

# SDW Saddleworth Land System

Undulating rises and valley flats of the Gilbert River Valley, from north of Manoora to Stockport

**Area:** 294.2 km<sup>2</sup>

**Annual rainfall:** 425 – 525 mm average

**Geology:** The land system is almost entirely underlain by siltstones of the Saddleworth Formation, with a narrow strip of Bethel Shale along the eastern margin, and a discontinuous strip of Undalya Quartzite along the western side. Calcareous or dolomitic strata are interbedded with the siltstones in places. The rocks are mostly mantled by aeolian carbonates which have accumulated in the lower soil profile. In places, especially where there are calcareous rocks, these usually soft carbonates have hardened into thin calcrete sheets overlying the basement siltstones. Extensive erosion and reworking of the soft basement rocks has resulted in large areas of alluvium, forming valley floors or outwash fans between the basement highs.

**Topography:** The land system represents a significant proportion of the Gilbert River valley above Stockport. The eastern boundary is clearly defined by a continuous and abrupt quartzite ridge. The River catchment extends beyond the western boundary which is defined by the edge of the Saddleworth Formation. The System has a remarkably consistent pattern of undulating rises and gently inclined outwash fans all draining toward the Gilbert which flows in a southerly direction near the western side of the System. Slopes on the rises rarely exceed 10%, while on the fans, 8% is the maximum. Water course erosion is common on fans and in drainage depressions, and saline seepage is common in places on the Gilbert River flats.

**Elevation:** 500 m at the northern end to 160 m at Stockport

**Relief:** Maximum relief is 60 m, but is commonly 20 - 40 m

**Soils:** Characteristic features of the soils include loamy to clay loamy surfaces with well structured red clayey subsoils. Soils which are clayey throughout are common.

**Main soils:**

- D1a** Hard loam over red clay on rock - extensive (rises)
- D1b** Hard loam over red clay on highly calcareous rock - extensive (rises)
- C2a** Shallow gradational red loam - limited (rises)
- D3** Hard loam over dispersive red clay - common (alluvial outwash fans and flats)

**Minor soils:** *Soils formed over weathering / deeply weathered basement rock on rises*

- A2** Calcareous loam
- B4** Shallow friable loam over calcrete
- C3a** Deep red clay loam
- C2b** Shallow friable loam
- D7** Hard loam over dispersive red clay on rock
- E3** Brown to red cracking clay
- L1** Shallow stony loam over rock

*Soils formed over clayey alluvium on outwash fans and flats*

- C3b** Deep gradational red loam
- D2** Hard loam over well structured red clay
- E2/E3** Red / brown cracking clay
- M2** Deep red clay loam



**Main features:** The Saddleworth Land System is characterized by medium to fine textured soils derived from siltstone parent rocks, in an undulating landscape. The soils are inherently fertile, moderately deep to deep and well drained. All land is arable except some minor steep rocky slopes and some wet saline flats associated with the Gilbert River. The main soil limitation is poor surface structure, mainly in texture contrast soils. This leads to excessive runoff and erosion, working difficulties and problems with emergence/early crop growth. However, the use of gypsum and modifications to surface management techniques can largely overcome this condition. Minor problems include water course erosion and waterlogging, salinity and boron toxicity on some flats and lower slopes. Overall, productivity potential is high.

