

MNN Mannanarie Land System

Undulating rises in the Mannanarie area

Area: 87.4 km²

Annual rainfall: 390 – 500 mm average

Geology: Most of the land system is underlain by fine grained rocks (siltstones and slates) of the Saddleworth and Tapley Hill Formations, with less common strata of Appila Tillite. Between the basement rock highs are valleys infilled with locally derived clay and sandy clay alluvium (Pooraka Formation). Rocks and sediments are mantled by windblown carbonate which is usually soft and fine grained, but in places has been hardened by exposure at or near the surface to form calcretes of various forms.

Topography: The landscape consists of undulating basement rock rises and associated gently inclined outwash fans grading to flats with watercourses draining northwards to the Black Rock Plain Land System. Slopes of the rises are generally less than 10% although there are some steeper rocky ridges with slopes to 20%. Fan slopes range from 2% adjacent to creek flats to 8% where they abut basement rock highs. Creek flat slopes are less than 2%. Watercourses are sometimes eroded, and most flats and adjacent lower fan slopes are sporadically affected by saline seepage.

Elevation: 480 m in the north (where drainage systems flow on to the Black Rock Plain Land System) to 630 m in the south.

Relief: Up to 70 m, (rocky ridges) but generally less than 30 m

Soils: Loamy texture contrast soils are common on both rises and flats. They are associated with gradational loams, calcareous loams and shallow stony loams.

Main soils

Soils formed on alluvium on gentle slopes and flats

- D2** Hard loam over red clay
- D3** Hard loam over dispersive red clay
- C3** Deep gradational loam

Soils formed on weathering rock on rising ground

- D1/D7** Hard loam over (dispersive) red clay on rock
- A2** Shallow calcareous loam over rock
- C2** Shallow gradational loam

Minor soils

Soils formed on alluvium on gentle slopes and flats

- A3** Deep calcareous loam

Soils formed on rock on steep rocky ridges

- L1** Shallow stony loam



Main features: This land system has a roughly equal mixture of rises with calcareous loams and loam over clay soils, and flats with red loamy texture contrast and gradational soils. It is fully arable except for some rocky reefs usually on steeper ridges. The soils on the rising ground are often shallow but the moisture holding capacity of the underlying weathering rock at least in part overcomes this limitation. The slopes are prone to erosion but this potential threat can be minimized through appropriate management practices. Natural fertility is moderate to high, with the more alkaline soils marginally susceptible to "lime-induced" deficiencies. The soils on the lower slopes and flats are deeper but are more likely to have structural problems, particularly those with dispersive subsoils. These can lead to excessive runoff and erosion, working difficulties and emergence problems. Sporadic saline seepage is a feature of the lower lying land.

Soil Landscape Unit Summary: 12 Soil Landscape Units (SLUs) mapped in the Mannanarie Land System:

SLU	% of area	Main features #
DCB DCC	1.0 22.9	Rises with relief of up to 40 m formed on generally fine grained basement rock. DCB Slopes of 1-3%. DCC Slopes of 3-10%. Main soils: shallow over rock- <u>hard loam over red clay on rock</u> - D1 (E), <u>shallow gradational loam</u> - C2 (E) and <u>shallow calcareous loam on rock</u> - A2 (E). The basement rock is commonly less than 50 cm deep, but usually has moisture storage capacity in its vertical fissures, thus overcoming an apparent limitation. Natural fertility is moderate to high, but hard setting and sealing surfaces are a problem - erosion potential is therefore significant.
DSD	2.6	Moderately inclined footslopes adjacent to Narien Range with slopes 10-15% and relief to 40 m. Main soils: <u>hard loam over red clay on rock</u> - D1 (E) and <u>shallow stony loam</u> - L1 (E). Slopes are semi-arable due to gradients. Erosion potential high due to slope and position below steeper land generating significant runoff. Rocky reefs and frequent watercourses also limit cropping potential.
DXH	6.6	Footslope complex of basement rock rises and valleys. Slopes 5-10% and maximum relief is 30 m. Main soils: <u>hard loam over (dispersive) red clay on rock</u> - D1/D7 (E) on rises and in valleys, with <u>shallow calcareous loam on rock</u> - A2 (L) and <u>shallow gradational loam</u> - C2 (M) on rises, and <u>hard loam over (dispersive) red clay</u> - D2/D3 (E), with <u>deep gradational loam</u> - C3 (M) over alluvium. The land is characterized by hard setting surface soils and poorly structured subsoils, and is highly susceptible to erosion, particularly as it lies below higher ground producing run off water. The poor structure also causes workability problems and patchy emergence.
EGB EGC	5.2 9.9	Rises and low hills formed on basement siltstones. EGB Rises with slopes of 1-4%. EGC Rises with slopes of 3-10% and up to 5% rocky outcrop. Main soils: well drained <u>shallow calcareous loam on rock</u> - A2 (V), with <u>hard loam over red clay on rock</u> - D1 (C) and <u>shallow gradational loam</u> - C2 (L). The land is fully arable (except for minor outcrop), but because most of the soils are relatively shallow, moisture shortages may limit crops in dry finishes. Reduction of water loss and erosion through runoff is the main management issue, together with fertility maintenance.
ESD	3.6	Rocky ridges with slopes of 10-20%, maximum relief of 60 m, and 10-20% rocky outcrops. Main soils: <u>shallow gradational loam</u> - C2 (E) and <u>shallow calcareous loam on rock</u> - A2 (E) formed over siltstone basement rock and containing variable amounts of soft and rubbly carbonate. <u>Shallow stony loam</u> - L1 (L) occurs in rocky areas. Rocky reefs, shallow stony soils and sometimes moderate slopes limit cropping of these areas. The arable land is generally confined to strips between the reefs of rock. Water erosion is a potential problem because of the high runoff from the shallow soils and rocky areas.



