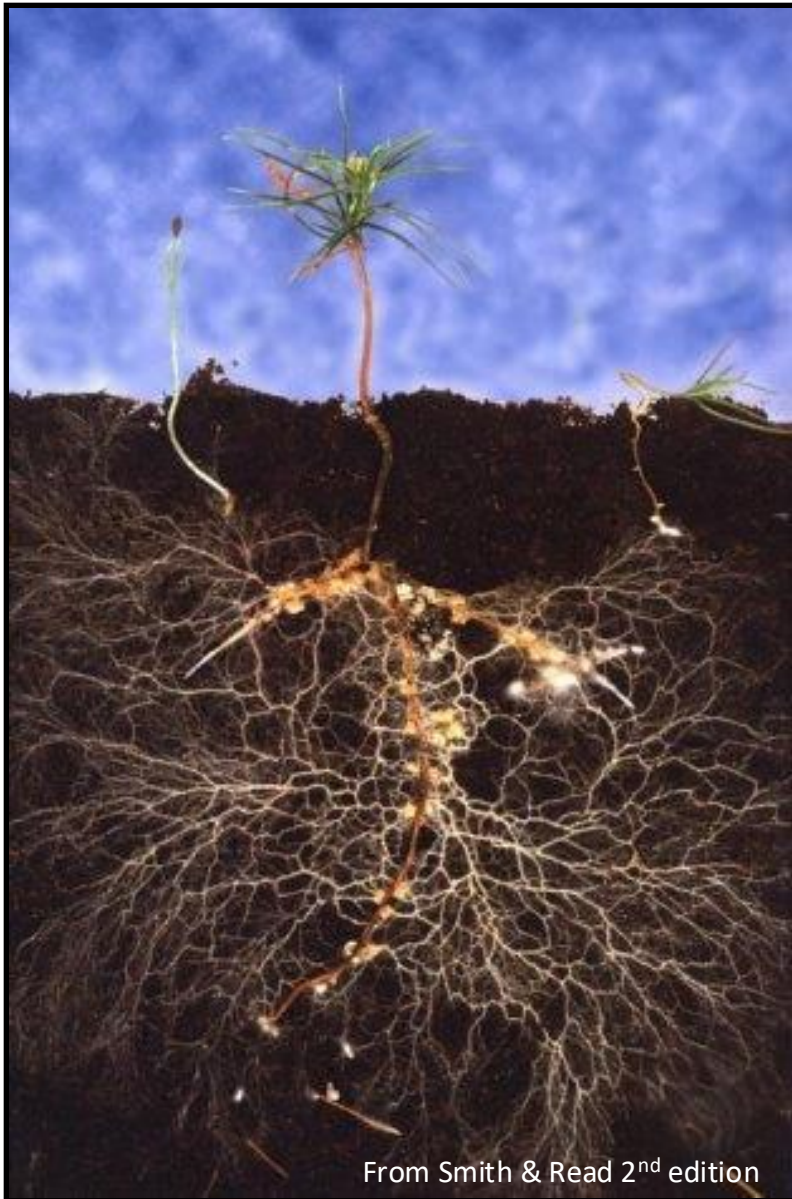


# Mycorrhizal Fungi and Restoration

Kitty Gehring



# What are mycorrhizal fungi?



From Smith & Read 2<sup>nd</sup> edition

- Symbiotic with the host plant's fine roots
- Larger area is explored for water and nutrients
- Improved growth, drought, pest tolerance...soil stability, etc.

