

BNL Burnlea Land System

Undulating rises immediately east of Strathalbyn

Area: 23.5 km²

Annual rainfall: 415 – 490 mm average

Geology: The System is formed on a Tertiary remnant, comprising the typical Murray Basin sequence of massive clayey sands to sandy clays, overlain by coarsely structured heavy clays (Blanchetown Clay equivalent), capped by variable calcareous deposits. These include soft and rubbly carbonate, but most distinctive in the Burnlea Land System is the sheet calcrete which caps substantial areas. Overlying the older sediments are low dunes and spreads of more recent Molineaux Sands.

Topography: The Burnlea Land System is an isolated remnant of an old Tertiary land surface which has been largely eroded by the Angas River to the west and the Bremer to the east. The "island" of Tertiary sediments left behind has generally undulating slopes of less than 10%, but in places where there was apparently vigorous downcutting by the Angas River, short steep cliffs were formed. These have been protected from further erosion by an extensive sheet of calcrete. There is extensive surface stone cover associated with the calcrete cap. Reworking of the sandier sediments has resulted in the development of extensive sand spreads and some low linear sandhills, draped over the undulating terrain.

Elevation: 30 m on the south eastern margin to 120 m in the north

Relief: Up to 70 m, but generally is less than 30 m

Soils: The soils reflect the underlying geological materials. Sandy soils occur in situ or on reworked Tertiary sands, loamy soils on the finer grained sediments, shallow stony soils on calcrete, and moderately deep rubbly calcareous soils on thick carbonate deposits.

Main soils

- D2** Sandy loam over red clay (flats and rises)
- G1** Sand over red sandy clay (sandy rises)
- B2** Shallow calcareous sandy loam on calcrete (stony rises)

Minor soils

Sandy soils on rises

- G2** Thick bleached sand over sandy clay loam
- G3** Thick sand over clay
- G4** Sand over brown dispersive sandy clay

Loamy soils on flats and rises

- A6** Gradational calcareous sandy loam

Shallow soils formed on calcrete

- B6** Sandy loam over red clay
- B7** Shallow sand over sandy clay

Moderately deep soils formed on calcareous rubble

- A4** Calcareous sandy loam
- C1** Gradational sandy loam



Main features:

The Burnlea Land System is a landscape of undulating rises comprising a range of soils which reflect the underlying sediments. Sandy surfaced soils with clayey subsoils are extensive. They are infertile, have restricted waterholding capacities and are prone to wind erosion. These characteristics are accentuated on the minor associated sandhills. Shallow stony soils and moderately deep calcareous sandy loams are formed on calcrete and variable rubbly to soft carbonate deposits. These soils have restricted waterholding capacities, and high pH induced nutrition problems. The shallow soils on calcrete are mostly non arable. On lower slopes are the most productive soils - loam over clay soils and deep calcareous loams. These soils are moderately deep and inherently fertile.

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

SLU	% of area	Main features #
DaC	2.2	<p>Undulating to gently rolling low rises and footslopes formed on basement rocks. Slopes are generally less than 10%, but are occasionally steeper to 16%. Relief is invariably less than 30 metres. There is minor to limited rock outcrop. Drainage depressions are shallow and broad and water courses are moderately well defined and are sometimes gullied.</p> <p>DaC Undulating rises and gently inclined footslopes with relief to 30 m and slopes of 3-10%.</p> <p>Main soils: <u>sandy loam over red clay</u> - D1 (E) with <u>shallow loamy sand / sandy loam</u> - L1a/L1b (L) and <u>calcareous loam</u> - A2 (L). On lower slope outwash areas, profiles are deeper, the typical soil being <u>sandy loam over red clay</u> - D2a (L) over localized alluvium. These soils are moderately fertile and productivity potential is largely determined by soil depth and water storage capacity. Most have poorly structured hard setting surfaces which shed water and readily erode.</p>
GQB	35.4	<p>Undulating and gently inclined rises and low hills formed on Tertiary age clayey sands and sandy clays, overlain by highly calcareous Class III A carbonates of the Woorinen Formation. Slopes are 3% to 10% and relief is up to 70 metres, but usually less than 30 metres. There is no surface drainage pattern and little surface stone. The soils are sandy surfaced, with variable subsoils ranging from red sandy clays, brown sodic clays and clayey sands. All soils are underlain by soft to semi-hard carbonates.</p> <p>Main soils: <u>Sand over red sandy clay</u> - G1 (E) <u>Sand over brown dispersive sandy clay</u> - G4 (C) <u>Thick sand over clay</u> - G3 (C) <u>Thick bleached sand over sandy clay loam</u> - G2 (M)</p> <p>These soils all have inherently low fertility and are susceptible to wind erosion. Water repellence is a problem in some seasons. Most surface soils are neutral to slightly acidic, and prone to acidification. However subsoils are strongly alkaline. Moisture holding capacities are moderately low to moderate, depending on depth to the very highly calcareous layer. All soils are easily worked. Shallow sodic clays impede drainage, so waterlogging can be expected in places during wet periods.</p>
HEA HEB	0.5 31.9	<p>Very gently undulating plains, gently inclined slopes and low rises with slopes ranging from 1% to 5% underlain by Blanchetown Clay mantled by fine carbonates, and in places by thick deposits of aeolian Woorinen Formation carbonates. There is minor surface calcrete on rises.</p> <p>HEA Very gently undulating plains and valley floors with slopes of 1-2%. HEB Gently inclined slopes and low rises with slopes of 2-5%.</p> <p>On the plains the soils are sandy loams over red clays, and calcareous loams, both formed over Class I carbonate layers grading to Blanchetown Clay. On the low rises of Woorinen Formation, the soils are sandier with subsoils of either red or mottled brown sandy clay, or rubbly calcrete.</p> <p>Main soils: Flats and gentle slopes: <u>Sandy loam over red clay</u> - D2 (E) <u>Gradational sandy loam</u> - C1 (L) <u>Gradational calcareous sandy loam</u> - A6 (L) Low rises: <u>Gradational sandy loam</u> - C1 (L) <u>Calcareous sandy loam</u> - A4 (M) <u>Sand over brown dispersive sandy clay</u> - G4 (M)</p>



