

# 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

Dust storm in Phoenix

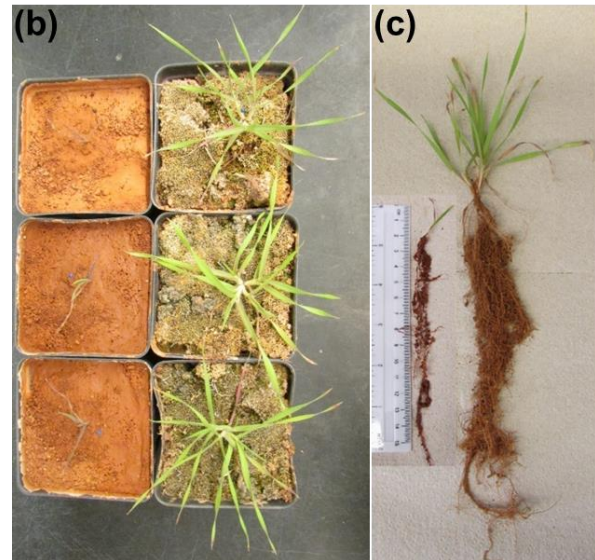


Increased soil stability  
Photo by Daniel Bryant



Increased H<sub>2</sub>O infiltration

Bowker *et al.* (2012) *Biodiversity & Conservation*



Increased soil fertility

Ferrenberg *et al.* (2018) *Plant & Soil*



Photo by Bill Bowman

