An introduction to the soils of the Albany advisory district

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National Soil Conservation Program (Australia)

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AN INTRODUCTION TO THE SOILS OF THE ALBANY 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 Soil Groups - the names used follow the identification discussed by Stace et al. (1968) in ‘A handbook 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 (CaCl₂) 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).

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

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The Albany advisory district

The Albany office of the Department of Agriculture services an advisory district embracing the Shires of Albany, Denmark and Plantagenet. The district is approximately 1.4 million hectares and has about 1700 farms.

Geologically, the district is composed of two broad groupings; west of the Cranbrook-Albany highway are mainly Precambrian granites and gneisses, while to the east, and south of the Stirling Ranges, the geology is mainly Tertiary siltstones and spongolite with minor areas of limestone near the coast.

Topographically, the district consists of a coastal zone sloping up gently from the coast northwards to the plateau of the Yilgarn Block in the western portion; and in eastern parts, across a gradually rising plateau of Tertiary sediments to the Porongurups and Stirling Ranges in the north. Drainage of the western district is via the Frankland, Kent, Denmark and Hay Rivers, which become progressively more incised as they leave the plateau. Between the rivers, the plateau is poorly drained, with shallow sluggish drainage lines, swamps and lakes. Similarly the landscape east of the Albany Highway has poorly developed drainage, much of it being directed into numerous circular swamps which act as internal sumps. Near the coast and inland of coastal dunes lie a series of low lying flats and swamps, often associated with adjacent inlets and estuaries.

Soils of the plateau are dominated by lateritic podzolics (soil 4), while the Tertiary sedimentary plateau in the east of the advisory district has a variety of soils including deep siliceous sands (soil 1), yellow podzolics (soil 2) and solodized solonetz (soil 3). The western slopes below the plateau have extensive areas of red earth (soil 6) and areas of very poorly drained soils including peaty sands (soil 7) and organic sands with cemented organic and gravel horizons (soil 5). The soils of the coastal swamps are variable; some are acid peats, some are diatomaceous organic clay overlying sand e.g. Owingup Swamp, and some are calcareous peats e.g. Lake Sadie Swamp (soil 8).

Agricultural land use in the district ranges from mixed cropping and sheep enterprises in the low rainfall areas of the district, with stock raising (cattle mainly, but not excluding sheep) being dominant in the high rainfall parts. Horticultural production is significant and includes vegetables and fruit, as well as greatly increased areas under vines in recent years. There are also significant areas of cleared land being planted for timber and wood chip production.

References to soils in the Albany district


(continued inside back cover)
**Soil 1. Albany advisory district**

**Classification**
Australian Great Soil Group: Siliceous sand.  
Northcote: Uc2.21.  
Local name: Deep sand (Kojaneup sand)

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

- 0-10 cm light grey fine sand, pH 6.3 (5.1 CaCl₂)
- 10-20 cm greyish brown loamy fine sand, pH 5.7 (4.2 CaCl₂)
- 20-90 cm light brownish grey fine sand, pH 5.9 (4.9 CaCl₂)
- 90-150 cm yellow fine sand, pH 6.0 (5.0 CaCl₂)
- 150-170+ cm pale yellow fine sand, pH 6.4 (5.5 CaCl₂)

**Distinguishing features**
- The profile is a deep fine sand, generally grey in the top metre, but yellow merging to pale yellow at depth. At this site the original surface is overlain with windblown sand.
- The profile is slightly acidic to neutral in reaction throughout.
- The soil commonly occurs on extensive areas of dunes with low relief, in association with Soils 2 and 3.
- The native vegetation is Albany blackbutt (*Eucalyptus staeri*), *Banksia* spp. and low heath.
- Map 1 provides an indication of the area within which this soil most commonly occurs in the Albany advisory district.

1 The alternative names given in parentheses are those used by Bettenay and Poutsma (1962) for soils 1, 2 and 3; and Hosking and Burvill (1938), Soils 6 and 7.
Agricultural use and management

Soil characteristics

Favourable attributes
Soil workability - good.

Limitations
Water entry - usually severely restricted by strong water repellency.
Nutrient status - very low.
Water storage - very low.

