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An introduction to the soils of the Katanning advisory district

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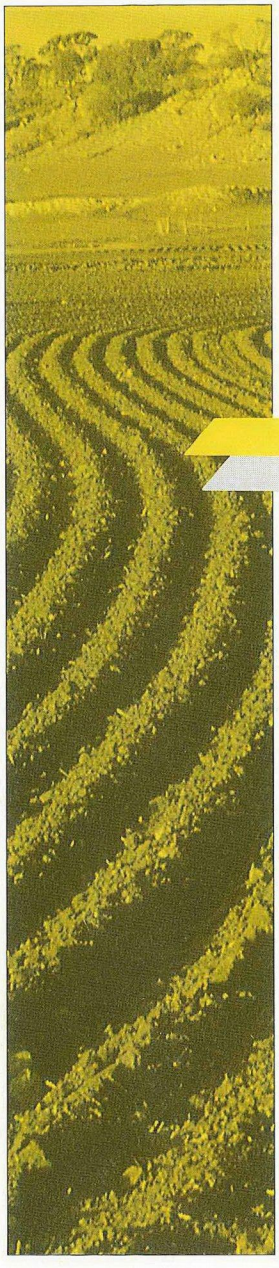


AN INTRODUCTION TO THE SOILS OF THE KATANNING ADVISORY DISTRICT

-descriptions, illustrations and notes on eight common soils

COMPILED BY T.C. STONEMAN

National Soil Conservation Program

WESTERN AUSTRALIAN DEPARTMENT OF AGRICULTURE

Foreword

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 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.

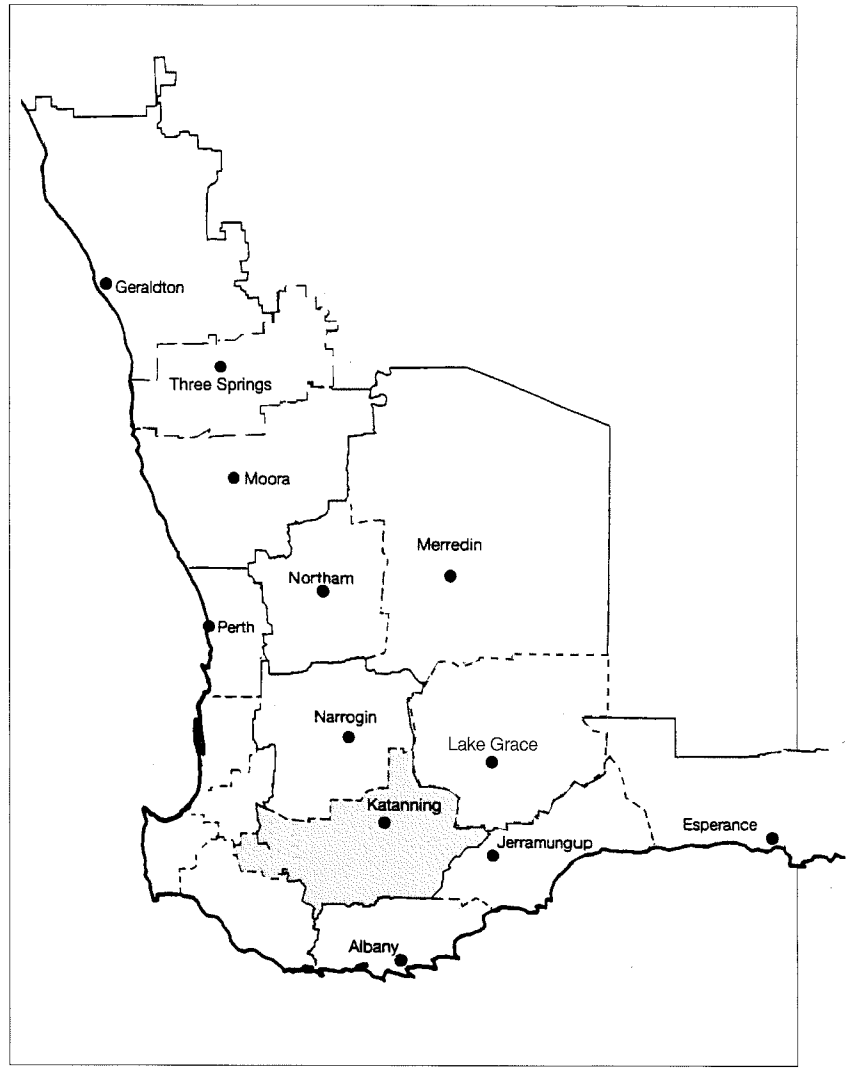
Colour photographs - many of the colour photographs show a darker coloured vertical band of soil on either side of the depth tape. The strip has been moistened and is intended to indicate moist and dry soil colours.

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

pH values - all pH values recorded in the text are from 1:5 soil water extracts. Values in 0.01 M calcium chloride ($CaCl_2$) 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 for funds provided by the National Soil Conservation Program to assist the Department of Agriculture undertake this project.



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The Katanning office of the Department of Agriculture services an advisory district embracing the shires of Broomehill, Katanning, Kojonup, Tambellup, Woodanilling, Cranbrook, Boyup Brook, and parts of Dumbleyung, Gnowangerup and Kent shires. The district has an area of approximately 1.82 million hectares and has about 1,350 farms.

Geologically the district is located on the Yilgarn Block and is composed of Archaean granites and gneisses, except along the southern boundary of the district where the Stirling Ranges are composed of Proterozoic metasediments of quartzite and sandstone. North and east of the Meckering Line†, which in the Katanning advisory district runs approximately between Wagin, Katanning, Broomhill and Gnowangerup, is a mature landscape with little relief between the valleys and hilltops. External drainage consists of a system of very low gradient salt lake channels which only flow in periods of above average rainfall. West and south of the Meckering Line the natural drainage system has been rejuvenated by uplift of the Old Plateau in past geological time. The upper reaches of the Blackwood, Warren and Frankland Rivers drain the west and south-west of the advisory district, while the Pallinup River drains to the south-east. North of the western portion of the Stirling Ranges is a predominantly flat area with scattered dune ridges and salt lakes; surface drainage is ill-defined and ineffective.

Inland of the Meckering Line, the soils are mainly hard setting or sandy alkaline soils with yellow or red mottled subsoils (e.g. Soils 1, 7 and 8). The dissected country associated with the Pallinup River is mainly hard neutral and alkaline red soils (Soil 2), while the dissected country draining to the west and south-west is chiefly hard or sandy neutral and acidic yellow mottled soils often containing moderate to large amounts of ironstone gravels (Soils 5 and 6). The flat and low lying area north of the Stirling Ranges has mainly sandy alkaline yellow mottled soils, but a variety of other soils are present, associated with swamps, salt lakes and remnants of ironstone gravel plateaus (Soils 3 and 4).

Agricultural land use is mainly cereal cropping (wheat most important in eastern areas, barley and oats in southern and western parts) and sheep raising, with cattle husbandry of lesser importance.

† The Meckering Line separates the zone of rejuvenated drainage from the poorly drained inland areas.

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Classification Australian Great Soil Group: Solonized brown soil	Northcote: Dg 2.53	Local name: Moort

Soil profile description

(See Figure 1, colour photograph inside back cover)

0-5 cm very dark grey sandy clay loam, pH 6.7 (6.0 $CaCl_2$)

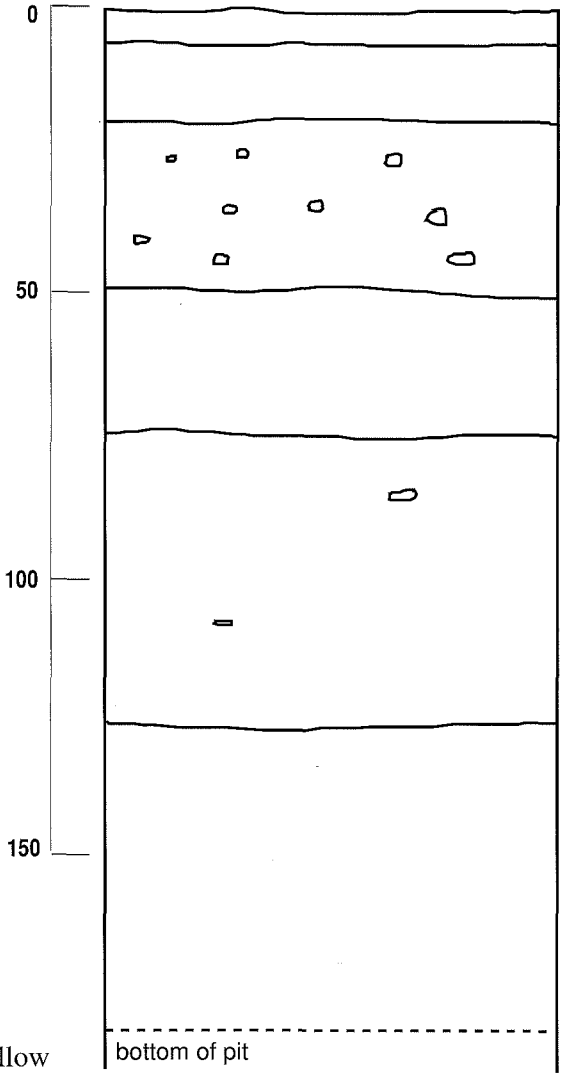
5-20 cm very pale brown with few faint brown mottles, sandy clay, pH 8.8 (7.6 $CaCl_2$)

20-50 cm very pale brown sandy clay with calcareous segregations common, pH 9.0

50-75 cm very pale brown with distinct orange mottles common, sandy clay, pH 8.7 (8.0 $CaCl_2$)

75-125 cm light grey with distinct red and yellow mottles common, medium clay with few calcareous segregations, pH 8.2 (7.7 $CaCl_2$)

125-180 cm light grey with distinct red mottles common, medium clay, pH 7.5



Distinguishing features

- The profile is a pale coloured clay soil with a shallow surface horizon of sandy clay loam. The clay is mottled and contains calcium carbonate segregations.
- The soil is strongly alkaline apart from the surface horizon which is neutral in reaction.
- The surface soil is typically very hard setting and often has quartz gravels on the surface.
- The soil usually occurs on level to gently sloping valley floors and lower slopes.
- The native vegetation is moort (*Eucalyptus platypus*) and small mallees (*Eucalyptus* spp.).
- Map 1 provides an indication of the area within which this soil most frequently occurs in the Katanning advisory district.

