An introduction to the soils of the Jerramungup advisory district

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National Soil Conservation Program (Australia)
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AN INTRODUCTION TO THE

SOILS

OF THE

JERRAMUNGUP

ADVISORY DISTRICT

- descriptions, illustrations and notes on eight common soils

COMPILED BY T.C. STONEMAN

WESTERN AUSTRALIAN DEPARTMENT OF AGRICULTURE
Descriptions, illustrations and notes on eight common soils

This publication is one of a series dealing with soils commonly occurring, or of particular significance, in the wheatbelt advisory districts of the Department of Agriculture. The districts regarded as 'wheatbelt' are Geraldton, Three Springs, Moora, Northam, Merredin, Narrogin, Katanning, Lake Grace, Jerramungup, Albany and Esperance (see map below). Most of the publications will be in this format, but those for Merredin and Northam will be rather more comprehensive in coverage of the soils, landscapes and agriculture of their respective districts.

The publications have the objective of encouraging and aiding recognition by advisory staff and farmers of different wheatbelt soils and the development of a greater appreciation of the influence that soil characteristics have on land capability.

Particular points to note with respect to the terminology and descriptions used in this publication follow.

Australian Great Soils Groups - the names used follow the identifications discussed by Stace et al. (1968) in 'A handbook of Australian soils'.

Northcote Soil Classification - as described in Northcote, K.H. (1979) 'A factual key for the recognition of Australian soils'.

Soil profile sketches - these line drawings interpret the profiles presented in the matching colour photographs.

Colour photographs - many of the colour photographs show a darker coloured vertical band of soil on either side of the depth tape. The strip has been moistened and is intended to indicate moist and dry soil colours.

Soil colours - the common names used in soil descriptions are standard names derived from Munsell soil colour codes.

pH - all pH values recorded in the text are from a 1:5 soil water extract. Values in 0.01 M calcium chloride are also given in the soil profile descriptions.

Soil maps - the maps indicating where each soil most commonly occurs are derived from interpretations of Sheet 5 of the Atlas of Australian Soils (Northcote et al. 1967).

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The Jerramungup advisory district

The Jerramungup office of the Department of Agriculture services an advisory district embracing the shire of Jerramungup and the western portion of the Shire of Ravensthorpe (west of the old Rabbit Proof Fence). The district has an area of approximately 1.35 million hectares and has about 650 farms.

Geologically, the advisory district is situated on two major geological zones, separated by the Stirling Fault which runs approximately parallel to the south coast and about 25 kilometres inland. Inland of the Stirling Fault are Archaean granites and gneisses of the Yilgarn Block, while to the south the rocks are of marine sedimentary origin mainly Eocene spongolite. At the eastern end of the advisory district, in the vicinity of Ravensthorpe is an area of basic and ultrabasic metamorphic rocks (greenstones) quite dissimilar to the rest of the district.

Virtually the whole of the advisory district drains south into the Southern Ocean; however, there are appreciable differences in the efficiency of drainage in different parts of the district. Much of the land north of the Stirling Fault is a reasonably well drained gently undulating upland within which are quite extensive depressions with virtually no exterior drainage (e.g. the ‘Mallee Sump’). South of the Stirling Fault is a relatively flat plain with few well defined drainage lines; small depressions and swamps occur frequently. Three major river systems (Bremer, Gairdner and Fitzgerald) transect both geological zones creating broad dissected valleys, particularly where they have cut through the uplands inland of the Stirling Fault.

The soils inland of the Stirling Fault are frequently solodized, for example Soil 1 is a solodized solonetz, Soil 4 is a solodized solonetz with shallow groundwater, and Soil 6 is a solodic soil with gravel and shallow groundwater. On the rises, lateritic gravels occur (Soil 3) and sand dunes and sheets are present (Soil 5). In the vicinity of the Ravensthorpe Ranges, areas of red cracking clays are present (Soil 8). Red and brown duplex soils are developed on the dissected country associated with the major river systems (Soil 2).

On the near coastal plains, a variety of mainly duplex soils are developed on the Eocene spongolites, including solodics (Soil 7).

Agricultural land use in the advisory district is cereal cropping (largely coarse grains) and sheep and cattle production.