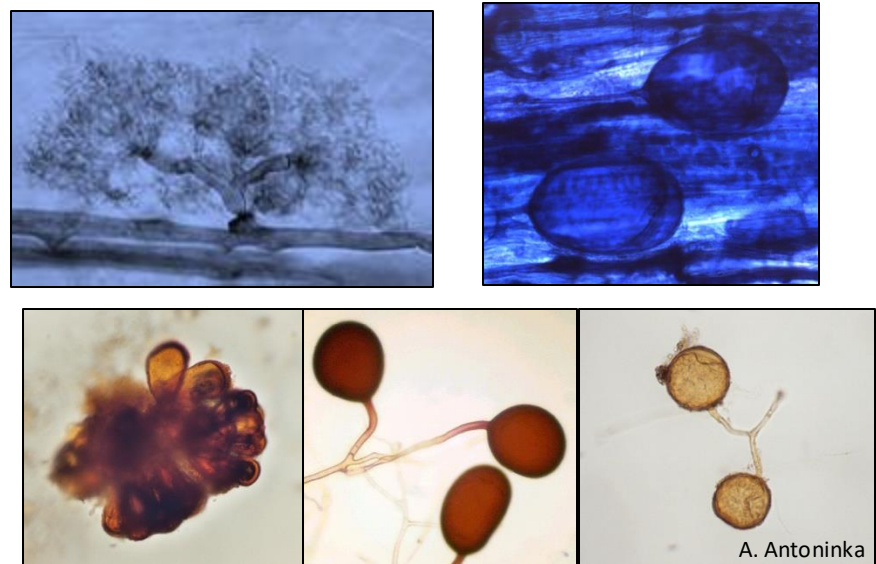
Plants provide products of photosynthesis in return

# Two major types of mycorrhizal fungi

**EMF** – woody perennials;  
thousands of species of  
fungi



**AMF** – diversity of plants,  
including grasses, crops,  
Some shrubs, trees;  
fewer species of fungi



# Can be used successfully for restoration

*Neuenkamp et al. 2019. Fungal Ecology; review of field studies*

“We conclude that the addition of mycorrhizal fungi to restoration sites can facilitate rapid establishment of **vegetation cover**, and restoration of diverse plant communities **more akin to reference sites**”.

**Context is important!**

e.g., no effect if soil is not altered by disturbance;  
large benefit if soil is significantly altered

**SOURCE OF MYCORRHIZAL FUNGI (INOCULUM SOURCE)**

# Inoculum Source is Important

## Commercial Products often not successful

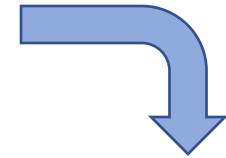
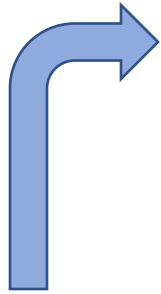
[Applied Soil Ecology](#) [Volume 202](#),  
October 2024, 105559



**“An assessment of twenty-three mycorrhizal inoculants reveals limited viability of AM fungi, pathogen contamination, and negative microbial effect on crop growth for commercial products”**

