

**Workshop Title: The Origin of Soil and Its Properties**

**Speaker(s) & their titles:** Dr. Andrew Hammermeister, Organic Agriculture Centre of Canada, Dalhousie University, Faculty of Agriculture

**Executive Summary**

Dr. Andrew Hammermeister discusses how soil is formed and the environmental factors that affect its quality. He also discusses soil health and touches on the basic chemistry behind soil.

**Detailed Notes**

What is Soil? Soil is any naturally occurring or unconsolidated (loose) material. Where did/do soils come from? Soil forming factors are parent material (i.e. bedrock), climate, topography, biology and time ...and humans! Canada's soil is relatively young in the context of the Earth. Glaciers pick up material and debris as they move across the landscape, creating huge amounts of pressure on the land as they move south and in other directions. There are areas of Canada where the soil has been "sorted" by water such as flat areas due to clay settling flat in Saskatchewan and Ontario.

Aeolian Materials: sorted by wind

Saskatchewan has the largest sand dunes in the world outside Africa (photo on slide).

Climate

Soil forms in distinctly different layers called soil horizons

Biology

Soil and life are completely interconnected. Mycorrhizal fungi can sometimes create connections with plants sending hormonal messages through the fungi. Earthworms are also a key factor in soil health.

Topographic Effects

The summit of a hill has thin soil while the shoulder is eroded and the foot of the slope has the thickest soil.

Ecosystems and Biology

In the Eastern Acid Forest Soil there is a lot of leaching due to high levels of rain.

Prairie Black Soil

There is less rain so there is less leaching.

Poorly Drained Soil

Separate coloured clumps is an indication of poorly drained soils. Some of our most productive land has been converted to urban areas.

Canadian System of Soil Classification

There are 4 layers in soil: ground horizon, A, B, C.

#### Main Components to Soil

The colour of the soil is related to organic matter content, iron oxides and drainage. Dark colour is rich in organic matter (humus).

#### Organic Matter Builds Structure

Soils high in organic matter hold together much better than those low in organic matter. Clay soil is very sticky and also grows and shrinks dramatically with moisture.

Soil is in three main particle sizes; sand largest, silt medium and slippery, clay really small and sticky. There are dramatic differences in the particle sizes (refer to chart on slide 41). The finer the particles the more surface area there is.

Healthy soil with lots of structure will have little clumps that stick together but not be too hard. Roots are able to move through the whole soil profile. Soil is like a magnet and has a negative charge.

Soil pH: measure of the concentration of H<sup>+</sup> in soil solution:  $\text{pH} = -\log [\text{H}^+]$ .  
Hydrogen will push other cations off of the soil; therefore you do not want a very acidic soil.