**Soil Landscape Unit summary:** 18 Soil Landscape Units (SLUs) mapped in the Saddleworth Land System

SLU	% of area	Main features #
AAI	0.3	Non arable rocky slopes of 15-25% with eroded watercourses. Main soils: <u>shallow friable loam</u> - <b>C2b/L1</b> (V) and <u>calcareous loam</u> - <b>A2</b> (C). These slopes are exposed, with shallow stony soils. Agricultural uses are restricted to grazing.
DEB DEC	9.8 43.4	Undulating rises formed on siltstones of the Saddleworth Formation. <b>DEB</b> Low rises and very gentle slopes of 2-3%. <b>DEC</b> Rises and gentle slopes of 3-10%. Main soils: <u>hard loam over red clay on rock</u> - <b>D1a/D1b</b> (E), <u>shallow gradational red loam</u> - <b>C2a</b> (C), and <u>shallow friable loam over calcrete</u> - <b>B4</b> (C), with <u>deep red clay loam to clay</u> - <b>C3a/E3</b> (L), <u>hard loam over dispersive red clay on rock</u> - <b>D7</b> (M) and <u>calcareous loam</u> - <b>A2</b> (M). These soils are generally moderately deep, inherently fertile and well drained. Hard setting sealing surfaces are widespread, particularly in the texture contrast soils (D1 and D7), and these result in excessive runoff and erosion, as well as workability difficulties and emergence/early growth problems. The gradational loams are well structured, and represent the best soils, although some B4 soils are shallow. The clayey soils are very fertile, but difficult to work, and are often slow to respond to rain due to their high wilting points. Boron toxicity is associated with some soils on lower slopes. Overall, provided that erosion is controlled, this land is potentially highly productive.
DOC DOD	0.6 2.0	Low ridges formed on Undalya Quartzite. <b>DOC</b> Slopes are 5-12%. <b>DOD</b> Slopes are 10-20% with minor rock outcrop and up to 20% surface quartzite. Main soils: <u>hard loam over red clay on rock</u> - <b>D1a/D1b</b> (E) and <u>hard loam over dispersive red clay on rock</u> - <b>D7</b> (E), with <u>shallow friable loam</u> - <b>C2b/L1</b> (C) and <u>shallow friable loam over calcrete</u> - <b>B4</b> (L). These soils are generally fertile and moderately deep, but have poorly structured hard setting surfaces. The D7 soils have poorly structured dispersive subsoils as well. These conditions lead to excessive runoff and associated erosion, poor workability and restricted emergence and early growth. The D7 soils are also likely to suffer from subsurface waterlogging due to perched water tables. Much of the land is only semi arable due to the slope and stone cover.
EJD	0.9	Rises to 30 m high with slopes of 10-20% formed on calcareous rocks. There is up to 20% rocky outcrop. Main soils: <u>shallow friable loam</u> - <b>C2b/L1</b> (E), with <u>hard loam over red clay on rock</u> - <b>D1a/D1b</b> (C) and <u>shallow friable loam over calcrete</u> - <b>B4</b> (L). This land is semi arable due to moderate slopes and rocky outcrops with associated shallow soils.
ESD	2.8	Moderately steep semi arable rises and footslopes with slopes of 10-20% and up to 10% rocky outcrop. Main soils: <u>hard loam over red clay on rock</u> - <b>D1a/D1b</b> (E) and <u>shallow friable loam</u> - <b>C2b/L1</b> (E). This land is too steep and stony for extensive cropping, although gentler slopes are similar to <b>DEC</b> , with productive potential. Elsewhere the land is useful for grazing or establishment of woodlots or shelter belts.



JAA	6.2	Flats and outwash fans formed on fine grained alluvium.
JAB	10.8	<b>JAA</b> Flats of the Gilbert River.
JAC	2.2	<b>JAB</b> Fans with slopes of 2-3%.
JAG	9.4	<b>JAC</b> Fans with slopes of 3-6%.
JAH	3.1	<b>JAG</b> Fans with slopes of 2-4% and eroded water courses.
JAJ	1.5	<b>JAH</b> Fans with slopes of 3-8% and eroded water courses.
JAK	1.1	<b>JAJ</b> Drainage depressions with slopes of 2-6% and severely eroded water courses.
JAO	0.4	<b>JAK</b> Flats of the Gilbert River with sporadic saline seepage.
JAP	1.5	<b>JAO</b> Drainage depressions with sporadic saline seepage. <b>JAP</b> Wet flats of the Gilbert River, with moderate to high levels of salinity. Main soils: <u>hard loam over dispersive red clay</u> - <b>D3</b> (E), <u>hard loam over well structured red clay</u> - <b>D2</b> (C) and <u>deep gradational red loam to clay loam</u> - <b>C3b/M2</b> (C), with <u>red / brown cracking clay</u> - <b>E2/E3</b> (L). The Gilbert River flats have less clayey soils than the fans and drainage depressions. These soils are deep and inherently fertile, but are prone to hard setting, sealing surfaces. These shed water, are difficult to work and cause emergence/early growth problems. They are also erodible. The D3 soils, with poorly structured and dispersive subsoils as well, are the most difficult to manage - the C3 soils are the best. Although the clays are well structured, they are prone to waterlogging and become sticky and intractable when wet. Water course erosion is common on many fans, so runoff control measures are required. Salinity has been a long term condition in the main river valley, but salt levels should be monitored throughout this land as minor seepages are developing. Boron toxicity tends to be associated with salinity.
JXC	2.2	Outwash fans with slopes of 3-8% formed on a complex of fine grained alluvium and basement siltstones ( <b>JXC</b> ). In <b>JXH</b> there is minor water course erosion. Main soils: <u>hard loam over dispersive red clay</u> - <b>D3</b> (E), <u>hard loam over well structured red clay</u> - <b>D2</b> (L) and <u>deep gradational red loam to clay loam</u> - <b>C3b/M2</b> (L) with <u>red / brown cracking clay</u> - <b>E2/E3</b> (M) on outwash fans, and <u>hard loam over red clay on rock</u> - <b>D1a/D1b</b> (C), <u>shallow gradational red loam</u> - <b>C2a</b> (M), and <u>shallow friable loam over calcrete</u> - <b>B4</b> (M) on rises. This land has features similar to <b>JAC/JAH</b> on the fans and DEC on the rises.
JXH	1.8	