Agronomic considerations
Crops and pasture - the soil is not capable of producing economic returns from annual crops and pastures. Tagasaste is a suitable alternative plant for this soil. In higher rainfall areas, kikuyu grass may be used to stabilize already cleared dunes.

Soil conservation
Wind erosion is a very common problem on this soil where the vegetative cover has been depleted by grazing or cultivation, or been depressed by water repellency. Exclusion of these deep sandy soils from normal agricultural use is necessary to prevent wind erosion. Areas of deep sandy soils can act as water intake areas which may accentuate off-site soil salinity problems. Similarly leaching of fertilizers from these soils may contribute to eutrophication problems of surface waters, both locally and regionally. Virgin areas should not be cleared.

Water conservation
The soil is unsuitable for farm dams or for water catchments.
Classification
Australian Great Soil Group: Yellow podzolic.
Northcote: Dy5.42. Local name: Sand over gravel (Napier sand)

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

0-12 cm dark greyish brown loamy fine sand,
pH 6.0 (4.8 CaCl₂)

12-20 cm light brownish grey fine sand,
pH 6.0 (4.8 CaCl₂)

20-70 cm pale yellow fine sand with very many ironstone nodules, pH 6.3 (5.3 CaCl₂)

70-90 cm brownish yellow with distinct yellow mottles common, medium clay with ironstone nodules common, pH 6.7 (6.0 CaCl₂)

90-140 cm light grey with many yellow and red mottles, medium clay with ironstone nodules common,
pH 7.4 (6.5 CaCl₂)

Distinguishing features
- The profile is a fine sand over a mottled yellow clay, with large quantities of ferruginous gravel in the subsurface and subsoil. The ferruginous material is sometimes cemented to form a continuous pan. Depth to clay can vary between about 40 and 90 cm.
- The soil is slightly acidic in reaction at the surface increasing to alkaline in the subsoil.
- The soil occurs on extensive very gently undulating plains in association with Soils 1 and 3.
- The native vegetation is commonly silver mallee (Eucalyptus tetragona) and Albany blackbutt (E. staeri).
- Map 2 provides an indication of the areas within which this soil most commonly occurs in the Albany advisory district.
Agricultural use and management

Soil characteristics
Favourable attributes
Water entry - the sandy surface encourages rapid water entry, but water repellency usually delays and restricts the movement of water into the soil profile.
Nutrient status - reasonable, apart from phosphorus.

Limitations
Drainage - temporary waterlogging can occur in low lying situations in periods of high rainfall.

Agronomic considerations
Crops - given appropriate fertilizer and rotation practices, cereals grow well on this soil. Lupins can also be grown on areas where waterlogging is not a problem.
Pastures - subterranean clover is the appropriate pasture legume. If depth of sand over gravel is deeper than about 60 cm, serradella should be considered.

Areas of this soil, where the depth of sand over the gravel is greater than about 40 cm, are usually less productive than shallower variants.

Soil conservation
Wind erosion of the fine sandy surface soil occurs unless plant cover is maintained. The non-wetting characteristic of the surface delays crop and pasture establishment and frequently leads to bare patches which are susceptible to wind erosion.
Waterlogging is a problem, particularly in low lying areas and where the clay subsoil is shallow.

Water conservation
Farm dams constructed in this soil hold water satisfactorily. Natural catchments usually do not shed water well due to the sandy soil surface and low gradients. Roaded catchments can be constructed and perform well.
**Classification**
Australian Great Soil Group: Solodized solonetz. Northcote: Dy4.43. Local name: Sand over clay. (Waychinicup sand)

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

0-10 cm dark greyish brown loamy fine sand with very few ironstone nodules, pH 5.9 (4.9 CaCl₂)

10-25 cm very pale brown fine sand with very many ironstone nodules, pH 6.3 (5.0 CaCl₂)

25-60 cm yellowish brown with few faint red mottles, medium clay, domed columnar structure, pH 6.6 (5.4 CaCl₂)

60-110 cm yellowish brown with few faint red mottles, medium clay, with pockets of soft and hard calcium carbonate, pH 8.9 (7.5 CaCl₂)

