MLL Mallala Land System

Alluvial plains of the River Light in the Mallala - Lower Light area

Area: 245.6 km^2

Annual rainfall: 370 – 410 mm average

Geology: The Land System is formed on fine sandy clay to silty clay alluvial sediments deposited by the flooding of the Light River. Near the present river course, the sediments are sandier and siltier. In the south the alluvium grades to older, heavier Pleistocene age (Hindmarsh) clay, with an extensive tract protruding through the younger alluvium in the south east. Except near the river, where alluvial sediments are youngest, the alluvium and the older Tertiary clays are intermingled with highly calcareous aeolian deposits of the Woorinen Formation. These materials are medium to fine grained, but hardened to rubbly forms in places. Generally, the calcareous material occurs as fine segregations in the soil profile.

Topography: The Mallala Land System includes the flood plain of the Light River, down to approximately the 10 metre contour, where the land begins to be influenced by saline water tables (Lower Light Land System). The land is essentially a flat alluvial plain extending westwards from the current course of the Light River. In areas of extensive calcareous deposits and the Hindmarsh Clay remnants (mainly in the south), the land surface is very gently undulating, with rises of only a few metres and slopes of less than 2%. The Light River has incised a well defined narrow channel in the alluvial plain. In the lower reaches, low levees border the river. In the north east where the river emerges from the older, higher Pinkerton Plains landscape, the river has cut a deeper channel and a five km section is characterized by a complex of older alluvial terraces and steep eroded banks.

Elevation: 70 m in the north east to 20 m in the south west

Relief: Maximum relief is 10 m

Soils: Most soils are deep with fine sandy loam surfaces. Subsoils vary from well structured red clays to poorly structured dispersive types, and a range of massive sandy to silty clay loams in younger soils. Many profiles are calcareous throughout.

Main soils

Soils of alluvial plains

D2a Hard silty loam over red clay
A6 Calcareous clay loam
C3 Gradational loam to clay loam
D3a Hard silty loam over dispersive red clay

Soils of Tertiary clay remnants

A5 Calcareous loam
D3b Hard loam over dispersive red clay

Minor soils

Soils of river terraces

A3 Calcareous silty loam
M1 Silty alluvial soil
M2 Gradational silty loam
M4 Gradational sandy loam

Calcareous soils on rises
A4 Rubbly calcareous loam
B2 Shallow calcareous sandy loam over calcrete
Soils of Tertiary clay remnants
D2b Hard loam over red clay
D5 Loamy sand over red sandy clay
Soils of alluvial plains
F1 Silty loam over dark clay structured clay
E2 Red cracking clay

Main features: The Mallala Land System is an alluvial plain characterized by deep, fertile and well drained soils. Except for minor small terraces and banks adjacent to the river, and a small saline depression, the land is fully arable with high productive potential. The main limitation is poor surface structure in the texture contrast soils (the most extensive soil class). This condition affects water infiltration, workability and emergence/early growth, but can be overcome with appropriate management. Shallow rubbly soils characteristic of the gently undulating section of the plains have reduced moisture holding capacity and fertility which may be reflected in patchy crop growth, particularly in drier seasons.

Soil Landscape Unit summary: 8 Soil Landscape Units (SLUs) mapped in the Mallala Land System:

