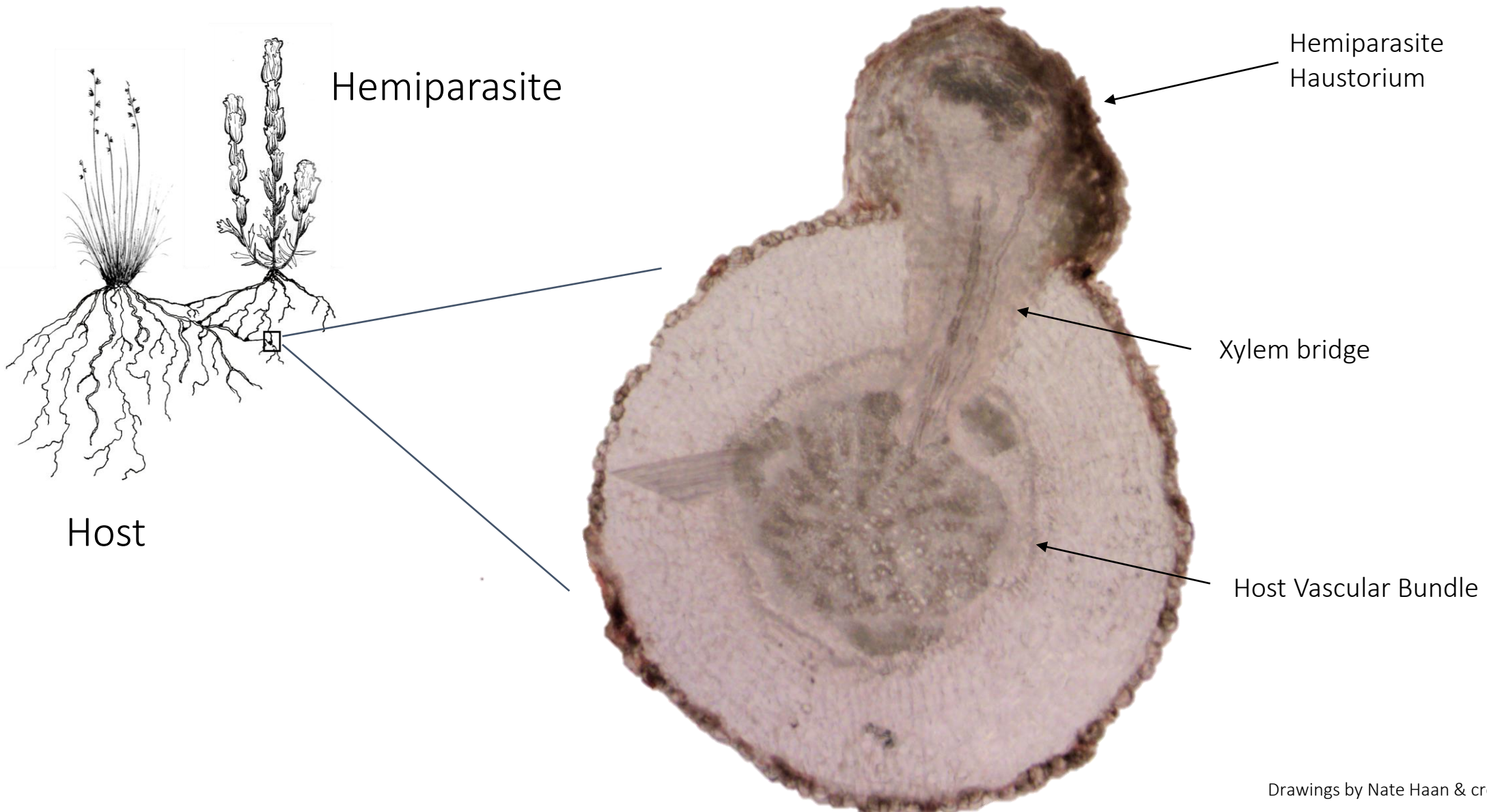


Root Hemiparasitic Plants are Associated with More Even Communities Across North America