110-150+ cm yellow with distinct red mottles common, medium clay, with very few calcareous and manganiferous segregations, pH 9.1 (7.6 CaCl₂)

**Distinguishing features**
- The soil is a pale coloured fine sand overlying yellow clay which has a columnar structure and a distinctly domed surface. The subsurface sand contains appreciable quantities of ironstone gravel. The ferruginous material is sometimes cemented to form a continuous pan. Depth of sand over clay can vary between about 25 and 80 cm.
- The soil is slightly acidic in reaction at the surface, but becomes strongly alkaline at depth.
- The soil occurs on extensive very gently undulating plains in association with Soils 1 and 2.
- The native vegetation is dominated by low and medium height mallees (*Eucalyptus* spp.).
- Map 3 provides an indication of the area within which this soil most commonly occurs in the Albany advisory district.
Agricultural use and management

Soil characteristics

Favourable attributes
Water entry - the sandy surface encourages rapid water entry, but water repellency frequently delays and restricts the movement of water into the soil profile.

Soil workability - good.

Nutrient status - reasonable apart from phosphorus.

Limitations
Drainage - waterlogging can occur in low lying situations in periods of high rainfall and particularly where the clay horizon is shallow e.g. less than 45 cm.

Agronomic considerations
Crops - given appropriate fertilizer and rotation practices, cereal crops grow well on these soils.

Pastures - subterranean clover is the appropriate pasture legume.

Soil conservation
Wind erosion of the fine sandy surface soil occurs unless plant cover is maintained. The non-wetting characteristics of the surface sand delays crop and pasture establishment and can lead to bare patches which are susceptible to erosion.

Waterlogging can be a problem in low lying areas, particularly where the clay subsoil is shallow.

Water conservation
Farm dams constructed in this soil hold water satisfactorily. Natural catchments usually do not shed water well due to the sandy soil surface and low gradients. Roaded catchments can be constructed and perform well.
**Classification**

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

0-10 cm very dark greyish brown clayey coarse sand, pH 5.3 (4.3 CaCl₂)

10-35 cm very pale brown coarse sandy clay loam with ironstone nodules common, pH 5.5 (4.6 CaCl₂)

35-80 cm very pale brown with many yellow mottles, silty light medium clay, pH 5.9 (5.0 CaCl₂)

80-220 cm white with many red mottles, silty light clay, pH 5.0 (4.1 CaCl₂)

**Distinguishing features**
- The profile is a shallow horizon of coarse sandy material over a very gravelly sandy clay loam, which in turn overlies, at about 35 cm, a very pale mottled silty clay which continues to below 2 m.
- The soil is usually very acidic in reaction throughout.
- The soil occurs on extensive gently undulating plateaus.
- The native vegetation is jarrah-marri woodland.
- Map 4 provides an indication of the area within which this soil most commonly occurs in the Albany advisory district.
Agricultural use and management

*Soil characteristics*

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

**Limitations**
Nutrient status - low, especially for phosphorus.

*Agronomic considerations*
Crops - generally unsuitable for cropping, apart from occasional oat crops for stock feed.
Pastures - subterranean clover is the appropriate pasture legume, but acidic soil reaction may require amendment with lime to improve productivity.

*Soil conservation*
This soil is generally not affected by land degradation problems.

*Water conservation*
The soil is suitable for farm dams and water catchments.

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**Map 4**

Producers by G.S. Group
W.A. Department of Agriculture GIS

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**Classification**

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

0-10 cm greyish brown clayey sand, pH 5.1 (4.3 CaCl₂)

10-30 cm grey sand, pH 5.0 (4.0 CaCl₂)

30-60 cm very pale brown sand, pH 5.4 (4.5 CaCl₂)

60-85 cm light brownish grey with few pale brown mottles, sand with many ferruginous nodules, moderately cemented, pH 6.2 (5.3 CaCl₂)

85-130+ cm very pale brown clayey coarse sand with very many ferruginous nodules, slightly cemented, pH 7.0.

130 cm water table.