Agricultural use and management

Agricultural use and management

Soil characteristics

Favourable attributes

Soil water storage - good.

Limitations

Nutrient status - high alkalinity and sodicity in the subsoil.

Soil workability - usually difficult owing 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.

Agronomic considerations

Crops - given appropriate fertilizer and rotation practices, wheat is the best crop for this soil. Other cereals can be grown but are not as profitable. Lupins can not be grown satisfactorily on this soil.

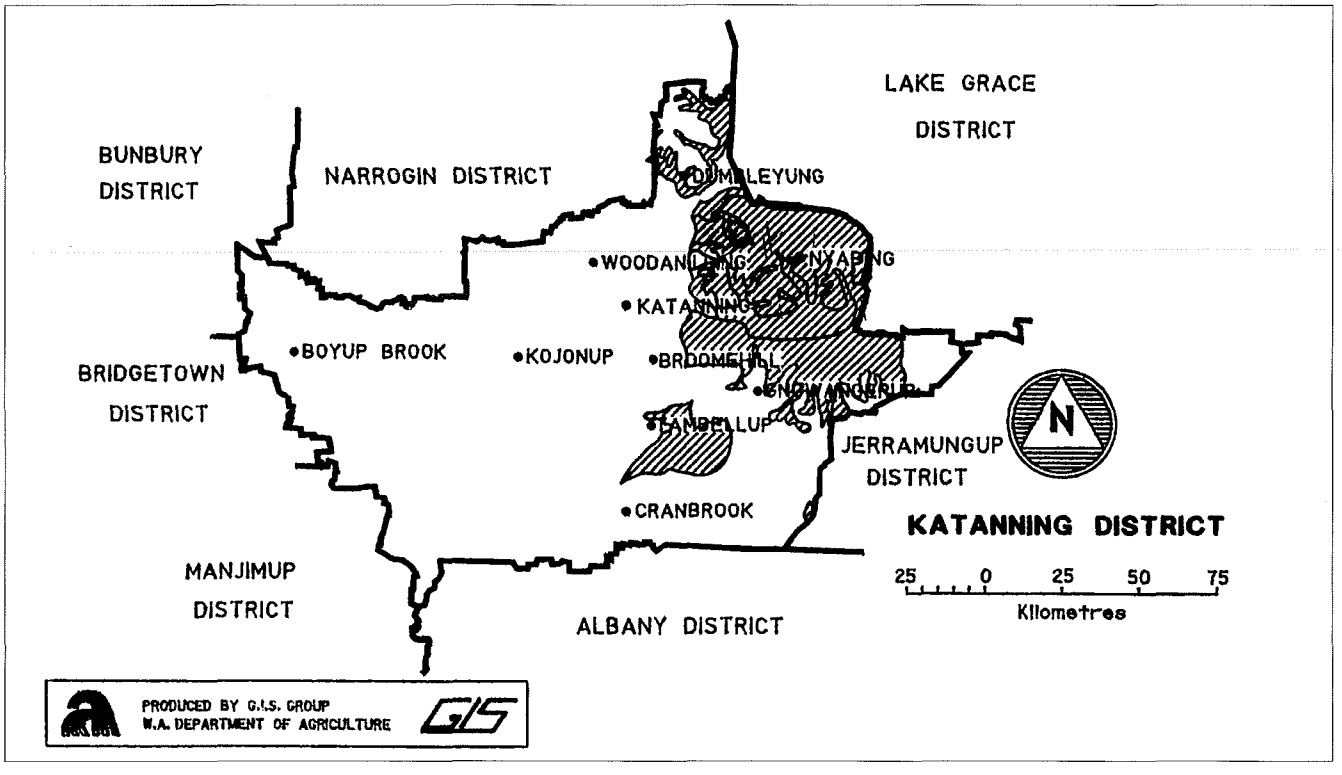
Pastures - medics are the appropriate pasture legumes, but difficulties frequently arise in maintaining improved pastures, due to adverse effects of the hardsetting soil surface on seedling establishment. Application of gypsum can improve soil structure and lead to improved crop and pasture performance.

Soil conservation

Waterlogging and shallow inundation can occur on flat areas in wet periods due to slow drainage of water into the subsoil.

Water conservation

Dams and natural catchments perform well.



Map 1.

Classification		
Australian Great Soil Group: No suitable group (Colluvial soil)	Northcote: Gn 1.13	Local name: None

Soil profile description

(See Figure 2, colour photograph inside back cover)

0-20 cm dark reddish brown loamy sand, pH 6.7 (5.9 $CaCl_2$)

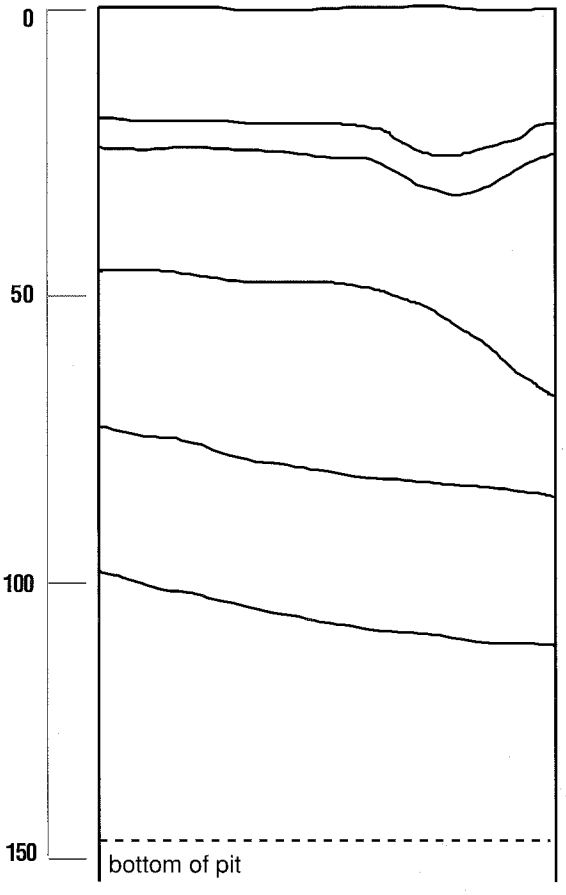
20-25 cm yellowish red sandy loam with very many angular granite fragments (6-20 mm) pH 7.4 (6.5 $CaCl_2$)

25-45 cm yellowish red sandy clay loam pH 7.7 (6.5 $CaCl_2$)

45-75 cm weathered micaceous granite

75-100 cm very pale brown medium clay, pH 8.0 (7.1 $CaCl_2$)

100 cm+ weathered granite



Distinguishing features

- The soil increases in texture gradually with depth, rising from loamy sand at the surface to medium clay by 75 cm depth. Weathering rock occurs at one metre depth and a band of weathered granite is present at about half a metre depth. The soil is red and brown throughout and is influenced by basic rocks present upslope.
- The soil is slightly acidic at the surface, becoming alkaline at depth.
- The soil occurs on valley slopes of dissected country associated with the Pallinup River.
- The native vegetation is a York gum woodland (*Eucalyptus loxophleba*).
- Map 2 provides an indication of the area within which this soil most commonly occurs in the Katanning advisory district.

Agricultural use and management

Soil characteristics

Favourable attributes

Water entry and storage - good.

Soil workability - good.

Nutrient status - good, apart from phosphorus.

Limitations

Rock outcrops sometimes interfere with cultivation.

Agronomic conservations

Crops - given appropriate fertilizer and rotation practices, cereal crops grow well.

