SYC Sandy Creek Land System

Sandy rises and low hills between Rowland Flat and Sandy Creek

Area: 28.6 km^2

Annual rainfall: 550 – 625 mm average

Geology: The landscape is underlain by basement siltstones, slates and fine sandstones, but on about 90% of the area they are covered by younger materials of mainly Tertiary age. These are usually massive clayey sands to sandy clays, commonly indurated to weak sandstones, with characteristic bright red, yellow and grey colourings. These sediments have been extensively reworked by water and wind. This has resulted in sandy and gravelly sediments commonly accumulating in drainage depressions, and deep sand banks on slopes. The sediments were apparently lateritized at some stage, as there are lateritic remnants on some crests, and transported ironstone gravel is common in many soils.

Topography: The land system is a belt of undulating to gently rolling rises and low hills dominated by sandy soils. The rises are separated by broad drainage depressions. Slopes over most of the land are less than 20%, except near Rowland Flat where the North Para River has cut a shallow steep sided gorge. Adjacent to these slopes are dissected rises of deep sands.

Elevation: 170 m to 260 m

Relief: 20 to 50 m

Soils: There is a wide range of soils reflecting the variety of geological materials in the land system. Soils formed on Tertiary sediments predominate. These usually have sandy surfaces with variable clayey subsoils. Deep sands and gravelly sands also occur. There are some loamy texture contrast soils. Texture contrast soils also dominate flats and lower slopes underlain by alluvium. Subsoils are invariably sodic, and surface soils vary from sands to loams. Deep sands occur in places. Soils formed on basement rocks are limited and are either shallow and stony or loam over red clay types.

Main soils:

G2 Bleached sand over sandy clay loam on Tertiary sandstone
H3 Bleached siliceous sand on reworked windblown Tertiary deposits
G3b Thick sand over clay on alluvium
F2b Sandy loam over poorly structured brown clay on alluvium

Minor soils:

Soils formed on Tertiary sediments
D6 Ironstone gravelly loam over red clay
F2a Sandy loam over poorly structured brown clay
G3a Thick sand over clay
G4 Sand over poorly structured clay
M3 Shallow stony loamy sand
Soils formed on basement rocks
D1 Shallow loam over red clay on rock
D7 Sandy loam over red clay on rock
L1 Shallow stony loam

Ironstone soils

J2 Deep acidic ironstone soil on lateritized Tertiary materials

Soils formed in alluvium

C1 Gradational red sandy loam

D2 Loam over red clay

D3 Sandy loam over poorly structured red clay

M1a Gravelly loamy sand associated with Tertiary sediments

M1b Sandy loam associated with basement rocks

Main features: The Sandy Creek Land System is characterized by undulating to gently rolling rises and low hills formed on Tertiary sediments. Surface soils are typically leached siliceous sands, but there is a variety of subsoils which affect drainage, waterholding capacity and root growth. All of these soils are infertile and prone to acidification, water repellence, and wind and water erosion. Minor loamy soils formed on outcrops of basement rock protruding through the Tertiary cover are the most fertile of the System. Despite the low agricultural quality of the land, it has potential for horticultural development provided that irrigation, drainage and nutrition are adequately managed.

Soil Landscape Unit summary: 12 Soil Landscape Units (SLUs) mapped in the Sandy Creek Land System

