A.4. 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. Soils of apparently different ages were observed in the study are, and their characteristics are discussed further in Part C.

This section gives a guide to the range of soils present in the study area, and lists their major occurrences. The actual soil type present at any particular site, however, cannot be inferred from these data, except at the broadest classificatory levels. If such detail is required an on-site inspection is necessary.

Classification of the soils

The soils are classified according to the Factual Key for the Recognition of 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.
Soils beginning 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 structures, soil reaction (pH trend throughout profile), mottling, soil depth, characteristics of an A_2 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 railway cuttings, or from samples obtained from hand augering.

Description of the major soil groups

Duplex soils are most common within the study area. They are predominantly red on the gentle slope and alluvial plains in the north, and yellowish and frequently mottled on gentler granitic and sedimentary terrain in the south. Red gradational soils are common on basalt in the north and south, whereas uniform clays or duplex souls predominate on basalt in the central areas. Shallow soils occur on the steeper slopes and sharper crests, with coarse sandy topsoils on granite and stony 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 coarser-grained rocks such as granite from finer-grained basalts and mudstones.

Coarse Sands

Ucl.2, Ucl.4, Uc2, Uc4
Coarse sandy soils, which are usually shallow, occur on the steeper slopes and crests in granitic areas, and occasionally on Tertiary gravel cappings. Profile development is usually limited to an accumulation of organic matter at the surface, and in some case a gradual increase in colour with depth. High soil permeability, low nutrient status and low water-holding capacity limit the use of the soils fro 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 if left unprotected during this period.

Coarse sands are dominant in map units L/Hrg, HrGl, HrG2, HrG3, and RgT, and of minor occurrence in RgGl, RgG3, Rg/uGl, Rg/uG2 and R/LuG.

Alluvial Soils

Uc1.21, Uc1.42, Uc2, Um1.4, Um5.5

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_2 horizon and some structural development. Older soils buried beneath more recent alluvial deposits also occur. 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, and the native vegetation is sometimes retained.

Alluvial soils occur in map units PlA1, PlA4, PlA5, and Pl/gA, but are usually of minor extent. They also occur sporadically in larger drainage depressions throughout most of the study area.

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 week species such as capeweed and thistles, and harbour pests such as rabbits.

Brown to reddish brown loams occur in map units PlB, EB, VB, PgB1, PgB3 and PdB.

Yellowish brown stony loams

Um1, Um2, Um4.11

These soils occur on the steeper slopes and sharper crests of dissected sedimentary terrain. They also shallow, consisting of little more than a fine sandy to loamy A horizon over fractures bedrock. Rock outcrop is a common feature. The soils are generally apedal or poorly structured, and their combined properties of shallowness, low water-holding capacity and low nutrient status results in low productivity. In many instances the native vegetation had been retained.

This soil type is never common, but does occur regularly in units RuS/, Lu/rS, LrS1, L/HrS, and HrS1.

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 map units PgB3, PgB5, RgB3 and PdB.

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 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 and the construction of roads and buildings.

Major occurrences on alluvium are found in the north on the poorer-drained parts of the riverine plain, including map units PlA2, PlA3, PlA4 and occasionally PlA1. Grey cracking clays also occur to the east of the Black Ranges in PlA6.

On basalt, cracking clays are common in map units PlB, PgB2, PgB3, PgB4, PgB5 and RgB3, and occasionally PdB and RgB1.

Very minor examples of grey cracking clays occur in the closed depressions of unit PgG1.

Gradational soils

Soils that exhibit a gradual increase in texture with depth are common on basaltic and sedimentary parent material. 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, Gn2.22

Well-structured red gradational soils are common on basaltic parent materials. The topsoils have loam to clay loam textures, and the clay content gradually increases with depth. Soil depth is variable, ranging from shallow on volcanoes and scarps, to deep on the cropped basalt country near Daylesford. The souls are well 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, notably for potato-growing in the south.

Red gradational soils on basalt predominate in map units PgB1, PgB2, PdB, RgB2, RgB3, Vb and to a lesser extent in Eb, PgB3, PgB5 and on the scarps of PlB.

Red or reddish brown gradational soils – sedimentary parent materials

Gn2.22, Gn3.74, Gn4.11

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 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 gentler sedimentary terrain throughout the study area. The native vegetation had usually been retained, otherwise native pastures persist.

