: Stable WT between 0 and -5 cm (optimum of FAL)
- Slow Fluctuation: Declining WT from +5 to -35 cm over 30 day period
- Rapid Fluctuation: Fluctuating WT between +5 and -35 cm every 10 days over 30 day period.

Methods

- Hydrolases
- Phenol oxidase
- Phenolics
- pH
- Conductivity

Results


Total Hydrolase activity (nmol g-1 min-1)
35
30
25
20
15
10
5
0
Phosphatase
β-glucosidase
Sulphatase
Xylosidase
Chitinase
Control
Slow
Fast
Control
Slow
Fast
Control
Slow
Fast
FALLAX
FUSCUM
MAGELLANICUM


35
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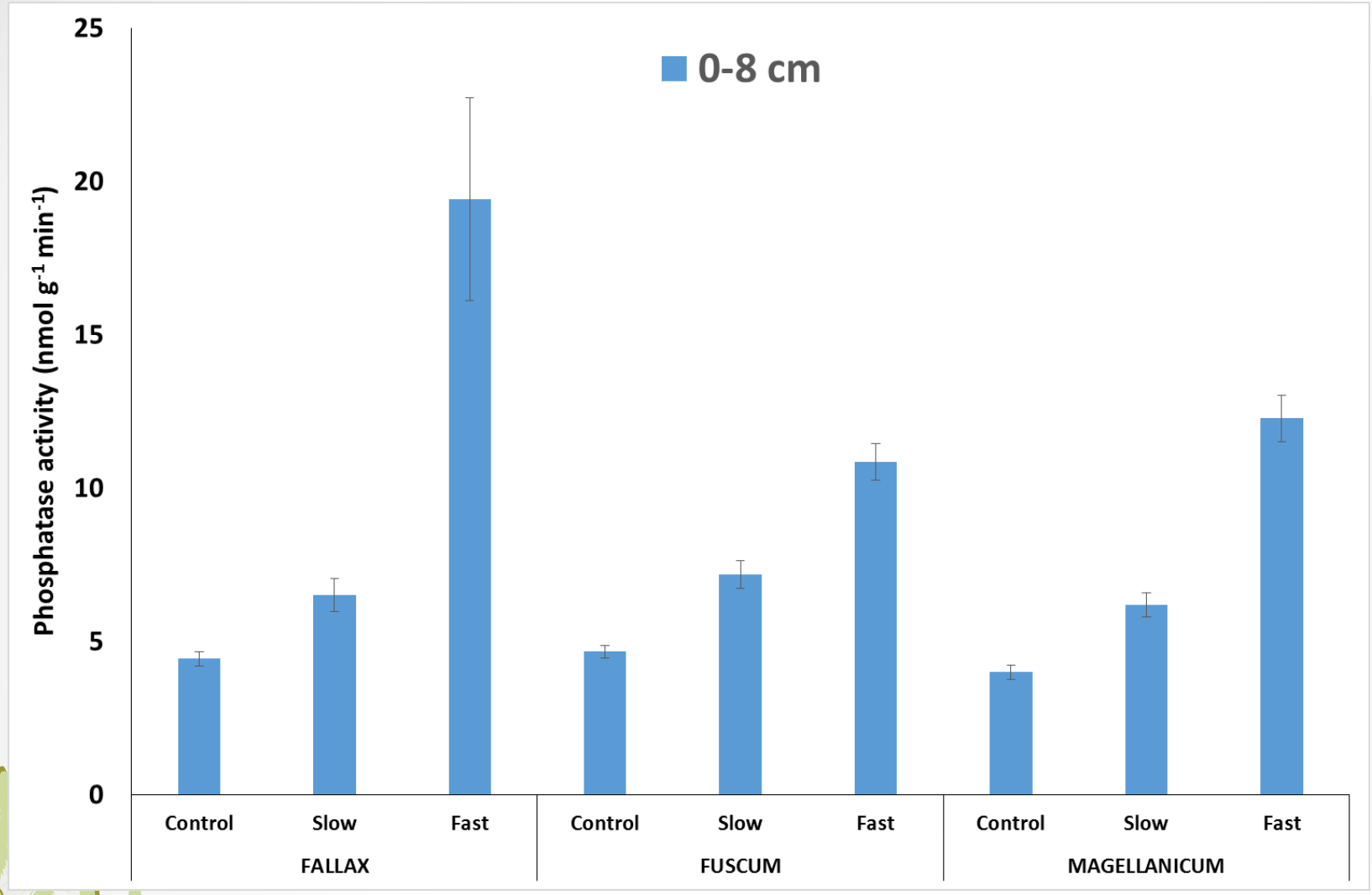
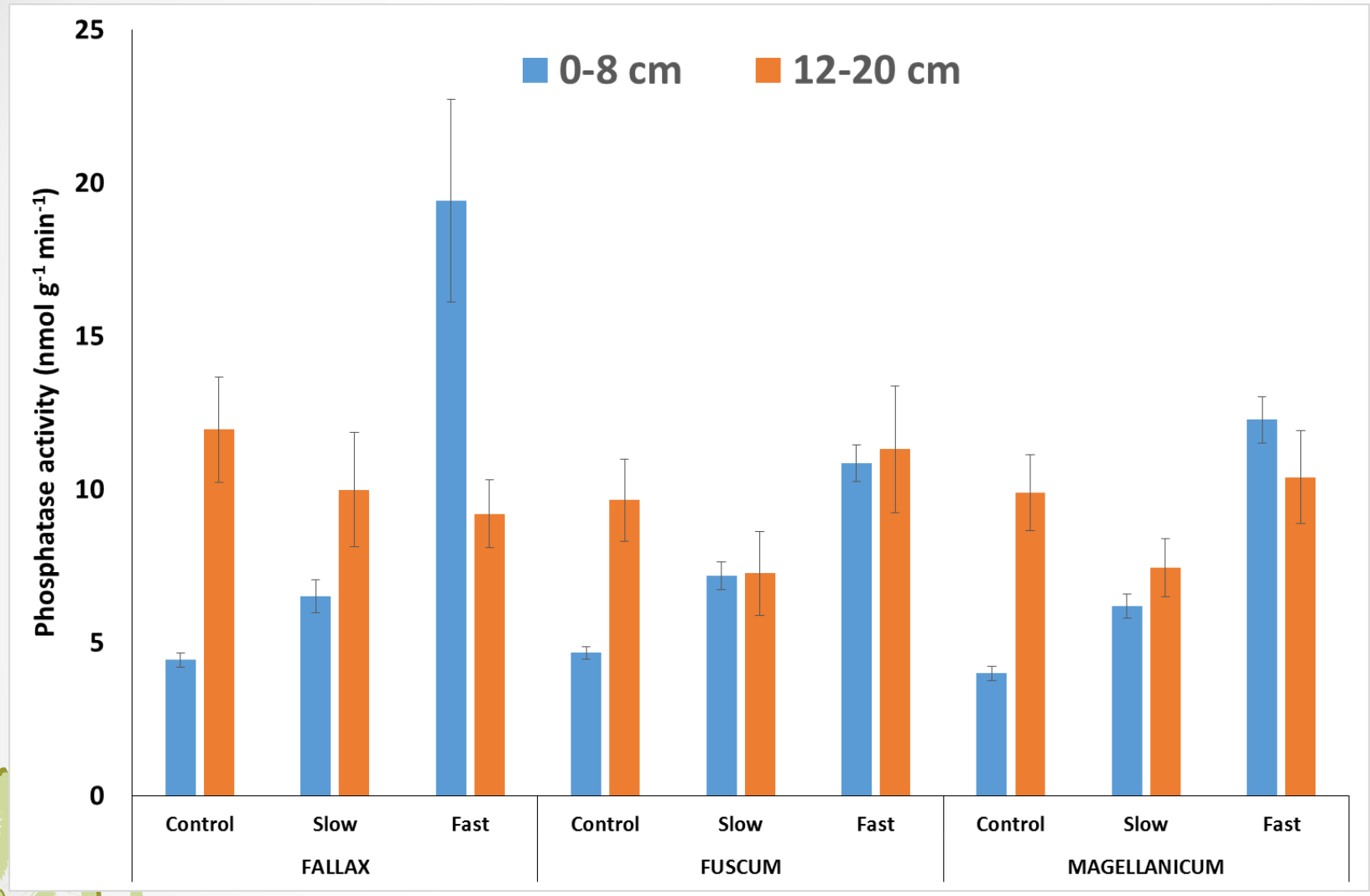
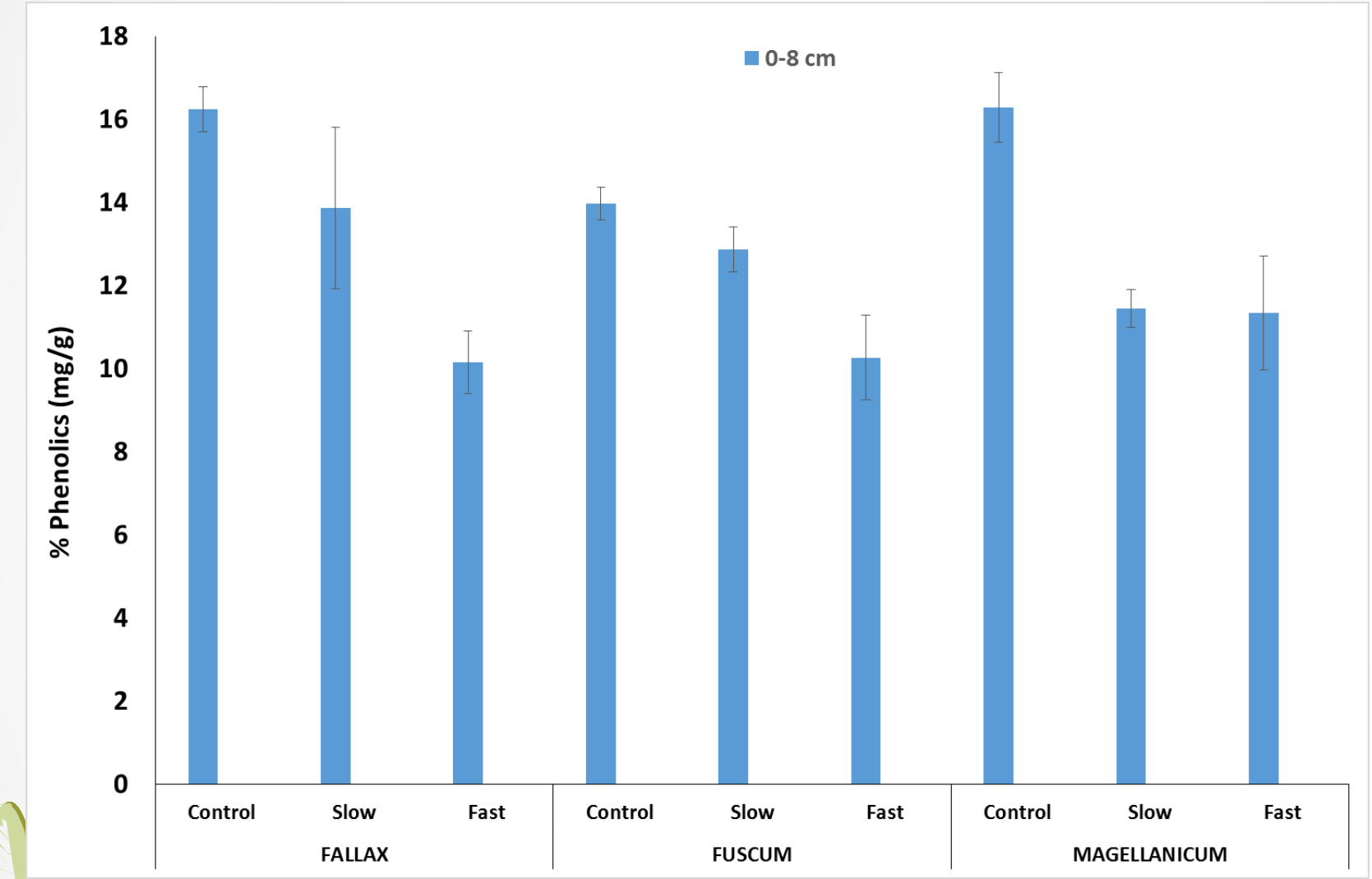
Total Hydrolase activity (nmol g-1 min-1)
Phosphatase
β-glucosidase
Sulphatase
Xylosidase
Chitinase
Control
Slow
Fast