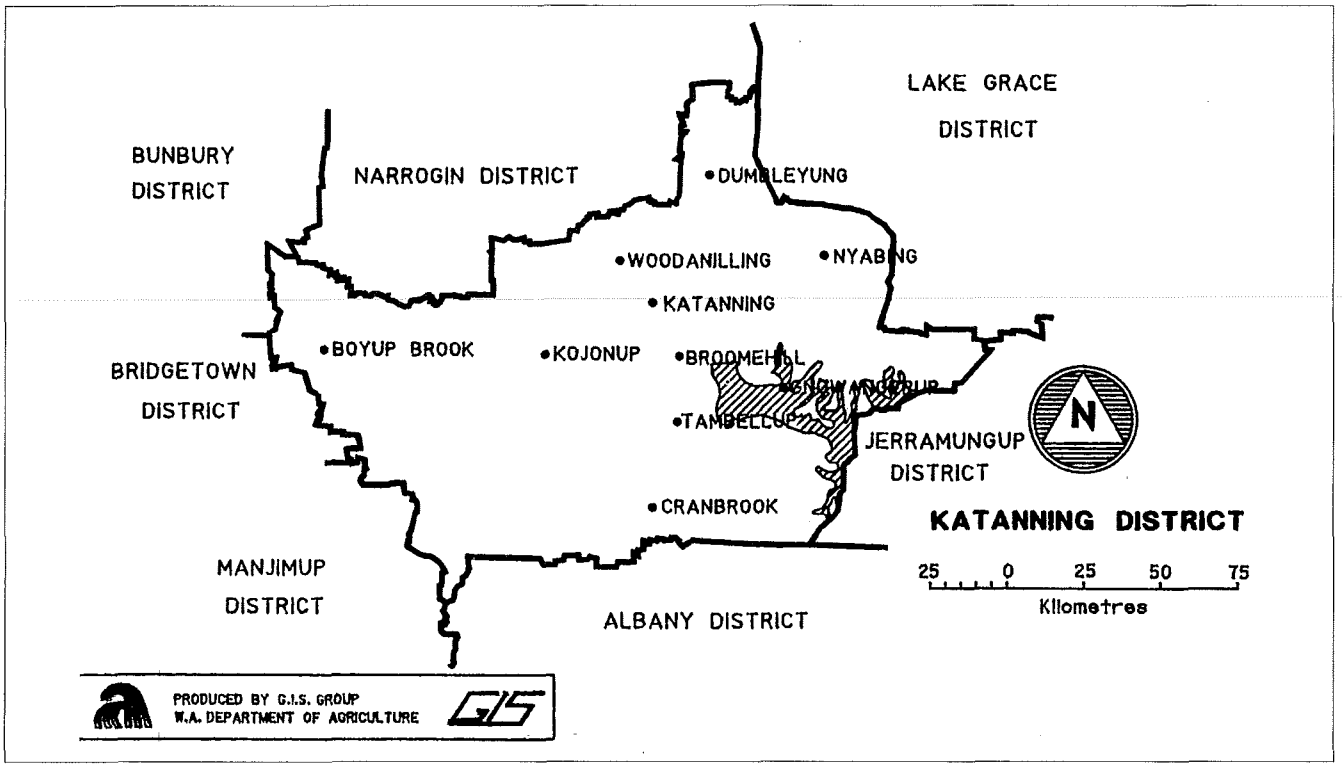
Pastures - subterranean clovers are the appropriate pasture legumes.

Soil conservation

Water erosion of sloping lands is a common problem. Contour earthworks are frequently necessary.

Water conservation

The soil provides good water catchments, but dam sites require careful selection to avoid shallow rocks.



Map 2.

Classification		
Australian Great Soil Groups: Solonized brown soil	Northcote: Gc 2.12	Local name: None

Soil profile description

(See Figure 3, colour photograph inside back cover)

0-12 cm dark brown silty clay loam, pH 8.1 (7.2 $CaCl_2$)

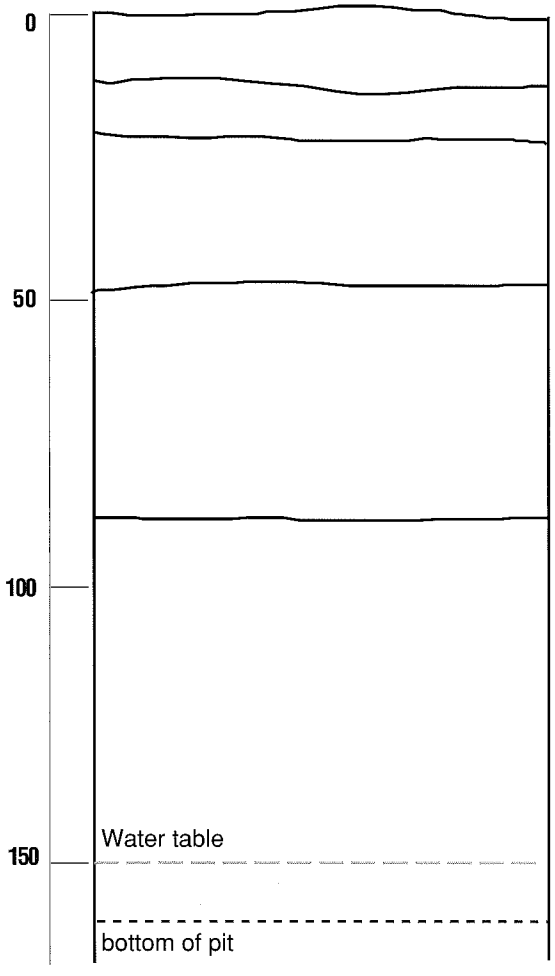
12-20 cm dark brown with few faint brown mottles, light medium clay, pH 8.2 (6.9 $CaCl_2$)

20-50 cm brown with faint light grey mottles common, light medium clay, calcareous pH 9.7 (8.5 $CaCl_2$)

50-90 cm very pale brown with very few faint brown mottles, light medium clay, calcareous, pH 9.4 (8.4 $CaCl_2$)

90-150 cm very pale brown medium clay, slightly calcareous, pH 9.0 (8.2 $CaCl_2$)

150 cm+ saline groundwater



Distinguishing features

- The profile increases in texture from silty clay loam at the surface to medium clay by 90 cm depth. Colour ranges from dark brown at the surface through brown to very pale brown below 50 cm. The soil is calcareous below 20 cm.
- The soil is alkaline throughout.
- The native vegetation is dominated by flat-topped yate (*Eucalyptus occidentalis*).
- The soil commonly occurs on level to gently sloping land in the vicinity of lakes and swamps.
- Map 3 provides an indication of the area within which this soil most commonly occurs in the Katanning advisory district.

Agricultural use and management

Soil characteristics

Favourable attributes

Soil workability - good.

Nutrient status - reasonably good, particularly for potassium.

Limitations

Soil water availability - usually limited by the osmotic effects of high concentrations of soluble salts in the soil solution.

Agronomic considerations

Crops - soil salinity and alkalinity limit productivity of cereals; cereal rye is the most tolerant, with barley and oats more tolerant than wheat. Lupins can not be grown satisfactorily on this soil.

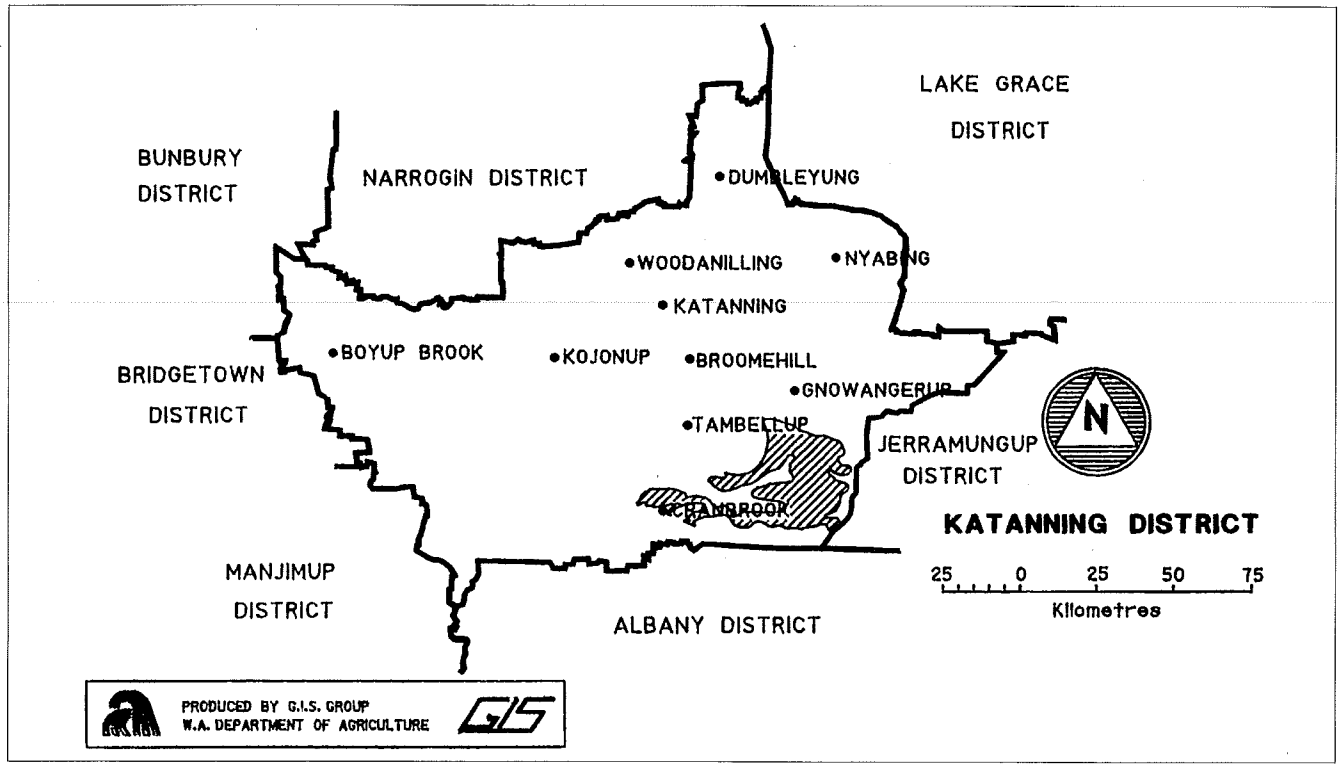
Pastures - because of the alkaline soil conditions, medics are the appropriate pasture legumes. In areas where salinity is a problem, puccinellia or salt tolerant saltbushes can provide valuable fodder.