Yellowish brown to greyish brown gradational soils

Gn3.71, Gn3.74, Gn3.75, Gn3.84, Gn3.85, Gn3.91, Gn4.51

These soils, mainly on sedimentary terrain, occur throughout the study area, but are most common in the south-east. They 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 lay loam to clay subsoils. In the north, particularly in the Whipstick area, the soils are shallow, stony and poorly structures, whereas those in the Wombat State forest to the south are moderately deep and friable, and grade into weathered bedrock at about 60-100 cm.

The greyish brown soils are usually mottled, slightly heavier in texture and occupy gentle slopes and flatter crests with poorer drainage. They are common in the south in the Wombat forest on lower slopes and in depressions.

Yellow gradational soils with buckshot in the brown silty loam topsoils occur in some areas of gently undulating basalt, notably in PgB3 and RgB3.

Yellowish brown gradational soils are common in map units RgS2, RuS, LuS, Lu/rS, KkrS1, LrS2, L/HrS, HrS1, and HrS2. The greyish brown variants occur in unit HrS2.

Dark gradational soils

Gn3.4
Minor drainage depressions on basalt in the south carry these soils, which are dark grey to black and have a medium to heavy dark clays at depth.

These soils occur in map units PgB5 and RgB1 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 of the gentler slopes and plains on sedimentary rocks and alluvium.

Yellow duplex soils

Mottled: Dy3.41, Dy3.42
Non-mottled: Dy2.11, Dy2.21, Dy2.22

Yellow duplex soils occur on all parent materials throughout the catchment, but also 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 loams on sedimentary rocks and silty 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 bleached A_2 horizon overlying the subsoil, indicating seasonal waterlogging of the surface horizons and low subsoil permeability.

The yellow grey duplex soils – characterised by grey to pale grey silty loam A horizons containing abundant buckshot – are common on basalt in map unit RgB3.

The yellow duplex soils are used for grazing native introduced pastures and are common in map units PgG1, PgG2, RgG1, RgG2, RgG3, Rg/uG2, R/LuG, RgS2, Rg/uS2, Lu/rS, and LrS2; they occur to a minor extent in PlA6, Pl/gA, RgT, PgB2, PgB4, Rg/uGl, L/HrG, HrG1, HrG2, HrG3, RgS1, Rg/uS3, LrS1, L/HrG, HrS1 and HrS2.

Red duplex soils

Non-mottled: Dr2.12, Dr2.41, Dr2.42, Dr2.13, Dr2.3, Dr2.23
Mottled: Dr3.41

Red duplex soils with neutral to alkaline subsoils predominate on the extensive alluvial plains in the north of the study area. They are moderately deep, with sandy loam topsoils, pale A_2 horizons and whole coloured subsoils that may contain concretions of carbonate at depth. Cereal cropping is the common land use and gypsum may be necessary to ameliorate the hard-setting nature of the topsoils, exacerbated by excessive cultivation.

Shallower soils with acidic to neutral subsoils are common on gentle granitic or colluvial slopes in the north. Minor occurrences also occur on basaltic plains and rises in the centre of the study area. The loamy A horizons of these soils frequently contain buckshot.

Red duplex soils are common in units PlA1, PlA4, PlA5, Pl/gA, PgB2, RgC, PgG1, RgG1, RgG3, Rg/uG1, Rg/uG3, RgS1, Rg/uSi and Rg/uS3, and occur to a limited extent in PlA2, PlA3, PlA6, RgG3, RuS, Lu/rS and L/HrS

Brown duplex soils

Db2.41, Db2.22

These soils are common in the north near Inglewood on highly weathered granitic or colluvial parent materials. The topsoils are sandy, and a pale or bleached A_2 is usually present. These subsoils frequently overlie a siliceous or ferruginous hardpan.

Brown duplex soils are also common on basalt in the central and southern areas. Topsoils here are moderately deep silty loams, and pale A_2 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 map units PgG2, RgG1, RgB3, PGB3 and PgB4, and occur to a minor extent in PgB2, PdB, Rg/uG1, R/LuG, RgS1, Rg/uS1, RgT and RgC.

Dark duplex soils

Dd3.13

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