**Distinguishing features**
- The profile consists of about 50 cm of grey sand over a darker cemented gravelly sand horizon which becomes slightly cemented gravelly clayey sand below 85 cm. Groundwater is present at 130 cm.
- The soil is strongly acidic in reaction at the surface, with pH increasing with depth to neutral below 85 cm.
- The soil occurs in depressions at the head of drainage lines in gently undulating plateaus e.g. Soil 4.
- The native vegetation is ti-tree (*Melaleuca* spp.), marri (*Eucalyptus calophylla*) and stunted jarrah (*E. marginata*).
- Map 5 provides an indication of the areas within which this soil most commonly occurs in the Albany advisory district.
Agricultural use and management

Soil characteristics

Favourable attributes
Water entry and drainage - good when the watertable is well below the surface, but for much of the year, impeded by a shallow watertable.

Soil workability - good when the watertable is well below the surface, but not trafficable when the watertable is near the soil surface.

Limitations
Drainage - impeded for much of the year by a shallow watertable.
Nutrient status - very low.

Agronomic considerations
Crops - the soil is unsuitable for crops because of extended seasonal waterlogging, very low nutrient levels and very acidic soil surface.

Pastures - subterranean clover, balansa clover, Lotus spp. and kikuyu can be grown, but liming and slow release fertilizer applications are necessary to achieve reasonable productivity.

Soil conservation
Drainage is often necessary to reduce waterlogging. These soils can act as water intake areas which may accentuate off-site salinity problems. Similarly leaching of nutrients from these soils may contribute to eutrophication problems of surface waters, both locally and regionally.

Water conservation
The soil is not suitable for normal farm dams or catchments, but dragline holes excavated into the groundwater readily provide stock water.

Map 5
**Classification**

Australian Great Soil Group: Gravelly red earth.  Northcote: Gn3.75.  Local name: Karri loam. (Scotsdale gravelly loam)

**Soil profile description**

(See Figure 6, colour photograph inside back cover)

<table>
<thead>
<tr>
<th>Depth (cm)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-10</td>
<td>Dark reddish grey sandy loam with few fine ironstone nodules, pH 6.2 (5.4 CaCl₂)</td>
</tr>
<tr>
<td>10-25</td>
<td>Yellowish red sandy clay loam with ironstone nodules common, pH 6.7 (5.6 CaCl₂)</td>
</tr>
<tr>
<td>25-50</td>
<td>Yellowish red slightly micaceous clay loam, pH 6.7 (5.7 CaCl₂)</td>
</tr>
<tr>
<td>50-75</td>
<td>Yellowish red with few faint yellow mottles, micaceous light clay, pH 6.7 (6.1 CaCl₂)</td>
</tr>
<tr>
<td>75-160+</td>
<td>Yellow with distinct red mottles common, micaceous light clay, pH 6.7 (6.3 CaCl₂)</td>
</tr>
</tbody>
</table>

**Distinguishing features**

- The profile is sandy loam at the surface, and increases gradually in texture with depth to light clay by 50 cm. The surface 25 cm contains appreciable quantities of ironstone gravel. Soil colours are mainly yellowish red, with some red mottling below 75 cm.
- The soil is slightly acidic to neutral in reaction throughout the profile.
- The soil occurs commonly on hillslopes and ridges.
- The native vegetation is typically karri (*Eucalyptus diversicolor*) forest.
- Map 6 provides an indication of the area within which this soil most commonly occurs in the Albany advisory district.
Agricultural use and management

Soil characteristics

Favourable attributes
Water entry and drainage - good.
Soil workability - good.
Nutrient status - good, apart from phosphorus.
Water storage - good.

Agronomic considerations
Crops - the soil is little used for cropping, but oats for feed are occasionally grown.
Pastures - subterranean clover with perennial grasses are the appropriate pasture species.

Soil conservation
No significant soil conservation problems occur, but if cultivated, water erosion is a hazard due to steep slopes.

Water conservation
The soil is suitable for farm dams and catchments.
Classification


Soil profile description

(See Figure 7, colour photograph inside back cover)

0-15 cm black loamy sand with much organic matter, pH 4.9 (4.2 CaCl₂)

15-35 cm dark grey loamy sand with organic matter, pH 4.8 (3.4 CaCl₂)

35-110 cm greyish brown sand, pH 5.0 (3.7 CaCl₂)

110-150 cm pinkish grey coarse sand, with many quartz gravels, pH 5.5 (4.4 CaCl₂)

150+ cm coarse sand, quartz grit and stones 10-20 mm.