**Liz Koziol, Terra Lubin, Jim Bever**

# Alternative: “Bulk up” inoculum from reference sites



Bulk up inoculum in GH



Small amt of live soil



Add plants/inoculum

# Inoculum Source is Important Example 1



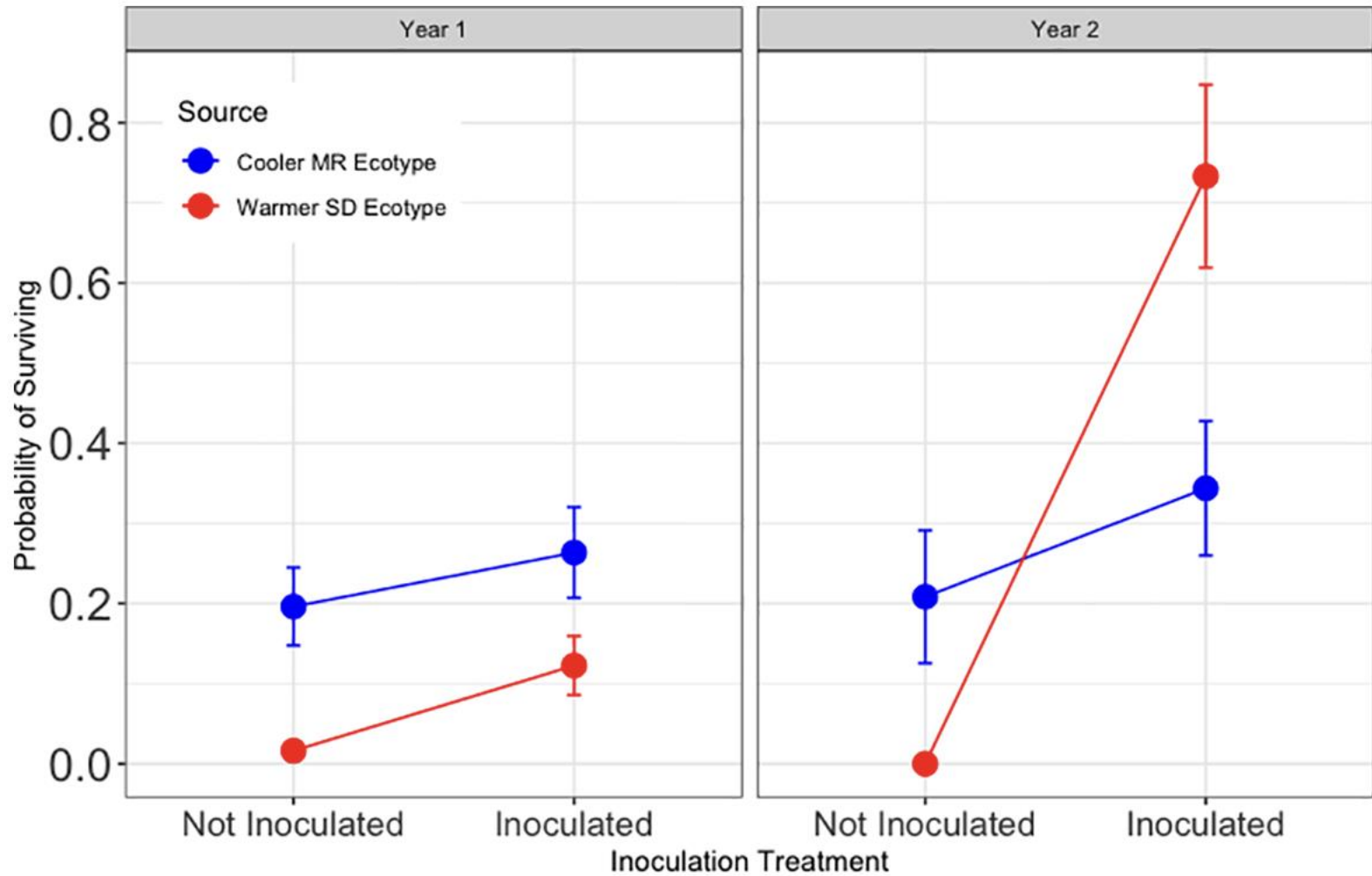
LCR Restoration Study led by recent PhD graduate,  
Lisa Markovchick



