A trait-based approach to using biological soil crusts in Colorado Plateau restoration efforts

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Dryland biocrusts perform numerous critical ecosystem functions

- Increased soil stability
- Increased H$_2$O infiltration

*Photo by Daniel Bryant*

*Increased soil fertility*

*Ferrenberg et al. (2018) Plant & Soil*
Biological soil crusts

Lichens

Moss

1 cm

Photo stolen from Matt Bowker
Great success growing biocrusts in the greenhouse

Photos stolen from Matt Bowker
Trait-based approaches to community restoration

“Functional traits can...describe the composition of communities through indices that...explain factors that drive community assembly, biotic effects on ecosystem processes or both.”

Butterfield & Suding (2012) *Journal of Ecology*
What do we want from biocrust restoration materials?

- Suitability for materials development
- Survivability, now and future
- Soil stability, quickly
- Fertility, the right amount
- Increased infiltration of precipitation
- Soil temperature and energy balance
- Photosynthetic rates
A trait-based approach for biocrust restoration

Site near Moab, UT on the Colorado Plateau
The abundance of biocrust is often quite high on the CP.

Torres-Cruz et al. (2018) *Plant & Soil*
Strong differences in $N_2$ fixation

Biocrusts can be the dominant source of new nitrogen to Colorado Plateau ecosystems

Torres-Cruz et al. (2018) *Plant & Soil*
And in tissue nitrogen concentrations

Tissue nitrogen can relate to photosynthesis and nitrogen inputs

Torres-Cruz et al. (2018) Plant & Soil
Spectral properties vary among biocrust organisms

With implications including photosynthetic rates, albedo, soil temperature, and remote sensing indices.

Rutherford et al. (In Prep)
Thank you!

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Joint Fire Science Program
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