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Root Hemiparasites



Host-hemiparasite relationship



Castilleja levisecta parasitizing *Achillea millefolium*

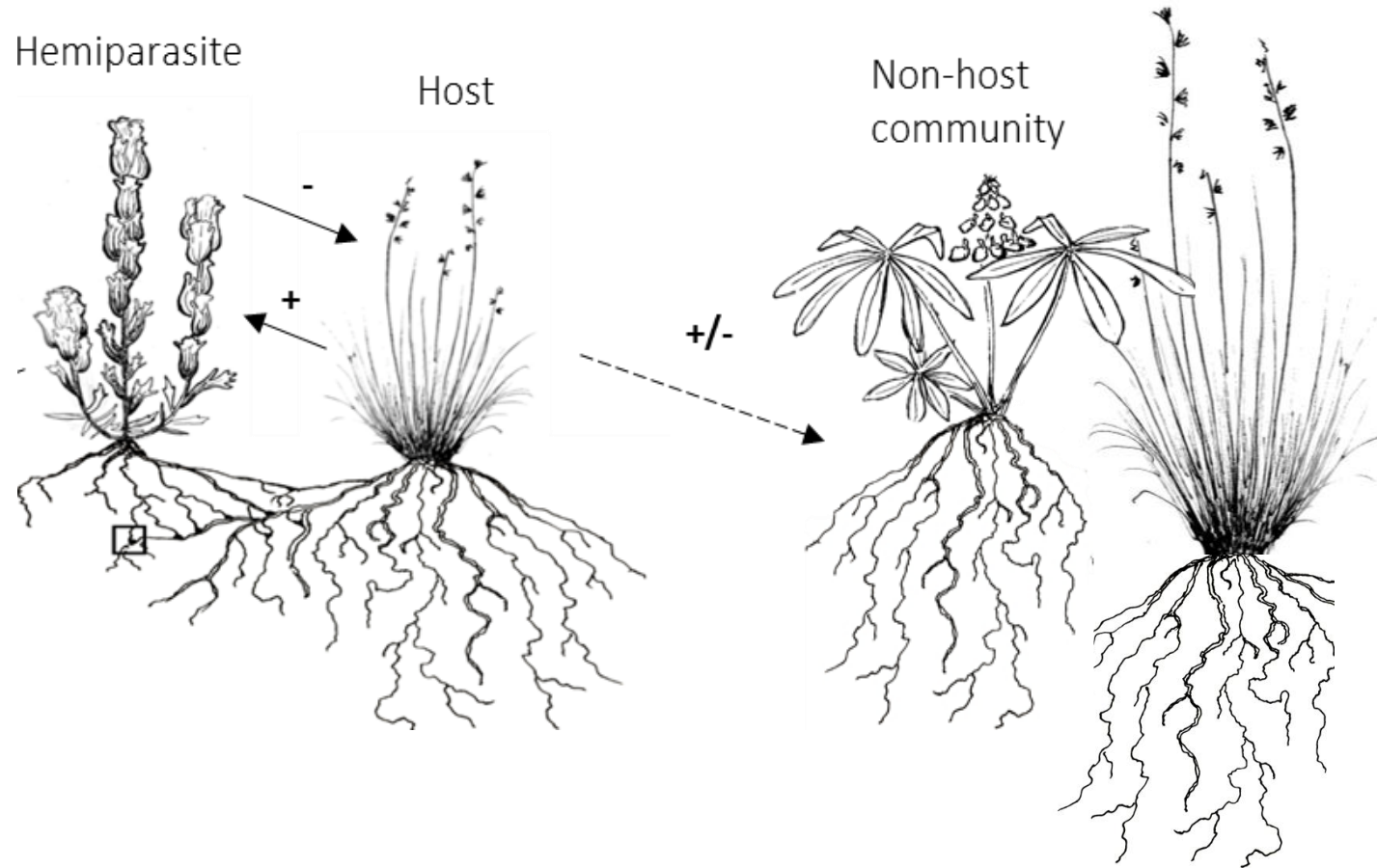
Hemiparasites are generalists

Small zone of influence – host proximity matters ; belowground abundance of a host huge factor in determining which species gets parasitized

Damage to the host varies

- Some hemiparasites rely more on their hosts than others
- Host tolerance and defense

Theory



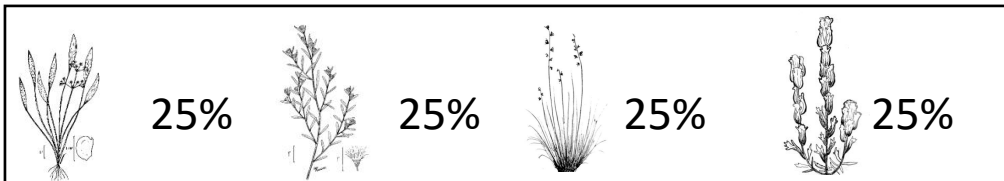
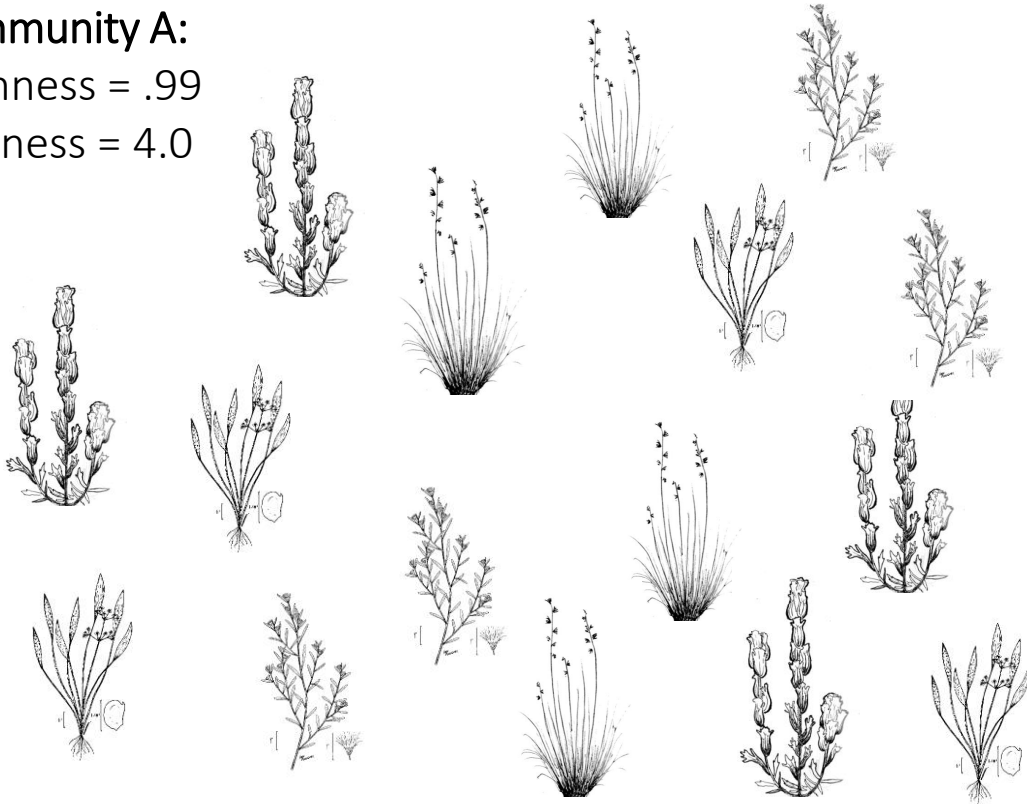
Richness & Evenness

Communities A and B have the same richness (4) but different evenness, & therefore different diversity

Community A:

