

# Interactions Between Roots and Soil Microbes in Promoting Resistance to Streambank Fluvial Erosion

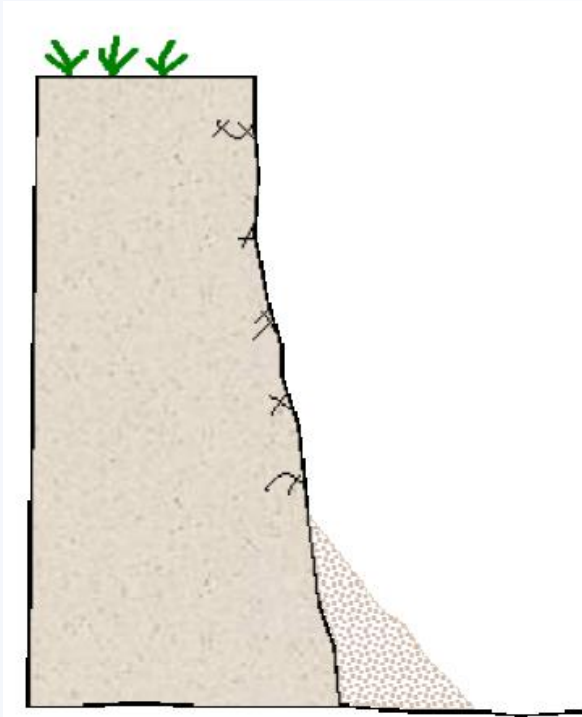


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EGU 2022 General Assembly  
Monday, May 23, 2022

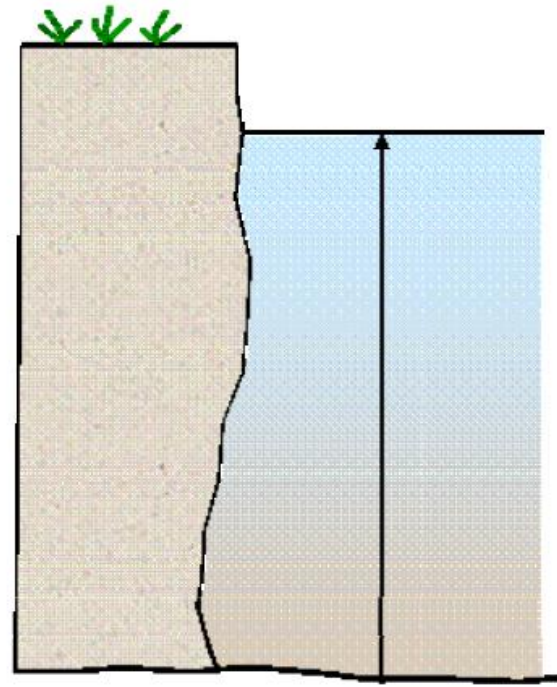


# Streambank erosion processes can significantly influence channel morphology

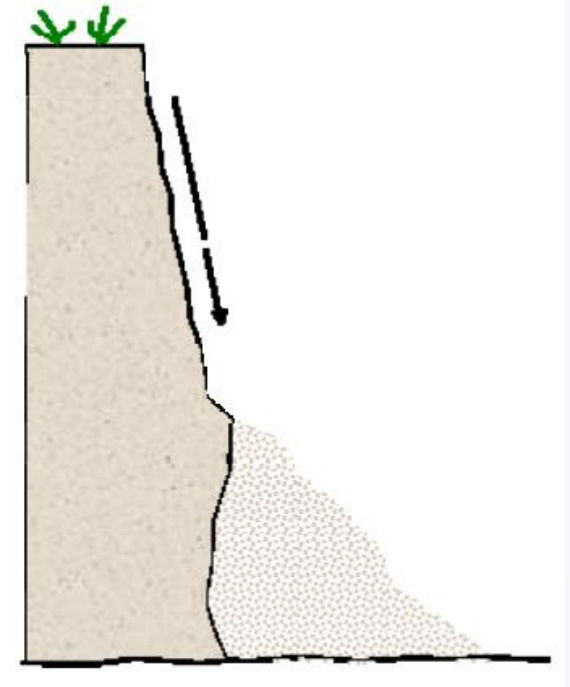
Wynn (2006)



