

MCA McCallum Land System

(Based on the description by A. K. McCord in "A Description of Land in the Southern Mallee of South Australia")

Dunefields around the intersection of Hundreds of McCallum, Cannawigara, Senior and Shaugh.

Area: 278.4 km²

Annual rainfall: 425 – 485 mm average

Geology: The Land System is formed on Tertiary age clays (Blanchetown Clay equivalent), sandy clays and clayey sands which are calcified by fine carbonates, leached into the soil from aeolian deposition over a considerable time. The clays in turn are extensively overlain by windblown Molineaux Sand deposits.

Topography: The McCallum Land System comprises a tract of moderate sand dune country. The landscape is gently undulating, consisting of a very gently inclined plain overlain by moderate sand dunes which are rounded and of irregular shape, but which show a distinct east - west orientation. The distinctive feature of the McCallum Land System is that it also has limited areas of high parabolic dunes, unlike the neighbouring and otherwise similar Senior, Shaugh and Sherwood Land Systems. The flats and swales between the sand hills have sand over clay soils - clayey soils are uncommon.

Elevation: 80 - 160 m

Relief: 5 - 30 m

Soils: Sandy soils predominate. They may be deep or shallow over clayey subsoil. Hard sandy loam texture contrast soils are minor (on flats), as are cracking clays.

Main soils

Sandy rises

H3 Deep bleached sand - Extensive on dunes

G2 Sand grading to sandy clay loam - Common on lower dune slopes

Flats

G3 Thick sand over clay - Common on higher elevation flats and swales

Minor soils

Flats

G4 Sand over dispersive brown clay - flats and swales

F2 Hard loam over dispersive brown clay - broader flats

F1 Sandy loam over red brown clay - broader flats

E3 Hard grey cracking clay - flats and lower elevation swales

E1 Black cracking clay - flats and lower elevation swales

Vegetation: Mallee, heath and stringybark on dunes
Mallee and broombush on flats and swales



Main features: The McCallum Land System is typical sand dune - swale country with significant changes in soil type over short distances. The dunes are dominant. They are characterized by deep, infertile water repellent sands, sometimes with saline seepages where they contact the intervening flats and swales. Some, mainly in the west are high and extremely unstable if bared off. The flats between the larger dunes have sandy texture contrast soils with moderately low to moderate fertility and impeded drainage. The broader flats have a wider variety of soils, with sand or sandy loam over clayey subsoils (usually dispersive) and minor areas of poorly drained but fertile clay soils. Moderate salinity and boron toxicity are likely in clayey soils.

Soil Landscape Unit summary: 9 Soil Landscape Units (SLUs) mapped in the McCallum Land System:

