

SOIL ECOLOGY TERMS^o

actinomycetes:

A large group of bacteria that grow in long filaments that are too small to see without magnification. Actinomycetes generate the smell of "healthy soil," and are important in decomposing cellulose, chitin, and other hard-to-decompose compounds, especially at higher pH levels. Many produce antibiotics.

aerobic:

With oxygen. Aerobic organisms, including animals and most soil organisms, require environments with oxygen. See **anaerobic**.

algae:

Non-vascular photosynthetic plant-like organisms, some of which live in or on the soil. They are informally divided into groups by their dominant pigments (i.e., green, blue-green, etc.)

anaerobic:

Without oxygen. Anaerobic organisms, including some soil bacteria, need oxygen-free environments such as saturated soils. Facultative anaerobes can function as either aerobes or anaerobes depending on environmental conditions. See **aerobic**.

AM (arbuscular mycorrhizae):

The group of endomycorrhizal fungi important in non-woody plants, including many agricultural crops. Sometimes called vesicular-arbuscular mycorrhizae (VAM).

arthropods:

Invertebrate animals with jointed legs. They include insects, crustaceans, sowbugs, springtails, arachnids (spiders), and others.

bacteria:

Microscopic, single-celled organisms. They include the photosynthetic cyanobacteria (formerly called blue-green algae), and actinomycetes (filamentous bacteria that give healthy soil its characteristic smell).

bacterial-dominated food web:

A soil food web in which the ratio of fungal biomass to bacterial biomass is less than one.

biological soil crust:

Also called microbiotic, microphytic, cryptobiotic or cryptogamic crusts. A living community of bacteria, microfungi, cyanobacteria, green algae, mosses, liverworts, and lichens that grow on or just below the soil surface. Biological crusts can heavily influence the morphology of the soil

^o From *Soil Quality Thunderbook*, National Resources Conservation Service, U.S. Department of Agriculture. (2005).

surface, stabilize soil, fix carbon and nitrogen, and can either increase or decrease infiltration. The percent cover and the components of the crust can vary across short distances. Identification of biological crust organisms is simplified through the use of three broad morphological groups: The cyanobacteria group includes **cyanobacteria** and green algae. The moss group includes short and tall **mosses**, but not club moss mats, such as those in northern latitudes, or spike moss. The lichen group includes crustose, gelatinous, squamulose, foliose, and fruiticose **lichen**, as well as liverworts.

comminuters:

Organisms that shred organic material into smaller pieces.

compost tea:

An infusion made by leaching water through compost, sometimes with nutrients added, such as molasses and kelp, to encourage certain organisms. Soluble organic matter and the organisms in the compost are rinsed out of the solid phase and left suspended in the water. This "liquid compost" is easier to apply than solid compost.

cyanobacteria:

Filamentous or single-celled bacteria that fix carbon and nitrogen (formerly called blue-green algae). Only the filamentous species can be seen without a microscope. Cyanobacterial crusts with low biomass are generally the color of the soil and those with high biomass and diversity are dark (brown to black),

decomposition:

The biochemical breakdown of organic matter into organic compounds and nutrients, and ultimately into its original components.

denitrification:

A process performed by a few species of anaerobic soil bacteria in which nitrite or nitrate is converted to nitrogen gas (N_2) or nitrous oxide (N_2O). Both N_2 and N_2O are volatile and lost to the atmosphere.

detritivores:

Organisms that eat detritus, that is, dead plants and animals.

diversity:

Biological diversity can refer to the number of species in an area, the number of types of species (e.g. microbial functional groups, or plant structural types), the degree of genetic variability within a species, or the distribution of species within an area.

ectomycorrhizal fungi:

A type of mycorrhizal fungi that grows between root cells and forms a sheath around roots, but does not actually invade cells. They are important to many woody plants.

emergent properties:

Properties of a whole system that are not apparent from examining properties of the components of the system.

endomycorrhizal fungi:

A type of mycorrhizal fungi that invades the cells of plant roots.

exudates:

Soluble sugars, amino acids and other compounds secreted by roots.

food web, soil:

The interconnected community of organisms living all or part of their lives in the soil.

functional redundancy

The presence of several species that serve similar functions (e.g. nitrification).

fungal-dominated food web:

A soil food web in which the ratio of fungal biomass to bacterial biomass is greater than one.