**Subaerial Processes  
(Freeze-thaw cycling)**



**Fluvial Erosion**



**Mass Wasting**



# Plant roots influence streambank fluvial erosion rates, but role of soil microbes is less understood

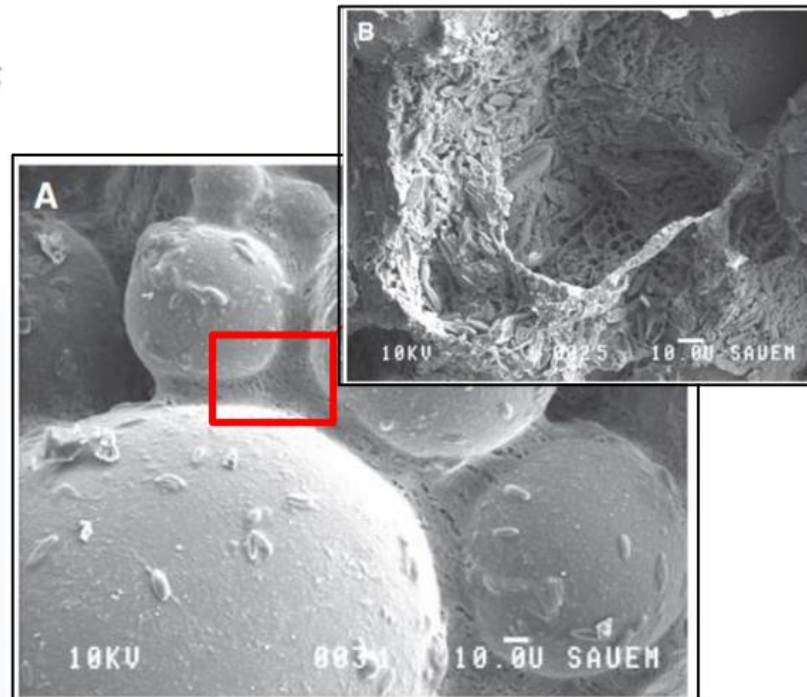
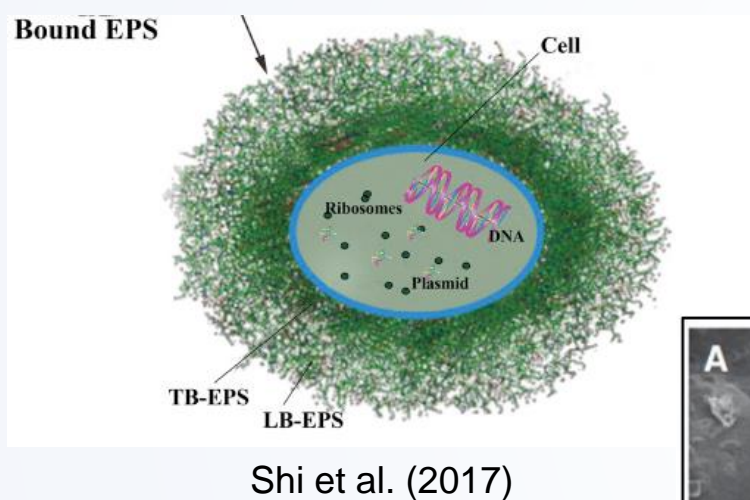


Photo Credit: Tess Thompson



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# Organic carbon is used by soil microbes, stimulating the production of Extracellular Polymeric Substances (EPS)



Teasdale et al (2018) and Gerbersdorf et al (2015)

EPS is very “sticky” material that is composed of:

- Polysaccharides
- Proteins
- Uronic acids
- Etc.