Evenness = .99

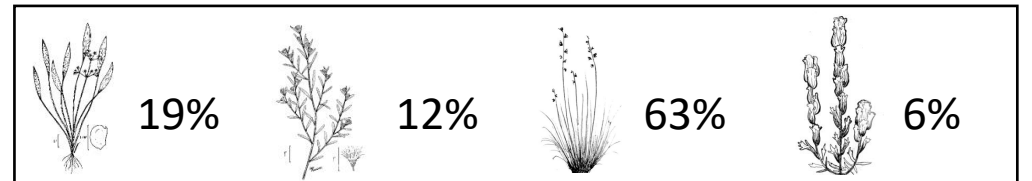
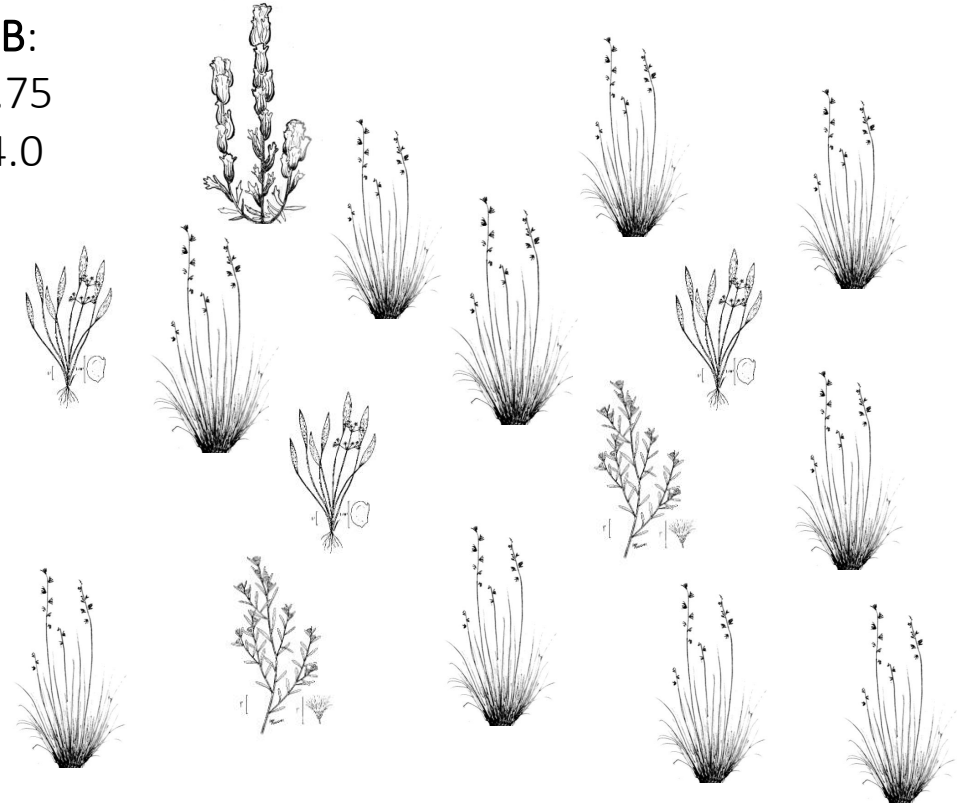
Richness = 4.0



Community B:

Evenness = .75

Richness = 4.0



The effect of multiple host species on a keystone parasitic plant and its aphid herbivores

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FORUM

Applied Vegetation Science

Native parasitic plants: Biological control for plant invasions?

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COMMUNITIES

plant communities across
vels

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Background

The majority of the research focuses on the genus *Rhinanthus*

Almost all are manipulative removal studies

Most studies focus solely on presence/absence

Can we make generalizations beyond specific taxa?

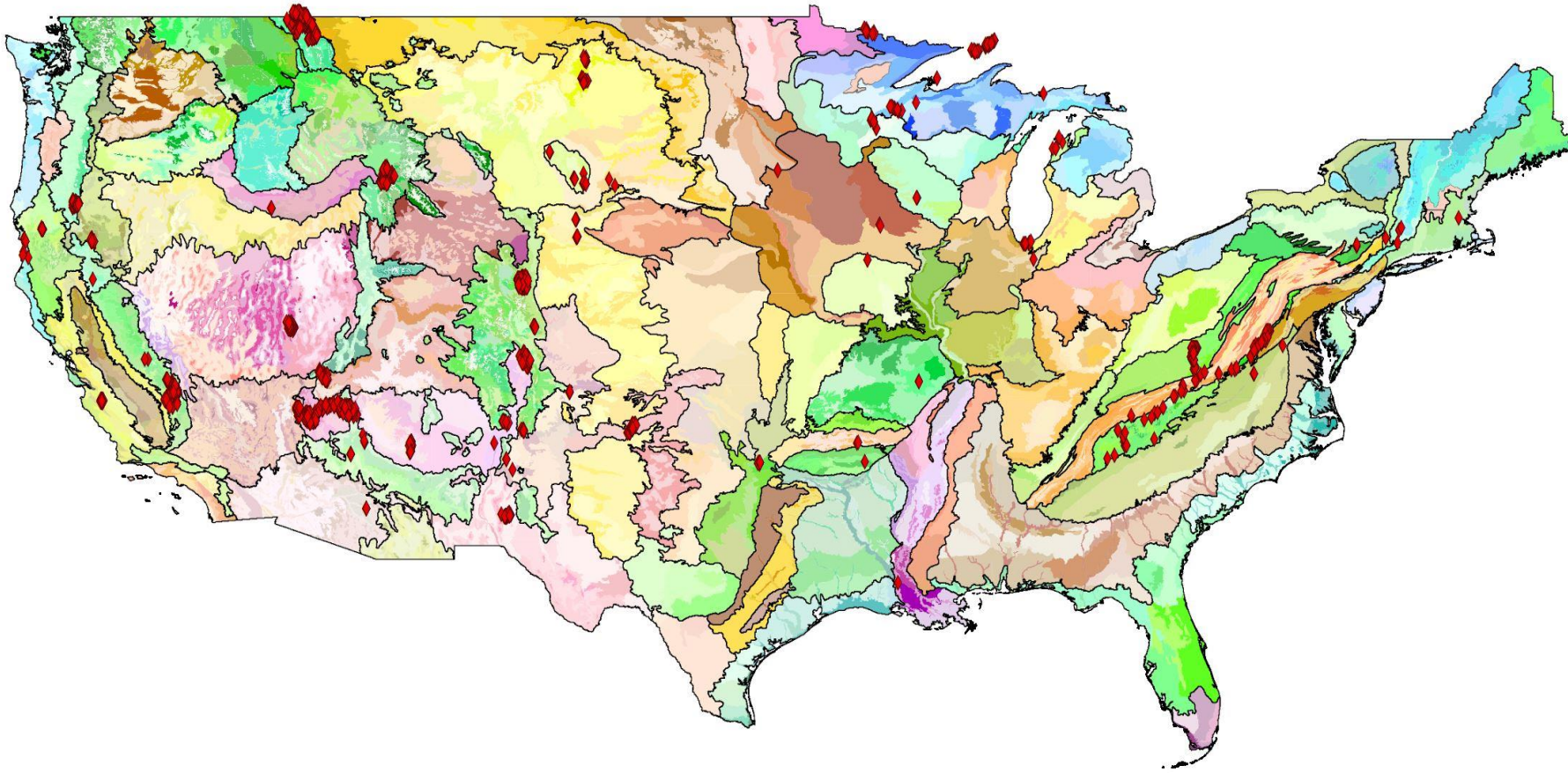


Objectives

We have the expectation that hemiparasites affect their communities, but what does this look like in natural systems?

Is hemiparasite presence or absence correlated with an increase in community richness or evenness? Are these effects density dependent?