# 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:

- A2** Calcareous loam (Paralithic / Petrocalcic Calcarosol)  
Calcareous loam to clay loam over brown soft or rubbly carbonate on a calcrete pan at 30 cm (35% of profiles) grading to weathering siltstone from about 70 cm.
- B4** Shallow friable loam over calcrete (Petrocalcic, Red Dermosol / Petrocalcic, Leptic Tenosol)  
20 - 30 cm friable loam to clay loam grading to a red well structured clay loam in 70 % of profiles, and overlying hard calcrete at about 45 cm.
- C2a** Shallow gradational red loam (Hypercalcic, Red Dermosol)  
20 - 35 cm clay loam to loam grading to a well structured red clay with soft carbonate from about 50 cm, over weathering siltstone from about 100 cm.
- C2b** Shallow friable loam (Hypercalcic, Red Kandosol)  
20 - 30 cm friable loam grading to a red clay loam overlying highly calcareous weathering siltstone at about 45 cm.
- C3a** Deep red clay loam to clay (Hypercalcic, Red Dermosol)  
15 - 25 cm brown crumbly light to medium clay grading to a well structured red or black heavy clay, with soft carbonate from about 60 cm grading to weathering siltstone from 60 cm to more than 100 cm.



- C3b** Deep gradational red loam (Hypercalcic, Red Dermosol)  
20 cm crumbly clay loam to light clay grading to a well structured red clay, with soft carbonate from about 50 cm over alluvium.
- D1a** Hard loam over red clay on rock (Calcic, Red Chromosol)  
20 - 35 cm hard loam to clay loam abruptly overlying a well structured red clay with minor to moderate amounts of soft and occasionally hard carbonate from about 50 cm. 20% of profiles have no carbonate. The soil overlies weathering siltstone at about 100 cm.
- D1b** Hard loam over red clay on highly calcareous rock (Hypercalcic, Red Chromosol)  
15 - 30 cm hard loam to clay loam abruptly overlying a well structured red clay with abundant fine carbonate from about 50 cm. The soil overlies weathering siltstone at between 100 and 150 cm.
- D2** Hard loam over well structured red clay (Calcic, Red Chromosol)  
35 - 45 cm hard silty loam to clay loam abruptly overlying a well structured red clay with soft carbonate from about 60 cm, over alluvium.
- D3** Hard loam over dispersive red clay (Calcic, Red Sodosol)  
30 - 40 cm hard silty loam to clay loam, often with a bleached A2 layer, abruptly overlying a red or brown coarsely structured clay with soft carbonate from about 80 cm (may be absent), over alluvium.
- D7** Hard loam over dispersive red clay on rock (Calcic, Red Sodosol)  
20 cm hard quartz gravelly sandy loam to clay loam sharply overlying a red or brown coarsely structured dispersive clay with soft carbonate from about 40 cm, grading to quartzitic shale or sandstone, or quartz gravel from about 65 cm.
- E3** Brown to red cracking clay (Epipedal, Brown Vertosol)  
Well structured dark clay (seasonally cracking) grading to a coarsely structured dark brown to red clay with variable fine carbonate, grading to very highly weathered rock deeper than 200 cm.
- E2/E3** Red / brown cracking clay (Epipedal, Red / Brown Vertosol)  
10 - 30 cm well structured, seasonally cracking red to dark brown clay, becoming more clayey and coarser structured with depth, with soft carbonate from 55 cm, grading to clayey alluvium.
- L1** Shallow stony loam over rock (Calcareous, Paralithic, Leptic Tenosol)  
Up to 30 cm stony loam overlying weathering siltstone or quartzite with fine carbonate in fissures.
- M2** Deep red clay loam (Calcic, Red Dermosol)  
Well structured brown loam to clay loam grading to a well structured red clay, weakly calcareous with depth, over alluvial clay.

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

