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Session D, 2017 First Place: Under the Sphagnum: An Observational Analysis of the Relationship Between Distance and Ectomycorrhizal Morphotype Diversity in *Larix laricina* Within Wetland Ecosystems

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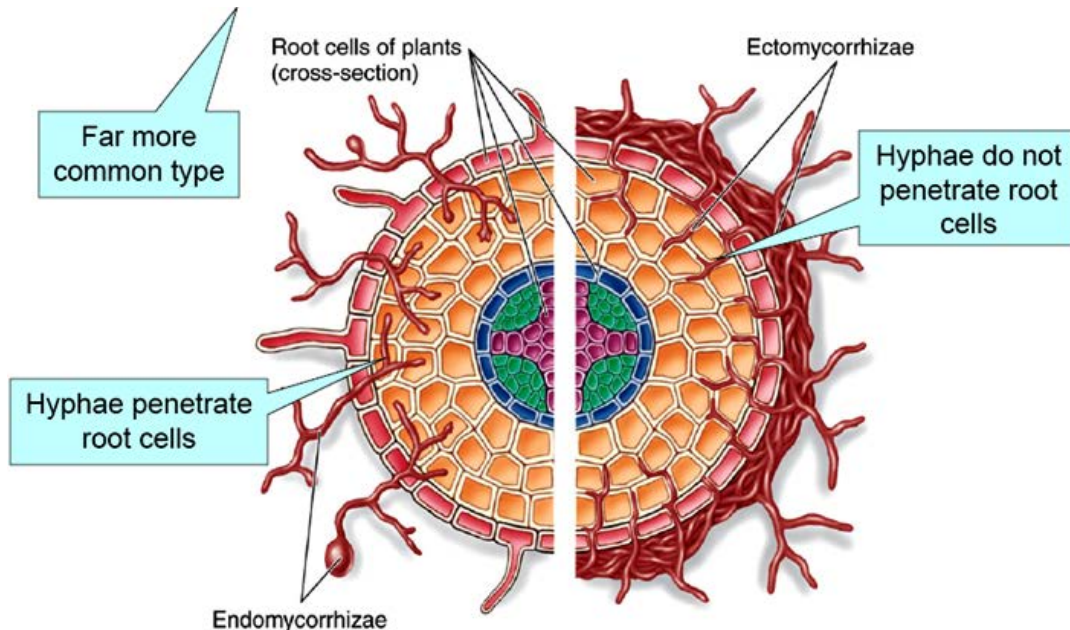
“Under the Sphagnum: An Observational Analysis of the Relationship Between Distance and Ectomycorrhizal Morphotype Diversity in *Larix laricina* Within Wetland Ecosystems