References to soils in the Jerramungup advisory district

Further reading
Classification
Australian Great Soil Group: Solodized solonetz (over truncated laterite)  Northcote: Dg 2.33  Local name: Moort

Soil profile description
(See Figure 1, colour photograph inside back cover)

0-10 cm dark grey sandy loam, with very few quartz gravels, pH 6.7 (5.4 CaCl₂)
At 10 cm sporadic bleach
10-25 cm very pale brown with many distinct dark brown mottles sandyclay, columnar structure, pH 8.4 (7.3 CaCl₂)
25-50 cm light grey with very few faint brown mottles, sandy clay, pH 9.1 (7.9 CaCl₂)
50-90 cm light grey light clay with very many calcium carbonate segregations, highly calcareous
90-150 cm light grey with many distinct orange mottles, medium clay, with very few manganiferous segregations, pH 8.1 (7.5 CaCl₂)
150-220+ cm white with many distinct red and yellow mottles, light clay, pH 5.0

Distinguishing features
- The profile is shallow sandy loam over a distinctly domed surface sandy clay subsoil with large quantities of calcium carbonate between 50 and 90 cm depth. Below 150 cm is a pale mottled acidic subsoil of a lateritic profile.
- The soil is slightly acidic in reaction at the surface rising to highly alkaline in the subsoil. Below 150 cm, the pH changes to strongly acidic.
- The soil surface is typically hard setting and quartz gravels are usually common on the soil surface.
- The soil usually occurs on level to gently sloping valley floors and undulating plateaus.
- The native vegetation is usually dominated by moort (Eucalyptus platypus) and mallees.
- Map 1 provides an indication of the area within which this soil usually occurs in the Jerramungup advisory district.
Agricultural use and management

Soil characteristics

Favourable attributes
Water storage - good.

Limitations
Nutrient status - reasonable, apart from phosphorus. High alkalinity in the subsoil adversely affects plant growth.

Soil workability - difficult usually due to incorporation of shallow subsoil material into the soil surface by clearing operations and cultivation. The resultant topsoil is usually very hardsetting and has a narrow range of soil moisture content within which it is workable.

Water entry and drainage - poor.

Agronomic considerations

Crops - given appropriate fertilizer and rotation practices, cereals and peas grow satisfactorily. Lupins are not suitable for this soil. Hardsetting surface soils frequently respond to gypsum applications, resulting in improved soil structure and yield increases.

Pastures - medics are the appropriate pasture legumes, but difficulties frequently arise in maintaining improved pastures due to adverse effects of the hardsetting soil surface on seedling establishment. Applications of gypsum can improve soil structure and lead to improved pasture and crop performance. Burr medics are more persistent than other medics and perform well in year in - year out rotations.

Soil conservation
Waterlogging and shallow inundation can occur on flat areas in wet periods due to poor drainage of water into the subsoil. Sheet water erosion can remove topsoil on sloping sites exposing intractable clay subsoils.

Water conservation
Dams and natural catchments perform well.
**Classification**
Australian Great Soil Group: Solodic (with colluvial surface soil)  
Northcote: Db 4.33  
Local name: None

**Soil profile description**
(See Figure 2, colour photograph inside backcover)

0-10 cm dark brown loamy sand, pH 5.8 (4.9 CaCl₂)  
10-20 cm dark reddish grey loamy sand, pH 6.0  
20-40 cm dark reddish grey coarse clayey sand with many fine granite fragments, pH 7.7 (6.1 CaCl₂)  
40 cm sporadic bleach  
40-60 cm dark brown with many distinct red mottles, sandy clay, pH 8.0 (6.6 CaCl₂)  
60-110 cm weathering micaceous granite  
110-125+ cm dark brown with distinct red mottles, common, medium clay with very few quartz fragments, pH 9.1 (7.7 CaCl₂)

**Distinguishing features**
- The profile is 40 cm of sandy material over sandy clay becoming medium clay by 1 m. The subsoil contains weathering granite between 60 cm and 1 m depth. Colour is mainly dark brown.
- The soil is slightly acidic in reaction at the surface increasing in pH with depth to highly alkaline below 1 m.
- The soil occurs on slopes of dissected river valleys.
- The native vegetation is dominated by flat topped yate (*Eucalyptus occidentalis*).
- Map 2 provides an indication of the area within which this soil most commonly occurs in the Jerramungup advisory district.
Agricultural use and management

**Soil characteristics**

*Favourable attributes*
Water entry - good.
Soil workability - good.
Nutrient status - good, apart from phosphorus.

*Limitations*
Drainage - impeded by abrupt texture change from sand to clay at 40 cm; waterlogging can result.
Water storage - fair, but limited by relatively deep sandy surface.

**Agronomic considerations**
Crops - given appropriate fertilizer and rotation practices, all crops can be grown satisfactorily.

Pastures - subterranean clovers are the appropriate pasture legumes.