SLU	% of area	Main features #
HGA	11.2	Very gently undulating plain formed on remnant Tertiary clays. The landscape is slightly elevated above the surrounding alluvial plain mapped as JDA. Occasional stony rises of superimposed Woorinen Formation carbonates - larger occurrences mapped as SbA. Soils are predominantly hard loam over clay, differences being attributable to the nature of the clay subsoil. Main soils: hard loam over dispersive red clay - **D3b** (E) and hard loam over red clay - **D2b** (C), with calcareous loam - **A5** (L), gradational clay loam - **C3** (M), loamy sand over red sandy clay - **D5** (M) and rubbly calcareous loam - **A4** (M) on rises. The soils are deep and inherently fertile, but have chemical and physical restrictions to plant growth. Subsoil levels of boron, exchangeable sodium and salt are high, as is the pH. These combine to limit rooting depth. Hard setting surface soils, and dispersive subsoils (D3b), also restrict root growth, as well as affecting water infiltration, workability and emergence.
JDA	41.3	Alluvial plains formed on silty to clayey sediments with slopes of less than 1%. Main soils: hard silty loam over red clay - **D2a** (E), with hard silty loam over dispersive red clay - **D3a** (C), gradational clay loam - **C3** (L), silty alluvial soil - **M1** (M), calcareous silty loam - **A3** (M) and calcareous clay loam - **A6** (M). These soils are deep, fertile and moderately well drained, although the D3a soils, with dispersive clay subsoils are prone to sub surface waterlogging in wet seasons. Many of the sandier surfaced profiles are hard setting, which affects water infiltration, workability and seedling emergence / early crop growth. However, use of gypsum and modified surface management practices can overcome this condition, and productive potential is high.
KLA	10.3	Gently undulating plains formed on a complex of alluvial sediments on flats (70%) and highly calcareous deposits on low rises (30%). Plains flat with slopes of less than 1%; the rises are less than 10 m high, have slopes of less than 2% and have 10-20% surface cover of calcrete stone. Main soils on flats: calcareous clay loam - **A6** (E) and calcareous loam - **A5** (C), with calcareous silty loam - **A3** (L), hard silty loam over red clay - **D2a** (L) and gradational clay loam - **C3** (M). Main soil on rising ground: rubbly calcareous sandy loam - **A4** (C). The soils on these areas are less fertile and shallower than on the flats of JDA and KNA, and have a greater degree of variability. This mainly affects nutrition management. Patchiness in crops and pastures reflecting the uneven soil depth can be expected in drier seasons.

KNA	27.0	Alluvial plains with slopes of less than 1% formed on silty to clayey sediments. Main soils: calcareous clay loam - **A6** (E), with gradational clay loam - **C3** (L), calcareous loam - **A5** (L), calcareous silty loam - **A3** (L), hard silty loam over red clay - **D2a** (M), hard silty loam over dispersive red clay - **D3a** (M), red cracking clay - **E2** (M) and silty alluvial soil - **M1** (M). These soils are deep, well drained and moderately fertile. Lime induced nutrient deficiencies may be a problem in the calcareous soils, and moderately low moisture holding capacities may limit plant growth in shallow rubbly soils. Overall productivity potential is high.
QMA	0.8	Very low stony rise formed on calcrete. Main soils: shallow calcareous sandy loam over calcrete - **B2** (E) and rubbly calcareous sandy loam - **A4** (E). This land is only semi arable due to the large proportion of shallow stony soils.
SbA	0.6	Low rises of Woorinen Formation carbonates superimposed on the Tertiary clay remnant (HGA). Main soil: rubbly calcareous sandy loam - **A4** (D). These soils are moderately deep (depending on strength of rubbly layer), which causes variable water holding capacity. They are well drained. As with all calcareous soils, there is the risk of nutrient tie-up.
XIA	6.9	Flats and very gently inclined levees adjacent to the lower reaches of the Light River. Underlying sediments are coarser textured than on the older flood plains, and are characteristically silty. Main soils: gradational silty loam - **M2** (C) and calcareous silty loam - **A3** (C), with silty alluvial soil - **M1** (L), gradational sandy loam - **M4** (L) and silty loam over dark clay - **F1** (L). These soils are deep and well drained, and moderately fertile despite their low clay content. However their high silt and fine sand content predisposes them to moisture deficit and compaction.
XJK	1.9	Complex landscape including the Light River channel, river flats and older terraces. Along the eastern side particularly are short steep slopes grading to the higher surface of the Pinkerton Plains Land System. These slopes are severely eroded in places. Main soils: silty alluvial soil - **M1** (E), gradational sandy loam - **M4** (E), hard silty loam over red clay - **D2a** (C) and calcareous silty loam - **A3** (L). Some of the broader terraces are arable, but generally the unevenness of the land surface (imparted by present and former river channels and old banks) makes working the land difficult. Steep dissection slopes (including the banks of the current river channel) are highly erodible and need protection.