Soil conservation

Salinity is the most common soil conservation problem on this soil.

Water conservation

Natural water catchments are satisfactory as are farm dams, unless shallow saline groundwater is present.



Map 3.

Classification		
Australian Great Soil Group: Gleyed podzolic soil	Northcote: Dg 4.13	Local name: Sand over gravel

Soil profile description

(See Figure 4, colour photograph inside back cover)

0-10 cm very dark greyish brown loamy sand, pH 5.8 (4.7 $CaCl_2$)

10-40 cm very pale brown sand, pH 6.3 (6.2 $CaCl_2$)

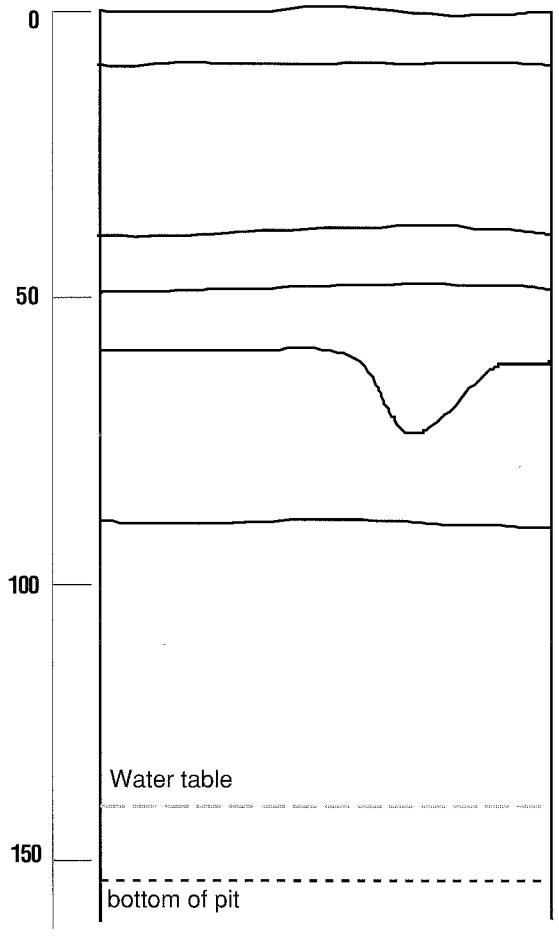
40-50 cm light grey, clayey sand with very many ferruginous nodules, pH 6.0

50-60 cm light grey sandy clay loam with few soft and hard ferruginous nodules, pH 7.0

60-90 cm light grey with many distinct yellow mottles, sandy clay, pH 8.4 (7.0 $CaCl_2$). Very hard horizon.

90-140 cm light grey with pale yellow mottles common, sandy clay pH 8.4 (7.5 $CaCl_2$)

140 cm+ Groundwater



Distinguishing features

- The profile is half a metre of pale brown sandy soil containing much ferruginous gravel over light grey with yellow mottles, sandy clay. Saline groundwater is present at 140 cm.
- The soil is acidic in reaction at the surface becoming alkaline by 60 cm depth.
- The soil occurs on extensive valley flats and very gentle slopes.
- The native vegetation is ti-tree (*Melaleuca* sp.) heath and scattered mallee (*Eucalyptus* spp.) with redheart/ moitch (*Eucalyptus decipiens*) on slight sandy rises.
- Map 4 provides an indication of the area within which this soil most commonly occurs in the Katanning advisory district.

Agriculture use and management

Soil characteristics

Favourable attributes

Water entry - good.

Soil workability - good.

Limitations

Nutrient status - low and applied nutrients leach quickly.

Soil water availability - very low.

Agronomic considerations

Crops - given appropriate fertilizer and rotation practices, cereals grow well, as do lupins, especially on the deeper sands.

Pastures - subterranean clovers are the normal pasture legumes, but balansa clover shows considerable promise. Perennial pastures, especially phalaris (Sirolan) and tall wheat grass (*Agropyron longatum*) are also suitable.

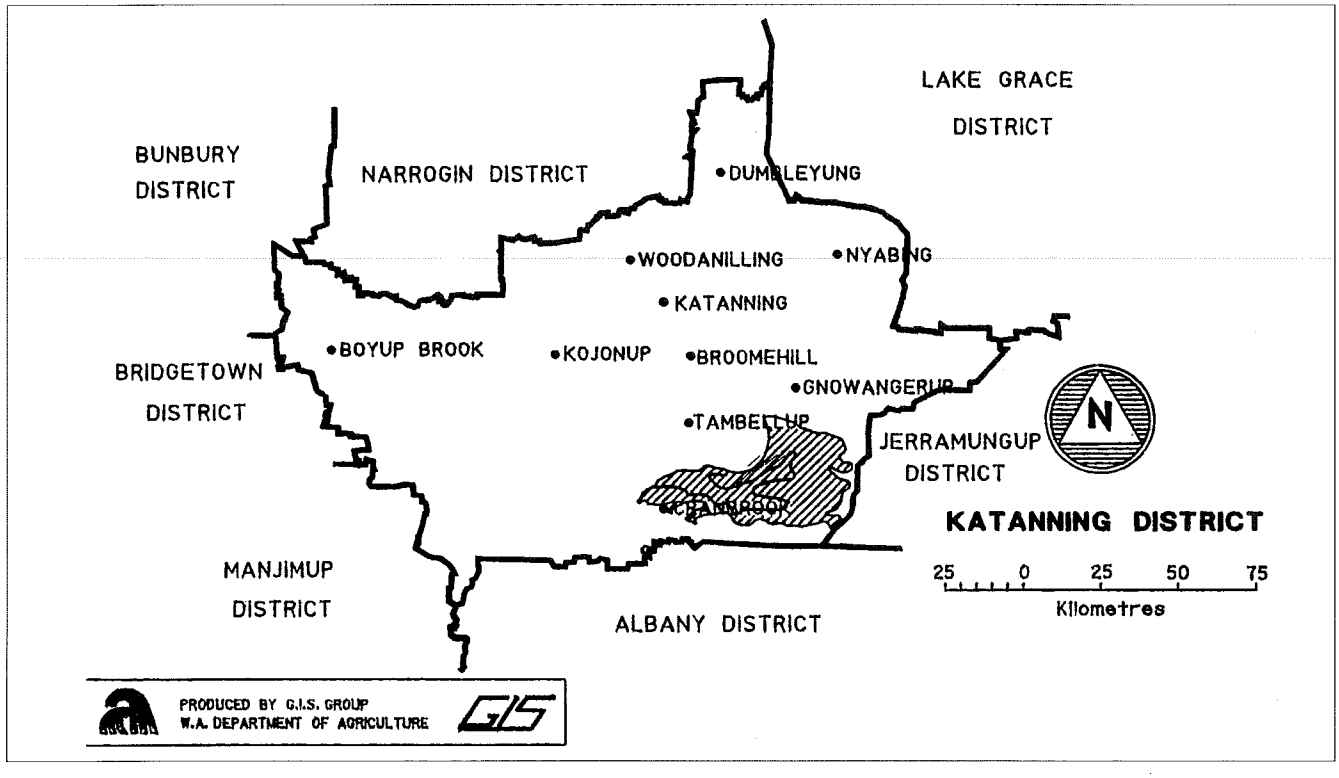
Soil conservation

Wind erosion can be a problem due to poor crop and pasture growth and the loose nature of the surface sand, particularly after cultivation or treading by stock.

Salinity is also a problem where shallow saline groundwaters are present.

Water conservation

Natural surfaces are poor water catchments, but roaded catchments can be constructed where subsoil clays occur within 60 cm of the surface. Where subsoil clays occur below 60 cm, flat batter dams can be constructed. Farm dams are satisfactory provided shallow saline groundwaters are not present.



Map 4.

