1990

An introduction to the soils of the Esperance advisory district

T C. Stoneman
Tim D. Overheu
P G. Muller

National Soil Conservation Program (Australia)

Follow this and additional works at: https://researchlibrary.agric.wa.gov.au/bulletins

Part of the Agriculture Commons, Natural Resources Management and Policy Commons, and the Soil Science Commons

Recommended Citation

This bulletin is brought to you for free and open access by the Research Publications at Research Library. It has been accepted for inclusion in Bulletins 4000 - by an authorized administrator of Research Library. For more information, please contact jennifer.heathcote@agric.wa.gov.au, sandra.papenfus@agric.wa.gov.au, paul.orange@dpird.wa.gov.au.
AN INTRODUCTION TO THE
SOILS OF THE
ESPERANCE ADVISORY DISTRICT
-descriptions, illustrations and notes on seven common soils

COMPILED BY T.C. STONEMAN,
T.D. OVERHEU AND P.G. MULLER

WESTERN AUSTRALIAN DEPARTMENT OF AGRICULTURE
Descriptive, Illustrations and Notes on Nine 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). Most of the publications will be in this format, but the Northam Bulletin will be rather more comprehensive in its coverage of the soils, landscapes and agriculture.

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 capabilities.

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

Australian Great Soil 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 values - pH values recorded in the text are from 1:5, 0.01 M calcium chloride (CaCl₂) solutions or 1:5 soil water extracts depending on the availability of data. Sometimes pH values are given for both procedures.

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). However, the maps showing the distribution of some soils are limited in their reliability due to the lack of adequate soils information.

Particular acknowledgement is made for funds provided by the National Soil Conservation Program to assist the Department of Agriculture undertake this project.

*T. C. Stoneman - formerly Principal Officer, Soil Conservation Branch, Department of Agriculture. Present address 112 Rosedale Street Floreat Park 6014

T. D. Overheau, Research Officer, Esperance District Office.

P. G. Muller, formerly Research Officer, Esperance District Office, now with the Queensland Department of Primary Industry.
The Esperance advisory district

The Esperance Office of the Department of Agriculture services an advisory district embracing the shires of Esperance and part of Ravensthorpe. The district has an area of approximately 1.6 million hectares and has about 600 farms.

Geologically, the Esperance district is underlain by Proterozoic igneous rocks. West of the Salmon Gums-Esperance highway, the rocks are dominantly gneisses, while to the east they are mainly granitic. Much of the area of the granite bedrock is overlain by thin discontinuous layers of sedimentary rocks (sandstone, siltstone, lignite and spongolite). The physiography of the district is that of a level to undulating plain, which in the western parts, has been dissected by well-incised drainage lines. The plain slopes to the south from its northern fringe (Dowak 290 m a.s.l.) until it reaches a low escarpment near the coast. The escarpment falls from 10 to 40 m to a narrow coastal plain which is, in places, only 10 m above sea level. Prominent sand dunes border much of the coast and cover large areas of the coastal plain.

From the edge of the escarpment to an inland contour of about 180 m lies the ‘Esperance sandplain’ comprising the southern half of the advisory district. The northern part of the advisory district comprises the ‘mallee’ area, which is quite different in character from the sandplain, carrying taller trees and having heavier soils.

Granitic domes, lakes and the dissected drainage lines are prominent features of the plain. The granitic domes are smooth rounded masses of bedrock which protrude to varying heights above the plain. Mount Le Grand is the highest, reaching an altitude of 345 m. Other granitic domes are scattered irregularly about the plain to the north-east and east of Esperance.

Many rounded depressions are scattered across the sandplain. They are of various sizes and fill with water during winter, but are usually dry during summer. There are few open lakes and most are grown over with vegetation. The water in depressions and lakes is generally saline. In the southern part of the mallee the salt lakes are elongated in a general east-west direction and are incised several metres into the plain. In places they occur in dense clusters. Further inland, the lakes are more scattered and tend to be more circular.

