A glimpse below…
The soil food web

Teri C. Balser, Assistant Professor, UW-Madison
tcbalser@wisc.edu
What is soil biology?

What role does it play in soil quality?
Soil organisms are involved in nearly every aspect of soil quality.

- Structure/Aggregation
- Humification
- Nitrate Leaching
- Nutrient cycling
- Organic matter
- Decomposition

Soil Community
In order to understand how biology affects our soils - we need to understand a little about the organisms who live there
Soil is a habitat

- Soil particles
- Plant roots
- Water
Soil is alive...

For example, in 1 g of soil:
>100,000,000 bacterial cells
>11,000 species of bacteria
Also fungi and larger animals
Who’s there?

Macrofauna: Soil ‘Engineers’

FIGURE 4.3 Size classification of organisms in decomposer food webs by body width (Swift et al., 1979).
Soil Animals

- Termite
- Earthworm
- Centipede
- Snail
- Pseudoscorpion
- Vole
Soil animals are important for:

1. Decomposition (shredding residues)
2. Mixing soil (aeration)

Decomposition rate of blue grama (*Bouteloua gracilis*)
Who's there?

Mesofauna: Soil predators, pathogens, herbivores

FIGURE 4.3 Size classification of organisms in decomposer food webs by body width (Swift et al., 1979).
Soil mesofauna

Nematodes

Protozoa

Mites

Protozoa
Soil mesofauna are important for

1. Residue decomposition
2. Predation
3. Pathogenesis
FIGURE 4.3 Size classification of organisms in decomposer food webs by body width (Swift et al., 1979).
Soil microorganisms
Fungi

- Filamentous growth

What are the advantages of filamentous habit?
Fungi

• Filamentous growth
• Functionally critical!

-Wood degrading
-Mycorrhizal association

• *myco* (fungus) + *rhiza* (root)

(Symbiotic structure formed by a fungus plus a plant)
Acquisition of Phosphate by Roots

Source: Harrison et al 1999
Acquisition of Phosphate by Mycorrhizal Roots

- Soil particle
- Phosphate

Source: Harrison et al 1999
Bacteria

• Small, single celled
  ~2µm

What is the importance of small size?
Figure 5.2. Trophic relationships among different groups of soil organisms are controlled by accessibility to their resources. This illustration represents approximately 1 cm³ of a highly structured microzone in the surface horizon of a grassland soil. Courtesy of S. Rose and T. Elliott, personal communication.)
Bacteria

- Small, single celled
- Abundant
Bacteria

- Small, single celled
- Abundant
- Diverse - taxonomically and functionally!
Diversity in soil is important for nitrogen cycling.
Relationship to soil quality?
Diversity may be important in response to management

Figure 2. A comparison of biological, physical, and chemical properties of minimum tillage and plowed soils (from Stinner and Stinner, 1989).
Ecosystem Microbiology Laboratory, UW-Madison
(www.ecosystem-microbiology.wisc.edu)

Teri C. Balser
tcbalser@wisc.edu

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THANK YOU!