Slide 1

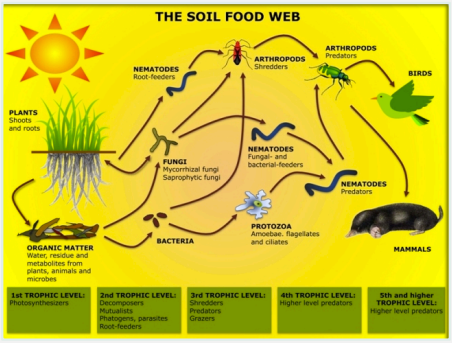
The Soil Food Web

Understanding the Five Trophic Level

These slides are from the USDA Web Soil Survey with my commentary added.

Slide 2

The Soil Food Web



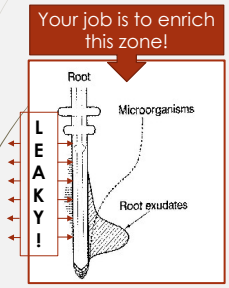
Slide 3

1st Level - Photosynthesizers

- Plants, roots, shoots
- Organic matter; "waste"
- Some bacteria; algae

Slide 4

1st Level - Photosynthesizers

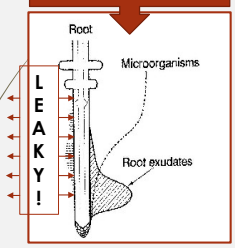


Rhizosphere

- Roots = Rhizo; fibrous and tap
- Microbes
- Exudates - candy for bacteria and fungi
  - H_2CO_3 carbonic acid; dissolves minerals
  - pectins
  - sugars
  - alcohols
  - aldehydes
  - Weak acids – acetic, formic, oxalic

Slide 5

1st Level - Photosynthesizers



Roots (cont.)

- Decayed roots provide channels for water and worms
- Roots are lazy
  - Do not grow toward water
  - Grow where there is water; decay and die back where there is no water

Slide 6

2nd Level – Decomposers, Mutualists, Pathogens, Parasites, Root Feeders

Organisms that eat photosynthesizers.

- Decomposers: bacteria, saprophytic fungi; break down residue
- Mutualists: mycorrhizal fungi, bacteria; enhance plant growth
- Pathogens: fungi, bacteria; disease markers
- Parasites: bacteria, fungi, nematodes, microarthropods

Slide 7

2nd Level – Decomposers, Mutualists, Pathogens, Parasites, Root Feeders

Bacteria

- Characteristics:
  - Single celled
  - Microscopic
  - Sometimes form chains or colonies
  - Mostly good guys with bad reputations
- Numbers:
  - 4 million species in a ton of soil
  - 300 million – 50 billion individuals in a handful of soil
  - 25K species in a gram of soil

Slide 8

2nd Level – Decomposers, Mutualists, Pathogens, Parasites, Root Feeders

Bacteria

- Role:
  - Decomposers of dead organic material
  - Their exudates and body fluids help bind soil into aggregates
  - Specialized groups are involved in the nitrogen cycle
  - Good bacteria far outnumber the bad
  - Actinomycetes – chains; good

Slide 9

2nd Level – Decomposers, Mutualists, Pathogens, Parasites, Root Feeders

Fungi

- Characteristics:
  - Multi-cellular; form chains or hyphae
  - Single celled - yeasts
  - Neither plant nor animal
  - Mushroom is the fruiting body, as is mold
  - They cannot photosynthesize
  - They must live off of other life forms

Slide 10

2nd Level – Decomposers, Mutualists, Pathogens, Parasites, Root Feeders

Fungi

- Role:
  - They are the most important decomposers in the world
  - Saprophytic – decompose already dead organic matter
  - Mycorrhizal – fungi that form associations with plant roots
  - They get energy from plant sugars
  - They help "fetch" nutrients to the plant roots

Slide 11

2nd Level – Decomposers, Mutualists, Pathogens, Parasites, Root Feeders

Nematodes

- Characteristics:
  - Non-segmented worms
  - Tiny
  - Feed at several trophic levels
  - There are many beneficial nematodes

Slide 12

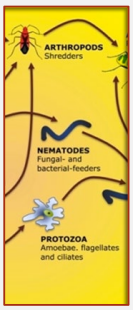
2nd Level – Decomposers, Mutualists, Pathogens, Parasites, Root Feeders

Nematodes

- Role:
  - They eat bacteria or fungi and release extra nitrogen to plants
  - They 'accidentally' move bacteria and fungi
  - They are food sources

Slide 13

3rd Level – Shredders, Predators, Grazers

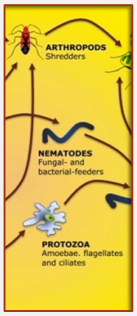


Arthropods

- Characteristics:
  - Jointed appendages
  - Segmented body
  - Exoskeleton that is shed during molting
- Grouped as:
  - Shredders – millipedes, sowbugs, dung beetles
  - Predators – spiders, scorpions, mites, millipedes, ants
  - Herbivores - crickets
  - Fungal feeders – springtails, mites

Slide 14

3rd Level – Shredders, Predators, Grazers

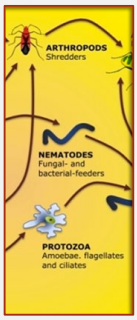


Arthropods

- Role:
  - Largest phylum in the animal kingdom; there are more types of arthropods than all other types of animals combined
  - They are important in the pollination of flowering plants.
  - Some play an important role in soil aeration and water infiltration
  - Found in all consumer roles of an ecosystem, whether they eat plants or animals,
  - Some are important decomposers

Slide 15

3rd Level – Shredders, Predators, Grazers

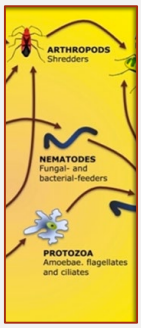


Protozoa

- Characteristics:
  - "pre" "animal"
  - Single celled animals
    - Amoebas
    - Ciliates
    - Flagellates

Slide 16

3rd Level – Shredders, Predators, Grazers



Protozoa

- Role:
  - They eat bacteria and recycle them
  - The release excess N as NH_4^+ for plants

Slide 17

4th Level

Higher Level Predators

- Arthropods, Nematodes, Birds, Mammals
- More complex life forms
- Tend to spend more time at or above the surface of the soil

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