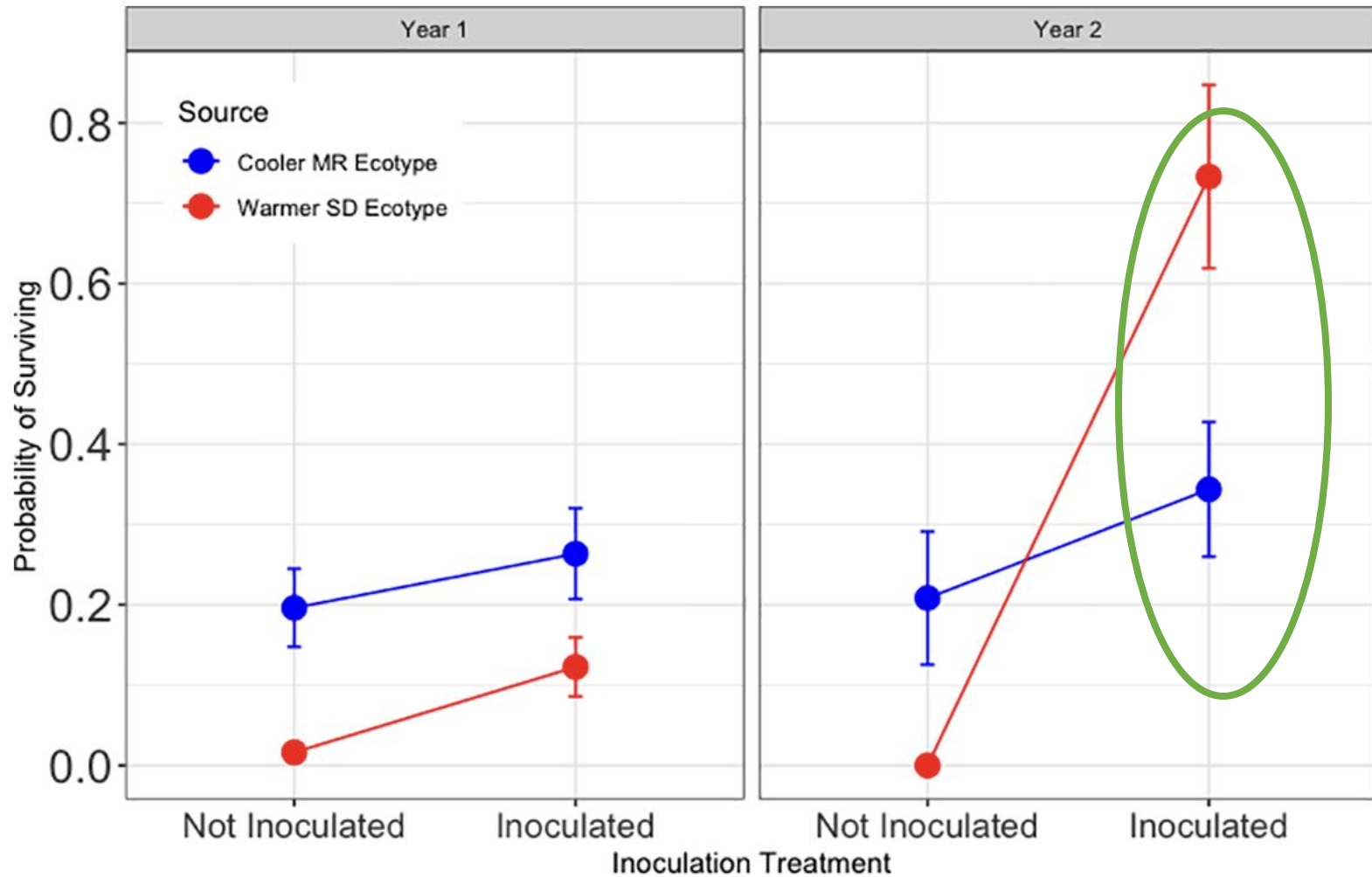
planted cottonwood cuttings into tamarisk  
legacy soil; inoculum soil from cottonwoods  
growing in 3C warmer areas w/o tamarisk  
(bulked up in GH; added at planting)