By Max Hermanson, Silus Weckel, Alex Kozisky, and Kyle Kozlowski



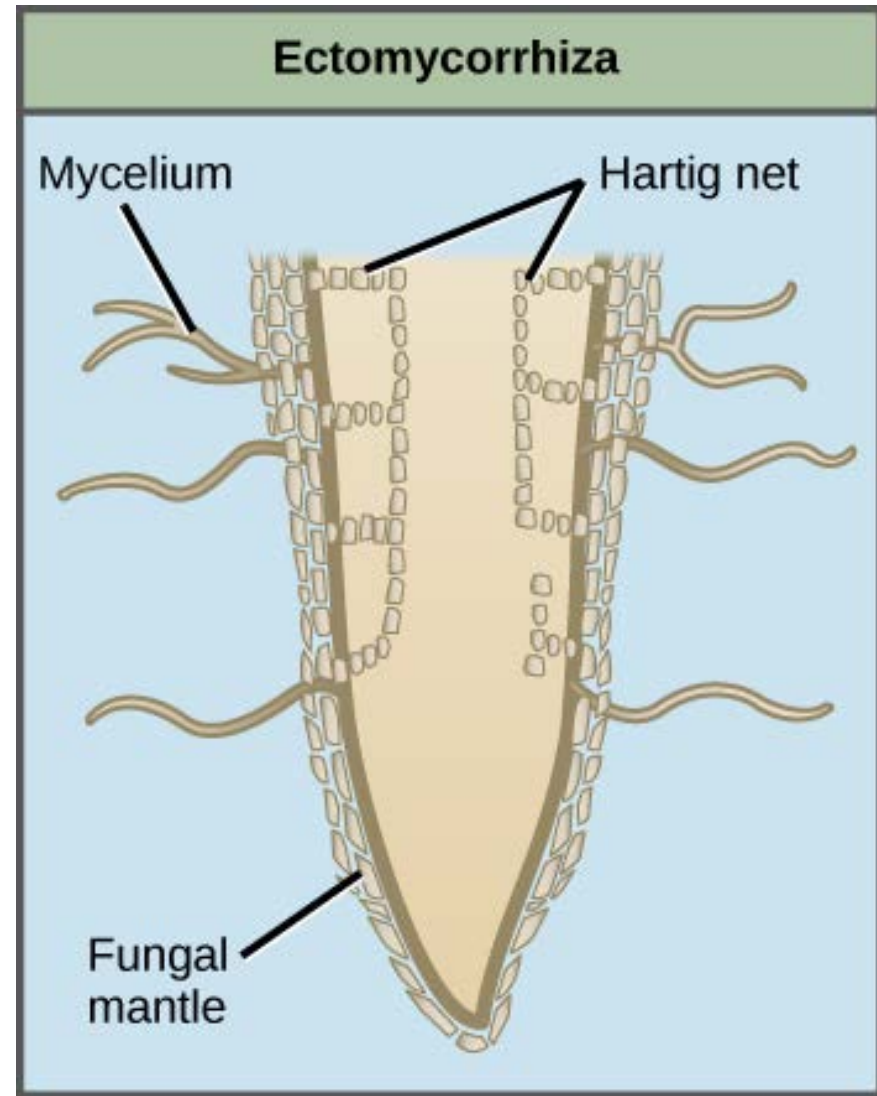
Mycorrhizal Fungi

- Form symbiotic relationships with plants
 - Attach to host roots
 - Increase host's water & nutrient uptake
 - Fungi gains access to carbs
- Ecto vs. Endo



Introduction

- What are **ectomycorrhizal** fungi?
- Associated with woody plants
 - *Betulaceae*,
Fagaceae, *Pinaceae*



(a)