Data Source



21,127 plots across 129 national parks and 219 USDA level four ecoregions

2,431 plots in 67 parks and 110 ecoregions contain hemiparasites.

Hemiparasites mostly represented by *Pedicularis*, *Castilleja*, *Krameria* and *Comandra*

Calculated plot evenness and richness using all plant species

Methods

- **Presence analysis**

Nearest Neighbor Analysis

1138 pairs spread over 60 parks and 96 level four ecoregions.

- **Abundance analysis**

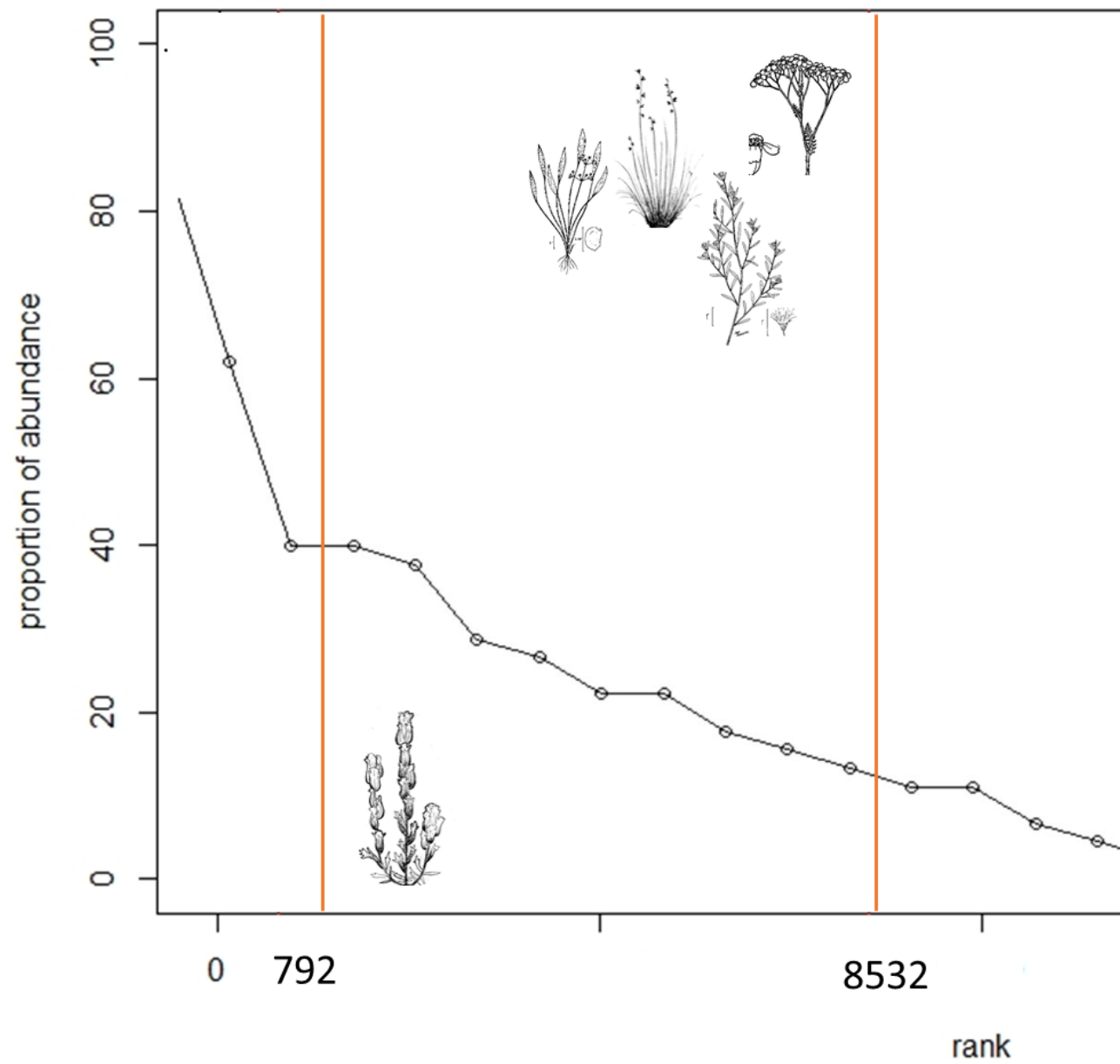
Using plots with hemiparasites (n = 2431)

Linear mixed model

- **Null Analysis**

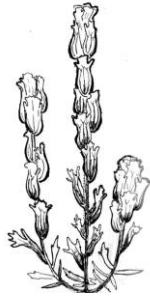
A hemiparasite's correlation with richness or evenness may be related to its distributional patterns (medium rare plants) than to a parasitic lifestyle

Compare hemiparasite model to null models of plants with similar distribution



Hemiparasite (n = 97 taxa within data)

