

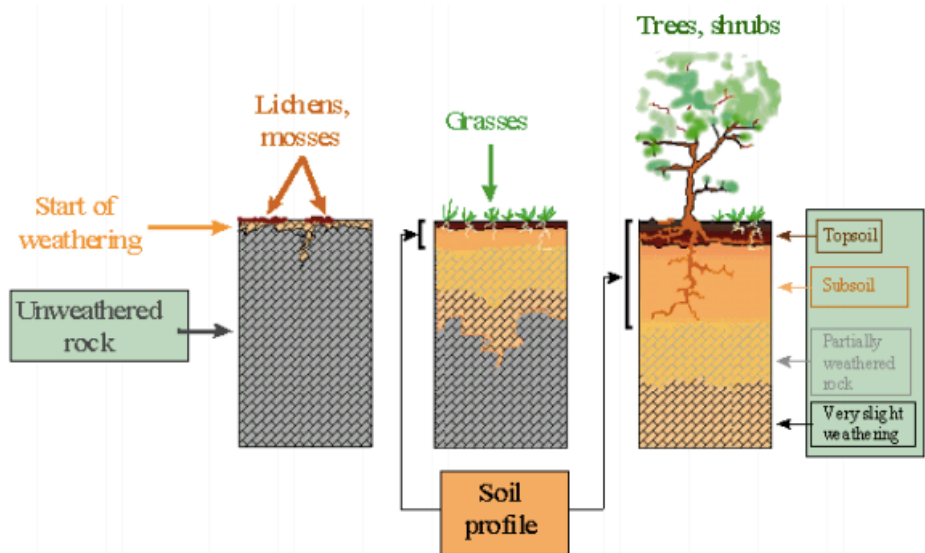
2	Introduction to Soils
The importance of soils to the production of food	<ul style="list-style-type: none"> • Soil resources are a central factor shaping human history and development • Pastures and crops grow in soil and provide all minerals required by herbivorous animals • Many health problems of plants and animals arise because of soil health issues
Components of a soil	<ul style="list-style-type: none"> • Soil is the unconsolidated mineral or organic material on the immediate surface of the earth that serves as a natural medium for growth of land plants • Five major components of soil <ul style="list-style-type: none"> ○ Mineral matter (45%) ○ Organic matter (5%) – variable ○ Air (25%) – variable ○ Water (25%) – variable ○ Soil organisms (billions) • Particles found in soils <ul style="list-style-type: none"> ○ Clay – less than 2 microns (<0.002mm) ○ Silt – 2-20 microns ○ Fine sand – 20 microns to 2mm ○ Coarse sand ○ Organic matter
Basic functions of soils and an understanding of how they support plant growth	<ul style="list-style-type: none"> • Basic functions of soils <ul style="list-style-type: none"> ○ Soil serves as a natural medium for the growth of plants ○ Regulates and purifies water ○ Recycles organic wastes and nutrients ○ Provides habitat to soil organisms ○ Serves as physical support for buildings and construction and animals • How soils support plant growth <ul style="list-style-type: none"> ○ Nutrition <ul style="list-style-type: none"> ▪ Provision of macronutrients (nitrogen, phosphorous and potassium) ▪ Provision of micronutrients (copper, zinc, manganese) ▪ Nutrients from chemical fertilisers or organic sources ○ Water holding <ul style="list-style-type: none"> ▪ The soil needs to take in water when it rains in order to provide water for a longer period of time ○ Stability <ul style="list-style-type: none"> ▪ Soils require good mechanical strength to provide crops good grounding to stay upright ○ Salinity <ul style="list-style-type: none"> ▪ Affects around 5% of Australian farmland ○ Waterlogging <ul style="list-style-type: none"> ▪ When soil can no longer take in more water ▪ Can cause roots to rot ○ Acidity/alkalinity ○ Aeration ○ Control of toxicities ○ Thermal insulation <ul style="list-style-type: none"> ▪ Maintains a stable microclimate

A knowledge of the complexity of managing the attributes of Australian soils

- Most, but not all, Australian soils are ancient, strongly weathered and infertile
- Australian soils tend to be
 - Old (no glaciation to carve up rocks)
 - Salty
 - Clayey – except in the west where they tend to be sandy
 - Acidic
 - Nutritionally and organically impoverished
 - Structurally challenging
 - Phosphorous deficient
- Australia’s rate of soil formation is low by world standard (~300years per cm)
- Dust storms cause major soil losses

An appreciation of how soils are formed and the factors which impact the rate of formation

- 5 major factors that impact soil formation
 - Parent material (original form)
 - Climate – precipitation and temperature effects
 - Macro and microorganisms
 - Topography – elevation, slope and position
 - Time



How can soils promote or constrain plant production and quality

- Soils can contribute to plant production through
 - Water holding capacity
 - Nutrients (e.g. N, P, K, Ca, Mg, trace elements)
 - Stability

Constraints	Management Responses
Waterlogging	Drainage
Salinity	Drainage
Nutrient deficiencies	Fertilisers
Extremes of pH	Liming
Toxicities (e.g. boron)	Crop variety
Hardsetting	Gypsum or ripping
Non-wetting	Clay/wetters
Compaction	Ripping

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The Physical Properties of Soil

The components of soil texture and how to

- Soil texture is a description of the proportions of sand, silt and clay
 - Sand – particulate matter from rock, disintegration, non-plastic
 - Silt – fine mineral material, crumbles when rolled into a ball