Why re-establish biocrusts? Because they are essential for successful plant restoration!!

And SO important we can no longer ignore them!!!
What are biocrusts?

Cyanobacteria/Fungi  Lichens  Mosses
Up to 40% of terrestrial surfaces are drylands
(not including polar regions)
Crusts occur in most dryland vegetation types
Can be the dominant life form
Soil Stability

Sparse vegetation
But soils do not erode

Hill slopes
Soils held beyond angle of repose
Fibers make soils erosion-proof
Biocrusts can prevent water erosion
In semi-arid deserts (Colorado Plateau, Great Basin), biocrusts increase plant-available water.

- Roughness
- Permeability
- Infiltration

- More capping = Less water out
- Darker surface = More water out

- Capping
- Soil Temperature
- Evaporation
Biocrusts also increase soil fertility in many ways:

- Capture nutrient-containing dust
- Retain seeds and litter
- Contribute C and N, available P to soils
Increase soil fertility

Greater abundance of soil biota = faster litter decomposition

Darker surfaces = higher temperatures = faster spring growth
Plants growing in biocrusted soils grow faster, are bigger, and are more nutritious than in uncrusted soils.
Biocrusts can influence plant community composition
The services provided by biocrusts are disrupted by surface disturbance, fire, and increased temperatures.
In summary, biocrusts are integral in creating the soil conditions (stability and fertility) needed for successful plant restoration, but with disturbance, biocrusts are generally lost as well as plants.

And although we know a lot about WHY we need biocrust to be part of restoration efforts, we know a lot less about getting them re-established...
The good news: we can now grow biocrusts FAST in the greenhouse

The not-as-good news:
1. Our scale of production and application is limited (oil pads, not large fires)
2. Growth of some critical species is very slow
3. We need more trait/genetic information to match propagules to sites (just like seeds!)
4. Cost-effective field survivorship is low (we HAVE to figure this out!!)

We have much work ahead and are 100+ years behind plant efforts...incredible, given how critical biocrusts are for healthy ecosystem function