		The soils of the flats are deep, inherently fertile, neutral to alkaline and moderately well drained with good to fair root growth conditions. Root growth may be restricted by hard clays in the texture contrast soils (eg D2), and by high levels of deep subsoil boron and sodium. Productivity potential is high. The soils of the rises are more variable, but generally of lower fertility and limited water holding capacity. The sandy texture contrast soils are slightly acidic and susceptible to water repellence and wind erosion. Root growth is restricted either by sodic subsoils, or very high pH and sodicity below the rubble. Productivity potential is moderate to low.
O-C	2.5	Low longitudinal dunes with west north west - east south east orientation superimposed on the rises of GQB . The soils are all sandy in the surface, but have variable subsoils. The most common profiles have deep sandy surfaces over slightly clayey subsoils. Other profiles have well developed clay subsoils at shallow to moderate depths. Main soils: <u>Bleached sand over sandy clay loam</u> - G2 (V) <u>Sand over brown dispersive sandy clay</u> - G4 (L) <u>Thick sand over clay</u> - G3 (L) These soils are infertile and prone to water repellence and wind erosion. Productivity potential is low.
QMB QMC	6.7 7.4	Low rises and benches with relief of up to 30 metres, formed on sheet or rubbly calcrete (Class II or III C carbonate), generally too hard to dig with hand tools. This material is softer and rubbly with depth and generally overlies Blanchetown Clay. Slopes of the rises are usually less than 8%, but relict sections of ancient river banks have slopes of up to 40%. Outcropping sheet calcrete and abundant surface stones are features of the landscape. There is no surface drainage pattern. QMB Gentle slopes. QMC Moderate slopes. The soils are generally shallow over sheet or rubbly calcrete, although there is a range of uniform textured stony soils and texture contrast profiles. Main soils: <u>Shallow calcareous sandy loam</u> - B2 (V) <u>Calcareous sandy loam</u> - A4 (M) <u>Gradational sandy loam</u> - C1 (M) <u>Shallow sand over sandy clay</u> - B7 (M) <u>Sandy loam over red clay</u> - D2 (M) This land is dominated by shallow soils with low water holding capacities. Fertility levels are low to moderate, and pH generally alkaline. Land use is restricted by the extensive cover of surface calcrete and outcrops of sheet rock. Most of the area is non arable.
SdB	13.4	Low benches and gently undulating low rises with relief of less than 10 metres and slopes of less than 4%, formed on rubbly to sheet calcrete, mostly Classes III C, IIIB and II, overlying Tertiary sands to sandy clays, or Blanchetown Clay. Surface calcrete stone is common and there is minor sheet rock outcrop. There is no surface drainage pattern. Soils are variable, but all overlie rubbly or sheet calcrete. Main soils: Moderately deep on rubble: <u>Calcareous sandy loam</u> - A4 (C) <u>Gradational sandy loam</u> - C1 (C) <u>Sand over brown dispersive sandy clay</u> - G4 (M) Shallow on sheet calcrete: <u>Shallow calcareous sandy loam</u> - B2 (E) <u>Shallow sand over sandy clay</u> - B7 (M) <u>Sandy loam over red clay</u> - B6 (M) These soils are mostly arable, despite a proportion of shallow soils on calcrete. Waterholding capacities vary considerably, but are generally limiting. Root growth is limited either by sheet calcrete or high pH below the rubble layer. Fertility is moderate to low. Most soils are easily worked, and well aerated and drained. Productive capacity is moderate.