SLU	% of area	Main features #
AZm	3.0	Steep slopes created by the down cutting of the North Para River. Slopes are variable up to 100% and relief is up to 40 m. There is up to 50% surface stone and rocky outcrop. Minor discontinuous flats adjoin the river. Main soils: Shallow stony loam - **L1** (V) } over basement rock on slopes Shallow loam over red clay - **D1** (L) } Deep sandy loam - **M1b** (L) on flats This land is either steep and rocky, or subject to flooding, so has very limited agricultural potential, but high conservation and water resource protection value.
DBC	6.5	Undulating rises and gentle slopes with relief to 30 m and slopes of 4-12%. Underlying rocks are siltstones, slates and fine sandstones, mantled by soft carbonates. Surface stone is minor. There is no rock outcrop. Loam over red clay soils predominate. Main soils: Shallow loam over red clay - **D1** (V) on slopes Loam over red clay - **D2** (L) on lower slopes These soils are moderately deep to deep, well drained and inherently fertile. Although there is a moderate erosion potential, the land is suited to a range of annual and perennial crops.
DFC	1.0	Undulating rises to 30 m high formed on calcified siltstones and slates. Slopes are 3-10%. A wide variety of soils occurs, differences being mainly attributable to parent materials. Common profiles include loams over red brown clays, cracking clays, and calcareous and non-calcareous loams. Main soils: shallow loam over red clay - **D1** (C), shallow gradational red loam - **C2** (C) and shallow stony loam - **L1** (L), all on basement rock, and gradational calcareous clay loam - **A6** (L), gradational friable red clay loam - **C3** (L) and black cracking clay - **E1** (M), all on deeply weathered rocks. Loam over red clay - **D2** (M) occurs on alluvium on lower slopes. The shallower soils on basement rock are similar to those of **DCC**, but the deeper soils on highly weathered rocks or alluvium are fertile and have high waterholding capacities. Although some have poor surface structure, they are potentially highly productive.
GAC	35.8	Undulating rises with relief to 40 m and slopes of 3-8% formed on massive clayey sands to sandy clays, commonly indurated to weak sandstones, with characteristic bright red, yellow and grey colourings. Water courses are only weakly defined. There is no surface stone or rock outcrop. The soils generally have sandy surfaces with a range of subsoils including friable sandy clay, sodic heavy clay, ironstone rich clay and loose sand. Main soils: Bleached sand over sandy clay loam - **G2** (E) } on slopes Bleached siliceous sand - **H3** (C) } Sand over poorly structured clay - **G4** (L) }

		Thick sand over clay - **G3a** (L) } on slopes Ironstone gravelly loam over red clay - **D6** (L) } Thick sand over clay - **G3b** (M) on lower slopes and flats The soils are all infertile and generally acidic, or at least prone to acidification. All are susceptible to water repellence and erosion by both wind and water. Drainage is variable. Most soils are moderately well to well drained and have satisfactory root growth conditions (except for those with sodic clay subsoils - G4 and G3b). Most soils are moderately deep to deep with adequate waterholding capacities. In places there is sub surface seepage resulting in minor lower slope salinization. Provided irrigation, drainage and nutrition are managed adequately, the land is suitable for horticulture. Productive potential from field crops and pastures is low.
GBC GBD	4.5 11.2	Gently rolling rises and low hills to 50 m high, formed on Tertiary clayey sands, sandy clays and gravels, usually weakly indurated to sandstones and conglomerates. On the margins, these sediments are thin over underlying basement rock. Slopes are 8-16%. Drainage depressions are broad and shallow with weakly defined water courses. **GBC** Undulating rises with relief to 20 m and slopes of 3-8%. **GBD** Gently rolling rises and low hills with relief to 50 m and slopes of 8-16%. Sand to sandy loam over clay soils are dominant, although variable subsoils include friable sandy clays, ironstone clays and heavy sodic clays. There are also deep reddish sands, gravelly soils, and ironstone gravelly soils on kaolinitic sandstone. Main soils: Bleached sand over sandy clay loam - **G2** (E) Ironstone gravelly loam over red clay - **D6** (L) Sandy loam over poorly structured brown clay - **F2a** (L) Deep loamy sand - **M1a** (L) Shallow stony loamy sand - **M3** (M) Sandy loam over red clay on rock - **D7** (M) Soils are variable, but low natural fertility is an over-riding feature of this land. Most soils are moderately deep to deep, and most are acidic. Impeded drainage is a limitation on F2a soils, but drainage is adequate in the others. Most of the soils are highly erodible to both wind and water, so care is needed during crop establishment. The land is generally suited to perennial horticulture and viticulture, where water is available.
GFB GFC GFE GFJ	7.0 8.8 8.3 5.9	Lower slopes and drainage depressions formed on alluvial sands, clayey sands and sandy clays derived from upslope Tertiary materials. Slopes are gently inclined, between 2% and 10%, below steeper rising ground. Drainage depressions are up to 300 metres wide, with floor slopes of less than 2%, rising to 5% on margins. Water courses are moderately well defined and are sometimes gullied. There is no rock or stone. **GFB** Very gently inclined lower slopes of 1-3%. **GFC** Gently inclined lower slopes of 3-10%. **GFE** Drainage depressions with slopes of 2% (floors) to 5% (margins). **GFJ** Drainage depressions (as for **GFE**) with eroded water courses. Texture contrast soils are predominant. Most have sandy surfaces with sodic clay subsoils, but some have well structured friable subsoils. There are also deep sandy soils. Main soils: Thick sand over clay - **G3b** (E) Sandy loam over poorly structured brown clay - **F2b** (C) Sand over poorly structured brown clay - **G4** (L) Sandy loam over poorly structured red clay - **D3** (L) Deep loamy sand - **M1a** (L) Deep acidic ironstone soil - **J2** (M) on some crests These soils are deep but generally imperfectly drained and infertile. Most are neutral to acidic at the surface, but alkaline with depth. There are sporadic saline seepages. The soils are highly erodible (to both water and wind). The land has potential for horticulture and viticulture, but drainage and salinity problems are a threat.
GNI	7.7	Irregular slopes created by the dissection of Tertiary sediments by the North Para River. Slopes range from 10% to 40% and maximum relief is 40 m. Deep gullies occur in some water courses. The underlying sediments are loose windblown sands and associated sandstones. The soils are mostly deep sands. Less common soils have clayey subsoils at varying depths. Main soils: Bleached siliceous sand - **H3** (E) Bleached sand over sandy clay loam - **G2** (E) Ironstone gravelly loam over red clay - **D6** (L)