PROPORTION codes assigned to soils within Soil Landscape Units (SLU):

(D) Dominant in extent (>90% of SLU)
(V) Very extensive in extent (60–90% of SLU)
(E) Extensive in extent (30–60% of SLU)
(C) Common in extent (20–30% of SLU)
(L) Limited in extent (10–20% of SLU)
(M) Minor in extent (<10% of SLU)

Detailed soil profile descriptions:

Soils of alluvial plains

A6 Calcareous clay loam (Regolithic, Hypercalcic Calcarosol)
Calcareous clay loam (loam to light clay) becoming more clayey and calcareous at depth with abundant clayey carbonate from about 40 cm.

C3 Gradational loam to clay loam (Hypercalcic, Red Dermosol)
10 - 30 cm loam to clay loam grading to a well structured red clay with abundant soft carbonate from about 45 cm.

D2a Hard silty loam over red clay (Calcic, Red Chromosol)
10 - 30 cm hard silty loam to clay loam abruptly overlying a well structured red clay with minor soft carbonate from about 50 cm.

D3a Hard silty loam over dispersive red clay (Calcic, Red Sodosol)
10 - 35 cm hard silty loam to clay loam abruptly overlying a coarsely structured dispersive red clay with minor soft carbonate from about 50 cm.

E2 Red cracking clay (Epipedal, Red Vertosol)
Red seasonally cracking medium clay becoming more clayey and calcareous with depth.

F1 Silty loam over dark clay (Hypocalcic, Brown Chromosol)
20 - 30 cm hard dark silty loam over a black or brown coarsely structured clay.

Soils of Tertiary clay remnants

A5 Calcareous loam (Regolithic, Hypercalcic / Supracalcic Calcarosol)
Calcareous loam becoming more calcareous and rubbly with depth, grading to heavy clay with decreasing carbonate content.

D2b Hard loam over red clay (Calcic, Red Chromosol)
15 - 40 cm hard loam over a well structured red clay with variable soft carbonate from 70 cm and occasional pockets of soft or crystalline gypsum. Substrate clay can be as shallow as 80 cm, but is usually deeper than 100 cm.

D3b Hard loam over dispersive red clay (Calcic, Red Sodosol)
15 - 25 cm hard setting loam to clay loam with a paler coloured A2 layer, over a dark red coarsely structured hard medium clay, with variable soft carbonate as shallow as 50 cm, and with pockets of soft or crystalline gypsum scattered erratically throughout. Substrate clay can be as shallow as 60 cm, but is usually deeper than 100 cm.

D5 Loamy sand over red sandy clay (Calcic, Red Chromosol)
15 cm firm loamy sand over a weakly structured red sandy clay with fine carbonate from about 35 cm.

Calcareous soils on rises

B2 Shallow calcareous sandy loam over calcrete (Petrocalcic Calcarosol)
15-35 cm calcareous and variably rubbly sandy loam abruptly overlying sheet calcrete.

A4 Rubbly calcareous loam (Regolithic, Supracalcic / Lithocalcic Calcarosol)
Calcareous sandy loam to loam grading to a rubble layer at about 30 cm, over a very highly calcareous clay loam to clay.

Soils of river terraces

A3 Calcareous silty loam (Regolithic, Calcic Calcarosol)
Calcareous silty loam grading to a brown calcareous silty clay loam.

M1 Silty alluvial soil (Basic, Regolithic, Brown-Orthic Tenosol)
25 - 50 cm dark brown loamy sand to silty loam with variable alluvial layering, over sandy to silty alluvium.

M2 Gradational silty loam (Calcic / Hypocalcic, Red Dermosol)
25 - 40 cm dark brown silty loam to clay loam grading to a well structured red brown clay loam to light clay, over silty alluvium.

M4 Gradational sandy loam (Eutrophic, Red / Brown Kandosol)
Thick loamy sand to sandy loam grading to a red or brown sandy clay loam, over silty to sandy alluvium.

Further information: DEWNR Soil and Land Program