

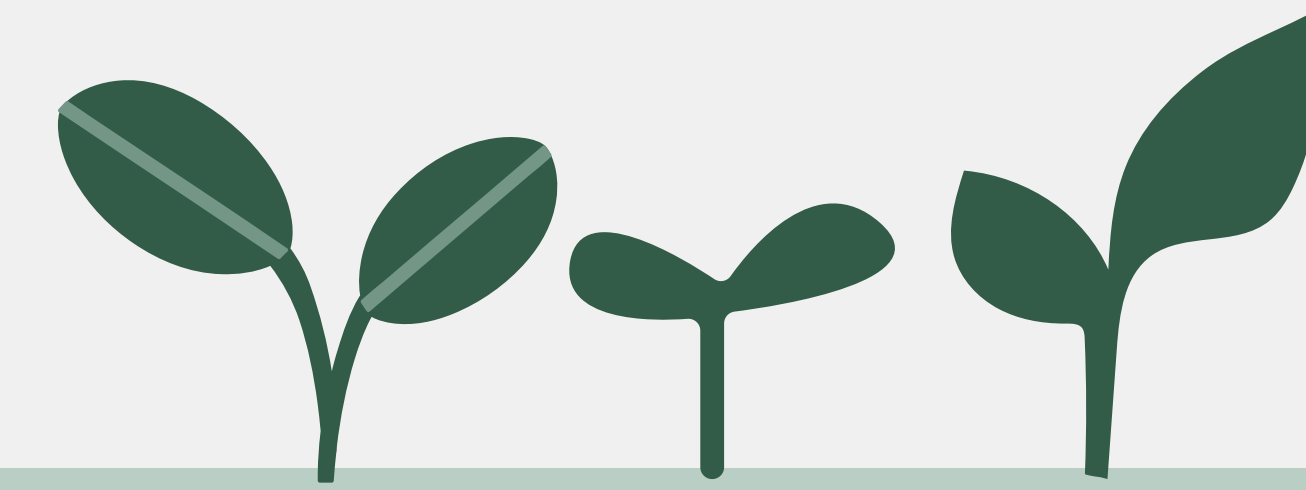
# O, SOIL!

## WHAT O HORIZON THICKNESS CAN TELL US ABOUT SUMMER SOIL MOISTURE IN PACIFIC NORTHWEST FORESTS AMIDST GLOBAL WARMING



**NORTHWEST NATURAL  
RESOURCE GROUP**  
LEADERS IN ECOLOGICAL FORESTRY

Niki Kiriara\*, Program on the Environment, University of Washington  
Site supervisor: Rowan Braybrook, Northwest Natural Resource Group  
Faculty Advisor: Tim Billo, Program on the Environment, University of Washington