JEA	2.9	Flats and fans formed on alluvium.
JEB	31.3	JEA Creek flats with slopes of less than 1% and a well defined watercourse.
JEC	7.6	JEB Very gently inclined fans with slopes of 1-3% and well defined watercourses. There are minor small basement rock rises throughout.
JEE	1.8	
JEJ	4.6	JEC Gently inclined fans with slopes of 3-7% and well defined watercourses. There are minor small basement rock rises throughout.
		JEE Narrow drainage depression with slopes of less than 2%.
		JEJ Narrow drainage depression with slopes of less than 2% and an eroded watercourse.
		Main soils: <u>hard loam over (dispersive) red clay - D2/D3 (V)</u> , with <u>deep gradational loam - C3 (L)</u> and <u>deep calcareous loam - A3 (L)</u> . Soils are generally naturally fertile although many have unfavourable physical properties, particularly the texture contrast soils (D3 and to a lesser extent D2). These characteristics result in poor water infiltration, patchy emergence and sub optimal root growth. Erosion can then be a problem, as indicated by some old scalded areas. Gradational C3 and A3 soils are well structured and potentially most productive. There is sporadic saline seepage on lower slopes and in drainage depressions. Waterlogging may be a problem for brief periods in wet seasons.

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

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

Detailed soil profile descriptions:

- A2** Shallow calcareous loam over rock (Paralithic / Petrocalcic, Calcic / Lithocalcic Calcarosol)
Medium thickness calcareous loam over soft to rubbly carbonate grading to weathering siltstone within 100 cm. In 10% of soils the carbonate layer is in sheet rock form.
- A3** Deep calcareous loam (Hypercalcic Calcarosol)
Calcareous loam to clay loam grading to a very highly calcareous clay with abundant soft carbonate within 50 cm, continuing below 100 cm in alluvium.
- C2** Shallow gradational loam (Calcic, Red Dermosol)
Medium thickness loam to clay loam grading to a well structured red clay with soft (occasionally rubbly) carbonate at depth, overlying weathering rock within 100 cm.
- C3** Deep gradational loam (Calcic, Red Dermosol)
Medium thickness loam to clay loam grading to a well structured red clay with soft (occasionally rubbly) carbonate at depth, overlying alluvium.
- D1/D7** Hard loam over (dispersive) red clay on rock (Calcic, Red Chromosol / Sodosol)
Medium thickness hard massive sandy loam to clay loam abruptly overlying a well structured friable red clay (Chromosol - D1), or poorly structured and dispersive red clay (Sodosol - D7), grading to soft carbonate with weathering rock within a metre.
- D2** Hard loam over red clay (Calcic, Red Chromosol)
Medium thickness hard massive sandy loam to clay loam abruptly overlying a well structured friable red clay grading to soft carbonate overlying alluvium.
- D3** Hard loam over dispersive red clay (Calcic, Red Sodosol)
Medium thickness hard massive sandy loam to clay loam abruptly overlying a poorly structured and dispersive red clay grading to soft carbonate overlying alluvium.
- L1** Shallow stony loam (Lithic, Leptic Tenosol / Rudosol)
Shallow stony loam grading to hard basement rock within 50 cm.

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