fungi:

Multi-celled, non-photosynthetic organisms that are neither plants nor animals. Fungal cells form long chains called hyphae and may form fruiting bodies such as mold or mushrooms to disperse spores. Some fungi such as yeast are single-celled.

fungivores :

Organisms that eat fungi.

generalist:

A species that will eat or prey on a wide variety of food resources. (See specialist)

grazers:

Organisms such as protozoa and nematodes that eat bacteria and fungi.

habitat: The environment where an animal, plant, or microbe lives and grows.

hyphae:

Long chains of cells formed by fungi usually occurring between aggregates rather than within micropores. (Compare to mycelium.)

immobilization:

The conversion by soil organisms of inorganic nutrients such as ammonium or nitrate into organic compounds that are part of their cells. This makes the nutrients temporarily immobile in the soil and unavailable to plants. (See mineralization.)

keystone species:

A species which, if removed from an ecosystem, causes a dramatic change in the system, and which has been proposed as an indicator of the functional capacity of the system.

lichen:

A composite of fungi and algae or cyanobacteria. The fungi capture and cultivate photosynthetic organisms which together provide themselves needed water and nutrients. Lichen species occur in many colors including black, brown, dark olive green, red, yellow and white.

lignin:

A hard-to-degrade compound that is part of the structure of older or woody plants. The carbon rings in lignin can be degraded by a few fungi.

liverworts:

Small non-vascular plants.

metabolic quotient (qCO₂):

The ratio of microbial activity to microbial biomass.

microbe or microorganism:

An imprecise term referring to any organism too small to see with the naked eye. Generally, "microbes" refers to bacteria, fungi, and sometimes protozoa.

mineralization:

The conversion of organic compounds into inorganic, plant-available compounds such as ammonium. This is accomplished by soil organisms as they consume organic matter and excrete wastes. (See immobilization.)

moss:

Photosynthetic plants with small leaves that unfurl when moistened (thus the moss appears to swell). When dry, mosses are dark and dull-colored; when moistened, the color changes markedly to a bright, light green to brown. This makes them easy to distinguish from lichens.

mutualists:

Two species that have evolved together into a mutually beneficial relationship. For example, mycorrhizal fungi get carbon compounds from plant roots and help deliver water and nutrients to the root.

mycelium:

A bundle of fungal hyphae that form the vegetative body of many fungal organisms.

mycorrhizal associations:

A symbiotic association of certain fungi with roots. The fungi receive energy and nutrients from the plant. The plant receives improved access to water and some nutrients. Except for brassicas (mustard, broccoli, canola) and chenopods (beets, lamb's-quarters, chard, spinach), most plants form mycorrhizal associations.

nematodes:

Tiny, usually microscopic, unsegmented worms. Some are parasites of animals or plants. Most live free in the soil.

nitrification:

A process accomplished by a few groups of aerobic organisms in which ammonia is converted to nitrite and then nitrate.

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population:

All the individuals of a species in a given area.

protozoa:

Single-celled organisms with animal-like cells, including amoeba, ciliates, and flagellates.

rhizine:

Root-like structure of lichen and other organisms.

rhizoid:

Root-like structure of mosses and ferns used to attach to a substrate.

rhizosphere:

The narrow region around roots where most soil biological activity occurs. Soil organisms take advantage of the sloughed and dead root cells and the root exudates found in this region.

saprophytic fungi:

Fungi that decompose dead organic matter.

sheath:

Tubular structure formed around a chain of cells or around a bundle of filaments. The fine, polysaccharide sheaths formed by some filamentous cyanobacteria help bind soil particles together and can be seen dangling from soil surface fragments. Ectomycorrhizal fungi form a sheath of hyphae around plant roots.

soil ecology:

The study of interrelations among soil organisms and between organisms and the soil environment.

specialist:

A species that consumes only one or a few types of food sources or forms associations with a narrow range of hosts. For example, certain collembola

(tiny insects called springtails) specialize in eating specific species of fungi.
(See generalist)

trophic levels:

Levels of the food chain. The first trophic level includes photosynthesizers that get energy from the sun. Organisms that eat photosynthesizers make up the second trophic level. Third trophic level organisms eat those in the second level, and so on. It is a simplified way of thinking of the food web. In fact, some organisms eat members of several trophic levels.