Classification Australian Great Soil Group: Yellow podzolic	Northcote: Dy 5.42	Local name: None

Soil profile description

(See Figure 5, colour photograph inside back cover)

0-12 cm dark brown loamy sand with very few ferruginous nodules, pH 5.9 (4.7 $CaCl_2$)

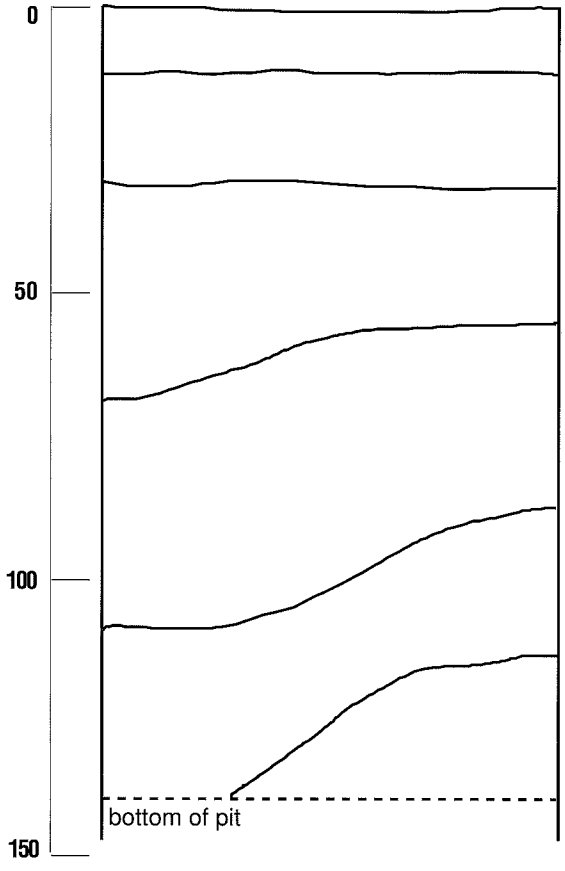
12-30 cm dark yellowish brown with very few ferruginous nodules, pH 5.4 (4.0 $CaCl_2$)

30-55 cm greyish brown loamy sand with few ferruginous nodules, pH 7.0 (6.6 $CaCl_2$)

55-90 cm light olive-brown with many distinct red mottles, medium clay, pH 7.4 (6.0 $CaCl_2$)

90-115 cm light olive-brown medium clay, pH 8.0 (6.9 $CaCl_2$)

115 cm+ weathering basic rock



Distinguishing features

- The soil is a bleached sand over a mottled olive-brown medium clay, with weathering basic rock at a little over one metre depth.
- The soil is acidic in reaction at the surface, becoming neutral at depth.
- The soil occurs on valley sides in dissected country.
- The native vegetation is dominated by marri (*Eucalyptus calophylla*) and jam (*Acacia* sp.).
- Map 5 provides an indication of the area within which this soil most commonly occurs in the Katanning 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.

Agronomic considerations

Crops - given appropriate fertilizer and rotation practices, cereals and lupins grow well.

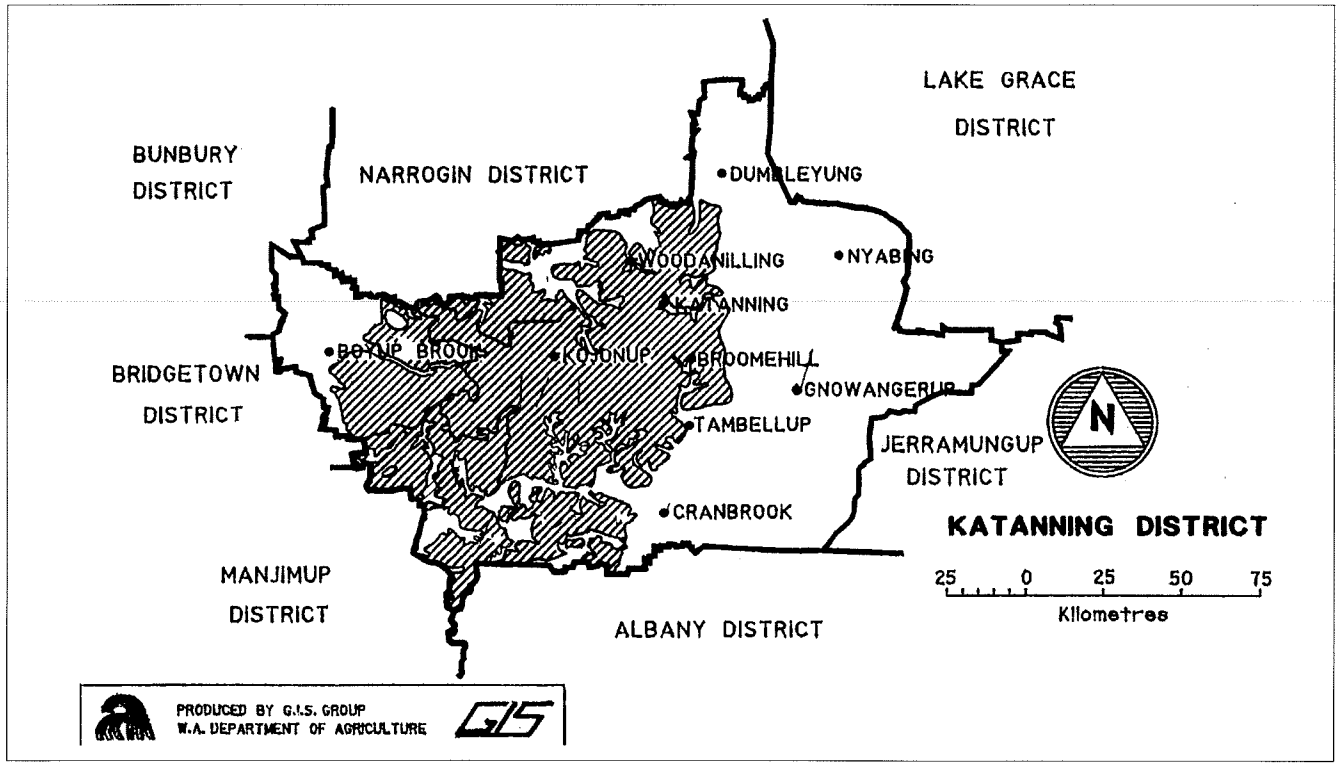
Pastures - subterranean clovers are the appropriate pasture legumes.

Soil conservation

Water erosion of sloping land is a common problem. Contour earthworks are frequently necessary. Rock outcrops interfere with cultivation patterns and complicate contour layouts.

Water conservation

The soil provides reasonable water catchments but dam sites require careful selection to avoid shallow rock.



Map 5.

Classification		
Australian Great Soil Group: Lateritic podzolic	Northcote: KS-Dy 5.41	Local name: Gravel

Soil profile description

(See Figure 6, colour photograph inside back cover)

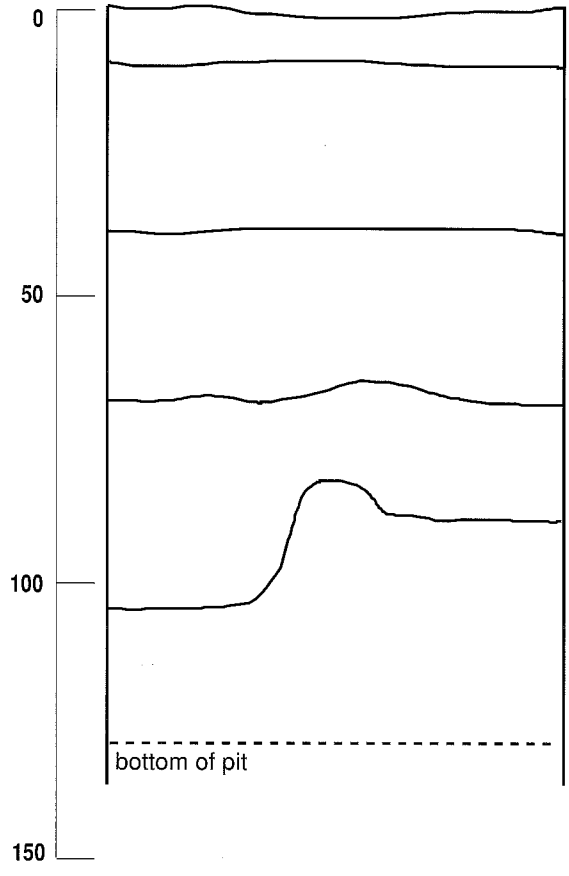
0-10 cm dark brown loamy sand with very many ferruginous nodules, pH 6.1 (5.3 $CaCl_2$)

10-40 cm dark yellowish brown sandy loam with very many ferruginous nodules, pH 6.7 (5.7 $CaCl_2$)

40-70 cm brownish yellow sandy loam with very many ferruginous nodules, pH 6.7 (6.2 $CaCl_2$)

70-90 cm very pale brown sandy loam with ferruginous nodules common, pH 6.5

90-130 cm yellow with many distinct red and white mottles, sandy clay, pH 6.1 (5.3 $CaCl_2$)



Distinguishing features

- The profile is a very gravelly sandy loam over a yellow mottled sandy clay at 90 cm depth.
- The soil is slightly acidic in reaction throughout the profile.
- The soil usually occurs on upper slopes, ridges and crests of hills.
- The native vegetation is mainly powderbark wandoo (*Eucalyptus accedens*) and marri (*E. calophylla*), with jarrah (*E. marginata*) in western areas.
- Map 6 provides an indication of the area within which this soil most commonly occurs in the Katanning advisory district.

Agricultural use and management

Agricultural use and management

Soil characteristics

Favourable attributes

Water entry and drainage - good.

Soil workability - good, unless massive surface laterite is present.

Limitations

Nutrient status - low especially for phosphorus.

Soil water availability - low due to sandy textures and presence of ironstone gravels.

Agronomic considerations

Crops - given appropriate fertilizer and rotation practices, cereals can be grown satisfactorily. Lupins and peas are satisfactory crops unless massive ironstone occurs at shallow depth.