SLU	% of area	Main features #
GaA	4.8	<p>Very gently undulating flats and swales, with limited gilgai, formed on Tertiary clays and sandy clays. Gilgai flats tend to be in the lower lying areas.</p> <p>Main soils: <u>thick sand over clay</u> - G3 (E) on flats and higher elevation swales, with <u>hard loam over dispersive brown clay</u> - F2 (L) on broader flats, and <u>sand over dispersive brown clay</u> - G4 (L), <u>hard grey cracking clay</u> - E3 (L) and <u>black cracking clay</u> - E1 (M) on flats and lower elevation swales.</p> <p>Key properties:</p> <p>Drainage: Generally well drained (G3 soils), but the rest are imperfectly drained due to dispersive clay subsoils or heavy poorly structured clays.</p> <p>Fertility: Marginal (sandy soils - G3/G4) to high (black cracking clays).</p> <p>Physical condition: Sandy soils and black cracking clays have loose sandy or friable surfaces which do not impede root growth. The loamy soils and grey cracking clays have hard surfaces which restrict emergence and root growth. All subsoil clays restrict root growth.</p> <p>AWHC: Moderate to high.</p> <p>Salinity: Moderately low to moderate in subsoils.</p> <p>Erosion potential: Water: Low. Wind: Moderately low.</p> <p>Water repellence: Nil (clayey E3/E1 soils) to moderate (sandy G3/G4 soils).</p> <p>Rockiness: Nil.</p> <p>Other: Boron toxicity can be expected in clay soils.</p> <p><u>Summary:</u> The flats are generally well drained, but lower elevation areas are imperfectly drained due to dispersive or heavy clay subsoils. Fertility varies from marginal on sand over clay soils to high on black cracking clays. Poor surface structure may be a problem on grey clays and loamy texture contrast soils. Subsoil salinity and boron toxicity can be expected.</p>
GbA	16.4	<p>Very gently undulating flats formed on Tertiary clays to sandy clays, overlain by 10-30% low (up to 5 m) dunes of Molineaux Sand.</p> <p>Main soils: <u>thick sand over clay</u> - G3 (E) with <u>sand over dispersive brown clay</u> - G4 (L), <u>sandy loam over red brown clay</u> - F1 (L) and <u>hard grey cracking clay</u> - E3 (M) on flats, and <u>deep bleached sand</u> - H3 (C) on dunes.</p> <p>Key properties:</p> <p>Drainage: Well (G3 and F1 soils) to imperfect (G4/E3 soils) on flats. Rapid on sandhills.</p> <p>Fertility: Moderately low on flats. Very low on sandhills.</p> <p>Physical condition: Good in surface (except grey cracking clays – E3). Limited subsoil restrictions associated with G3 and F1 soils, but texture contrast soils with dispersive clays (G4) and cracking clays (E3) have fair to poor subsoil structure due to their dispersive clays.</p> <p>AWHC: Moderate to moderately high on flats. Moderately low on sandhills.</p> <p>Salinity: Moderately low on flats. Low on sandhills.</p>



		<p>Erosion potential: Water: Low. Wind: Moderately low on flats. Moderately high on sandhills.</p> <p>Water repellence: Moderately low to nil on flats. High on sandhills.</p> <p>Rockiness: Nil.</p> <p><u>Summary:</u> The flats are generally well to moderately well drained, except for limited areas of sandy texture contrast soils and cracking clays where drainage is imperfect due to dispersive clay subsoils. Sandy surfaces are physically favourable, but low in fertility. Soils on rises are infertile, water repellent and prone to wind erosion.</p>
MHB	0.5	Isolated low stony rises formed on Bridgewater Formation calcarenites. These are outliers of the Archibald Range Land System.
OBE OBF OBI OBJ OBp	22.0 21.3 15.9 1.2 12.9	<p>Gently undulating plains comprising flats formed on Tertiary clays and sandy clays, and low to moderate jumbled sand dunes up to 10 metres high formed on Molineaux Sand. Some swales are prone to severe waterlogging or inundation.</p> <p>OBE 60-90% coverage of high dunes. OBF 60-90% coverage of moderate dunes OBI 30-60% coverage of moderate dunes. OBJ 30-60% coverage of low dunes. OBp 60-90% coverage of moderate dunes with up to 10% swales subject to seepage.</p> <p>Main soils: <u>deep bleached sand</u> - H3 (E) on dunes, with <u>sand grading to sandy clay loam</u> - G2 (C) in swales and dunes. <u>Thick sand over clay</u> - G3 (M-L), <u>sand over dispersive brown clay</u> - G4 (M-L) and <u>hard grey cracking clay</u> - E3 (M) occur in swales.</p> <p>Key properties:</p> <p>Drainage: Rapid (sand dunes). Well to imperfectly drained in swales, depending on the nature and depth of the subsoil. Subsoils of sand over dispersive clay soils and cracking clays cause water to perch and clay soils, once wet, have low permeability throughout. The swales in OBp prone to seepage are poorly drained.</p> <p>Fertility: Very low (sand hills). Moderately low (swales).</p> <p>Physical condition: Good in surface soils. Subsoils generally are not limiting except in the sand over dispersive clay soils (G4) and the cracking clays (E3) where dispersive clays restrict root growth. Deep sandy soils (H3 and G2) do not have limiting subsoils.</p> <p>AWHC: Moderately low (sandhills) to moderate in sandy gradational soils (G2), and moderately high (other soils).</p> <p>Salinity: Low (sand hills). Moderately low (swales).</p> <p>Erosion potential: Water: Low. Wind: Moderate to high (sand hills). Moderately low (swales).</p> <p>Water repellence: High (sandhills), moderate (swales).</p> <p>Rockiness: Nil.</p> <p>Other: Saline seepage at base of some sand hills.</p> <p><u>Summary:</u> Deep very infertile water repellent sands on dunes. Marginal fertility sand over clay soils with good moisture holding capacity dominate the swales, and are associated with sand over clay and cracking clay soils with impeded drainage and poor root growth conditions.</p>
TTA	5.0	<p>Low lying flats and swales, with extensive gilgai formed on clayey sediments of Tertiary age.</p> <p>Main soils: <u>hard grey cracking clay</u> - E3 (E) and <u>hard loam over dispersive brown clay</u> - F2 (C), with <u>black cracking clay</u> - E1 (L) in gilgai areas, and <u>sand over dispersive brown clay</u> - G4 (L) and <u>sandy loam over red brown clay</u> - F1 (M) elsewhere.</p> <p>Key properties:</p> <p>Drainage: Imperfect to poor due to heavy poorly structured clays and / or dispersive clay subsoils</p> <p>Fertility: Moderate to high (heavier soils) to moderately low (sandy soils).</p> <p>Physical condition: The loamy F2 soils and the grey cracking clays (E3) have hard surfaces which restrict emergence and root growth. Sandy soils (G4) and black cracking clays (E1) have loose sandy or friable surfaces which are not</p>



