

Understanding soil

In order to manage soils so that they are used in a productive and sustainable manner there is a need to understand the various properties of the soil.

Soil is the thin outer layer covering the land surface of the earth. It is made up mainly of mineral particles, organic materials, air, water and living organisms—all of which slowly yet constantly interact.

Most plants get their nutrients from the soil and in turn, are the main source of food for animals and birds. Therefore, most living things on land depend on soil for their very existence.

However, soil is more fragile than it appears and is easily damaged, washed or blown away. If we understand soil and manage it properly, we will avoid destroying the basis of our environment.

How soil forms

Soil forms continuously from the gradual break-up of rocks through physical, chemical and biological processes—known as weathering. The accumulation of material through the action of water, wind and gravity also contributes to soil formation.

These processes can be very slow, taking many thousands of years. Five main interacting factors affect the formation of soil including:

- parent material—minerals forming the basis of soil
- living organisms—influencing soil formation
- climate—affecting the rate of weathering and organic decomposition
- topography—grade of slope affecting drainage
- time—influencing soil properties.

Interactions between these factors cause an infinite variety of soils across the earth's land surface.

Soil properties

Soils vary in their suitability for specific purposes. For example, a deep, fertile clay soil is suitable for intensive agriculture but a shallow, sandy soil is most suited to grazing and growing trees.

The suitability of a soil for a particular purpose can be determined by looking at some of the easily recognisable features and carrying out simple tests.

The most common properties used to compare and recognise soil are:

- soil depth—examined from the surface to the parent material

- texture—proportion of sand, silt and clay sized particles of the soil
- structure—how soil particles group together to form aggregates (or peds)
- colour—influenced by organic and parent materials
- soil pH—acidity or alkalinity level of the soil
- nutrient status—presence of macronutrients and micronutrients

Other important soil properties include dispersibility, organic matter and soil carbon sequestration, permeability and porosity, salinity and water holding capacity.

Soil profile

As soil develops over time, layers or horizons form and collectively constitute a soil profile. Most soils exhibit three horizons:

- A horizon—humose-rich topsoil (where most plant roots, earthworms, insects and micro-organisms are active)
- B horizon—clay rich sub-soil
- C horizon—underlying weathering rock material (from which the A and B horizons form).

Many soils also have an O horizon which consists mainly of plant litter which has accumulated on the soil surface.

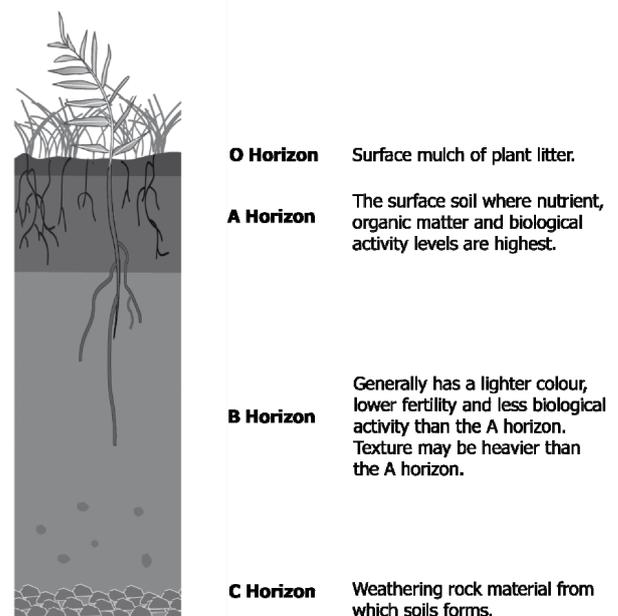


Figure 1. A typical soil profile

The A horizon is the most fertile part of the soil profile—acting like a sponge that soaks up water when it rains. Plants rely on the stored water (in A horizon) till it rains again. The deeper the A and B horizons of the soil, the more water it can store and the better plants will grow.

Soil degradation

Soils can be subjected to various forms of degradation that affect their productive potential. Some forms of degradation can be reversed while others can be difficult or uneconomic to treat.

Prevention is far better than cure and it is necessary for land managers to understand what forms of degradation are most likely to affect individual soils. An important concept is using land in accordance with its capability.

Soils and land-use

A productive soil, that will support healthy plants, has several characteristics. It needs to be deep, well structured, fertile, well drained, biologically active and of medium pH level. The combination of these features provides an environment that is ideal for plant growth.

A soil that is prized for its agricultural value may be less suitable for other uses. For example, some of our best cropping soils are cracking clays, but their capacity to shrink when dry and expand when wet creates problems for buildings and roads.

To assist land managers in determining land use options for their soil, a series of soil maps, land resource bulletins and land management manuals have been prepared for most parts of Queensland.

In addition to information on soil types and soil properties, these resources may provide a regional overview of the land resources, climate, vegetation, and land management issues.

Further information

For further information about soils visit the DERM website <www.derm.qld.gov.au>.

October 2009

L1

For general enquiries contact the
Queensland Government call centre 13 13 04
or visit www.derm.qld.gov.au