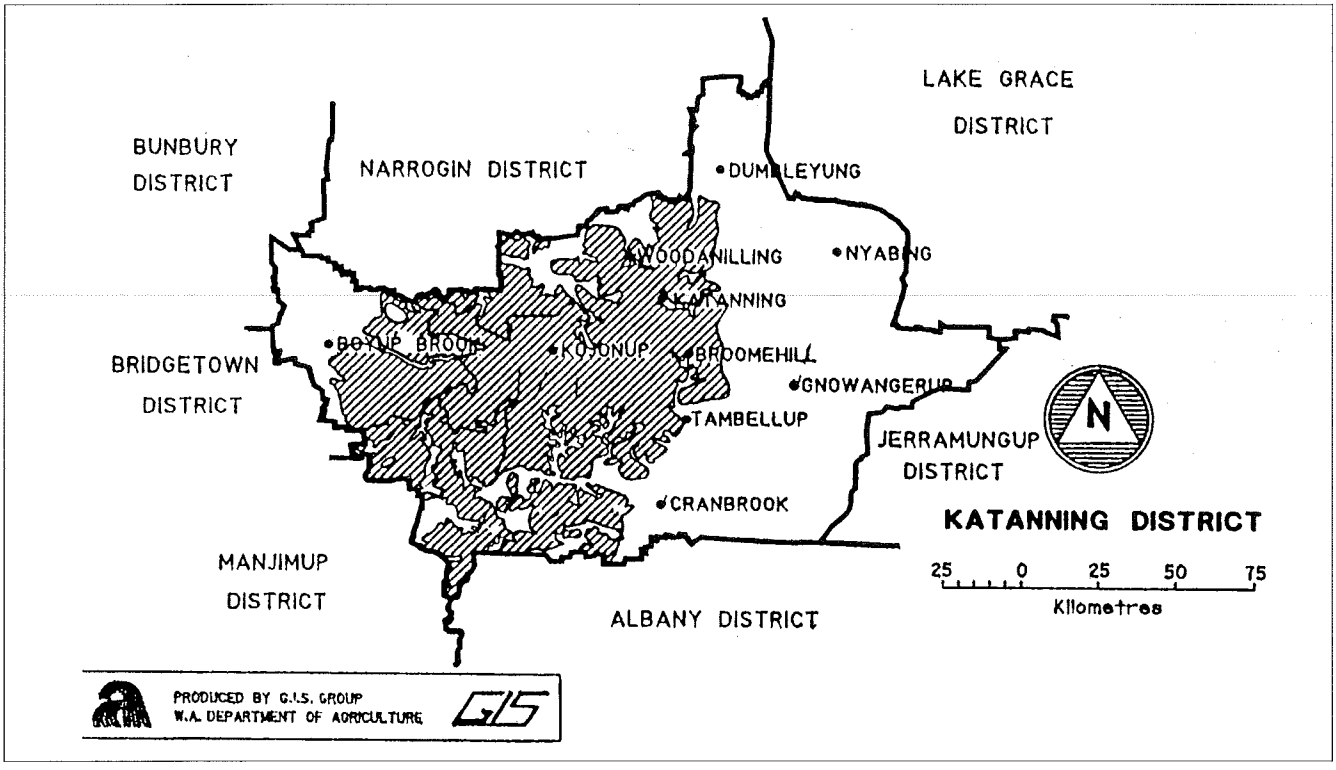
Pastures - subterranean clovers are the appropriate pasture legumes.

Soil conservation

Water erosion - sheet and rill erosion can occur on sloping land, especially below massive ironstone outcrops and breakaways.

Water conservation

Dams excavated in this soil usually hold water satisfactorily and natural catchments shed water reasonably well, particularly when in pasture.



Map 6.

Classification		
Australian Great Soil Group: Solodized solonetz	Northcote: Dy 5.43	Local name: Sand over clay.

Soil profile description

(See Figure 7, colour photograph inside back cover)

0-10 cm dark brown sand, pH 6.1 (5.3 $CaCl_2$)

10-25 cm reddish brown sand, pH 6.5 (5.4 $CaCl_2$)

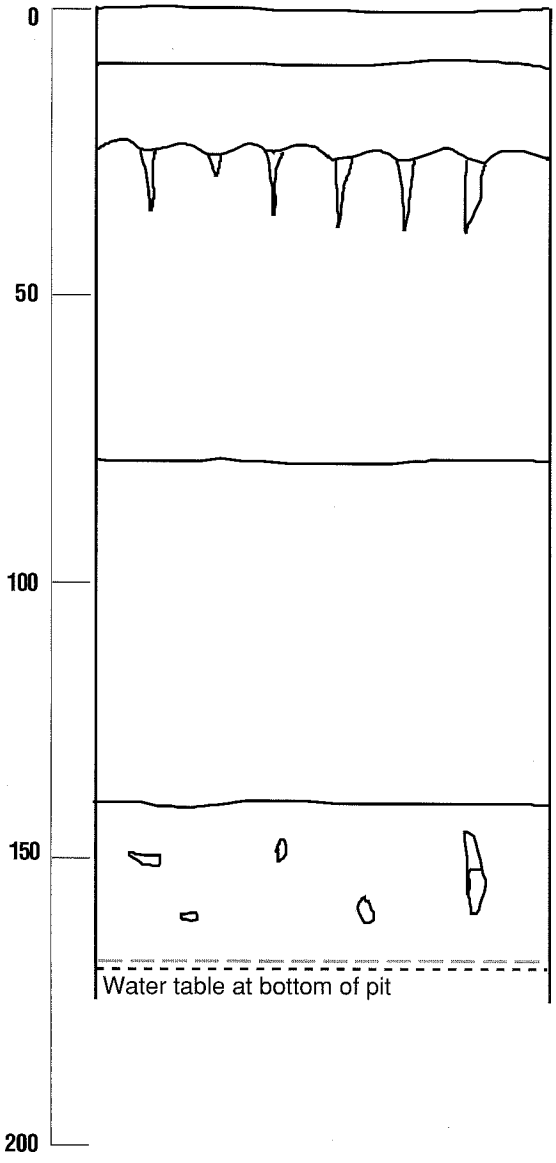
At 25 cm white sand coating on and between domes and columnar structure

25-80 cm pale brown with many distinct orange mottles, sandy clay, columnar structure, pH 6.8 (6.0 $CaCl_2$)

80-140 cm brownish yellow with many prominent grey mottles, medium clay, pH 8.7 (7.3 $CaCl_2$)

140-170 cm light grey with prominent yellow mottles common, heavy clay, calcareous, with pockets of soft calcium carbonate. pH 9.3 (8.2 $CaCl_2$)

170 cm Saline groundwater



Distinguishing features

- The profile is about 25 cm of sand over a sandy clay with a domed surface. A saline groundwater is present below 170 cm.
- The profile is slightly acidic in reaction at the surface becoming alkaline and calcareous with depth.
- The soil occurs on shallow flat-bottomed valley plains.
- The native vegetation is a York gum (*Eucalyptus loxophleba*) woodland.
- Map 7 provides an indication of the area within which this soil most commonly occurs in the Katanning advisory district.

Agricultural use and management

Soil characteristics

Favourable attributes

Water entry - good.

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

Limitations

Nutrient status - poor, due to sand surface and alkaline and sodic subsoil.

Soil water availability - limited due to restricted root penetration of dense clay subsoil.

Agronomic considerations

Crops - given appropriate fertilizer and rotation practices, cereals can be grown satisfactorily. Lupins do not do well, due to restricted root penetration and alkaline subsoils.

Pastures - subterranean clovers are the appropriate pasture legumes.

Soil conservation

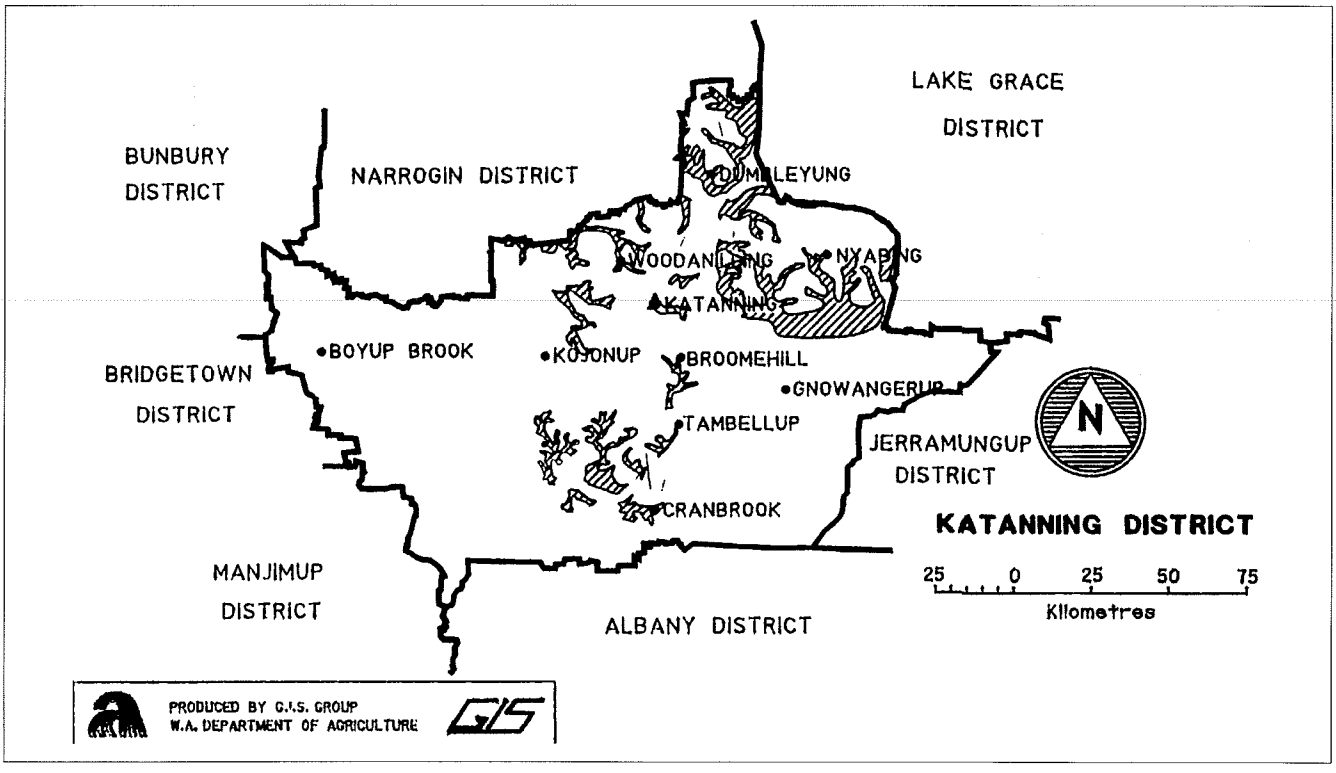
Wind erosion of the sandy surface soil occurs unless surface cover is maintained.

