



## Topic 8: The Living Soil

**Introduction** The soil is an ecosystem in which millions, even billions, of living creatures live and interact. Rather little is known about this huge population because for the most part they are underground and out of sight. The soil ecosystem has been declared by some scientists to be the last great biotic frontier that we need to discover. One thing we do know is that there can be more organisms in a teaspoonful of good soil than there are people in the entire planet earth -that is more than 6 billion. Wow ! There is a very wide range of organisms in the soil, ranging from protozoa which require the strongest of microscopes to detect them, up to large burrowing animals like badgers and rabbits which can readily be seen with the naked eye.



### The Larger Fauna (greater than 2mm in size)

The macrofauna include a wide size range from badgers, on the one hand, down the tiny creatures such as ants. This group of creatures that depend on the soil include rabbits, badgers and gophers, which spend part of their life in the soil, and slugs, moles, earthworms, ants, millipedes, which spend most of their life in the soil. The burrowing animals such as earthworms, ants, millipedes create their own living space by burrowing into the soil whereas creatures such as mites and collembola live in existing air spaces (little pores) in the soil.

These larger fauna play an important part in creating soil structure and helping with soil drainage. Think of the earthworm that burrows through the soil, creating channels, eating some soil as it burrows and then defecating the soil in the form of small granules.

## The Medium Sized Fauna (Mesofauna) (0.1 to 2mm)

Now we are beginning to think about some of the much smaller soil organisms. These include arthropods such as mites; collembola; and enchytraeids. Please excuse the complicated names but this is what they are called

More than 200,000 arthropods have been recorded in a square metre of soil that has been under grassland for many years. Some mesofauna feed on the even smaller organisms like bacteria, fungi and algae, others scavenge dead organic matter usually after it has been partly broken down. They thus contribute to the recycling of the nutrients that are in organic matter.

You will need a microscope or strong magnifying glass to see some of these creatures. They are below our feet in the soil in huge numbers, working away as we walk over the surface of a lawn, field or woodland.

## The Microfauna (less than 0.1mm in size).

Now we are talking about the really, really tiny creatures that live in the soil. These play the final role of converting plant debris back into plant nutrients and in making the nutrients and water available to the plant again. Microfauna that are small enough to be in this category include nematodes which depend on a thin film of water around soil particles for their movement and protozoa which are variable in shape and which eat bacteria for much of their food. There are three main microflora in soils: bacteria, fungi and viruses. These play a major part in breaking down plant debris so that the nutrients in it can be reused. There are many different species of each of these, for example there can be as many as 20000 species of bacteria in just one gram of soil.

The soil is teeming with these small creatures but thank goodness they are there so that they can make the soil water and nutrients available to the growing plants. Say 'hurrah' for the microflora and microfauna when you are next walking on the soil in your garden.

**Other Important Points** It is these living creatures that create the living soil and enable it to do marvellous things like grow crops and beautiful flowers

Such a wide range of creatures thrive in the soil because the soil is a source of such a wide range of foods for them and a wide range of habitats that suit their style of living.

Earthworms are one of the best known of the larger creatures in soils. They are not pests like some animals, but instead do a lot of good things like begin the decomposition of plant fragments, create a good soil structure and their burrows help the soil to drain well. There are several thousand species of earthworm worldwide.

There may be billions of bacteria in just a gram of soil. They take part in many of the important transformations in soil including weathering of rocks and minerals, breakdown of organic matter and many aspects of nutrient cycling.

Fungi in soils come in the form of filaments, spores and globules. They are extremely important in the link between soils and plant production. Many thousands of species have been identified and it is thought that there are several thousand more awaiting discovery

We live in dangerous times when we are using soil more intensively than ever without a full understanding of the soil ecosystem. We need to develop a fuller understanding of this biotic community.