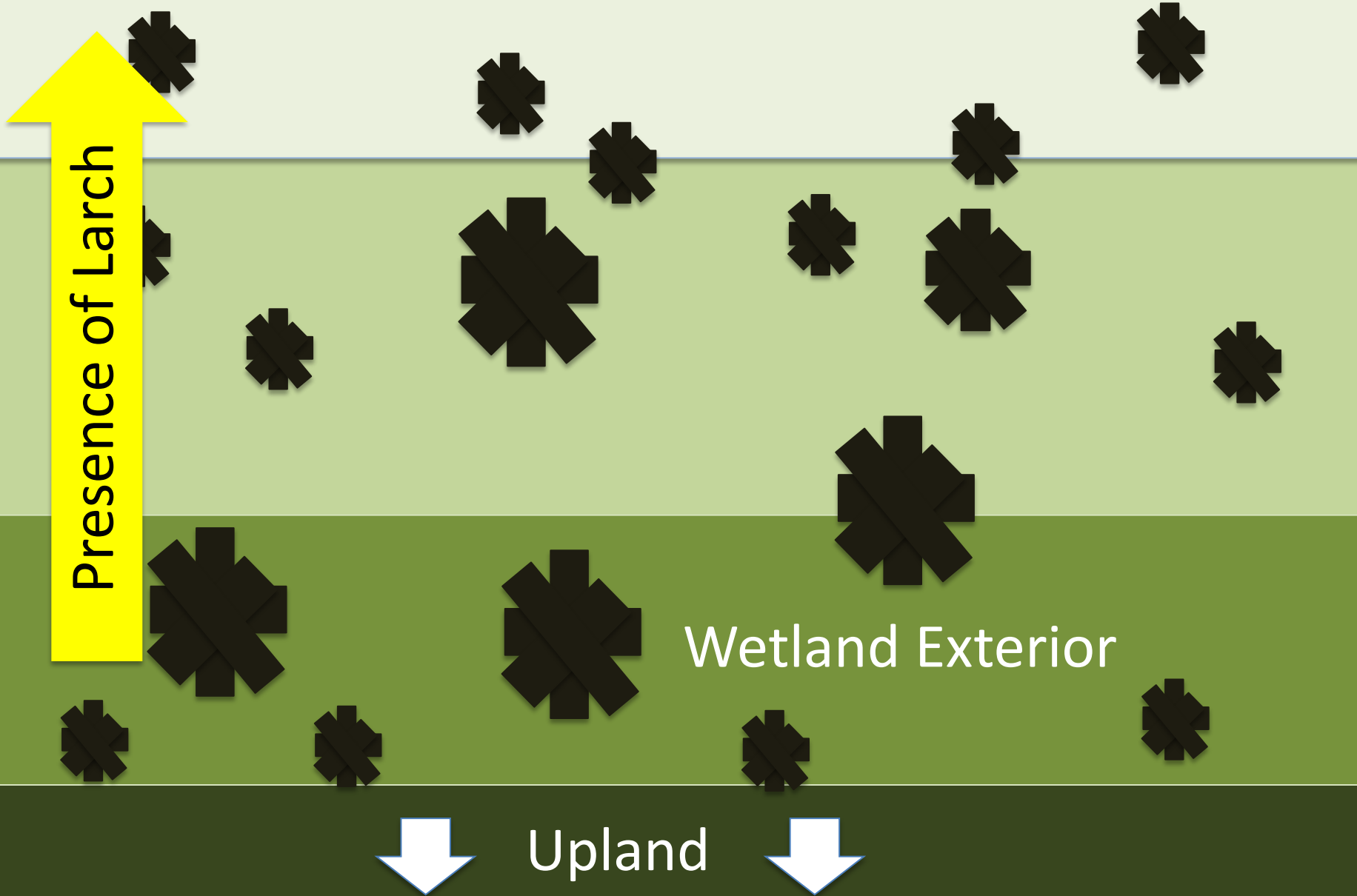
Inspiration

- Distance from woodland edge in old fields affects EMF colonization
- Roots of adjacent trees can act as sources for fungal colonization among different tree sp.
- EMF diversity is higher in uplands than wetlands
- Higher root density has been correlated with higher EMF diversity

Hypothesis

- H_0 - There will be no relationship between EMF morphotype diversity and distance from the edge of the wetland.
- H_a - There will be a negative relationship present on the morphotype diversity of EMF as the distance from the edge of the wetland increases.
- **Independent Variable:** distance from the edge of the wetland
- **Dependent variable:** morphotype diversity of EMF

Wetland Interior



Presence of Larch

Wetland Exterior

Upland

Importance of Study

- Examines relationship between distance and EMF diversity in wetlands
- First CLBS project to study EMFs
- Not much EMF research with *Larix laricina*





Methods

Experimental Design:

- Experimental unit: the three wetlands
- Sample Unit: trees within wetlands
 - Subsample unit: root tips
- The study was replicated in 3 wetlands, with 9 trees sampled from each wetland