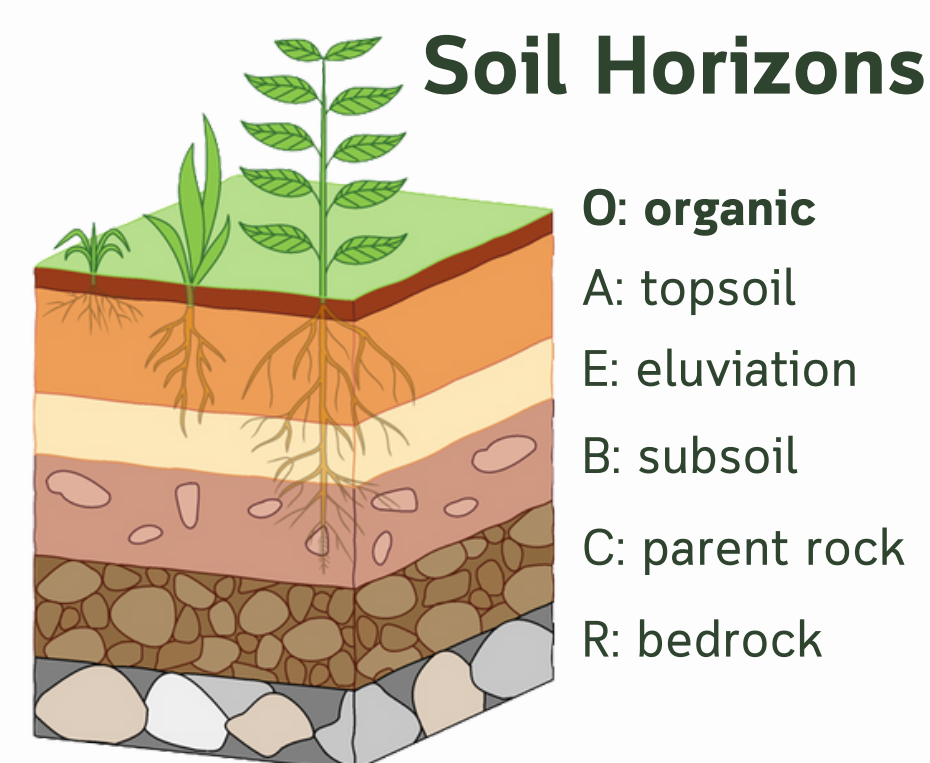
@nikiKiriara

### BACKGROUND

- Global warming exacerbates water availability limitations in forests quicker than these ecosystems can adapt

- Forests are foundational ecological service providers that act as carbon sinks, watersheds, wildlife habitats, natural resource suppliers, and more

- Evolving forest management and incessant global warming necessitate research into strategies that account for holistic forest health and foster climate resiliency.



**Figure 1:** The typical layers, or horizons, of soil. O horizon is the first layer composed of decayed or humified organic matter.  
(<https://www.sciencefacts.net/soil-horizons.html>)

### RESEARCH QUESTIONS

- What is the relationship between soil moisture content (VWC%) and O horizon thickness (cm)
- How does soil moisture compare across various stand densities?

### INTERNSHIP & METHODS

- I interned with the Northwest Natural Resource Group and worked on their summer forest climate resiliency project.
- Measured soil moisture levels (VWC%) and O horizon thickness (cm) weekly
- Two sites:
  - Nisqually Community Forest** (Ashford) - 70% thinned, gap-cut, 50% thinned, and control transects
  - Taylor Mountain** (Issaquah) - 12 plots (4 plots each) of 170-200, 220-260, and 300-360 trees per acre
- Analyzed data for relationships between variables at these sites