# Inoculum Source is Important Plant-Soil Feedback



# Inoculum Source is Important Plant-Soil Feedback



**Cottonwoods and soil from the same site type – Plant Soil Feedback**

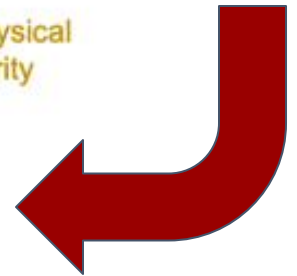
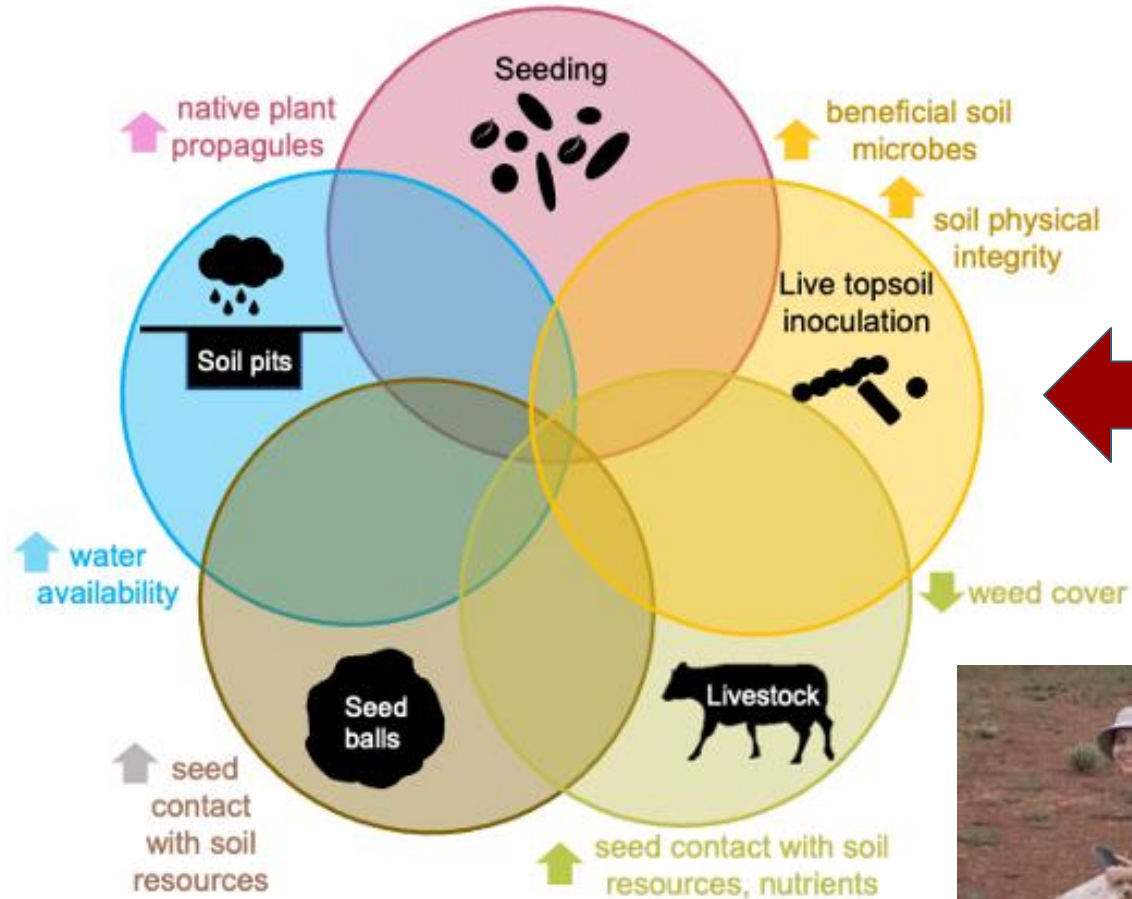
# Example 2

