

## SOILS

Soils are the product of complex interactions between factors such as climate, soil parent material, biological activity, topographic position and time. The role of time in soil formation is especially important, firstly because many soil-forming processes are slow, and secondly because environmental conditions may change over time and hence a soil may be the product of a number of soil forming conditions.

This section gives a guide to the range of soil present in the study area, and lists their major occurrences. As soils can vary greatly over short distances (e.g. over 10 metres) within a particular classification Unit, the precise soil type present at any particular site cannot be inferred from these data except at the broadest levels. None-the-less, general soil type-landscape position relationships are given (where applicable) in the soil system Unit descriptions.

### *Classification of the Soil*

The soils are classified according to the “Factual Key for the Recognition of Australian Soils” (Northcote 1979), and written descriptions are also given to accompany the Northcote classifications. They are initially separated into three principal profile forms:

- ❖ **uniform soils** – soil profiles dominated by the mineral fraction with small, if any, textural change with depth
- ❖ **gradational soils** – soil profiles dominated by the mineral fraction and gradually becoming increasingly finer-textured (more clayey) with depth
- ❖ **duplex soils** – soil profiles dominated by the mineral fraction and having a pronounced and clearly defined texture contrast between the A and B horizons, which usually coincides with a marked increase in clay content.

Soil belonging to a fourth group – the **organic soils** in which the profile is dominated by the organic fraction – were not observed in the study area.

Each primary profile form has been subdivided according to colour and other factors including structure, soil reaction (pH trend throughout profile), mottling (regular repetitive change in colour within a horizon), soil depth, characteristics of an A<sub>1</sub> horizon if present, and surface condition.

No detailed chemical or physical analyses were performed. Where possible, relatively undisturbed sites were selected and the soils were described and classified from exposures in gullies and roadside cuttings, or from samples obtained from hand augering or manual excavation of a pit. Information regarding the soils of the northern region of the study area from Schoknecht (1988) was also extensively used.

### *Description of the Major Soil Groups*

Duplex soils are common within the study area. They have predominantly yellowish subsoils and are frequently mottled. Red, brown, yellow gradational soils are common on basalt, as are grey uniform clays and yellow and brown mottled duplex soils. Shallow soils occur on the steeper slopes and sharper crests, with coarse sandy topsoils on granite and stony fine sandy clay loams on sedimentary rocks.

#### **Uniform soils**

Soils of uniform texture ranging from sands to clays occur on a variety of parent materials and landscape positions. The sandy soils are usually derived from granite, whereas the clayey soils are usually derived from basalts.

#### **Coarse sands**

##### **Uc1.2, Uc1.4, Uc2, Uc4**

Coarse sandy soils, which are usually shallow, occur on the steeper slopes and crests in granitic areas. Profile development is usually limited to an accumulation of organic matter at the surface, and in some cases a gradual increase in colour with depth. High soil permeability, low nutrient status and low water-holding capacity limit the use of the soils for introduced pastures, and consequently they support native vegetation or low-productivity native pastures.

The soils are droughty in summer, and are prone to wind erosion is left unprotected during this period.

Coarse sands are common in the Mt Misery Hills, Mt Misery Slopes and Ercildoun Slopes Units.

#### **Alluvial soils**

##### **Um1**

Uniform sandy or loamy textured soils occur on youthful alluvial deposits. The soils vary considerably in the degree of development, ranging from limited organic matter accumulation at the surface to soils with well developed horizonation, including a bleached A<sub>2</sub> horizon and some structural development. Colours range from greys to browns. The soils are suitable for introduced pasture species or cropping; however, the small areas involved and the flooding hazard often restrict land use.

Alluvial soils occur in the Entrenched Valleys Unit to a minor extent.

### **Brown to reddish brown loams**

#### **Um6.1**

Well-structured brown to reddish brown loams are common, although of limited extent, on steeper basaltic slopes such as scarps and volcanoes. They are usually very shallow and stony. Cultivation of the soils is usually impracticable due to excessive slope and stone, and they are typically unimproved, often carry weed species such as capeweed and thistles, and harbour pests such as rabbits.