Phosphatase is of major interest in Florida and the Everglades

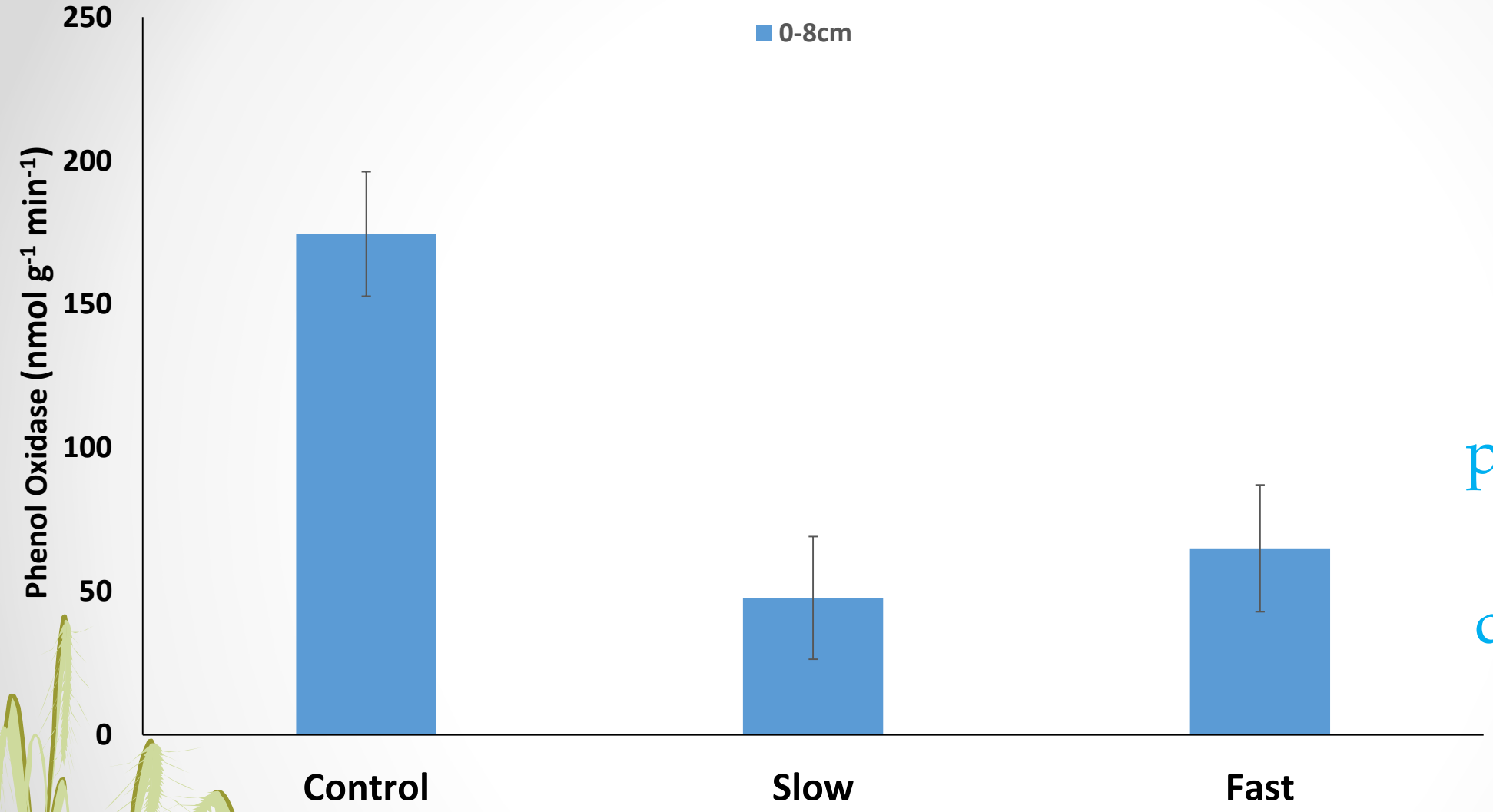