The western part of the sandplain is dissected by five major south-flowing rivers which terminate in inlets or lakes on the coastal plain. The rivers flow only in winter and in summer only pools of brackish water remain. The valleys have moderate to steep sided slopes and are incised up to 60 m below the general level of the sandplain. East of Esperance the sandplain lacks well-defined drainage lines apart from several short coastal streams which extend only 10 to 15 km inland.

There are no well-defined watercourses in the central and eastern mallee and the salt lakes act as drainage sumps.

The soils of the sandplain are mainly duplex soils with gravelly sand surfaces (lateritic podzolic soils, Soils 1 and 2; yellow podzolic soil, Soil 4 and deep sands, podzols, Soil 3) while in the more northern mallee area, soils are chiefly calcareous, alkaline and sodic (solodic, Soil 5; solonized brown soil, Soils 7 and 8; calcareous yellow earth, Soil 9; and solodized solonetz, Soil 6).

Agricultural land use is predominantly sheep grazing and cropping; cattle raising is practised by some farmers on the sandplain. Crops grown include wheat, barley, lupins, oats and small areas of oilseeds, field peas and summer fodder crops.
References to soils of the Esperance advisory district


Further reading


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

0-10 cm grey loamy fine sand, pH 6.0 (CaCl₂)
10-20 cm light grey fine sand, pH 6.4 (CaCl₂)
20-35 cm light grey fine sand with very many 5-10 mm ironstone nodules, pH 6.2 (CaCl₂)
35-60 cm light grey fine sand with very many 10-20 mm ironstone nodules, pH 6.3 (CaCl₂)
60-110 cm yellow sandy clay loam with few ironstone nodules, pH 6.7 (CaCl₂)
110-130 cm yellow light-medium clay with distinct grey mottles, pH 6.9 (CaCl₂)
130+ weathering granite

Distinguishing features
- The soil is very fine sand over a layer of ironstone gravel, beneath which is yellow sandy clay loam on yellow and grey mottled clay. The ironstone gravel occurs at less than 30 cm depth. This soil usually occurs in association with Soil 2.
- The soil is slightly acidic in reaction throughout the profile.
- The soil usually occurs on level to gently undulating plains.
- The native vegetation is dominated by tall sparse mallee shrubs (*Eucalyptus tetragona* (tallerack), *E. incrassata* (ridge-fruit mallee)) with dense low heath.
- Map 1 provides an indication of the area within which this soil most commonly occurs in the Esperance advisory district.
Agricultural use and management

Soil characteristics
Favourable attributes
Water entry - good
Soil workability - good

Limitations
Nutrient status - poor
Soil water availability - low, and surface sand often water repellent
Drainage - on flat areas, waterlogging can occur in late winter

Agronomic considerations
Crops - given appropriate fertilizer and rotation practices, cereals grow well on sloping sites not subject to waterlogging. Barley and oats are grown; wheat and lupins do not do well.

Pastures - subterranean clover is an appropriate pasture legume. Other sown pasture species include balansa clover, annual ryegrass and selected perennial species.

Soil conservation
Wind erosion of the fine sand soil surface is a problem where surface plant cover is removed by overgrazing, cultivation, or ponding. Careful grazing and adoption of minimum cultivation techniques are required.

Waterlogging and salinity occur in low lying and flat situations.

Water conservation
The soil is suitable for farm dams, but is only moderately successful as natural water catchments because of the sandy soil surface and low gradients. Improved catchments such as roaded catchments or spread batter dams are frequently necessary. Where clay is no deeper than 40 cm, roaded catchments can be constructed; on deeper sands, spread batter dams are necessary.
**Classification**
Australian Great Soil Group: Lateritic podzolic  | Northcote: Dy 5.82  | Local name: Fleming sand (Smith 1951).

