WLK Willalooka Land System

Flats and low ranges occupying most of the Hundred of Willalooka

Area: 305.4 km^2

Annual rainfall: 475 - 525 mm average

Geology: The Land System is part of an old coastal dune - lagoon complex. Three broad geological materials occur. A north - south coastal dune, capped by calcarenite (Bridgewater Formation) runs through the centre of the system. The bulk of the area is formed on sediments laid down in lagoons on either side of the dune. These are limestones with sandy clay and clay lenses (Padthaway Formation). Reworking of the carbonates from the limestones has resulted in a calcrete capping on most of the sediments. More recently, siliceous sands from the dunes have been redistributed over the landscape by the wind to form low dunes and sand spreads. These deposits are equivalent to the Molineaux Sands.

Topography: The Willalooka Land System is a flat to very gently undulating plain between the Black Range to the west and the Naracoorte Range to the east. Between these two ranges and parallel to them is a lower, discontinuous range (a smaller coastal dune). There are sporadic sand spreads and low dunes with east - west orientation scattered over both plains and ranges. Along the western edge (ie abutting the Black Range) is a chain of swamps. Groundwater tables are rising through the district and are within one to two metres of the surface over much on the land system.

Elevation: 30 - 65 m

Relief: Maximum relief is 35 m

Soils: Sand over clay soils are characteristic, but shallow sandy to loamy soils over calcrete are common, as are deeper sands.

Main soils:

Very gently undulating flats

B7a Sand over brown clay on calcrete
G4 Sand over dispersive brown clay
G3/G4 Sand over dispersive brown clay on calcrete

Minor soils:

Very gently undulating flats

B3a Shallow stony loamy sand on calcrete
B7b Sand over grey clay on calcrete

Soils on sandy rises

H3 Deep bleached sand
G2 Sand grading to sandy clay loam

Very gently undulating flats

F1 Sandy loam over brown clay

Soils on stony rises

B8 Bleached sand on calcrete
B3b Shallow stony sandy loam on calcrete
B3c Loamy sand over red sandy clay

Vegetation: Mallee-broombush, yacca, heath and pink gum (some blue gum) on flats.
Mallee, heath and stringybark on rises.

Main features: The Willalooka Land System is a very gently undulating plain bisected by a linear calcarenite range. The plains are characterized by sandy soils with clayey subsoils which are usually dispersive. These soils have moderately low fertility and impeded drainage. Drainage is deteriorating as saline water tables rise. Substantial areas are affected by salinity. Soils on rising ground are either deep sands with low fertility and prone to water repellence, or shallow stony soils with limited waterholding capacity.

Soil Landscape Unit summary: 15 Soil Landscape Units (SLUs) mapped in the Willalooka Land System

SLU	% of area	Main features #
A-g	0.04	Isolated granite outcrop (Christmas Rocks).
MHB MHC	1.0 9.7	Rises formed on calcarenites of ancient coastal dunes, partially overlain by Molineaux Sands. There is variable surface stone on the non sandy slopes. **MHB** Isolated low rises, less than 10 m high, with sand spreads. **MHC** Discontinuous ridges with a NNW-SSE orientation. The ridges are up 35 m high, with slopes of 3-10%, partially overlain by low parallel east - west sand dunes, which tend to be more common in the north, and on the eastern sides of the ridges. Main soils: shallow stony sandy loam on calcrete - **B3b** (L), bleached sand on calcrete - **B8** (L) and loamy sand over red sandy clay - **B3c** (L) on stony areas, and deep bleached sand - **H3** (C) and sand grading to sandy clay loam - **G2** (C) on sand dunes. Key properties: Drainage: Rapidly to well drained. Fertility: Moderately low on stony soils, to very low on deep sands. Physical cond.: Surface soils are soft to loose and do not restrict root growth. Subsoils (if present) are friable and not restrictive to root growth. AWHC: Very low to low on stony soils, due to shallow depth to hard calcrete. Moderate on sandy soils. Salinity: Low. Erosion potential: Water: Low to moderate, depending on slope. Wind: Moderately low on stony ground to high on sand spreads. Water repellence: Low to slight on stony land. Strong on sand spreads. Rockiness: Variable to 50%, usually less than 20%. Nil on sand spreads. Other: The higher rises are exposed. Summary: Shallow, stony soils of marginal fertility with deep, low fertility, water repellent and erodible sands.
NAA NAa	5.9 2.5	Flat plains with occasional very low stony or sandy rises formed on calcreted sediments of the Padthaway Formation. Groundwater tables are within two metres of the surface. Main soils: sand over brown clay on calcrete - **B7a** (E) and shallow stony loamy sand on calcrete - **B3a** (E). Key properties: Drainage: Well or moderately well (**NAA**) to imperfectly (**NAa**) drained. Fertility: Moderately low. Physical cond.: There are no surface or subsurface soil structure impediments to root growth. AWHC Moderately low. Salinity Moderately low (**NAA**) to moderately high (**NAa**). This land is being increasingly affected by rising saline water tables. Erosion potential: Water: Low. Wind: Low to moderately low. Water repellence: Slight to moderate. Rockiness: Up to 5% surface calcrete stone with heavier patches. Summary: Slightly to moderately saline flats dominated by soils with sandy surfaces and thin clayey subsoils over calcrete. Drainage is moderate, fertility is moderately low.