Actual dataset



Model

Real model coefficient

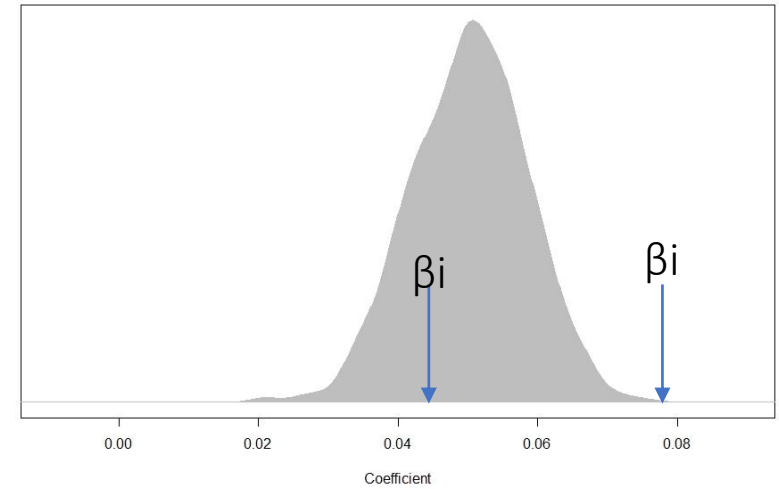
Fake hemiparasite

1000
Null datasets

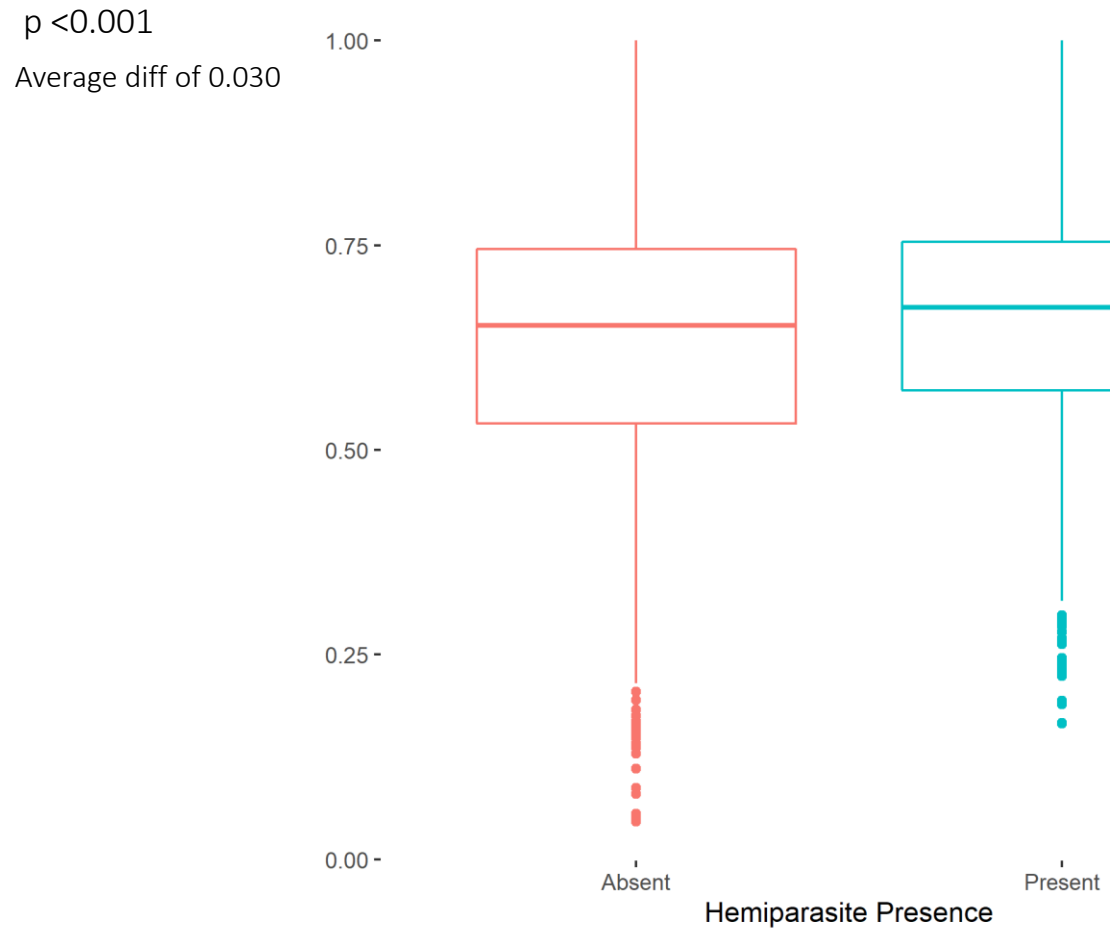


Model x 1000

Distribution of
1000 model
coefficients for
null datasets



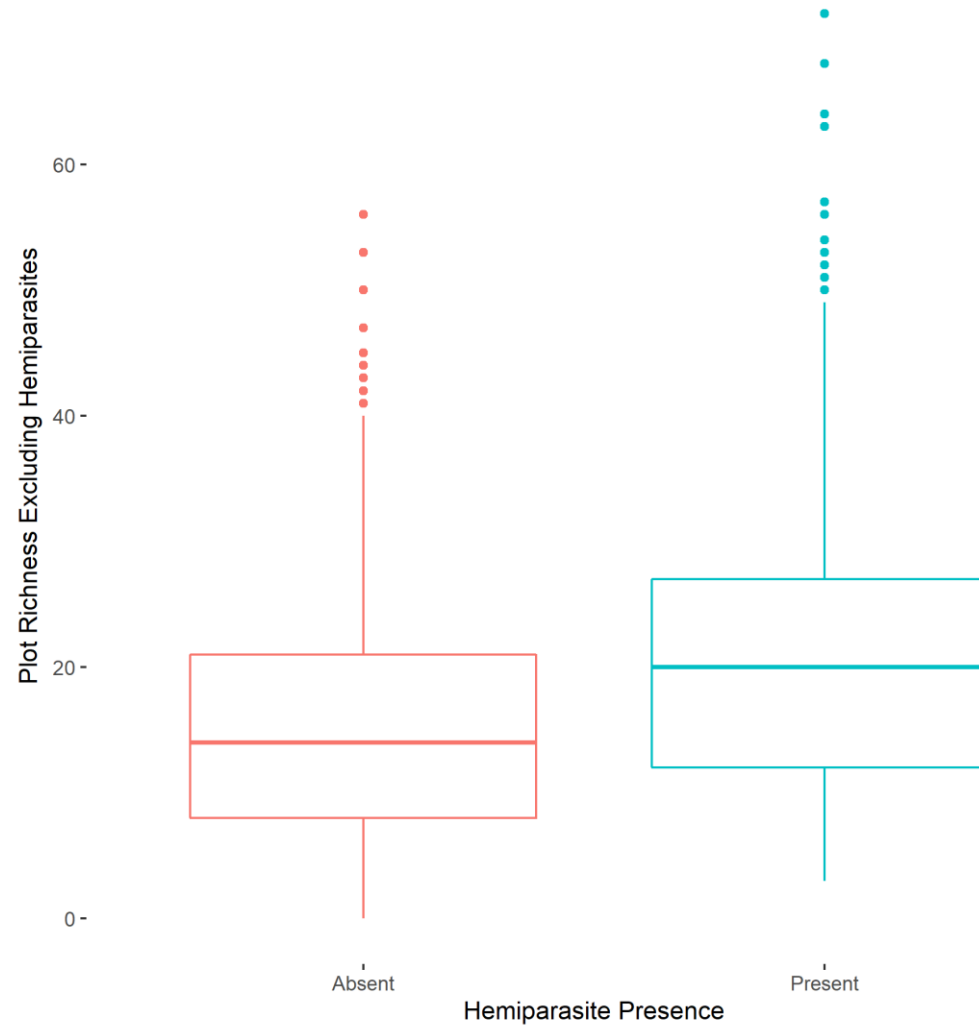
Results: Evenness – Paired Presence Analysis