**Soil profile description**
(see Figure 2, colour photograph inside back cover)

<table>
<thead>
<tr>
<th>Depth (cm)</th>
<th>Description</th>
<th>pH (CaCl₂)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-18</td>
<td>0-18 cm dark grey loamy fine sand</td>
<td>5.5</td>
</tr>
<tr>
<td>18-45</td>
<td>18-45 cm brownish grey fine sand</td>
<td>6.1</td>
</tr>
<tr>
<td>45-60</td>
<td>45-60 cm brown fine sand with very many large</td>
<td>6.1</td>
</tr>
<tr>
<td></td>
<td>ironstone nodules</td>
<td></td>
</tr>
<tr>
<td>60-80</td>
<td>60-80 cm yellow sandy clay loam with very many</td>
<td>6.8</td>
</tr>
<tr>
<td></td>
<td>small ironstone nodules</td>
<td></td>
</tr>
<tr>
<td>80-150+</td>
<td>80-150+ cm yellow with grey mottles medium</td>
<td>7.0</td>
</tr>
<tr>
<td></td>
<td>clay</td>
<td></td>
</tr>
</tbody>
</table>

**Distinguishing features**
- The soil is grey fine sand over a layer of ironstone gravel, beneath which is yellow sandy clay loam on yellow and grey mottled clay. The ironstone gravel layer starts at depths of 30-80 cm. The soil is a deeper version of Soil 1 and occurs in association with it and Soils 3 and 4.
- The soil is slightly acidic in reaction throughout the profile.
- The soil occurs on level to gently undulating plains.
- The native vegetation is dominated by *Lambertia inermis* (chittick) with a few *Nuytsia floribunda* (Christmas tree), and dense low heath.
- Map 2 provides an indication of the area within which this soil most commonly occurs in the Esperance advisory district.
Agricultural use and management

Soil characteristics

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

Limitations
Nutrient status - low
Soil water availability - low, and surface sand frequently water repellant

Agronomic considerations
Crops - given appropriate fertilizer practices, cereal crops grow reasonably well in rotation with lupins or subterranean clover. Lupins grow on sloping well drained areas.
Pastures - Subterranean clover is an appropriate pasture legume. Serradella grows on areas where the depth to gravel is deeper and subterranean clover fails to persist. Other sown pasture species include annual ryegrass and selected perennial grasses.

Soil conservation
Wind erosion of the fine surface sand is a problem where surface plant cover is removed by overgrazing or by excessive cultivation. Careful grazing and adoption of minimum cultivation techniques are required.
Waterlogging and salinity can occur in low lying and flat situations.

Water conservation
The soil is suitable for farm dams, but artificial catchments are usually necessary.

Map 2
### Soil profile description
(see Figure 3, colour photograph inside back cover)

- **0-20 cm** grey fine sand, pH 5.6 (water)
- **20-40 cm** light yellowish grey fine sand, pH 5.7 (water)
- **40-65 cm** reddish yellow fine sand, pH 6.2 (water)
- **65-80 cm** yellow clayey fine sand, pH 6.5 (water)
- **80-120+ cm** pale yellow clayey fine sand,

---

### Distinguishing features
- The profile is a deep fine sand, grey at the surface over very light grey or yellow fine sand below about 40 cm. The soil usually occurs in association with Soils 1, 2 and 4.
- The soil is slightly acidic in reaction throughout.
- The soil usually occurs on subdued dunes and sand sheets on the Esperance sandplain. It also has a more restricted occurrence in the ‘mallee’.
- The native vegetation on the Esperance sandplain deep sands is typically very dense pure stands of *Banksia speciosa* (showy banksia) associated with low heath shrubs. In the ‘mallee’, the deep sands usually have *Banksia media* (southern plains banksia).
- Map 3 provides an indication of the area within which this soil most commonly occurs in the Esperance advisory district.
Agricultural use and management

Soil characteristics

Favourable attributes
Soil workability - good
Water entry and drainage - good, except where non-wetting occurs

Limitations
Soil water availability - very low, and surface sand often water repellant
Nutrient availability - very low and applied nutrients leach rapidly

Agronomic considerations
Crops - the soil is suitable for cereal cropping, but only in lupin-cereal or cereal-serradella rotations. Lupins grow well when protected from wind.
Pastures - normal pasture establishment is not possible. Tagasaste may provide a useful perennial alternative. Lucerne is grown, but frequently encounters establishment problems.

