

ENDANGERED SOIL

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(1) The United Nations declared 2015 *The International Year of Soils*. There has been a growing awareness that soil isn't only important for healthy ecosystems, but that soil is also critical to our ability to make enough food to feed the world. Food security, which is the access that humans have to healthy food, is threatened when soil is threatened.

(2) The way we have been conducting intensive modern agriculture, polluting our lands and expanding urban cities has had a huge effect on the Earth's soil for the last two centuries. These things, along with the effects of climate change, have made soil endangered and has increased concerns over food security.

(3) Let's first examine the soil itself. If you think that soil is just simply dirt, then you are mistaken. Dirt isn't alive while soil is brimming with life. Besides minerals, water and decomposing organic matter, soil also contains thousands of species of small insects, worms, fungi and microorganisms. A handful of soil contains more microorganisms than there are people on Earth! One key to healthy soil is numerous and diverse soil organisms.

(4) There are two main branches of soil science: pedology and edaphology. Pedology is concerned with how soil forms. Edaphology is the study of how soil conditions affect organisms, like the plants, living in the soil.

(5) We take for granted that soil has always been here and will always be here, but pedology tells us something different. Soil forms very slowly over time. Pedogenesis is the scientific term for soil formation. The uppermost layer of soil is called topsoil and it is the most nutrient rich part of the soil. The pedogenesis of topsoil is very slow. An inch of it takes 500 to 1000 years to form. We grow almost all of our food in topsoil so it is vital that we keep it safe, yet we are destroying topsoil at a much faster rate than it can naturally form.

(6) The main reason why pedogenesis is so slow is because it depends on the breakdown of the "parent material". The parent material is the rock that forms the mineral content of the soil. This rock needs to be broken down into smaller and smaller pieces over time



through contact with the forces of nature. Once weathering forms the initial cracks in the rock, the eroding actions of water, chemical reactions and living organisms (like plants) can start to erode and break apart the rock even further. This process takes a long time causing topsoil to form very slowly.

(7) Edaphology helps us study and examine how altering our soil affects the plants grown in it. Proper soil conditions are vital for healthy plant growth. Over the last two centuries, not only have we seen a decrease in the amount of topsoil on Earth, we've also seen a huge decrease in soil quality and fertility.

(8) Every time a crop is grown in soil, the crop absorbs nutrients from the soil to help it grow. Nutrients like nitrogen, potassium, phosphorus, calcium, magnesium, sulfur and many other nutrients are sucked up by crops which are then transported to markets for sale. In natural ecosystems, like forests, plants suck up nutrients as well, but when the plants die and decompose, the nutrients are returned to the soil. The nutrients in crops end up in our toilets, trash bins and landfill sites and aren't returned to the soil. After years of farming soils in this manner, soils become drained of their nutrients causing nutrient exhaustion. For many exhausted soils, adding synthetic fertilizers can prolong the use of the soil for several more years but inevitably the soil, especially the living components of the soil, begin to suffer when so many chemicals are added. As well, most fertilizers only return nitrogen, phosphorus and potassium to the soil and no other nutrients. This helps keep the price of the fertilizer cheap but at the cost of

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soil quality. More soil friendly and less intensive farming practices need to be adopted to preserve soil fertility.

(9) As well, as cities expand in size and numbers, more concrete covers over arable land and heavy urban machinery compacts the soil. Compaction causes air pockets in the soil to be squeezed out making it harder for gases and water to penetrate the soil. Compaction also makes it harder for plant roots to grow.

(10) Soil erosion and climate change is also a big factor in soil loss. When trees are cut down for their wood and cleared to make farmland,

soil is more easily washed away after a rainfall. Without tree roots, the soil can't anchor itself to the earth. One big storm can wash away soil that took thousands of years to form. Climate change has also turned some fertile lands into deserts and others into flood plains, thus removing the use of these lands for agriculture.

(11) Over half of the Earth's topsoil has been lost in the last 150 years. By 2100 there will be an estimated 11 billion people on the planet. If we don't manage and preserve our soils more intelligently, then the ability to feed everyone on the planet will be in jeopardy which might trigger global resource wars.

Article Questions

- 1) What are some of the living organisms found in soil?
- 2) What is pedology and pedogenesis?
- 3) What is the rate of pedogenesis for topsoil?
- 4) Why is topsoil pedogenesis so slow?
- 5) In commercial modern agriculture, why do soils eventually suffer from nutrient exhaustion?
- 6) Describe two reasons why the use of synthetic fertilizers is not the answer to decreasing soil quality.
- 7) How does cutting down trees lead to soil erosion?
- 8) How do you think food security is linked to "food resource wars"?