	<p>restrictive. All subsoil clays restrict root growth.</p> <p>AWHC: Moderate to high.</p> <p>Salinity: Moderately high in subsoils.</p> <p>Erosion potential: Water: Low. Wind: Moderately low.</p> <p>Water repellence: Nil (cracking clays) to moderate (sandy soils)</p> <p>Rockiness: Nil.</p> <p>Other: Boron toxicity can be expected in clay soils.</p> <p><u>Summary:</u> The flats are generally imperfectly to poorly drained due to heavy and / or dispersive clay soils at or near the surface. Fertility varies from moderate to high for the heavier soils to moderately low on sand over clay soils. Poor surface structure is widespread. Subsoil salinity and boron toxicity can be expected.</p>
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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:

- E1** Black cracking clay (Self-mulching, Black Vertosol)
Black self-mulching seasonally cracking clay, becoming coarser structured, greyer and calcareous with depth.
- E3** Hard grey cracking clay (Epipedal, Grey Vertosol)
Hard coarse blocky seasonally cracking grey clay, calcareous and prismatic structured at depth.
- F1** Sandy loam over red brown clay (Hypercalcic, Brown / Red Chromosol)
Thin to medium brown loamy sand to sandy loam with a bleached A2 layer abruptly overlying a brown to red clay, calcareous from 30 cm.
- F2** Hard loam over dispersive brown clay (Hypercalcic, Brown Sodosol)
Medium thickness hard setting loamy sand to loam abruptly overlying a coarsely structured grey brown, yellow and red clay grading to soft carbonate.
- G2** Sand grading to sandy clay loam (Mesotrophic, Brown Kandosol)
Thick to very thick bleached sand, organically darkened at surface, grading to a yellowish brown and red friable massive sandy clay loam.
- G3** Thick sand over clay (Eutrophic / Calcic, Brown / Red Chromosol)
Thick to very thick bleached sand to loamy sand with an organically darkened surface abruptly overlying a friable yellowish brown or red sandy clay, with or without soft carbonate accumulations, over Tertiary sand or Blanchetown Clay.
- 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](#)