Trees - given careful management, *Pinus radiata*, *Eucalyptus gomphocephala* (tuart), *E. globulus* (Tasmanian blue gum) are appropriate species to be planted for wind breaks and/or agroforestry (where the rainfall exceeds 500 mm/year).

Soil conservation
Because plant growth is usually very poor, grazing and cultivation frequently result in serious wind erosion. These areas of deep sands act as recharge areas for groundwater, thus contributing to salinity problems. Consideration may need to be given to retiring cleared 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: Yellow podzolic soil  
Northcote: Dy 5.82  
Local name: Sandplain. Other names: Gibson sand (Smith 1950).

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

- 0-15 cm Greyish brown loamy fine sand, pH 5.6 (water)
- 15-20 cm Brownish yellow fine sand, pH 5.6 (water)
- 20-60 cm Light yellowish brown fine sand, pH 6.9 (water)
- 60-90 cm Olive yellow light sandy clay loam, pH 6.9 (water)
- 90-140 cm Very pale brown with strong red mottles, fine sandy clay loam, pH 6.7 (water)
- 140+ cm Very pale brown with strong orange mottles, fine sandy clay, pH 6.8 (water)

**Distinguishing features**
- The soil is a very fine sand over a yellow and grey mottled sandy clay. Ironstone gravel is absent. Deeper versions of this soil also commonly occur throughout the area.
- The profile is neutral to slightly acidic in reaction throughout.
- The soil occurs on level to gently undulating plains. Associated soils are Soils 1, 2 and 3 of the Esperance sandplain.
- The native vegetation is dominated by shrubland *Eucalyptus tetragona* (tallerack), *Nuytsia floribunda* (Christmas tree) and low dense heath.
- Map 4 provides an indication of the area within which this soil most commonly occurs in the Esperance advisory district.
Agricultural use and management

Soil characteristics

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

Limitations
Water storage - low
Nutrient status - low

Agronomic considerations
Crops - given appropriate fertilizer and rotation practices, cereal crops can be grown satisfactorily, in rotations with lupins or subterranean clover.

Lupins grow on well drained areas of this soil. On poorly drained areas, cereals (particularly barley) in rotation with subterranean clover based pastures are recommended.

Pastures - Subterranean clovers are the appropriate legumes.

Serradella grows on deeper sand areas of this soil where subterranean clover fails to persist. Other sown pasture species include annual ryegrass, lucerne and selected perennial grasses.

Soil conservation
Wind erosion of the fine sand soil surface is a problem where surface plant cover is removed by overgrazing or excessive cultivation. Careful grazing and adoption of minimum cultivation techniques are required. Wind-breaks and agroforestry also provide protection from wind erosion.

Waterlogging and salinity may occur in low lying and flat positions within the landscape.

Water conservation
The soil is suitable for farm dams, but artificial catchments are usually necessary. Where clay is deeper than 40 cm, roaded catchments can be constructed; on deep sands, spread batter dams are necessary.
Soil profile description
(see Figure 5, colour photograph inside back cover)

0-8 cm greyish brown fine sand, pH 7.0 (water)
8-15 cm greyish light brown fine sand, pH 7.4 (water)
15-25 cm light brown fine sandy clay, faint surface doming of the clay sometimes visible, pH 8.4 (water)

25-120+ cm yellow and greenish brown fine sandy clay with much soft and hard calcium carbonate segregations, pH 8.6 (water)