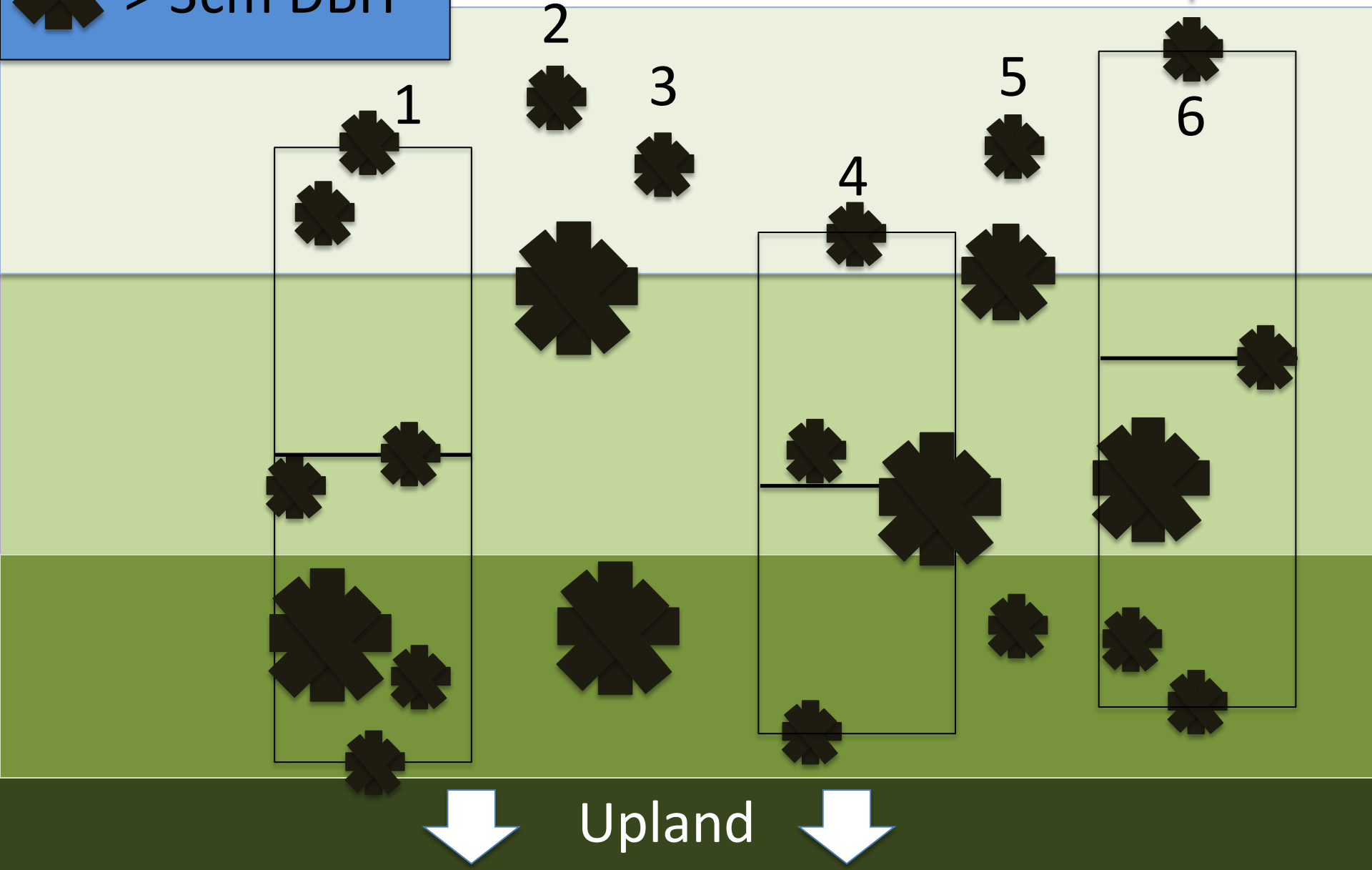
Study Sites



 = < 3cm DBH
 > 3cm DBH

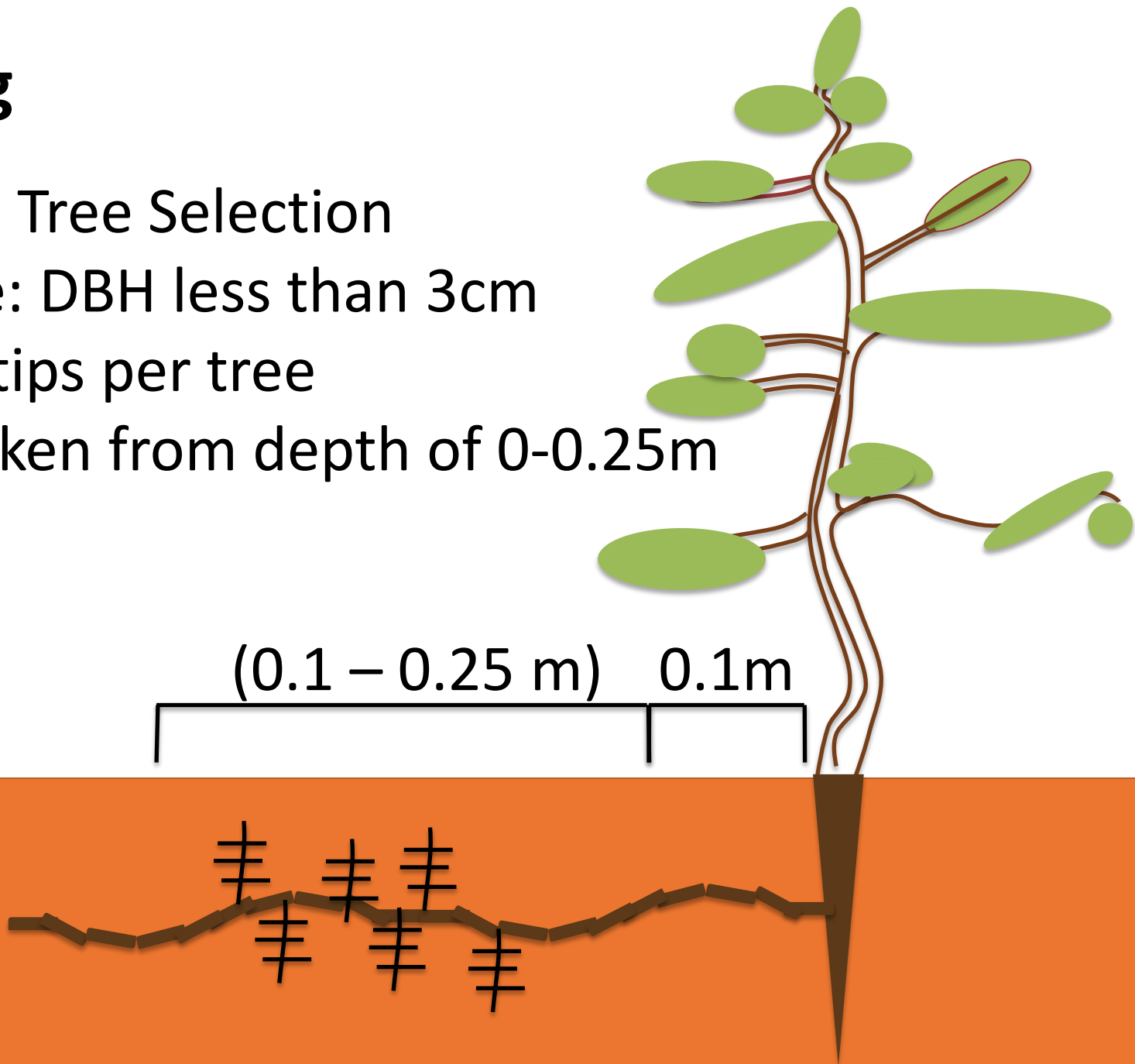
Transects

5m 5m
← | →



Sampling

- Random Tree Selection
- Tree size: DBH less than 3cm
- 10 root tips per tree
- Roots taken from depth of 0-0.25m