**Soil conservation**
Waterlogging can occur on gentle slopes in wet periods, and water erosion is a problem on steep slopes, especially where rock outcrops are common.

**Water conservation**
Natural catchments perform reasonably well under pasture on reasonable slopes (> 2%). The soil is suitable for farm dams, but care is needed to avoid shallow rock.
**Classification**
Australian Great Soil Group: Lateritic podzolic  
Northcote: Dy 5.81  
Local name: Sand over gravel

**Soil profile description**
(See Figure 3, colour photograph inside back cover)

0-10 cm greyish brown loamy sand with few ferruginous nodules, pH 6.2 (4.9 CaCl₂)

10-30 cm pale brown (conspicuously bleached) coarse clayey sand, with very many ferruginous nodules, pH 6.4 (5.5 CaCl₂)

30-170+ cm brownish yellow with many prominent red mottles, sandy clay loam, pH 6.0 (5.4 CaCl₂)

**Distinguishing features**
- The profile is 30 cm of very gravelly sand over yellow and red mottled sandy clay loam to at least 170 cm depth.
- The profile is neutral to slightly acidic in reaction throughout.
- The soil usually occurs on flat to gently undulating ridge crests.
- The native vegetation is mallee (*Eucalyptus* spp.).
- Map 3 provides an indication of the area within which this soil most commonly occurs in the Jerramungup advisory district.
Agricultural use and management

Soil characteristics

Favourable attributes
Water entry and drainage - good.
Soil workability - good.

Limitations
Nutrient status - low.
Water storage - low.

Agronomic considerations
Crops - given appropriate fertilizer and rotation practices, cereal crops can be grown satisfactorily, as can lupins.
Pastures - subterranean clovers are the appropriate pasture legumes.

Soil conservation
There are usually no soil conservation problems with this soil.

Water conservation
Dams excavated in this soil generally hold water satisfactorily.
Natural catchments perform reasonably when in pasture, especially if on a reasonable slope (> 2%).

Map 3
**Classification**
Australian Great Soil Group: Solodized solonetz (over acidic mottled clay)  
Northcote: Dy 5.43  
Local name: Sand over clay

**Soil profile description**
(See Figure 4, colour photograph inside back cover)

- **0-5 cm** dark grey loamy sand, pH 7.1 (5.9 CaCl₂)
- **5-10 cm** pale brown (conspicuously bleached) coarse sand, pH 7.5
- **10-35 cm** brown with distinct light brown mottles common, sandy clay, columnar structure, pH 6.8 (6.4 CaCl₂)
- **35-75 cm** light grey with distinct orange mottles common, sandy clay, pH 8.4 (7.2 CaCl₂)
- **75-150 cm** light grey with prominent red mottles common, medium clay, pH 8.1 (5.2 CaCl₂)
- **150-200+ cm** light grey with prominent yellow, red and orange mottles, medium clay, pH 4.9 (4.1 CaCl₂)

N.B. Groundwater at 220 cm.

**Distinguishing features**
- The profile is a very shallow bleached sand over a distinctly domed mottled sandy clay. Below 75 cm is prominently mottled acidic light grey medium clay. Brackish groundwater is present below 2 m.
- The soil is neutral in reaction at the surface rising to highly alkaline by 35 cm. Below 75 cm the light grey mottled clay is strongly acidic in reaction.
- The soils occurs on flat to very gently undulating landscapes, often with shallow depressions and swamps.
- The native vegetation is mixed mallee (*Eucalyptus* spp.) and moort (*Eucalyptus platypus*).
- Map 4 provides an indication of the area within which this soil most commonly occurs in the Jerramungup advisory district.
Agricultural use and management

Soil characteristics

Favourable attributes
Water entry and storage - good.

Soil workability - good, unless clay subsoil is shallow and within depth of cultivation.

Limitations

Nutrient status - poor, due to surface sand, and high sodicity and dense nature of clay subsoil.

Agronomic considerations

Crops - given appropriate fertilizer and rotation practices, cereals grow satisfactorily on this soil. Lupins do not do well because of restricted root penetration and highly alkaline subsoil.
Pastures - subterranean clovers are the appropriate pasture legumes.

Soil conservation

Wind erosion of the sandy surface soil occurs unless surface is protected with plant cover.

Waterlogging of the surface sands can occur in wet periods because of slow drainage into the subsoil.

Salinity due to shallow groundwater also occurs, particularly in areas with poor external drainage systems.

Water conservation

Dams excavated in this soil hold water satisfactorily, but test boring is required to make sure salty groundwater is not encountered in dam excavations.