Distinguishing features
- The soil is a shallow surface fine sand overlying a brown clay containing large quantities of calcium carbonate. The top of the clay horizon frequently shows faint signs of a domed surface.
- The soil is neutral in reaction at the surface, becoming strongly alkaline in the subsoil.
- The soil occurs on level to gently undulating landscapes.
- The native vegetation is very tall open mallee shrubland, *Eucalyptus forrestiana* (fuchsia gum), *E. goniantha* (Jerdacuttup mallee), *E. redunca*, *E. eremophila* (tall sand mallee).
- Map 5 provides an indication of the area within which this soil most commonly occurs in the Esperance advisory district.
Agricultural use and management

**Soil characteristics**

*Favourable attributes*

- Water entry - good
- Soil workability - good
- Nutrient status - good, apart from phosphorus

**Limitations**

- Soil water availability - limited by high soluble salt concentrations in the subsoil

**Agronomic considerations**

- Crops - given appropriate fertilizer and rotation practices, cereal crops grow well, but yields are heavily dependent on evenly distributed rainfall, especially spring rains (related to soil water availability - see above).
- Pastures - medics are the appropriate pasture legumes.

**Soil conservation**

Wind erosion of the fine sand soil surface is a problem if plant cover is removed by overgrazing or by cultivation. Careful grazing management and reduced cultivation techniques are required.

Water erosion occurs on loose bare surfaced sloping land, particularly in autumn in the western parts of the 'mallee'.

**Water conservation**

The soil is suitable for farm dams although saline groundwater frequently limits depth. Care is needed for catchment construction, as deep roads will intersect well structured calcareous clay, which is both permeable and erodible. Flat scraped catchments are frequently preferred to roaded catchments.

---

Map 5

PRODUCED BY G.I.S. GROUP
W.A. DEPARTMENT OF AGRICULTURE
**Classification**
Australian Great Soil Group: Solodized solonetz

**Northcote:** Dg 3.43

**Local name:** Scaddan sand (Burvill 1988).

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

- **0-8 cm dark grey fine loamy sand,** pH 7.5 (6.4 CaCl₂)

- **8-20 cm light brownish grey fine sand,** pH 8.0 (6.7 CaCl₂)

- **20-100 cm light grey fine sandy clay with many segregations and soft patches of calcium carbonate; surface of clay distinctly domed and stained with organic matter,** pH 9.3 (8.1 CaCl₂)

- **100-130+ cm light grey with few faint orange mottles light medium clay, with many segregations and soft patches of calcium carbonate,** pH 9.3 (8.4 CaCl₂)

**Distinguishing features**
- The soil profile is a shallow fine sand over a dense fine sandy clay subsoil which has a distinctly domed surface. The subsoil contains large amounts of soft lime patches and calcareous segregations. The soil is mainly grey throughout.

- The soil is neutral at the surface, becoming highly alkaline in the subsoil.

- The soil occurs on level to gently undulating landscapes. The soil profile is somewhat similar to Soil 5, and Soils, 7, 8 and 9 frequently occur in the same area.

- The native vegetation is tall open mallee shrubland dominated by *Eucalyptus forrestiana* (fuchsia mallee), *E. gonianta* (Jerdacuttup mallee), *E. redunca*, *E. eremophila* (tall sand mallee) and *E. conglobata*.

- Map 6 provides an indication of the area within which this soil most commonly occurs in the Esperance advisory district.
Agricultural use and management

Soil characteristics

Favourable attributes

Water entry - good

Soil workability - good except if clay subsoil is very shallow and is within depth of cultivation

Limitations

Nutrient status - poor, because of sand surface and highly alkaline and sodic subsoil

Soil water availability - limited because of restricted root penetration of dense clay subsoil

Soil workability - if the surface sand is very shallow, cultivation can incorporate some of the subsoil clay and will produce a very hardsetting soil surface.

Agronomic considerations

Crops - given appropriate fertilizer and rotation practices, wheat and barley are the most suitable crops for this soil.

Pastures - medics are the appropriate pasture legumes.

Soil conservation

Wind erosion of the fine sand surface soil occurs unless surface plant cover is protected. The adverse effects of wind erosion are particularly bad if the surface sand is completely removed leaving exposed subsoil.