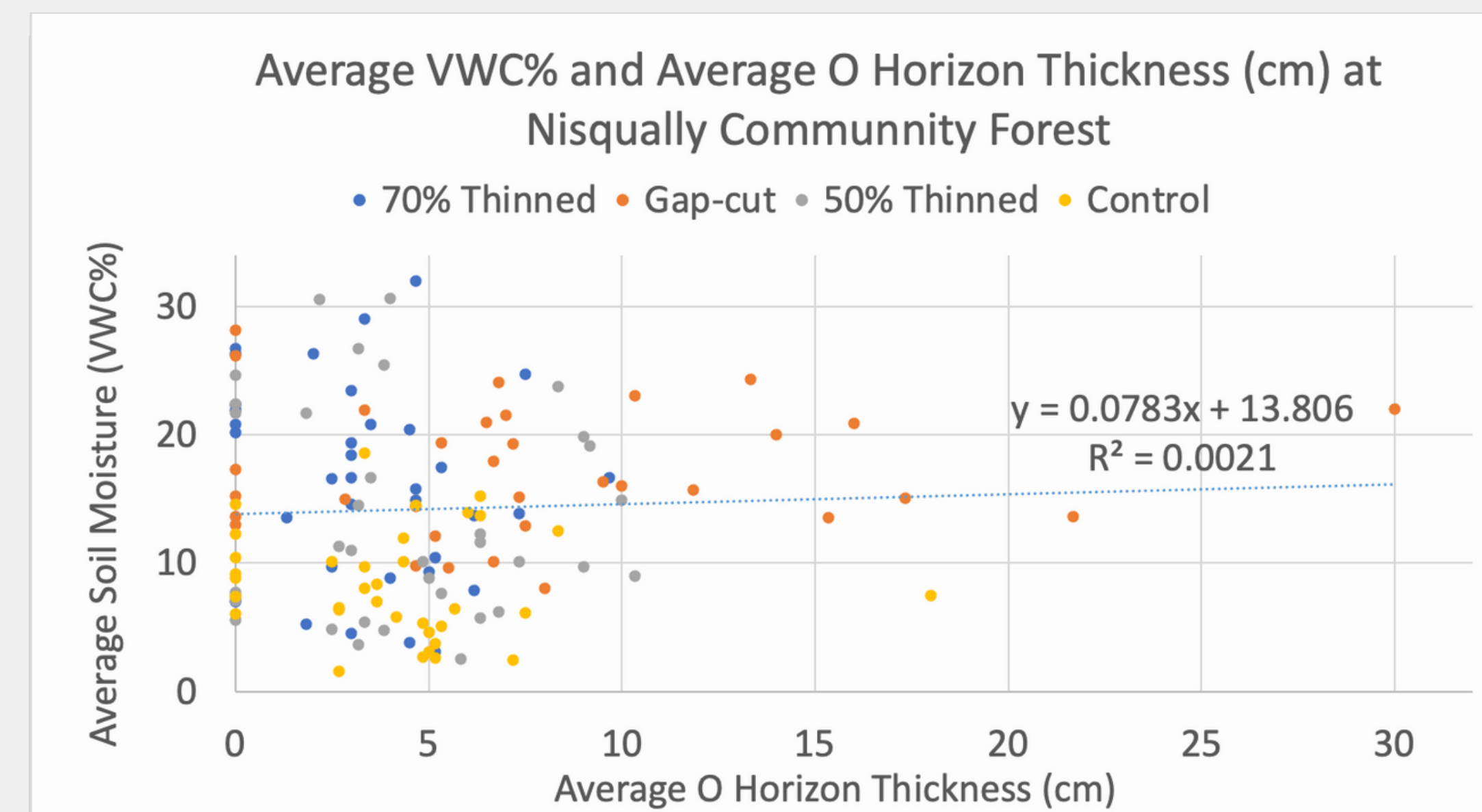
**Figure 2:** Niki (NNRG intern) taking soil moisture measurements using a soil moisture probe. The inset image shows the soil horizons and the probe's console. The probe reads soil moisture in volumetric water content (VWC%) and how long the reading took in microseconds (μs).

(Photo credit: Jaal Man, NNRG lead forester)