NAB NAb	11.4 0.6	Flat to gently undulating plains with very low stony rises formed on calcreted sediments of the Padthaway Formation. Groundwater tables are often within two metres of the surface. Main soils: shallow stony loamy sand on calcrete - **B3a** (E) and sand over brown clay on calcrete - **B7a** (E). Key properties: Drainage: Moderately well or well (**NAB**) to imperfectly (**NAb**) drained. Fertility: Low to moderately low. Physical cond.: No soil structure impediments to root growth. AWHC: Low. Salinity: Moderately low (**NAB**) to moderately high (**NAb**). This land is being increasingly affected by rising saline groundwater tables. Erosion potential: Water: Low. Wind: Low. Water repellence: Slight to nil. Rockiness: Up to 10% surface calcrete stones on flats, up to 20% on rises. Summary: Slightly to moderately saline plain with shallow stony soils having low waterholding capacity and moderately low fertility. This is a stonier variant of **NAA/NAa**.
NAf	1.1	Flat plains formed on calcreted sediments of the Padthaway Formation, with 10-20% swampy depressions. Groundwater tables are within two metres of the surface. Main soils: sand over grey clay on calcrete - **B7b** (E) and sand over brown clay on calcrete - **B7a** (E), with wet soils (L) in swamps. Key properties: Drainage: Imperfectly to poorly drained. Fertility: Moderately low. Physical cond.: No surface soil structure impediments to root growth. Subsoil clays of grey soils are slightly limiting. AWHC: Moderate. Salinity: Moderately high to high. This land is being increasingly affected by rising saline groundwater tables. Erosion potential: Water: Low. Wind: Low to moderately low. Water repellence: Slight. Rockiness: Up to 2% surface calcrete stone. Summary: Moderately saline flats dominated by soils with sandy surfaces and clayey subsoils over calcrete. Drainage is imperfect to poor, fertility is moderately low - a less well drained variant of **NAa**.
NDA NDa	7.2 34.8	Very gently undulating plains with occasional low sandy or stony rises formed on calcreted sediments of the Padthaway Formation. Groundwater tables are within two metres of the surface in places. Main soils: sand over dispersive brown clay on calcrete - **G3/G4** (E), sand over brown clay on calcrete - **B7a** (E) and sand over dispersive brown clay - **G4** (C). Key properties: Drainage: Moderately well drained (NDA) to imperfectly or poorly drained (**NDa**). Dispersive subsoils and/or shallow groundwater tables prevent good drainage. Fertility: Moderate to moderately low. Physical cond.: Surface soils usually sandy (no limitations to root growth). Subsoils are commonly dispersive, preventing even root growth. AWHC Moderate. Salinity: Moderately low (**NDA**) to moderately high (**NDa**). This land is being increasingly affected by rising saline groundwater tables. These tend to be shallower in **NDa**. Erosion potential: Water: Low. Wind: Moderately low. Water repellence: Slight to moderate. Rockiness: Less than 2% surface calcrete stone. Summary: Gently undulating plains with increasing evidence of salinization, characterized by sandy soils with dispersive clay subsoils over rubbly calcrete. Drainage is impeded, fertility is moderately low.