Water conservation

Dams excavated in this soil hold water satisfactorily. Natural catchments are fair to poor, depending on depth of surface sand, and slope of the catchment. Shallow scraped catchments perform well, but deep roaded catchments intersect soft patches of calcium carbonate, which is both porous and erodible.
### Classification


### Soil profile description

(see Figure 7, colour photograph inside back cover)

- 0-8 cm brown calcareous sandy loam, powdery, pH 8.8 (water) (8.4 CaCl₂)
- 8-30 cm greyish brown sandy loam, pH 9.3 (water) (9.3 CaCl₂)
- 30-50 cm very pale brown clay loam, with calcareous segregations and soft patches common, pH 9.1 (water) (9.3 CaCl₂)
- 50-120+ cm brown sandy clay with few calcareous segregations and soft patches common, pH 9.0 (water) (8.7 CaCl₂)

### Distinguishing features

- The soil has a very noticeably loose and powdery ('fluffy'/‘snuffy’) soil surface, over an alkaline, highly calcareous clay subsoil. The soil is usually mainly grey or white, but brown or red variants occur.
- The soil profile is strongly alkaline throughout, and has high salt contents in the subsoil.
- The soil occurs on level to gently undulating landscapes of the ‘mallee’ country. Associated soils are Soils 5, 6, 8 and 9. It is often found as a complex, particularly with Soil 9.
- The native vegetation is very tall open mallee shrubland mainly *Eucalyptus conglobata*, *E. oleosa* (giant mallee) and *E. transcontinentalis* (redwood).
- Map 7 provides an indication of the area within which this soil most commonly occurs in the Esperance advisory district; however the soil is undoubtedly more widespread than indicated on the map (see comment on page 3 concerning the soil maps).
Agricultural use and management

Soil characteristics

Favourable attributes
Nutrient status - good, apart from phosphorus
Soil workability - good

Limitations
Soil water availability - limited by high concentrations of soluble salts in the profile, and the soil is frequently water repellent

Agronomic considerations
Crops - cereal growth is unreliable being heavily dependent on evenly distributed rainfall, and especially spring rains for reasonable yields (see water availability above). Early planting is important.
Pastures - medics are the appropriate pasture legumes. Salt tolerant shrubs provide valuable grazing on salt affected areas.

Soil conservation
Wind erosion of overgrazed or cultivated land is a problem. Careful grazing management and reduced cultivation techniques are required. Soil salinity is often a problem where the surface soil has been removed by wind erosion, exposing saline subsoils.

Water conservation
The soil is unsuitable for farm dams or for natural or improved water catchments.

Map 7
Soil 8 - Esperance advisory district

**Classification**
Australian Great Soil Group: Solonized brown soil  
Northcote: Gc 1.22  
Local name: Kumarl clay loam (Burvill 1988).

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

<table>
<thead>
<tr>
<th>Depth Range</th>
<th>Description</th>
<th>pH</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-5 cm</td>
<td>brown clay loam, pH 8.7 (water)</td>
<td></td>
</tr>
<tr>
<td>5-15 cm</td>
<td>brown light clay, pH 9.5 (water)</td>
<td></td>
</tr>
<tr>
<td>15-30 cm</td>
<td>brown medium clay, with few patches of soft lime and calcium carbonate segregations, pH 9.5 (water)</td>
<td></td>
</tr>
<tr>
<td>30-100 cm</td>
<td>reddish brown medium clay with pockets of soft lime common and few calcium carbonate segregations, pH 9.4 (water)</td>
<td></td>
</tr>
<tr>
<td>100-120+ cm</td>
<td>reddish brown heavy clay, pH 9.2 (water)</td>
<td></td>
</tr>
</tbody>
</table>