Digging for Roots







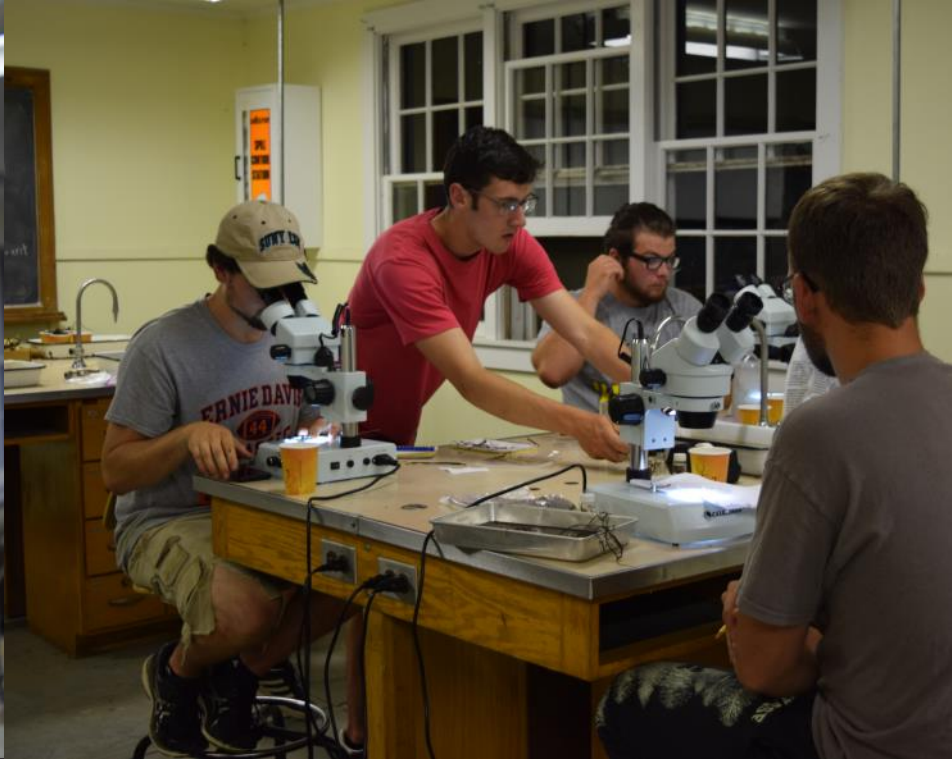


Root Processing & Morphology

- Dissecting microscopes
- EMF's were classified based on morphological differences
 - Shape
 - Color
 - *Staining*
- Morphotypes compared to photographs of known EMF associates of *Larix laricina*



^“White Deer”



Results

- Distance into wetland vs. morphotype diversity $p=0.031$, $F=7.22$, $R^2= 50.77$
- Comparing 3 sections of each transect $p=0.012$, $F=10$, $DF=2$
- Tukey: Exterior – A, Intermediate –B, Interior – B