N.B. watertable at 130 cm, 18 hours after pit dug.

Distinguishing features

- The profile is a deep sand overlying a layer of quartz sand, grit and small stones at 150 cm. The surface 35 cm contains much organic matter. The soil commonly has dark brown organic staining below one metre, and often has a black somewhat cemented organic layer below about two metres.
- The soil is usually strongly acidic in reaction throughout the profile.
- The soil usually occurs on very gently undulating to almost flat floors of broad open valleys and in depressions on elevated flat areas.
- The native vegetation is almost treeless heathland.
- Map 7 provides an indication of the area within which this soil most commonly occurs in the Albany advisory district.
Agricultural use and management

Soil characteristics

Limitations
Nutrient status - very low, especially for phosphorus and potassium.

Drainage - restricted for much of the year by shallow watertable.

Soil workability - restricted for much of the year by shallow watertable.

Agronomic considerations
Crops - the soil is not suitable for cropping.
Pastures - slow release fertilizer applications and frequent heavy lime dressings are necessary to achieve production. Serradella and Lotus spp. are the dominant pastures.

Soil conservation
There are no significant on-site soil conservation problems associated with agricultural use of this soil. However, elevated areas of this soil can act as water intake areas which may accentuate off-site salinity problems. Similarly leaching of fertilizers from these soils may contribute to eutrophication problems of surface waters, both locally and regionally.

Water conservation
Dragline holes excavated in this soil readily yield potable stock water.
Soil 8. Albany advisory district

<table>
<thead>
<tr>
<th>Classification</th>
<th>Northcote: 0</th>
<th>Local name: Swamp soil.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australian Great Soil Group: Alkaline peat (?)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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

0-35 cm dark grey with faint orange mottles common, silty loam, highly calcareous, pH 7.6 (7.2 CaCl₂)

35-55 cm shell fragments, calcareous

55-65 cm light brownish grey gel, highly calcareous, with many small shells, pH 8.1 (7.7 CaCl₂)

65-150 cm black peaty sand, pH 6.8 (6.6 CaCl₂)

150+ cm white sand.

N.B. watertable rest level at about 80 cm.

Distinguishing features
- The soil profile is a horizon of silty loam over a layer of shells and shell fragments between 35 and 55 cm. Beneath this is a thin band of organic gel underlain by a thick horizon of peaty sand. Below 1.5 metres is white sand.
- The profile is highly calcareous to a depth of 65 cm, then neutral in reaction.
- The soil occurs in low lying swampy situations, often adjacent to lakes, for example Lake Sadie, just inland of the coastal dunes.
- The native vegetation is ti tree (Melaleuca spp.) and sword grass.
- Map 8 provides an indication of the area within which this soil occurs in the Albany advisory district.
Agricultural use and management

Soil characteristics

Favourable attributes
Water availability - good, due to high water storage capacity of topsoil and shallow depth to groundwater; usually controlled by artificial drainage when used for intensive agriculture.

Limitations
Continual evaporation of shallow groundwater from the soil surface, combined with heavy fertilizer applications can lead to salinity problems.

Agronomic considerations
These swamp soils are usually only developed for intensive horticultural use, particularly potato growing. Specific fertilizer requirements depend on the crops, irrigation and drainage practices, and the acidity or alkalinity of the particular swamp soil.

Soil conservation
There are no land degradation problems associated with the agricultural use of this soil.

Water conservation
Good quality groundwater is usually readily available at shallow depths. In some areas, salinity problems have arisen due to seawater flooding low lying areas in winter storms at periods of high tide.
FIGURE 1. Siliceous sand (Deep sand)

FIGURE 2. Yellow podzolic sand (Sand over gravel)

FIGURE 3. Solodized solonetz (Sand over clay)

FIGURE 4. Soloth (Sandy gravel)

FIGURE 5. Podzol (Waterlogged sand)

FIGURE 6. Gravelly red earth (Karri loam)

FIGURE 7. Humus podzol (Peaty sand)

FIGURE 8. Alkaline peat (Swamp soil)

Further reading