**Distinguishing features**

- The soil is brown throughout, with a shallow clay loam surface horizon on calcareous clay subsoil. The soil surface generally has crabholes (gilgai) and is frequently strewn with small siliceous stones.
- The profile is alkaline throughout and has high concentrations of soluble salts in the subsoil.
- The soil occurs on level to gently undulating plains of the ‘mallee’ country. Associated soils are Soils 5, 6, 7 and 9.
- The native vegetation is tall open mallee shrubland mainly *Eucalyptus calycogona* (square-fruited mallee) and *E. flocktoniae* (merrit) with ti-tree and *Acacia* spp. undergrowth, and with some *E. salmonophloia* (salmon gum).
- Map 8 provides an indication of the area within which this soil most commonly occurs in the Esperance advisory district; however, the soil is undoubtedly more widespread than indicated on the map (see comment on page 3 covering the soil maps).
Agricultural use and management

Soil characteristics

Favourable attributes
Nutrient status - good, apart from phosphorus

Limitations
Soil workability - slippery when wet and hard when dry, except if the surface is self-mulching
Soil water availability - limited by high concentrations of soluble salts in the subsoil

Agronomic considerations
Crops - generally the soil is suitable for cropping, fallowing being practised to conserve water.
Pastures - medics are the appropriate pasture legumes. Salt tolerant shrubs provide valuable alternative grazing, especially where surface soil salinity has developed.

Soil conservation
Wind erosion, sometimes associated with dryland salinity, is the major soil conservation problem on this soil.

Water conservation
The soil is suitable for farm dams and for constructed catchments, but sites have to be chosen carefully because the soil often occurs as small patches among other soils less suitable for water conservation.
**Classification**
Australian Great Soil Group: Calcareous yellow earth  
Northcote: Gn 2.23  
Local name: Dowak clay loam (Burvill 1988).

**Soil profile description**
(see Figure 9, colour photograph inside back cover)

- 0-5 cm dark grey clay loam, pH 7.9 (water)
- 5-15 cm greyish brown fine sandy clay loam, pH 8.5 (water)
- 15-50 cm light brown fine sandy clay with soft patches of calcium carbonate common, pH 8.5 (water)
- 50-100+ cm brown with faint grey mottles sandy clay, slightly calcareous, pH 8.2 (water)

**Distinguishing features**
- The soil has a clay loam surface and increases in texture gradually with depth. It is generally grey to brown. The soil surface often has crabholes (gilgai) and is frequently strewn with small siliceous stones.
- The profile is alkaline throughout and has high concentrations of soluble salt in the subsoil.
- The soil occurs on level to gently undulating plains of the ‘mallee’ country. Associated soils are Soils 5, 6, 7 and 8. Soil 7 (‘Kopi’) often occurs between the crabholes of the Dowak clay loam.
- The native vegetation is tall open mallee shrubland [Eucalyptus goniantha (Jerdacuttup mallee), E. calycogona (square fruited mallee) and E. flocktoniae (merrit)] with ti-tree and Acacia spp. undergrowth.

- Map 9 provides an indication of the area within which this soil most commonly occurs in the Esperance advisory district; however, the soil is undoubtedly more widespread than indicated on the map (see comment on page 3 covering the soil maps).
Agricultural use and management

Soil characteristics

Favourable attributes
Nutrient status - good

Limitations
Soil workability - hard when dry, slippery when wet
Soil water availability - limited by high concentrations of soluble salts in the subsoil

Agronomic considerations
Crops - generally the soil is unreliable for cropping, because of restricted soil water availability, due to high subsoil salt contents, high clay contents, combined with usually low and/or unreliable rainfall. Fallowing is often practised to improve water conservation and lift yields.
Pastures - medics are the appropriate pasture legumes. Salt tolerant shrubs provide valuable alternative grazing, especially where surface soil salinity has developed.

Soil conservation
Dryland salinity can be a soil conservation problem on this soil.

Water conservation
The soil is marginally suitable for farm dams but not for natural water catchments because of the uneven soil surface due to crabholes. Shallow scraped catchments are advisable.

Map 9

PRODUCED BY G.I.S. GROUP
W.A. DEPARTMENT OF AGRICULTURE

GIS