Deeper peat is unaffected

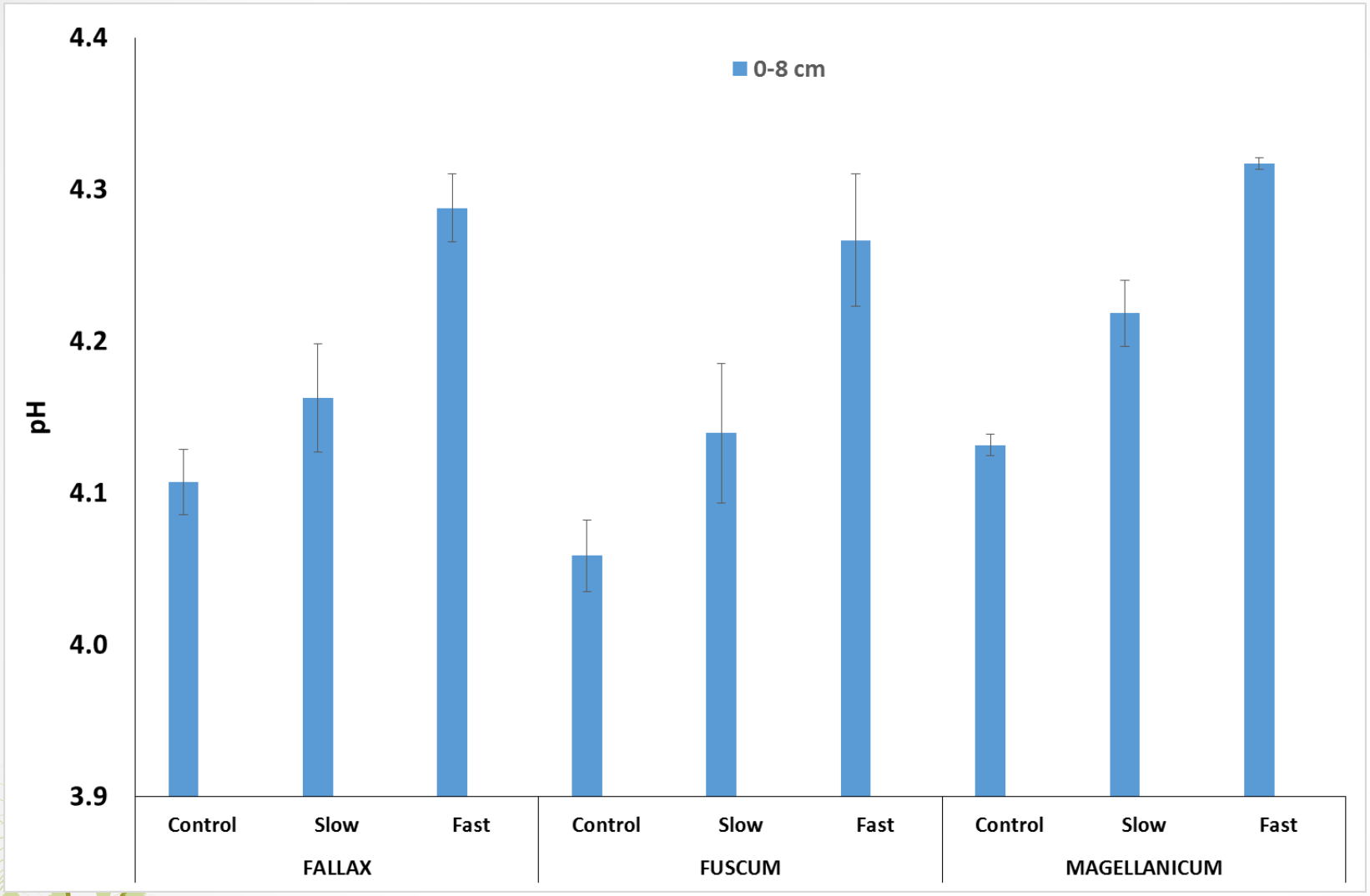


Phenolics decline with frequency of WT in each species.