Plots with hemiparasites were more even than plots without hemiparasites

Richness – Hemiparasite Presence

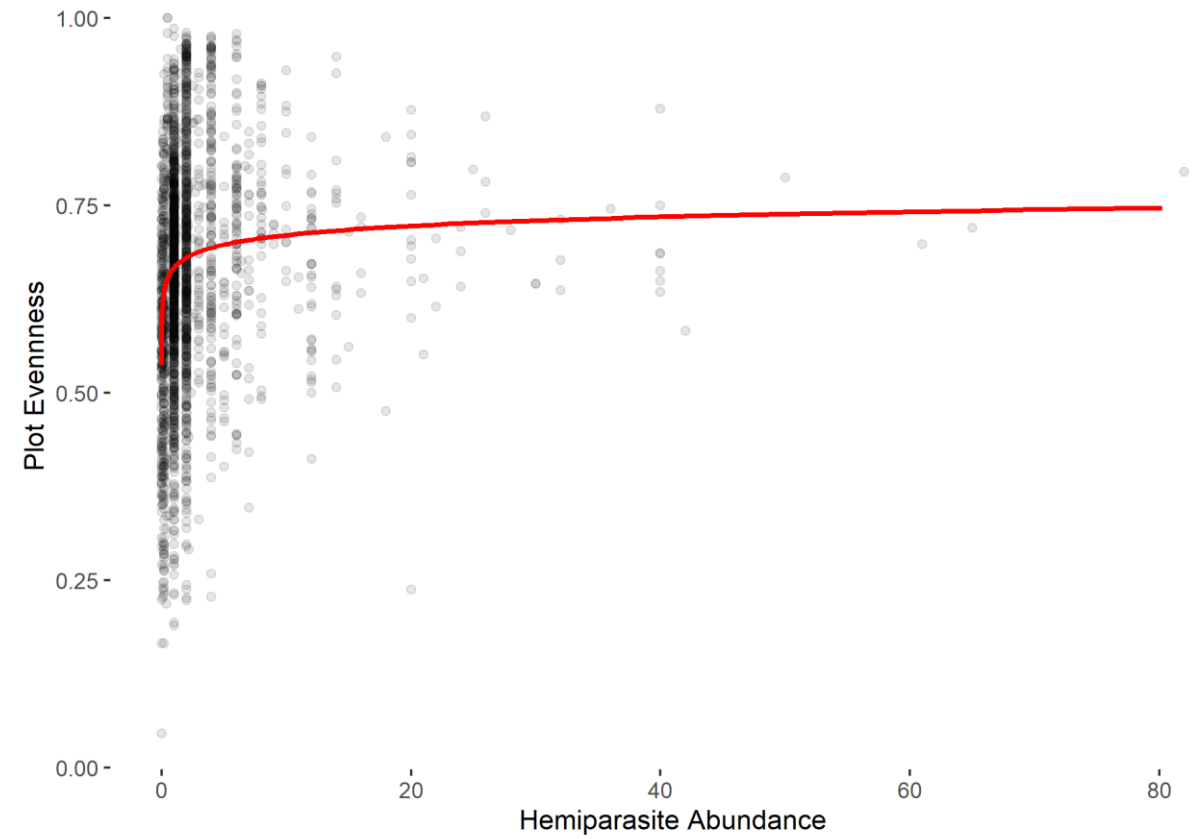
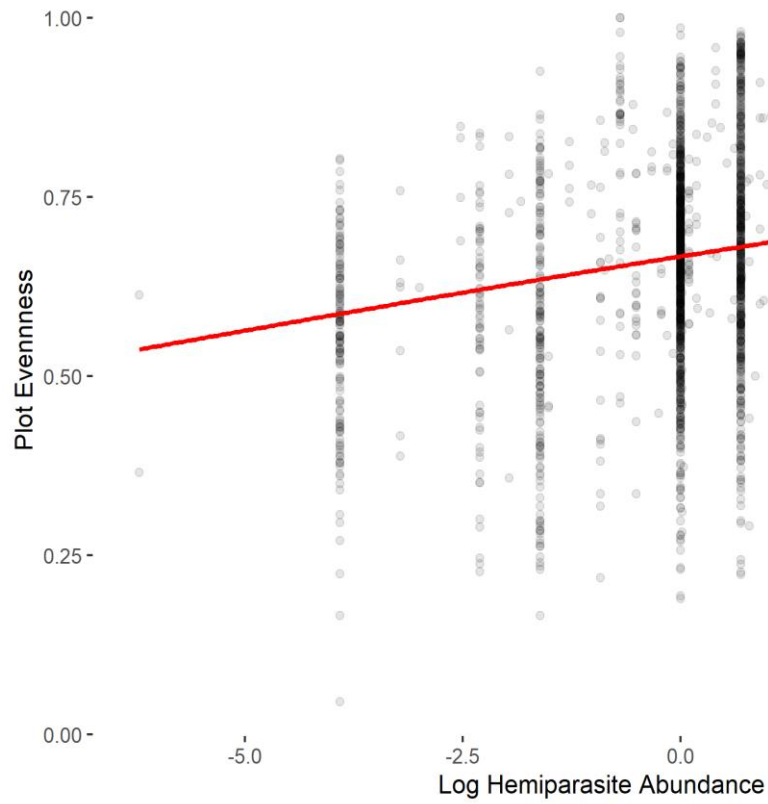
$p < 0.001$
Average diff of 4.0



