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What you should know about soil

What is soil?

Soil is a mixture of organic and mineral material. It is made up of various proportions of:

- weathered rock: gravel, sand, silt, clay, minerals and salts, all of which have been subjected to freezing and thawing, wetting and drying for many centuries.
- organic matter: decaying plant and animal remains that are acted upon by organisms. This is usually called humus.
- soil organisms: small animals (insects, worms, protozoa), fungi, molds and bacteria. These are usually present in countless millions.
- air: oxygen, nitrogen, carbon dioxide and other gases.
- soil water: moisture is most important since it regulates the activity of other soil constituents.

Soil for agricultural use occupies only about 7 percent of Canada's land mass. It is our most valuable asset, and it must, therefore, be understood and properly managed.

Canada's soil was formed gradually. At the beginning, this country's land surface was modified by glaciers. These glaciers broke down prehistoric rock, and when they melted, they deposited clay, silt, sand, gravel and rocks which formed the parent material of our soils.

Canada is a vast country, the second largest in the world, and it has a great variety of soils. Differences in soil are the result of the action of climate and vegetation on the parent material over many hundreds of years.

Major soil regions

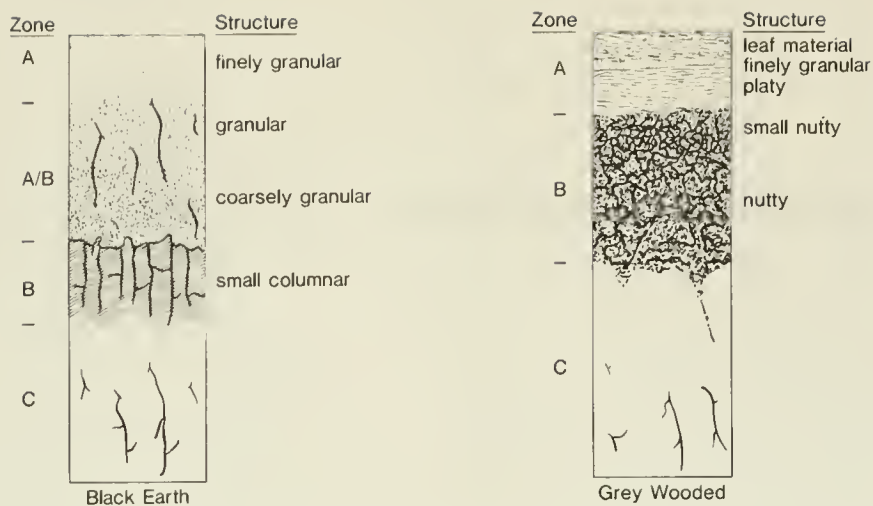
Canada may be divided into five main soil regions:

- *The Appalachian-Acadian Region* includes the Atlantic Provinces (New Brunswick, Nova Scotia, Prince Edward Island and Newfoundland) and the Gaspé part of Quebec. Soils in this area have been influenced by forest vegetation during countless centuries. The climate, moderated by the Atlantic Ocean, is generally warm and humid. This region is suitable for mixed farming, potatoes and orchard crops. For good crop yields, lime (calcium compounds) is often required to counteract the acid nature of the soil.
- *The St. Lawrence Region* includes the St. Lawrence Valley and the land adjoining the Great Lakes. It may be subdivided into an upland region (northwestern Quebec and Ontario), and a lowland region (Lac St. Jean in Quebec, the St. Lawrence Valley and southern

Ontario). In the upland areas the land is undulating and the soil is generally coarse-textured. The lowlands are smoother and level and are characterized by a high percentage of silt and clay deposits. The native vegetation of the St. Lawrence Valley is forest. The climate is moderated by large bodies of water (St. Lawrence River and the Great Lakes) which favor fruit production, as in the Niagara peninsula, as well as vegetables, tobacco and root crops. In most of this region lime is necessary for good crop yields.