Waterlogging of the surface sand can occur in wet periods because of very slow drainage into the subsoil. Salinity due to shallow groundwater is also a common problem on valley floors near drainage lines.

Water conservation

Dams excavated in this soil hold water satisfactorily but test boring is necessary 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 7.

Classification		
Australian Great Soil Group: Red brown earth	Northcote: Dr 2.13	Local name: Salmon gum/York gum soil

Soil profile description

(See Figure 8, colour photograph inside back cover)

0-8 cm dark reddish brown loamy sand pH 6.8, (5.7 $CaCl_2$)

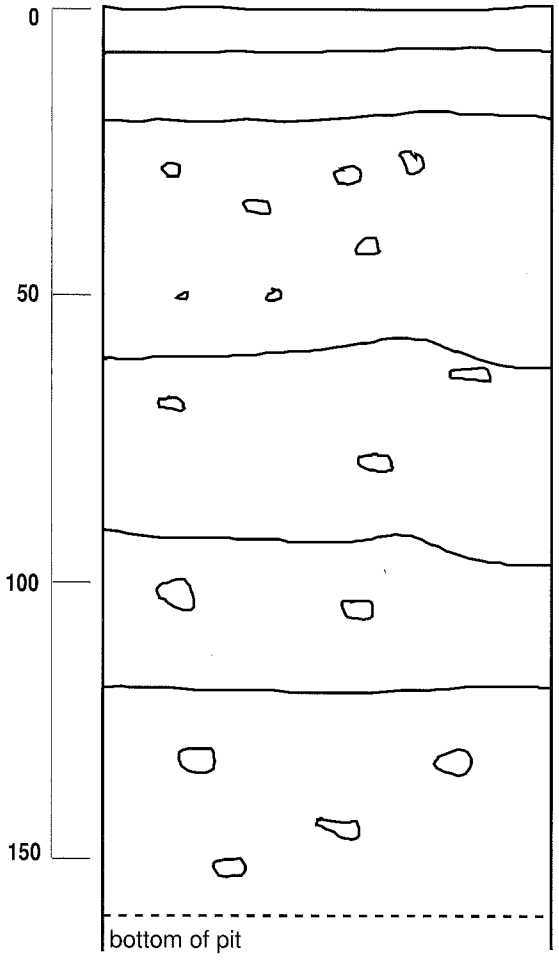
8-20 cm reddish brown light clay, pH 8.7 (7.8 $CaCl_2$)

20-60 cm yellowish red light medium clay, calcareous, pH 9.5 (8.3 $CaCl_2$)

60-90 cm yellowish red with very few faint red mottles, medium clay, calcareous and with very few ferruginous and manganiferous segregations, pH 9.8 (8.6 $CaCl_2$)

90-120 cm strong brown with very few faint red and grey mottles, sandy clay, calcareous, with few calcium carbonate and ferruginous segregations, pH 9.0

120-160 cm+ brown with very few faint orange mottles, heavy clay with few calcium carbonate and manganiferous segregations, pH 9.0



Distinguishing features

- The soil is a very shallow sandy loam over a calcareous mottled clay containing pockets of calcium carbonate and segregations. The profile is red to brown throughout.
- The soil is neutral in reaction at the surface, becoming strongly alkaline with depth.
- The soil occurs on flat and gently sloping areas of valleys subsidiary to the main regional drainage systems.
- The native vegetation is salmon gum (*Eucalyptus salmonophloia*) and York gum (*E. loxophleba*).
- Map 8 provides an indication of the area within which this soil most commonly occurs in the Katanning advisory district.

Agricultural use and management

Soil characteristics

Favourable attributes

Nutrient status - reasonable apart from phosphorus.

Soil water availability - good.

Limitations

Soil workability - frequently poor, due to surface soil structure breakdown.

Water entry - often limited by surface soil structure deterioration.

Agronomic considerations

Crops - given appropriate fertilizer and rotation practices cereal crops grow satisfactorily. The soil is not suitable for lupins.

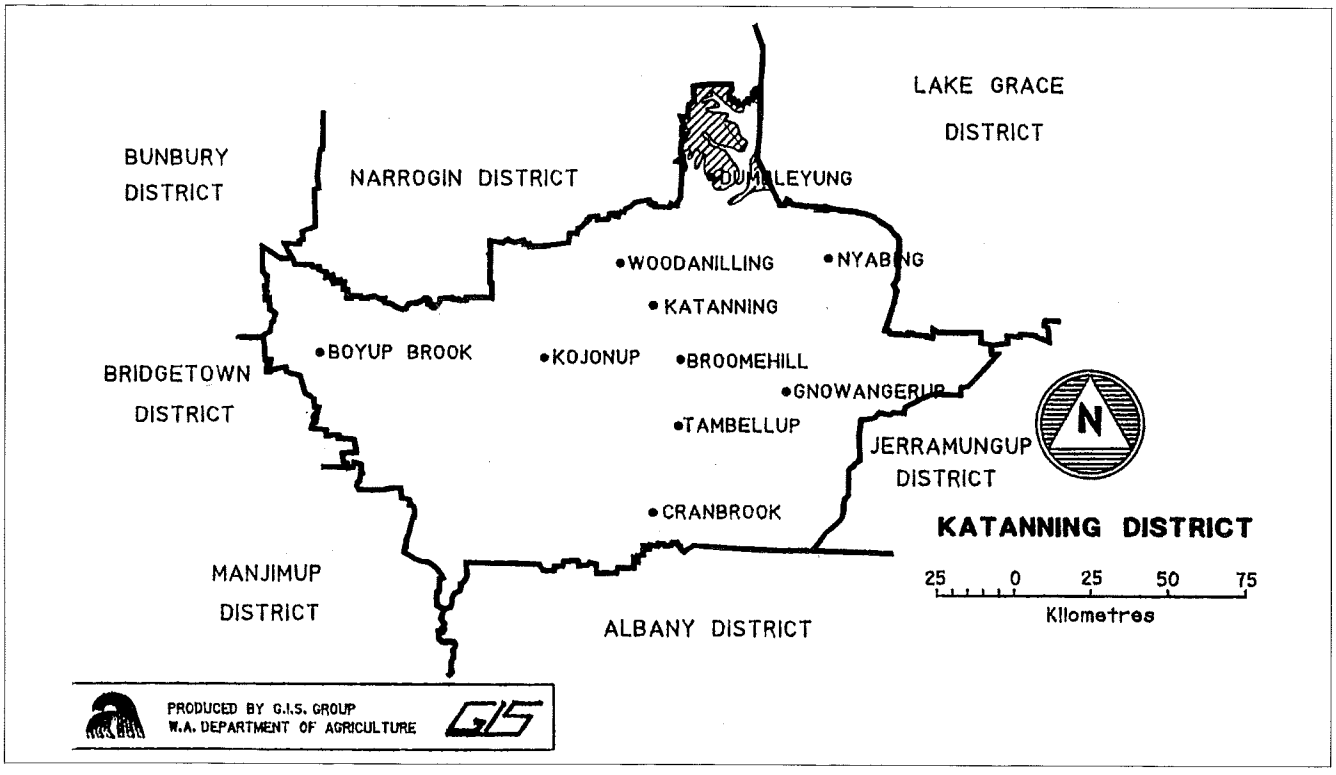
Pastures - medics are the appropriate pasture legumes, but persistence can be affected adversely by emergence problems due to poor soil structure.

Soil conservation

Soil structure problems are common and can be associated with waterlogging in wet periods. Application of gypsum usually improves surface soil structure.

Water conservation

The soil is suitable for farm dams and for surface water catchments.



Map 8.