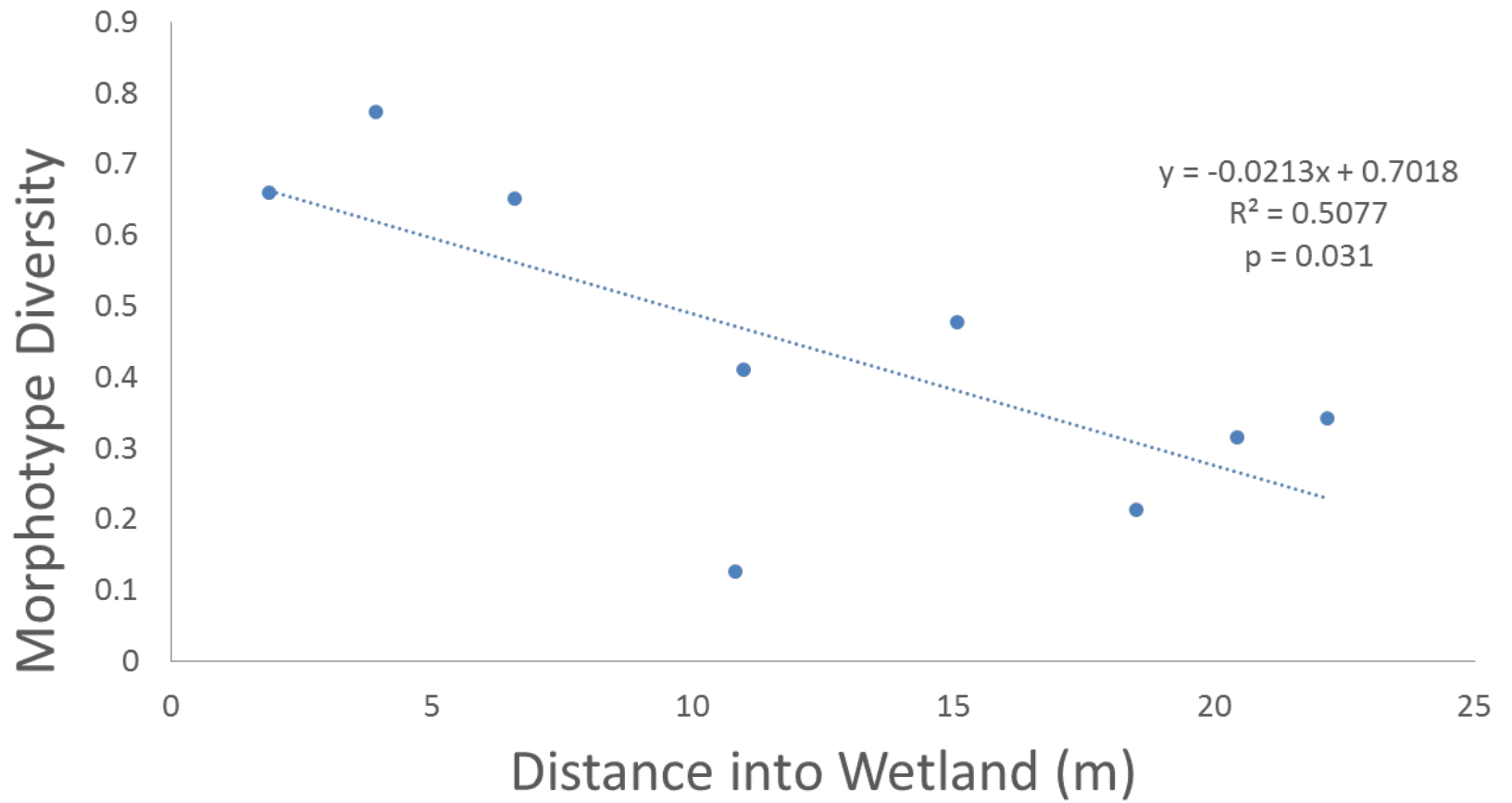
Shannon-Weiner Diversity Average

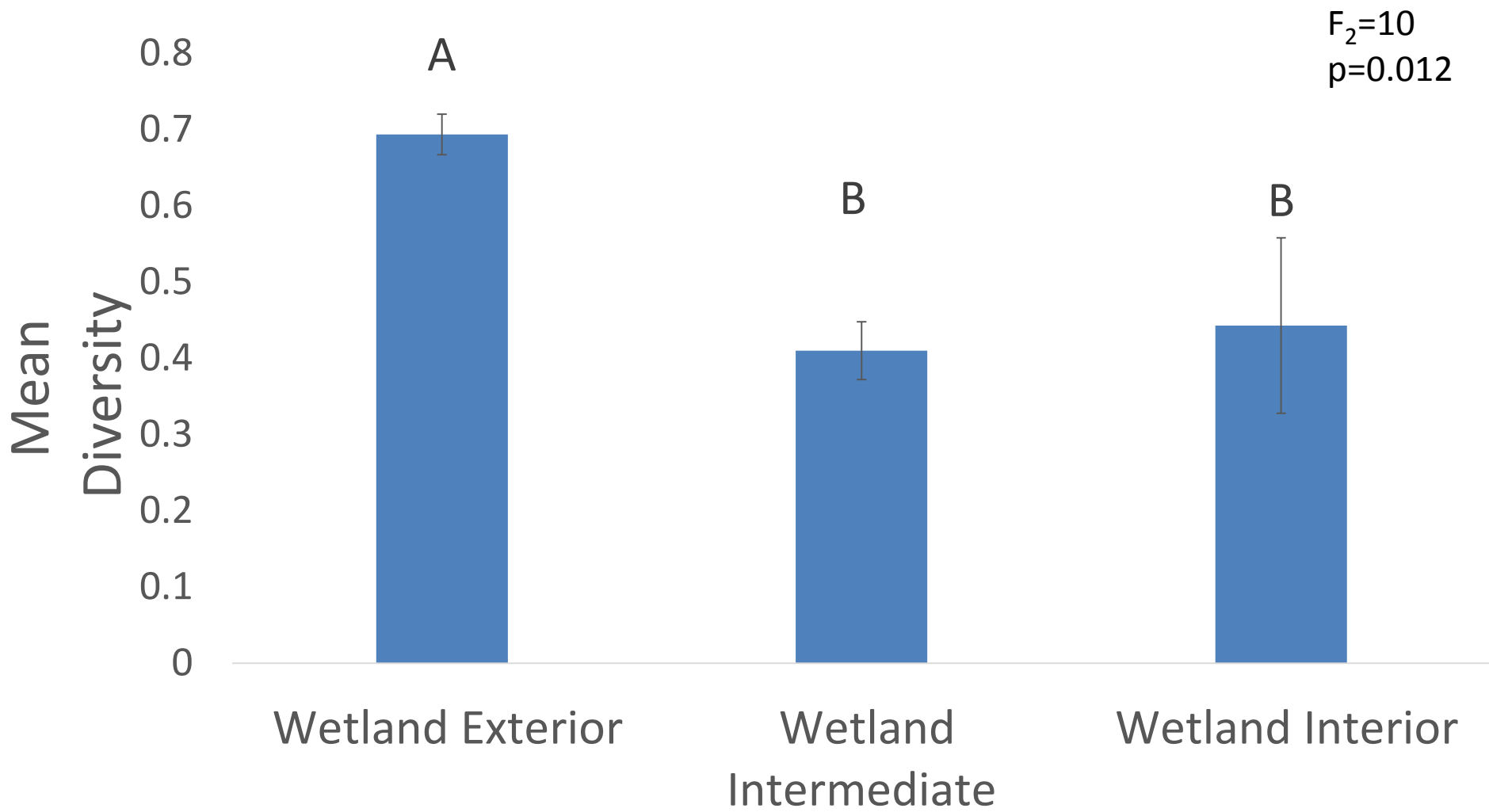
	Wetland Exterior	Wetland Intermediate	Wetland Interior
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Fen	0.655	0.410	0.315
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Forsaitth's	0.650	0.476	0.341
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Lost Pond	0.772	0.126	0.212
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Morphotype Abundance