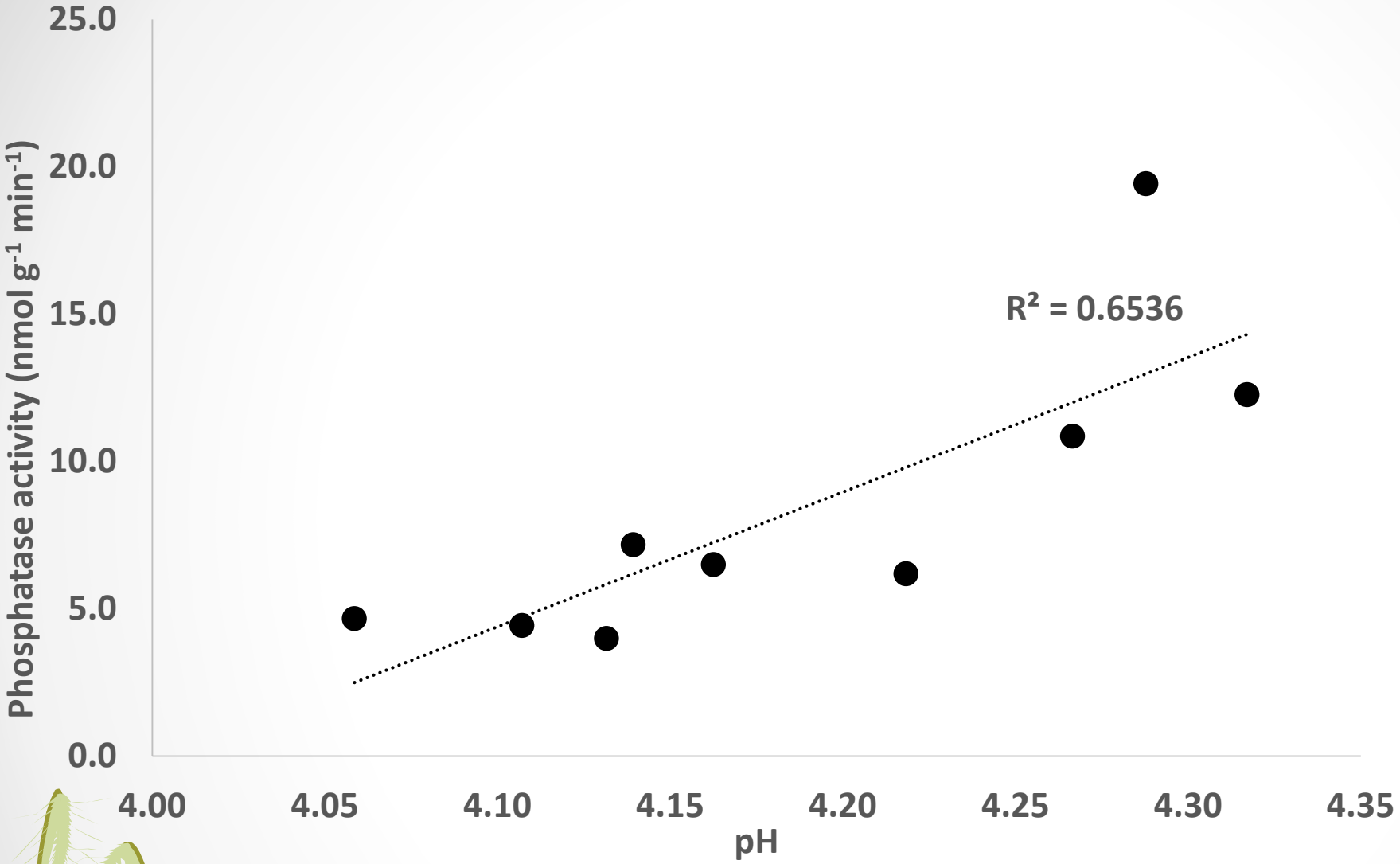
- All of these results so far tie in nicely to the discussions today on the enzymic latch
- (Phenolics are inhibitors of hydrolases enzymes)



