### Soil Health in the Appalachian Region: Relationships between Plant Community, Physical and Chemical Soil Properties



#### Photo: Peña-Yewtukhiw (2019)

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Explore how plant communities are related to physical and chemical soil properties in grasslands of the Appalachian region of WV.



Introduction





Materials and Methods







Plant community in grasslands refers to the variety and abundance in plant species and it is often related to the health status of the system.





## Introduction

This variety showcases the unique contributions of each plant species due to their distinct nature (composition, root system).





## Introduction

Greater plant diversity is seen as a sign of more resilient and productive grazing system.

Cuervo, J (2024)

## Introduction

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Greater plant diversity is seen as a sign of more resilient and productive grazing system.

The connection between plant diversity and soil health in grasslands is taken for granted.







There is a significant correlation between plant diversity and soil physical and chemical properties (such as pH, nutrient availability, bulk density) in the grasslands of the Appalachian region of WV.

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**Hypothesis** 

- 8 farms/grasslands (7 WV counties)
- Different soil types
- Multiple management (Hay, grazing, or both)
- Soil Health Status (healthy, unhealthy)
- Yield, Shannon's Index, Soil nutrient content (K, Mg, P – Mehlich III–), SOM (LOI), MWD, BD, Total Porosity, pH (1:1)– at of depth 0 to 10 cm –
- t-test (*p*-value= 0.1)
- Summer 2022





# **Materials and Methods**

Our findings indicate that in the studied area, grasslands with higher relative yields are associated with healthier soils compared to unhealthy soils.







The higher Shannon Diversity Index observed in healthy soils compared to unhealthy soils indicates increased plant species diversity under "improved" SH conditions.







Under unhealthy soil conditions, the concentration of K concentration and SOM content was significantly lower compared to healthy soil conditions.





A weak trend suggested that healthy soils tend to have higher P concentrations and Dry Mean Weight Diameter than unhealthy soils.





These results do not show a clear trend that would allow us to conclusively assert a direct link between soil health and BD, TP,  $MWD_{wet}$ , and pH.



No clear relationship exists between Shannon's Index and available Mg (mg  $kg^{-1}$ ) at a depth from 0 to 10 cm in both healthy and unhealthy soils.





A significant positive correlation was found between SDI and Mg concentration specifically in healthy soils.





Although it is no significant, the correlation between SDI and soil P follows a negative trend in healthy soils.



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## Conclusions

- The farmer's assessment of SH appears to be linked to the plant diversity and productivity of the grasslands.
- K and SOM levels are highly related to SH status in grasslands of the Appalachian region of WV.
- In healthy soils, plant diversity shows strong
   relationships with certain soil properties, but in
   unhealthy soils, these connections weaken or
   disappear, suggesting that soil health plays a key role in
   supporting these interactions.





## Conclusions

 Special attention should be given to the effects of weather, season, and animal behavior on plant communities and soils.









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