		The soils are deep but highly infertile, water repellent and subject to wind erosion. The landscape is irregular and often steep and is largely uncleared except where it has been quarried for sand.
JGJ	0.3	Outwash fans and flats formed on clay and sandy clay alluvium. **JGJ** Eroded water courses and immediately adjacent outwash fan slopes. Main soils: hard sandy loam over red clay - **D2a** (E) and clay loam over red clay - **D2b** (C) with hard sandy loam over dispersive red clay - **D3** (L), thick loamy sand over red clay - **G3b** (L), sandy loam over brown mottled clay - **F1/G3** (L), sandy loam over poorly structured clay - **F2a** (M) and calcareous clay loam - **A6** (M). Soils of **JGD** in particular are very stony. The dispersive soils are dominant in **JGP**. Soils are deep and moderately fertile, and generally well drained, although dispersive subsoils cause water tables to develop on top of the clay in winter. The main limitation is poor surface structure which restricts water entry, reduces waterholding capacity, impedes good shallow root growth and predisposes the soils to erosion, particularly if excessively worked. All sloping land is at risk of erosion if disturbed. Erosion has been severe in the past, especially in **JGJ**. The problem of imperfect drainage in **JGP** is exacerbated in places by salinity.

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 formed on calcified basement rock

D1 Shallow loam over red clay on rock (Hypercalcic, Red Chromosol)
Medium thickness hard setting loam with a paler and stony A2 horizon, overlying a dark reddish brown well structured clay which is highly calcareous from about 50 cm. Weathering calcified siltstone or slate occurs within 100 cm.

D7 Sandy loam over red clay on rock (Calcic, Red Sodosol)
Medium thickness hard quartz gravelly sandy loam with a bleached A2 layer, over a red dispersive clay, calcareous from about 40 cm, grading to weathering quartzitic phyllite.

L1 Shallow stony loam (Calcareous, Paralithic, Leptic Tenosol)
Thick stony reddish brown loam, grading to calcified weathering siltstone or fine sandstone within 50 cm.

Soils formed on Tertiary sediments

D6 Ironstone gravelly loam over red clay (Calcic, Red Chromosol)
Medium thickness reddish brown loamy sand to sandy loam with a paler coloured and ironstone gravelly A2 horizon, overlying a well structured red clay with soft calcareous segregations (Class III A carbonate) from 70 cm, grading to soft ferruginized sandstone at 100 cm.