However… phenol oxidase was not the driver of these changes

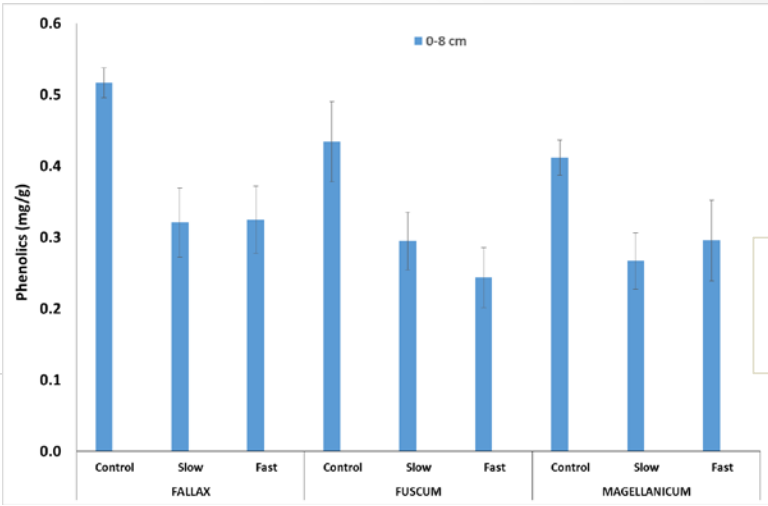


But pH has a strong effect, and may be a driver

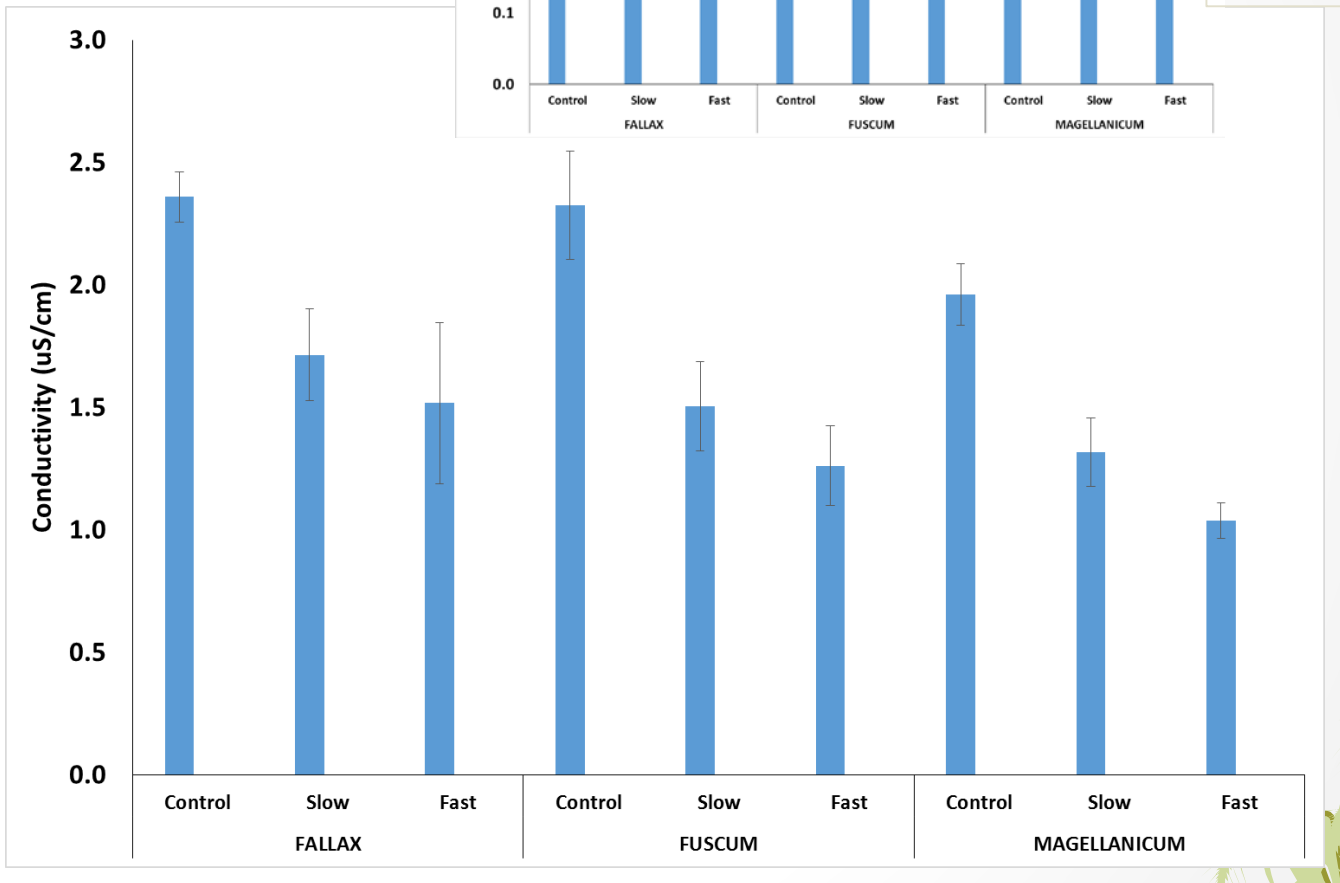


Strong correlation between pH and phosphatase

- Conductivity can be uses like a “hydrological tracer”
- suggests the hydrological manipulation is leaching solutes out of the mesocosm.



A similar pattern
In phenolics



- So… what is causing the increased hydrolase activity?

- Possibly removal of phenolic inhibitors
- Possibly increased pH
  - Due to loss of humic acids?
- Definitely caused by hydrological leaching processes

- Riparian wetlands are strongly analogous to the systems we describe here

- Lateral water movements wash solutes from the soil column

- Suggests that the enzymic latch may have less of a role to play in regulating decomposition in riparian systems than physical/hydrological processes

- Thanks

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Any question