## Inoculum Source is Important

### RestoreNet 2.0



Colorado State University



Ri Corwin



# Inoculum Source is Important Reference vs. Disturbed


## SOIL INOCULUM ON THE RANGE

RI CORWIN (GEHRING + JOHNSON LABS)

  
HEAVILY GRAZED  
SITE SOIL

  
EXCLOSURE REFERENCE  
SITE SOIL

  
  
BIOASSAY TO COMPARE  
COLONIZATION  
(MYCORRHIZAL INOCULUM  
POTENTIAL)

  
IF REFERENCE  
SOIL IS A GOOD SOURCE OF  
INOCULUM, BULK IT IN  
THE GREENHOUSE

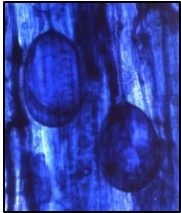
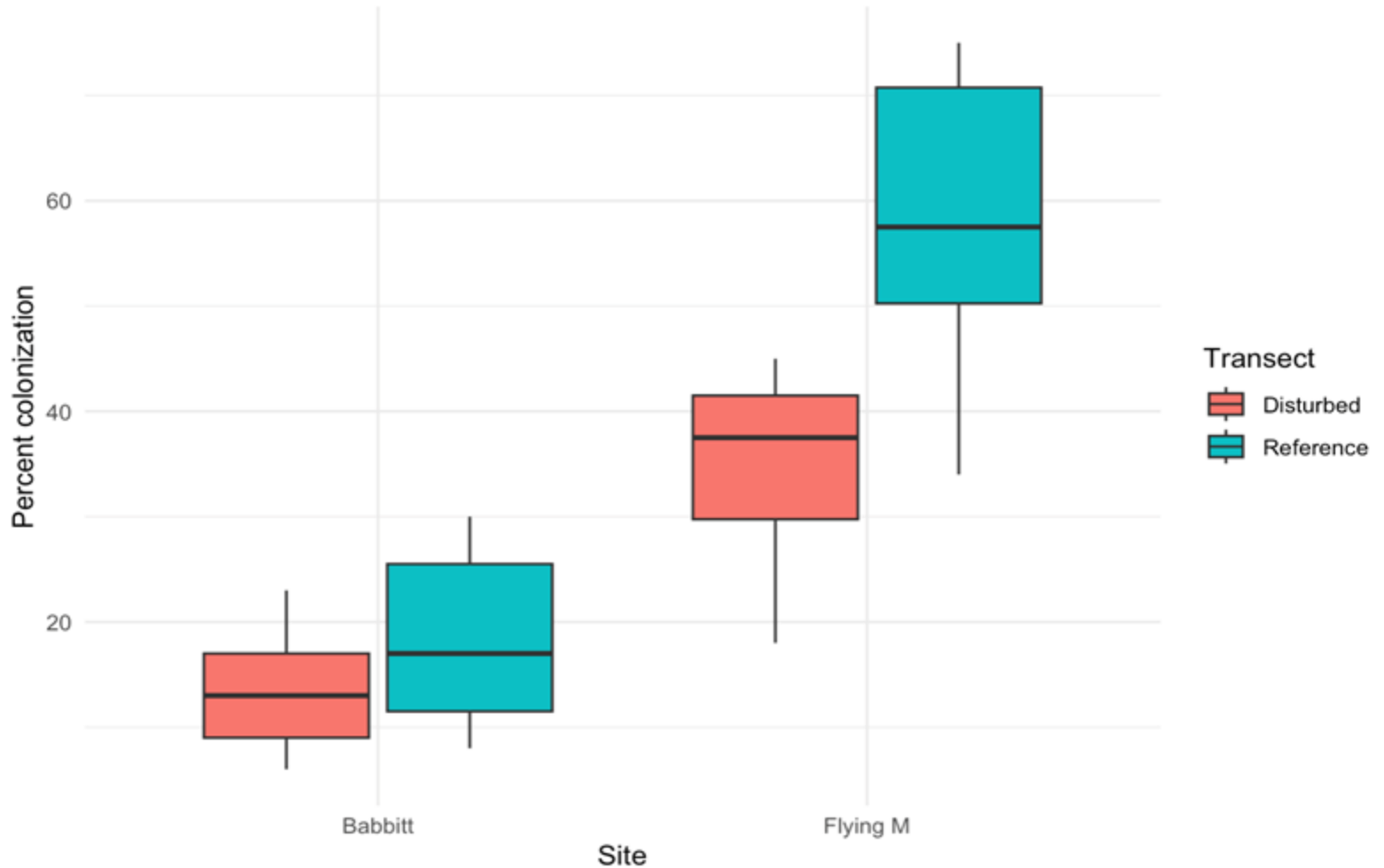