Natural catchments are fair to poor, depending on depth of surface sand, and slope of the catchment. Roaded catchments perform well.

Map 4
Classification
Australian Great Soil Group: Siliceous sand  Northcote: Uc 1.21  Local name: Deep sands

Soil profile description
(See Figure 5, colour photograph inside back cover)

0-8 cm grey sand, pH 6.5 (5.2 CaCl₂)
8-35 cm light grey sand, pH 6.8 (5.5 CaCl₂)
35-140+ cm very pale yellow with few faint yellow mottles, sand, pH 6.5 (5.6 CaCl₂)

Distinguishing features
- The profile is a deep sand, grey at the surface and yellow with depth.
- The soil is neutral in reaction throughout.
- The soil occurs as a very gently undulating sand sheet or as small low sand dunes.
- The native vegetation is sandplain heath.
- Map 5 provides an indication of the area within which this soil most commonly occurs in the Jerramungup advisory district.
Agricultural use and management

**Soil characteristics**

**Favourable attributes**
- Water entry and drainage - good.
- Soil workability - good.

**Limitations**
- Nutrient supply - very low and applied nutrients leach rapidly.
- Water storage - low and non-wetting can be a problem.

**Agronomic considerations**
- Crops - the soil is unsuitable for cropping.
- Pastures - normal pasture establishment is not possible. Mixed sowings of veldt grass and cereal rye can be successful, but careful grazing management is essential to retain plant cover. Planting with tagasaste is a useful alternative.

**Soil conservation**

Wind erosion from summer grazing can occur under poor management.

If the deep sands are much lighter in colour than the soil shown here, productivity will be very low and risks of wind erosion high. Consideration may need to be given to retiring such areas from agriculture. Uncleared areas should not be developed.

**Water conservation**

The soil is unsuitable for water catchments or for farm dams.
Classification
Australian Great Soil Group: Solodic (over truncated laterite) | Northcote: Dy 5.43 | Local name: Sand over gravel

Soil profile description
(See Figure 6, colour photograph inside back cover)

0-15 cm very dark greyish brown sand with many ferruginous nodules, pH 6.0 (5.1 CaCl₂)

15-40 cm very pale brown (conspicuously bleached) sand with many ferruginous nodules, pH 6.9 (6.1 CaCl₂)

40-80 cm yellow with distinct grey and orange mottles common, sandy clay with very few ferruginous nodules, pH 7.8 (6.5 CaCl₂)

80-130 cm yellow with distinct grey and orange mottles common, sandy clay pH 8.2 (7.1 CaCl₂)

130-200+ cm light grey with few distinct red and orange mottles, medium clay, pH 5.1 (4.4 CaCl₂)

N.B. Brackish groundwater at 230 cm.

Distinguishing features
- The profile is a pale brown sand containing very large amounts of ironstone gravels over a yellow mottled sandy clay. The profile is underlain at 130 cm by a light grey mottled acidic medium clay. The upper part of the sandy clay has a columnar structure with widely spaced vertical faces, and the domed surface of the columns has very large dimensions - up to 100 cm across.
- The soil is near neutral in reaction at the surface becoming highly alkaline in the sandy clay layer. The underlying medium clay is highly acidic.

- The soil occurs on undulating plateaus with some near flat ridge crests.
- The native vegetation is small to medium height mallees (Eucalyptus spp.).
- Map 6 provides an indication of the area within which this soil most commonly occurs in the Jerramungup advisory district.
Agricultural use and management

Soil characteristics

Favourable attributes
Soil workability - good.
Water entry and storage - good.

Limitations
Nutrient status - poor, due to sandy surface and dense alkaline and sodic subsoil.

Agronomic considerations
Crops - given appropriate fertilizer and rotation practices, cereals and lupins grow well on this soil.
Pastures - subterranean clover is the appropriate pasture legume.

Soil conservation
Waterlogging can be a problem on areas of low relief, particularly where the clay subsoil is shallow.
Wind erosion of the sandy surface soil occurs unless surface cover is protected.

Water conservation
Dams in this soil hold water well, but test boring is required to make sure salty groundwater is not encountered in excavations.
Natural catchments are fair to poor, depending on depth of surface sand and slope of the catchment. Roaded catchments perform well.