Plots with hemiparasites were more rich than plots without hemiparasites

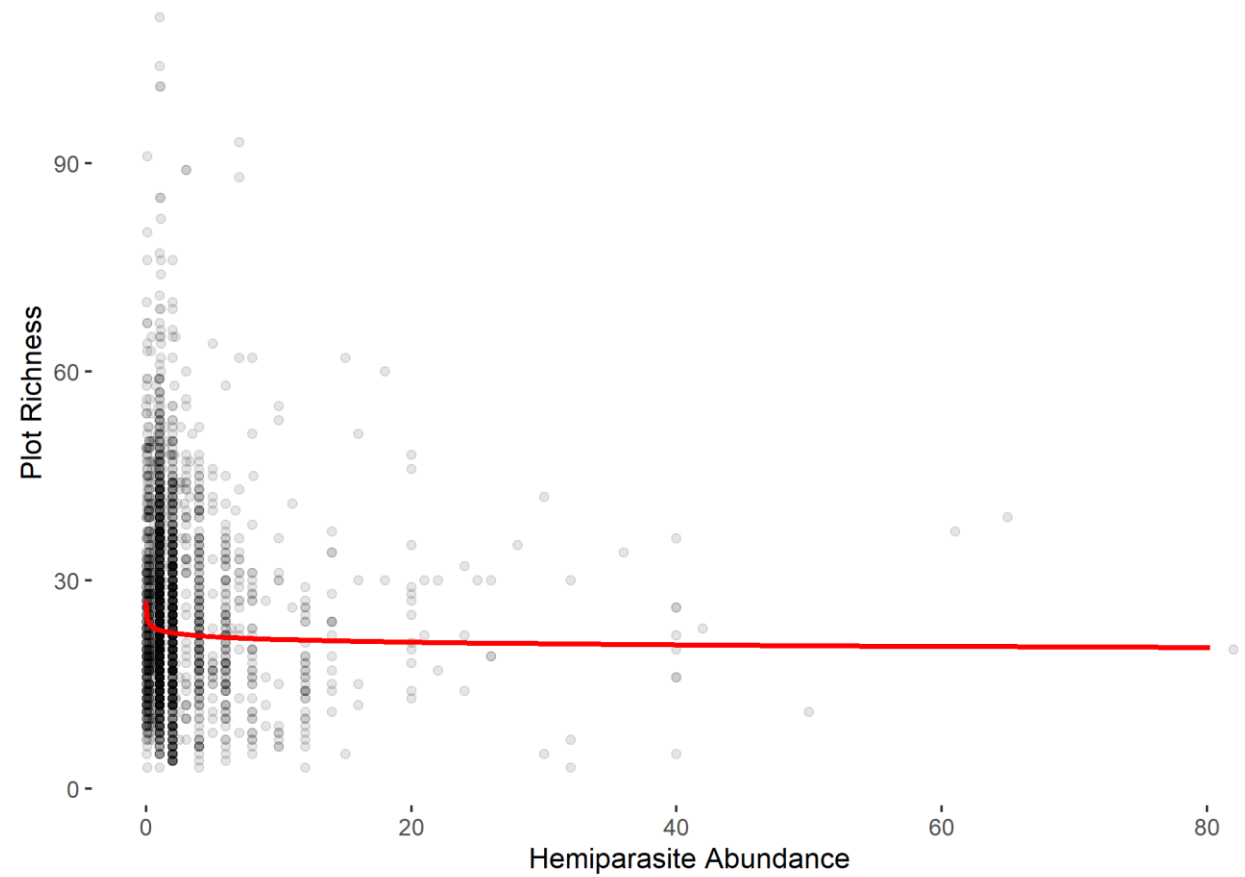
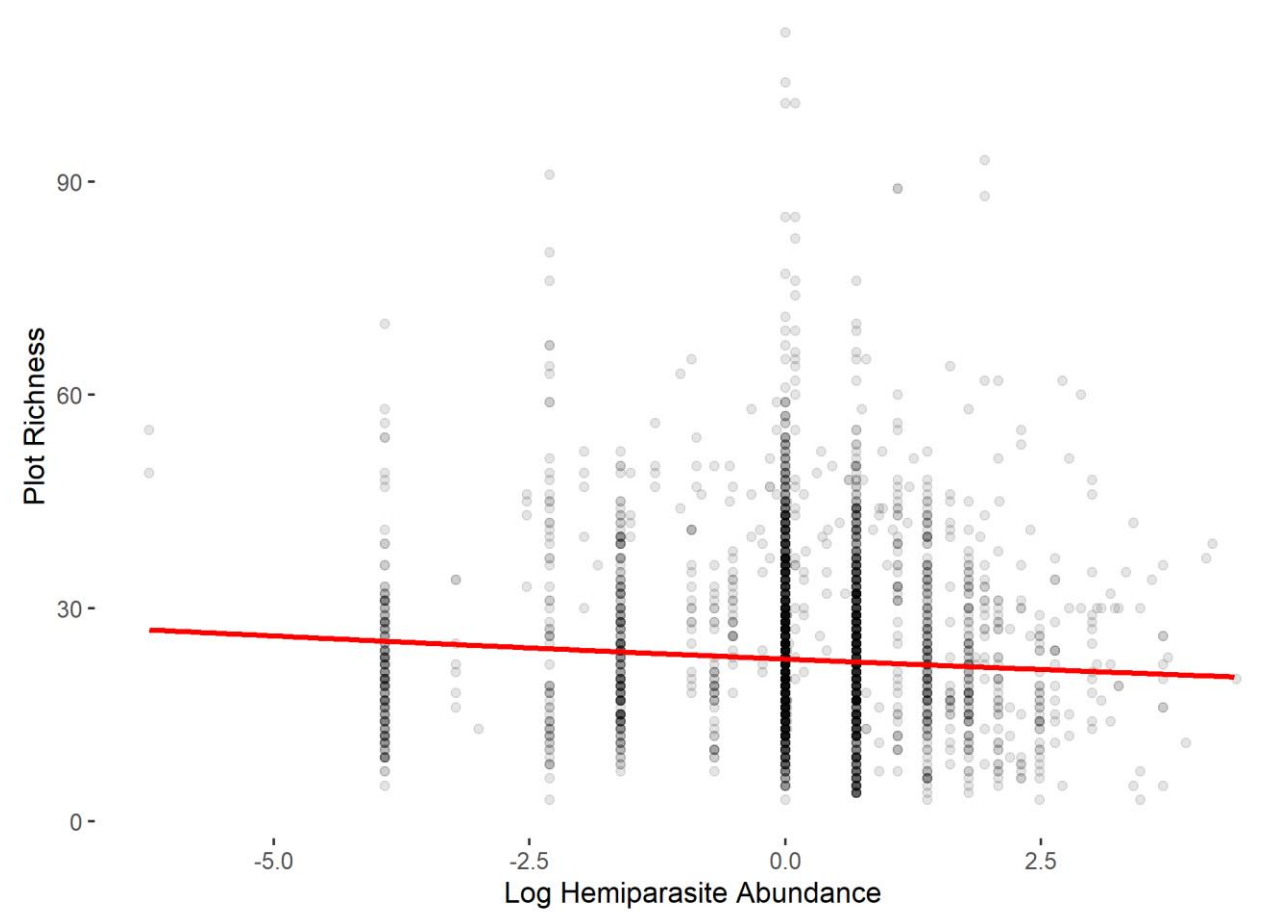
Evenness – Hemiparasite Abundance