# Research Question: How do root physical and biological mechanisms influence streambank soil erosion rates?



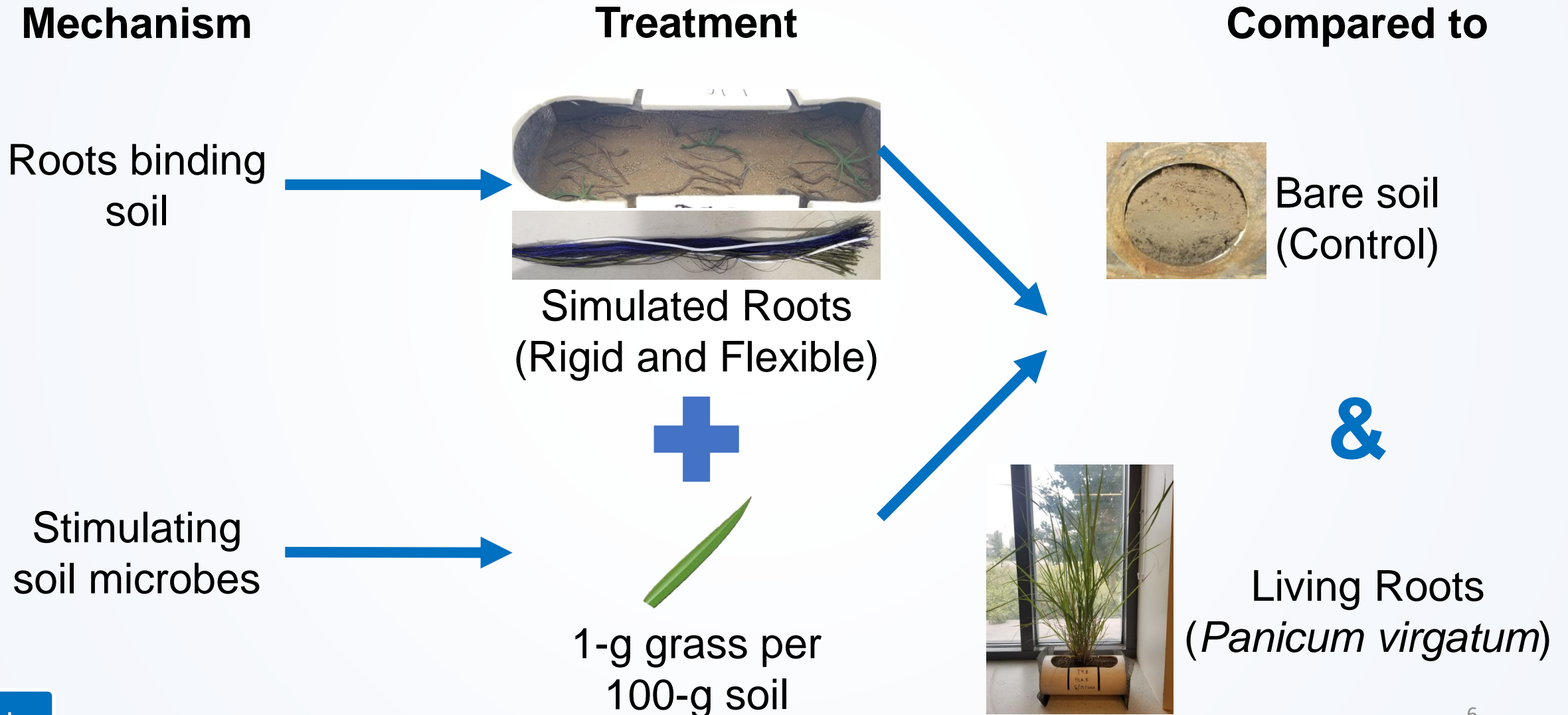
1. Physical **binding** of soil
2. **Stimulating soil microbes** through organic carbon inputs into the soil environment



~~3. Impact of root fibers on stream hydrodynamics~~



# Unique treatments were created to study root and microorganism impacts on erosion



# Six replicates per treatment matured in a greenhouse under similar conditions prior to erosion testing and soil analysis