  
SHARE  
METHODS +  
RESULTS WITH  
LAND MANAGERS

  
APPLY BULKED INOCULUM TO  
GRAZED SITES ALONGSIDE  
RESEEDING

# Inoculum Source is Important Reference vs. Disturbed

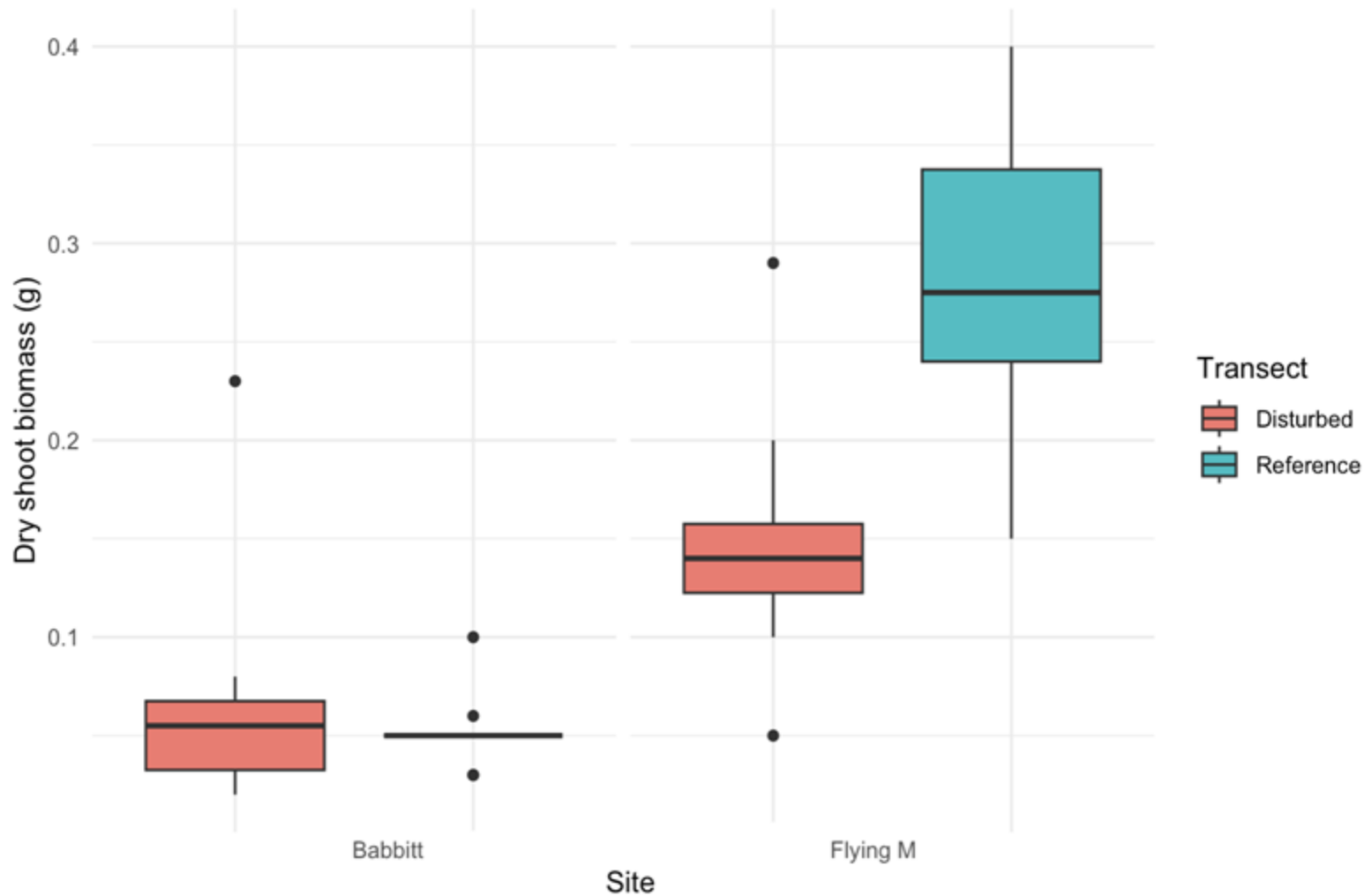
Mycorrhizal colonization of greenhouse plants grown in site soils



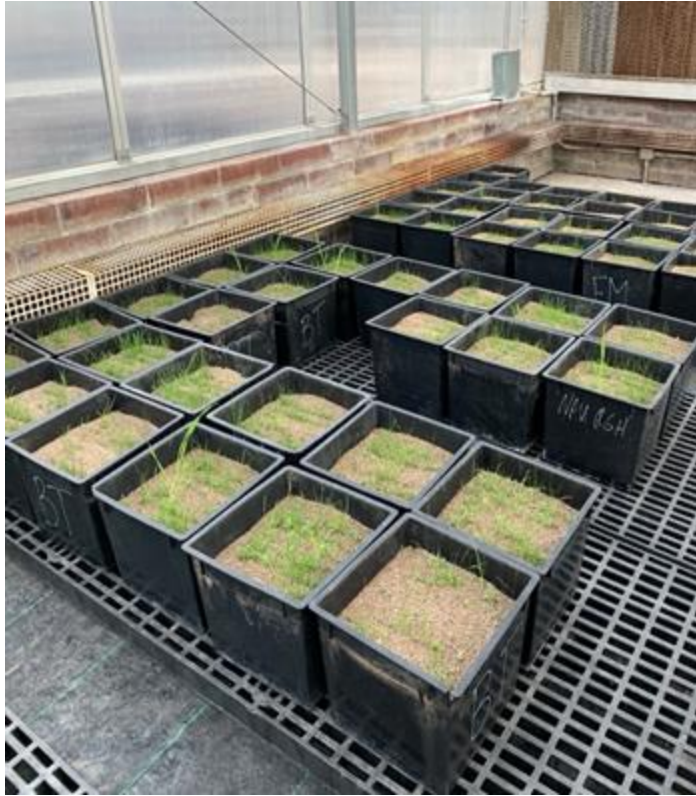
\*Preliminary data

# Inoculum Source is Important Reference vs. Disturbed

Mass comparisons of greenhouse plants grown in site soils



**Conclusion:** Mycorrhizal fungi are successfully used in restoration when soils are disturbed and if appropriate inoculum is used



**THANK YOU!**