F2a Sandy loam over poorly structured brown clay (Eutrophic, Brown Sodosol)
Thick brown loamy sand to sandy loam with a bleached and quartz gravelly A2 horizon, overlying a brown, yellow and red mottled clay with strong blocky structure, grading to soft sandstone deeper than 100 cm.

G2 Bleached sand over sandy clay loam (Bleached, Mesotrophic, Brown Chromosol)
Thick grey sand with a bleached A2 horizon containing ironstone and sandstone gravel, overlying a brown, yellow and red sandy clay loam to clay, grading to weakly cemented Tertiary sandstone within 100 cm.

G3a Thick sand over clay (Bleached, Mesotrophic, Yellow Chromosol)
Thick grey sand to loamy sand with a bleached and ironstone gravelly A2 horizon, overlying a yellow and red sandy clay to clay with ironstone gravel, grading to a grey and red mottled sandy clay forming in indurated sandstone deeper than 200 cm.

G4 Sand over poorly structured clay (Calcic, Brown Sodosol)
Medium to thick brown loamy sand to light sandy loam with a bleached A2 horizon, overlying a dark brown, yellow and red mottled clay with strong coarse columnar structure, and up to 50% soft calcareous segregations (Class I carbonate) from 65 cm, grading to Tertiary sandy clay.

H3 Bleached siliceous sand (Basic, Arenic, Bleached-Orthic Tenosol)
Very thick white sand, organically darkened at the surface, overlying yellow loose sand.

M3 Shallow stony loamy sand (Basic, Regolithic, Bleached-Orthic Tenosol)
Thick grey gravelly loamy coarse sand to coarse sandy loam with a bleached A2 horizon containing more than 50% quartz gravel and cobbles, overlying a yellow gravelly sandy clay loam grading to gravel and stone beds in a clay matrix.

Ironstone soils

J2 Deep acidic ironstone soil on Tertiary materials (Ferric, Mesotrophic / Petroferric, Brown / Red Kurosol)
Thick brown very ironstone gravelly loamy sand with a pale A2 horizon, overlying a red, brownish yellow and orange sandy clay to sandy clay loam with ironstone gravel throughout, grading to sandstone or ferricrete.

Soils formed in alluvium

C1 Gradational red sandy loam (Calcic, Red Kandosol)
Thick reddish brown loamy sand to fine sandy loam with a pink A2 horizon, overlying a yellowish red weakly structured clay loam to clay, calcareous with depth.

D2 Loam over red clay (Sodic, Calcic, Red Chromosol)
Thick loam with a paler coloured A2 horizon, overlying a dark reddish brown, well structured clay , which is highly calcareous (Class I carbonate) from about 60 cm. The soil grades to medium to fine grained alluvium below 100 cm.

D3 Sandy loam over poorly structured red clay (Calcic, Red Sodosol)
Medium thickness brown loamy sand to light sandy clay loam with a bleached A2 horizon, overlying a red and brown mottled clay with prismatic structure and calcareous segregations (Class I carbonate) from 50 cm.

F2b Sandy loam over poorly structured brown clay (Calcic, Brown Sodosol)
Thick grey brown massive sandy loam to loam with a bleached A2 horizon, overlying a yellowish brown, dark brown and grey mottled clay with strong blocky structure and soft Class I carbonate from 75 cm.

G3b Thick sand over clay (Eutrophic, Brown Sodosol)
Thick soft greyish brown sand to loamy sand with a bleached A2 horizon, overlying a yellowish brown, grey and red mottled clay with coarse prismatic structure.

M1a Deep loamy sand (Basic, Regolithic, Brown-Orthic Tenosol)
Very thick brown loamy sand with a yellowish and quartz gravelly A2 horizon, overlying a yellowish red clayey sand with variable gravel.

M1b Deep sandy loam (Basic, Regolithic, Brown-Orthic / Red-Orthic Tenosol)
Thick brown sandy loam to loamy sand, overlying a reddish brown clayey coarse sand to silty sand, grading to variable sandy and gritty alluvial sediments.

Further information: DEWNR Soil and Land Program