# A model streambank was built in a recirculating flume to conduct erosion testing

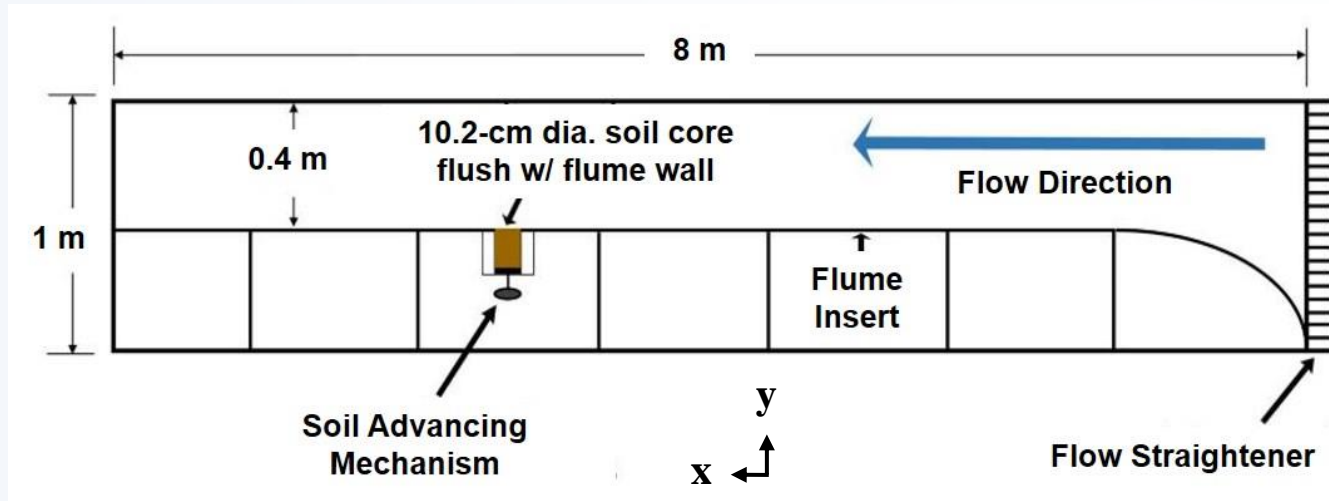
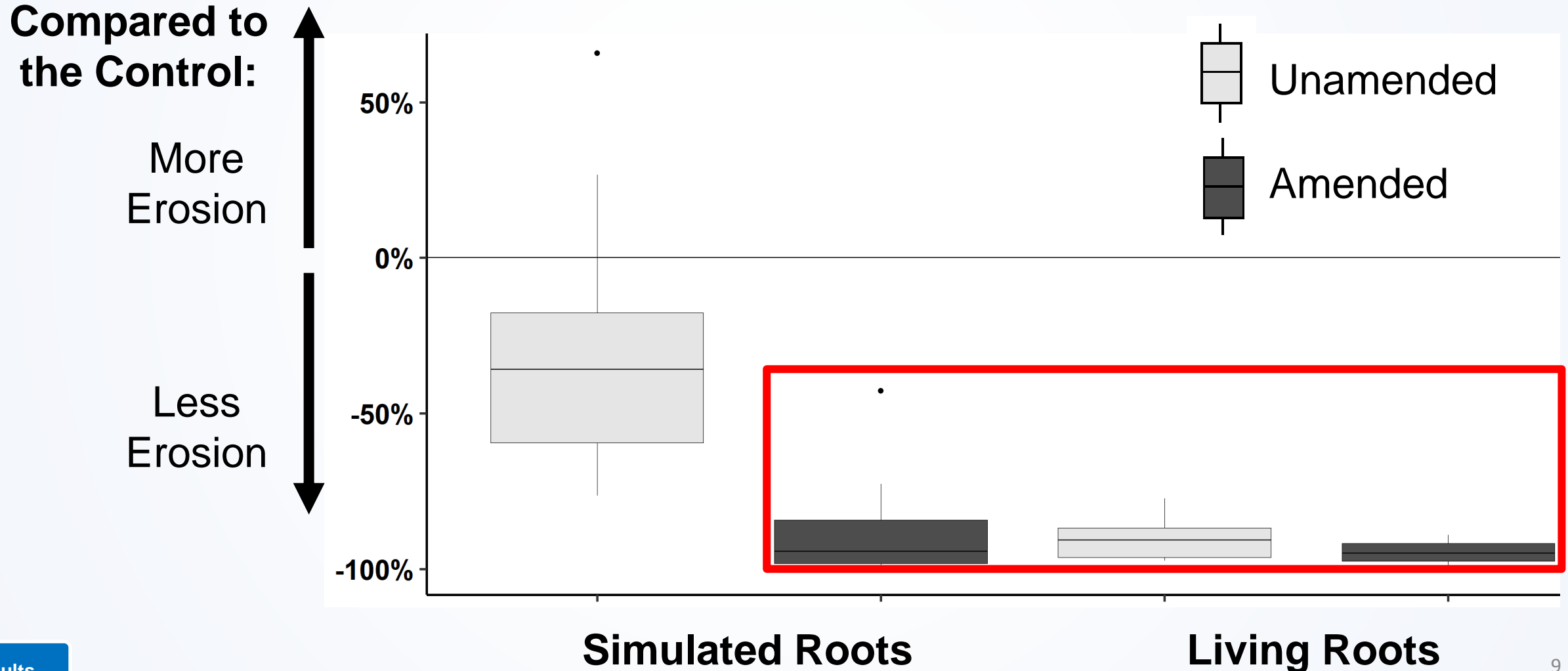