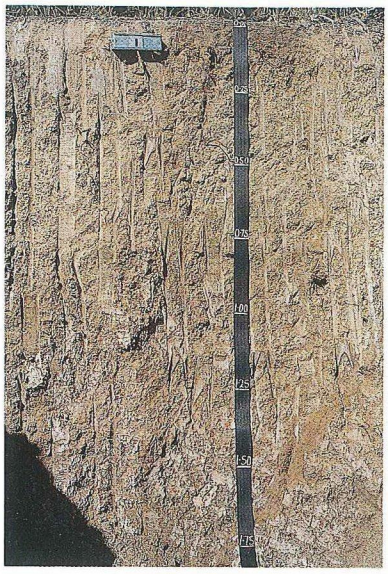


FIGURE 1. Solonized brown soil (Moort)

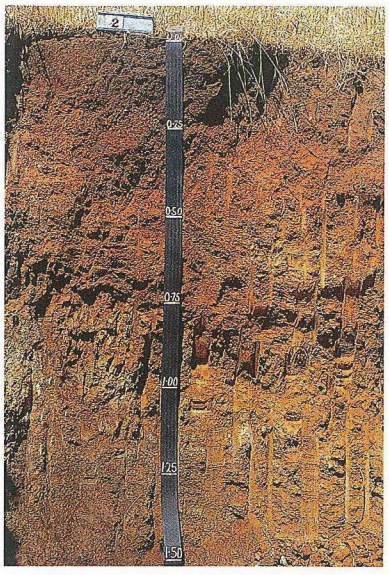


FIGURE 2. Colluvial soil

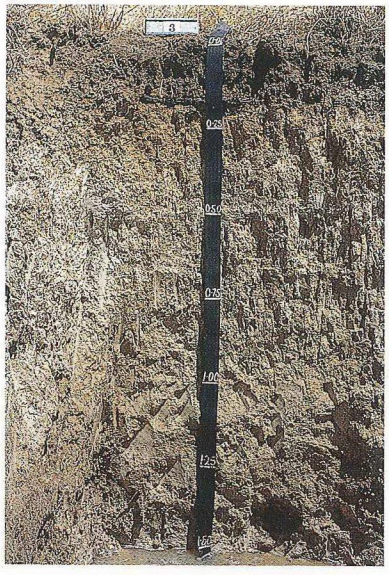


FIGURE 3. Solonized brown soil

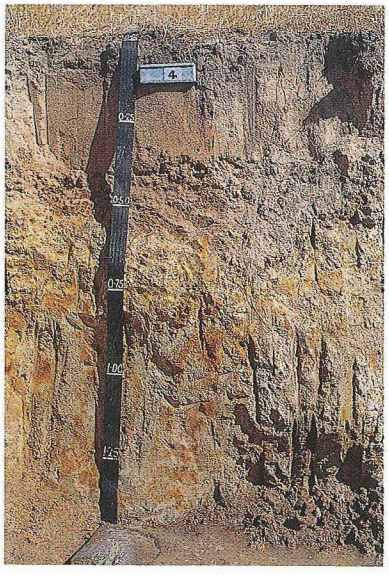


FIGURE 4. Gleyed podzolic (Sand over gravel)

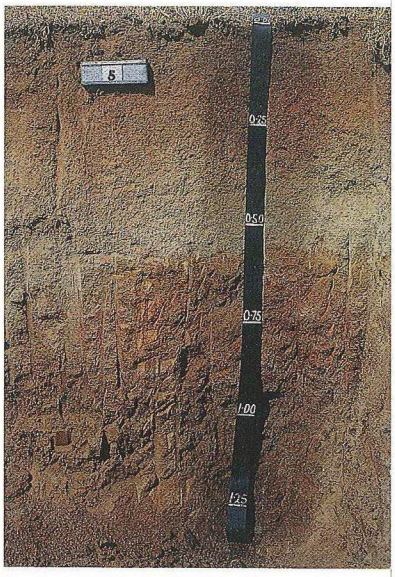


FIGURE 5. Yellow podzolic

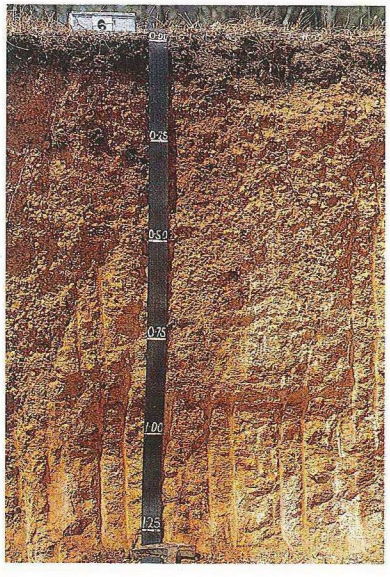


FIGURE 6. Lateritic podzolic (Gravel)

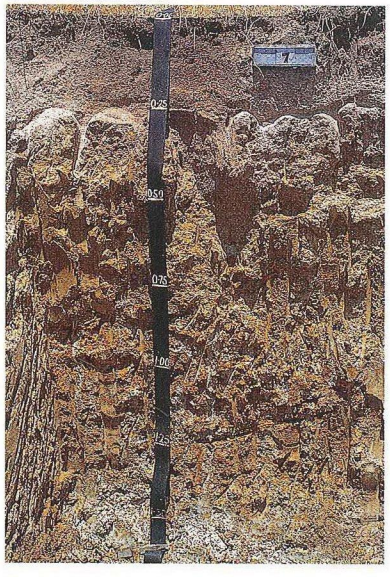


FIGURE 7. Solodized solonetz (Sand over clay)

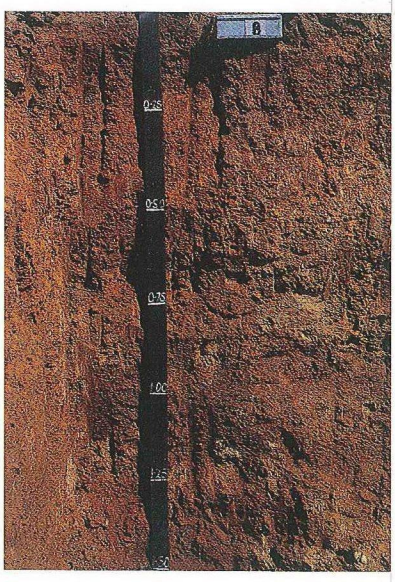
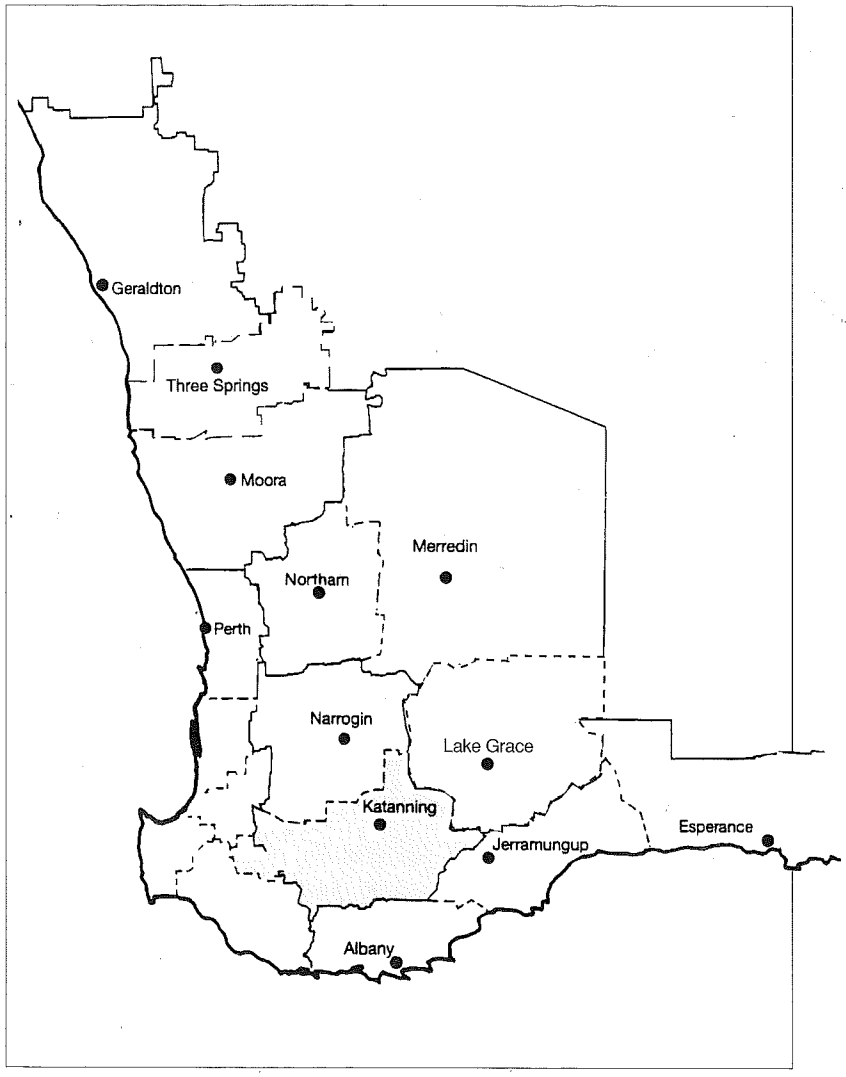


FIGURE 8. Red brown earth (Salmon gum/York gum soil)



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