Map 6
Classification
Australian Great Soil Group: Solodic Northcote: Dy 3.42 Local name: Sand over clay

Soil profile description
(See Figure 7, colour photograph inside back cover)

0-12 cm very dark greyish brown loamy fine sand, pH 5.9 (4.5 CaCl₂)
12-15 cm light grey (conspicuously bleached) fine sand, pH 6.0
15-45 cm yellowish red with few faint orange and grey mottles, sandy clay (not fine sand), columnar structure, pH 6.5 (4.8 CaCl₂)
45-70 cm light reddish brown with few faint grey and orange mottles, sandy clay, pH 8.0 (6.4 CaCl₂)
70+ cm spongolite including blocks of chert

Distinguishing features
- The horizon is a grey, fine sand over a distinctly domed red-brown mottled subsoil. The soil is underlain at 70 cm by spongolite including blocks of chert.
- The soil is acidic in reaction at the surface increasing to slightly alkaline in the subsoil.
- The soil occurs on flat to gently undulating plains with scattered swamps and depressions.
- The native vegetation is medium height mallee (Eucalyptus spp.).
- Map 7 provides an indication of the area within which this soil most commonly occurs in the Jerramungup advisory district.
Agricultural use and management

Soil characteristics

Favourable attributes
Water entry and storage - good.
Soil workability - good.

Limitations
Nutrient status - fair, limited by surface sand, and dense subsoil clay which may restrict root penetration.

Agronomic considerations
Crops - given appropriate fertilizer and rotation practices, cereals and lupins grow well on this soil.
Pastures - subterranean clover is the appropriate pasture legume.

Soil conservation
Wind erosion of the fine sand surface soil occurs unless plant cover is maintained.
Waterlogging can be a problem on flat areas, especially where the clay subsoil is shallow.

Water conservation
The soil is unsuitable for farm dams because of shallow spongolite and rock.
Natural catchments are fair to poor, depending on depth of surface sand and slope of catchment. Roaded catchments perform well.
Classification
Australian Great Soil Group: Red cracking clay | Northcote: Ug 5.37. | Local name: Red clay

Soil profile description
(See Figure 8, colour photograph inside back cover)

0-10 cm dark reddish brown medium clay, slightly calcareous with many coarse basic rock fragments, self-mulching, pH 8.8 (7.9 CaCl₂)

10-35 cm yellowish red medium clay, highly calcareous with few basic rock fragments, pH 9.4 (8.2 CaCl₂)

35-50 cm reddish yellow medium-heavy clay, highly calcareous with very few rock fragments, pH 9.6 (8.4 CaCl₂)

50-105 cm reddish yellow light clay, calcareous with many rock fragments, pH 9.4 (8.6 CaCl₂)

105-150+ cm weathering rock

Distinguishing features
- The profile is clay textured throughout, with obvious surface cracks present when the soil is dry. The soil is red throughout the profile.
- The soil is calcareous and strongly alkaline in reaction throughout the profile.
- The soil occurs in association with areas of basic and ultrabasic rocks (‘greenstones’) in the general vicinity of the Ravensthorpe Ranges.
- The native vegetation is salmon gum (Eucalyptus salmonophloia) and mallee (Eucalyptus spp.)
- Map 8 provides an indication of the area within which this soil most commonly occurs in the Jerramungup advisory district.
Agricultural use and management

Soil characteristics
Favourable attributes
Nutrient status - good.
Water storage - good.

Limitations
Water entry and drainage - slow due to high clay content.
Soil workability - difficult especially when wet; narrow range of soil water contents within which soil is easily cultivated.

Agronomic considerations
Crops - all cereals yield well given adequate rainfall; however, the high soil clay content means that the soil needs to be at a relatively high water content to maintain a supply of water to growing plants (because of the high soil water content at the wilting point). The soil is not suitable for lupins.

Pastures - medics are the appropriate pasture legumes.

Soil conservation
Water erosion of sloping cultivated land is a common problem.

Water conservation
Excavated dams generally hold water well, but problems sometimes arise if water is stored against a dam wall; prolonged dry weather leads to soil cracking and subsequent sudden filling of the dam can lead to collapse of the dam wall.

Natural catchments are generally poor, the cracking nature of the soil surface requiring appreciable amounts of rain to seal the surface before runoff commences.
FIGURE 1. Solodized solonetz (Moort)

FIGURE 2. Solodic (with colluvial surface soil)

FIGURE 3. Lateritic podzolic (Sand over gravel)

FIGURE 4. Solodized solonetz (Sand over clay)

FIGURE 5. Siliceous sand (Deep sands)

FIGURE 6. Solodic over truncated lateritic (Sand over gravel)

FIGURE 7. Solodic (Sand over clay)

FIGURE 8. Red cracking clay (Red clay)