Native soil materials; what can soil biota do for our restoration efforts?

Michael Remke; Nancy Johnson; Matthew Bowker
In 10 seconds...

draw the plant you would most like to seed successfully
Plants don’t just stick out of soil, they interact with it...a lot

Do we know how much soils affect restoration seeding success?
Soils influence plant success

Exhibit A. Abiotic soil environment

Exhibit B. Soil biota (e.g. mycorrhizal fungi)

Problem? Seed transfer zones pretend plants care only about climate

Smith & Read 1997

Problem? Seeding divorces plants from co-adapted soil biota
The “home team” hypothesis

Plants + soil organisms from same neighborhood = home team

The home team grows better than away teams (combos of plant and soil organisms that don’t “know” each other)

(Johnson et al. 2010)
Maybe some soil awareness can help us use seed better

Seed strategy actions:
- Improve tech for seed use
- Use of soil organisms with seeding?
- Develop tools for land managers
  - Soil-smart seed transfer

DOI Priorities
- Stewardship
- Climate Change

BLM Leadership Priorities
- Conservation Stewardship
- Enhance environmental responsibility of energy extraction
Our blue grama common gardens at SEGA

Transplant here: simulate assisted migration & “pre-storation” (Butterfield et al.)

Source sites

Transplant here: simulate warming climate
Limestone Soils

Basalt Soils

Soil Biota

Soils

2C Warmer
Basalt Soils

3C Warmer
Mixed Alluvium

3C Cooler
Basalt Soils

2C Cooler
Limestone Soils

Home Sites
3C Cooler
Basalt Soils

2C Cooler
Limestone Soils

Home Sites

Soil Biota
Soils

2 C Warmer
Basalt Soils

3 C Warmer
Mixed Alluvium

Basalt Soils

Limestone Soils

Home Team
Away Soil

Soil Biota
Soils

Home Team
Away Soil

Home Team
Away Soil
Climate Matters......

Limestone Population

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Soil Biota Source

Home Team

Increase in Biomass (%)

Same soil, Same soil Biota
Home soil not consistently better

All of these outcomes were observed:

No preference
Preference for home soil
Preference for away soil
Home team effects are common!

**Basalt Population**

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<th>Temperature</th>
<th>Basalt Soil Away</th>
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**Soil Biota Source**

- Away Team
- Home Team
Concluding thought darts

Seed transfer zones may be OK without soil data (for one species anyway)...yay!

With CPNPP support, we’re testing in *Pleuraphis jamesii*

If a general pattern, maybe **home team** soil biota in seed coats is the key to operationalize
Home soil not consistently better