# Biological soil crusts

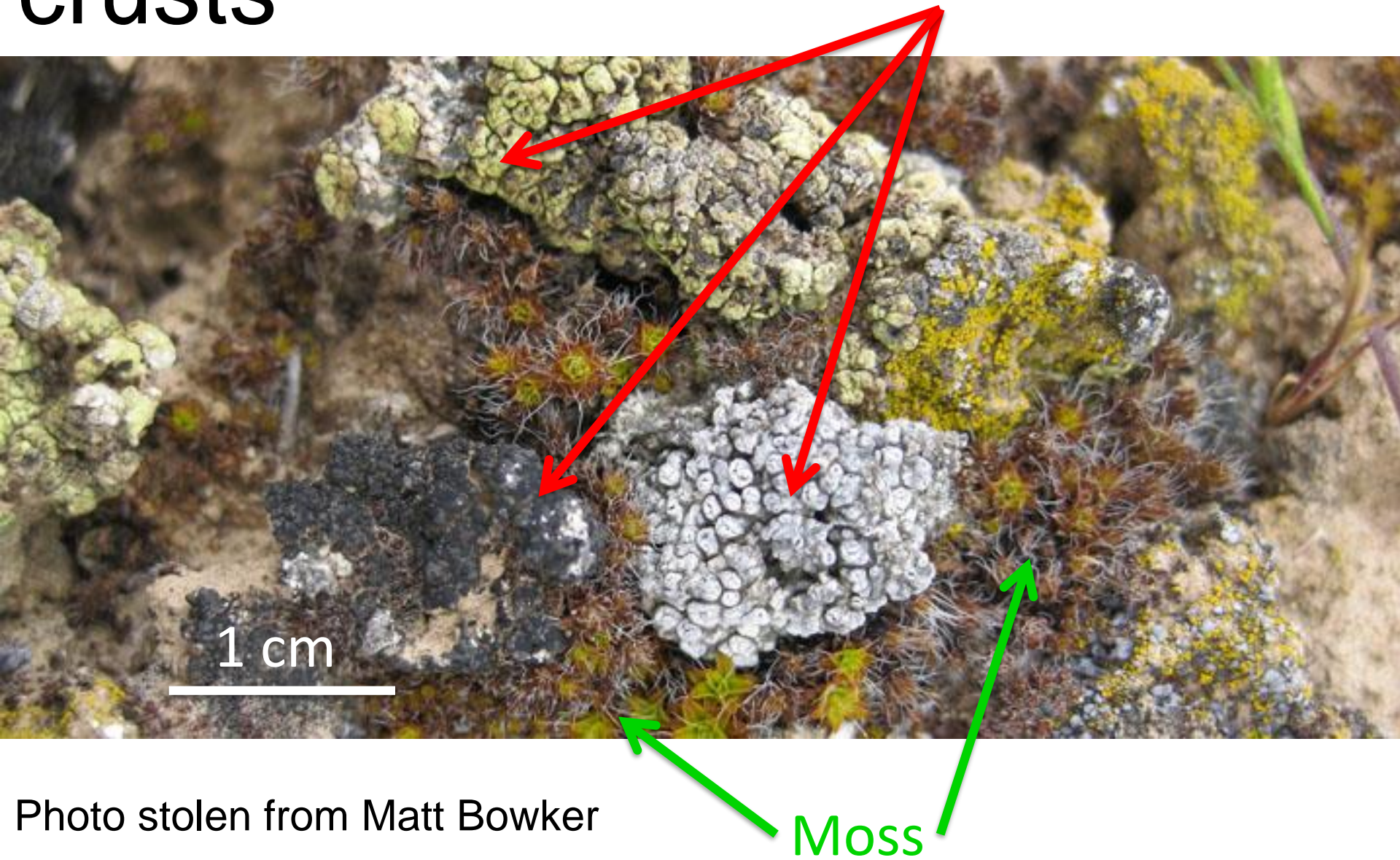


Photo stolen from Matt Bowker

# 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?



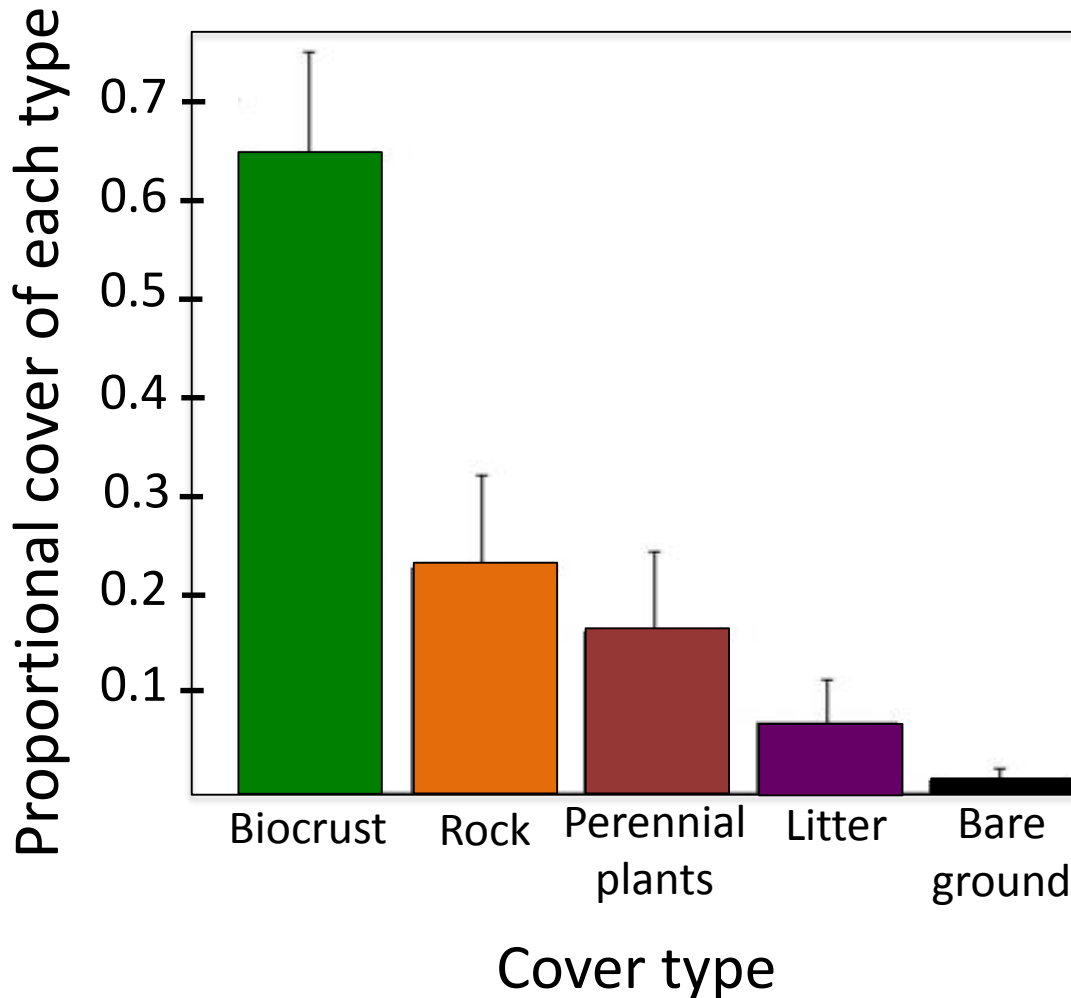
- Suitability for materials development
- Survivability, now and future
- Soil stability, quickly
- Fertility, the right amount
- Increased infiltration of precipitation
- Soil temperature and energy balance
- Photosynthetic rates

