Bunch grass and shrubs
Arid lands without crusts!
Arid lands without crusts!
Different ecosystems have different processes that they are adapted for.
The arid steppe
All Crusts are not created equal
Warm versus Cold deserts
“Crusts are where they are needed”
Build the structure and the crusts will come!
Clumped vegetation, Jacks Cr.
Crustose lichen
Squamulose lichen
Lichens

- Alice and Freddy

Cross Section of Lichen

- Cortex (top)
- Algal Layer
- Medulla (bottom)
Lichen roots!
Lichen roots up close
Lichen roots!
Apothecia on a lichen
Reproductive Spores in Spore Sacs

The Fungus

The Algae

Cross-cut through an Apothecium
Spores of the crustose lichen
Different size and shaped spores
Perithecia
Cross section of a lichen

FIGURE 1 Cross section through a typical foliose lichen thallus
Foliose Thallus

- Apothecia
- Lobes
- Isidia
- Cilia
- Rhizines
- Soredia
soredia erupting from inside the lichen

note how the fungus wraps around the algal cells
soredia
Fungal hyphae surrounding the algal cells forming the soredia
Lower and upper surface
Different Growth Forms
Morphological groups

- Cyanobacteria - Algae
- lichens
  - Crustose, Gelatinous, squamulose, foliose, fruticose
- Bryophytes
  - Short mosses, tall mosses
  - Liverworts
Cyanobacteria
Morphological groups

- Cyanobacteria - Algae
- lichens
  - Crustose, Gelatinous, squamulose, foliose, fruticose
- Bryophytes
  - Short mosses, tall mosses
  - Liverworts
Crustose lichen
Why did the soil cross the Road?
Because there were not enough biological soil crusts to hold the soil in place.
Gelatinous Lichens
Squamulose lichen
Squamulose lichen
Psora, a squamulose lichen
Foliose lichen
Fruticose Lichen
Fruticose lichen
Fruitcose lichen, Cladonia
Morphological groups

- Cyanobacteria- Algae
- lichens
  - Crustose, Gelatinous, squamulose, foliose, fruticose
- Bryophytes
  - Short mosses, tall mosses
  - Liverworts
Short mosses
Tall Moss, twisted moss, *Tortula ruralis*
Liverwort
Morphological groups

- Cyanobacteria - Algae
- lichens
  - Crustose, Gelatinous, squamulose, foliose, fruticose
- Bryophytes
  - Short mosses, tall mosses
  - Liverworts
What type of Crust?
What type of Crust?
Why not use species level data?

Biological considerations

1. Morphological groups are functionally similar
2. Difficult to identify in the field
3. Is independent of continent, region or area
Why not use species level data?

Efficiency considerations

1. Easier to measure with less indecision and > repeatability
2. More rapid and statistically powerful data analysis
3. Rapid field measurements
4. Less costly to monitor
Midwestern Prairie

Desert Grassland

Native Invertebrates

Buffalo

No interspace

Short grass prairie

Deer

Native bunchgrasses

No dung beetles

Antelope

Interspace with crust