- *The Interior Plains Region* makes up 75 percent of Canada's farming soil. It was formed by the action of ice and water during glacial times and is therefore relatively flat. Grasses are the dominant native vegetation of this large area, and as a result the soils are usually alkaline, and typically black, dark brown and brown. Prairie soils are suitable for grain production, and for pasture and rangeland. Because of low summer rainfall, these soils are subject to droughts and wind erosion.
- *The Cordilleran Region* is the mountainous area of British Columbia and western Alberta. Farmland is confined to valleys and smooth plateaux. The coastal areas are favored by warm westerly winds from the Pacific Ocean and receive considerable rain. Farther inland, the range in temperature widens and rainfall decreases. As a result, many different soil types are present. The more southerly and sheltered areas are suitable for orchards, as in the Okanagan Valley, whereas other areas are excellent for vegetables, grain crops and ranching.





EXAMPLE OF TWO MAJOR SOIL PROFILES FOUND IN CANADA

- *The Canadian Shield* comprises nearly half of Canada's land area. It consists of most of Quebec, Ontario and the northern part of Manitoba and Saskatchewan. Although it may contain isolated pockets of soil suitable for farming, particularly in the southern areas, most of it is unsatisfactory because of rock outcrops, swamps and unfavorable climate.

Soil profile

A vertical cross section of the soil through all of its horizons, or layers, extending down into unweathered material, is referred to as the soil profile. It may be different in appearance, structure and texture in one area as compared to another.

The upper part of the soil profile, the topsoil, is generally known as the "A" horizon. Its depth varies from less than one to several centimetres. It is usually black or dark brown because of its humus content. Also, it is the most "active" layer as it is undergoing changes more rapidly than deeper zones. It is therefore more fertile.

The second layer or "B" zone contains most of the material that filtered or leached through from the "A" zone. It has a distinct color, usually brownish, and often has a definite structure. It may be several inches to several feet deep.

The third layer, or the "C" zone, is the parent material of the soil. It may consist of bedrock, sand or gravel, plus an accumulation of leached salts, minerals and other materials from the "B" zone.

Factors affecting soils

- **Parent Material.** The parent material of present-day soils may have been derived from prehistoric rock formations, for example, granite, limestone, shale or sandstone.
- **Topography.** This is the lay-of-the-land. It may be flat, rolling, steep or mountainous.
- **Drainage.** In depressions where water accumulates, swamps, muskegs or bogs are formed. Poor drainage may also be a problem in flatlands and valleys.

- **Vegetation.** Soil is profoundly affected by vegetation. It is usually acid where forests once stood, and neutral or alkaline where grassland existed.
- **Climate.** Amount of rainfall has a significant influence on soil. Repeated freezing and thawing, wetting and drying affect soil structure and decomposition rate.
- **Maturity.** The length of time that soil is left undisturbed, so that natural elements have a chance to exert their influence, is referred to as soil maturity.
- **Culture.** Man has modified soil by cultivation. Poor farming practices result in soils of low fertility and, in some areas, lead to wind and water erosion which result in loss of some or all of the surface layers. Forest fires and periodic flooding also modify the soil.

Soil classification

Canada's soils are either organic or mineral.

Organic soils: are usually referred to as muck or peat soils. Both are known for their low mineral content. Muck soils are predominantly well-decomposed whereas peat soils are predominantly fibrous.

Mineral soils: contain less than 30 percent organic matter. They are classified as to composition, texture, color, structure and horizon.

Soil surveys

In most areas, provincial and federal agronomists have conducted soil surveys. These are detailed studies, or land inventories, of the soil of an area. From such surveys, soil maps and reports have been compiled and these are available from universities, agricultural representatives, or Agriculture Canada's Research Stations.

Soil testing

Soil tests eliminate guesswork on the part of farmers in determining fertilizer requirements of their crops. Testing services, involving laboratory analysis of soil samples submitted by farmers, are available in all provinces. Analysis of a sample provides an inventory of the soil nutrients (nitrogen, phosphorus and potassium, for example) that are available for crop production and this serves as a basis for determining whatever additional fertilization if any is needed to meet crop requirements. The acidity or alkalinity of the soil (the pH level), the salinity and other conditions can be assessed by soil tests.

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