

## Building New Topsoil

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Soil with poor structure cannot function effectively, even when nutrient and moisture levels are optimal. The roof of a healthy soil is the groundcover of plants and plant litter, which buffer temperatures, improve water infiltration and slow down evaporation, so that soil remains moister for longer following rainfall.

Friable, porous top soils make it easier for plant roots to grow and for small soil invertebrates to move around. Well-structured soils retain the moisture necessary for microbial activity, nutrient cycling and vigorous plant growth and are less prone to erosion.

An ongoing supply of energy in the form of carbohydrates from actively growing plant roots and decomposing plant litter is required, so that soil organisms can flourish and produce adequate amounts of the sticky secretions.

There are six essential ingredients for soil formation.

1. Minerals
2. Air
3. Water
4. Living things IN the soil (plants and animals) and their by-products
5. Living things ON the soil (plants and animals) and their by-products
6. Intermittent and patchy disturbance regimes
  - For soil to form, it needs to be living (4)

- To be living, soil needs to be covered (5)
- To be covered with healthy plants and decomposing plant litter, soil needs to be managed with appropriate disturbance regimes (6)

There is little information available as to how to increase the levels of air, water and organic materials in soil. For this reason, components 5 and 6 of the soil building checklist tend to be overlooked. That may explain why many people believe that new topsoil cannot be formed.

### Rules for Building Topsoil

For all land, whether for grazing, cropping, horticulture, timber, conservation or recreation.

- **NO BARE SOIL.** Soil must always be COVERED with plants or plant litter.
- **Produce ORGANIC MATTER.** Rest ground cover from grazing.
- **GRAZE** or slash the ground cover periodically. Use high stock densities for short periods to place organic matter both **IN** and **ON** the soil (root pruning and litter trampling). The higher the biomass and turnover of plant roots, the faster new topsoil will form. It is the energy from biological activity that drives the process.

When new topsoil is forming, it will have better structure and will contain more air and more pore spaces than degraded soil, so the bulk density will be less. That is, a given volume of new topsoil will weigh less than an equal volume of non-living mineral soil. The bulk density of healthy topsoil may be as low as 0.5 g/cm<sup>3</sup>. In practical terms, a one millimeter increase in the height of new soil would equate to the formation of around 5 to 10 t/ha of organically enriched topsoil.