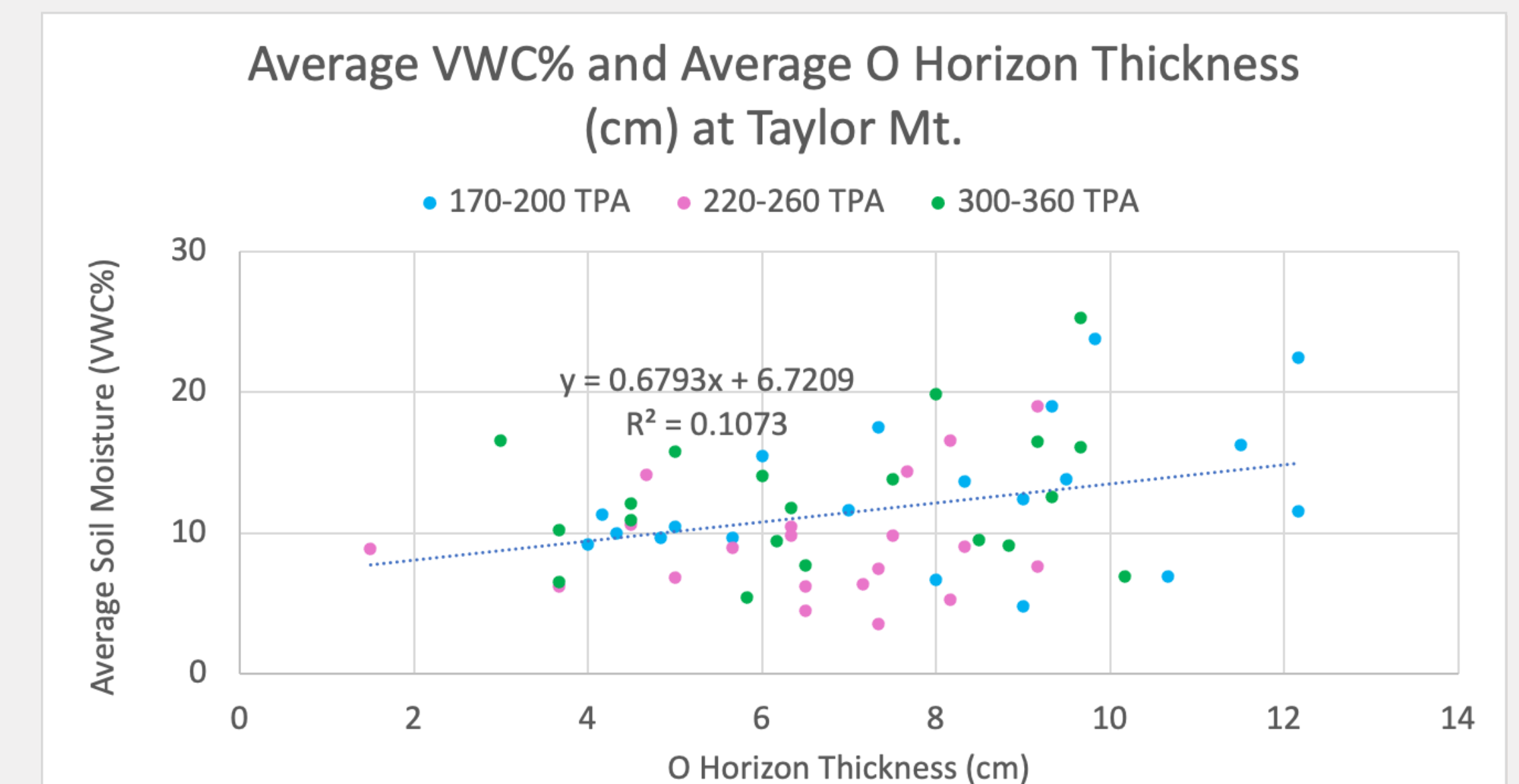
### RESULTS

#### 1. No correlation between soil moisture content and O horizon thickness

- Figures 3 & 4 suggest that thicker O horizon is not associated with higher soil moisture
- No correlation between these variables observed per individual stand density type
- Average O horizon thickness did not greatly differ across stand density or trees per acre, except at gap-cut transect



