

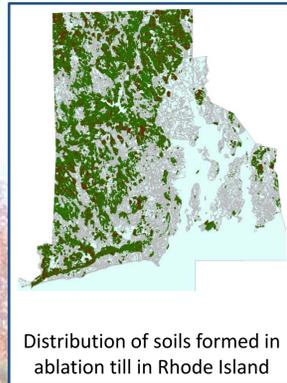
Soil Quality in Rhode Island Pastures Grazed by Different Types of Livestock



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Introduction

- Consumer demand for local, sustainably produced food is increasing, as are the number of farms and acres used for farming in Rhode Island
- Critical knowledge of the impacts different types of livestock have on pasture soil quality is missing in RI
- Well-managed pasture can increase soil quality, decrease the amount of feed farmers must purchase and buffer threats to water supplies
 - Common concerns in pasture soils include compaction and reduced infiltration, leading to poor soil conditions and risk of nutrient run-off
- Soil quality parameters quantify various aspects of soil health, by rating physical, chemical and biological properties of soil
- Data from this study can provide important baseline data, as well as suggest land use management strategies for improving New England soils
- We compared soil quality in RI pastures used to raise beef cattle, sheep and horses, with hayed pastures serving as a control

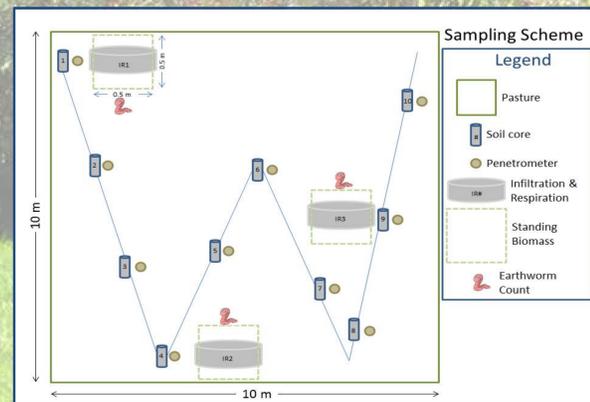


Methods



Typical soil profile of a Charlton sandy loam (parent material: glacial ablation till)

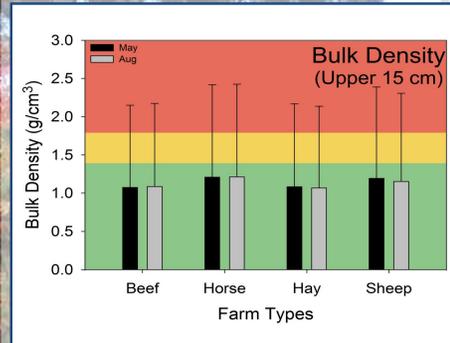
- Selected three RI pastures supporting each type of livestock (beef cattle, sheep, horses and hay) situated on glacial ablation till



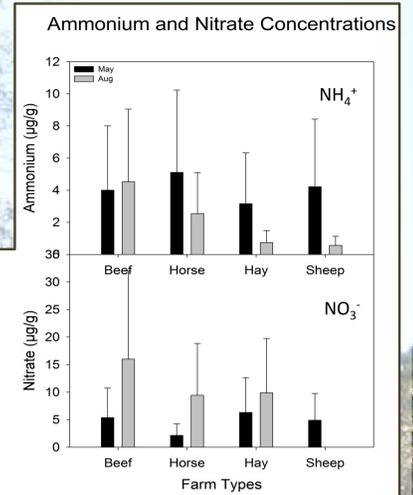
- Collected 10 soil samples in May, August and October 2012 in each of the 12 pastures
- Assessed standing plant biomass, soil respiration, infiltration rates, penetration resistance and earthworm counts
- Described soil profiles and characterized plant community
- Analyzed soil samples for
 - bulk density
 - organic matter
 - water-stable aggregates
 - texture
 - pH
 - electrical conductivity
 - extractable NPK
 - active carbon

Results & Discussion

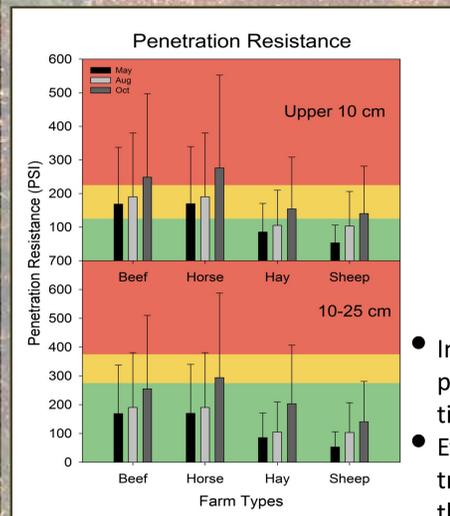
Values are grand means, error bars signify one standard deviation



- Bulk density does not appear to vary with livestock type or season
- All values are in "good" range (Cornell Soil Health Assessment Training Manual, 2009)

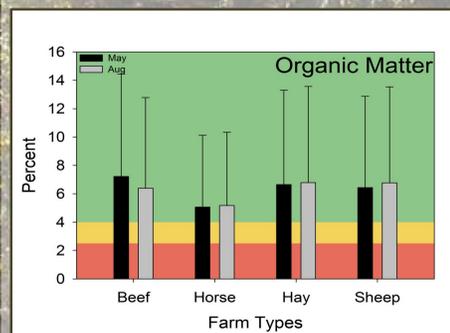
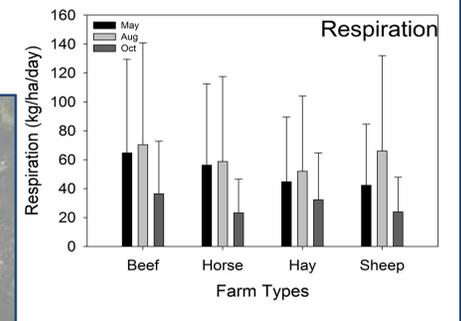


- NH₄⁺ concentrations are higher in spring than summer
- NO₃⁻ concentrations are higher in summer
- Livestock type and season affect N species

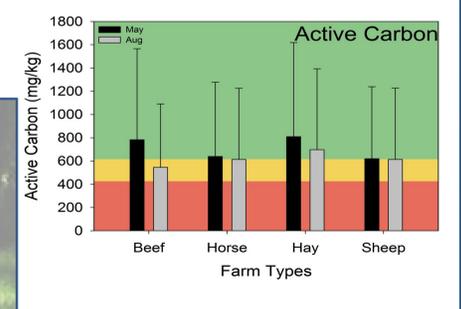


- Respiration varies with season, not livestock type
- Manure does not seem to affect respiration

- In contrast to bulk density, penetration resistance varies with time and livestock type
- Effects of animal and machinery traffic may be mitigated by freeze-thaw cycles in winter



- Active C varies little across livestock types or seasons
- Organic matter content is similar among livestock types and seasons



Conclusions

- Penetration resistance is significantly different among livestock types and seasons
 - Increases from spring to fall, though bulk density does not
 - Could be a result of trampling by livestock and haying machinery
 - Increases are potentially mitigated by freeze-thaw cycles in winter
- Sheep seem to have least negative impact on soil quality properties
 - Horses and cattle are larger => potential for increased localized soil compaction
- Results relevant to RI farmers and RI Natural Resources Conservation Service
 - Implications for land use and management decisions

Acknowledgements

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