Photo Credit: Riley DeHority

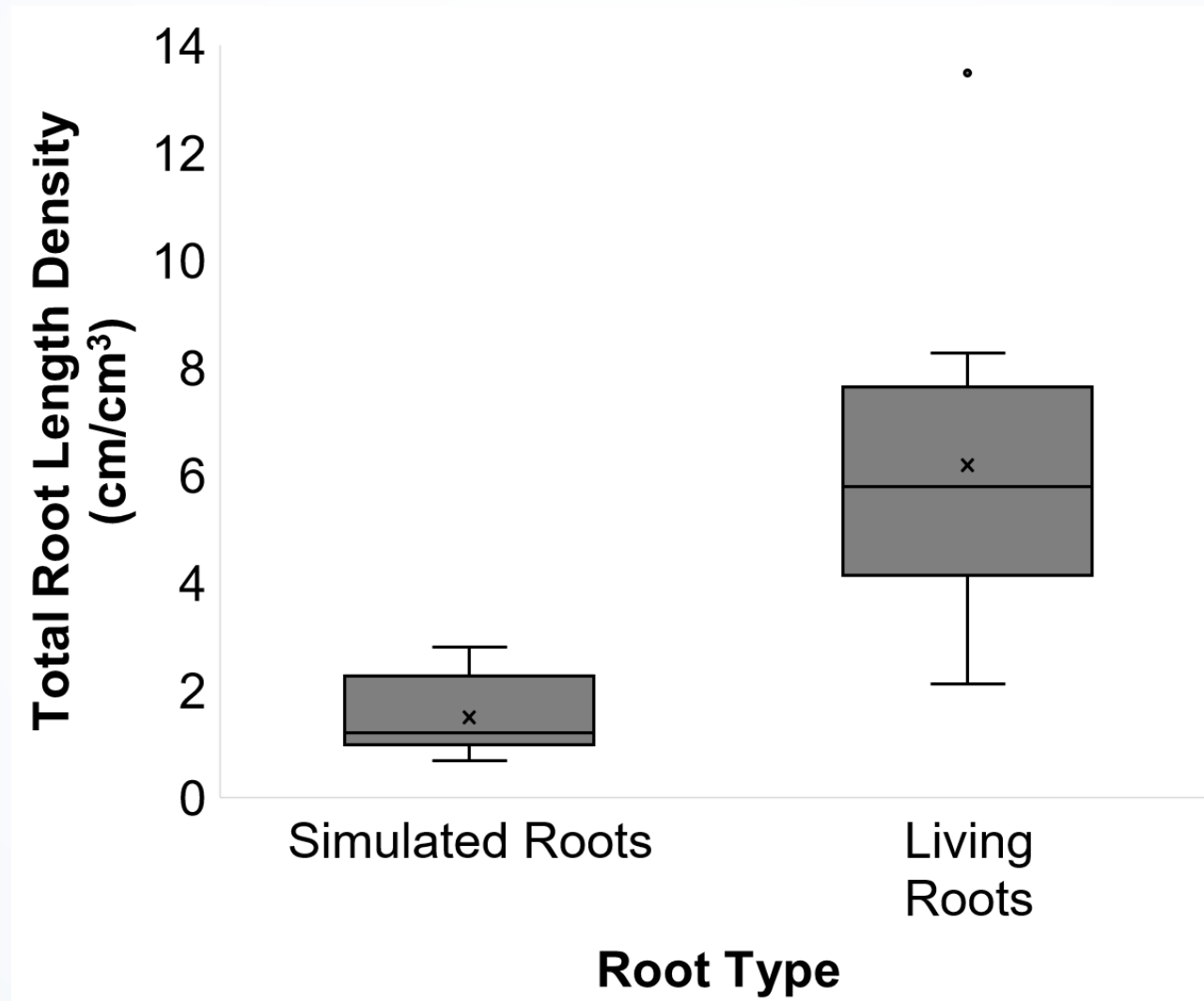




# Simulated roots + OM inputs performed just as well as living roots...



... regardless of total root length in soil



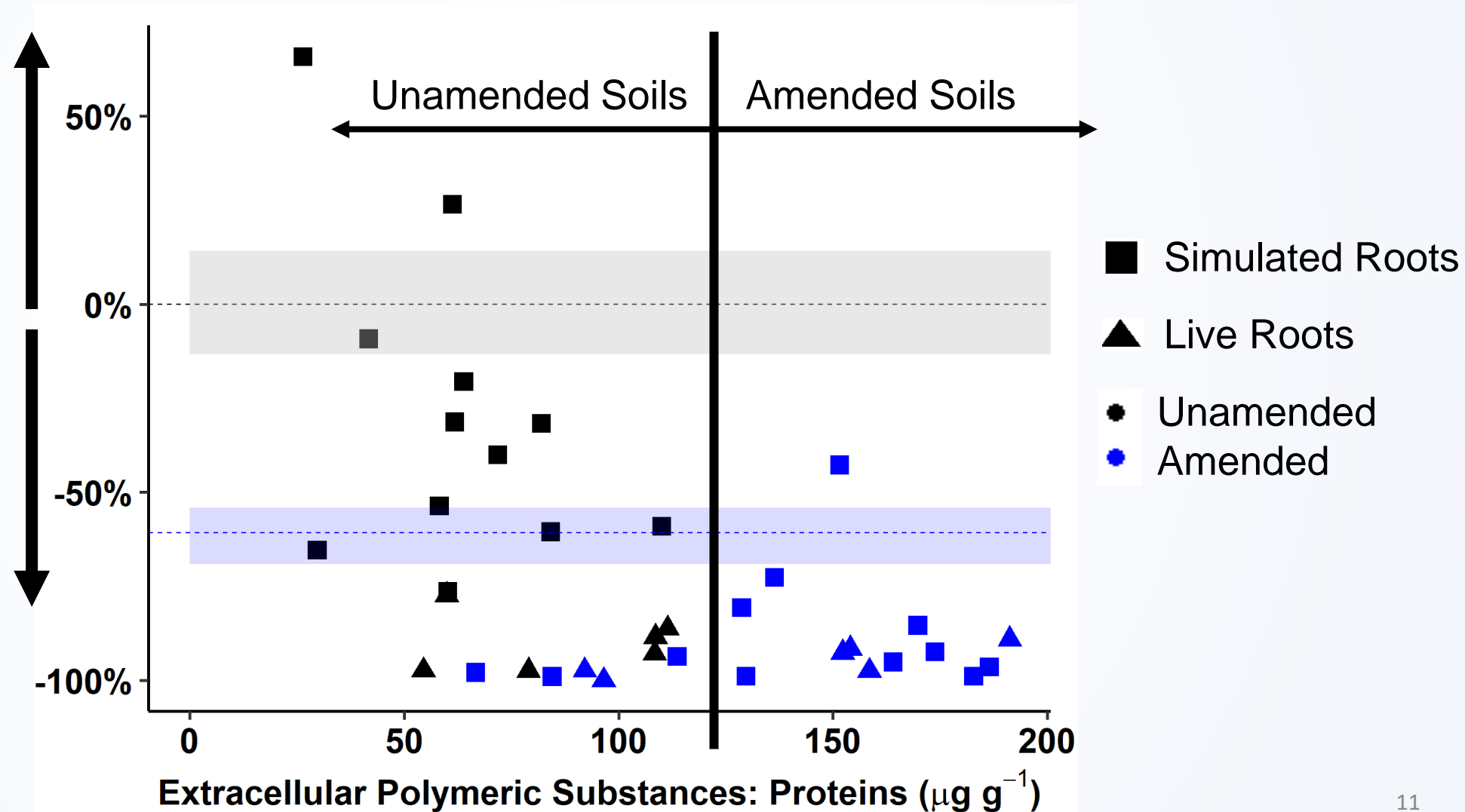


# EPS protein production was a primary driver of increased resistance to erosion for OM samples

Compared to  
the Control:

More  
Erosion

Less  
Erosion





Vegetation increases soil resistance to fluvial erosion. Similar erosion resistance can be achieved by adding simulated roots and organic material to soils (fiber reinforcement and EPS production).

- Applications in ecological restoration and soil stabilization projects





# Questions?

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# References

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