NIA NIa	6.5 4.4	Flat to very gently undulating plains, with minor (less than 5% sandy rises) formed on calcified clays of the Padthaway Formation. Groundwater tables are within two metres of the surface in places. Main soils: sand over dispersive brown clay - **G4** (E) and sandy loam over brown clay - **F1** (E). Key properties: Drainage: **NIA** Imperfect (G4 soils) to moderate (F1 soils). Clayey subsoils perch water. **NIa** Imperfect to poor, due to effect of shallow groundwater table. Fertility: Moderately low to moderate, due to low clay content surface soils. Physical cond. Surface soils are loose to soft with no limitations. Root growth in subsoils is slightly restricted in F1 soils, and significantly limited in G4 soils. AWHC: Moderate. Salinity: Moderately low (**NIA**). Moderately high (**NIa**). This land is being increasingly affected by rising saline groundwater tables. Erosion potential: Water: Low. Wind: Moderately low to moderate. Water repellence: Moderately low. Rockiness: Nil. Other: Acidification potential. Summary: Plains with shallow saline groundwater tables characterized by sand to sandy loam over clay soils with moderately low fertility and impeded drainage.
NID	12.7	Flat to very gently undulating plains, with up to 25% low east - west trending longitudinal sand rises formed on calcified clays of the Padthaway Formation, partially overlain by Molineaux Sand. Main soils: sand over dispersive brown clay - **G4** (V) on flats, with deep bleached sand - **H3** (C) on rises. Key properties: Drainage: Imperfect on flats (dispersive clay subsoils). Rapid on rises. Fertility: Moderately low (flats). Very low (rises). Physical cond.: Sandy surface soils (non limiting). Fair to poor in subsoils on flats (dispersive clays). No subsoil restrictions on rises. AWHC: Moderate (flats). Low to moderately low (rises). Salinity: Moderately low (flats). Low (rises). Erosion potential: Water: Low. Wind: Moderately low (flats). High (rises). Water repellence: Moderately low to moderate (flats). High (rises). Rockiness: Nil. Other: Acidification potential. Summary: Imperfectly drained sand over clay soils with moderately low fertility on flats, and deep, infertile, water repellent sands on rises.
OBK	1.3	Low rises formed on Molineaux Sand. Main soils: sand grading to sandy clay loam - **G2** (E) and deep bleached sand - **H3** (E). Key properties: Drainage: Rapidly to well drained. Fertility: Low to very low. Physical cond.: There are no impediments to root growth. AWHC: Moderately low to moderate. Salinity: Low. Erosion potential: Water: Low. Wind: Moderate to high. Water repellence: High. Rockiness: Nil. Summary: Isolated low sandy rises with very low fertility, well drained soils prone to water repellence and erosion.
Xq-	0.9	Marginally saline swamps, at least seasonally inundated.

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:

B3a Shallow stony loamy sand on calcrete (Petrocalcic, Leptic Tenosol)
Medium thickness loamy sand to sandy loam overlying a layer of mixed calcrete rubble and pockets of brown sandy clay grading to calcreted lagoonal sediments.

B3b Shallow stony sandy loam on calcrete (Petrocalcic, Leptic Tenosol)
Loamy sand to loam with variable rubble and slight clay increase with depth overlying calcreted calcarenite shallower than 50 cm.

B3c Loamy sand over red sandy clay (Petrocalcic, Red Kandosol)
Medium thickness loamy sand with slight ironstone gravel overlying a weakly structured reddish brown sandy clay on calcarenite.

B7a Sand over brown clay on calcrete (Petrocalcic, Brown Chromosol)
Medium thickness sand overlying yellow brown clay on limestone or calcreted sandy clay within 50 cm.

B7b Sand over grey clay on calcrete (Petrocalcic, Grey Chromosol)
Medium thickness loamy sand abruptly overlying a grey brown firm clay with calcreted lagoonal sediments within 50 cm.

B8 Bleached sand over calcrete (Petrocalcic, Bleached-Leptic Tenosol)
Thick bleached sand over calcarenite.

F1 Sandy loam over brown clay (Hypercalcic, Brown Chromosol)
Medium thickness loamy sand to sandy loam abruptly overlying a brown and yellow friable clay grading to Class III A or B carbonate.

G2 Sand grading to sandy clay loam (Mesotrophic, Yellow Kandosol)
Thick bleached sand, organically darkened at surface, grading to a yellow and red friable massive sandy clay loam.

G3/G4 Sand over dispersive brown clay on calcrete (Lithocalcic / Petrocalcic, Brown Sodosol)
Medium thickness sand sharply overlying a coarsely structured dispersive brown and yellow mottled clay over rubbly or sheet calcrete.

G4 Sand over dispersive brown clay (Hypercalcic, Brown Sodosol)
Thin to medium thickness sand sharply overlying a brown and yellow or grey mottled dispersive clay with strong columnar structure, calcareous with depth.

H3 Deep bleached sand (Basic, Arenic, Bleached-Orthic Tenosol)
Thick to very thick bleached sand, organically darkened at the surface over yellow sand continuing below 100 cm.

Further information: DEWNR Soil and Land Program