P<0.001

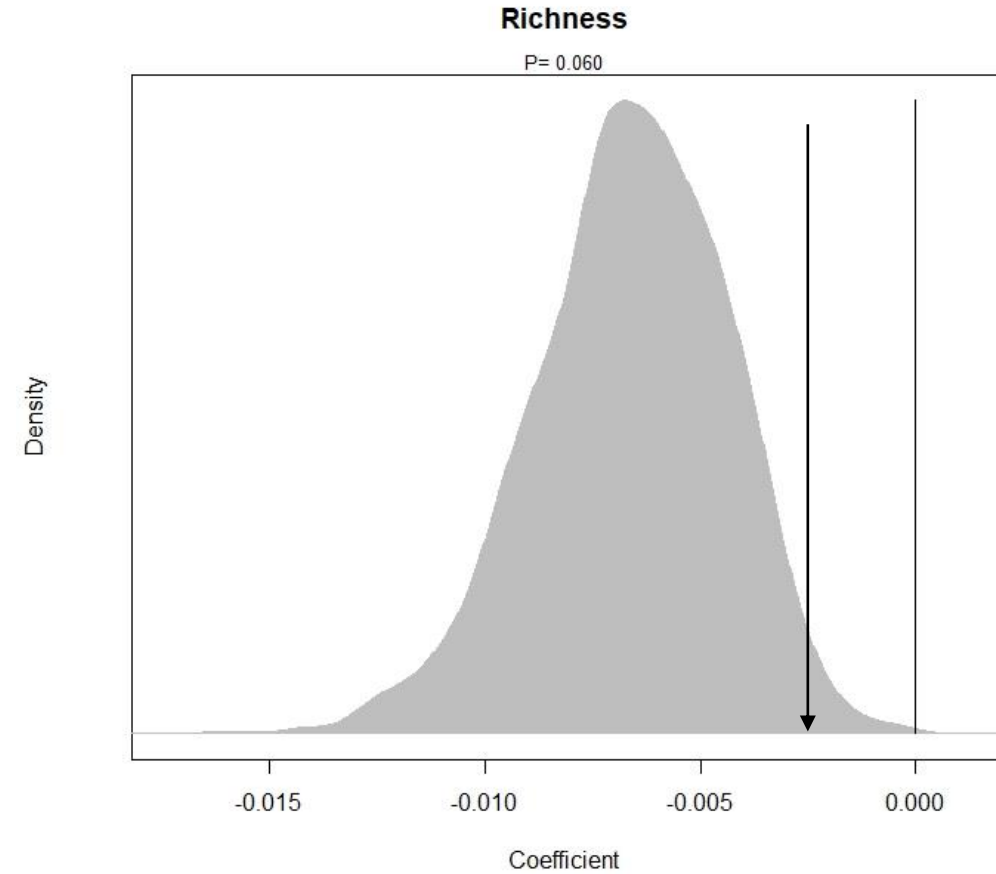
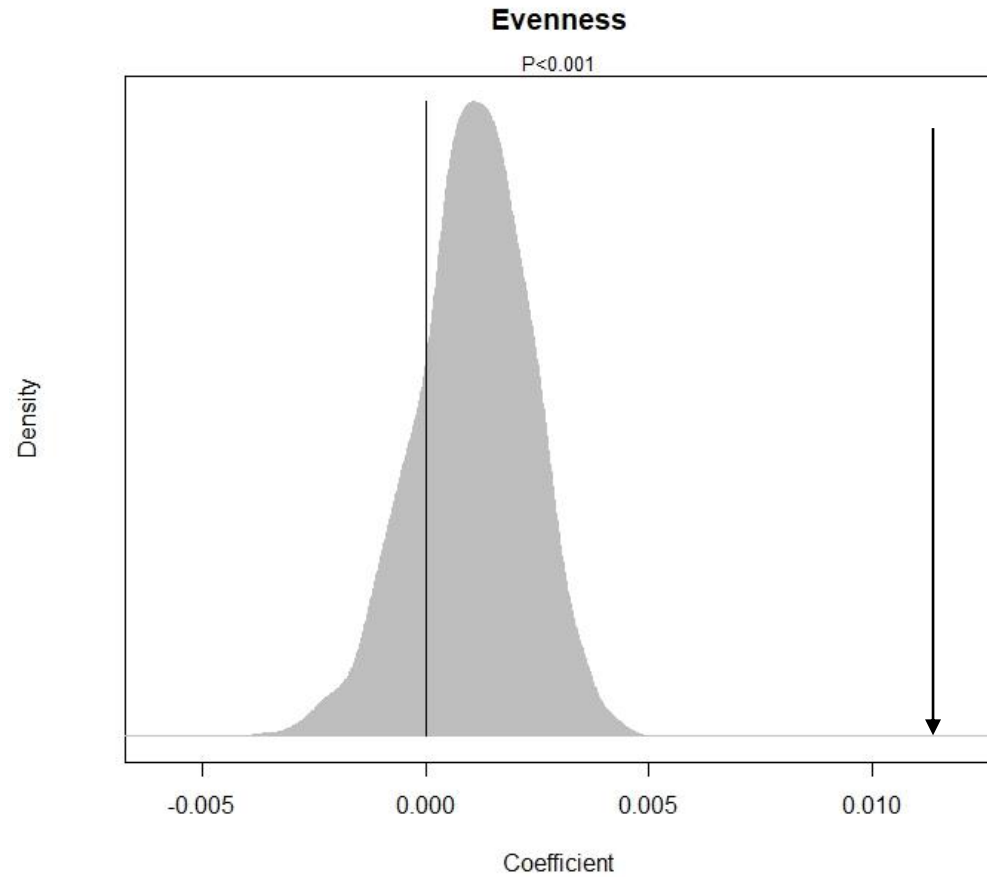


Richness – Hemiparasite Abundance

P<0.001



Evenness – Hemiparasite Abundance Null Models



Increased hemiparasite abundance is associated with more even communities than would be expected based on their distribution

Relationship with richness is more related to distribution than to a parasitic lifestyle



Conclusions

- Hemiparasites are associated with more even communities across North America
- Relationship with evenness is density dependent
- Relationship with Richness is less pronounced



Limitations & Future Directions

- Correlative
- Abiotic factors
- Revisit data
- More manipulative experiments needed with these genera
- Role of Life History
- Hemiparasites are important, but role in restoration is unclear

Thanks!

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College of the Environment



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USDA, NRCS. 2021. The PLANTS Database National Plant Data Team, Greensboro, NC

Questions?