	Abundance	Percent of colonization
White Deer	97	52.4
Mold Deer	31	16.8
White Pyramid	5	2.7
Cinnamon Bulge	6	3.2
Black Fuzzy	32	17.3
Shroom	1	0.5
Worm	1	0.5
Grey Deer	2	1.1
Wrinkle Pickle	7	3.8
Cob Web	3	1.6
Total	185	

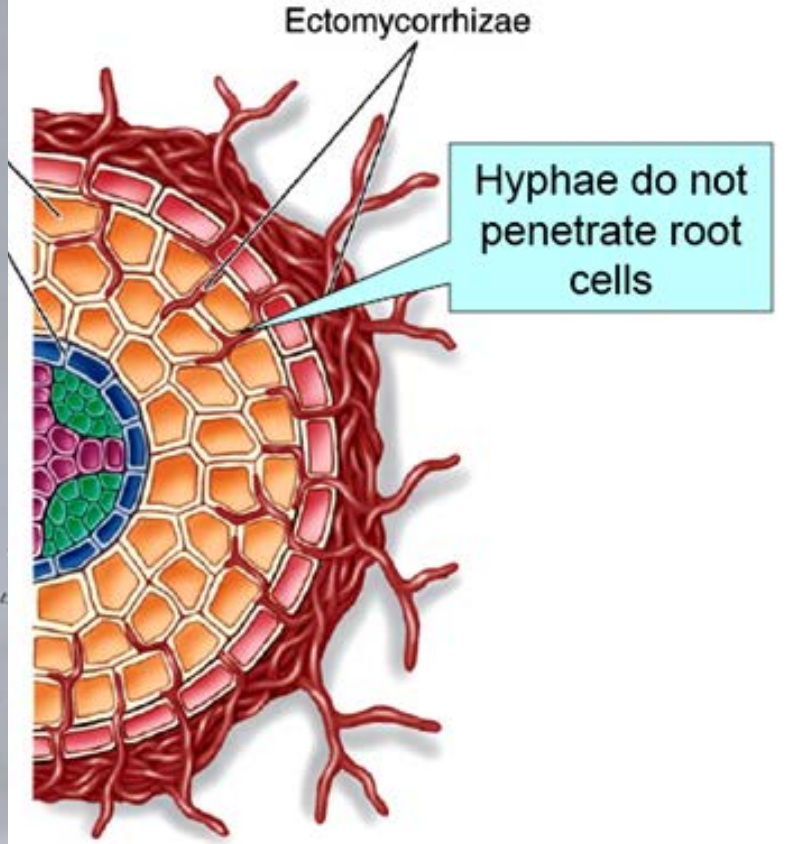
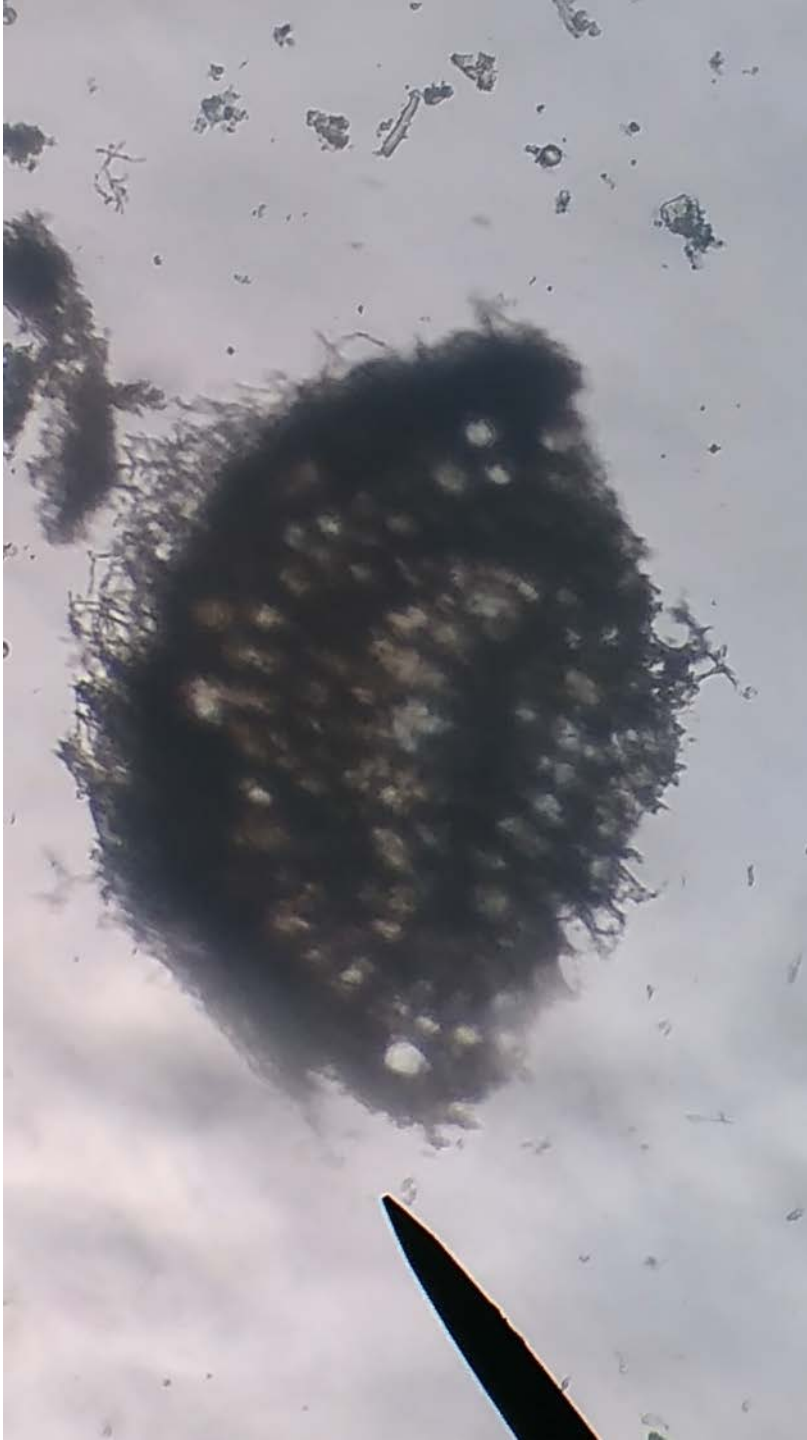


Discussion

- Possible explanations for results
 - Larches on border between wetland and upland had root contact with upland trees
 - Moisture levels
 - Soil moisture levels were higher in the wetland interior
 - Plants farther from edge benefit less from mycorrhizal relationship
 - Tree density, nitrogen
- The use of morphotypes for EMF validation

Ways to Improve

- Use more similar wetlands
- Larger sample sizes
- Genetic Analysis
- N, P, K test
- Account for tree age
- Take surveys of surrounding vegetation
- Upland tree surveys along boundaries



Ectomycorrhizae

Hyphae do not
penetrate root
cells

Future Studies

- The effect of wetland size on diversity
- Correlation between moisture levels and diversity
- Compare pure stands of *Larix laricina*, *Picea mariana*, and mixed stands



Conclusion

- We rejected the null hypothesis ($p=0.031$)
- There was a relationship between EMF morphotype diversity and distance from the edge of the fen.





Questions?



A photograph of a dense forest floor. The ground is covered in vibrant green moss and various ferns. Tall, thin trees are visible in the background, and the overall atmosphere is bright and natural.

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