Brown to reddish brown loams occur in the Entrenched Valleys and Volcanic Hills Units.

### **Friable clays**

#### **Uf6.3**

Friable black or dark-brown clays occur infrequently on basalt in the central parts of the catchment. The clayey topsoils are well structured and friable, and may represent a transition phase between the heavier poorer drained cracking clays of the depressions and the gradational better-drained soils of the slopes. The soils are moderately shallow and stony, and these features combined with their slow subsoil drainage restrict agricultural productivity.

They are found in Norbury, Glenbrae and Entrenched Valleys Units.

### **Cracking clays**

#### **Ug5.15, Ug5.25, Ug5.3**

Cracking clay soils are common on plains of basaltic and alluvial parent materials. They are moderately deep and have a light to medium clay surface, which is usually self-mulching, over a heavy clay subsoil that cracks during dry periods. Colours include grey, brown and black. A gilgaied micro-relief has developed in some areas. The soils' heavy textures coupled with their seasonal shrink-swell characteristics create difficult conditions for plant growth.

On basalt, grey cracking clays are common in the Norbury, Glenbrae, East Mt Mitchell-Carinya and Grandview Units.

Black cracking clays occupy the drainage depressions that constitute the Whitestone Swamp Unit.

### ***Gradational Soils***

Soils that exhibit a gradual increase in texture with depth are common on basaltic and sedimentary parent materials. Surface textures range from sandy loams to clay loams, and subsoils from clay loams to clays. Soil depth varies markedly.

### **Red gradational soils – basaltic parent materials**

#### **Gn3.11, Gn3.12, Gn3.14, Gn4.12, Gn4.4**

Well-structured red gradational soils are common on basaltic parent materials. The topsoils have loam to clay loam textures (mostly clay loam), and the clay content gradually increases with depth. Soil depth is variable. The soils are well drained, friable and stony on the steeper slopes. In colour, although typically red, they may be reddish brown or occasionally brown. They are moderately fertile, and have excellent physical properties; this makes the deeper profiles suitable for agricultural land use.

Red gradational soils on basalt predominate in the Volcanic Hills Unit, but are also found to a limited extent in the Glenbrae and Norbury Units.

### **Brown gradational soils – basaltic parent materials**

#### **Gn3.21, Gn3.31, Gn3.22, Gn3.32**

Brown gradational soils, common throughout the plain, are moderately deep and well structured with silty loam to clay loam surface textures and clayey subsoils; in some instances the B horizons are mottled and an A<sub>2</sub> horizon is present; buckshot is common in the upper horizons: the brown gradational soils appear to be slightly poorer-drained variants of the red gradational soils, which are restricted to the better-drained crests, the slopes flanking the volcanic hills and the scarps.

## **Red or reddish brown gradational soils – sedimentary parent materials**

### **Gn3.74, Gn3.14**

In contrast to the well-structured red gradational soils found on basalt, these reddish gradational soils are poorly structured and usually shallow, and have a low nutrient status. They are characterised by a reddish brown or brown fine sandy loam to clay loam topsoil, and a gradual increase in clay content with depth to a clay loam or light clay. Fragments of stone are common throughout the profile.

They occur, to a limited extent, on slopes and crests of the sedimentary regions (Burnbank Slopes, Ben More Foothills, Bundarra and Ben More Hills Units) throughout the study area.

### **Yellowish brown to greyish brown gradational soils**

#### **Gn3.71, Gn3.72, Gn3.74, Gn4.31**

These soils occupy landscape positions ranging from crests, where they are stony and shallow, to lower slopes and depressions where they are moderately deep. The yellowish brown soils occur on the well-drained slopes and crests; they have sandy loam to light clay loam surface textures, which grade into clay loam to clay subsoils.

Yellow gradational soils with buckshot in the brown silty loam topsoils occur in some areas of gently undulating basalt, notably in the East Mt Mitchell-Carinya Unit.