# A trait-based approach for biocrust restoration

Site near Moab, UT on the Colorado Plateau

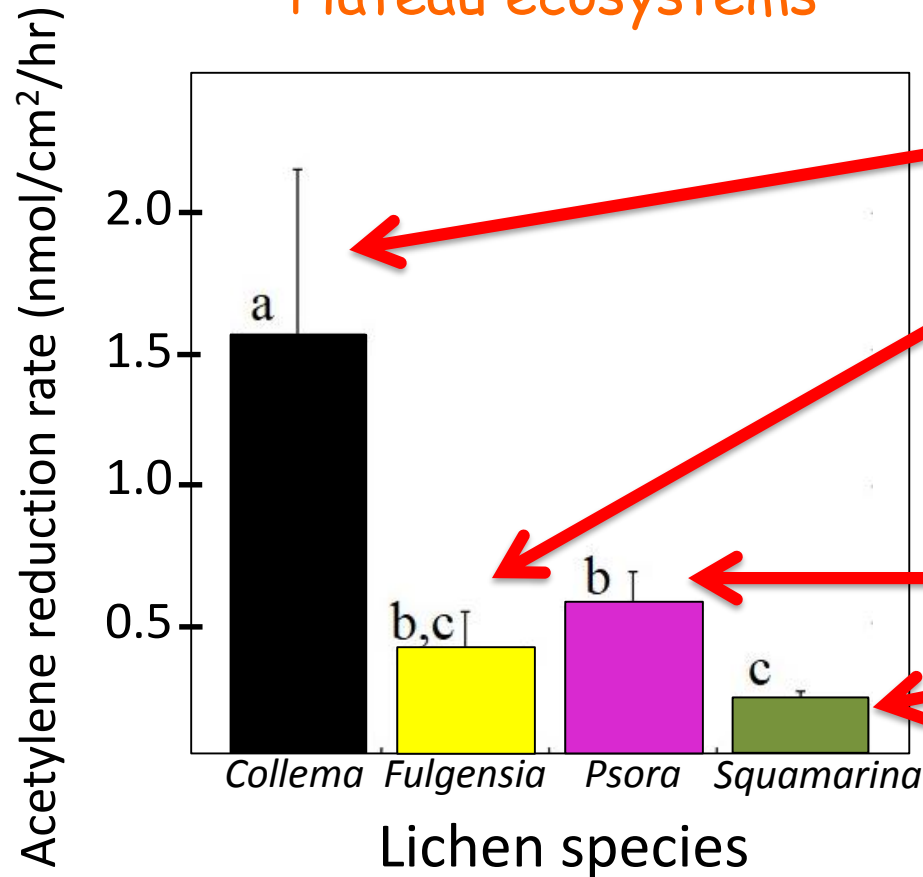


The abundance of biocrust is often quite high on the CP



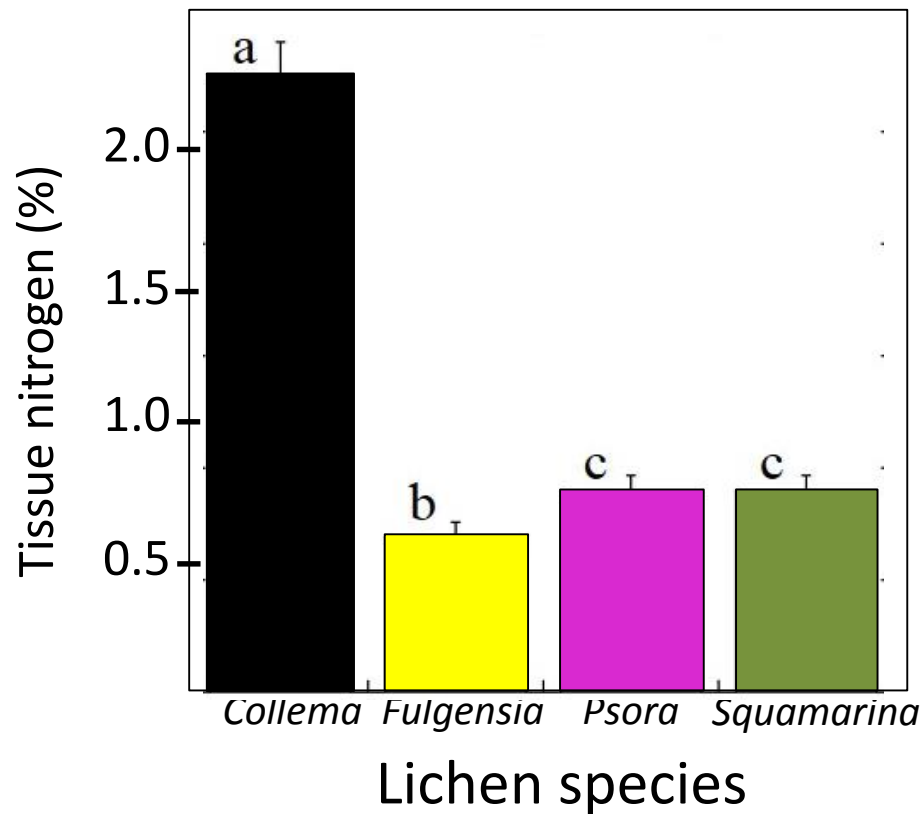
# Strong differences in N<sub>2</sub> fixation

