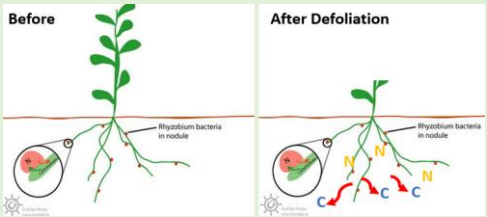


## Introduction

- Bi-cultures provide forage for livestock.
- Legumes decrease the need for external N inputs due to their associated N fixing bacteria
- Can improve soil quality indicators like organic matter, nitrogen, water holding capacity, and soil aggregation compared to monocultures
- Defoliation disturbance through grazing and or haying can alter growth aboveground and belowground and root exudation<sup>6</sup>, below-ground N fluxes



**Figure 1.** Defoliation increasing carbon and nitrogen flux belowground

*Appropriately managing defoliation could enhance the benefits of grass legume bi-cultures*

**Overarching question:** How does defoliation management intensity effect indicators of soil quality and microbial communities?

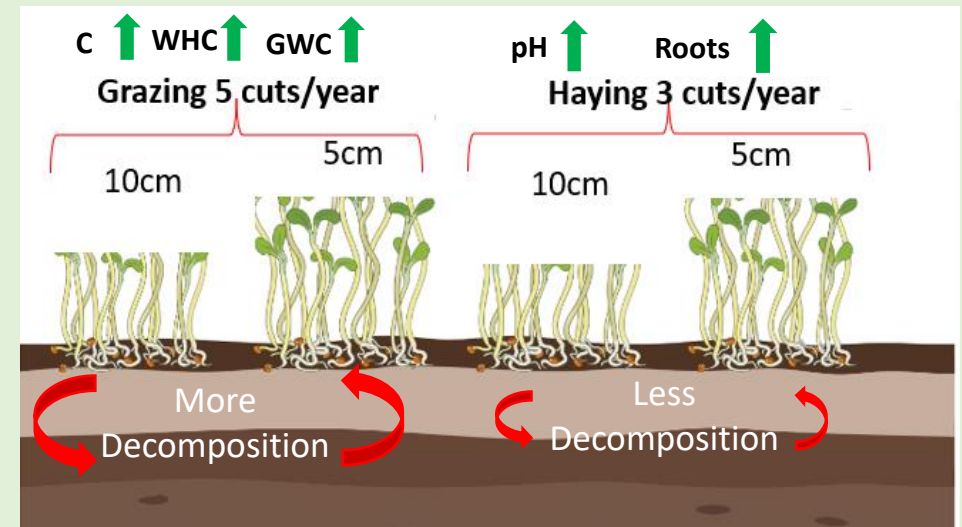
## Design/Methods

- 6 orchard grass (ORC) legume bi-cultures, alfalfa, red and white clover, and birdsfoot trefoil in a ratio of 30% legume + 70% ORC, and mixtures at 30% to 70% and 70% to 30% ratios
- Crossed cutting schedule 5 (grazing) and 3 (cutting) x year and cutting height 5 and 10 cm
- sampled after 3 years



**Figure 2.** Grass legume bi-culture

**Soil quality indicators were altered most by cutting frequency, the magnitude of which was affected by cutting height. Also, bi-culture type explained no variation in soil quality indicators.**

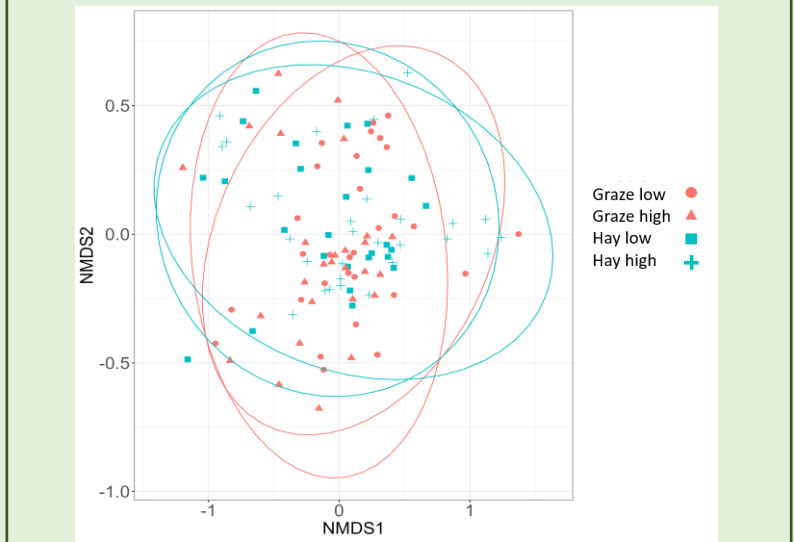


**Figure 3.** Green arrows indicate metric is greater under corresponding cut frequency. Total carbon (C), water holding capacity (WHC), gravimetric water content (GWC), dry root biomass (roots).

**Table 1.** Soil quality indicator differences between treatment combinations. Shared letters indicate no difference.

	PMN	Total C	Total N	DOC	TDN	GWC	WHC	Roots	pH
<b>Graze low</b>	a	a	a	a	a	a	a	a	a
<b>Graze high</b>	a	ab	a	a	b	ab	a	a	b
<b>Hay low</b>	a	b	a	a	b	b	b	ab	ab
<b>Hay high</b>	a	a	a	a	ab	ab	a	b	b

**Bacterial community composition was significantly different between cutting frequencies and frequency/height combinations**



**Figure 4.** Non-metric multidimensional scaling ordination plot. Points represent a bacterial community from 1 sample. Points grouped together are more similar in community composition.

## Next Step/Significance

Next, I will address: **Do communities exhibit more genes associated with decomposition and nitrogen cycling pathways under frequent cutting?**

*Microbial community functional genes can help inform the mechanisms of change to soil quality indicators and potential soil function moving forward.*

## Acknowledgments/References

NH Agricultural Experimental Station for funding. Hannah Holland-Moritz, Nathan Alexander, 2021 UNH Soil Ecology class. [1] Li et al., 2022, [2] Sanderson et al., 2013, [3] Samarappuli et al., 2014, [4] Roy et al., 2020, [5.] Verket et al., 2022, [6] Hamilton et al. 2008, [7] Ayres et al., 2007