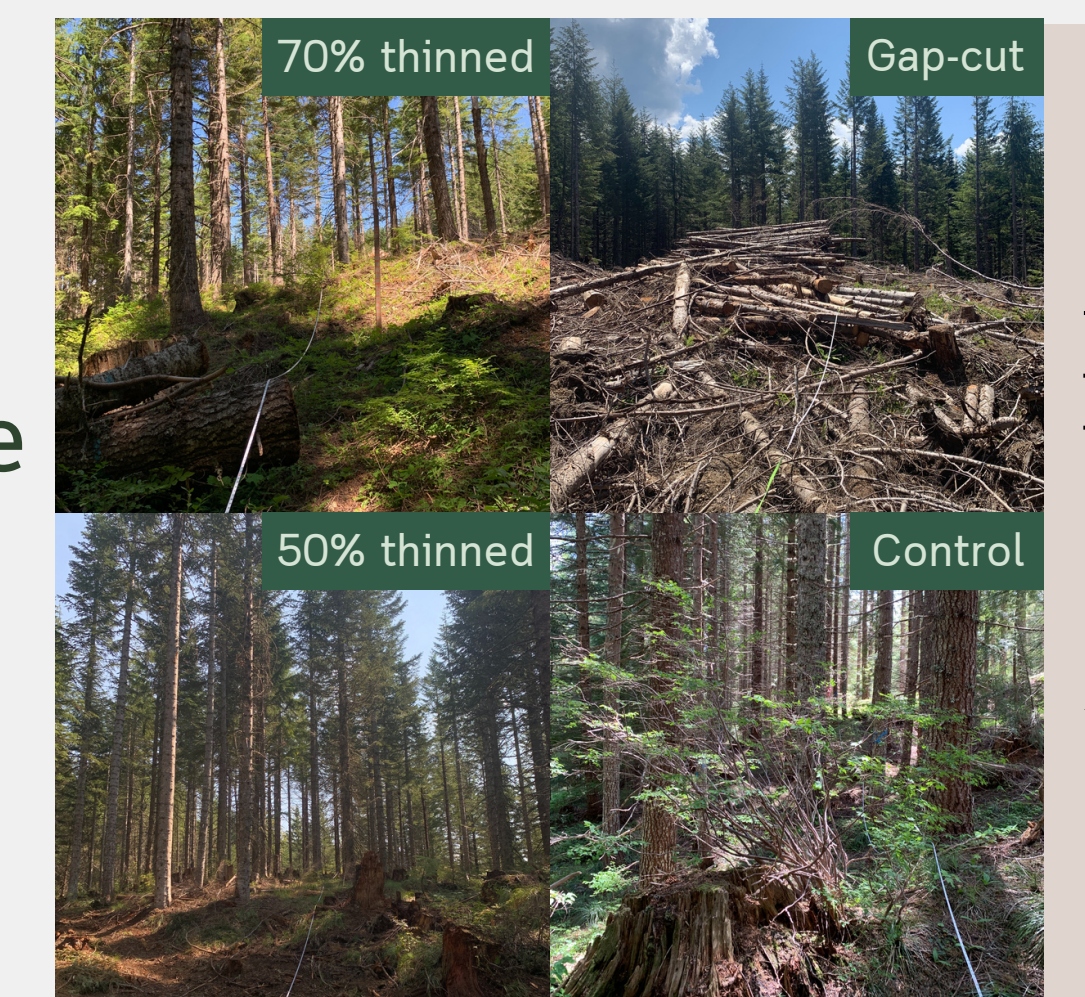
**Figure 3:** Relationship between average soil moisture (VWC%) and average O horizon thickness (cm) at the NCF. Linear regression shows small  $R^2 = 0.0021$ .



**Figure 4:** Relationship between average soil moisture (VWC%) and average O horizon thickness (cm) at Taylor Mt. Linear regression and  $R^2 = 0.1073$  illustrates slightly stronger correlation, but still not considerably strong.

#### 2. Soil moisture correlates with stand density

- Average soil moisture over time did not vary between trees per acre at Taylor Mt., but higher rates of thinning correlated with higher soil moisture retention at Nisqually Community Forest
- Figure 5 depicts the left over logging debris in the gap-cut transect responsible for its high O horizon measurements and soil moisture levels



**Figure 5:** The four transects at the Nisqually Community Forest with different stand densities.

### IMPLICATIONS

- Findings suggest that factors other than O horizon thickness may influence summer soil moisture levels
- While higher thinning rates correlated with higher soil moisture content at Nisqually Community Forest, considering canopy coverage, evaporation, and winter snowpack is crucial
- Not removing logging debris before regenerating forests is a possible strategy worth investigating
- Experimental research needed to explore possible causal relationships between these variables

### ACKNOWLEDGEMENTS

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