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



# And in tissue nitrogen concentrations

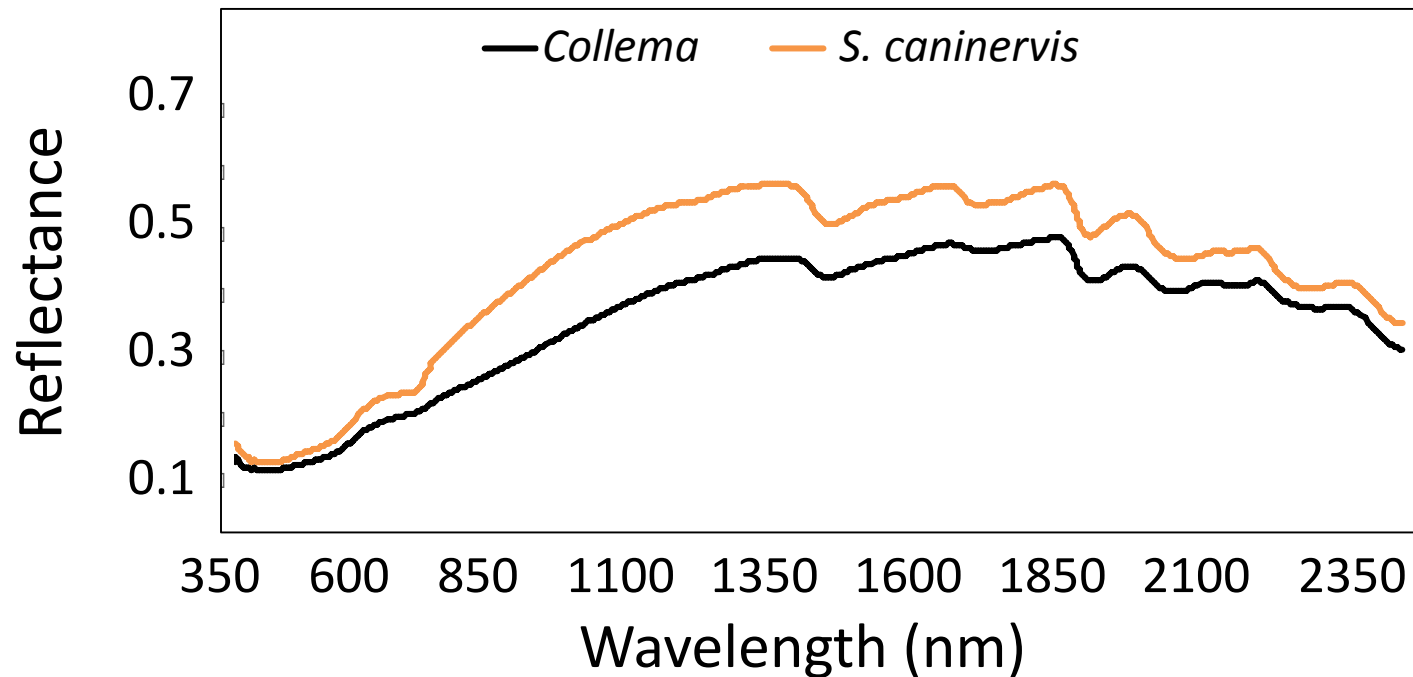
Tissue nitrogen can relate to photosynthesis and nitrogen inputs



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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Bureau of Land Management



## All of you!



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