Yellowish brown gradational soils are common in the Ben More Foothills and Ben More Hills Units.

### **Dark gradational soils**

#### **Gn3.4**

Minor drainage depressions on basalt carry these soils, which are dark grey to black and have clay loam or silty clay loam topsoils that grade into medium to heavy dark clays at depth.

These soils occur in the Norbury Unit and are uncommon.

### ***Duplex Soils***

A rapid increase in texture between a lighter topsoil and a heavier subsoil characterises the duplex soils. These occur on all parent materials in the study area, although they are most common on the gentler slopes and plains on sedimentary rocks and alluvium.

### **Yellow duplex soils**

**Mottled: Dy3.41, Dy3.42, Dy3.21, Dy3.22, Dy3.12, Dy3.32, Dy3.11**

**Non-mottled: Dy2.11, Dy2.21, Dy2.22, Dy2.41, Dy2.42, Dy4.11**

Yellow duplex soils occur on all parent materials throughout the catchment, but most notably on granitic and sedimentary rocks. The majority have reddish brown or grey mottles and are acidic to neutral at depth. The topsoil textures vary depending on the coarse fraction of the parent material, with coarse sandy loams to loamy coarse sands common on granitic rocks, sandy loams to fine sandy clay loams on sedimentary rocks and silty loams or clay loams on basalt. Subsoil textures are less variable, ranging from sandy clays to clays. The subsoils are frequently sodic, contributing to subsoil dispersibility and increasing their susceptibility to gully and tunnel erosion. The mottled soils have a bleached A<sub>2</sub> horizon often contain small (up to 10 mm diameter, but more frequently from 3-5 mm in diameter), spheroidal, ironstone concretions locally described by the term 'buckshot'.

The yellow duplex soils are used for grazing introduced or native pastures and are dominant soil types in the Burnbank Plains, Burnbank Slopes, Ben More Foothills, Ben More Hills, Mt Misery Slopes, Glenbrae, East Mt Mitchell-Carinya, Trawalla-Pinepark, Grandview, Ercildoun Plain, Bundarra and Ercildoun Slopes Unit. They are also found to a minor extent in the Entrenched Valleys and Mt Misery Hills Units. They are the most widely distributed soil type found within the study area.

### **Red duplex soils**

**Non-mottled: Dr2.22**

Red duplex soils occur to only a limited extent in the study area. They often contain stone fragments, have pale A<sub>2</sub> horizons below a grey-brown loamy topsoils, with red clayey subsoils that are moderately to strongly structured.

Red duplex soils are found to a limited extent only in the Ben More Foothills Unit.

## **Brown duplex soils**

### **Db2.41, Db2.22, Db1.81, Db1.21, Db1.11**

These soils are common on highly weathered granitic or colluvial parent materials. The topsoils are sandy, and a pale or bleached A<sub>2</sub> is usually present. These subsoils sometimes overlie a ferruginous hardpan.

Brown duplex soils are also common on basalt. Topsoils here are moderately deep clay loams, and a pale A<sub>2</sub> is sometimes present, often containing buckshot. The clayey subsoil is whole-coloured, well structured and neutral.

Minor occurrences of brown duplex soils also occur on sedimentary parent materials.

These soils are common in the Glenbrae, East Mt Mitchell-Carinya and Grandview Units and are also found in the Burnbank Plains, Burnbank Slopes, Ben More Foothills, Trawalla-Pinepark, Mt Misery Slopes and Bundarra Units.

## **Dark duplex soils**

### **Dd2.41, Dd2.81**

These soils occasionally occur in drainage depressions on basalts. The loamy to clay loamy surface textures change to medium to heavy clays just below the soil surface. The soils have a moderate to high nutrient status; however, their landscape positions results in them being wet for much of the year and land use is restricted to grazing.

They are found in the Ercildoun Plains, Entrenched Valleys and Ercildoun Slopes Units.