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:

- A4** Calcareous sandy loam (Supracalcic / Lithocalcic Calcarosol)
Medium thickness brown calcareous loamy sand to light sandy clay loam with minor calcrete nodules, overlying a brown highly calcareous massive sandy clay loam, grading to a pale brown very highly calcareous clayey sand to light clay with 20% to more than 50% carbonate nodules (Class III B / III C carbonate). The carbonate grades to a non calcareous brown, yellow, grey and red sandy clay from 65 cm.
- A6** Gradational calcareous sandy loam (Hypercalcic Calcarosol) Medium thickness grey brown or red brown moderately calcareous loamy sand to light sandy clay loam, becoming more clayey and calcareous with depth, overlying a brown to red highly calcareous sandy clay loam to light clay, grading to a pale brown very highly calcareous sandy clay with up to 50% soft carbonate segregations (Class I carbonate). The carbonate grades to Blanchetown Clay at 80 cm.
- B2** Shallow calcareous sandy loam (Petrocalcic Calcarosol)
Medium thickness brown moderately calcareous loamy sand to light sandy clay loam with variable calcrete fragments, overlying sheet calcrete or heavy rubble grading to soft very highly calcareous pale brown sandy loam to clay loam with decreasing rubble content. The profile overlies Blanchetown Clay at depths from 100 cm to 10 m.
- B6** Sandy loam over red clay on calcrete (Petrocalcic, Red Chromosol)
Medium thickness reddish brown slightly calcareous soft sandy loam, overlying a brown massive sandy clay loam to sandy clay on sheet calcrete (Class II carbonate) at 30 cm.
- B7** Shallow sand over sandy clay (Petrocalcic, Brown Sodosol)
Thin brown sand to sandy loam with a pink A2 horizon, overlying an orange sandy clay loam to light clay with calcrete fragments. At 30 cm is a layer of massive or rubbly calcrete, grading to a pale brown very highly calcareous clayey sand to sandy clay.
- C1** Gradational sandy loam (Lithocalcic, Red Kandosol)
Medium thickness reddish loamy sand to light sandy clay loam, grading to a red brown weakly structured sandy clay loam to light clay, over a highly calcareous layer with abundant carbonate nodules from 30 cm (Class III B carbonate). Brown, yellow, red and grey clayey sand to sandy clay underlies the carbonate from 70 cm.
- D2** Sandy loam over red clay (Sodic, Hypercalcic, Red Chromosol)
Medium thickness red brown loamy sand to clay loam with weak structure, overlying a dark reddish brown clay with strong blocky structure, highly calcareous from 30 cm, with abundant soft carbonate segregations (Class I carbonate). The carbonate grades to Hindmarsh Clay at 90 cm.
- G1** Sand over red sandy clay (Hypercalcic, Red Sodosol)
Thick red brown sand with a paler coloured A2 horizon, overlying a red sandy clay with weak coarse columnar structure and up to 50% soft Class III A carbonate from 55 cm. Semi-hard calcrete pans occur in many profiles. Soft sandstone from 80 cm.
- G2** Thick bleached sand over sandy clay loam (Bleached-Sodic, Calcic, Yellow Kandosol)
Very thick white sand, organically darkened at the surface, overlying a reddish yellow massive clayey sand to light sandy clay loam with limited soft calcareous segregations (Class IV carbonate) from 90 cm. The profile becomes sandier with depth.
- G3** Thick sand over clay (Calcic, Brown Sodosol)
Thick grey sand with a strongly bleached A2 horizon, overlying a yellowish brown, brown and red mottled sandy clay with coarse columnar structure, more clayey with depth, and highly calcareous (Class I carbonate) from 80 cm.
- G4** Sand over brown dispersive sandy clay (Lithocalcic, Brown Sodosol)
Medium thickness brown sand with a thin bleached A2 horizon, overlying a brown and red columnar sandy clay becoming more clayey and massive with depth, grading to a very highly calcareous pale brown clayey sand to sandy clay with up to 50% carbonate nodules (Class III A or B carbonate). This is underlain by a brown, yellow, grey and red sandy clay from 70 cm.

Further information: [DEWNR Soil and Land Program](#)

